

APPENDIX A

AIR QUALITY AND GREENHOUSE GAS MODELING RESULTS

**Pinole Square Project
CalEEMod Results
Existing Development**




TYPE OF SERVICES	Design-Level Geotechnical Investigation
PROJECT NAME	Pinole Square Shopping Center
LOCATION	1421 Tara Hills Drive Pinole, California
CLIENT	Hillsboro Properties, Inc.
PROJECT NUMBER	856-1-6
DATE	October 31,2019



GEOTECHNICAL

Type of Services	Design-Level Geotechnical Investigation
Project Name	Pinole Square Shopping Center
Location	1421 Tara Hills Drive Pinole, California
Client	Hillsboro Properties, Inc.
Client Address	1300 South El Camino Real, Suite 525 San Mateo, CA
Project Number	856-1-6
Date	October 31, 2019

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APPENDIX A: FIELD INVESTIGATION

APPENDIX B: LABORATORY TEST PROGRAM

APPENDIX C: SITE CORROSIVITY EVALUATION

APPENDIX D: PREVIOUS SUBSURFACE DATA FROM CORNERSTONE ENVIRONMENTAL STUDIES

APPENDIX E: PREVIOUS SUBSURFACE DATA BY OTHERS

Type of Services	Design-Level Geotechnical Investigation
Project Name	Pinole Square Shopping Center
Location	1421 Tara Hills Drive Pinole, California

SECTION 1: INTRODUCTION

This geotechnical report was prepared for the sole use of Hillsboro Properties, Inc. for the Pinole Square Shopping Center in Pinole, California. The location of the site is shown on the Vicinity Map, Figure 1. For our use, we were provided with the following documents:

- A set of plans titled "Pinole Square, DR-17-23, CUP 17-12-CUP 17-18 & VAR 17-1, 1200-1577 Tara Hills Drive, Pinole, CA" prepared by Lowney Architecture, dated August 30, 2019.
- A set of preliminary grading and utility civil plans title "Pinole Square, 1200-1577 Tara Hills Drive, Pinole, CA, Sheets C3.1, C3.2, C4.1, C4.2" prepared by AMS Associates, Inc. dated August 28, 2019.

1.1 PROJECT DESCRIPTION

The project site is located at the southwest corner of the intersection of Tara Hills Drive and Appian Way in Pinole, California. The site is currently occupied by an existing shopping center (Appian 80) consisting of multiple one-story commercial/retail buildings, appurtenant asphalt parking, and landscaping areas. Redevelopment will consist of new commercial, retail, and restaurant buildings with footprints ranging from 4,159 to 55,746 sq. ft to be built in three phases. A new fuel station, canopy, kiosk and underground fuel tanks are proposed in the northern section of site. We expect the commercial, retail, and restaurant buildings to be of wood, concrete, or masonry construction with concrete slab-on-grade floors.

Structural loads are not yet finalized for the proposed structures; however, structural loads are expected to be typical of similar type structures. Preliminary grading plans indicate cuts and fills on the order of 1 to 3 feet would be required for the minor shops and pads. The new major grocery and shops building will require fills ranging from approximately 1 to 6 feet. Minor cuts and fills of approximately 1 foot or less are planned for the parking lot areas.

1.2 SCOPE OF SERVICES

Our scope of services was presented in our proposal dated March 29, 2019 and consisted of field and laboratory programs to evaluate physical and engineering properties of the subsurface soils, engineering analysis to prepare recommendations for site work and grading, building foundations, flatwork, and pavements, and preparation of this report. Brief descriptions of our exploration and laboratory programs are presented below.

1.3 EXPLORATION PROGRAM

Field exploration consisted of 11 borings drilled on October 8 and 9, 2019, with truck-mounted, hollow-stem auger drilling equipment. The borings were drilled to depths ranging from approximately 15 to 40 feet. The borings were backfilled with cement grout in accordance with local requirements; exploration permits were obtained as required by local jurisdictions.

The approximate locations of our exploratory borings are shown on the Site Plan, Figure 2. Details regarding our field program are included in Appendix A.

1.4 LABORATORY TESTING PROGRAM

In addition to visual classification of samples, the laboratory program focused on obtaining data for foundation design and seismic ground deformation estimates. Testing included moisture contents, dry densities, washed sieve analyses, Plasticity Index tests, and triaxial compression tests. Details regarding our laboratory program are included in Appendix B.

1.5 CORROSION EVALUATION

Four samples from our borings from depths from 1 to 5 feet were tested for saturated resistivity, pH, and soluble sulfates and chlorides. JDH Corrosion Consultants prepared a brief corrosion evaluation based on the laboratory data, which is attached to this report in Appendix C. In general, the on-site soils can be characterized as potentially corrosive to buried metal, and non-corrosive to buried concrete.

1.6 ENVIRONMENTAL SERVICES

Cornerstone Earth Group also provided environmental services for this project, including Phase 1 and 2 site assessments; environmental findings and conclusions are provided under separate covers. Exploration logs from our prior environmental studies are presented in Appendix D.

SECTION 2: REGIONAL SETTING

2.1 REGIONAL SEISMICITY

The San Francisco Bay area region 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 2015 revises earlier estimates from their 2008

(2008, [UCERF2](#)) publication. Compared to the previous assessment issued in 2008, the estimated rate of earthquakes around magnitude 6.7 (the size of the destructive 1994 Northridge earthquake) has gone down by about 30 percent. The expected frequency of such events statewide has dropped from an average of one per 4.8 years to about one per 6.3 years. However, in the new study, the estimate for the likelihood that California will experience a magnitude 8 or larger earthquake in the next 30 years has increased from about 4.7 percent for UCERF2 to about 7.0 percent for UCERF3.

UCERF3 estimates that each region of California will experience a magnitude 6.7 or larger earthquake in the next 30 years. Additionally, 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.

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	Distance	
	(miles)	(kilometers)
Hayward (Total Length)	2.6	4.2
Rogers Creek	6.7	10.8
West Napa	12.0	19.3
Concord-Green Valley	12.1	19.5

A regional fault map is presented as Figure 3, illustrating the relative distances of the site to significant fault zones.

SECTION 3: SITE CONDITIONS

3.1 SITE BACKGROUND

Based on our review of the information described in our Phase 1 Environmental Assessment report, prior environmental consultant's reports and available historic topographic and aerial photographs, the general site vicinity appears to have historically consisted mainly of vacant/undeveloped land with little agricultural activities. The site and vicinity appeared as gently sloping hillsides covered by grasses and localized drainages that likely conveyed surface water to one of several seasonal creeks that flowed north to San Francisco Bay. By 1958, Interstate 80 and the Appian Way interchanges were constructed. Fill was placed at the site during the highway construction. By 1968, much of the site vicinity had been developed with mostly residential properties and few commercial properties, mainly located near Appian Way. The existing commercial development appears to have been graded and constructed by the early 1960s. With the exception of a few newer commercial building additions, the site appears to have remained relatively unchanged since the 1990s.

A former Chevron gas station was originally located at the northwest corner of the site. The tanks and associated piping, waste oil and hydraulic lifts were reportedly removed from the site in 1997. Excavations during removal reportedly extended to depths ranging from about 7 to 14 feet below original site grades. Documentation or records of the excavation backfill were not available. The approximate locations of the former tank and piping excavations are shown on the Site Plan, Figure 2.

A car care center with fueling canopy, most recently referred to as the Rent-a-Rack filling station, was constructed near the southwest corner of the site in the early 1970s. The service station reportedly had two 10,000-gallon, one 1,000-gallon and one 500-gallon tanks removed in 1986. In 1987, the UST pits were reportedly re-excavated to a depth of approximately 26 feet to remove potentially impacted soils. Documentation or records of the excavation backfill were not available. The approximate location of the former tank excavation is also shown on the Site Plan, Figure 2.

3.2 SURFACE DESCRIPTION

The approximately 11.9-acre site is currently occupied by an existing retail shopping center referred to as Appian 80. The site is bounded by Tara Hills Drive to the north, Interstate 80 and associated undeveloped Caltrans right-of-way to the south, commercial properties and Appian Way to the east and existing residential development to the west. The site is occupied by one large commercial building at the south end of the site (existing Safeway and former drug store) and five smaller retail buildings along the west end of the site. The remainder of the site, with the exception of the former Chevron gas station, is covered with asphalt concrete paved surface parking and minor landscaping medians.

Based on available topographic plans, site grades generally range from approximately Elevation 195 to 200 feet along the eastern edge of the site to approximately Elevation 182 to 185 feet along the western edge of the site. A man-made fill slope borders the west and south edges of the site, which were constructed at an inclination of approximately 2:1 (horizontal:vertical). The west slope, which occurs just west of the property line on adjacent residential parcels, ranges from roughly 10 to 40 feet high. The south-facing fill slope adjacent to the Caltrans right-of-way ranges from about 40 feet high at the southwest corner to less than 5 feet high behind the southeast corner of the existing Safeway store. The slope transitions to a cut slope ranging up to 30 feet high along the east edge of the site. The approximate locations of the cut and fill slopes are depicted on the Site Plan, Figure 2.

Surface pavements generally consisted of 2 to 6 inches of asphalt concrete over 0 to 8 inches of granular base. Based on visual observations, the existing pavements are in fair to poor condition with localized significant cracking.

3.3 SUBSURFACE CONDITIONS

Below the surface pavements, our explorations generally encountered undocumented (man-made) fill that was primarily placed during original site development in the 1950s and 1960s.

Historic aerial photographs indicate most of the fill was likely derived from cuts made for the construction of Interstate 80 that was imported to the site and possibly from cuts at the east end of the site. The thickness of the original fill generally ranges from less than a few feet along the east edge of the site up to 32 feet thick at the southern edge of the site at Boring EB-10. The approximate thickness of the original fill is presented on Figure 2 at each boring location.

Recent localized undocumented fills are also present at the former gas stations (Chevron and Rent-a-Rack locations), as shown on Figure 2. These fills reportedly range up to 26 feet deep at the Rent-a-Rack site, where USTs and impacted soils were removed and replaced (Fugro 2013), to roughly 7 to 14 feet thick at the former Chevron site (Touchstone Developments 1997). Compaction records for these original and more recent fills were not available; therefore, these fills are considered undocumented.

The original fills primarily consist of alternating layers of stiff to very stiff lean and fat clays with varying percentages of sand and gravel, interbedded with occasional layers of medium dense to very dense clayey sand. The borings drilled for this investigation did not encounter recent fills in the former UST backfill areas; however, based on our review of prior borings drilled in 2013, the Rent-a-Rack UST fill consisted primarily of clay with varying percentages of sand and gravel. The stiffness or density of the Rent-a-Rack UST fill was not reported due to the direct-push method of drilling used (Fugro 2013).

The original and recent fills are underlain by a 2- to 5-foot thick layer of native residual soil consisting of very stiff fat clay. This residual soil layer is underlain by highly weathered, friable, weak bedrock regionally mapped as Tertiary-aged, interbedded sandstone, siltstone and conglomerate (Tcgl, Graymer 1994). Our borings primarily encountered interbedded sandstone, siltstone and some claystone. Conglomerate was not encountered in our borings. A more detailed description of the subsurface conditions is presented on the boring logs in Appendix A.

3.3.1 Plasticity/Expansion Potential

We performed three Plasticity Index (PI) tests on representative samples. Test results were used to evaluate expansion potential of surficial soils. The results of the surficial PI tests indicated PIs ranging from 20 to 36, indicating moderate to high expansion potential to wetting and drying cycles.

3.3.2 In-Situ Moisture Contents

Laboratory testing indicated that the in-situ moisture contents within the upper 15 feet range from 5 to 30 percent over the estimated laboratory optimum moisture.

3.4 GROUNDWATER

Groundwater was not encountered in any of our recent borings during drilling; however, the borings were not left open and were immediately backfilled when the boring was completed. As predominantly clay fill and bedrock were encountered, the borings were not likely left open long enough for water to seep into the boreholes.

We reviewed available groundwater data presented in prior environmental reports, including our recent soil and groundwater quality investigations (July 2019), and prior studies by West Environmental 2016 and Fugro 2013. Groundwater was encountered in Cornerstone environmental borings GW-3 and GW-4 in July 2019 at depths of approximately 15 and 20 feet, respectively, corresponding to Elevation 177 to 182 feet.

Monitoring wells installed in 2015 by West Environmental at the northeast corner of the site indicated groundwater levels ranging from approximately 5 to 17 feet deep, corresponding to Elevation 180 to 195 feet between April 2015 and November 2016. The location of these wells is shown on Figure 2.

Borings B-1, B-3 and B-4 drilled by Fugro in 2013 near the former Rent-a-Rack USTs encountered groundwater at depths of approximately 30 to 42 feet, corresponding to approximately Elevation 148 to 160 feet.

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 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. As shown in Figure 3, no known surface expression of fault traces is thought to cross the site; therefore, fault 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 peak ground acceleration (PGA) was estimated for analysis using a value equal to $F_{PGA} \times PGA$, as allowed in the 2016 edition of the California Building Code. For our analysis we used a PGA of 0.76g.

4.3 LIQUEFACTION POTENTIAL

The site is not currently mapped by the State of California, but is within a zone mapped as having a low liquefaction potential by the Association of Bay Area Governments (ABAG, 2006). However, we screened the site for liquefaction during our site exploration by retrieving samples from the site, performing visual classification on sampled materials, and performing various tests to further classify the soil properties.

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 4 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, we primarily encountered stiff cohesive and dense granular soils underlain by bedrock. In addition, the design ground water level is anticipated to be below any granular soils. Based on the above, our screening of the site for liquefaction indicates a low potential for liquefaction.

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 potential for liquefaction is considered low; therefore, in our opinion, the potential for lateral spreading to affect the site is low.

4.5 SEISMIC SETTLEMENT/UNSATURATED SAND SHAKING

Loose unsaturated sandy soils can settle during strong seismic shaking. As the soils encountered at the site were predominantly stiff to very stiff clays and medium dense to dense sands, in our opinion, the potential for significant differential seismic settlement affecting the proposed improvements is low. The exception is at former underground storage tank (UST) locations. As previously discussed, prior USTs associated with former gas stations have been removed and backfilled. The fill is considered undocumented and may be susceptible to densification following strong ground shaking in the region. Undocumented fills will need to be removed and replaced with compacted fill. Once completed, the potential for seismic settlement should be adequately mitigated. Further discussion is presented in the "Conclusions" section of this report.

4.6 TSUNAMI/SEICHE

The terms tsunami or seiche are described as ocean waves or similar waves usually created by undersea fault movement or by a coastal or submerged landslide. Tsunamis may be generated at great distance from shore (far field events) or nearby (near field events). Waves are formed, as the displaced water moves to regain equilibrium, and radiates across the open water, similar to ripples from a rock being thrown into a pond. When the waveform reaches the coastline, it quickly raises the water level, with water velocities as high as 15 to 20 knots. The water mass, as well as vessels, vehicles, or other objects in its path create tremendous forces as they impact coastal structures.

Tsunamis have affected the coastline along the Pacific Northwest during historic times. The Fort Point tide gauge in San Francisco recorded approximately 21 tsunamis between 1854 and 1964. The 1964 Alaska earthquake generated a recorded wave height of 7.4 feet and drowned eleven people in Crescent City, California. For the case of a far-field event, the Bay area would have hours of warning; for a near field event, there may be only a few minutes of warning, if any.

A tsunami or seiche originating in the Pacific Ocean would lose much of its energy passing through San Francisco Bay. Based on the study of tsunami inundation potential for the San Francisco Bay Area (Ritter and Dupre, 1972), areas most likely to be inundated are marshlands, tidal flats, and former bay margin lands that are now artificially filled, but are still at or below sea level, and are generally within 1½ miles of the shoreline. The site is approximately 1 mile inland from the San Francisco Bay shoreline and is approximately 185 to 200 feet above mean sea level. Therefore, the potential for inundation due to tsunami or seiche is considered low.

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, described as "Area of minimal flood hazard. We recommend the project civil engineer be retained to confirm this information and verify the base flood elevation, if appropriate.

SECTION 5: CONCLUSIONS

5.1 SUMMARY

From a geotechnical viewpoint, the project is feasible provided the concerns listed below are addressed in the project design. Descriptions of each concern with brief outlines of our recommendations follow the listed concerns.

- Presence of undocumented fill
- Presence of moderately to highly expansive soils
- Presences of localized shallow bedrock
- Potential high moisture content of shallow clay fills
- Soil corrosion potential

5.1.1 Undocumented Fill

As discussed in Section 3, our explorations generally encountered undocumented (man-made) fill blanketing most of the site that was primarily placed during original site development in the 1950s and 1960s. Historic aerial photographs indicate most of the fill was likely derived from cuts made for the construction of Interstate 80 that was imported to the site and from cuts at the east end of the site. The thickness of the original fill generally ranges from less than 5 feet along the east edge of the site up to 32 feet thick at the southern edge of the site at Boring

EB-10. The approximate thickness of the original fill is presented on Figure 2 at each boring location.

The original site fill appears relatively firm and consistent where encountered, therefore, most of the fill can remain in place. However, due to the variability of the shallow fills and likely disturbance during site demolition, we recommend that approximately 12 to 18 inches of fill be over-excavated and re-compacted within future building pad areas.

Recent localized fills associated with former Rent-a-Rack fuel UST backfill should be over-excavated and re-compacted to reduce the potential for localized differential settlement within future foundation and slab areas. The approximate location of the former Rent-a-Rack UST backfill is shown on Figure 2. In the former Chevron UST backfill areas, a new parking lot is planned. Therefore, over-excavation and re-compaction can be limited to the shallow portion of the fill. If desired, additional geotechnical exploration, potholing and/or in-situ density testing can be performed prior to or during site demolition to evaluate the density of the prior UST backfill. Recommendations addressing this concern are presented in the "Earthwork" section.

5.1.2 Expansive Soils

Moderately to high expansive surficial soils were encountered in our explorations are varying depths across the site. Expansive soils can undergo significant volume change with changes in moisture content. They shrink and harden when dried and expand and soften when wetted. To reduce the potential for damage to the planned structures, slabs-on-grade should have sufficient reinforcement and be supported on a layer of non-expansive fill; footings should extend below the zone of seasonal moisture fluctuation. 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. Grading and foundation recommendations addressing this concern are presented in the following sections.

5.1.3 Shallow Bedrock

Bedrock was encountered as shallow as 5 feet below current site grades in Boring EB-1. Bedrock was encountered below a depth of 10 feet in the remainder of our borings. The bedrock consists of interbedded sandstone, siltstone and claystone that is generally highly weathered, friable and with relatively low hardness. The bedrock can likely be excavated with conventional earthwork equipment; however, it is possible that localized harder bedrock could be encountered for deep utility or manhole excavations that encounter sandstone. Bedrock in the future underground fuel tank area was encountered at a depth of approximately 14 feet (Boring EB-11). Contractors performing deep excavations should be made aware of the variable soil and bedrock conditions.

5.1.4 High Moisture Content of Shallow Soils

As discuss above, clayey fills generally blanket the site and the moisture content of those clay soils was higher than anticipated. The moisture content of these soils ranged about 25 to 46 percent (average of about 30 percent), which is roughly 7 to 30 percent above the assumed

laboratory optimum moisture content. Although shallow groundwater was not encountered in our recent borings, it is possible the clays remain seasonally moist due to capillary rise and surface water infiltration through existing pavements. Because the site is covered with pavement and building slabs, the soil likely does not dry out seasonally. Therefore, soil excavated during grading and underground utility installation may need to moisture conditioned to roughly 15 to 20 percent moisture prior to re-using the soil as fill material.

5.1.5 Soil Corrosion Potential

A preliminary soil corrosion screening was performed by JDH Corrosion Consultants based on the results of analytical tests on samples of the near-surface soil. In general, the JDH report concludes that the corrosion potential for buried concrete does not warrant the use of sulfate resistant concrete. However, the corrosion potential for buried metallic improvements, such as metal pipes, is considered corrosive. JDH recommends that special requirements for corrosion control be made to protect metal pipes. A more detailed discussion of the site corrosion evaluation is presented in Appendix C.

5.2 PLANS AND SPECIFICATIONS REVIEW

We recommend that we be retained 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.

5.3 CONSTRUCTION OBSERVATION AND TESTING

As site conditions may vary significantly between the small-diameter borings performed during this investigation, we also recommend that a Cornerstone representative be present to provide geotechnical observation and testing during earthwork and foundation construction. This will allow us to form an opinion and prepare a letter at the end of construction regarding contractor compliance with project plans and specifications, and with the recommendations in our report. We will also be allowed to evaluate any conditions differing from those encountered during our investigation and provide supplemental recommendations as necessary. For these reasons, the recommendations in this report are contingent of Cornerstone providing observation and testing during construction. Contractors should provide at least a 48-hour notice when scheduling our field personnel.

SECTION 6: EARTHWORK

6.1 SITE DEMOLITION

All existing improvements not to be reused for the current development, including all foundations, flatwork, pavements, utilities, and other improvements should be demolished and removed from the site. Recommendations in this section apply to the removal of these improvements, which are currently present on the site, prior to the start of mass grading or the construction of new improvements for the project.

Cornerstone should be notified prior to the start of demolition and should be present on at least a part-time basis during all backfill and mass grading as a result of demolition. Occasionally, other types of buried structures (wells, cisterns, debris pits, etc.) can be found on sites with prior development. If encountered, Cornerstone should be contacted to address these types of structures on a case-by-case basis.

6.1.1 Demolition of Existing Slabs, Foundations and Pavements

All slabs, foundations, and pavements should be completely removed from within planned building areas.

As an owner value-engineered option, existing slabs, foundations, and pavements that extend into planned flatwork, pavement, or landscape areas may be left in place provided there is at least 3 feet of engineered fill overlying the remaining materials, they are shown not to conflict with new utilities, and that asphalt and concrete more than 10 feet square is broken up to allow subsurface drainage. Future distress and/or higher maintenance may result from leaving these prior improvements in place. A discussion of recycling existing improvements is provided later in this report.

Special care should be taken during the demolition and removal of existing floor slabs, foundations, utilities and pavements to minimize disturbance of the subgrade. Excessive disturbance of the subgrade, which includes either native or previously placed engineered fill, resulting from demolition activities can have serious detrimental effects on planned foundation and paving elements.

Existing foundations are typically mat-slabs, shallow footings, or piers/piles. If slab or shallow footings are encountered, they should be completely removed. If drilled piers are encountered, they should be cut off at an elevation at least 60-inches below proposed footings or the final subgrade elevation, whichever is deeper. The remainder of the drilled pier could remain in place. Foundation elements to remain in place should be surveyed and superimposed on the proposed development plans to determine the potential for conflicts or detrimental impacts to the planned construction. Following review, additional mitigation or planned foundation elements may need to be modified.

6.1.2 Abandonment of Existing Utilities

All utilities should be completely removed from within planned building areas. For any utility line to be considered acceptable to remain within building areas, the utility line must be completely backfilled with grout or sand-cement slurry (sand slurry is not acceptable), the ends outside the building area capped with concrete, and the trench fills either removed and replaced as engineered fill with the trench side slopes flattened to at least 1:1, or the trench fills are determined not to be a risk to the structure. The assessment of the level of risk posed by the particular utility line will determine whether the utility may be abandoned in place or needs to be completely removed. The contractor should assume that all utilities will be removed from within

building areas unless provided written confirmation from both the owner and the geotechnical engineer.

Utilities extending beyond the building area may be abandoned in place provided the ends are plugged with concrete, they do not conflict with planned improvements, and that the trench fills do not pose significant risk to the planned surface improvements.

The risk for owners associated with abandoning utilities in place include the potential for future differential settlement of existing trench fills, and/or partial collapse and potential ground loss into utility lines that are not completely filled with grout.

6.2 SITE CLEARING AND PREPARATION

6.2.1 Site Stripping

The site should be stripped of all surface vegetation, and surface and subsurface improvements to be removed within the proposed development area. Demolition of existing improvements is discussed in the prior paragraphs. A detailed discussion of re-compaction of existing fills is provided later in this report. Surface vegetation and topsoil, where present in existing landscaping areas, should be stripped to a sufficient depth to remove all material greater than 3 percent organic content by weight. Based on our site observations, surficial stripping should extend about 3 to 6 inches below existing grade in vegetated areas.

6.2.2 Tree and Shrub Removal

Trees and shrubs designated for removal should have the root balls and any roots greater than ½-inch diameter removed completely. Mature trees are estimated to have root balls extending to depths of 2 to 4 feet, depending on the tree size. Significant root zones are anticipated to extend to the diameter of the tree canopy. Grade depressions resulting from root ball removal should be cleaned of loose material and backfilled in accordance with the recommendations in the "Compaction" section of this report.

6.3 EXISTING FILL OVER-EXCAVATION

As discussed, our explorations encountered existing undocumented fills that were reportedly placed during original site construction or during subsequent underground storage tank (UST) removals. The original site fills appear to be relatively firm and do not warrant significant re-compaction. However, we recommend that the upper portion of these original fills be recompacted prior to placement of new fills or foundation construction, as summarized in the following table.

Table 2. Summary of Original Fill Over-Excavation Depths

Building Location	Recommended Over-Excavation Depth ¹ (feet)
Safeway/Major Shops	24
Shops 1	18
Fueling Station Kiosk	12
Fueling Station	12
Pad 1	12

¹ Depth below current site grades in unimproved areas or bottom of existing pavement section or slab-on-grade.

For the former Rent-a-Rack UST backfill area, the depth of the undocumented fill is reportedly up to 26 feet. The fill compaction was not documented and could potentially settle under the weight of future fill and foundation loads. Therefore, on a preliminary basis, we recommend that all former Rent-a-Rack UST backfill be re-excavated and replaced with compacted fill.

For the former Chevron UST backfill area, the depth of the fill reportedly ranges from 5 to 14 feet. The fill compaction was also not documented and could potentially settle under the weight of future fill and parking lot loads. Therefore, on a preliminary basis, we recommend that the former Chevron UST backfill be over-excavated to a depth of 3 feet and replaced with compacted fill.

Re-use of the former UST backfill will need to be further evaluated in accordance with the Site Management Plan prepared by Cornerstone Earth Group dated September 20, 2019. For budgeting purposes, we recommend the above over-excavation depths be used. It may be possible to reduce the depth of UST fill over-excavation if additional subsurface exploration and/or in-situ density testing is performed within the fill. Additional subsurface exploration in the former UST areas could consist of supplemental borings, potholes and/or in-situ density field density testing.

In general, over-excavation should be performed 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. Based on review of the samples collected from our borings, it appears that the fill may be reused. 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 be removed from the site. Backfill of excavations should be placed in lifts and compacted in accordance with the "Compaction" section below.

6.4 TEMPORARY CUT AND FILL SLOPES

The contractor is responsible for maintaining all temporary slopes and providing temporary shoring where required. Temporary shoring, bracing, and cuts/fills should be performed in accordance with the strictest government safety standards. On a preliminary basis, the upper 15 feet at the site may be classified as OSHA Site C materials. A Cornerstone representative should be retained to confirm the preliminary site classification.

Excavations performed during site demolition and fill removal should be sloped at 2:1 (horizontal:vertical) within the upper 5 feet below building subgrade. Excavations extending more than 5 feet below building subgrade and excavations in pavement and flatwork areas should be slope at a 1:1 inclination unless the OSHA soil classification indicates that slope should not exceed 1.5:1.

6.5 SUBGRADE PREPARATION

After site clearing and demolition is complete, and prior to backfilling any excavations resulting from fill over-excavation or demolition, the excavation subgrade and subgrade within areas to receive additional site fills, slabs-on-grade and/or pavements should be scarified to a depth of 12 inches, moisture conditioned, and compacted in accordance with the "Compaction" section below.

6.6 SUBGRADE STABILIZATION MEASURES

Soil subgrade and fill materials, especially soils with high fines contents such as clays and silty soils, can become unstable due to high moisture content, whether from high in-situ moisture contents or from winter rains. As the moisture content increases over the laboratory optimum, it becomes more likely the materials will be subject to softening and yielding (pumping) from construction loading or become unworkable during placement and compaction.

There are several methods to address potential unstable soil conditions and facilitate fill placement and trench backfill. Some of the methods are briefly discussed below. Implementation of the appropriate stabilization measures should be evaluated on a case-by-case basis according to the project construction goals and the particular site conditions.

6.6.1 Scarification and Drying

The subgrade may be scarified to a depth of 6 to 12 inches and allowed to dry to near optimum conditions, if sufficient dry weather is anticipated to allow sufficient drying. More than one round of scarification may be needed to break up the soil clods.

6.6.2 Removal and Replacement

As an alternative to scarification, the contractor may choose to over-excavate the unstable soils and replace them with dry on-site or import materials. A Cornerstone representative should be present to provide recommendations regarding the appropriate depth of over-excavation,

whether a geosynthetic (stabilization fabric or geogrid) is recommended, and what materials are recommended for backfill.

6.6.3 Chemical Treatment

Where the unstable area exceeds about 5,000 to 10,000 square feet and/or site winterization is desired, chemical treatment with quicklime (CaO), kiln-dust, or cement may be more cost-effective than removal and replacement. Recommended chemical treatment depths will typically range from 12 to 18 inches depending on the magnitude of the instability.

6.7 MATERIAL FOR FILL

6.7.1 Re-Use of On-site Soils

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.

6.7.2 Re-Use of On-Site Site Improvements

We anticipate that significant quantities of asphalt concrete (AC) grindings and aggregate base (AB) will be generated during site demolition. If the AC grindings are mixed with the underlying AB to meet Class 2 AB specifications, they may be reused within the new pavement and flatwork structural sections. AC/AB grindings may not be reused within the retail building areas. Laboratory testing will be required to confirm the grindings meet project specifications.

If the site area allows for on-site pulverization of PCC and provided the PCC is pulverized to meet the "Material for Fill" requirements of this report, it may be used as select fill within the retail building areas, excluding the capillary break layer; as typically pulverized PCC comes close to or meets Class 2 AB specifications, the recycled PCC can likely be used within the pavement structural sections. PCC grindings also make good winter construction access roads, similar to a cement-treated base (CTB) section.

6.7.3 Potential Import Sources

Imported fill for use as general building pad fill should be inorganic and have a Plasticity Index of 20 or less; non-expansive material should have a Plasticity Index (PI) of 15 or less. Import fill should not contain recycled asphalt concrete where it will be used within the building areas. To prevent significant caving during trenching or foundation construction, imported material should have sufficient fines. Samples of potential import sources should be delivered to our office at least 10 days prior to the desired import start date. Information regarding the import source should be provided, such as any site geotechnical reports. If the material will be derived from an excavation rather than a stockpile, potholes will likely be required to collect samples from

throughout the depth of the planned cut that will be imported. At a minimum, laboratory testing will include PI tests. Material data sheets for select fill materials (Class 2 aggregate base, ¾-inch crushed rock, quarry fines, etc.) listing current laboratory testing data (not older than 6 months from the import date) may be provided for our review without providing a sample. If current data is not available, specification testing will need to be completed prior to approval.

Environmental and soil corrosion characterization should also be considered by the project team prior to acceptance. Suitable environmental laboratory data to the planned import quantity should be provided to the project environmental consultant; additional laboratory testing may be required based on the project environmental consultant's review. The potential import source should also not be more corrosive than the on-site soils, based on pH, saturated resistivity, and soluble sulfate and chloride testing.

6.7.4 Non-Expansive Fill Using Lime Treatment

As discussed above, non-expansive fill should have a Plasticity Index (PI) of 15 or less. Due to the high clay content and PI of the on-site soil materials, it is not likely that sufficient quantities of non-expansive fill would be generated from cut materials. As an alternative to importing non-expansive fill, chemical treatment can be considered to create non-expansive fill. It has been our experience that high PI clayey soil will likely need to be mixed with at least 3 to 4 percent quicklime (CaO) or approved equivalent to adequately reduce the PI of the on-site soils to 15 or less. If this option is considered, additional laboratory tests should be performed during initial site grading to further evaluate the optimum percentage of quicklime required.

6.8 COMPACTION REQUIREMENTS

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 in accordance with ASTM D1557 (latest version) requirements as shown in the table below. In general, clayey soils should be compacted with sheepfoot 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. The contractor (with input from a Cornerstone representative) should evaluate the in-situ moisture conditions, as the use of vibratory equipment on soils with high moistures can cause unstable conditions. General recommendations for soil stabilization are provided in the "Subgrade Stabilization Measures" section of this report. Where the soil's PI is 20 or greater, the expansive soil criteria should be used.

Table 3: Compaction Requirements

Description	Material Description	Minimum Relative ¹ Compaction (percent)	Moisture ² Content (percent)
General Fill (within upper 5 feet)	On-Site Expansive Soils	87 – 92	>3
	Low Expansion Soils	90	>1
Trench Backfill	On-Site Expansive Soils	87 – 92	>3
Trench Backfill	Low Expansion Soils	90	>1
Trench Backfill (upper 6 inches of subgrade)	On-Site Low Expansion Soils	95	>1
Crushed Rock Fill	¾-inch Clean Crushed Rock	Consolidate In-Place	NA
Non-Expansive Fill	Imported Non-Expansive Fill	90	Optimum
Flatwork Subgrade	On-Site Expansive Soils	87 - 92	>3
Flatwork Subgrade	Low Expansion Soils	90	>1
Flatwork Aggregate Base	Class 2 Aggregate Base ³	90	Optimum
Pavement Subgrade	On-Site Expansive Soils	87 - 92	>3
Pavement Subgrade	Low Expansion Soils	95	>1
Pavement Aggregate Base	Class 2 Aggregate Base ³	95	Optimum
Asphalt Concrete	Asphalt Concrete	95 (Marshall)	NA

1 – Relative compaction based on maximum density determined by ASTM D1557 (latest version)

2 – Moisture content based on optimum moisture content determined by ASTM D1557 (latest version)

3 – Class 2 aggregate base shall conform to Caltrans Standard Specifications, latest edition, except that the relative compaction should be determined by ASTM D1557 (latest version)

4 – Using light-weight compaction or walls should be braced

6.8.1 Construction Moisture Conditioning

Expansive soils can undergo significant volume change when dried then wetted. The contractor should keep all exposed expansive soil subgrade (and also trench excavation side walls) moist until protected by overlying improvements (or trenches are backfilled). If expansive soils are allowed to dry out significantly, re-moisture conditioning may require several days of re-wetting (flooding is not recommended), or deep scarification, moisture conditioning, and re-compaction.

6.9 TRENCH BACKFILL

Utility lines constructed within public right-of-way should be trenched, bedded and shaded, and backfilled in accordance with the local or governing jurisdictional requirements. Utility lines in private improvement areas should be constructed in accordance with the following requirements unless superseded by other governing requirements.

All utility lines should be bedded and shaded to at least 6 inches over the top of the lines with crushed rock (¾-inch-diameter or greater) or well-graded sand and gravel materials conforming

to the pipe manufacturer's requirements. Open-graded shading materials should be consolidated in place with vibratory equipment and well-graded materials should be compacted to at least 90 percent relative compaction with vibratory equipment prior to placing subsequent backfill materials.

General backfill over shading materials may consist of on-site native materials provided they meet the requirements in the "Material for Fill" section, and are moisture conditioned and compacted in accordance with the requirements in the "Compaction" section.

Where utility lines will cross perpendicular to strip footings, the footing should be deepened to encase the utility line, providing sleeves or flexible cushions to protect the pipes from anticipated foundation settlement, or the utility lines should be backfilled to the bottom of footing with sand-cement slurry or lean concrete. Where utility lines will parallel footings and will extend below the "foundation plane of influence," an imaginary 1:1 plane projected down from the bottom edge of the footing, either the footing will need to be deepened so that the pipe is above the foundation plane of influence or the utility trench will need to be backfilled with sand-cement slurry or lean concrete within the influence zone. Sand-cement slurry used within foundation influence zones should have a minimum compressive strength of 75 psi.

On expansive soils sites it is desirable to reduce the potential for water migration into building and pavement areas through the granular shading materials. We recommend that a plug of low-permeability clay soil, sand-cement slurry, or lean concrete be placed within trenches just outside where the trenches pass into building and pavement areas.

6.10 SITE DRAINAGE

Surface runoff should not be allowed to flow over the top of existing fill slopes along the southern edge of the site. Ponding should not be allowed 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 percent towards suitable discharge facilities. Roof runoff should be directed away from building areas in closed conduits, to approved infiltration facilities, or on to hardscaped surfaces that drain to suitable facilities. Retention, detention or infiltration facilities should be spaced at least 10 feet from buildings, and preferably at least 5 feet from slabs-on-grade or pavements. However, if retention, detention or infiltration facilities are located within these zones, we recommend that these treatment facilities meet the requirements in the Storm Water Treatment Design Considerations section of this report.

6.11 LOW-IMPACT DEVELOPMENT (LID) IMPROVEMENTS

The Municipal Regional Permit (MRP) requires regulated projects to treat 100 percent of the amount of runoff identified in Provision C.3.d from a regulated project's drainage area with low impact development (LID) treatment measures onsite or at a joint stormwater treatment facility. LID treatment measures are defined as rainwater harvesting and use, infiltration, evapotranspiration, or biotreatment. A biotreatment system may only be used if it is infeasible to implement harvesting and use, infiltration, or evapotranspiration at a project site.

Technical infeasibility of infiltration may result from site conditions that restrict the operability of infiltration measures and devices. Various factors affecting the feasibility of infiltration treatment may create an environmental risk, structural stability risk, or physically restrict infiltration. The presence of any of these limiting factors may render infiltration technically infeasible for a proposed project. To aid in determining if infiltration may be feasible at the site, we provide the following site information regarding factors that may aid in determining the feasibility of infiltration facilities at the site.

- The near-surface soils at the site are primarily clayey and categorized as Hydrologic Soil Group D. These soils are expected to have infiltration rates of less than 0.2 inches per hour. In our opinion, these clayey soils will significantly limit the infiltration of stormwater.
- Locally, seasonal high ground water is mapped at a depth of about 10 feet or more, and therefore is expected to be at least 10 feet below the base of the infiltration measure.

6.11.1 Storm Water Treatment Design Considerations

If storm water treatment improvements, such as shallow bio-retention swales, basins or pervious pavements, are required as part of the site improvements to satisfy Storm Water Quality (C.3) requirements, we recommend the following items be considered for design and construction.

6.11.1.1 General Bioswale Design Guidelines

- If possible, avoid placing bioswales or basins within 10 feet of the building perimeter or within 5 feet of exterior flatwork or pavements. If bioswales must be constructed within these setbacks, the side(s) and bottom of the trench excavation should be lined with 10-mil visqueen to reduce water infiltration into the surrounding expansive clay.
- Bioswales constructed within 3 feet of proposed buildings may be within the foundation zone of influence for perimeter wall loads. Therefore, where bioswales will parallel foundations and will extend below the "foundation plane of influence," an imaginary 1:1 plane projected down from the bottom edge of the foundation, the foundation will need to be deepened so that the bottom edge of the bioswale filter material is above the foundation plane of influence.
- The bottom of bioswale or detention areas should include a perforated drain placed at a low point, such as a shallow trench or sloped bottom, to reduce water infiltration into the surrounding soils near structural improvements, and to address the low infiltration capacity of the on-site clay soils.

6.11.1.2 Bioswale Infiltration Material

- Gradation specifications for bioswale filter material, if required, should be specified on the grading and improvement plans.
- Compaction requirements for bioswale filter material in non-landscaped areas or in pervious pavement areas, if any, should be indicated on the plans and specifications to satisfy the anticipated use of the infiltration area.
- If required, infiltration (percolation) testing should be performed on representative samples of potential bioswale materials prior to construction to check for general conformance with the specified infiltration rates.
- It should be noted that multiple laboratory tests may be required to evaluate the properties of the bioswale materials, including percolation, landscape suitability and possibly environmental analytical testing depending on the source of the material. We recommend that the landscape architect provide input on the required landscape suitability tests if bioswales are to be planted.
- If bioswales are to be vegetated, the landscape architect should select planting materials that do not reduce or inhibit the water infiltration rate, such as covering the bioswale with grass sod containing a clayey soil base.
- If required by governing agencies, field infiltration testing should be specified on the grading and improvement plans. The appropriate infiltration test method, duration and frequency of testing should be specified in accordance with local requirements.
- Due to the relatively loose consistency and/or high organic content of many bioswale filter materials, long-term settlement of the bioswale medium should be anticipated. To reduce initial volume loss, bioswale filter material should be wetted in 12-inch lifts during placement to pre-consolidate the material. Mechanical compaction should not be allowed, unless specified on the grading and improvement plans, since this could significantly decrease the infiltration rate of the bioswale materials.
- It should be noted that the volume of bioswale filter material may decrease over time depending on the organic content of the material. Additional filter material may need to be added to bioswales after the initial exposure to winter rains and periodically over the life of the bioswale areas, as needed.

6.11.1.3 Bioswale Construction Adjacent to Pavements

If bio-infiltration swales or basins are considered adjacent to proposed parking lots or exterior flatwork, we recommend that mitigative measures be considered in the design and construction of these facilities to reduce potential impacts to flatwork or pavements. Exterior flatwork, concrete curbs, and pavements located directly adjacent to bio-swales may be susceptible to settlement or lateral movement, depending on the configuration of the bioswale and the setback

between the improvements and edge of the swale. To reduce the potential for distress to these improvements due to vertical or lateral movement, the following options should be considered by the project civil engineer:

- Improvements should be setback from the vertical edge of a bioswale such that there is at least 1 foot of horizontal distance between the edge of improvements and the top edge of the bioswale excavation for every 1 foot of vertical bioswale depth, or
- Concrete curbs for pavements, or lateral restraint for exterior flatwork, located directly adjacent to a vertical bioswale cut should be designed to resist lateral earth pressures in accordance with the recommendations in the "Retaining Walls" section of this report, or concrete curbs or edge restraint should be adequately keyed into the native soil or engineered to reduce the potential for rotation or lateral movement of the curbs.

6.12 LANDSCAPE CONSIDERATIONS

Since the near-surface soils are expansive, we recommend greatly reducing the amount of surface water infiltrating these soils near foundations and exterior slabs-on-grade. This can typically be achieved by:

- Using drip irrigation
- Avoiding open planting within 3 feet of the building perimeter or near the top of existing slopes
- Regulating the amount of water distributed to lawns or planter areas by using irrigation timers
- Selecting landscaping that requires little or no watering, especially near foundations.

We recommend that the landscape architect consider these items when developing landscaping plans.

SECTION 7: FOUNDATIONS

7.1 SUMMARY OF RECOMMENDATIONS

In our opinion, the proposed structures may be supported on shallow foundations provided the recommendations in the "Earthwork" section and the sections below are followed.

7.2 SEISMIC DESIGN CRITERIA

We understand that the project structural design will be based on the 2016 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 borings and review of local geology, the site is underlain by very stiff man-made clay fill and native alluvial soil underlain by Tertiary-aged bedrock consisting of interbedded sandstone and siltstone. The subsurface data indicates soil shear strengths of approximately 2,000 psf. Available published data by Wills & Silva (1998) indicates the shear wave velocity for this age bedrock ranges from about 400 to 450 m/s. SPT "N" values for the bedrock were generally greater than 50 blows per foot. Therefore, we have classified the site as Soil Classification C. The mapped spectral acceleration parameters S_s and S_1 were calculated using the ATC Location web-based program *ATC Hazard by Location*, located at <https://hazards.atcouncil.org/>, based on the site coordinates presented below and the site classification. The table below lists the various factors used to determine the seismic coefficients and other parameters.

Table 4: CBC Site Categorization and Site Coefficients

Classification/Coefficient	Design Value
Site Class	C
Site Latitude	37.994395°
Site Longitude	-122.304946°
0.2-second Period Mapped Spectral Acceleration ¹ , S_s	1.978g
1-second Period Mapped Spectral Acceleration ¹ , S_1	0.804g
Short-Period Site Coefficient – F_a	1.0
Long-Period Site Coefficient – F_v	1.3
0.2-second Period, Maximum Considered Earthquake Spectral Response Acceleration Adjusted for Site Effects – S_{MS}	1.978g
1-second Period, Maximum Considered Earthquake Spectral Response Acceleration Adjusted for Site Effects – S_{M1}	1.045g
0.2-second Period, Design Earthquake Spectral Response Acceleration – S_{DS}	1.319g
1-second Period, Design Earthquake Spectral Response Acceleration – S_{D1}	0.697g

¹For Site Class B, 5 percent damped.

7.3 SHALLOW FOUNDATIONS

7.3.1 Spread Footings

The proposed retail buildings and fuel station canopy may be supported on conventional shallow footings that bear on engineered fill and have the minimum dimensions presented in the table below. Bottom of footing is based on lowest adjacent grade, defined as the deeper of the following: 1) bottom of the adjacent interior slab-on-grade, or 2) finished exterior grade, excluding landscaping topsoil.

Table 5: Minimum Footing Dimensions

Building Type	Minimum Footing Width (inches)	Minimum Depth to Bottom of Footing (inches)
Major Retail	18	18
Minor Shops/Pads	15	18
Fuel Canopy	24	24

The deeper footing embedment is due to the presence of expansive soils and is intended to embed the footing below the zone of significant seasonal moisture fluctuation, reducing the potential for differential movement.

Footings constructed to the above dimensions and in accordance with the “Earthwork” recommendations of this report are capable of supporting maximum allowable bearing pressures of 2,000 psf for dead loads, 3,000 psf for combined dead plus live loads, and 4,000 psf for all loads including wind and seismic. These pressures are based on factors of safety of 3.0, 2.0, and 1.5 applied to the ultimate bearing pressure for dead, dead plus live, and all loads, respectively. These pressures are net values; the weight of the footing may be neglected for the portion of the footing extending below grade (typically, the full footing depth). Top and bottom reinforcing steel should be included in continuous footings to help span irregularities and differential settlement.

7.3.2 Footing Settlement

Structural loads were not available at the time this report was prepared. For the Safeway and major shops buildings, we assumed that maximum interior column dead plus real live loads would be on the order of 150 kips and perimeter wall loads would be on the order of 6 to 8 kips per lineal foot. Based on the above loading and the allowable bearing pressures presented above, and assuming undocumented fills associated with the former UST backfill areas are mitigated in accordance with the recommendations presented in the “Earthwork” section, we estimate that the total static footing settlement will be on the order of $\frac{3}{4}$ to 1 inch, with about $\frac{1}{2}$ to $\frac{3}{4}$ inch of post-construction differential settlement between adjacent foundation elements.

For the remaining retail structures (minor shops and pads), we assumed that maximum interior column dead plus real live loads would be on the order of 25 to 50 kips and perimeter wall loads would be on the order of 3 kips per lineal foot or less. We estimate that the total static footing settlement will be on the order of $\frac{1}{2}$ to $\frac{3}{4}$ inch, with about $\frac{1}{2}$ inch of post-construction differential settlement between adjacent foundation elements.

7.3.3 Lateral Loading

Lateral loads may be resisted by friction between the bottom of footing and the supporting subgrade, and also by passive pressures generated against footing sidewalls. An ultimate frictional resistance of 0.45 applied to the footing dead load, and an ultimate passive pressure

based on an equivalent fluid pressure of 450 pcf may be used in design. The structural engineer should apply an appropriate factor of safety (such as 1.5) to the ultimate values above. Where footings are adjacent to landscape areas without hardscape, the upper 12 inches of soil should be neglected when determining passive pressure capacity.

7.3.4 Spread Footing Construction Considerations

Where utility lines will cross perpendicular to strip footings, the footing should be deepened to encase the utility line, providing sleeves or flexible cushions to protect the pipes from anticipated foundation settlement, or the utility lines should be backfilled to the bottom of footing with sand-cement slurry or lean concrete. Where utility lines will parallel footings and will extend below the "foundation plane of influence," an imaginary 1:1 plane projected down from the bottom edge of the footing, either the footing will need to be deepened so that the pipe is above the foundation plane of influence or the utility trench will need to be backfilled with sand-cement slurry or lean concrete within the influence zone. Sand-cement slurry used within foundation influence zones should have a minimum compressive strength of 75 psi.

Footing excavations should be filled as soon as possible or be kept moist until concrete placement by regular sprinkling to prevent desiccation. A Cornerstone representative should observe all footing excavations prior to placing reinforcing steel and concrete. If there is a significant schedule delay between our initial observation and concrete placement, we may need to re-observe the excavations.

7.4 DRILLED PIERS

As an alternative to shallow footings, the proposed structural loads for the fuel island canopy may be supported on drilled, cast-in-place, straight-shaft friction piers. The piers should have a minimum diameter of 24 inches and extend to a depth of at least 15 feet below existing grade or 2 feet into native bedrock, whichever is deeper. Adjacent piers centers should be spaced at least three diameters apart, otherwise, a reduction for group effects may be required.

7.4.1 Vertical Capacity and Estimated Settlement

The vertical capacity of the piers may be designed based on the allowable skin friction values presented below for combined dead plus live loads based on a factor of safety of 2.0; dead loads should not exceed two-thirds of the allowable capacities. The allowable skin friction may be increased by one-third for wind and seismic loads. Frictional resistance to uplift loads may be developed along the pier shafts based on the allowable frictional resistance value shown in the following table.

Table 6: Allowable Skin Friction

Depth Below Existing Grade (feet)	Allowable Skin Friction (psf)	Allowable Uplift Skin Friction (psf)
0 – 10	500	400
10 – 20	700	575

Total settlement of individual piers or pier groups of four or less should not exceed $\frac{1}{4}$ to $\frac{1}{2}$ inch to mobilize static capacities and post-construction differential settlement between piers should not exceed $\frac{1}{4}$ inch due to static loads.

7.4.2 Lateral Capacity

Lateral loads exerted on drilled piers may be resisted by a passive resistance based on an ultimate equivalent fluid pressure of 500 pcf acting against twice the projected area of piers below the pier cap or grade beam within pier groups of two or more and over two pier diameters for single piers, up to a maximum uniform pressure of 3,000 psf at depth. The structural engineer should apply an appropriate factor of safety to the ultimate passive pressures.

7.4.3 Construction Considerations

The excavation of all drilled shafts should be observed by a Cornerstone representative to confirm the soil profile, verify that the piers extend the minimum depth into suitable materials and that the piers are constructed in accordance with our recommendations and project requirements. The drilled shafts should be straight, dry, and relatively free of loose material before reinforcing steel is installed and concrete is placed. If ground water is encountered and cannot be removed from the excavations prior to concrete placement, drilling slurry or casing may be required to stabilize the shaft and the concrete should be placed using a tremie pipe, keeping the tremie pipe below the surface of the concrete to avoid entrapment of water or drilling slurry in the concrete.

SECTION 8: CONCRETE SLABS AND PEDESTRIAN PAVEMENTS

8.1 INTERIOR SLABS-ON-GRADE

As the Plasticity Index (PI) of the surficial soils ranges up to 36, the proposed slabs-on-grade should be supported on at least 18 inches of non-expansive fill (NEF) to reduce the potential for slab damage due to soil heave. The NEF layer should be constructed over subgrade prepared in accordance with the recommendations in the "Earthwork" section of this report. If moisture-sensitive floor coverings are planned, the recommendations in the "Interior Slabs Moisture Protection Considerations" section below may be incorporated in the project design if desired. If significant time elapses between initial subgrade preparation and NEF construction, the subgrade should be proof-rolled to confirm subgrade stability.

The structural engineer should determine the appropriate slab reinforcement for the loading requirements and considering the expansion potential of the underlying soils. For unreinforced concrete slabs, ACI 302.1R recommends limiting control joint spacing to 24 to 36 times the slab thickness in each direction, or a maximum of 18 feet.

8.2 INTERIOR SLABS MOISTURE PROTECTION CONSIDERATIONS

The following general guidelines for concrete slab-on-grade construction where floor coverings are planned are presented for the consideration by the developer, design team, and contractor. These guidelines are based on information obtained from a variety of sources, including the American Concrete Institute (ACI) and are intended to reduce the potential for moisture-related problems causing floor covering failures, and may be supplemented as necessary based on project-specific requirements. The application of these guidelines or not will not affect the geotechnical aspects of the slab-on-grade performance.

- Place a minimum 10-mil vapor retarder conforming to ASTM E 1745, Class C requirements or better directly below the concrete slab; the vapor retarder should extend to the slab edges and be sealed at all seams and penetrations in accordance with manufacturer's recommendations and ASTM E 1643 requirements. A 4-inch-thick capillary break, consisting of crushed rock should be placed below the vapor retarder and consolidated in place with vibratory equipment. The mineral aggregate shall be of such size that the percentage composition by dry weight as determined by laboratory sieves will conform to the following gradation:

Sieve Size	Percentage Passing Sieve
1"	100
3/4"	90 – 100
No. 4	0 – 10

The capillary break rock may be considered as the upper 4 inches of the non-expansive fill previously recommended.

- The concrete water:cement ratio should be 0.45 or less. Mid-range plasticizers may be used to increase concrete workability and facilitate pumping and placement.
- Water should not be added after initial batching unless the slump is less than specified and/or the resulting water:cement ratio will not exceed 0.45.
- Polishing the concrete surface with metal trowels is not recommended.
- Where floor coverings are planned, all concrete surfaces should be properly cured.
- Water vapor emission levels and concrete pH should be determined in accordance with ASTM F1869-98 and F710-98 requirements and evaluated against the floor covering manufacturer's requirements prior to installation.

8.3 EXTERIOR FLATWORK

Exterior concrete flatwork subject to pedestrian and/or occasional light pick up loading should be at least 4 inches thick and supported underlain by at least 6 inches of non-expansive fill overlying subgrade prepared in accordance with the "Earthwork" recommendations of this report. Flatwork that will be subject to heavier or frequent vehicular loading should be designed in accordance with the recommendations in the "Vehicular Pavements" section below. To help reduce the potential for uncontrolled shrinkage cracking, adequate expansion and control joints should be included. Consideration should be given to limiting the control joint spacing to a maximum of about 2 feet in each direction for each inch of concrete thickness. Flatwork should be isolated from adjacent foundations.

SECTION 9: VEHICULAR PAVEMENTS

9.1 ASPHALT CONCRETE

The following asphalt concrete pavement recommendations tabulated below are based on the Procedure 608 of the Caltrans Highway Design Manual, estimated traffic indices for various pavement-loading conditions, and on a design R-value of 5. The design R-value was chosen based on the results of the laboratory testing and engineering judgment considering the variable expansive clay soil conditions.

Table 7: Asphalt Concrete Pavement Recommendations

Design Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base* (inches)	Total Pavement Section Thickness (inches)
4.0	2.5	8.0	10.5
4.5	2.5	10.0	12.5
5.0	3.0	10.0	13.0
5.5	3.0	12.0	14.0
6.0	3.5	13.0	16.5
6.5	4.0	14.0	18.0

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

Frequently, the full asphalt concrete section is not constructed prior to construction traffic loading. This can result in significant loss of asphalt concrete layer life, rutting, or other pavement failures. To improve the pavement life and reduce the potential for pavement distress through construction, we recommend the full design asphalt concrete section be constructed prior to construction traffic loading. Alternatively, a higher traffic index may be chosen for the areas where construction traffic will use the pavements.

Asphalt concrete pavements constructed on expansive subgrade where the adjacent areas will not be irrigated for several months after the pavements are constructed may experience

longitudinal cracking parallel to the pavement edge. Pavements constructed immediately adjacent to existing fill slopes may also experience minor cracking due to gradual creep or changes in soil moisture. These cracks typically form within a few feet of the pavement edge and are due to seasonal wetting and drying of the adjacent soil. The cracking may also occur during construction where the adjacent grade is allowed to significantly dry during the summer, pulling moisture out of the pavement subgrade. Any cracks that form should be sealed with bituminous sealant prior to the start of winter rains. One alternative to reduce the potential for this type of cracking is to install a moisture barrier at least 24 inches deep behind the pavement curb.

9.2 PORTLAND CEMENT CONCRETE

The Portland Cement Concrete (PCC) pavement recommendations outlined below are based on methods presented in ACI 330R-01 – Guide for Design and Construction of Concrete Parking Lots (2001). The following table presents minimum PCC pavements thicknesses for various traffic loading categories and an anticipated Average Daily Truck Traffic (ADTT).

Table 8: PCC Pavement Recommendations

Traffic Category	Minimum PCC Thickness (inches)
Category A – Car Parking Areas and Access Lanes	4.0
Category A-1 – Truck Access Lanes (ADTT = 1)	5.0
Category A-1 – Truck Access Lanes (ADTT = 10)	6.0
Category B – Bus Parking Area and Interior Lanes (ADTT = 25)	6.5
Category C – Bus Entrance and Exterior Lanes (ADTT = 100)	7.0

The PCC thicknesses above are based on a concrete compressive strength of at least 3,500 psi, supporting the PCC on at least 6 inches of Class 2 aggregate base compacted as recommended in the “Earthwork” section, and laterally restraining the PCC with curbs or concrete shoulders. Adequate expansion and control joints should be included. Consideration should be given to limiting the control joint spacing to a maximum of about 2 feet in each direction for each inch of concrete thickness.

9.3 STRESS PADS FOR TRASH ENCLOSURES

Pads where trash containers will be stored, and where garbage trucks will park while emptying trash containers, should be constructed on Portland Cement Concrete. We recommend that the trash enclosure pads and stress (landing) pads where garbage trucks will store, pick up, and

empty trash be increased to a minimum PCC thickness of 8 inches. The compressive strength, underlayment, and construction details should be consistent with the above recommendations for PCC pavements.

9.4 PAVEMENT CUTOFF

Surface water penetration into the pavement section can significantly reduce the pavement life, due to the native expansive clays. While quantifying the life reduction is difficult, a normal 20-year pavement design could be reduced to less than 10 years; therefore, increased long-term maintenance may be required.

It would be beneficial to include a pavement cut-off, such as deepened curbs, redwood-headers, or "Deep-Root Moisture Barriers" that are keyed at least [4] inches into the pavement subgrade. This will help limit the additional long-term maintenance.

SECTION 10: RETAINING WALLS

10.1 STATIC LATERAL EARTH PRESSURES

The structural design of any site retaining wall should include resistance to lateral earth pressures that develop from the soil behind the wall, any undrained water pressure, and surcharge loads acting behind the wall. Provided a drainage system is constructed behind the wall to prevent the build-up of hydrostatic pressures as discussed in the section below, we recommend that the walls with level backfill be designed for the following pressures:

Table 9: Recommended Lateral Earth Pressures

Wall Condition	Lateral Earth Pressure*	Additional Surcharge Loads
Unrestrained – Cantilever Wall	40 pcf	½ of vertical loads at top of wall
Restrained – Braced Wall	40 pcf + 8H** psf	½ of vertical loads at top of wall

* Lateral earth pressures are based on an equivalent fluid pressure for level backfill conditions

** H is the distance in feet between the bottom of footing and top of retained soil

If adequate drainage cannot be provided behind the wall, an additional equivalent fluid pressure of 40 pcf should be added to the values above for both restrained and unrestrained walls for the portion of the wall that will not have drainage. Damp proofing or waterproofing of the walls may be considered where moisture penetration and/or efflorescence are not desired.

10.2 SEISMIC LATERAL EARTH PRESSURES

The 2016 CBC states that lateral pressures from earthquakes should be considered in the design of basements and retaining walls. At this time, we understand that retaining walls less than 6 feet high are planned for the project. In our opinion, design of these walls for seismic lateral earth pressures in addition to static earth pressures is not warranted.

10.3 WALL DRAINAGE

Adequate drainage should be provided by a subdrain system behind all walls. This system should consist of a 4-inch minimum diameter perforated pipe placed near the base of the wall (perforations placed downward). The pipe should be bedded and backfilled with Class 2 Permeable Material per Caltrans Standard Specifications, latest edition. The permeable backfill should extend at least 12 inches out from the wall and to within 2 feet of outside finished grade. Alternatively, ½-inch to ¾-inch crushed rock may be used in place of the Class 2 Permeable Material provided the crushed rock and pipe are enclosed in filter fabric, such as Mirafi 140N or approved equivalent. The upper 2 feet of wall backfill should consist of compacted on-site soil. The subdrain outlet should be connected to a free-draining outlet or sump.

Miradrain, Geotech Drainage Panels, or equivalent drainage matting can be used for wall drainage as an alternative to the Class 2 Permeable Material or drain rock backfill. Horizontal strip drains connecting to the vertical drainage matting may be used in lieu of the perforated pipe and crushed rock section. The vertical drainage panel should be connected to the perforated pipe or horizontal drainage strip at the base of the wall, or to some other closed or through-wall system such as the TotalDrain system from AmerDrain. Sections of horizontal drainage strips should be connected with either the manufacturer's connector pieces or by pulling back the filter fabric, overlapping the panel dimples, and replacing the filter fabric over the connection. At corners, a corner guard, corner connection insert, or a section of crushed rock covered with filter fabric must be used to maintain the drainage path.

Drainage panels should terminate 18 to 24 inches from final exterior grade. The Miradrain panel filter fabric should be extended over the top of and behind the panel to protect it from intrusion of the adjacent soil.

10.4 BACKFILL

Where surface improvements will be located over the retaining wall backfill, such as truck dock walls, backfill placed behind the walls should be compacted to at least 95 percent relative compaction using light compaction equipment. Where no surface improvements are planned, backfill should be compacted to at least 90 percent. If heavy compaction equipment is used, the walls should be temporarily braced.

10.5 FOUNDATIONS

Retaining walls may be supported on a continuous spread footing designed in accordance with the recommendations presented in the "Foundations" section of this report.

SECTION 11: LIMITATIONS

This report, an instrument of professional service, has been prepared for the sole use of Hillsboro Properties, Inc. specifically to support the design of the Pinole Square Shopping Center project in Pinole, California. The opinions, conclusions, and 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.

Recommendations in this report are based upon the soil and ground water conditions encountered during our subsurface exploration. If variations or unsuitable conditions are encountered during construction, Cornerstone must be contacted to provide supplemental recommendations, as needed.

Hillsboro Properties, Inc. may have provided Cornerstone with plans, reports and other documents prepared by others. Hillsboro Properties, Inc. 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.

SECTION 12: REFERENCES

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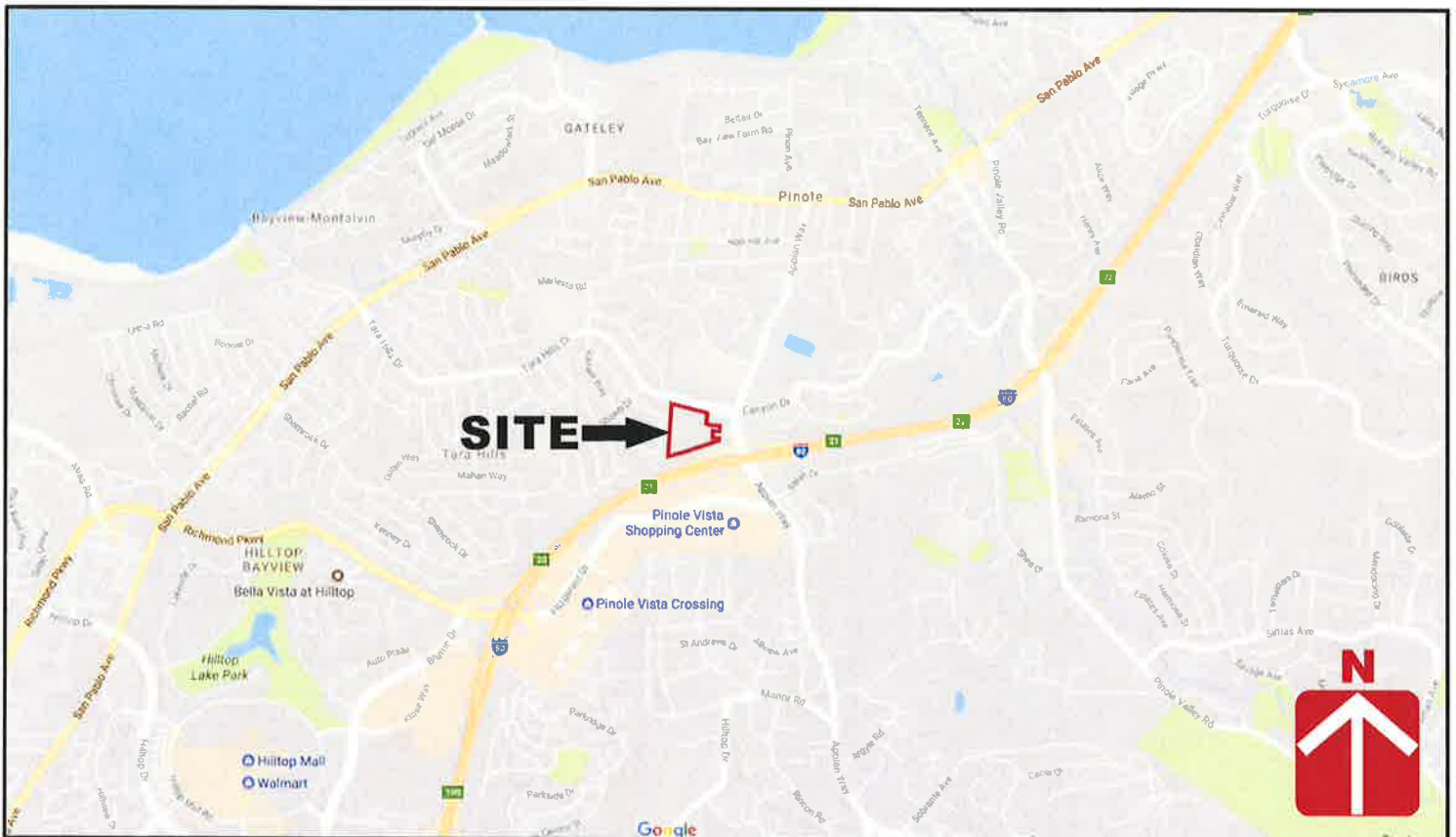
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Vicinity Map

**Appian 80 Shopping Center
Pinole, CA**

Project Number

856-1-6

Figure Number

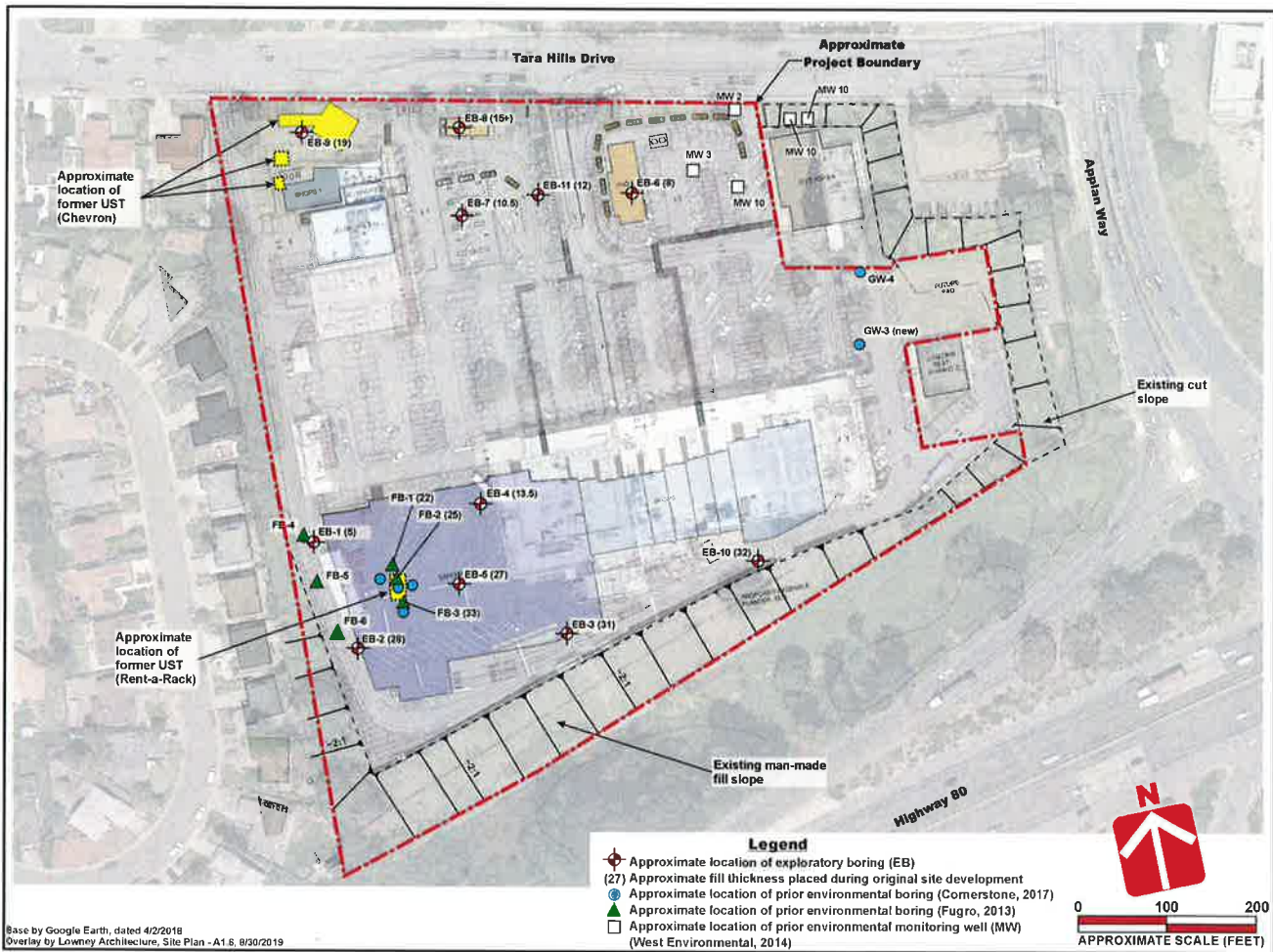
Figure 1

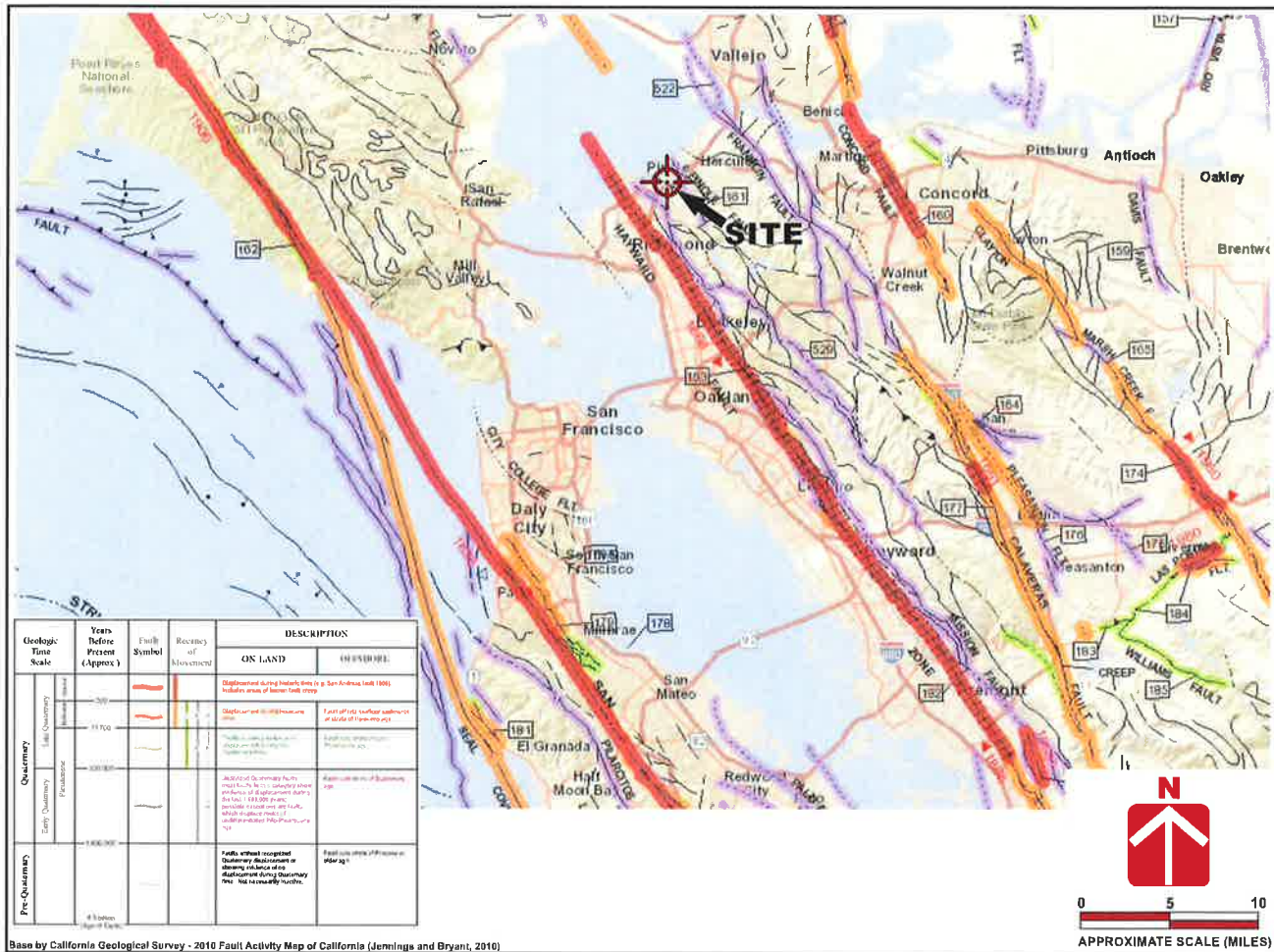
Date

October 2019

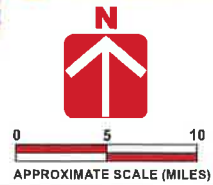
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Based by California Geological Survey - 2010 Fault Activity Map of California (Jennings and Bryant, 2010)



Regional Fault Map

856-1-6

Figure 3

October 2019

Applian 80 Shopping Center

Pinole, CA

CORNERSTONE

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APPENDIX A: FIELD INVESTIGATION

The field investigation consisted of a surface reconnaissance and a subsurface exploration program using truck-mounted, hollow-stem auger drilling. Eleven (11) 8-inch-diameter exploratory borings were drilled on (date) to depths of approximately 15 to 40 feet. The approximate locations of exploratory borings 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 logs, as well as a key to the classification of the soil, are included as part of this appendix.

Boring locations were approximated using existing site boundaries, a hand-held GPS unit, and other site features as references. Boring elevations were based on interpolation of plan contours were not determined. The locations and elevations of the borings 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. 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). 2.5-inch I.D. samples were obtained using a Modified California Sampler driven into the soil with the 140-pound hammer previously described. 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.

Field tests included an evaluation of the unconfined compressive strength of the soil samples using a pocket penetrometer device. The results of these tests are presented on the individual boring logs at the appropriate sample depths.

Attached boring logs and related information depict subsurface conditions at the locations indicated and on the date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these boring 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

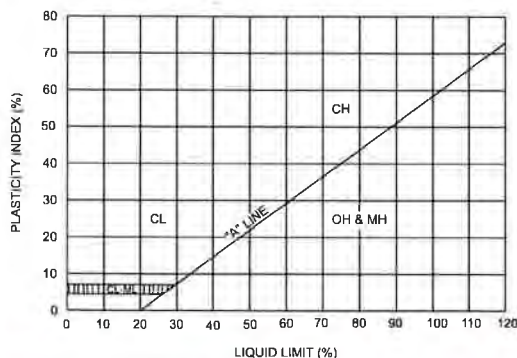
SAMPLER TYPES

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

ADDITIONAL TESTS

CA	CHEMICAL ANALYSIS (CORROSIVITY)	PI	PLASTICITY INDEX
CD	CONSOLIDATED DRAINED TRIAXIAL	SW	SWELL TEST
CN	CONSOLIDATION	TC	CYCLIC TRIAXIAL
CU	CONSOLIDATED UNDRAINED TRIAXIAL	TV	TORVANE SHEAR
DS	DIRECT SHEAR	UC	UNCONFINED COMPRESSION
PP	POCKET PENETROMETER (TSF)	(1.5)	(WITH SHEAR STRENGTH IN KSF)
(3.0)	(WITH SHEAR STRENGTH IN KSF)	UU	UNCONSOLIDATED UNDRAINED TRIAXIAL
RV	R-VALUE		
SA	SIEVE ANALYSIS: % PASSING #200 SIEVE		
	WATER LEVEL		

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



CORNERSTONE EARTH GROUP

BORING NUMBER EB-1

PAGE 1 OF 1

DATE STARTED 10/8/19 DATE COMPLETED 10/8/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Appian 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 15 ft.

LATITUDE 37.99445° LONGITUDE -122.30577°

GROUNDWATER LEVELS:

▽ AT TIME OF DRILLING Not Encountered

▼ AT END OF DRILLING Not Encountered

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
	0		3 inches asphalt concrete over 3 inches aggregate base										
			Sandy Lean Clay (CL) [Fill] very stiff, moist, brown with dark brown mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity	35	MC-1B	93	26					○	
	5			50	MC-2B	95	23					○	
			Sandy Siltstone [Tcgl] low hardness, friable, deep weathering, brown to light brown, fine sand, low plasticity	50	MC								
				56	SPT-4		14						
	10		Silty Sandstone [Tcgl] low hardness, friable, deep weathering, brown to light brown, fine sand										
			Sandy Siltstone [Tcgl] low hardness, friable, deep weathering, brown to light brown, fine sand, low plasticity	51	SPT-5		19						
	15		Bottom of Boring at 15.0 feet.										
	20												
	25												



CORNERSTONE EARTH GROUP

BORING NUMBER EB-2

PAGE 1 OF 2

DATE STARTED 10/9/19 DATE COMPLETED 10/9/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Applan 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 40 ft.

LATITUDE 37.99397° LONGITUDE -122.30567°

GROUNDWATER LEVELS:

▽ AT TIME OF DRILLING Not Encountered

▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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.

DESCRIPTIONN-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
PCFNATURAL
MOISTURE CONTENT

PLASTICITY INDEX, %

PERCENT PASSING
No. 200 SIEVEUNDRAINED SHEAR STRENGTH,
ksf

○ HAND PENETROMETER

△ TORVANE

● UNCONFINED COMPRESSION

▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL

1.0 2.0 3.0 4.0

0	3 inches asphalt concrete over 3 inches aggregate base
	Lean Clay with Sand (CL) [Fill] very stiff, moist, brown with gray mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity Liquid Limit = 38, Plastic Limit = 18
5	Clayey Sand (SC) [Fill] medium dense, moist, brown to grayish brown, fine to medium sand, some fine to coarse sandstone gravel
	Sandy Lean Clay (CL) [Fill] very stiff, moist, gray with dark gray mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity
10	
	Lean Clay with Sand (CL) [Fill] very stiff, moist, dark brown with reddish brown mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity
15	
	Clayey Sand (SC) [Fill] very dense, moist, brown to grayish brown, fine to medium sand, some fine siltstone gravel
20	
	Sandy Lean Clay (CL) [Fill] stiff, moist, gray with dark gray mottles, fine to coarse sand, some fine to coarse siltstone gravel, moderate plasticity
25	

Continued Next Page



CORNERSTONE EARTH GROUP

BORING NUMBER EB-2

PAGE 2 OF 2

PROJECT NAME Appian 80 Shopping CenterPROJECT NUMBER 856-1-6PROJECT LOCATION Pinole, 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

DESCRIPTIONN-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
pcfNATURAL
MOISTURE CONTENT

PLASTICITY INDEX, %

PERCENT PASSING
No. 200 SIEVEUNDRAINED SHEAR STRENGTH,
ksf

○ HAND PENETROMETER

△ TORVANE

● UNCONFINED COMPRESSION

▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL

1.0 2.0 3.0 4.0

Fat Clay (CH) [Residual soil]
very stiff, moist, dark gray, some fine sand,
high plasticity

Sandy Siltstone [Tcgl]
low hardness, friable, deep weathering,
brown to light brown, fine sand, low plasticity

Bottom of Boring at 40.0 feet.

65

MC

50

6"

MC-9B

110

17

80

SPT



CORNERSTONE EARTH GROUP

BORING NUMBER EB-3

PAGE 1 OF 2

DATE STARTED 10/8/19 DATE COMPLETED 10/8/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Appian 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 35.5 ft.

LATITUDE 37.99399° LONGITUDE -122.30489°

GROUNDWATER LEVELS:

▽ AT TIME OF DRILLING Not Encountered

▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

3 inches asphalt concrete over 3 inches aggregate base
Fat Clay with Sand (CH) [Fill]
very stiff, moist, dark brown with light brown mottles, fine to medium sand, some fine to coarse sandstone gravel, high plasticity
Liquid Limit = 51, Plastic Limit = 22
Lean Clay with Sand (CL) [Fill]
very stiff, moist, brown with gray mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Sandy Lean Clay (CL) [Fill]
very stiff, moist, brown with gray mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Fat Clay with Sand (CH) [Fill]
very stiff, moist, dark brown with brown mottles, fine to medium sand, some fine to coarse sandstone gravel, high plasticity

Sandy Lean Clay (CL) [Fill]
very stiff, moist, light brown, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

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
33	MC-1B	76	36	29					○
33	MC-2B	84	31				○		
58	MC-3B	88	35				○		
44	MC-4B	86	31					○	
36	MC-5A	72	42						○
41	SPT							○	
74	MC-7B	87	32						○
50 6"	MC								○

Continued Next Page



CORNERSTONE EARTH GROUP

BORING NUMBER EB-3

PAGE 2 OF 2

PROJECT NAME Applan 80 Shopping CenterPROJECT NUMBER 856-1-6PROJECT LOCATION Pinole, CA

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ELEVATION (ft)

DEPTH (ft)

SYMBOL

DESCRIPTION

Sandy Lean Clay (CL) [Fill]
very stiff, moist, light brown, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Fat Clay (CH) [Residual soil]
very stiff, moist, dark gray, some fine sand, high plasticity

Sandy Siltstone [Tcgl]
low hardness, friable, deep weathering, brown to light brown, fine sand, low plasticity

Bottom of Boring at 35.5 feet.

N-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
pcfNATURAL
MOISTURE CONTENT

PLASTICITY INDEX, %

PERCENT PASSING
No. 200 SIEVEUNDRAINED SHEAR STRENGTH,
ksf

○ HAND PENETROMETER

△ TORVANE

● UNCONFINED COMPRESSION

▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL

1.0 2.0 3.0 4.0

55

MC-9B

61

61

40

SPT

50

5"

MC

50

6"

SPT-12

22



CORNERSTONE EARTH GROUP

BORING NUMBER EB-4

PAGE 1 OF 1

DATE STARTED 10/9/19 DATE COMPLETED 10/9/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Appian 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 27.5 ft.

LATITUDE 37.99444° LONGITUDE -122.30510°

GROUNDWATER LEVELS:

▽ AT TIME OF DRILLING Not Encountered

▽ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

3 inches asphalt concrete over 8 inches aggregate base
Sandy Lean Clay (CL) [Fill]
very stiff, moist, gray with light brown mottles, fine to medium sand, some fine to coarse gravel, moderate plasticity

Sandy Silt (ML) [Fill]
very stiff, moist, brown with gray mottles, fine to medium sand, some fine to coarse sandstone gravel, low plasticity

Fat Clay (CH) [Residual soil]
very stiff, moist, dark gray, some fine sand, high plasticity

becomes hard

Sandy Claystone [Tcgl]
soft, plastic, deep weathering, brown, fine sand, moderate plasticity

Sandy Siltstone [Tcgl]
low hardness, friable, deep weathering, brown to light brown, fine sand, low plasticity

Bottom of Boring at 27.5 feet.

N-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
pcfNATURAL
MOISTURE CONTENT

PLASTICITY INDEX, %

PERCENT PASSING
No. 200 SIEVEUNDRAINED SHEAR STRENGTH,
ksf

○ HAND PENETROMETER

△ TORVANE

● UNCONFINED COMPRESSION

▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL

1.0 2.0 3.0 4.0



CORNERSTONE EARTH GROUP

BORING NUMBER EB-5

PAGE 1 OF 2

DATE STARTED 10/8/19 DATE COMPLETED 10/8/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Appian 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 35 ft.

LATITUDE 37.99421° LONGITUDE -122.30526°

GROUNDWATER LEVELS:

▽ AT TIME OF DRILLING Not Encountered

▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

3 inches asphalt concrete over 3 inches aggregate base

Sandy Silt (ML) [Fill]

very stiff, moist, brown with gray mottles, fine to medium sand, some fine to coarse sandstone gravel, low plasticity

Fat Clay with Sand (CH) [Fill]

stiff, moist, dark brown with light brown mottles, fine to medium sand, some fine to coarse sandstone gravel, high plasticity

Sandy Lean Clay (CL) [Fill]

very stiff, moist, gray with brown mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Clayey Sand (SC) [Fill]

very dense, moist, brown to grayish brown, fine to medium sand, some fine to coarse subangular to subrounded sandstone gravel

Sandy Lean Clay (CL) [Fill]

stiff, moist, dark brown and light brown mottled, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

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

Continued Next Page



CORNERSTONE EARTH GROUP

BORING NUMBER EB-5

PAGE 2 OF 2

PROJECT NAME Applan 80 Shopping CenterPROJECT NUMBER 856-1-6PROJECT LOCATION Pinole, CA

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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									
			Fat Clay (CH) [Residual soil] very stiff, moist, dark gray, some fine sand, high plasticity										
	30			50 6"	MC								○
			Sandy Claystone [Tcgl] soft, plastic, deep weathering, brown, fine sand, moderate plasticity										
	35			77	MC-9B	104	21						○ >4.5
			Bottom of Boring at 35.0 feet.										
	40												
	45												
	50												
	55												



CORNERSTONE EARTH GROUP

BORING NUMBER EB-6

PAGE 1 OF 1

DATE STARTED 10/9/19 DATE COMPLETED 10/9/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Appian 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 20 ft.

LATITUDE 37.99524° LONGITUDE -122.30423°

GROUNDWATER LEVELS:

▽ AT TIME OF DRILLING Not Encountered

▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

2 inches asphalt concrete over 2 inches aggregate base

Lean Clay with Sand (CL) [Fill]
very stiff, moist, dark brown with gray mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Fat Clay with Sand (CH) [Fill]
very stiff, moist, dark brown with light brown mottles, fine to medium sand, some fine to coarse sandstone gravel, high plasticity

Fat Clay (CH) [Residual soil]
very stiff, moist, dark gray, some fine sand, high plasticity

Sandy Claystone [Tcgl]
soft, plastic, deep weathering, brown, fine sand, moderate plasticity

Bottom of Boring at 20.0 feet

N-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
PCFNATURAL
MOISTURE CONTENT

PLASTICITY INDEX, %

PERCENT PASSING
No. 200 SIEVEUNDRAINED SHEAR STRENGTH,
ksf

○ HAND PENETROMETER

△ TORVANE

● UNCONFINED COMPRESSION

▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL

1.0 2.0 3.0 4.0

40

MC-1B

91

30

61

MC-2B

81

33

23

MC-3B

85

24

66

MC-4B

95

23

50
6"

MC-5B

107

19

69

SPT

>4.5

>4.5



CORNERSTONE EARTH GROUP

BORING NUMBER EB-7

PAGE 1 OF 1

DATE STARTED 10/8/19 DATE COMPLETED 10/8/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Aprian 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 20.4 ft.

LATITUDE 37.99530° LONGITUDE -122.30489°

GROUNDWATER LEVELS:

AT TIME OF DRILLING Not Encountered

AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

2 inches asphalt concrete over 3 inches aggregate base

Lean Clay with Sand (CL) [Fill]
hard, moist, brown with gray mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Fat Clay with Sand (CH) [Fill]
hard, moist, dark brown with light brown mottles, fine to medium sand, some fine to coarse sandstone gravel, high plasticity

Lean Clay with Sand (CL) [Fill]
very stiff to hard, moist, gray with brown mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Fat Clay (CH) [Residual soil]
very stiff, moist, dark gray, some fine sand, high plasticity

Sandy Claystone [Tcgl]
soft, plastic, deep weathering, brown, fine sand, moderate plasticity

Claystone [Tcgl]
low hardness, friable, deep weathering, brown to light brown, fine sand, high plasticity

Bottom of Boring at 20.4 feet.

N-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
pcfNATURAL
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

73

MC-1B

86

30

>4.5

49

MC-2B

68

50

>4.5

45

MC-3B

82

36

○

35

MC-4B

88

31

▲

>4.5

59

MC-5B

82

39

▲

○

50

MC-6

90

31

>4.5

50

SPT

5"

>4.5



CORNERSTONE EARTH GROUP

BORING NUMBER EB-8

PAGE 1 OF 1

DATE STARTED 10/8/19 DATE COMPLETED 10/8/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Applan 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 15 ft.

LATITUDE 37.99556° LONGITUDE -122.30481°

GROUNDWATER LEVELS:

AT TIME OF DRILLING Not Encountered

AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

3 inches asphalt concrete over 6 inches aggregate base

Sandy Lean Clay (CL) [Fill]

very stiff, moist, light brown to brown, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Clayey Sand with Gravel (SC) [Fill]

dense to very dense, moist, brown with gray mottles, fine to medium sand, fine to coarse sandstone gravel

Bottom of Boring at 15.0 feet.

N-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
pcfNATURAL
MOISTURE CONTENT

PLASTICITY INDEX, %

PERCENT PASSING
No. 200 SIEVEUNDRAINED SHEAR STRENGTH,
ksf

○ HAND PENETROMETER

△ TORVANE

● UNCONFINED COMPRESSION

▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL

1.0 2.0 3.0 4.0

50
6"

MC-1B

83

27

50
6"

MC

50

SPT-3

24

47

SPT

45

SPT-5

38



CORNERSTONE EARTH GROUP

BORING NUMBER EB-9

PAGE 1 OF 1

DATE STARTED 10/9/19 DATE COMPLETED 10/9/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Applan 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 25 ft.

LATITUDE 37.99571° LONGITUDE -122.30541°

GROUNDWATER LEVELS:

AT TIME OF DRILLING Not Encountered

AT END OF DRILLING Not Encountered

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				
	0		Clayey Sand with Gravel (SC) [Fill] very dense, moist, light brown, fine to medium sand, fine to coarse subangular to subrounded sandstone gravel	50 6"	MC-1B	83	22							
			Sandy Lean Clay (CL) [Fill] hard, moist, light brown, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity	78	MC-2B	92	24							>4.5 ○
	5			23	SPT-3		31							
			Fat Clay with Sand (CH) [Fill] very stiff, moist, dark brown with light brown mottles, fine to medium sand, some fine to coarse sandstone gravel, high plasticity	19	SPT									
	10			26	SPT-5		40							
			Lean Clay with Sand (CL) [Fill] very stiff, moist, light brown with dark brown mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity	37	SPT									
	15													
			Fat Clay (CH) [Residual soil] very stiff, moist, dark gray, some fine sand, high plasticity	29	SPT-7B		21							○
	20													
			Silty Sandstone [Tcgl] low hardness, friable, deep weathering, brown to light brown, fine sand	77	SPT									
	25		Bottom of Boring at 25.0 feet.											



CORNERSTONE EARTH GROUP

BORING NUMBER EB-10

PAGE 1 OF 2

DATE STARTED 10/9/19 DATE COMPLETED 10/9/19
 DRILLING CONTRACTOR Geoservices Exploration Inc.
 DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger
 LOGGED BY BCG
 NOTES _____

PROJECT NAME Applan 80 Shopping Center
 PROJECT NUMBER 856-1-6
 PROJECT LOCATION Pinole, CA
 GROUND ELEVATION _____ BORING DEPTH 35 ft.
 LATITUDE 37.99406° LONGITUDE -122.30411°
 GROUNDWATER LEVELS:
 ▽ AT TIME OF DRILLING Not Encountered
 ▽ AT END OF DRILLING Not Encountered

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
	0		6 inches asphalt concrete										
			Fat Clay with Sand (CH) [Fill] very stiff, moist, dark brown with light brown mottles, fine to medium sand, some fine to coarse sandstone gravel, high plasticity Liquid Limit = 51, Plastic Limit = 15	53	MC-1B	91	27	36					
				49	MC-2B	82	31						
	5			62	MC-3B	85	33						
			Lean Clay with Sand (CL) [Fill] very stiff, moist, dark brown with brown mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity	58	MC-4B	83	35						
	10												
			Sandy Lean Clay (CL) [Fill] very stiff, moist, light brown, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity	50 5"	MC-5B	82	33						
	15												
			Lean Clay with Sand (CL) [Fill] very stiff, moist, dark brown with brown mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity	34	SPT								
	20												
				58	SPT-7		37						
	25												

Continued Next Page



CORNERSTONE EARTH GROUP

BORING NUMBER EB-10

PAGE 2 OF 2

PROJECT NAME Applan 80 Shopping CenterPROJECT NUMBER 856-1-6PROJECT LOCATION Pinole, CA

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ELEVATION (ft)

DEPTH (ft)

SYMBOL

DESCRIPTIONN-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
PCFNATURAL
MOISTURE CONTENT

PLASTICITY INDEX, %

PERCENT PASSING
No. 200 SIEVEUNDRAINED SHEAR STRENGTH,
ksf

○ HAND PENETROMETER

△ TORVANE

● UNCONFINED COMPRESSION

▲ UNCONSOLIDATED-UNDRAINED
TRIAXIAL

1.0 2.0 3.0 4.0

Lean Clay with Sand (CL) [Fill]
very stiff, moist, dark brown with brown
mottles, fine to medium sand, some fine to
coarse sandstone gravel, moderate plasticity

48

SPT

30

Fat Clay (CH) [Residual soil]
very stiff, moist, dark gray, some fine sand,
high plasticity

26

SPT

35

Sandy Claystone [Tcgl]
soft, plastic, deep weathering, brown, fine
sand, moderate plasticity

Bottom of Boring at 35.0 feet.

40

45

50

55



CORNERSTONE EARTH GROUP

BORING NUMBER EB-11

PAGE 1 OF 1

DATE STARTED 10/8/19 DATE COMPLETED 10/8/19

DRILLING CONTRACTOR Geoservices Exploration Inc.

DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger

LOGGED BY BCG

NOTES

PROJECT NAME Applan 80 Shopping Center

PROJECT NUMBER 856-1-6

PROJECT LOCATION Pinole, CA

GROUND ELEVATION BORING DEPTH 15 ft.

LATITUDE 37.99531° LONGITUDE -122.30457°

GROUNDWATER LEVELS:

▽ AT TIME OF DRILLING Not Encountered

▽ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

3 inches asphalt concrete over 4 inches aggregate base

Lean Clay with Sand (CL) [Fill]

very stiff, moist, dark brown with gray mottles, fine to medium sand, some fine to coarse sandstone gravel, moderate plasticity

Sandy Fat Clay (CH) [Fill]

very stiff, moist, dark brown with light brown mottles, fine to medium sand, some fine to coarse siltstone gravel, high plasticity

Fat Clay (CH) [Residual soil]

very stiff, moist, dark gray, some fine sand, high plasticity

Sandy Claystone [Tcgl]

soft, plastic, deep weathering, brown, fine sand, moderate plasticity

Bottom of Boring at 15.0 feet.

N-Value (uncorrected)
blows per footSAMPLES
TYPE AND NUMBERDRY UNIT WEIGHT
PCFNATURAL
MOISTURE CONTENT

PLASTICITY INDEX, %

PERCENT PASSING
No. 200 SIEVEUNDRAINED SHEAR STRENGTH,
ksf

○ HAND PENETROMETER

△ TORVANE

● UNCONFINED COMPRESSION

▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL

1.0 2.0 3.0 4.0

APPENDIX B: LABORATORY TEST PROGRAM

The laboratory testing program was performed to evaluate the physical and mechanical properties of the soils retrieved from the site to aid in verifying soil classification.

Moisture Content: The natural water content was determined (ASTM D2216) on 59 samples of the materials recovered from the borings. These water contents are recorded on the boring logs at the appropriate sample depths.

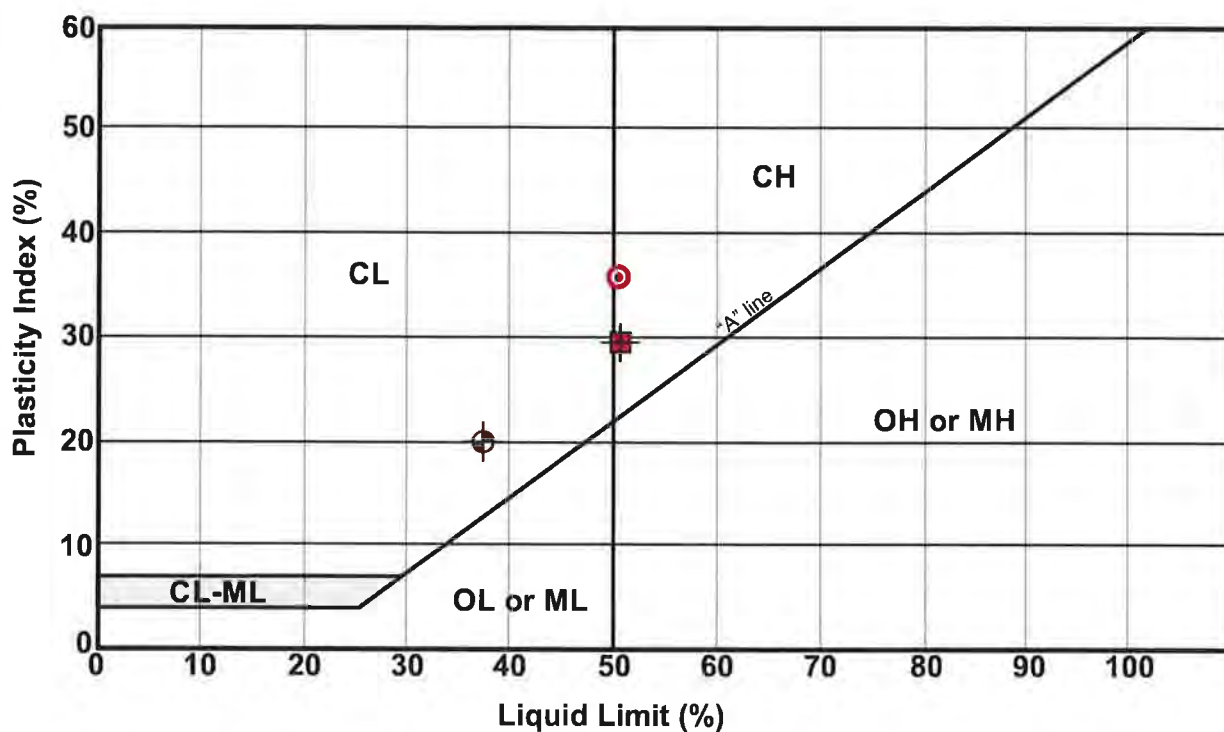
Dry Densities: In place dry density determinations (ASTM D2937) were performed on 49 samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

Washed Sieve Analyses: The percent soil fraction passing the No. 200 sieve (ASTM D1140) was determined on one sample of the subsurface soils to aid in the classification of these soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

Plasticity Index: Three Plasticity Index determinations (ASTM D4318) were performed on samples of the subsurface soils to measure the range of water contents over which this material exhibits plasticity. The Plasticity Index was 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 shown on the boring logs at the appropriate sample depths.

Undrained-Unconsolidated Triaxial Shear Strength: The undrained shear strength was determined on two relatively undisturbed sample(s) by unconsolidated-undrained triaxial shear strength testing (ASTM D2850). The results of this test are included as part of this appendix.

Plasticity Index (ASTM D4318) Testing Summary



Symbol	Boring No.	Depth (ft)	Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Passing No. 200 (%)	Group Name (USCS - ASTM D2487)
⊗	EB-2	4.0	31	38	18	20	—	Lean Clay with Sand (CL) [Fill]
⊠	EB-3	2.0	36	51	22	29	—	Fat Clay with Sand (CH) [Fill]
⊙	EB-10	2.0	27	51	15	36	—	Fat Clay with Sand (CH) [Fill]



**CORNERSTONE
EARTH GROUP**

Plasticity Index Testing Summary

**Appian 80 Shopping Center
Pinole, CA**

Project Number

856-1-6

Figure Number

Figure B1

Date

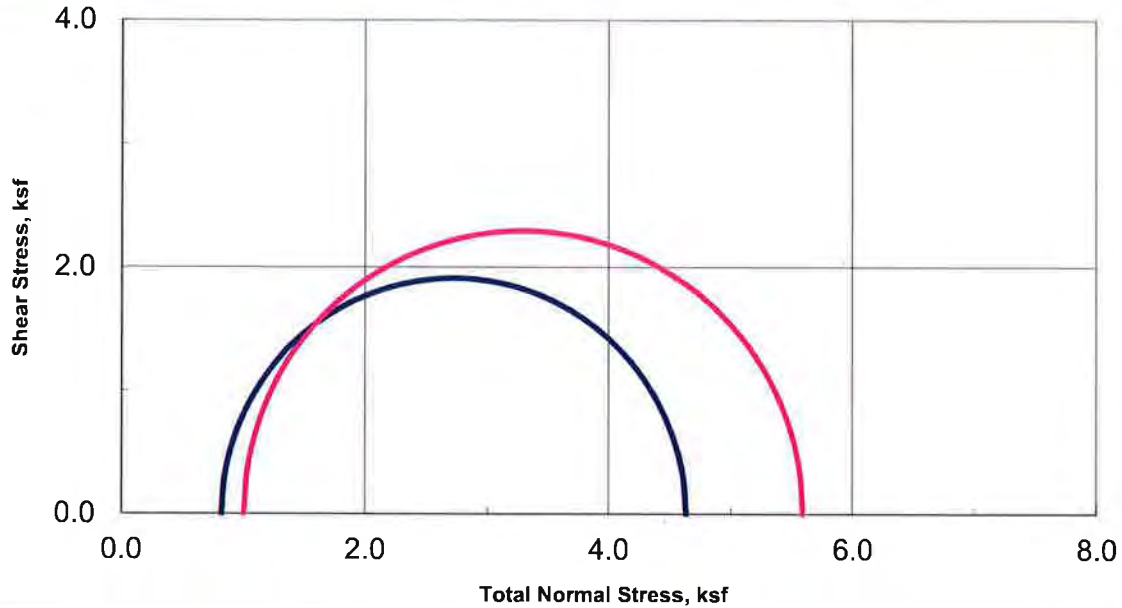
October 2019

Drawn By

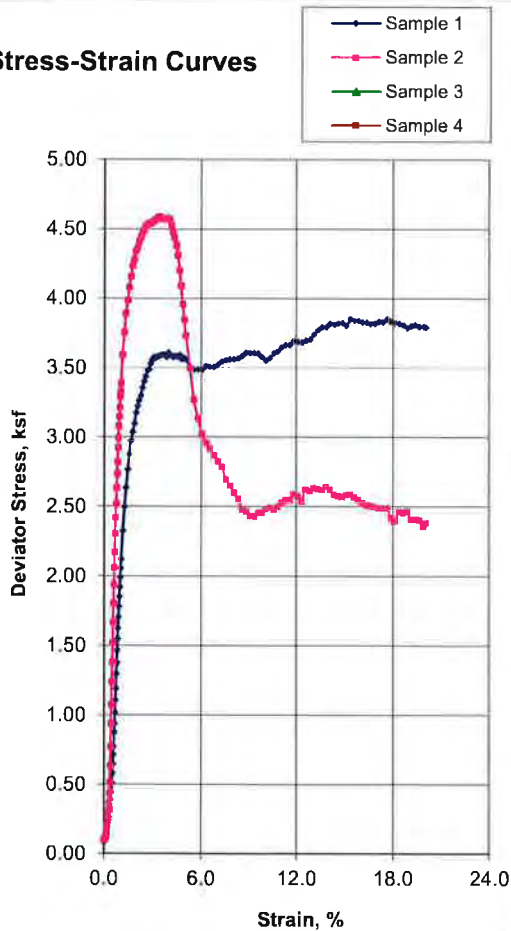
FLL



Unconsolidated-Undrained Triaxial Test ASTM D2850



Stress-Strain Curves



Sample Data

	1	2	3	4
Moisture %	30.5	38.9		
Dry Den,pcf	88.1	81.8		
Void Ratio	0.912	1.061		
Saturation %	90.1	99.1		
Height in	5.03	5.01		
Diameter in	2.39	2.41		
Cell psi	5.7	6.9		
Strain %	15.00	3.34		
Deviator, ksf	3.822	4.591		
Rate %/min	1.00	1.00		
in/min	0.050	0.050		
Job No.:	640-1358			
Client:	Cornerstone Earth Group			
Project:	856-1-6			
Boring:	EB-7	EB-7		
Sample:	4B	5B		
Depth ft:	9.5	14.0		

Visual Soil Description

Sample #	
1	Dark Olive Gray Clayey GRAVEL w/ Sand
2	Olive Brown Sandy CLAY
3	
4	

Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

APPENDIX C: SITE CORROSIVITY EVALUATION

JDH CORROSION CONSULTANTS REPORT DATED OCTOBER 30, 2019

October 30, 2019

Cornerstone Earth Group, Inc.
1220 Oakland Blvd, Suite 220
Walnut Creek, California 94596

Attention: **John R. Dye, P.E., G.E.**
Principal Engineer

Subject: **Site Corrosivity Evaluation**
Pinole Square Shopping Center
Pinole, CA
Project: 856-1-6

Dear John,

In accordance with your request, we have reviewed the laboratory soils data for the above referenced project site. Our evaluation of these results and our corresponding recommendations for corrosion control for the above referenced project foundations and buried site utilities are presented herein for your consideration.

Soil Testing & Analysis

Soil Chemical Analysis

Four (4) soil samples from the project site were chemically analyzed for corrosivity by **Cooper Testing Laboratories**. Each sample was analyzed for chloride and sulfate concentration, pH, resistivity at 100% saturation and moisture percentage. The test results are presented in Cooper Testing Laboratories Corrosivity Test Summary dated 10/22/2019. The results of the chemical analysis were as follows:

Soil Laboratory Analysis

Chemical Analysis	Range of Results	Corrosion Classification*
Chlorides	2 – 10 mg/kg	Non-corrosive*
Sulfates	12 – 66 mg/kg	Non-corrosive**
pH	7.6 – 8.1	Non-corrosive*
Moisture (%)	13.0 – 36.3 %	Not-applicable
Resistivity at 100% Saturation	1,044 – 1,699 ohm-cm	Corrosive*

* With respect to bare steel or ductile iron.

** With respect to mortar coated steel

Discussion

Reinforced Concrete Foundations

Due to the low levels of water-soluble sulfates found in these soils, there is no special requirement for sulfate resistant concrete to be used at this site. The type of cement used should be in accordance with California Building Code (CBC) for soils which have less than 0.10 percent by weight of water soluble sulfate (SO_4) in soil and the minimum depth of cover for the reinforcing steel should be as specified in CBC as well.

Underground Metallic Pipelines

The soils at the project site are generally considered to be "corrosive" to ductile/cast iron, steel and dielectric coated steel based on the saturated resistivity measurements. Therefore, special requirements for corrosion control are required for buried metallic utilities at this site depending upon the critical nature of the piping. Pressure piping systems such as domestic and fire water should be provided with appropriate coating systems and cathodic protection, where warranted. In addition, all underground pipelines should be electrically isolated from above grade structures, reinforced concrete structures and copper lines in order to avoid potential galvanic corrosion problems.

LIMITATIONS

The conclusions and recommendations contained in this report are based on the information and assumptions referenced herein. All services provided herein were performed by persons who are experienced and skilled in providing these types of services and in accordance with the standards of workmanship in this profession. No other warranties or guarantees, expressed or implied, is provided.

We thank you for the opportunity to be of service to **Cornerstone Earth Group** on this project and trust that you find the enclosed information satisfactory. If you have any questions, or if we can be of any additional assistance, please feel free to contact us at (925) 927-6630.

Respectfully submitted,

Brendon Hurley

Brendon Hurley
JDH Corrosion Consultants, Inc.
Field Technician

Mohammed Ali

Mohammed Ali, P.E.
JDH Corrosion Consultants, Inc.
Principal

CC: File19265



APPENDIX D: PREVIOUS SUBSURFACE DATA FROM CORNERSTONE ENVIRONMENTAL STUDIES



CORNERSTONE EARTH GROUP

BORING NUMBER GW-3 (NEW)

PAGE 1 OF 1

DATE STARTED 7/25/19 DATE COMPLETED 7/25/19

DRILLING CONTRACTOR Penecore

DRILLING METHOD Direct Push

LOGGED BY NKM

NOTES

PROJECT NAME Pinole Square Additional Drycleaner Investigation

PROJECT NUMBER 856-1-5

PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CA

GROUND ELEVATION BORING DEPTH 17.5 ft.

LATITUDE LONGITUDE

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 15 ft.

▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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.

DESCRIPTION

3 inches asphalt concrete
Sandy Lean Clay with Gravel (CL)
fine sand, fine subrounded gravel

Fat Clay (CH)
moist, dark brown

Lean Clay (CL)
moist, brown

Poorly Graded Sand (SP)
moist, brown, fine sand

becomes wet at 15'

Bottom of Boring at 17.5 feet.

N-Value (uncorrected)
blows per foot

Sample Type and Interval
Sample Submitted for
Laboratory Analysis

Percent Recovery
(%)

OM Reading
(ppm)

Odors or Discoloration

Notes



CORNERSTONE EARTH GROUP

BORING NUMBER GW-4

PAGE 1 OF 1

DATE STARTED 7/25/19 DATE COMPLETED 7/25/19

DRILLING CONTRACTOR Penecore

DRILLING METHOD Direct Push

LOGGED BY NKM

NOTES

PROJECT NAME Pinole Square Additional Drycleaner Investigation

PROJECT NUMBER 856-1-5

PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CA

GROUND ELEVATION BORING DEPTH 22.5 ft.

LATITUDE LONGITUDE

GROUND WATER LEVELS:

AT TIME OF DRILLING 20.5 ft.

AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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.

DESCRIPTION

3 inches asphalt concrete

Fat Clay (CH)
moist, dark brown**Lean Clay with Sand (CL)**
moist, brown, fine sand**Poorly Graded Sand (SP)**
brown, fine sand**Lean Clay with Sand (CL)**
moist, orange and brown mottling, fine sand**Fat Clay (CH)**
wet**Lean Clay with Sand (CL)**
moist, gray**Clayey Sand (SC)**
wet, gray

Bottom of Boring at 22.5 feet.

N-Value (uncorrected)
blows per foot

Sample Type and Interval

Sample Submitted for
Laboratory AnalysisPercent Recovery
(%)OVM Reading
(ppm)

















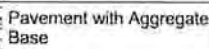
Odors or Discoloration

Notes

CORNERSTONE GE LOG DEC192007 - CORNERSTONE 0812.GDT - 7/29/19 14:16 - P:\DRAFTING\GINT FILES\856-1-5 PINOLE SQUARE GE.GPJ

APPENDIX E: PREVIOUS SUBSURFACE DATA BY OTHERS

CLASSIFICATION AND MATERIAL SYMBOLS

MAJOR DIVISIONS PER ASTM D2488-06			MAJOR GROUP NAMES AND MATERIAL SYMBOLS		
COARSE-GRAINED SOILS More than 50% retained on the No. 200 sieve	GRAVELS	Clean gravels less than 5% fines	GW		Well-Graded GRAVEL
			GP		Poorly Graded GRAVEL
		Gravels with more than 12% fines	GM		SILTY GRAVEL
			GC		CLAYEY GRAVEL
	SANDS	Clean sand less than 5% fines	SW		Well-Graded SAND
			SP		Poorly Graded SAND
		Sands with more than 12% fines	SM		SILTY SAND
			SC		CLAYEY SAND
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	SILTS AND CLAYS	Liquid Limit Less than 50%	ML		SILT
			CL		Lean CLAY
			OL		ORGANIC SILT
	SILTS AND CLAYS	Liquid Limit Greater than 50%	MH		Elastic SILT
			CH		Fat CLAY
			OH		ORGANIC CLAY
	HIGHLY ORGANIC SOILS	PT		Peat or Highly Organic Soils	
Notes: Classification of soils on the boring logs is in general accordance with ASTM D2488, or D2487 if appropriate laboratory data are available The geologic formation is noted in bold font at the top of interpreted interval on the boring logs.			OTHER MATERIAL SYMBOLS		
				Debris or Mixed Fill	
				Pavement with Aggregate Base	

SAMPLER TYPE

Note: Refer to text of report for additional details or other sampler types.

BLOW COUNT

Number of blows required to drive sampler each of three 6-in. intervals, as measured in the field (uncorrected). An SPT hammer (140 lb., falling 30-in.) was used unless otherwise noted on the boring log. For example:

Blow Count	Description
5 7 8	5, 7, and 8 blows for first, second, and third interval, respectively.
35 50/3"	35 blows for the first interval. 50 blows for the first 3 inches of the second interval. Lack of third value implies that driving was stopped 3 inches into the second interval.
WOH WOH 5	"WOH" indicates that the weight of the hammer was sufficient to advance the sampler over the first two intervals. 5 blows were required to advance the sampler over the third interval.

N-VALUE

The N-Value represents the blowcount for the last 12 inches of the sample drive if three 6-inch intervals were driven. N-value presented is independent of impact energy. If 50 hammer blows were insufficient to drive through either the second or the third interval, the total number of blows and total length driven are reported (excluding the first interval). "ref" (refusal) indicates that 50 blows were insufficient to drive through the first 6-inch interval.

Parenthesis indicate that an approximate correction has been applied for non-SPT drive samplers. For example, a factor of 0.63 is commonly used to adjust blow counts obtained using a 3-inch outside diameter modified California sampler to correspond to Standard Penetration Test.

UNDRAINED SHEAR STRENGTH

A value of undrained shear strength is reported. The value is followed by a letter code indicating the type of test that was performed, as follows:

- U - Unconfined Compression
- Q - Unconsolidated Undrained Triaxial
- T - Torvane
- P - Pocket Penetrometer
- M - Miniature Vane
- F - Field Vane
- R - R-value

OTHER TESTS

Field or laboratory tests without a dedicated column on the boring log are reported in the Other Tests column. A letter code is used to indicate the type of test. For certain tests, a value representing the test result is also provided. Typical letter codes are as follows. Additional codes may be used. Refer to the report text and the laboratory testing results for additional information.

- k - Permeability (cm/s)
- Consol - Consolidation
- Gs - Specific Gravity
- MA - Particle Size Analysis
- EI - Expansion Index
- OVM - Organic Vapor Meter

WATER LEVEL SYMBOLS

-
-
-

INCREASING MOISTURE CONTENT

-
-
-

CONSISTENCY OF COHESIVE SOIL

CONSISTENCY	UNDRAINED SHEAR STRENGTH (KIPS PER SQUARE FOOT)
Very Soft	< 0.25
Soft	0.25 to 0.50
Medium Stiff	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	> 4.0

Note: In absence of test data, consistency has been estimated based on manual observation.

APPARENT DENSITY OF COHESIONLESS SOIL

APPARENT DENSITY	N-VALUE
Very Loose	0 to 4
Loose	5 to 9
Medium Dense	10 to 29
Dense	30 to 49
Very Dense	> 49

DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	LOCATION:	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u , ksf	OTHER TESTS
						271 Tara Hills Drive							
						3" Asphalt Pavement, 3" Concrete							PID = 0.5
						ARTIFICIAL FILL (af)							PID = 4.4
						CLAYEY SILT (MH): yellowish brown, moist, occasional medium subrounded gravel, no odor or staining							PID = 14
						- color change to bluish gray, slight hydrocarbon (gasoline) odor							PID = 1.0
						Lean CLAY with GRAVEL (CL): brown, moist, with gray mottling, subangular gravel, low plasticity, no odor or staining							PID = 0.8
						SILTY CLAY with GRAVEL (CL-ML): gray, moist, low plasticity, medium to coarse angular gravel, no staining, slight hydrocarbon (gasoline) odor							PID = 1.6
						Lean CLAY with GRAVEL (CL): dark brown, moist, low plasticity, fine to coarse gravel, pockets of gray clay observed. Iron oxide staining, slight hydrocarbon (gasoline) odor							PID = 5.1
						SILTY SAND (SM): bluish-gray, moist, fine grained, no staining, moderate hydrocarbon (gasoline) odor							PID = 10.9
						Lean CLAY with GRAVEL (CL): black, moist, low plasticity, medium to coarse angular gravel, no staining, moderate hydrocarbon (gasoline) odor							PID = 42.6
						- organics present (wood)							PID = 66
						SILTY CLAY (CL-ML): bluish-gray, moist, low plasticity, no staining, slight hydrocarbon (gasoline) odor							PID = 7.6
						NATIVE							PID = 2.8
						CLAYEY SILT (MH): yellowish brown, moist, no odor or staining							PID = 2.0
						- some fine grained sand							PID = 1.6
						- bluish gray clay inclusions							PID = 1.8
						SANDY Lean CLAY (CL): bluish-gray, moist, low plasticity, medium to coarse grained sand, no odor, iron oxide staining							PID = 1.3
						- moisture increasing to very moist							PID = 1.6
						CLAYEY SAND (SC): brown, moist to wet, medium to coarse grained sand, no odor or staining							PID = 237
						CLAYEY SILT (MH): brown, moist, low plasticity, no odor, iron oxide staining							PID = 8.5
						- Bluish-gray staining							PID = 3.3
						Lean CLAY (CL): bluish-gray, moist, low plasticity, no staining, moderate hydrocarbon (gasoline) odor							PID = 0.7
						CLAYEY SILT (MH): brown, moist, low plasticity, no odor, iron oxide staining							PID = 0.6
						- bluish gray clay inclusions							
						water encountered at 39.85 ft bgs, measured at 14:49							
						Lean CLAY (CL): grayish brown, dry, moderate plasticity, no odor or staining							
						- Iron oxide staining							
						- moisture increasing							
						- color change to bluish gray							
						- Boring Terminated at 50 feet bgs							
						NOTES:							
						1. Terms and symbols defined on Plate B-1.							

BORING DEPTH: 50.0 ft
BACKFILL: Grout
DEPTH TO WATER: 39.8 ft 39.8
FIELDWORK DATE: October 10, 2013
DRILLING METHOD: 2-in. dia. Direct Push

HAMMER TYPE: Automatic Trip
RIG TYPE: Geoprobe 7822DT
DRILLED BY: Vaportech
LOGGED BY: M. D'Anna
CHECKED BY: K. Emery

LOG OF BORING NO. B-1

Antique Restoration
Pinole, California



DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	LOCATION:	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u ksf	OTHER TESTS
						MATERIAL DESCRIPTION							
						1271 Tara Hills Drive							
						3" Asphalt Pavement, 3" Concrete							PID = 63.7
						ARTIFICIAL FILL (af)							
						CLAYEY SAND (SC): bluish gray, moist, fine grained sand, iron oxide staining, moderate hydrocarbon (gasoline) odor							PID = 364
						Lean CLAY with GRAVEL (CL): bluish gray, moist, low plasticity, medium subangular gravel, some black staining, moderate hydrocarbon (gasoline) odor							PID = 11.7
						CLAYEY SAND with GRAVEL (SC): bluish gray, moist, fine grained sand, medium subangular gravel, no staining, moderate hydrocarbon (gasoline) odor							PID = 12.9
						GRAVELLY Lean CLAY (CL): bluish gray, moist, low plasticity, fine to medium subangular gravel, no staining, moderate hydrocarbon (gasoline) odor							PID = 133
						Lean CLAY (CL): dark brown, moist, moderate plasticity, occasional subrounded coarse gravel, slight hydrocarbon (gasoline) odor							PID = 14.4
						CLAYEY SAND (SC): bluish gray, moist, fine grained sand, no staining, moderate hydrocarbon (gasoline) odor							PID = 129
						GRAVELLY Lean CLAY (CL): black, moist, low plasticity, medium subangular gravel, no staining, moderate hydrocarbon (gasoline) odor							PID = 629
						- Iron oxide staining							PID = 49.3
						- color change to grayish brown with black staining							
						Lean CLAY (CL): grayish brown, moist, low plasticity, no odor or staining. Pockets of bluish gray lean CLAY (CL) with moderate hydrocarbon (gasoline) odor present							PID = 13
						CLAYEY SILT (MH): brown, moist, no odor or staining							PID = 3.6
						Lean CLAY (CL): black, moist, moderate plasticity, organics (rootlets) present, no odor or staining							PID = 2.1
						- slight hydrocarbon (gasoline) odor							PID = 2.4
						- color change to bluish gray							PID = 1.2
						- low plasticity							
						NATIVE							PID = 482
						SILTY SAND (SM): bluish gray, moist, fine grained sand, no odor or staining							PID = 9.5
						CLAYEY SILT (MH): brown, moist, no odor or staining							PID = 101
						Lean CLAY (CL): grayish brown, moist, low plasticity, no odor or staining. Pockets of bluish gray lean CLAY (CL) with moderate hydrocarbon (gasoline) odor present							PID = 11.2
						- iron oxide staining							PID = 1.0
						- 2" bluish gray fine grained SAND (SP) lense							
						- moderate hydrocarbon (gasoline) odor							
						SANDY Lean CLAY (CL): bluish gray, moist, low plasticity, medium grained sand, no staining, moderate hydrocarbon (gasoline) odor							
						Lean CLAY (CL): stiff, brown, dry, low plasticity, no odor or staining bluish gray lean CLAY (CL) inclusion, moderate hydrocarbon (gasoline) odor							
						- iron oxide staining							
						- bluish gray mottling							
						- Boring Terminated at 40 feet bgs							
						NOTES:							
						1. Terms and symbols defined on Plate B-1.							

BORING DEPTH: 40.0 ft
BACKFILL: Grout
DEPTH TO WATER: Not Encountered
FIELDWORK DATE: October 10, 2013
DRILLING METHOD: 2-in. dia Direct Push

HAMMER TYPE: Automatic Trip
RIG TYPE: Geoprobe 7822DT
DRILLED BY: Vaportech
LOGGED BY: M. D'Anna
CHECKED BY: K. Emery

LOG OF BORING NO. B-2

Antique Restoration
Pinole, California

DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	LOCATION: 1271 Tara Hills Drive	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u ksf	OTHER TESTS
							3" Asphalt Pavement, 3" Concrete							PID = 0.1
							ARTIFICIAL FILL (af)							
							CLAYEY SILT (MH): brown, moist, occasional subrounded gravel							PID = 0.1
5							Lean CLAY (CL): blue, moist, low plasticity, no staining, moderate hydrocarbon (motor oil) odor							PID = 38.5
							- with medium angular gravel							PID = 1.6
							- moderate hydrocarbon (gasoline) odor, black staining							PID = 1.6
10							- Thin lense of poorly-graded SAND with CLAY and GRAVEL (SP-SC), moderate hydrocarbon (gasoline) odor							PID = 2.5
							Lean CLAY with GRAVEL (CL): black, moist, low plasticity, fine to medium subangular to subrounded gravel, no staining, slight hydrocarbon (gasoline) odor							PID = 9.3
							Lean CLAY (CL): blue, moist, low plasticity, no staining, moderate hydrocarbon (gasoline) odor							PID = 2.4
15							Lean CLAY with GRAVEL (CL): black, moist, low plasticity, fine to medium subangular to subrounded gravel, no staining, slight hydrocarbon (gasoline) odor							PID = 1.2
							Lean CLAY (CL): blue, moist, low plasticity, no staining, moderate hydrocarbon (gasoline) odor							PID = 4.6
20							Lean CLAY with GRAVEL (CL): black, moist, low plasticity, fine to medium subangular to subrounded gravel, no staining, slight hydrocarbon (gasoline) odor							PID = 6.3
							- moisture increasing to very moist							PID = 1.3
25							NATIVE							PID = 0.7
							Lean CLAY (CL): grayish black, moist, low plasticity, no odor or staining							PID = 0.5
							SILT (ML): grayish brown, moist, no odor or staining							PID = 0.6
30														PID = 0.6
							SANDY SILT (ML): brown, moist, fine to medium grained sand, iron oxide staining, no odor							PID = 0.5
35														PID = 0.5
							SILT (ML): brown, moist, iron oxide staining, no odor							PID = 1.8
							- moderate hydrocarbon (gasoline) odor							PID = 320
40														PID = 196
							CLAYEY SILT (MH): brown, moist, no staining, moderate hydrocarbon (gasoline) odor							PID = 246
							water encountered at 42.8 ft bgs, measured at 14:15							PID = 141
45														PID = 2.4
50							- Boring Terminated at 50 feet bgs							PID = 1.8
NOTES: 1. Terms and symbols defined on Plate B-1.														

BORING DEPTH: 50.0 ft
BACKFILL: Grout
DEPTH TO WATER: 43.2 ft 43.2
FIELDWORK DATE: October 10, 2013
DRILLING METHOD: 2-in. dia. Direct Push

HAMMER TYPE: Automatic Trip
RIG TYPE: Geoprobe 7822DT
DRILLED BY: Vaportech
LOGGED BY: M. D'Anna
CHECKED BY: K. Emery

LOG OF BORING NO. B-3

Antique Restoration
Pinole, California

DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	LOCATION:	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u , ksf	OTHER TESTS
						1271 Tara Hills Drive							
						6 inches Asphalt Pavement							PID = 2.4
						SILTY SAND with GRAVEL (SM): brown, moist, fine grained sand, fine angular gravel, no odor, iron oxide staining							
5						SANDY Lean CLAY (CL): brown, moist, low plasticity, fine grained sand, no odor or staining, lite brown mottling							PID = 2.1
10						Lean CLAY (CL): brown, moist, moderate plasticity, lite brown mottling, no odor or staining							
						Lean CLAY (CL): light brown, moist, low plasticity, no odor or staining							PID = 1.9
15						CLAYEY SAND (SC): light brown, moist, fine grained sand, no odor or staining							
						- no fines, color change to brown							
						- iron oxide staining							PID = 1.3
						- fines							
20						- no fines, iron oxide staining							PID = 1.2
						Poorly-graded SAND with CLAY (SP-SC): brown, moist, fine to medium grained sand, no odor or staining							
25						Lean CLAY (CL): brown, moist, moderate plasticity, no odor, iron oxide staining, black veins, caliche							PID = 1.2
30						- with fine grained sand, Static Water at 29.84'							PID = 2.1
35						CLAYEY SAND (SC): brown, moist, fine grained sand, iron oxide staining, no odor							PID = 2.4
40						Lean CLAY (CL): brown, moist, low plasticity, no odor or staining							
						- iron oxide staining							
						Lean CLAY (CL): blue gray, dry, low plasticity, no odor or staining							PID = 2.9
45						- Boring Terminated at 45 feet bgs							PID = 1.7
						NOTES: 1. Terms and symbols defined on Plate B-1							

BORING DEPTH: 45.0 ft
BACKFILL: Grout
DEPTH TO WATER: 29.8 ft
FIELDWORK DATE: November 21, 2013
DRILLING METHOD: 2-in. dia. Direct Push

HAMMER TYPE: Automatic Trip
RIG TYPE: Geoprobe 7822DT
DRILLED BY: Vaportech
LOGGED BY: M. D'Anna
CHECKED BY: K. Emery

LOG OF BORING NO. B-4 Antique Restoration Pinole, California



FCLP STANDARD LOG \\SACWEST\04\PUBLIC\JOBDOCS\04.72130077 ANTIQUE RESTORATION\GINT\GINT COPY OF 04.72130077.GPJ ENVIRONMENTAL VERSION OF OIGEM LIB JAN2012.GLB 12/9/13 11:53 a

DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	LOCATION:	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u ksf	OTHER TESTS
						1271 Tara Hills Drive							
						6 inches Asphalt Pavement							PID = 1.3
						SILTY SAND (SM): tan, moist, fine grained sand, no odor or staining							
5						Lean CLAY (CL): brown, moist, low plasticity, some silt, no odor, iron oxide staining							PID = 1.2
						Lean CLAY (CL): black, moist, low plasticity, no odor or staining							PID = 0.9
10						- organic odor							
						- iron oxide staining							
						Poorly-graded SAND (SP): brown, moist, fine grained sand, no odor, iron oxide staining							PID = 1.9
15						SANDY Lean CLAY (CL): brown, moist, low plasticity, no odor, iron oxide staining							
						CLAYEY SAND (SC): brown, moist, fine grained sand, no odor, iron oxide staining							PID = 1.1
20						SANDY Lean CLAY (CL): brown, moist, low plasticity, fine grained sand, no odor or staining							PID = 2.1
						- color change to reddish brown							
25						Poorly-graded SAND (SP): brown, moist, fine grained sand, no odor or staining							PID = 1.2
						- fine to coarse sand							
						- color change to red							
30						Lean CLAY (CL): brown, moist, low plasticity, some fine grained sand, no odor, iron oxide staining							PID = 2.3
35						Lean CLAY (CL): bluish gray, moist, low plasticity, no odor or staining							PID = 2.3
40													PID = 1.6
45													PID = 1.6
						- Boring Terminated at 45 feet bgs							
						NOTES:							
						1. Terms and symbols defined on Plate B-1							

BORING DEPTH: 45.0 ft
BACKFILL: Grout
DEPTH TO WATER: Not Encountered
FIELDWORK DATE: November 21, 2013
DRILLING METHOD: 2-in. dia. Direct Push

HAMMER TYPE: Automatic Trip
RIG TYPE: Geoprobe 7822DT
DRILLED BY: Vaportech
LOGGED BY: M. D'Anna
CHECKED BY: K. Emery

LOG OF BORING NO. B-5

Antique Restoration
Pinole, California

DEPTH, ft	MATERIAL SYMBOL	SAMPLER TYPE	BLOW COUNT OR PRESSURE, psi	N VALUE OR RQD%	RECOVERY	LOCATION: 1271 Tara Hills Drive	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u , ksf	OTHER TESTS
							6 inches Asphalt Pavement							PID = 1.8
							Lean CLAY (CL): light brown, moist, low plasticity, no odor or staining							
							- medium to coarse angular gravel							
5							- bluish gray mottling							PID = 1.5
							- black staining							PID = 1.9
10							CLAYEY SAND (SC): brown, moist, fine grained sand, no odor, iron oxide staining							
							Lean CLAY with GRAVEL (CL): dark brown, moist, low plasticity, medium to coarse angular gravel, no odor, iron oxide staining							PID = 1.4
15							Lean CLAY (CL): blue gray, moist, moderate plasticity, black staining, no odor							PID = 1.8
							Poorly-graded SAND (SP): blue gray, moist, fine grained sand, no odor or staining							PID = 1.4
20							Lean CLAY with GRAVEL (CL): black, moist, low plasticity, medium angular gravel, organic odor, no staining							
							Lean CLAY (CL): black, moist, low plasticity, blue gray mottling, organic odor, no staining							PID = 2.1
25							CLAYEY SAND (SC): blue gray, moist, fine grained sand, no odor, iron oxide staining							
							- color change to brown							PID = 1.3
30							Poorly-graded SAND (SP): reddish brown, moist, fine to medium grained sand, no odor or staining							
							- iron oxide staining							PID = 0.9
35							CLAYEY SAND (SC): brown, moist to wet, fine grained sand, no odor or staining							
							Lean CLAY (CL): olive, moist, low plasticity, no odor, iron oxide staining							PID = 1.7
40							SANDY Lean CLAY (CL): olive, moist, low plasticity, fine grained sand, no odor, iron oxide staining							
														PID = 1.5
45							Lean CLAY (CL): olive, moist, low plasticity, no odor or staining							
							- iron oxide staining							PID = 1.1
50														
							- color change to blue gray							PID = 0.5
55							- Boring Terminated at 55 feet bgs							PID = 0.9
							NOTES: 1. Terms and symbols defined on Plate B-1.							

BORING DEPTH: 55.0 ft
BACKFILL: Grout
DEPTH TO WATER: Not Encountered
FIELDWORK DATE: November 21, 2013
DRILLING METHOD: 2-in. dia. Direct Push

HAMMER TYPE: Automatic Trip
RIG TYPE: Geoprobe 7822DT
DRILLED BY: Vaportech
LOGGED BY: M. D'Anna
CHECKED BY: K. Emery

LOG OF BORING NO. B-6

Antique Restoration
Pinole, California

TABLE 2-2
SUMMARY OF GROUNDWATER ELEVATIONS
1577 Tara Hills Drive
Pinole, California

Well ID	Screen Interval	Top of Casing Elevation	Date	Depth to Water	Groundwater Elevation	Ground-water Flow Direction	Hydraulic Gradient
	(ft bgs)	(ft MSL)		(ft bTOC)	(ft MSL)	(degrees)	(ft/ft)
MW-1	7 to 12	200.251	4/9/15	5.46	194.79	226	0.162
			2/12/16	4.55	195.70	227	0.173
			9/22/16	6.77	193.48	228	0.136
			11/9/16	6.40	193.85	223	0.148
MW-1A	30 to 35	200.373	4/9/15	5.30	195.07	226	0.162
			2/12/16	4.31	196.06	227	0.173
			9/22/16	6.55	193.82	228	0.136
			11/9/16	6.11	194.26	223	0.148
MW-2	19 to 29	207.362	4/9/15	12.67	194.69	226	0.162
			2/12/16	11.82	195.54	227	0.173
			9/22/16	13.95	193.41	228	0.136
			11/9/16	13.40	193.96	223	0.148
MW-3	15 to 30	197.58	4/9/15	17.03	180.55	226	0.162
			2/12/16	17.41	180.17	227	0.173
			9/22/16	16.68	180.90	228	0.136
			11/9/16	17.13	180.45	223	0.148
MW-10	? to 32.2	198.813	4/9/15	17.15	181.66	226	0.162
			2/12/16	16.98	181.83	227	0.173
			9/22/16	15.99	182.82	228	0.136
			11/9/16	16.58	182.23	223	0.148

Notes:

ft bgs: feet below ground surface

ft MSL: feet above Mean Sea Level

ft bTOC: feet below top-of-casing

ft/ft: feet per foot

Monitoring wells surveyed by Luk and Associates on May 19, 2015

Groundwater flow direction based on monitoring wells MW-1A, MW-2, MW-3 and MW-10

APPENDIX D

PHASE I ENVIRONMENTAL SITE ASSESSMENT



Type of Services	Phase I Environmental Site Assessment Update and Preliminary Soil Vapor Quality Evaluation
Location	Appian 80 Shopping Center 1201 to 1577 Tara Hills Drive Pinole, California
Client	Hillsboro Properties
Client Address	1300 South El Camino Real, Suite 525 San Mateo, California 94402
Project Number	856-1-4
Date	June 27, 2019

DRAFT

Prepared by **Sarah E. Kalika, P.G.**
Senior Project Geologist

Christopher J. Heiny, P.G.
Principal Geologist

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FIGURE 1 – VICINITY MAP

FIGURE 2 – SITE PLAN

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APPENDIX F – QUESTIONNAIRE

APPENDIX G – BORING LOGS AND SOIL VAPOR SAMPLING LOGS

APPENDIX H – LABORATORY ANALYTICAL REPORTS

DRAFT

Type of Services	Phase I Environmental Site Assessment Update and Preliminary Soil Vapor Quality Evaluation
Location	Appian 80 Shopping Center 1201 to 1577 Tara Hills Drive Pinole, California

SECTION 1: INTRODUCTION

This report presents the results of the Phase I Environmental Site Assessment (ESA) Update and Preliminary Soil Vapor Quality Evaluation performed at the Appian 80 Shopping Center located at 1201 to 1577 Tara Hills Drive in Pinole, California (Site) as shown on Figures 1 and 2 and described in Table 1. This work was performed for Hillsboro Properties in accordance with our April 24, 2019 Agreement (Agreement).

This report updates our Phase I ESA dated November 24, 2015. In addition, this report includes a preliminary soil vapor quality evaluation performed near the former on-Site drycleaner and off-Site dry cleaner as discussed below.

1.1 PURPOSE

The scope of work presented in the Agreement was prepared in general accordance with ASTM E 1527-13 titled, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" (ASTM Standard). The ASTM Standard is in general compliance with the Environmental Protection Agency (EPA) rule titled, "Standards and Practices for All Appropriate Inquiries; Final Rule" (AAI Rule). The purpose of this Phase I ESA is to strive to identify, to the extent feasible pursuant to the scope of work presented in the Agreement, Recognized Environmental Conditions at the property.

As defined by ASTM E 1527-13, the term Recognized Environmental Condition means the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not Recognized Environmental Conditions.

Cornerstone Earth Group, Inc. (Cornerstone) understands that Hillsboro Properties currently owns portions of the Site and intends to purchase the remaining portions of the Site for a commercial redevelopment. The redevelopment tentatively will consist of demolishing the current structures and the construction of new retail space. We performed this Phase I ESA to support Hillsboro Properties in evaluation of Recognized Environmental Conditions at the Site. This Phase I ESA is intended to reduce, but not eliminate, uncertainty regarding the potential for Recognized Environmental Conditions at the Site.

1.2 SCOPE OF WORK

As presented in our Agreement, the scope of work performed for this Phase I ESA included the following:

- A reconnaissance of the Site to note readily observable indications of significant hazardous materials releases to structures, soil or ground water.
- Drive-by observation of adjoining properties to note readily apparent hazardous materials activities that have or could significantly impact the Site.
- Acquisition and review of a regulatory agency database report of public records for the general area of the Site to evaluate potential impacts to the Site from reported contamination incidents at nearby facilities.
- Review of readily available information on file at selected governmental agencies to help evaluate past and current Site use and hazardous materials management practices.
- Review of readily available maps and aerial photographs to help evaluate past and current Site uses.
- Interviews with persons reportedly knowledgeable of existing and prior Site uses, including the current and past Site owners, and the current and past Site operator(s).
- Collection of soil vapor samples near the former on-Site drycleaner and off-Site drycleaner.
- Preparation of a written report summarizing our findings and recommendations.

The limitations for the Phase I ESA are presented in Section 10; the terms and conditions of our Agreement are presented in Appendix A.

1.3 ASSUMPTIONS

In preparing this Phase I ESA, Cornerstone assumed that all information received from interviewed parties is true and accurate. In addition, we assumed that all records obtained by other parties, such as regulatory agency databases, maps, related documents and environmental reports prepared by others are accurate and complete. We also assumed that the boundaries of the Site, based on information provided by Hillsboro Properties, are as shown on Figure 2. We have not independently verified the accuracy or completeness of any data received.

1.4 ENVIRONMENTAL PROFESSIONAL

This Phase I ESA was performed by Ms. Sarah E. Kalika, P.G., and Mr. Christopher J. Heiny, P.G., Environmental Professionals who meet the qualification requirements described in ASTM E 1527-13 and 40 CFR 312 § 312.10 based on professional licensing, education, training and experience to assess a property of the nature, history and setting of the Site.

SECTION 2: SITE DESCRIPTION

This section describes the Site as of the date of this Phase I ESA. The location of the Site is shown on Figures 1 and 2. Tables 1 through 3 summarize general characteristics of the Site and adjoining properties. The Site is described in more detail in Section 7, based on our on-Site observations.

2.1 LOCATION AND OWNERSHIP

Table 1 describes the physical location, and ownership of the property, based on information provided by Hillsboro Properties. We understand that Hillsboro Properties owns companies that own most of the Site parcels and intends to redevelop a portion of the Site.

Table 1. Location and Ownership

APN No.	Building Address	Owner	Current Occupant	Year Built	Building Size (sq. ft.)	Lot Size (sq. ft.)
402-282-006-0	1201 Tara Hills	Pinsquare 2, LLC*	Vacant Land	n/a	n/a	14,375
402-282-016	No Address	Thomas G. Paulson Trust	Vacant	n/a	n/a	741
402-282-007-2	1211 Tara Hills	Appian 80 LP*	Pizza Hut	1973	1,080	2,091
402-282-008	1213 Tara Hills	Nga Tran	Pinole Key & Gift Shop	1973	900	1,394
	1215 Tara Hills	Nga Tran	Vaikiki Nails			
402-282-009-8	1221 Tara Hills	Appian 80 LLC*	Bank of America	1967	7,020	10,019
402-282-010-6	1251 Tara Hills	Paul Goldstone Enterprises, Inc.*	Vacant (former CSK/O'Reillys / Wheel Works)	1977	8,015	17,859
402-282-013-0	1261 Tara Hills	Appian 80 LP*	Vacant (former Car Wash)	1966	12,464	43,603
402-282-014-8	1271 Tara Hills	Pinsquare 1, LLC*	Vacant (former Antique Restoration)	1972	1,728	7,667
402-282-005-6	1401 Tara Hills	Appian 80 LP*	Vacant (former CVS)	1966	25,963	80,063
402-282-018-9	1421 Tara Hills	Appian 80 LP*	Safeway	1965	25,733	89,995
402-282-017-1	1431 Tara Hills	Appian 80 LP*	Vacant (former Tropical Fish and Pet Store)	1966	12,464	43,603
	1441 Tara Hills	Appian 80 LP*	Vacant (former Four Mile Cleaners)			
	1481 Tara Hills	Appian 80 LP*	Bar None			
	1491 Tara Hills	Appian 80 LP*	Vacant			

*Indicates company owned by Hillsboro Properties.

2.2 CURRENT/PROPOSED USE OF THE PROPERTY

The current and proposed uses of the property are summarized in Table 2.

Table 2. Current and Proposed Uses

Current Use	Commercial / Retail
Proposed Use	Commercial / Retail

2.3 SITE SETTING AND ADJOINING SITE USE

Land use in the general Site vicinity appears to be primarily commercial and residential. Based on our Site vicinity reconnaissance, adjoining Site uses are summarized below in Table 3.

Table 3. Adjoining Site Uses

North	Tara Hills Drive, Restaurant (McDonald's), Medical Offices, Gas Station (Pinole Express)
South	Interstate 80 and Commercial
East	Medical Offices and Appian Way
West	Residential

SECTION 3: USER PROVIDED INFORMATION

The ASTM standard defines the User as the party seeking to use a Phase I ESA to evaluate the presence of Recognized Environmental Conditions associated with a property. For the purpose of this Phase I ESA, the User is Hillsboro Properties. The "All Appropriate Inquiries" Final Rule (40 CFR Part 312) requires specific tasks be performed by or on behalf of the party seeking to qualify for Landowner Liability Protection under CERCLA (*i.e.*, the User).

Per the ASTM standard, if the User has information that is material to Recognized Environmental Conditions, such information should be provided to the Environmental Professional. This information includes: 1) specialized knowledge or experience of the User, 2) commonly known or reasonably ascertainable information within the local community, and 3) knowledge that the purchase price of the Site is lower than the fair market value due to contamination. A search of title records for environmental liens and activity and use limitations also is required.

3.1 CHAIN OF TITLE

A chain-of-title was not provided for our review.

3.2 ENVIRONMENTAL LIENS OR ACTIVITY AND USE LIMITATIONS

An environmental lien is a financial instrument that may be used to recover past environmental cleanup costs. Activity and use limitations (AULs) include other environmental encumbrances, such as institutional and engineering controls. Institutional controls (ICs) are legal or regulatory restrictions on a property's use, while engineering controls (ECs) are physical mechanisms that restrict property access or use.

The regulatory agency database report described in Section 4.1 did not identify the Site as being in 1) US EPA databases that list properties subject to land use restrictions (*i.e.*, engineering and institutional controls) or Federal Superfund Liens or 2) lists maintained by the California Department of Toxic Substances Control (DTSC) of properties that are subject to AULs or environmental liens where the DTSC is a lien holder.

A Preliminary Title Report by Fidelity National Title Company (dated March 25, 2015) was provided for our review (Appendix B). The title report contained several references to utility easements. No environmental liens or records of ownership (including leases) indicative of significant hazardous materials use associated with the Site were listed in the title report.

3.3 SPECIALIZED KNOWLEDGE AND/OR COMMONLY KNOWN OR REASONABLY ASCERTAINABLE INFORMATION

Based on information provided by or discussions with Hillsboro Properties, we understand that fueling stations were formerly located at 1201 Tara Hills Drive and 1271 Tara Hills Drive. These properties are discussed further in Section 4. Hillsboro Properties also indicated that a Texaco fueling station was formerly located adjacent and to the east of the Site. The fueling station is a closed leaking underground storage tank (UST) site and is further discussed in Section 4. Based on information provided to us and reported within our previous Phase I ESA for this Site in 2015, we understand that litigation has been ongoing between the former fueling station and the owners of parcel 402-282-002-3 (1565, 1569, 1573, and 1577 Tara Hills Drive). No update was provided regarding the litigation for this current ESA Update.

3.4 DOCUMENTS PROVIDED BY HILLSBORO PROPERTIES

In addition to the most recently available Preliminary Title Report, Hillsboro Properties provided property, parcel, tenant, and ownership information; record of survey dated October 15, 2015; and proposed development plans. Information from these documents is incorporated into the above sections. In addition, Hillsboro Properties provided documentation related to the leaking UST case closure for the former Texaco Station located on the adjacent property to the east at 1599 Tara Hills Drive. This information is included in Section 4.1.3

SECTION 4: RECORDS REVIEW

4.1 STANDARD ENVIRONMENTAL RECORD SOURCES

Cornerstone conducted a review of federal, state and local regulatory agency databases provided by Environmental Data Resources (EDR) to evaluate the likelihood of contamination incidents at and near the Site. The database sources and the search distances are in general accordance with the requirements of ASTM E 1527-13. A list of the database sources reviewed, a description of the sources, and a radius map showing the location of reported facilities relative to the project Site are attached in Appendix B.

The purpose of the records review was to obtain reasonably available information to help identify Recognized Environmental Conditions. Accuracy and completeness of record information varies among information sources, including government sources. Record information is often inaccurate or incomplete. The Environmental Professional is not obligated to identify mistakes or insufficiencies or review every possible record that might exist with the Site. The customary practice is to review information from standard sources that is reasonably available within reasonable time and cost constraints.

4.1.1 On-Site Database Listings

The Site was identified in the regulatory agency databases listed in Table 4.

Table 4. On-Site Database Listings

Facility Name and Address	Database Listings
Chevron 1201 Tara Hills Drive	<ul style="list-style-type: none"> Facility and Manifest Data (HAZNET) Facility Indexing System / Facility Registry System (FINDS) EPA's Resource Conservation and Recovery Act Comprehensive database (RCRA / NLR)
Kenneth Regalia Inc 1201 Tara Hills Drive	<ul style="list-style-type: none"> California State-wide Environmental Evaluation and Planning System (CA SWEEPS UST) Contra Costa County UST and Hazardous Waste Program Sites (SL CONTRA COSTA) Historical UST Listing State-wide Environmental Evaluation and Planning System (CA SWEEPS UST)
All Cars Incorporated 1251 Tara Hills Drive	<ul style="list-style-type: none"> EDR Historical gas/service/repair Stations (EDR US Hist Auto Stat) HAZNET
Kragen Auto Parts / Wheel Works 1251 Tara Hills Drive	<ul style="list-style-type: none"> HAZNET FINDS
O'Reilly Auto Parts 1251 Tara Hills Drive	<ul style="list-style-type: none"> SL CONTRA COSTA
All Cars Incorporated / Grand Auto #71 1251 Tara Hills Drive	<ul style="list-style-type: none"> HAZNET
Super Car Wash 1261 Tara Hills Drive	<ul style="list-style-type: none"> HAZNET
Antique Restoration 1271 Tara Hills Drive	<ul style="list-style-type: none"> Emission Inventory Data (EMI) SL CONTRA COSTA Leaking Underground Storage Tank Database (LUST) Historical Hazardous Waste and Substances Sites List (HIST CORTESE) FINDS
Rent A Rack 1271 Tara Hills Drive	<ul style="list-style-type: none"> RGA LUST
CVS Pharmacy 1401 Tara Hills Drive	<ul style="list-style-type: none"> SL CONTRA COSTA HAZNET FINDS Resource Conservation and Recovery Act Large Quantity Generator (RCRA-LQG)
Long's Drug Store 1401 Tara Hills Drive	<ul style="list-style-type: none"> HAZNET
Safeway / Nexcycle 1421 Tara Hills Drive	<ul style="list-style-type: none"> FINDS HAZNET SL CONTRA COSTA SWRCY

Facility Name and Address	Database Listings
Four Mile Cleaners 1441 Tara Hills Drive	<ul style="list-style-type: none"> ▪ EDR Dry Cleaner List (EDR DRY CLEANERS) ▪ EMI ▪ RCRA Small Quantity Generator (RCRA-SQG) ▪ FINDS ▪ Drycleaners database listing (DRYCLEANERS) ▪ SL CONTRA COSTA ▪ HAZNET

The HAZNET, EMI, FINDS, RCRA-LQG, RCRA-SQG, RCRA / NLR, and SWRCY database listings are related to permitting through local, state, and/or federal agencies. No violations of concern were noted for these listings.

The historical auto station listing for 1251 Tara Hills Drive (former All Cars Incorporated / Grand Auto #71) is related to the automotive repair activities associated with this business. This unit was most recently occupied by Kragen Auto Parts and Wheel Works. This facility is further discussed in Section 4.2.

The database listings indicate that former gasoline filling stations were formerly located at 1201 Tara Hills Drive (Chevron) and 1271 Tara Hills Drive (Rent A Rack). The database listings for the former Chevron Station indicate that one 1,000-gallon waste oil UST and three 10,000-gallon gasoline USTs were formerly located at this facility. The database listings for the former Rent A Rack indicate that two 10,000-gallon gasoline USTs and one 500-gallon waste oil UST were present at this facility. These facilities are further discussed in Section 4.2.

The database listings indicate a dry cleaner was present at 1441 Tara Hills Drive (Four Mile Cleaners). Cornerstone performed a soil vapor quality evaluation near this property in conjunction with this Phase I Update. Results from this evaluation are discussed in Section 9.

4.1.2 Adjoining Property Database Listings and Nearby Spill Incidents

Table 5. Adjoining and Nearby Property Database Listings

Facility Name and Address	Database Listings
2298 Appian Way Former BP Station (current Pinole Express Station)	<ul style="list-style-type: none"> ▪ HIST UST ▪ SWEEPS UST ▪ LUST ▪ HAZNET ▪ ENR ▪ HIST CORTESE ▪ CONTRA COSTA CO. SITE LIST ▪ EDR HIST AUTO ▪ UST ▪ CERS TANKS ▪ CERS HAZ WASTE

Facility Name and Address	Database Listings
1599 Tara Hills Drive Former Exxon and Texaco Stations	<ul style="list-style-type: none"> ▪ LUST ▪ HIST CORTESE ▪ CONTRA COSTA CO. LIST SITE ▪ CPS-SLIC ▪ CERS ▪ SWEEPS ▪ FINDS ▪ ECHO ▪ ERNS ▪ RGA LUST
Appian 80 Cleaners 1577 Tara Hills Drive	<ul style="list-style-type: none"> ▪ EDR DRY CLEANERS ▪ FINDS ▪ DRYCLEANERS ▪ Voluntary Cleanup Program (VCP) ▪ EMI ▪ SL CONTRA COSTA ▪ Department of Toxic Substances Control Board Database Listing (ENVIROSTOR) ▪ HAZNET

The database listings for the former BP Station (current Pinole Express Station) located at 2298 Appian Way and the former Texaco and Exxon Station located at 1599 Tara Hills Drive are related to UST releases. The Appian 80 Cleaners located at 1577 Tara Hills Drive is related to the dry-cleaning operations and a reported dry-cleaning solvent release. These facilities are further discussed in Section 4.1.3.

4.1.3 Further Review of Database Listings

Cornerstone performed a cursory review of readily available documents from the state's Geotracker (<http://geotracker.waterboards.ca.gov>) and Envirostor (<https://www.envirostor.dtsc.ca.gov/public/>) databases for the leaking UST cases at 2298 Appian Way and 1599 Tara Hills Drive, and the dry cleaning facility located at 1577 Tara Hills Drive. Geotracker is a database and geographic information system (GIS) that provides online access to environmental data. It tracks regulatory data about leaking underground storage tank (LUST), Department of Defense, Site Cleanup Program and Landfill sites. The Envirostor database is maintained by the Department of Toxic Substances Control (DTSC) and contains information on investigation, cleanup, permitting, and/or corrective actions that are planned, being conducted or have been completed under DTSC's oversight. The Envirostor database includes the following site types: Federal Superfund sites; State Response sites; Voluntary Cleanup sites; and School sites. Please refer to the original documents reviewed for each case from Geotracker and Envirostor for complete information.

2298 Appian Way – Former BP Station (Current Pinole Express)

According to the *Conceptual Site Model and Request for Low-Threat Closure* report by Arcadis and dated August 30, 2013, the former BP Station reportedly had three gasoline USTs that were removed in 1987. Laboratory analyses of the soil samples collected from the base of the UST excavation and a sample collected from ground water that percolated into the tank pit reportedly contained elevated concentrations of gasoline-range petroleum hydrocarbons (TPHg) and

petroleum-related volatile organic compounds (VOCs). Subsequent ground water monitoring in seven monitoring wells established that the former USTs impacted ground water beneath the Site. In addition, up to approximately 6 feet of separate phase hydrocarbons (SPH) reportedly was measured in monitoring well MW-5, which is located immediately down-gradient of the former UST pit. SPH removal was conducted by manual methods (bailer) and by a floating SPH extraction pump that operated between 1993 and 2003. In 2011, Arcadis implemented the Water Board-approved Corrective Action Plan (CAP) that consisted of the operation of a mobile dual-phase extraction (DPE) unit for the extraction and treatment of soil vapor and ground water. The DPE operated from March 12 to 17, 2012. In August 2012, approximately 0.01 foot of SPH reportedly was measured in MW-5. Arcadis performed further remediation by conducting a 7-hour vacuum truck extraction (VTE) event to remove the additional SPH.

In 2015, Arcadis performed dual-phase extraction of light non-aqueous phase liquid (LNAPL) occurred in the vicinity of MW-5 and reported this event in the report titled *Dual-Phase Extraction Event Summary Report and Request for Site Closure* dated January 29, 2016. In November 2016, Arcadis issued an addendum to the summary report and requested case closure under the Water Board's low-threat closure policy.

In 2018, remaining on-Site monitoring wells were destroyed and case closure was granted by the Water Board in a letter dated May 14, 2018.

Based on the documents reviewed, the reported extent of impacts appears limited to this facility and does not appear to have likely impact the Site.

1599 Tara Hills Drive – Former Texaco/Exxon Station

In 1986, four 6,000-gallon gasoline USTs and one 550-gallon waste oil UST were removed from this facility and replaced with two 10,000-gallon gasoline USTs, one 8,000-gallon gasoline USTs, and one 12,000-gallon diesel UST. This second set of USTs were removed in 1992.

In 1986, elevated concentrations of total petroleum hydrocarbons (TPH) reportedly were detected in soil samples collected beneath the waste oil UST. Thirteen monitoring wells were subsequently installed between 1987 and 1995 and were sampled on a semi-annual basis. Gasoline-range TPH (TPHg), diesel-range TPH (TPHd), and petroleum-related VOCs (benzene, toluene, ethylbenzene, and xylenes [BTEX]) were detected in ground water samples, but were reportedly limited to the ground water beneath this property. A soil vapor extraction system reportedly was installed in 1995 and operated to remove VOCs from soil. Three monitoring wells (MW-10, MW-16 and MW-17) were installed down-gradient from the facility (and on-Site) and reportedly monitored until 2009. No TPHd, TPHg, or BTEX were detected in these wells indicating the release appeared to be limited to the facility.

On May 14, 2012, the Water Board approved closure of this case citing that the *"leak has been stopped and sources have been removed; the site has been adequately characterized; the dissolved hydrocarbon plume is stable, decreasing, and is not migrating; no water wells, deeper drinking water aquifers, surface water, or other sensitive receptors are likely to be impacted; and the site presents no significant risk to human health or the environment"*. Based on the case closure status and ground water sampling data showing no petroleum-related detections in monitoring wells installed on-Site, this leaking UST case does not appear likely to significantly impact the Site.

On February 10, 2015, the attorney representing the Tara Hills Drive LP (owner of the adjacent properties 1565 to 1577 Tara Hills Drive) sent a *Notice pursuant to the Resource Conservation and Recovery Act; re: Former Texaco Station 21-1212, 1599 Tara Hills Drive* to Texaco Downstream Properties and its affiliate Chevron Environmental Management Company, notifying them of the intent to bring claim and litigation due to the leaks at this former gasoline station. This notice indicated that recent indoor air sampling had been performed that detected “benzene at a concentration of 2.7 microgram per cubic meter ($\mu\text{g}/\text{m}^3$), above its relevant indoor air residential Regional Screening Levels (RSL) of $0.084 \mu\text{g}/\text{m}^3$ [the document incorrectly refers to the indoor air Environmental Screening Level (ESL; the correct indoor air RSL is $0.36 \mu\text{g}/\text{m}^3$]; ethylbenzene up to $1.6 \mu\text{g}/\text{m}^3$, above indoor air RSL of $1.10 \mu\text{g}/\text{m}^3$; and 1,2,4-TMB [1,2,4-trimethylbenzene] up to $47 \mu\text{g}/\text{m}^3$, above indoor RSL of $7.3 \mu\text{g}/\text{m}^3$ ”. The letter contended that the VOCs were “attributed to releases from the upgradient Gas Station, which is 50-feet east of the site”. The Water Board reviewed this notice and compared the detected concentrations of benzene and ethylbenzene to the then current commercial ESLs (no ESL has been established for 1,2,4-TMB). The Water Board concluded that the “detected contaminant concentrations are below their applicable ESLs” and “I do not recommend that the former Texaco Station 21-1212 be reopened at this time”. The Water Board’s statement regarding the detected concentrations being lower than then current (2013) ESLs appears to be in error as the detected benzene concentration ($2.7 \mu\text{g}/\text{m}^3$) exceeds the commercial/industrial ESL of $0.42 \mu\text{g}/\text{m}^3$. The current (2019) commercial/industrial ESLs for benzene and ethylbenzene have not changed.

No further recent information regarding this property was available for Cornerstone’s review.

1577 Tara Hills Drive – Appian 80 Cleaners

Dry cleaning businesses have operated at this address since approximately 1981. Cornerstone reviewed documents provided by the Contra Costa County Hazardous Materials Program (County) that indicates PCE was previously used as the primary dry-cleaning solvent, followed by a synthetic aliphatic hydrocarbon (DF-2000) solvent. Releases associated with the prior use of PCE were discovered in 2008. Several investigations were conducted between 2008 and 2013 that detected PCE in soil up to $1.1 \text{ mg}/\text{kg}$, in soil vapor up to $5,800 \mu\text{g}/\text{m}^3$, indoor air up to $35 \mu\text{g}/\text{m}^3$, and ground water up to 12,000 micrograms per liter ($\mu\text{g}/\text{L}$).

In September 2014, West Environmental submitted an *Interim Remedial Measures Work Plan* to the DTSC that proposed remedial measures to address the PCE release. Between March and June 2015, West collected soil and ground water grab samples and installed two monitoring wells to further delineate the extent of impacts. PCE was detected at concentrations up to $1,660 \text{ mg}/\text{kg}$ in soil samples collected and up to $94,800 \mu\text{g}/\text{L}$ in the ground water samples collected. West concluded that the data from these and previous samples indicate a release from the dry cleaners is the likely source of PCE in soil and ground water. The data distribution indicate the highest soil and ground water concentrations are present beneath the boiler room within the dry cleaner. PCE ground water detections reportedly extend to the northwest into the parking lot area west of the dry cleaner.

In accordance with the *Interim Remedial Measures Work Plan* and the revised excavation area presented in the *Interim Data Submittal*, the soil beneath the boiler room is to be excavated to a depth of approximately 20 feet or until ground water is encountered. Confirmation soil samples and organic vapor meter (OVM) measurements are to be used to guide the excavation extents. An enhanced *in situ* biodegradation product is to be placed in the excavation to further

remediation. Vapor extraction piping will reportedly be installed to extract vapors from the source area.

In June 2018, West Environmental submitted a *Final Removal Action Work Plan* to DTSC to propose a remediation method to address the release of PCE in ground water. This work plan included an assessment of various alternative remediation options and recommended to install a soil vapor extraction system, install a bioremediation system to facilitate enhanced in-situ degradation of VOCs within ground water, and monitor ground water attenuation over time. This plan was approved by DTSC in July 2018. No additional documents were available for Cornerstone's review on the Envirostore website.

4.2 ADDITIONAL ENVIRONMENTAL RECORD SOURCES

The following additional sources of readily ascertainable public information for the Site also were reviewed during this Phase I ESA.

4.2.1 City and County Agency File Review

Cornerstone requested available files pertaining to 1201 to 1577 Tara Hills Drive at the following public agencies: the City of Pinole Building Department (BD), City of Pinole Fire Department (FD), the Water Board, the DTSC, and the Contra Costa County Hazardous Materials Program (County). Representatives from the DTSC and FD indicated no files were available for the addresses requested. The BD did not respond to our request for a file review as of the date of this report. The information reviewed is summarized in Table 6.

Table 6. File Review Information

Agency Name	Date	Occupant	Remarks
1201 Tara Hills Drive			
County	1981	Chevron	Application to operate three 10,000-gallon gasoline USTs and one 1,000-gallon waste oil UST. The applications indicate the tanks were of single-walled fiberglass construction. Tanks were monitored for leaks using daily inventory reconciliation.
County	5/15/1997	Chevron	UST Removal Permit and Information Form: Documents indicate USTs were removed in 1997; County staff reports indicate the tanks were in good condition upon removal.
County	7/7/1997	Chevron	<i>UST Closure Report</i> , Touchstone Developments. Report documenting the removal of the USTs. This report is discussed further below.
1251 Tara Hills Drive			
County	8/5/1997	Super Auto	<i>Hydraulic Lift Removal Report</i> , Walker's Hydraulics, Inc.; Report documents removal of 5 hydraulic lifts and associated oil tanks. TPH-oil impacted soil was reportedly present around oil tanks number 1 and 2, and around lift number 5. The soil from around these areas was reportedly excavated and soil confirmation samples were collected. TPH-oil was detected at concentrations below 1,000 mg/kg, except for the Tank 1 and 2 excavation where further excavation would have undermined the building and, therefore, was not possible at that time.

Agency Name	Date	Occupant	Remarks
County	Various Dates	O'Reilly Auto Parts	Hazardous Materials Inventory List: Indicates used oils, flammable liquids, and corrosive liquids are stored on-Site.
County	Various Dates	Wheel Works	Hazardous Materials Inventory List: Indicates used oils, antifreeze, and other automotive fluids are stored on-Site.
1271 Tara Hills Drive			
County	Various Dates	Antique Restorations	Hazardous Material Inspection reports and inventories dated between 1989 and 2013. These documents indicate paint removers containing methylene chloride are stored on-Site. Inspection violations related to labeling and documentation were noted; however, no indications of spills or leaks were noted.
Water Board	11/17/1986	Rent-A-Rack	<i>Underground Storage Tank Removal Sampling Report</i> , Blaine Tech Services. This document is discussed further below
Water Board	12/27/2013	Rent-A-Rack	<i>Request for Case Closure, Former Rent-A-Rack</i> , Fugro Consultants, Inc. This site is discussed further below.
1401 Tara Hills Drive			
County	Various Dates	Longs Drugs and CVS Pharmacy	Hazardous waste inventory, inspection, business plans, and permits between 1995 and 2015. Documents indicate that hazardous materials associated with photographic processing equipment (silver-containing waste) is stored on-site. No documentation was noted indicating spills or leaks.
1421 Tara Hills Drive			
County	Various Dates	Safeway	Hazardous waste inventory, inspection, business plans, and permits; Documents indicate storage/use of refrigerants (Freon), helium, pressurized carbon dioxide, and miscellaneous cleaning products. No documentation was noted indicating spills or leaks.
1441 Tara Hills Drive			
County	Various Dates	Holiday Cleaners / Four Mile Cleaners	Hazardous material program inspection reports dated between 1989 and 2015. These documents note the use and storage of tetrachloroethene (PCE). Violations noted for improper documentation, training, and waste labeling.
1577 Tara Hills Drive (Off-Site)			
County	Various Dates	Appian 80 Cleaners	Hazardous material program inspection reports, hazardous material business plans, and inventory reports dated between 1989 and 2015. These documents indicate the storage and use of PCE, Stoddard solvent, and petroleum naphtha dry cleaning solvent (DF-2000). Violations documented for improper documents and labeling.
DTSC	9/2014	Appian 80 Cleaners	<i>Interim Remedial Measures Work Plan</i> , West Environmental. Work plan to address the source of PCE at this facility. This document is discussed further below.
DTSC	7/24/2015	Appian 80 Cleaners	<i>Interim Data Submittal</i> , West Environmental. Summary of findings for activities conducted between March and June 2015. This document is discussed further below.

Agency Name	Date	Occupant	Remarks
DTSC	06/2018	Appian 80 Cleaners	<i>Final Removal Action Work Plan</i> , West Environmental. Work Plan to install soil vapor extraction system, install bioremediation system to facilitate enhanced in-situ degradation of VOCs within ground water, and monitor ground water attenuation.
DTSC	07/17/18	Appian 80 Cleaners	DTSC approval of the Removal Action Work Plan.

1201 Tara Hills Drive – Former Chevron Station

According to the *UST Closure Report* (Touchstone Development, 1997), the facility consisted of a Chevron-branded gasoline station with three 10,000-gallon gasoline USTs, one 1,000-gallon waste oil UST, three hydraulic hoists, and one oil/water separator reportedly that were installed in 1981. According to the site map presented in this report, the fuel USTs were located adjacent to Tara Hills Drive near the northwest corner of the property; the pump islands were located immediately east of the fuel USTs; the hoists and oil/water separator were located within the garage portion of the structure; and the waste oil UST was located adjacent and south of the structure. The approximate locations of the USTs are shown on Figure 2. The USTs and associated piping, dispensers, and hoists were removed on June 16, 1997 under the oversight of County Health. Confirmation soil samples were collected from each excavation as reportedly directed by County Health. The results from the samples collected reportedly indicated no significant impacts from the USTs, hoists, and oil/water separator. On July 31, 1997, the County concurred stating “*that the Site does not pose a threat to human health or the environment and will require no additional investigation or monitoring*”. A copy of this case closure letter is provided in Appendix C. Based on this report, significant impacts from these underground structures do not appear likely.

According to the historical documents discussed below in Section 6, the Site appears to have been used as a gasoline service station since at least 1968. However, no files were available pertaining any the presence of USTs prior to the reported installation of the three gasoline USTs and one waste oil UST in 1981. The aerial photograph from 1981 shows what appears to be a newly-patched area where the USTs were documented to be installed in 1981. No other excavations were noted in that image. Presumably, any underground tanks in operation prior to 1981 were likely removed and replaced with the USTs that were in service between 1981 and 1997. However, it is uncertain if the previous USTs resulted in any subsurface impacts.

1271 Tara Hills Drive – Former Rent-A-Rack

In 1986, two 10,000-gallon gasoline USTs, one 1,000-gallon gasoline UST, and one 500-gallon waste oil UST reportedly were removed from the former Rent-A-Rack filling station. The USTs reportedly were located within the parking area east of the existing Antiques Restoration building. These USTs reportedly were installed in 1972. According to the sampling *Underground Storage Tank Removal Sampling Report* (Blaine Tech, 1986), elevated TPHg, benzene, toluene, and xylenes were detected in the two soil samples collected beneath the former 10,000-gallon gasoline USTs. In early 1987, the UST pit reportedly was excavated to a depth of approximately 26 feet to remove soil with TPHg concentrations greater than 100 mg/kg. Confirmation soil samples indicated the TPHg concentrations of the remaining in-place soil was below 100 mg/kg. The excavated soil was stockpiled and aeriated on the adjacent parking lot.

Sampling was performed on the soil stockpile, but no documentation was available that indicated if any of this soil was used as backfill or whether the soil was transported off-Site for disposal.

In October 2013, six exploratory borings were advanced to a depth of up to 50 feet as reported in the *Request for Case Closure* report (Fugro Consultants, 2013). Soil samples were collected from three of the borings located within the former UST area at depths of up to approximately 37 feet. Ground water was observed in three of the six borings and ground water grab samples were collected from each of these borings (two located within the former UST area and one located down-gradient of the UST area). For the soil samples collected, elevated concentrations of TPHg were detected in one sample collected at a depth of approximately 17 feet in the area of the former USTs. For the ground water grab samples, elevated concentrations of TPHg, TPHd, TPHo, and benzene were detected in samples collected in the UST area. However, no TPHg, TPHd, TPHo, and VOCs were detected in the sample collected downgradient of the former USTs. Fugro concluded that the extent of petroleum-related impacts beneath the site was defined and limited to the area around the former UST and, therefore, qualified for closure under the Water Board's Low Threat Closure Policy (LTCP). Case closure was subsequently approved by the Water Board in a letter dated April 8, 2014. This letter indicated that *"residual contamination in both soil and ground water may remain at the Site that could pose an unacceptable risk under certain development activities such as site grading, excavation, or installation of water wells."* The closure letter also indicated that *the Contra Costa County Health Services Department, and the appropriate planning and building department should be notified prior to any changes in land use, grading activities, excavation and installation or water wells."* A copy of this case closure letter is provided in Appendix C.

In December 2015, Cornerstone attempted to collect a soil vapor sample from one soil vapor probe installed to a depth of approximately 5 feet. The vapor probe was installed using a direct push drilling rig at a location within the footprint of the former UST pit. Vapor sampling was not successful due to water accumulation within the vapor probe. Perched water appeared to have accumulated within the clayey material beneath the asphalt parking area. The water observed is believed to be perched as groundwater was not observed in borings later advanced to depths of up to approximately 10 feet.

On August 22, 2017, Cornerstone collected soil samples from four borings (EB-1 through EB-4) advanced to depths of up to approximately 10 feet within and adjacent to the approximate location of the former USTs. Results from this sampling event were reported in Cornerstone's *Site Management Plan* (SMP) dated September 20, 2017.

The detected concentrations of TPHd, TPHo, TPHg, and the VOCs toluene and total xylenes were below their respective commercial and construction worker ESLs. The detected concentrations detected were similar to those previously detected in 2013 prior to case closure by the Water Board.

Based on these detections, the SMP indicated that soil and/or groundwater with residual fuel-related impacts could be encountered during excavation around the former UST locations. If encountered, the SMP provides protocols for the special handling and disposal of such material.

4.2.2 Radon

Elevated levels of radon in indoor air are a result of radon moving into buildings from the soil, either by diffusion or flow due to air pressure differences. The ultimate source of radon is the uranium that is naturally present in rock, soil, and water. Some types of rocks are known to have uranium concentrations greater than others and, consequently, there is an increased chance of elevated radon concentrations in soils and weathered bedrock where they are located. Areas down-slope which received sediments and/or surface and ground water from rock units with above average uranium content also have an increased likelihood of elevated radon concentrations in soil gas. In California, bedrock that can contain above average uranium concentrations includes the Monterey formation, asphaltic rocks, marine phosphatic rocks, granitic rocks, felsic volcanic rocks, and certain metamorphic rocks.

The federal EPA has established an action level of 4 pCi/L, above which the EPA recommends taking action to reduce radon levels in structures. To help local, state, and federal agencies prioritize resources and implement radon-control building codes, the EPA published maps of radon hazards for each county in California (www.epa.gov/radon/zonemap/california.htm).

The Site is located in Contra Costa County, which is designated by the EPA as Zone 2 with a moderate potential (from 2 to 4 pCi/L). It is important to note that EPA has identified structures with elevated levels of radon in all three zones, and the EPA recommends Site-specific testing in order to determine radon testing at a specific location.

Based on information present in the previous regulatory agency database report (October 2015), nine radon screening tests have been performed in the Site vicinity (zip code 94564), with no results exceeding 4pCi/L.

4.2.3 Division of Oil, Gas and Geothermal Resources Maps

To evaluate the presence of oil or gas wells on-Site and in the immediate Site vicinity, maps available on-line at the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (<http://www.consrv.ca.gov/dog>) were reviewed. Review of the available map for the Site area did not show oil or gas wells on-Site or on the adjacent properties.

4.2.4 Lead in Drinking Water

The East Bay Municipal Utility District (EBMUD) provides drinking water to the Site. The 2018 water quality report published by the EBMUD states that the 90th percentile concentration of lead detected was 2.4 µg/L, with no detections exceeding the drinking water standard established by the US EPA of 15 ppb.

SECTION 5: PHYSICAL SETTING

We reviewed readily available geologic and hydrogeologic information to evaluate the likelihood that chemicals of concern released on a nearby property could pose a significant threat to the Site and/or its intended use during our previous Phase I ESA performed for this Site, dated November 24, 2015. This information is included below.

5.1 RECENT USGS TOPOGRAPHIC MAP

A 2012 USGS 7.5 minute topographic map was reviewed to evaluate the physical setting of the Site. The Site's elevation is approximately 200 feet above mean sea level; topography in the vicinity of the Site slopes to the north-northwest towards the San Pablo Bay.

5.2 HYDROGEOLOGY

Based on our previous monitoring wells installed on-Site as presented in the California Geotracker database, depth to the shallow ground water beneath the Site appears to be highly variable, ranging between depths of approximately 4 to 20 feet. The reported ground water flow in this shallow zone ranges between the southwest to northwest.

SECTION 6: HISTORICAL USE INFORMATION

The objective of the review of historical use information is to develop a history of the previous uses of the Site and surrounding area in order to help identify the likelihood of past uses having led to Recognized Environmental Conditions at the property. The ASTM standard requires the identification of all obvious uses of the property from the present back to the property's first developed use, or back to 1940, whichever is earlier, using reasonably ascertainable standard historical sources.

6.1 HISTORICAL SUMMARY OF SITE

The historical sources reviewed are summarized below. The results of our review of these sources are summarized in Table 7.

- **Historical Aerial Photographs:** We reviewed aerial photographs dated between 1939 and 2012 obtained from EDR and Quantum Spatial; copies of aerial photographs reviewed are presented in Appendix D.
- **Historical Topographic Maps:** We reviewed USGS 15-minute and 7.5-minute historic topographic maps dated 1895, 1915, 1948, 1949, 1959, 1968, 1973, 1980, 1993, and 1995; copies of historic topographic maps reviewed are presented in Appendix D.
- **Historical Fire Insurance Maps:** EDR reported that the Site was not within the coverage area of fire insurance maps.
- **Local Street Directories:** We reviewed city directories obtained from EDR that were researched at approximately 5 year intervals between 1922 and 2013 to obtain information pertaining to past Site occupants. The city directory summary is presented in Appendix E.

Table 7. Summary of Historical Source Information for Site

Date	Source	Comment
1895, 1915, 1948, 1949, and 1959	Topographic Maps	No structures are depicted on the maps
1939, 1946, and 1950	Aerial Photographs	Site appears vacant. The natural topography appears to consist of rolling hills across the Site.
1958	Aerial Photographs	Some grading appears to have occurred in the central portion of the Site. The adjacent Interstate 80 and associated interchanges is present.
1968 and 1971	Aerial Photographs	Beginning with the 1968 image, the Site has been developed and consists of two structures at the northwest corner of the Site (1201 and 1211 to 1221 addresses), one large structure in the center of the Site (1401 to 1499 addresses), and a surrounding parking lot. An "L"-shaped structure is present at the northeast corner that appears to be a service station. The 1971 image is similar to the 1968 image.
1968 and 1973	Topographic Maps	Three structures are depicted starting with the 1968 map.
1974 and 1975	Aerial Photographs	Two new structures are present at the 1271 address, with one that appears to be a canopy, similar to what is used at fueling stations. A new rectangular structure is present north of the 1501 address.
1975	City Directory	1201: Regalias Chevron 1211: Winchell Donut House 1213: The Flower Hut 1215: J RS Jewelry 1221: Bank of America 1271: Car Care Center 1401: Longs Drugs 1409: Fotomat Drive Thru 1421: Safeway 1431: Baby News 1441: One Hour Martinizing 1451: Burger Haven 1461: Quill Stationary and Gift 1481: Silveridge Lounge 1491: Sybals Silveridge Barber Salon 1499: Marjories Appian 80 1511: Lafayette Federal Savings
1976	Aerial Photographs	A new square-shaped structure is present at the 1501 address.
1978	Aerial Photographs	The building at the 1211 to 1221 addresses has been expanded south to include the 1251 address. A new structure is present at the 1565 to 1577 addresses. The rectangular structure north of the 1501 address is no longer present.

Date	Source	Comment
1980	City Directory	1201: Regalias Chevron 1211: Winchell Donut House 1213: The Flower Hut 1215: J RS Jewelry 1221: Bank of America 1251: Super Auto 1261: Fotomat Corporation 1271: Car Care Center 1401: Longs Drugs 1421: Safeway 1451: Lily's Garden Restaurant 1481: Silveridge Lounge 1491: Sybals Silveridge Barber Salon 1499: Marjories Appian 80 1501: Mi Place Pizza 1565: Lafayette Federal Savings 1569: La Vals Stuffery 1573: Sports Corner 1577: Super Scoop
1980	Topographic Maps	Eight structures are depicted on Site.
1981	Aerial Photographs	Overall the Site layout is similar. What appears to be a rectangular asphalt patch is present adjacent and east of the Chevron Station (1201). This apparent patch corresponds to the location of the USTs that were installed in 1981.
1982 and 1983	Aerial Photographs	The Site is similar to the 1981 image.
1985	City Directory	1201: Regalias Chevron 1211: Winchell Donut House 1213: The Flower Box 1215: J RS Jewelry 1221: Bank of America 1251: Super Auto 1271: Antique Restoration 1401: Long's Drugs 1409: Fotomat Corporation 1421: Safeway 1481: Silveridge Lounge 1491: Sybals Silveridge Style Salon 1499: Marjories Appian 80 1501: Mi Place Pizza 1565: Capitol Federal Savings 1569: La Vals Stuffery 1573: American Protective Services 1577: Appian 80 Express Cleaners
1988	Aerial Photographs	Construction of the building at the 1261 address is present in the 1988 image. The apparent canopy is no longer present at the 1271 address. What appears to be 2 concrete or asphalt patches are present in its former location.

Date	Source	Comment
1990	City Directory	1201: Regalias Chevron 1211: Winchell Donut House 1213: Pinole Key & Gift Shop 1215: Allstar Sportscard 1221: Bank of America 1251: Super Auto 1261: Super Car Wash 1271: Antique Restoration 1401: Long's Drugs 1409: Fotomat Corporation 1421: Safeway 1431: Video International 1441: Holiday Cleaners 1481: Silveridge Lounge 1499: Sybals Silveridge Style Salon 1501: Cybelles Pizza 1565: Capitol Federal Savings 1569: Stuffery La Vals 1573: Automatic Appliance 1577: Appian 80 Express Cleaners
1992	City Directory	1201: Regalias Chevron 1211: Winchell Donut House 1213: Pinole Key & Gift Shop 1215: Lisa's Nails 1251: Super Auto 1261: Super Car Wash 1271: Antique Restoration 1401: Long's Drugs 1421: Safeway 1431: Video International 1441: Holiday Cleaners 1481: Silveridge Lounge 1499: Sybals Silveridge Style Salon 1501: Cybelles Pizza 1565: Capitol Federal Savings 1569: Stuffery La Vals 1573: Automatic Appliance 1577: Appian 80 Express Cleaners
1993 and 1995	Topographic Maps	No features are depicted on these maps.
1993	Aerial Photographs	A new structure is present at the 1261 address.

Date	Source	Comment
1995	City Directory	1201: Regalias Chevron 1211: Pizza Hut 1213: Pinole Key & Gift Shop 1215: Lisa's Nails 1221: Bank of America 1251: All Cars Inc. / Super Auto 1261: Appian 80 Car Wash 1271: Antique Restoration / Shaker Furniture Showroom 1401: Long's Drugs 1421: Safeway 1441: Four Mile Cleaners 1481: Silveridge Lounge 1499: Sybals Silveridge Style Salon 1501: Peking Garden Restaurant 1565: San Francisco Federal Savings 1569: Boun Thai Cuisine 1573: Automatic Appliance 1577: Appian 80 Express Cleaners
1998	Aerial Photographs	The Chevron Service Station located at the 1201 address is no longer present. The remainder of the Site is similar.
1999	City Directory	1211: Pizza Hut 1213: Pinole Key & Gift Shop 1215: Lisa's Nails 1251: Grand Auto Supply 1261: Appian 80 Car Wash 1271: Antique Restoration / Shaker Furniture Showroom 1401: Long's Drugs 1421: Safeway 1431: Tropical Fish & Pet Shop 1441: Four Mile Cleaners 1481: Silveridge Lounge 1499: Sybals Silveridge Style Salon 1501: Peking Garden Restaurant 1569: Bangkok Thai Cuisine 1577: Appian 80 Express Cleaners
2003	City Directory	1211: Pizza Hut 1213: Pinole Key & Gift Shop 1215: Waikiki Nails 1251: Kragen Auto Parts / Tires Plus 1271: Shaker Furniture Showroom 1421: Safeway 1431: Tropical Fish & Pet Shop 1441: Jung Lee 1501: China Delights 1569: Bangkok Thai Cuisine 1573: Blockbuster Video / Ladies Workout Express 1577 Appian 80 Express Cleaners
2005, 2009, and 2012	Aerial Photographs	The Site is similar to the 1998 image.

Date	Source	Comment
2008	City Directory	1211: PAC Pizza Inc. / Pizza Hut 1213: Pinole Key & Gift Shop 1215: Waikiki Nails 1251: Kragen Auto Parts / Wheel Works 1261: Bubbles Car Wash & Center 1271: Antique Restoration 1401: Long's Drugs 1421: Safeway 1431: Tropical Fish & Pet Shop 1441: Best Cleaning Valet Service / Four Mile Cleaners 1481: Bar None 1501: China Delights 1565: California Federal Bank / Citi Bank 1573: Blockbuster Video / Ladies Workout Express
2013	City Directory	1211: Locksmith 24 hr / Pizza Hut 1213: Pinole Key & Gift Shop 1215: Waikiki Nails 1251: O'Reilly Auto Parts / Wheel Works 1261: Bubbles Car Wash & Center 1271: Antique Restoration 1401: CVS Pharmacy 1421: Safeway 1431: Tropical Fish & Pet Shop 1441: Best Cleaning Valet Service / Four Mile Cleaners 1481: Bar None / Safe and Locks 1501: A Emergency Locksmith Services / China Delights 1573: Ladies Workout Express 1577: Appian 80 Express Cleaners

6.2 HISTORICAL SUMMARY OF SITE VICINITY

Based on our review of the information described in Section 6.1, the general Site vicinity appears to have historically consisted mainly of vacant/undeveloped land with little agricultural activities. By 1958, Interstate 80 and the Appian Way interchanges were constructed. By 1968, much of the Site vicinity had been developed with mostly residential properties and few commercial properties, mainly located near Appian Way. By 1982, a portion of the commercial development south of Interstate 80 is present. By 1993, the Site vicinity development appears similar to the current.

SECTION 7: SITE RECONNAISSANCE

We performed a Site reconnaissance to evaluate current Site conditions and to attempt to identify Site Recognized Environmental Conditions. The results of the reconnaissance are discussed below. Additional Site observations are summarized in Table 8 in Section 7.2. Photographs of the Site are presented in Section 7.2.1.

7.1 METHODOLOGY AND LIMITING CONDITIONS

To observe current Site conditions (readily observable environmental conditions indicative of a significant release of hazardous materials), Cornerstone staff Ms. Sarah E. Kalika, P.G., visited the Site on May 10, 2019, and was accompanied for a portion of the visit by Mr. Mark Goldstone

of Hillsboro Properties. Site reconnaissance was conducted by walking representative areas of the Site, including the interior(s) of the on-Site structure(s), the periphery of the structure(s) and the Site periphery. Cornerstone staff only observed those areas that were reasonably accessible, safe, and did not require movement of equipment, materials or other objects. Physical obstructions that limited our ability to view the ground surface at the Site included asphalt paved vehicle drives and parking areas (typical of developed properties).

7.2 OBSERVATIONS

During our Site visit, the Site was observed to consist of five structures and appurtenant parking and landscaped areas. The southern border of the Site was observed to be a steep, grass covered hill that sloped towards a drainage swale located off-Site and adjacent to Interstate 80. Signage for a petroleum pipeline was observed along this border. The parcel located at 1201 Tara Hills Drive was observed to be vacant and covered with gravel. No readily apparent surficial indications of the former USTs or service station were observed.

The on-Site buildings consisted of a five-unit structure with addresses of 1211 to 1251 Tara Hills Drive, a six-unit structure with addresses of 1401 to 1491 Tara Hills Drive, and single unit structures with addresses of 1261 and 1271 Tara Hills Drive. The occupants were observed to be those listed in Table 1.

No environmental concerns were noted at the Key's and Gift Shop (1213 Tara Hills Drive), Nail Salon (1215 Tara Hills Drive), vacant former CVS Pharmacy (1401 Tara Hills Drive), Safeway (1421 Tara Hills Drive), Bar None (1481 Tara Hills Drive), and the fitness gym (1573 Tara Hills Drive). Small quantities of cleaners were observed within these businesses that were stored in properly labeled containers. No signs of spills or leaks were noted. During our site visit, the restaurant at 1215 Tara Hills Drive and the bank at 1221 were not accessed. However, the exterior of each business was observed, and cooking grease/oil containers were observed at the restaurant. No evidence of spills or leaks were noted at these properties. The inaccessibility of these units is not considered a data gap as the business types are generally associated with activities that are use significant quantities of hazardous materials.

The vacant space (formerly occupied by O'Reilly Auto Parts with an address of 1251 Tara Hills Drive) contained shelving racks and general garbage and debris related to a transient campsite. During our Site visit, the space was being cleared by a junk hauling company. No remaining hazardous materials were observed.

The vacant space (formerly occupied by Wheel Works also listed at 1251 Tara Hills Drive) was vacant and unoccupied. No remaining hazardous materials were observed.

The vacant building (formerly occupied by Bubble's Car Wash with an address of 1261 Tara Hills Drive) consisted of an open area where the automatic car wash used to be located, utility/storage room, and a vacant area that appeared to be a former customer reception/waiting area. The interior of the former automatic car was enclosure appeared to be vandalized and damaged by fire. No remaining hazardous materials were observed.

The vacant building (formerly occupied by Antique Restoration with an address of 1271 Tara Hills Drive) consisted of a vacant space. A large pile of debris consisting of wood, metal, cardboard, pieces of carpet and carpet padding, and other items was covered by a large piece of carpet. A clothes washer was observed near the debris pile. In another room, a mattress

was observed. Several former exploratory borings associated with previous sampling events discussed above were also observed in the parking area outside of this business.

The vacant space formerly occupied by Four Mile Cleaners at 1441 Tara Hills Drive was cleared of all equipment. No hazardous materials were observed within the unit.

Table 8. Summary of Readily Observable Site Features

General Observation	Comments
Aboveground Storage Tanks	Not Observed
Agricultural Wells	Not Observed
Air Emission Control Systems	Not Observed
Boilers	Not Observed
Burning Areas	Not Observed
Chemical Mixing Areas	Not Observed
Chemical Storage Areas	Observed – small volumes of containerized cleaners observed in several businesses.
Clean Rooms	Not Observed
Drainage Ditches	Not Observed
Elevators	Not Observed
Emergency Generators	Not Observed
Equipment Maintenance Areas	Not Observed
Fill Placement	Not Observed
Ground Water Monitoring Wells	Observed – related to release at 1577 Tara Hills Drive
High Power Transmission Lines	Not Observed
Hoods and Ducting	Not Observed
Hydraulic Lifts	Not Observed
Incinerator	Not Observed
Petroleum Pipelines	Observed – signage along the southern border of the Site
Petroleum Wells	Not Observed
Ponds or Streams	Not Observed
Railroad Lines	Not Observed
Row Crops or Orchards	Not Observed
Stockpiles of Soil or Debris	Not Observed
Sumps or Clarifiers	Observed – inactive oil/water separator observed at the car wash. Oil/grease separators observed at the restaurants.
Transformers	Observed, pole-mounted transformers labeled as non-PCB
Underground Storage Tanks	Not Observed
Vehicle Maintenance Areas	Not Observed
Vehicle Wash Areas	Not Observed
Wastewater Neutralization Systems	Not Observed

The comment "Not Observed" does not warrant that these features are not present on-Site; it only indicates that these features were not readily observed during the Site visit.

7.2.1 Site Photographs



Photograph 1. View of Site at looking southwest.



Photograph 2. View of Site looking west.



Photograph 3. View of Site looking south.



Photograph 4. Vacant parcel at 1201 Tara Hills Drive (former Chevron Station).



Photograph 5. View of southwest corner of Site (former car wash and former antiques restoration).



Photograph 6. Former car wash structure.



Photograph 7. Car wash automatic wash bay.



Photograph 8. Drains associated with former car wash.



Photograph 9. Former Antiques Restoration structure.



Photograph 10. Interior of former Antiques Restoration.



Photograph 11. Additional room inside former Antiques Restoration.



Photograph 12. Pile of debris and discarded washing machine within former Antiques Restoration structure.



Photograph 13. Additional view of debris pile.



Photograph 14. Interior (rear) of Safeway (photo from 2015).



Photograph 15. Storage room containing cleaning products within Safeway store (photo from 2015).



Photograph 16. Rear of Safeway showing box crushing machine (photo from 2015).



Photograph 17. Pole-mounted transformer labeled "non-PCB".



Photograph 18. Loading dock area at rear of former CVS Pharmacy.



Photograph 19. Rear of Safeway store.



Photograph 20. 55-gallon drums observed in loading dock area behind Safeway.



Photograph 21. Interior of former CVS Pharmacy.



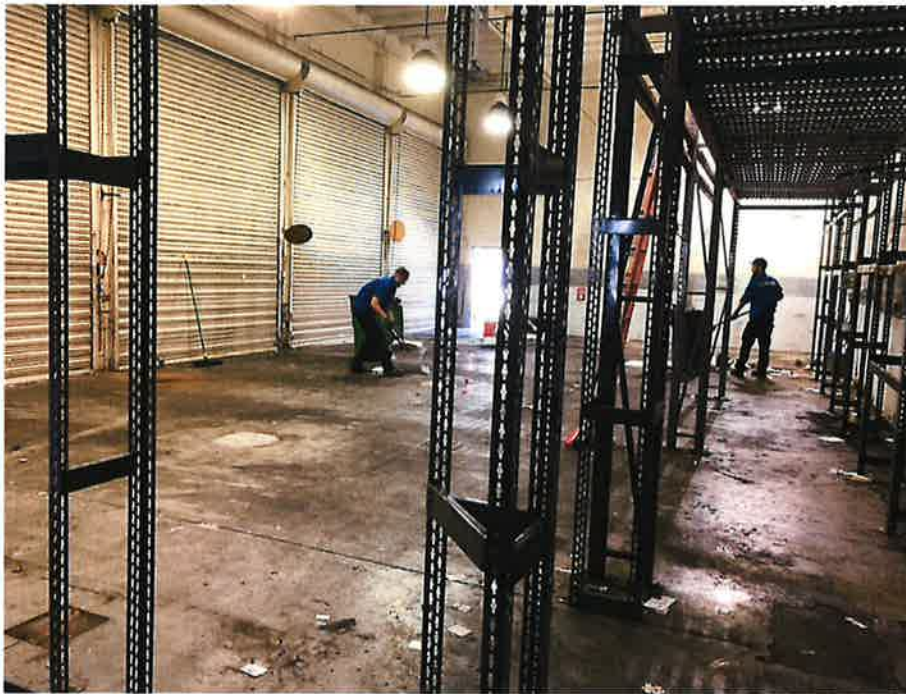
Photograph 22. Rear storage area of former CVS Pharmacy.



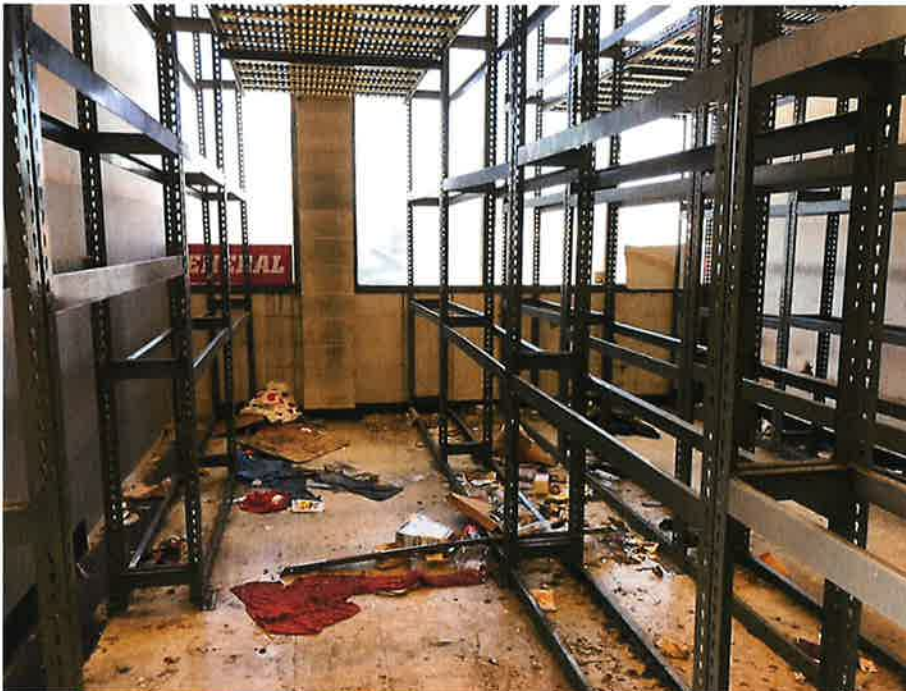
Photograph 23. Electrical control panel within former CVS Pharmacy.



Photograph 24. Front entry counter at former Wheel Works.



Photograph 25. Bay area of former Wheel Works.



Photograph 26. Storage racks within former Wheel Works.



Photograph 27. Interior of former O'Reilly Auto Parts store.



Photograph 28. Alternate view of former O'Reilly Auto Parts store.



Photograph 29. Electrical control panel and floor staining within former O'Reilly Auto Parts store.



Photograph 30. Exterior of former Four Mile Cleaners and adjacent former pet store.



Photograph 31. Interior of former Four Mile Cleaners.



Photograph 32. Disconnected vents within former Four Mile Cleaners.



Photograph 33. Previous location of dry cleaning equipment.



Photograph 34. Previous location of dry cleaning equipment.



Photograph 35. Exterior of restaurant located in south east corner of Site.



Photograph 36. Monitoring well and structure with restaurant, gym, and dry cleaner in northeast corner of Site.

SECTION 8: ENVIRONMENTAL QUESTIONNAIRE AND INTERVIEWS

8.1 ENVIRONMENTAL QUESTIONNAIRE / OWNER INTERVIEW

To help obtain information on current and historical Site use and use/storage of hazardous materials on-Site, we provided an environmental questionnaire during our previous investigation in 2015, to Hillsboro Properties and they were asked to forward the questionnaire to the owners of the other units at the Site (Appian 80 LP, Thomas G. Paulson Trust, Nga Tran, John Johnson, Arco Building Company, and Tara Hills Drive, LP) for completion. Mr. Christopher Paulson from the Thomas G. Paulson Trust and Mr. John Johnson from Antiques Restoration completed their respective questionnaires in 2015. The questionnaire from Mr. Paulson acknowledged the former use of 1201 Tara Hills Drive as a Chevron-branded gasoline station and acknowledged the former presence of USTs. The questionnaire from Mr. Johnson acknowledged the former use of 1271 Tara Hills Drive as a Car care center with two USTs that were removed in 1987. Copies of these completed questionnaires are provided in Appendix F. The completed questionnaires from the remaining owners were not returned to us. We additionally interviewed Mr. Mark Goldstone of Hillsboro Properties during our 2015 Site visit and Mr. Carl Goldstone of Hillsboro Properties via email and telephone communication in 2015. Paul Goldstone Enterprises is associated with Hillsboro Properties and owns a portion of the Site. Much of the historical Site information and current use information used in this report was provided by Hillsboro Properties.

In preparation for this Phase I ESA Update, we asked Mr. Carl Goldstone for updates to the Site questionnaire. Mr. Goldstone reported that the former Antiques Restoration portion of the Site

is now owned by Pinsquare 1, LLC and that the former Chevron Station at 1201 Tara Hills Drive is now owned by Pinsquare 2, LLC. He stated that Pinsquare 1, LLC and Pinsquare 2, LLC are owned by Hillsboro Properties. He additionally stated that he did not have an updated title report.

8.2 INTERVIEWS WITH PERSON(S) KNOWLEDGEABLE OF SITE USE

Contact information for persons knowledgeable of existing and prior site uses was not provided to us prior to or at the Site visit.

8.3 INTERVIEWS WITH PREVIOUS OWNERS AND OCCUPANTS

Contact information for previous Site owners and occupants was not provided to us. Therefore, interviews with previous Site owners and occupants could not be performed.

SECTION 9: PRELIMINARY SOIL VAPOR EVALUATION

As noted above, Four Mile Cleaners was formerly located on-Site at 1441 Tara Hills Drive. In addition, there is an off-Site and adjacent drycleaner (Appian 80 Cleaners located at 1577 Tara Hills Drive) (Figure 2). PCE subsurface impacts from the off-Site cleaners have been documented and the adjacent property is currently undergoing remediation under DTSC oversight. The on-Site dry cleaner previously used PCE as a dry cleaning solvent as indicated in the County records reviewed.

Cornerstone directed a subsurface investigation and advanced six borings to depths of up to approximately 5 feet for the installation of temporary soil vapor probes (SV-1 through SV-6). Soil vapor sampling was attempted at each probe to determine if the former on-Site dry cleaner (former Four-Mile Cleaners) impacted the subsurface and/or if the documented PCE subsurface impacts from the existing off-Site dry-cleaner (Appian 80) have significantly impacted the Site. The six boring locations were positioned as follows:

- Boring SV-1 was positioned along the western exterior of the former on-Site drycleaner.
- Boring SV-2 was positioned within the interior of the former on-Site dry cleaner.
- Boring SV-3 was positioned along the northern exterior of the on-Site former dry cleaner.
- Boring SV-4 was positioned approximately 175 feet from the northern property boundary closest to the off-Site drycleaner.
- Boring SV-5 was positioned approximately 125 feet from the northern property boundary closest to the off-Site drycleaner.
- Boring SV-6 was positioned approximately 50 feet from the northern property boundary closest to the off-Site drycleaner.

9.1 SUBSURFACE MATERIALS

The subsurface materials observed in the exploratory borings generally consisted of sandy clay. Some gravel was observed between a depth of approximately 2 and 5 feet in all borings except SV-1 and SV-5. No apparent chemical odors were observed in the exploratory borings. Ground water was not observed in any of the borings. The lithologic observations are included on the boring logs in Appendix F.

9.2 ORGANIC VAPOR READINGS

Soil samples retrieved from the exploratory borings were monitored with a MiniRAE 3000 Organic Vapor Meter (OVM) to record VOC vapors. No organic vapor readings were measured in the soil samples screened from each boring.

9.3 SOIL VAPOR QUALITY EVALUATION

On May 24, 2019, Cornerstone oversaw the installation of six temporary soil vapor probes (SV-1 through SV-6) using a direct push drilling rig. The temporary soil vapor probes were installed following the general requirements of the July 2015 document entitled, "Advisory: Active Soil Gas Investigations", prepared by the DTSC.

9.4 TEMPORARY SOIL VAPOR PROBE INSTALLATION AND SAMPLE COLLECTION

The six temporary soil vapor probes were installed to depths of approximately 4½ to 5 feet at each location. Each probe was completed with stainless steel expendable tip and screen affixed to stainless steel tubing. Each probe was constructed by first placing approximately ½ foot of coarse aquarium-type sand into the bottom of the boring. The stainless steel tip and tubing was then lowered into the boring via a tremie pipe. Additional sand was then placed in the boring via tremie when needed to create an approximately 1 foot sand pack interval around the vapor tip. Approximately 1 foot of granular bentonite was placed on top of the sand pack. Hydrated bentonite was then placed down the boring; the mixture consisted of approximately 50 percent water to bentonite and was placed in less than ½ foot lifts to just below the surface. The stainless steel tubing was labeled with depth of placement and capped utilizing a vapor-tight Swagelok valve set in the "off" position.

The temporary vapor probes were sampled on May 27, 2015, approximately 72 hours after installation. The DTSC guidance recommends sampling at least 2 hours after installation for soil vapor probes installed using direct push drilling. A 167 milliliters-per-minute flow regulator inclusive of a particulate filter was fitted to the shut-off valve and the other end to a "T" fitting. A Summa canister was connected to the "T" fitting. The other end of the "T" fitting was affixed to a digital vacuum gauge and a 1-liter Summa canister utilized for purging.

A minimum 10 minute vacuum tightness test was performed on the manifold and connections by opening and closing the 1-liter purge canister valve and applying and monitoring a vacuum on the vacuum gauge. The sample shut-off valve on the downhole side of the sampling manifold remained in the "off" position. When gauge vacuum was maintained for at least 10 minutes without any noticeable decrease (less than approximately 0.1 inches of mercury (Hg) for properly connected fittings), purging began. The downhole shut off valve was opened and approximately three purge volumes of vapor were removed using the purging 1-liter Summa. The volume of vapor removed was verified by the calculated versus observed pressure drop in the purging Summa canister. The purge volume was calculated based on the length and inner diameter of the sampling probe and the connected sampling tubing and equipment. Assuming the vapor probe was properly sealed, the borehole sand pack vapor space will have equilibrated with the surrounding vapors following the more than 48 hour equilibration period. Thus, the sand pack vapor space was not included in the purge volume calculation.

Samples were successfully collected from temporary soil vapor probes SV-1 through SV-4. However, soil vapor samples could not be collected from probes SV-5 and SV-6 due to the tight clay subsurface materials. Soil vapor sampling field notes and logs are included in Appendix F.

9.5 SOIL VAPOR LABORATORY SAMPLING AND ANALYSES

Cornerstone collected soil vapor samples from temporary probes SV-1 through SV-4 in laboratory-provided cannisters and submitted the samples for analysis to a state-certified analytical laboratory under a chain of custody control. The four samples were analyzed for TPHg and VOCs (EPA Test Method TO-15SIM). In addition, one air sample collected from the shroud atmosphere was analyzed for isopropyl alcohol. As noted, soil vapor samples could not be collected from probes SV-5 and SV-6.

9.6 SOIL VAPOR ANALYTICAL SUMMARY

The detected soil vapor concentrations were compared to the Tier 1 ESLs (Water Board, 2019). Since the land-use will be commercial, the detected concentrations were also compared to the commercial direct exposure ESLs (Water Board, 2019). Detected compounds are presented in Table A. Chain of custody documentation and laboratory analytical reports are presented in Appendix H.

A summary of the analytical results is presented below:

- Trichloroethene (TCE) was detected at concentrations of 320 $\mu\text{g}/\text{m}^3$ and 4,800 $\mu\text{g}/\text{m}^3$ in the samples collected from SV-3 and SV-4, respectively. The Tier 1 ESL for TCE is 16 $\mu\text{g}/\text{m}^3$ and the commercial ESL is 100 $\mu\text{g}/\text{m}^3$. TCE was detected in SV-1 and SV-2 but at concentrations below the Tier 1 ESL.
- PCE was detected below the Tier 1 ESL, at a maximum concentration of 12 $\mu\text{g}/\text{m}^3$.
- Cis-1,2-dichloroethene (cDCE) exceeded the Tier 1 ESL of 280 $\mu\text{g}/\text{m}^3$ in the four soil vapor samples collected, with detections ranging from 540 $\mu\text{g}/\text{m}^3$ at SV-1 to 9,500 $\mu\text{g}/\text{m}^3$ at SV-3. The detected concentration in SV-3 exceeded the commercial direct exposure ESL of 1,200 $\mu\text{g}/\text{m}^3$.
- Trans-1,2-Dichloroethene (tDCE) exceeded the Tier 1 ESL of 2,800 $\mu\text{g}/\text{m}^3$ in the soil vapor sample collected from SV-3, with a detected concentration of 3,800 $\mu\text{g}/\text{m}^3$. This detected concentration was below the commercial direct exposure ESL of 12,000 $\mu\text{g}/\text{m}^3$. Samples collected from the three remaining soil vapor probes had concentrations of tDCE below the Tier 1 ESL.
- Vinyl Chloride exceeded the Tier 1 ESL of 0.32 $\mu\text{g}/\text{m}^3$ and the commercial direct exposure ESL of 5.2 $\mu\text{g}/\text{m}^3$ in the four soil vapor samples collected, with detections ranging from 62 $\mu\text{g}/\text{m}^3$ at SV-4 to 3,500 $\mu\text{g}/\text{m}^3$ at SV-3.
- TPHg was detected at a concentration of 15,000 $\mu\text{g}/\text{m}^3$ at SV-4, which is above the Tier 1 ESL of 3,300 $\mu\text{g}/\text{m}^3$ but below the commercial direct exposure ESL of 83,000 $\mu\text{g}/\text{m}^3$.
- Benzene was detected at concentrations exceeding the Tier 1 ESL of 3.2 $\mu\text{g}/\text{m}^3$ in three of four soil vapor samples collected, ranging in concentrations from 14 $\mu\text{g}/\text{m}^3$ in SV-2 to 130 $\mu\text{g}/\text{m}^3$ in the sample collected for SV-4. The benzene soil vapor concentration detected in the sample from SV-4 also exceeded the commercial direct exposure ESL of 14 $\mu\text{g}/\text{m}^3$.

TCE, cDCE, tDCE, and vinyl chloride were detected at concentrations exceeding their respective Tier 1 and commercial ESLs. PCE was detected at low concentrations below the Tier 1 ESL. In anerobic conditions, PCE can degrade to TCE, cDCE, tDCE, and vinyl chloride through the sequential replacement of chlorine atoms with hydrogen atoms (dechlorination). During degradation, the concentrations of PCE will decrease giving way to increased concentrations of its daughter products (TCE, cDCE, tDCE, and vinyl chloride). The on-Site drycleaner reportedly used PCE during normal operations based on agency files Cornerstone reviewed. The low concentrations of PCE and higher concentrations of its daughter products may indicate an older PCE release that is degrading to its daughter products.

SECTION 10: FINDINGS, OPINIONS AND CONCLUSIONS (WITH RECOMMENDATIONS)

Cornerstone performed this Phase I ESA in general accordance to ASTM E1527-13 to support Hillsboro Properties in evaluation of Recognized Environmental Conditions. Our findings, opinions and conclusions are summarized below.

10.1 HISTORICAL SITE USAGE

Based on information reviewed during this study, the Site was vacant/undeveloped until approximately 1966 when structures were built at the addresses of 1201, 1211 to 1221, and 1401 to 1499 Tara Hills Drive. Initially, the businesses consisted of a Chevron service station, retail commercial businesses, restaurants, pharmacy, grocery store, photograph processing business, and a dry cleaner. Additions to the shopping center occurred by 1978 (1251 and 1271) and by 1993 (1261 Tara Hills Drive). The Chevron Station was reportedly demolished by 1997. A second fueling station (Rent-A-Rack) was formerly located at 1271 Tara Hills Drive from approximately 1972 until 1986. The dry cleaner business located at 1441 Tara Hills Drive operated from at least 1975 until its closure in approximately 2017.

10.2 CHEMICAL STORAGE AND USE

Hazardous material storage and use is documented at Safeway. These materials mostly consist of cleaning products. No spills or leaks were observed during our Site visit or were indicated in the records reviewed.

CVS Pharmacy (formerly Long's Drugs), Antique Restoration, Bubbles Car Wash & Center, O'Reilly Auto Parts (formerly Kragen Auto Parts and Super Auto), and the former Fotomat business are now vacant. Previously, these businesses used and stored hazardous. During our previous Site visit, no spills or leaks were observed at the CVS Pharmacy, Antique Restoration, Bubbles Car Wash, or O'Reilly Auto Parts. The Fotomat business was no longer in operation during our previous Site visit. Based on our Site visits and records reviewed, these former businesses are not expected to have significantly impacted the Site.

Hazardous materials were used and stored at the former Chevron and Rent-A-Rack businesses. These facilities are further discussed in Section 9.4.

A dry cleaner formerly operated at 1441 Tara Hills Drive at least 1975 until approximately 2017 and operated under the names of One Hour Martinizing, Holiday Cleaners, and Four Mile Express Cleaners. Hazardous materials records indicate the prior use of PCE as a dry-cleaning solvent. No investigations appear to have been previously performed to determine if soil, soil vapor, or ground water impacts are present due to the prior use of PCE at this unit. As such,

Cornerstone collected soil vapor samples from beneath and adjacent to the former dry-cleaning unit as discussed in Section 9. Results from the soil vapor samples collected detected TCE, cDCE, tDCE, and vinyl chloride at concentrations that exceed their Tier 1 ESLs, and in some samples, also exceed the commercial direct exposure ESLs. The highest concentrations were detected in the sample collected adjacent to and north of the former dry cleaner. The VOCs detected are degradation products of PCE, which was previously used as a dry-cleaning solvent. These soil vapor detections may have resulted from an old PCE release from the dry cleaner that has since degraded to its daughter products. We recommend the collection of additional samples, including soil and groundwater, to determine if a source area is present in or near the drycleaner.

10.3 FORMER USTS

Fueling and waste oil USTs were formerly located on Site at the former Chevron service station (1201 Tara Hills Drive) and the Rent-A-Rack service station (1271 Tara Hills Drive). In addition, hydraulic lifts and associated oil tanks were formerly located at the Super Auto business (1251 Tara Hills Drive) and the Chevron Service Station.

According to the *Hydraulic Lift Removal Report* (Walker's Hydraulics, 1997), five hydraulic lifts and associated oil tanks were removed from Super Auto (1251 Tara Hills Drive). TPHo impacted soil was reportedly encountered around two of the tanks, and soil was subsequently excavated. However, the report indicates that some TPHo soil was not excavated due to the risk of undermining the building. Based on this report, there appears to be TPHo impacted soil beneath this facility. Although, the extent appears limited to these former tanks, any impacted soils encountered during construction may require special handling and disposal. Following demolition, soil exceeding commercial screening levels that was previously left in place should be removed for appropriate off-Site disposal. Cornerstone prepared a SMP dated September 20, 2017 that provided protocols for handling such material.

Two 10,000-gallon gasoline USTs and one 5,000-gallon waste oil UST were present at the Rent-A-Rack service station, located at 1271 Tara Hills Drive (former Antiques Restoration business). The tanks were reportedly removed in 1986. Sampling performed in October 2013 detected elevated concentrations of TPHg in soil and TPHg, TPHd, TPHo, and benzene in ground water. These elevated concentrations were detected in samples collected in the area of the former USTs. These compounds were not detected in samples collected downgradient of the tanks, indicating the extent of impacts appeared limited to the area beneath the former USTs. Although this facility was closed under the Water Board's LTCP, areas of isolated impacted soil could be encountered during construction that would require special handling. Our recommendations for handling any impacted soil are included in Section 9.9. Cornerstone's SMP provides protocols for handling such material.

A Chevron service station was present at 1201 Tara Hills Drive from at least 1975 until 1997. Documentation was reviewed related the installation of four USTs in 1981. These USTs along with three hydraulic hoists and one oil/water separator were removed in 1997. Soil samples collected from the excavations indicated no soil impacts resulted from these buried structures, and the County subsequently closed this facility. No documentation was available related to the USTs present before 1981. These USTs were presumably replaced in 1981. Since the sampling associated with the UST closure in 1997 revealed no significant impacts, significant impacts from the original USTs, if present, does not appear likely. However, any impacted soils encountered during construction may require special handling. The protocols presented in the SMP (2017) can be applied to work in this area as well.

10.4 OIL/WATER SEPARATORS

Oil/water separators (OWSs) were previously observed at 1251 Tara Hills Drive (former Wheel Works) and 1261 Tara Hills Drive (former Bubbles Car Wash). OWSs treat wash water by allowing oils and greases to float to the surface for separation and substances heavier than water to sink. If OWSs are not maintained on a regular basis, oil/grease (and potentially other chemicals used on-Site) can be discharged to the sewer during high flow period. Sludge can also build up in OWSs. We recommend that an environmental professional observe the underlying soil following demolition of these structures. If apparent stains are observed, we recommend collecting soil samples for analyses. If significant impacts are detected, the business operators should be responsible for costs associated with excavation and removal of the soil.

10.5 UNDOCUMENTED FILL

Fill soil was used during the backfilling of the UST pits located at 1201 and 1271 Tara Hills Drive. The source and quality of this soil is not known. Cornerstone collected soil samples from one boring that is believed to be located within the former UST excavation fill from 1271 Tara Hills Drive (Rent A Rack). Petroleum hydrocarbons and VOCs were detected in this sample, but at concentrations below their respective commercial direct exposure ESLs. If removed, this soil likely will require disposal at a landfill. The fill material within the UST pit located at 1201 Tara Hills Boulevard was not sampled.

10.6 DISPOSAL OF EXCESS SOIL DURING CONSTRUCTION

Contaminated soil may be present at the former UST locations and the former dry cleaning location. If present, this soil may require special handling and disposal considerations.

10.7 IMPORTED SOIL

If the planned development will require importing soil for Site grading, we recommend documenting the source and quality of imported soil. The DTSC's October 2001 Clean Fill Advisory provides useful guidance on evaluating imported fill.

10.8 POTENTIAL ENVIRONMENTAL CONCERNS WITHIN THE SITE VICINITY

UST releases have been documented at the facilities located at 2298 Appian Way and 1599 Tara Hills Drive. Investigations conducted at both facilities indicate that impacts appear limited to the soil and ground water beneath each facility and do not appear to have migrated to the Site. The facility at 1599 Tara Hills Drive was granted regulatory closure. As such, these facilities are not likely to impact the soil and/or ground water quality beneath the Site. Note, however, that there is litigation on-going between the owner of 1565 to 1577 Tara Hills Drive and the owner of 1599 Tara Hills Drive due to alleged indoor air quality impacts associated with the former Texaco station.

One dry cleaner is currently present adjacent to the Site: Appian 80 Express Cleaners at 1577 Tara Hills Drive. A PCE release to the soil and ground water has been documented at this dry cleaner. The highest concentrations in subsurface media were detected beneath the boiler room within the dry-cleaning business. Groundwater flow direction appears to be to the west-northwest. Previous groundwater sampling detected PCE in samples collected northwest of this dry cleaner and on-Site. Based on records reviewed, we understand that soil removal,

placement of a bioremediation product, and installation of a soil vapor extraction system will be performed. Remedial work will likely continue at this property in the future, which may require further subsurface exploration activities that may extend onto the Site. The proposed development in this area will be required to provide continued access for remedial activities and monitoring if those activities are continuing at the time of development. Structures on and near this dry cleaner likely will require vapor intrusion engineering controls. In addition, we recommend that an environmental professional periodically review available future correspondence related to the dry cleaner to help track the progress and status of remedial work.

10.9 REGULATORY AGENCY CONSIDERATIONS

Per the Water Board closure letter for the former Rent-A-Rack station, the Water Board indicated that the *"Contra Costa County Health Services Department, and the appropriate planning and building department should be notified prior to any changes in land use, grading activities, excavation, and installation of wells"*. We recommend contracting these agencies to inform them of the proposed project and determine what, if any, site management requirements may be required.

The DTSC is currently overseeing the investigation and remediation activities at the Appian 80 Cleaners (1577 Tara Hills Drive). We recommend discussing the planned development with the DTSC before acquiring the parcel.

We recommend engaging with a regulatory oversight agency for the further evaluation of the VOCs detected near the former on-Site dry cleaner (1441 Tara Hills Drive). Additional reporting will be determined based on the agency involved and their requirements.

10.10 ENVIRONMENTAL ATTORNEY

We recommend consulting with an environmental attorney regarding liabilities associated with the impacts identified that appear associated with the former on-Site dry cleaner.

10.11 ASBESTOS CONTAINING BUILDING MATERIALS (ACBMS)

Due to the age of the on-Site structure(s), building materials may contain asbestos. For the buildings that will be demolished, an asbestos survey is required by local authorities and/or National Emissions Standards for Hazardous Air Pollutants (NESHAP) guidelines. NESHAP guidelines require the removal of potentially friable ACBMs prior to building demolition or renovation that may disturb the ACBM.

10.12 LEAD-BASED PAINT

The Consumer Product Safety Commission banned the use of lead as an additive in paint in 1978. Based on the age of the building, lead-based paint may be present. If demolition is planned, the removal of lead-based paint isn't required if it is bonded to the building materials. However, if the lead-based paint is flaking, peeling, or blistering, it should be removed prior to demolition. In either case, applicable OSHA regulations must be followed; these include requirements for worker training, air monitoring and dust control, among others. Any debris or soil containing lead must be disposed appropriately.

10.13 DATA GAPS

ASTM Standard Designation E 1527-13 requires the Environmental Professional to comment on significant data gaps that affect our ability to identify Recognized Environmental Conditions. A data gap is a lack of or inability to obtain information required by ASTM Standard Designation E 1527-13 despite good faith efforts by the Environmental Professional to gather such information. A data gap by itself is not inherently significant; it only becomes significant if it raises reasonable concerns. No significant data gaps were identified during preparation of this Phase I ESA.

10.14 DATA FAILURES

As described by ASTM Standard Designation E 1527-13, a data failure occurs when all of the standard historical sources that are reasonably ascertainable and likely to be useful have been reviewed and yet the historical research objectives have not been met. Data failures are not uncommon when attempting to identify the use of a Site at five year intervals back to the first use or to 1940 (whichever is earlier). ASTM Standard Designation E 1527-13 requires the Environmental Professional to comment on the significance of data failures and whether the data failure affects our ability to identify Recognized Environmental Conditions. A data failure by itself is not inherently significant; it only becomes significant if it raises reasonable concerns. No significant data failures were identified during this Phase I ESA.

10.15 RECOGNIZED ENVIRONMENTAL CONDITIONS

Cornerstone has performed a Phase I ESA in general conformance with the scope and limitations of ASTM E 1527-13 of 1201 to 1577 Tara Hills Drive, Pinole, California. This assessment identified the following Recognized Environmental Condition¹.

- A former dry cleaner (Four Mile Express Cleaners) is present on-Site. Soil vapor sampling conducted in conjunction with this Phase I ESA Update detected elevated chlorinated VOCs beneath and adjacent to the former dry cleaner. These detections suggest a past dry cleaning solvent release.
- A dry cleaner (Appian 80 Cleaners) is present at 1577 Tara Hills Drive that is currently undergoing investigation and remediation activities under DTSC oversight.

This assessment did not identify any Controlled Recognized Environmental Conditions²; the following Historical Recognized Environmental Condition were identified³:

- A Chevron-branded gasoline station was located at 1201 Tara Hills Drive from at least 1968 until 1997. The gasoline station had three 1,000-gallon gasoline USTs and one 1,000-gallon waste oil UST that were removed in 1997. Confirmation sampling

¹ The presence or likely presence of hazardous substances or petroleum products on the Site: 1) due to significant release to the environment; 2) under conditions indicative of a significant release to the environment; or 3) under conditions that pose a material threat of a future significant release to the environment.

² A Recognized Environmental Condition that has been addressed to the satisfaction of the applicable regulatory agency with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls or restrictions.

³ A past Recognized Environmental Condition has been addressed to the satisfaction of the applicable regulatory agency or meeting of unrestricted use criteria established by the applicable regulatory agency without subjecting the Site to required controls or restrictions.

conducted during removal did not indicate that a release had occurred and the County required no further action.

- A Rent-A-Rack-branded gasoline station was located at 1271 Tara Hills Drive until approximately 1986 when two 1,000-gallon gasoline USTs and one 500-gallon waste oil UST were removed. Sampling indicated isolated areas of gasoline-related soil impacts. Due to these isolated impacts, the Site was grouted and closed in 2014. Due to the change in Site use in the area of these former USTs, we recommend the collection of soil, soil vapor, and ground water grab samples to determine if special considerations will be required during building design and/or Site development.

SECTION 11: LIMITATIONS

Cornerstone performed this Phase I ESA to support Hillsboro Properties in evaluation of Recognized Environmental Conditions associated with the Site. Hillsboro Properties understands that no Phase I ESA can wholly eliminate uncertainty regarding the potential for Recognized Environmental Conditions to be present at the Site. This Phase I ESA is intended to reduce, but not eliminate, uncertainty regarding the potential for Recognized Environmental Conditions. Hillsboro Properties understands that the extent of information obtained is based on the reasonable limits of time and budgetary constraints.

Findings, opinions, conclusions and recommendations presented in this report are based on readily available information, conditions readily observed at the time of the Site visit, and/or information readily identified by the interviews and/or the records review process. Phase I ESAs are inherently limited because findings are developed based on information obtained from a non-intrusive Site evaluation. Cornerstone does not accept liability for deficiencies, errors, or misstatements that have resulted from inaccuracies in the publicly available information or from interviews of persons knowledgeable of Site use. In addition, publicly available information and field observations often cannot affirm the presence of Recognized Environmental Conditions; there is a possibility that such conditions exist. If a greater degree of confidence is desired, soil, ground water, soil vapor and/or air samples should be collected by Cornerstone and analyzed by a state-certified laboratory to establish a more reliable assessment of environmental conditions.

Cornerstone acquired an environmental database of selected publicly available information for the general area of the Site. Cornerstone cannot verify the accuracy or completeness of the database report, nor is Cornerstone obligated to identify mistakes or insufficiencies in the information provided (ASTM E 1527-13, Section 8.1.3). Due to inadequate address information, the environmental database may have mapped several facilities inaccurately or could not map the facilities. Releases from these facilities, if nearby, could impact the Site.

Hillsboro Properties may have provided Cornerstone environmental documents prepared by others. Hillsboro Properties understands that Cornerstone reviewed and relied on the information presented in these reports and cannot be responsible for their accuracy.

This report, an instrument of professional service, was prepared for the sole use of Hillsboro Properties and may not be reproduced or distributed without written authorization from Cornerstone. It is valid for 180 days. 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.

Cornerstone makes no warranty, expressed or implied, except that our services have been performed in accordance with the environmental principles generally accepted at this time and location.



**CORNERSTONE
EARTH GROUP**

Vicinity Map

**Pinole Square
Pinole, CA**

Project Number

856-1-4

Figure Number

Figure 1

Date

May 2019

Drawn By

RRN

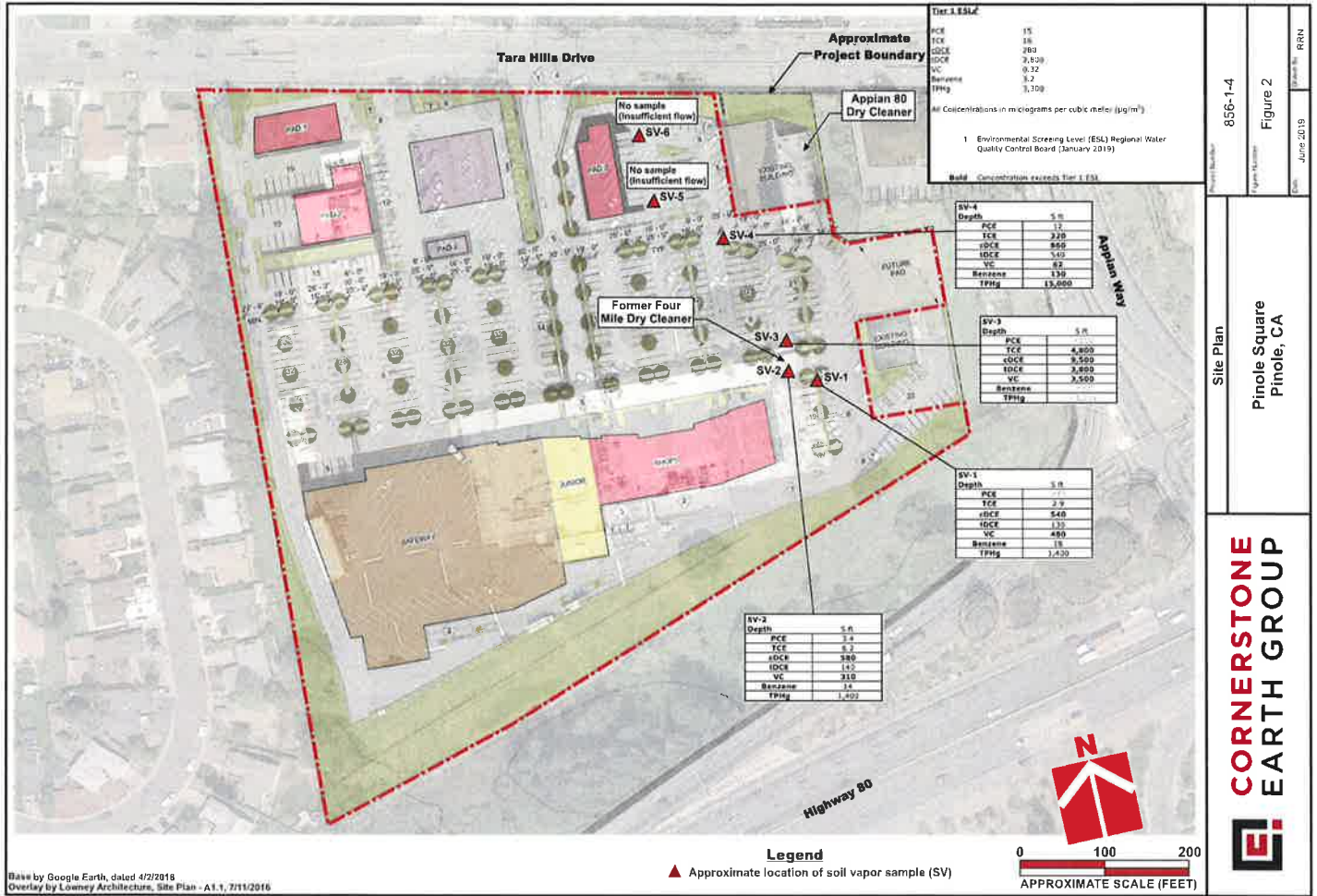


Table 1. Analytical Results of Selected Soil Vapor Samples
(Concentrations in $\mu\text{g}/\text{m}^3$)

Sample ID	Date	Depth (feet)	PCE	TCE	cDCE	tDCE	Vinyl Chloride	1,1 - DCE	Benzene	Toluene	Ethyl-benzene	m,p-Xylene	o-xylene
SV-1	5/28/2019	5		2.9	540*	130	480	9	18*	7.5			
SV-2	5/28/2019	5	3.4	6.2	580*	140	310	19	14*	12		5.4	
SV-3	5/28/2019	5		4,800	9,500	3,800*	3,500	690					
SV-4	5/28/2019	5	12	320	860*	540	62	22	130	200	23	85	25
ESL ¹ - Tier 1			15	16	280	2,800	0.32	2,400	3.2	10,000	37	3,500	3,500
ESL ¹ - Commercial (Direct Exposure)			67	100	1,200	12,000	5.2	10,000	14	44,000	160	15,000	15,000

Sample ID	Date	Depth (feet)	1,2,4-TMB	1,3,5-TMB	2,2,4-Trimethyl-pentane	4-Ethyl Toluene	Acetone	Carbon Disulfide	Cyclo-hexane	Heptane	Hexane	Isopropanol	TPHg
SV-1	5/28/2019	5					29		8.6		16		1,400
SV-2	5/28/2019	5	3.1		2.8	2.3		14	8.8	4	23	9.3	1,400
SV-3	5/28/2019	5									26		
SV-4	5/28/2019	5	14	5.9	7.9	18	35	270	6.5	5.5	7.2		15,000*
ESL ¹ - Tier 1			NE	NE	NE	NE	1.0E+06	NE	NE	NE	NE	NE	3,300
ESL ¹ - Commercial (Direct Exposure)			NE	NE	NE	NE	4.5E+06	NE	NE	NE	NE	NE	83,000

¹ Environmental Screening Level (ESL), RWQCB, San Francisco Bay Region - January 2019

< Not detected at or above laboratory reporting limit

NE Not Established

--- Not Analyzed

BOLD Concentration exceeds selected environmental screening criteria

* Concentration exceeds Tier 1 ESL but is below the commercial direct exposure ESL

APPENDIX A – TERMS AND CONDITIONS

APPENDIX B – DATABASE SEARCH REPORT

APPENDIX C – SELECTED REGULATORY DOCUMENTS

APPENDIX D – HISTORIC AERIAL PHOTOGRAPHS AND TOPOGRAPHIC MAPS

APPENDIX E – LOCAL STREET DIRECTORY SEARCH RESULTS

APPENDIX F – QUESTIONNAIRE

APPENDIX E

ADDITIONAL SOIL, SOIL VAPOR, AND GROUNDWATER QUALITY EVALUATION

Date: August 30, 2019
Project No.: 856-1-5

Prepared For: Mr. Carl Goldstone
Hillsboro Properties, Inc.
1300 S. El Camino Real, Suite 525
San Mateo, California 94402

Re: Additional Soil, Soil Vapor and Groundwater Quality Evaluation
Pinole Square
1211 to 1501 Tara Hills Drive
Pinole, California

Dear Mr. Goldstone:

This letter summarizes the results of the additional soil, soil vapor, and groundwater quality evaluation performed at the Pinole Square Shopping Center. Cornerstone Earth Group (Cornerstone) performed this scope of work in accordance with our agreement dated July 2, 2019 (Agreement).

Project Background

The Pinole Square Shopping Center is located at 1211 to 1501 Tara Hills Drive in Pinole, California (Site, Figures 1 and 2). The existing Site is anchored by a Safeway grocery store and is surrounded by several smaller businesses located in outlying pads. We understand that Hillsboro Properties intends to renovate the Site, which includes enlarging the footprint to the west and construction of a fuel center.

The previous 2015 Phase I Environmental Site Assessment (ESA) and 2019 Phase I ESA Update prepared by Cornerstone identified two areas where underground storage tanks (USTs) were formerly located on-Site: former Chevron Station (1201 Tara Hills Drive) and the former Rent A Rack (1271 Tara Hills Drive). In addition, the reports identified an on-Site drycleaner located at 1441 Tara Hills Drive (Four Mile Cleaners) and an off-Site drycleaner located at 1577 Tara Hills Drive (Appian 80 Cleaners). The on-Site drycleaner is no longer in operation, but the off-Site drycleaner remains in operation. Information reviewed during preparation of the Phase I ESA and Phase I ESA Update reports indicate that this off-Site drycleaner has a documented tetrachloroethene (PCE) release and is currently performing cleanup activities under oversight by the California Department of Toxic Substance Control (DTSC).

In December 2015, Cornerstone advanced four borings to depths of approximately 10 feet at the former Rent-A-Rack. A petroleum odor and green discoloration were observed in all borings. Cornerstone attempted to collect soil vapor samples from these borings but was unsuccessful due to water intrusion from precipitation.

In August 2017, Cornerstone collected soil samples from four borings advanced near the former Rent-A-Rack UST at depths of up to approximately 10 feet. All compounds detected in these

soil samples were below their respective commercial and construction worker ESLs¹. The results of this sampling event were presented in the *Site Management Plan (SMP)* dated September 20, 2017.

On May 28, 2019, Cornerstone collected soil vapor samples from beneath and adjacent to the former on-Site drycleaner as well as near the property boundary adjacent to an off-Site drycleaner. Results from this event were included in the draft *Phase I Environmental Site Assessment Update and Preliminary Soil Vapor Quality Evaluation* dated June 27, 2019. Results from these samples detected elevated concentrations of the chlorinated volatile organic compounds (VOCs) trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethene (tDCE), and vinyl chloride adjacent to the former on-Site cleaner. These VOCs are degradation products of PCE, which is a dry-cleaning solvent. PCE was also detected in soil vapor samples but at concentration below the Tier 1 ESL. The highest chlorinated VOC concentrations detected were in the soil vapor sample collected SV-3, which was located adjacent and north of the former on-Site drycleaner. Elevated chlorinated VOC concentrations were also detected in the soil vapor samples collected from beneath the building slab within the former drycleaner unit, adjacent and to the east of the unit, and north of the drycleaner along the sewer lateral shared with the structure that contains the off-Site drycleaner. The soil vapor sampling locations are shown in Figure 2 and the previous results are included in Table 1.

Soil vapor concentrations of benzene and gasoline-range petroleum hydrocarbons (TPHg) exceeding the Tier 1 soil vapor ESL were also detected in the soil vapor samples collected the soil vapor samples collected in May 2019. Information reviewed by Cornerstone in preparation of the Phase I ESA and Phase I ESA Update, did not identify an on-site source in the northeastern area of the Site where these soil vapor samples were collected. However, a closed UST release is located adjacent and northeast of the Site (former Texaco-branded station, 1599 Tara Hills Drive). The Water Board reportedly closed this case in 2012 on the basis that the source had been removed, the contamination was properly characterized and contained, and the property was used for commercial purposes. At the time of closure, residual contamination appeared to remain beneath this property, which could be a source of the TPHg and benzene soil vapor detections on-Site.

Purpose

The purpose of this Scope of Work was to further evaluate the subsurface conditions near the former on-Site drycleaner by collecting soil vapor and groundwater samples. In addition, the purpose of this Scope of Work was to collect two soil vapor samples at the approximate location of the former Rent-A-Rack UST where previous soil vapor sampling was unsuccessful.

Subsurface Investigation

On July 25 and 26, 2019, Cornerstone directed a subsurface investigation and advanced 10 borings using a direct push drilling rig as described below:

- Former on-Site dry cleaner:
 - Four borings (SV-7, SV-8, SV-9, and SV-10) advanced to depths of approximately 5 feet for soil vapor sample collection

¹ Environmental Screening Levels (ESLs), California Regional Water Quality Control Board (Water Board), January 2019

- Four borings (GW-1, GW-2, GW-3, and GW-4) advanced to approximately 22 ½ feet for groundwater sample collection. Groundwater sampling was unsuccessful at borings GW-1 and GW-2. Instead, a soil sample was collected from GW-2 (labeled SS-2).
- Former Rent A Rack USTs:
 - Two borings (SV-11 and SV-12) advanced to depths of approximately 5 feet at for soil vapor sample collection.

Soil vapor probes SV-7 through SV-10 were installed adjacent to the locations of sanitary sewer and stormwater sewer utilities as determined from maps provided by Hillsboro Properties and by field verification using a private utility locating contractor. The purpose of these soil vapor probes was to determine if the subsurface utilities could be acting as a preferential pathway for soil vapor migration and to further evaluate the extent of VOCs that previously detected in soil vapor. Groundwater samples were collected from GW-3 and GW-4, which were located adjacent to soil vapor probes SV-7 and SV-8, respectively, to determine if the soil vapor detections were due to groundwater impacts. The soil sample SS-2 (collected from the GW-2 boring) was located adjacent to former soil vapor probe SV-3, which contained the highest chlorinated VOC vapor concentrations detected during the May 2019 event. The soil sample was collected from a depth of approximately 15 to 15 ½ feet to help evaluate the presence of VOCs in the shallow groundwater zone; as noted above, an insufficient amount of groundwater was encountered in this boring to allow collection of a groundwater sample.

SUBSURFACE UTILITIES

As discussed, the borings near the former on-Site drycleaner were located along existing subsurface utilities to determine if a preferential pathway was present for soil vapor migration either to or from the Site. Specifically, the sanitary and stormwater sewers near the on-Site drycleaner were located for this evaluation, and their approximate locations are provided in Figure 2. Based on the provided utility plans, the sanitary sewer begins at 1577 Tara Hills Drive, which contains the off-Site drycleaner, flows south towards the on-Site drycleaner where it joins a larger sewer lateral that flows to the west and eventually turns to the north where it connects to the sanitary sewer main beneath Tara Hills Drive. The east-west oriented sanitary sewer lateral begins with the lateral connected to the restaurant adjacent and to the east of the Site. The on-Site drycleaner connects to this east-west lateral at the manhole located northeast of the on-Site drycleaner.

The stormwater sewer appears to flow from the parking lot south of 1577 Tara Hills Drive, diagonally towards Safeway where it turns to the west, and then eventually to the south where it discharges off-Site and south of the Site. Catch basins are located at various locations along the stormwater sewer.

SUBSURFACE MATERIALS

The subsurface materials observed in the exploratory borings generally consisted of sandy clay with some gravel. No apparent chemical odors were observed in the exploratory borings. Organic vapor meter (OVM) readings of up to 41.2 parts per million by vapor (ppmv) were detected in the soil samples retrieved from SV-12. No other OVM readings were recorded in the other borings. Our lithologic descriptions and OVM readings are included in the boring logs attached to this letter.

Groundwater was encountered at depths of approximately 15 feet and 20 feet in borings GW-3 and GW-4, respectively, but was not encountered in borings GW-1 and GW-2 advanced to depths of up to 17 feet. Limited access drilling equipment was required at GW-1 and GW-2 due to low clearance, and the subsurface conditions prevented this equipment from drilling deeper than approximately 17 feet.

SOIL QUALITY EVALUATION

One soil sample was collected at a depth of approximately 15 to 15 ½ feet at GW-2 and labeled SS-2(15 to 15.5). The sample was collected in three 5-gram Core-N-One capsules per DTSC guidance and analyzed for VOC (EPA Test Method 8260B). No VOCs were detected in this sample.

This soil sample was collected adjacent to the location of soil vapor probe SV-3 where the highest soil vapor concentrations were previously detected in May 2019. The SS-2 soil results indicate that there does not appear to be VOC impacts in soil at the depth where this sample was collected.

GROUND WATER QUALITY EVALUATION

Groundwater samples were collected from locations GW-3 and GW-4. GW-3 was located adjacent to soil vapor probe SV-7 along the sanitary sewer lateral, and GW-4 was located adjacent to SV-8 adjacent to the stormwater sewer. Groundwater samples were not collected from GW-1 and GW-2. The groundwater sampling locations are presented in Figure 2 and the laboratory report is attached to this letter.

Once groundwater was encountered, a section of slotted PVC was lowered into the exploratory boring to facilitate groundwater sample collection. The grab groundwater samples were collected using a peristaltic pump and clean (new) tubing. The samples were collected in clean laboratory-provided sampling containers, pre-preserved as appropriate. The two grab groundwater samples were analyzed for VOCs (EPA Test Method 8260B). No VOCs were detected in the two groundwater samples analyzed.

SOIL VAPOR EVALUATION

The six temporary soil vapor probes were installed to depths of approximately 4½ to 5 feet at each location. Each probe was completed with stainless steel expendable tip and screen affixed to stainless steel tubing. Each probe was constructed by first placing approximately ½ foot of coarse aquarium-type sand into the bottom of the boring. The stainless steel tip and tubing was then lowered into the boring via a tremie pipe. Additional sand was then placed in the boring via tremie when needed to create an approximately 1 foot sand pack interval around the vapor tip. Approximately 1 foot of granular bentonite was placed on top of the sand pack. Hydrated bentonite was then placed down the boring; the mixture consisted of approximately 50 percent water to bentonite and was placed in less than ½ foot lifts to just below the surface. The stainless steel tubing was labeled with depth of placement and capped utilizing a vapor-tight Swagelok valve set in the "off" position.

The temporary vapor probes were sampled on July 31, 2019, at least 5 days after installation. The DTSC guidance recommends sampling at least 2 hours after installation for soil vapor probes installed using direct push drilling. A 167 milliliters-per-minute flow regulator inclusive of a particulate filter was fitted to the shut-off valve and the other end to a "T" fitting. A Summa

canister was connected to the "T" fitting. The other end of the "T" fitting was affixed to a digital vacuum gauge and a 1-liter Summa canister utilized for purging.

A minimum 10-minute vacuum tightness test was performed on the manifold and connections by opening and closing the 1-liter purge canister valve and applying and monitoring a vacuum on the vacuum gauge. The sample shut-off valve on the downhole side of the sampling manifold remained in the "off" position. When gauge vacuum was maintained for at least 10 minutes without any noticeable decrease (less than approximately 0.1 inches of mercury (Hg) for properly connected fittings), purging began. The downhole shut off valve was opened and approximately three purge volumes of vapor were removed using the purging 1-liter Summa. The volume of vapor removed was verified by the calculated versus observed pressure drop in the purging Summa canister. The purge volume was calculated based on the length and inner diameter of the sampling probe and the connected sampling tubing and equipment. Assuming the vapor probe was properly sealed, the borehole sand pack vapor space will have equilibrated with the surrounding vapors following the equilibration period. Thus, the sand pack vapor space was not included in the purge volume calculation.

Samples were successfully collected from temporary soil vapor probes SV-7 and SV-9 through SV-12. However, a soil vapor sample could not be collected from probe SV-8 due to the tight clay subsurface materials. Soil vapor sampling field notes and logs are attached to this letter.

Soil Vapor Laboratory Sampling and Analyses

Cornerstone collected soil vapor samples from temporary probes SV-7 and SV-9 through SV-12 in laboratory-provided cannisters and submitted the samples for analysis to a state-certified analytical laboratory under a chain of custody control. The five samples were analyzed for TPHg and VOCs (EPA Test Method TO-15). In addition, one air sample collected from the shroud atmosphere was analyzed for isopropyl alcohol.

Soil Vapor Analytical Summary

The detected soil vapor concentrations were compared to the Tier 1 ESLs. Detected compounds are presented in Table 1. Selected compounds are presented on Figure 2. Chain of custody documentation and laboratory analytical reports attached to this letter.

A summary of the analytical results is presented below separately for the former on-Site drycleaner and the former Rent-A-Rack UST location:

Former On-Site Drycleaner:

- PCE was detected at concentrations up to 220 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and exceeded the Tier 1 ESL of $16 \mu\text{g}/\text{m}^3$ in the three samples collected near the former drycleaner. The highest concentration was detected in the sample collected from SV-9, which was located northeast of the former on-Site drycleaner and adjacent to the east-west sewer lateral.
- TCE was detected at concentrations of $1,900 \mu\text{g}/\text{m}^3$ in SV-9 and $110 \mu\text{g}/\text{m}^3$ in SV-10, which both exceeded the Tier 1 ESL of $16 \mu\text{g}/\text{m}^3$. TCE was not detected in SV-7; however, dilution of this sample necessary for the laboratory to analyze resulted in an increased reporting limit that is above the Tier 1 ESL. SV-10 was located north of the

on-Site drycleaner and adjacent to the stormwater sewer. SV-7 was located along the E-W sewer lateral and northeast of the on-Site drycleaner.

- cDCE was detected in the soil vapor sample collected from SV-9 at a concentration of 580 $\mu\text{g}/\text{m}^3$, which exceeds the Tier 1 ESL of 280 $\mu\text{g}/\text{m}^3$. cDCE was detected below the Tier 1 ESL in the sample collected from SV-10 but was not detected in the sample collected from SV-7.
- Vinyl Chloride was detected at a concentration of 9.4 $\mu\text{g}/\text{m}^3$ in the sample collected from SV-9, which exceeds the Tier 1 ESL of 0.32 $\mu\text{g}/\text{m}^3$. Vinyl chloride was not detected in the samples collected from SV-7 or SV-10, although these reporting limits were raised due to required sample dilution by the laboratory.
- TPHg was detected at a concentration of 18,000 $\mu\text{g}/\text{m}^3$ at SV-7, which is above the Tier 1 ESL of 3,300 $\mu\text{g}/\text{m}^3$.
- Benzene was detected at concentrations exceeding the Tier 1 ESL of 3.2 $\mu\text{g}/\text{m}^3$ in the samples collected from SV-7 (50 $\mu\text{g}/\text{m}^3$) and SV-10 (6.1 $\mu\text{g}/\text{m}^3$).

Former Rent-A-Rack UST

- TPHg was detected at concentrations of 1,600,000 $\mu\text{g}/\text{m}^3$ and 110,000,000 $\mu\text{g}/\text{m}^3$ in the samples collected from SV-11 and SV-12, respectively. The Tier 1 ESL for TPHg is 3,300 $\mu\text{g}/\text{m}^3$.
- Soil vapor concentrations of benzene, ethylbenzene, and m,p-xylene exceeded their respective Tier 1 ESLs in the soil vapor sample collected from SV-12. These VOCs were not detected in the sample collected from SV-11; however, the sample dilution performed by the laboratory for this sample increased the reporting limits of these VOCs.

Conclusions

The results from the soil vapor probes installed along the sewer laterals near the former on-Site drycleaner confirm the presence of chlorinated VOCs in soil vapor and appear to indicate the higher concentrations are located near sewer laterals. The highest concentrations were detected along the east-west oriented lateral in front of and to the northwest of the former on-Site drycleaner, and in the lateral that carries wastewater from the off-Site property at 1577 Tara Hills Drive. Low to non-detect VOCs were detected at the soil vapor probe installed adjacent to the sewer later that carries wastewater from the restaurant east of the Site. VOCs were not detected in the soil and groundwater samples collected. Typically, VOCs are detected in soil and/or groundwater samples collected near a source area. The subsurface data collected to date indicates that significant VOC concentrations are present in soil vapor that appear to be migrating along subsurface utilities. However, the data does not clearly identify a source area or areas of these VOCs in soil vapor.

Benzene and TPHg were detected in the soil vapor samples collected near the former on-Site drycleaner. These samples were collected at least 475 feet from the former Rent-A-Rack UST location and at least 500 feet from the former Chevron Station located in the northwestern corner of the Site. No potential fuel-related on-Site sources were identified in the area near the former drycleaner; however, the property adjacent and to the northeast is a closed leaking UST

case with residual impacts at the time of closure. These fuel-related impacts in the eastern portion of the Site could be related to residual fuel-related impacts at this off-Site property.

The soil vapor samples collected from the approximate location of the former Rent-A-Rack UST indicate elevated concentrations of fuel-related VOCs in soil vapor that are likely due to residual UST impacts. Previous sampling indicates these impacts are limited to the former UST area. As discussed in other reports, the fill material used to fill the excavation after UST removal may require excavation and recompaction for geotechnical purposes. Cornerstone prepared a *Site Management Plan* dated September 20, 2017 that provides protocols for handling this material during excavation. The fill material, along with other impacted soil encountered during excavation, could be removed and replaced with clean fill. Soil vapor sampling could be performed after removal of this material to determine the effect on soil vapor concentrations. Removal of the residual fuel impacts from the former UST area is expected to significantly lower these VOCs detected in soil vapor.

Due the potential of off-Site sources of the VOCs detected on-Site, we recommend discussing the results of this and previous evaluations with an environmental attorney to determine appropriate next steps.

Limitation

This letter, an instrument of professional service, was prepared for the sole use of Hillsboro Properties and may not be reproduced or distributed without written authorization from Cornerstone. The chemical data presented in this report may change over time and are only valid for this time and location. Hillsboro Properties understands that Cornerstone reviewed and relied on the information presented in these reports and cannot be responsible for their accuracy. Cornerstone makes no warranty, expressed or implied, except that our services have been performed in accordance with the environmental principles generally accepted at this time and location.

Closing

Should you have any questions regarding this letter, or if we may be of further service, please contact us at your convenience.

Sincerely,

Cornerstone Earth Group, Inc.

DRAFT

Christopher J. Heiny, P.G.
Principal Geologist

DRAFT

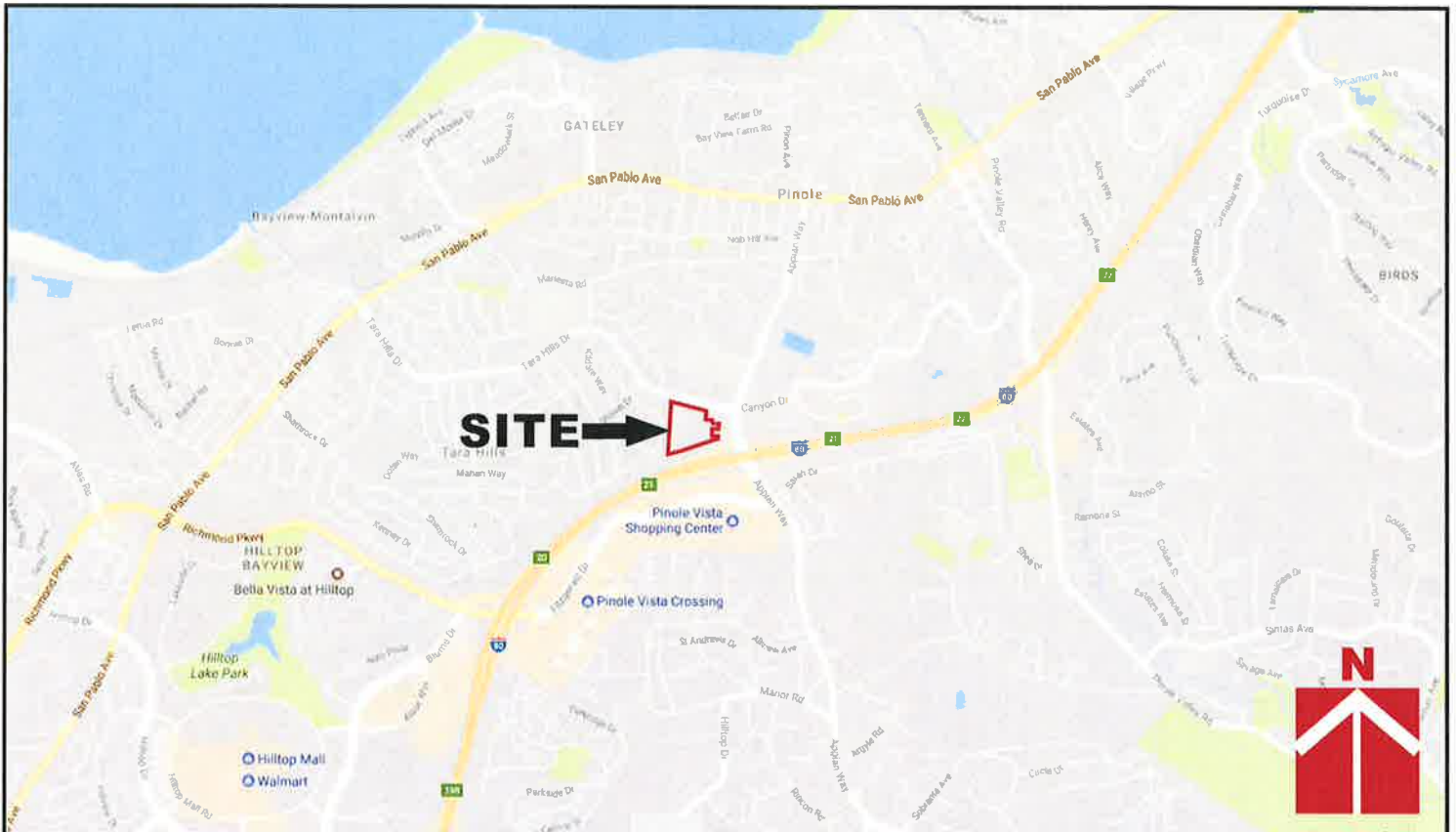
Peter M. Langtry, P.G., C.E.G.
Senior Principal Geologist

Table 1. Analytical Results of Selected Soil Vapor Samples
(Concentrations in µg/m³)

Sample ID	Date	Depth (feet)	TPH _g	PCE	TCE	cDCE	tDCE	Vinyl Chloride	1,1 - DCE	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-xylene	1,1,1-Trichloroethane	1,1-Dichloroethane	1,2,4-TMB	1,3,5-TMB
SV-1	5/28/2019	5	1,400		2.9	540*	130	480	9	18	7.5							
SV-2	5/28/2019	5	1,400	3.4	6.2	580*	140	310	19	14*	12		5.4				3.1	
SV-3	5/28/2019	5			4,800	9,500	3,800*	3,500	690									
SV-4	5/28/2019	5	15,000*	12	320	860*	540	62	22	130	200	23	85	25			14	5.9
SV-7	7/31/2019	5	18,000*	36*						50	110	26	78	26			35	
SV-9	7/31/2019	5	1,200	220	1,900	580*	100	9.4	20		8.3	<5.4			12	41		
SV-10	7/31/2019	5	3,000	52*	110	8.8			<4.8	6.1*	7.8	<5.2	5.6					
SV-11	7/31/2019	5	1,800,000														340	
SV-12	7/31/2019	5	110,000,000							14,000		470,000	16,000					
ESL ¹ - Tier 1			3,300	15	16	280	2,800	0.32	2,400	3.2	10,000	37	3,500	3,500	35,000	58	NE	NE
ESL ¹ - Commercial (Direct Exposure)			83,000	67	100	1,200	12,000	5.2	10,000	14	44,000	160	15,000	15,000	150,000	2,600	NE	NE

Sample ID	Date	Depth (feet)	2,2,4-Trinitrophenol	4-Ethyl Toluene	Acetone	Carbon Disulfide	Cyclohexane	Heptane	Hexane	Isopropanol	2-Butanone	2-Hexanone	Chloroform	Isopropylbenzene	Ethanol	Freon 12	Propylbenzene
SV-1	5/28/2019	5			29		8.6		16								
SV-2	5/28/2019	5	2.8	2.3		14	8.8	4	23	9.3							
SV-3	5/28/2019	5							26								
SV-4	5/28/2019	5	7.9	18	35	270	6.5	5.5	7.2								
SV-7	7/31/2019	5	35	37	250	130	61	150	330		83		31		70		
SV-9	7/31/2019	5	6.2			20		5.4	5.5				22		14	34	
SV-10	7/31/2019	5						12	46				100		13		
SV-11	7/31/2019	5	63,000	230	480			17,000	4,500								160
SV-12	7/31/2019	5	3,700,000	6,600			1,000,000	1,400,000	1,400,000			35,000		64,000			160,000
ESL ¹ - Tier 1			NE	NE	1.0E+06	NE	NE	NE	NE	NE	1.70E+05	NE	4.1	NE	NE	NE	NE
ESL ¹ - Commercial (Direct Exposure)			NE	NE	4.5E+06	NE	NE	NE	NE	NE	7.30E+05	NE	18	NE	NE	NE	NE

- 1 Environmental Screening Level (ESL), RWQCB, San Francisco Bay Region - January 2019
 < Not detected at or above laboratory reporting limit
 NE Not Established
 --- Not Analyzed
BOLD Concentration exceeds selected environmental screening criteria
 * Concentration exceeds Tier 1 ESL but is below the commercial direct exposure ESL



**CORNERSTONE
EARTH GROUP**

Vicinity Map

**Pinole Square
Pinole, CA**

Project Number

856-1-5

Figure Number

Figure 1

Date

August 2019

Drawn By

RRN



BORING NUMBER GW-1

PAGE 1 OF 1

DATE STARTED 7/26/19 DATE COMPLETED 7/26/19

DRILLING CONTRACTOR Penecore

DRILLING METHOD Direct Push

LOGGED BY NKM

NOTES

PROJECT NAME Pinole Square Additional Drycleaner Investigation

PROJECT NUMBER 856-1-5

PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CA

GROUND ELEVATION BORING DEPTH 17 ft.

LATITUDE LONGITUDE

GROUND WATER LEVELS:

AT TIME OF DRILLING Not Encountered

AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

Sandy Lean Clay (CL)
moist, yellowish brown

color becomes greenish gray at 3'

Fat Clay (CH)
moist, dark brown

Sandy Lean Clay (CL)
moist, greenish brown

Fat Clay (CH)
moist, dark brown

Sandy Lean Clay (CL)
moist, greenish gray, fine sand

Sandy Lean Clay (CL)
moist, yellowish brown, fine sand

Bottom of Boring at 17.0 feet.

N-Value (uncorrected)
blows per foot

Sample Type and Interval

Sample Submitted for
Laboratory Analysis

Percent Recovery
(%)

OVN Reading
(ppm)

Odors or Discoloration

Notes



0

72

0

92

0

100

0

97

0

89

0



CORNERSTONE EARTH GROUP

BORING NUMBER GW-2

PAGE 1 OF 1

PROJECT NAME Pinole Square Additional Drycleaner InvestigationPROJECT NUMBER 856-1-5PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CAGROUND ELEVATION _____ BORING DEPTH 15.5 ft.

LATITUDE _____ LONGITUDE _____

GROUND WATER LEVELS:▼ AT TIME OF DRILLING Not Encountered▼ AT END OF DRILLING Not EncounteredDATE STARTED 7/26/19 DATE COMPLETED 7/26/19DRILLING CONTRACTOR PenecoreDRILLING METHOD Direct PushLOGGED BY NKM

NOTES _____

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ELEVATION (ft)

DEPTH (ft)

SYMBOL

DESCRIPTIONN-Value (uncorrected)
blows per foot

Sample Type and Interval

Sample Submitted for
Laboratory AnalysisPercent Recovery
(%)OVM Reading
(ppm)

Odors or Discoloration

Notes

0

Sandy Lean Clay (CL)
moist, yellowish brown, fine sand

0

Sandy Lean Clay (CL)
moist, green with dark brown mottles

color becomes yellowish brown at 4'

97

0

5

Sandy Lean Clay (CL)
moist, yellowish brown**Sandy Lean Clay (CL)**
moist, greenish brown

100

0

10

Fat Clay (CH)
moist, dark brown

0

15

Bottom of Boring at 15.5 feet.

20



CORNERSTONE EARTH GROUP

BORING NUMBER GW-3

PAGE 1 OF 1

DATE STARTED 7/25/19 DATE COMPLETED 7/25/19DRILLING CONTRACTOR PenecoreDRILLING METHOD Direct PushLOGGED BY NKM

NOTES _____

PROJECT NAME Pinole Square Additional Drycleaner InvestigationPROJECT NUMBER 856-1-5PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CAGROUND ELEVATION _____ BORING DEPTH 15 ft.

LATITUDE _____ LONGITUDE _____

GROUND WATER LEVELS:▼ AT TIME OF DRILLING 13 ft.▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	Sample Type and Interval	Sample Submitted for Laboratory Analysis	Percent Recovery (%)	QVM Reading (ppm)	Odors or Discoloration	Notes
	0		3 inches asphalt concrete over 3 inches aggregate base							
			Sandy Lean Clay with Gravel (CL) moist, brown, fine sand, fine subangular gravel				47	0		
	5									
			Lean Clay (CL) moist, brown				55	0		
	10									
			becomes wet, fine sand at 12.5'				83	0		
	15		Bottom of Boring at 15.0 feet.							
	20									



BORING NUMBER GW-3 (NEW)

PAGE 1 OF 1

DATE STARTED 7/25/19 DATE COMPLETED 7/25/19
 DRILLING CONTRACTOR Penecore
 DRILLING METHOD Direct Push
 LOGGED BY NKM
 NOTES _____

PROJECT NAME Pinole Square Additional Drycleaner Investigation
 PROJECT NUMBER 856-1-5
 PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CA
 GROUND ELEVATION _____ BORING DEPTH 17.5 ft.
 LATITUDE _____ LONGITUDE _____
 GROUND WATER LEVELS:
 ▽ AT TIME OF DRILLING 15 ft.
 ▽ AT END OF DRILLING Not Encountered

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	Sample Type and Interval	Sample Submitted for Laboratory Analysis	Percent Recovery (%)	OVM Reading (ppm)	Odors or Discoloration	Notes
	0		3 inches asphalt concrete							
			Sandy Lean Clay with Gravel (CL) fine sand, fine subrounded gravel							
			Fat Clay (CH) moist, dark brown				100			
	5									
			Lean Clay (CL) moist, brown				70			
	10									
			Poorly Graded Sand (SP) moist, brown, fine sand				77			
	15		becomes wet at 15'							
			Bottom of Boring at 17.5 feet.							
	20									

CORNERSTONE GE LOG DEC192007 - CORNERSTONE 0812.GDT - 7/29/19 14:15 - P:\DRAFTING\GINT FILES\856-1-5 PINOLE SQUARE GE.GPJ



CORNERSTONE EARTH GROUP

BORING NUMBER GW-4

PAGE 1 OF 1

PROJECT NAME Pinole Square Additional Drycleaner InvestigationPROJECT NUMBER 856-1-5PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CAGROUND ELEVATION _____ BORING DEPTH 22.5 ft.

LATITUDE _____ LONGITUDE _____

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 20.5 ft.▼ AT END OF DRILLING Not EncounteredDATE STARTED 7/25/19 DATE COMPLETED 7/25/19DRILLING CONTRACTOR PenecoreDRILLING METHOD Direct PushLOGGED BY NKM

NOTES _____

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ELEVATION (ft)

DEPTH (ft)

SYMBOL

DESCRIPTION

N-Value (uncorrected)
blows per foot

Sample Type and Interval

Sample Submitted for
Laboratory AnalysisPercent Recovery
(%)OVM Reading
(ppm)

Odors or Discoloration

Notes

0	3 inches asphalt concrete						
	Fat Clay (CH)						
	moist, dark brown						
	Lean Clay with Sand (CL)			93	0		
	moist, brown, fine sand						
5	Poorly Graded Sand (SP)						
	brown, fine sand						
	Lean Clay with Sand (CL)			97	0		
	moist, orange and brown mottling, fine sand						
10	Fat Clay (CH)						
	wet						
				100	0		
15	Lean Clay with Sand (CL)						
	moist, gray			100	0		
20	Clayey Sand (SC)						
	wet, gray						
	Bottom of Boring at 22.5 feet.						



CORNERSTONE EARTH GROUP

BORING NUMBER SV-7

PAGE 1 OF 1

DATE STARTED 7/25/19 DATE COMPLETED 7/25/19

DRILLING CONTRACTOR Penecore

DRILLING METHOD Direct Push

LOGGED BY NKM

NOTES

PROJECT NAME Pinole Square Additional Drycleaner Investigation

PROJECT NUMBER 856-1-5

PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CA

GROUND ELEVATION BORING DEPTH 5.5 ft.

LATITUDE LONGITUDE

GROUND WATER LEVELS:

AT TIME OF DRILLING Not Encountered

AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

2 inches asphalt concrete
Sandy Lean Clay with Gravel (CL)
moist, dark brown, fine sand, fine subrounded gravel

becomes wet, dark brown

Bottom of Boring at 5.5 feet.

N-Value (uncorrected)
blows per footSample Type and Interval
Sample Submitted for
Laboratory AnalysisPercent Recovery
(%)OVM Reading
(ppm)

Odors or Discoloration

Notes



CORNERSTONE EARTH GROUP

BORING NUMBER SV-9

PAGE 1 OF 1

DATE STARTED 7/26/19 DATE COMPLETED 7/26/19DRILLING CONTRACTOR PenecoreDRILLING METHOD Direct PushLOGGED BY NKM

NOTES _____

PROJECT NAME Pinole Square Additional Drycleaner InvestigationPROJECT NUMBER 856-1-5PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CAGROUND ELEVATION _____ BORING DEPTH 5.5 ft.

LATITUDE _____ LONGITUDE _____

GROUND WATER LEVELS:

▼ AT TIME OF DRILLING Not Encountered▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

Lean Clay with Gravel (CL)
moist, brown, fine gravel
color becomes greenish gray at 1.5'

Sandy Lean Clay (CL)
moist, yellowish brown, some gravel

Bottom of Boring at 5.5 feet.

N-Value (uncorrected)
blows per foot

Sample Type and Interval

Sample Submitted for
Laboratory AnalysisPercent Recovery
(%)OVM Reading
(ppm)

Odors or Discoloration

Notes



CORNERSTONE EARTH GROUP

BORING NUMBER SV-10

PAGE 1 OF 1

DATE STARTED 7/25/19 DATE COMPLETED 7/25/19DRILLING CONTRACTOR PenecoreDRILLING METHOD Direct PushLOGGED BY NKM

NOTES _____

PROJECT NAME Pinole Square Additional Drycleaner InvestigationPROJECT NUMBER 856-1-5PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CAGROUND ELEVATION _____ BORING DEPTH 5.5 ft.

LATITUDE _____ LONGITUDE _____

GROUND WATER LEVELS:▼ AT TIME OF DRILLING Not Encountered▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

Sandy Lean Clay with Gravel (CL)
moist, brown, fine subrounded gravel

Bottom of Boring at 5.5 feet.

N-Value (uncorrected)
blows per foot

Sample Type and Interval

Sample Submitted for
Laboratory AnalysisPercent Recovery
(%)OVM Reading
(ppm)

Odors or Discoloration

Notes



CORNERSTONE EARTH GROUP

BORING NUMBER SV-11

PAGE 1 OF 1

DATE STARTED 7/26/19 DATE COMPLETED 7/26/19DRILLING CONTRACTOR PenecoreDRILLING METHOD Direct PushLOGGED BY NKM

NOTES _____

PROJECT NAME Pinole Square Additional Drycleaner InvestigationPROJECT NUMBER 856-1-5PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CAGROUND ELEVATION _____ BORING DEPTH 5.5 ft.

LATITUDE _____ LONGITUDE _____

GROUND WATER LEVELS:▼ AT TIME OF DRILLING Not Encountered▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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.

DESCRIPTION

Lean Clay with Sand (CL)
moist, yellowish brown
color becomes greenish at 1.5'

color becomes yellowish brown at 3'

color becomes greenish gray at 4'

Bottom of Boring at 5.5 feet.

N-Value (uncorrected)
blows per foot

Sample Type and Interval

Sample Submitted for
Laboratory AnalysisPercent Recovery
(%)OVM Reading
(ppm)

Odors or Discoloration

Notes



CORNERSTONE EARTH GROUP

BORING NUMBER SV-12

PAGE 1 OF 1

DATE STARTED 7/26/19 DATE COMPLETED 7/26/19DRILLING CONTRACTOR PenecoreDRILLING METHOD Direct PushLOGGED BY NKM

NOTES _____

PROJECT NAME Pinole Square Additional Drycleaner InvestigationPROJECT NUMBER 856-1-5PROJECT LOCATION 1211 to 1501 Tara Hills Drive, Pinole, CAGROUND ELEVATION _____ BORING DEPTH 5.5 ft.

LATITUDE _____ LONGITUDE _____

GROUND WATER LEVELS:

▼ AT TIME OF DRILLING Not Encountered▼ AT END OF DRILLING Not Encountered

ELEVATION (ft)

DEPTH (ft)

SYMBOL

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DESCRIPTION

Lean Clay with Sand (CL)
moist, yellowish brown
Sandy Lean Clay with Gravel (CL)
moist, greenish gray

Bottom of Boring at 5.5 feet.

N-Value (uncorrected)
blows per footSample Type and Interval
Sample Submitted for
Laboratory AnalysisPercent Recovery
(%)OVM Reading
(ppm)

Odors or Discoloration

Notes

APPENDIX F

ENVIRONMENTAL NOISE AND VIBRATION ASSESSMENT

Environmental Noise & Vibration Assessment

Pinole Square Redevelopment Project – Phases 1-3

Pinole, California

BAC Job # 2019-120

Prepared For:

Raney Planning & Management, Inc.

Attn: Angela DaRosa
1501 Sports Drive, Suite A
Sacramento, CA 95834

Prepared By:

Bollard Acoustical Consultants, Inc.



Dario Gotchet, Consultant

January 13, 2020



CEQA Checklist

NOISE AND VIBRATION – Would the Project Result in:	NA – Not Applicable	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generation of substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X		
b) Generation of excessive groundborne vibration or groundborne noise levels?				X	
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?					X

Introduction

The proposed Pinole Square Redevelopment Phases 1-3 (project) is located west of Appian Way, in between Tara Hills Drive and Interstate 80 in Pinole, California. Existing land uses in the project vicinity include residential to the west, and commercial to the north and east. The project site is bordered by Interstate 80 to the south. The project area and site illustrative plan are shown on Figures 1 and 2, respectively.

The first phase of the project would involve the demolition of an existing CVS Pharmacy store, and the construction of a gas station and retail center in the northwest corner of the parcel. The second phase would include the demolition of an existing Safeway supermarket and the development of additional retail centers. The third and final phase would involve the partial demolition of an existing retail center at the northwest corner of the parcel and the construction of two restaurant pads, one of which would include drive-through services.

The purposes of this analysis are to quantify the existing noise and vibration environments, identify potential noise and vibration impacts resulting from the project, identify appropriate mitigation measures, and provide a quantitative and qualitative analysis of impacts associated with the project. Specifically, impacts are identified if project-related activities would cause a substantial increase in ambient noise or vibration levels at existing noise-sensitive uses in the project vicinity. An impact would also be identified if project-generated noise or vibration levels would exceed applicable City of Pinole standards at existing noise-sensitive uses in the project vicinity.

Noise and Vibration Fundamentals

Noise

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are designated as sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or Hertz (Hz). Definitions of acoustical terminology are provided in Appendix A.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals of pressure) as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in decibel levels correspond closely to human perception of relative loudness. Noise levels associated with common noise sources are provided in Figure 3.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable and can be approximated by filtering the frequency

response of a sound level meter by means of the standardized A-weighting network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}). The L_{eq} is the foundation of the day/night average noise descriptor, L_{dn} , and shows very good correlation with community response to noise.

The day/night average sound level (L_{dn}) is based on the average noise level over a 24-hour day, with a +10 decibel weighting applied to noise occurring during nighttime (10:00 PM to 7:00 AM) hours. The nighttime penalty is based on the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. For this reason, the City of Pinole utilizes performance standards for non-transportation noise sources.

Vibration

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, while vibration is usually associated with transmission through the ground or structures. As with noise, vibration consists of an amplitude and frequency. A person's response to vibration will depend on their individual sensitivity as well as the amplitude and frequency of the source.

Vibration can be described in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration in terms of velocity in inches per second peak particle velocity (IPS, PPV) or root-mean-square (VdB, RMS). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocity as well as RMS velocities.

As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. The maximum rate, or velocity of particle movement, is the commonly accepted descriptor of the vibration "strength".

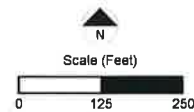
Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does frequency. Generally, as the duration and vibration frequency increase, the potential for adverse human response increases.

According to the Transportation and Construction-Induced Vibration Guidance Manual (Caltrans, June 2004), operation of construction equipment and construction techniques generate ground vibration. Traffic traveling on roadways can also be a source of such vibration. At high enough amplitudes, ground vibration has the potential to damage structures and/or cause cosmetic damage. Ground vibration can also be a source of annoyance to individuals who live or work close to vibration-generating activities. However, traffic, rarely generates vibration amplitudes high enough to cause structural or cosmetic damage.



Legend

- Project Area (Approximate)
- Short-Term Noise & Vibration Survey Locations



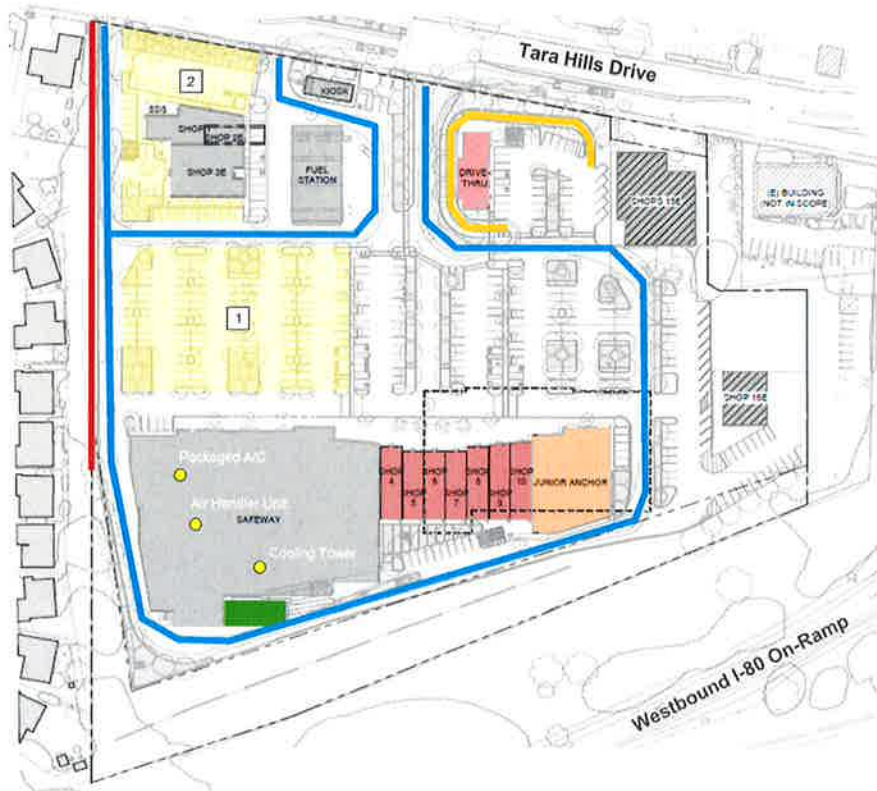
Pinole Square Redevelopment
Phases 1-3
Pinole, California

Project Area

Figure 1



1121 Tara Hills Dr
 1048 Alberdan Cir.
 1054 Alberdan Cir.
 1060 Alberdan Cir.
 1066 Alberdan Cir.
 1072 Alberdan Cir.
 1078 Alberdan Cir.
 1084 Alberdan Cir.
 1090 Alberdan Cir.
 1096 Alberdan Cir.
 1100 Alberdan Cir.



Appian Way

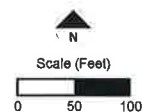
Legend

- Proposed On-Site Delivery Truck Circulation Route
- Proposed Restaurant Drive-Through Lane
- Proposed Parking Areas (Nearest to Residences)
- Proposed Loading Dock Area

— Recommended 7-Foot Tall Property Line Noise Barrier

Barrier Notes:

- Barrier Length: Approximately 525' in length
- Start Point: Northeast corner of 1121 Tara Hills Drive property
- End Point: Southeast corner 1072 Alberdan Circle property



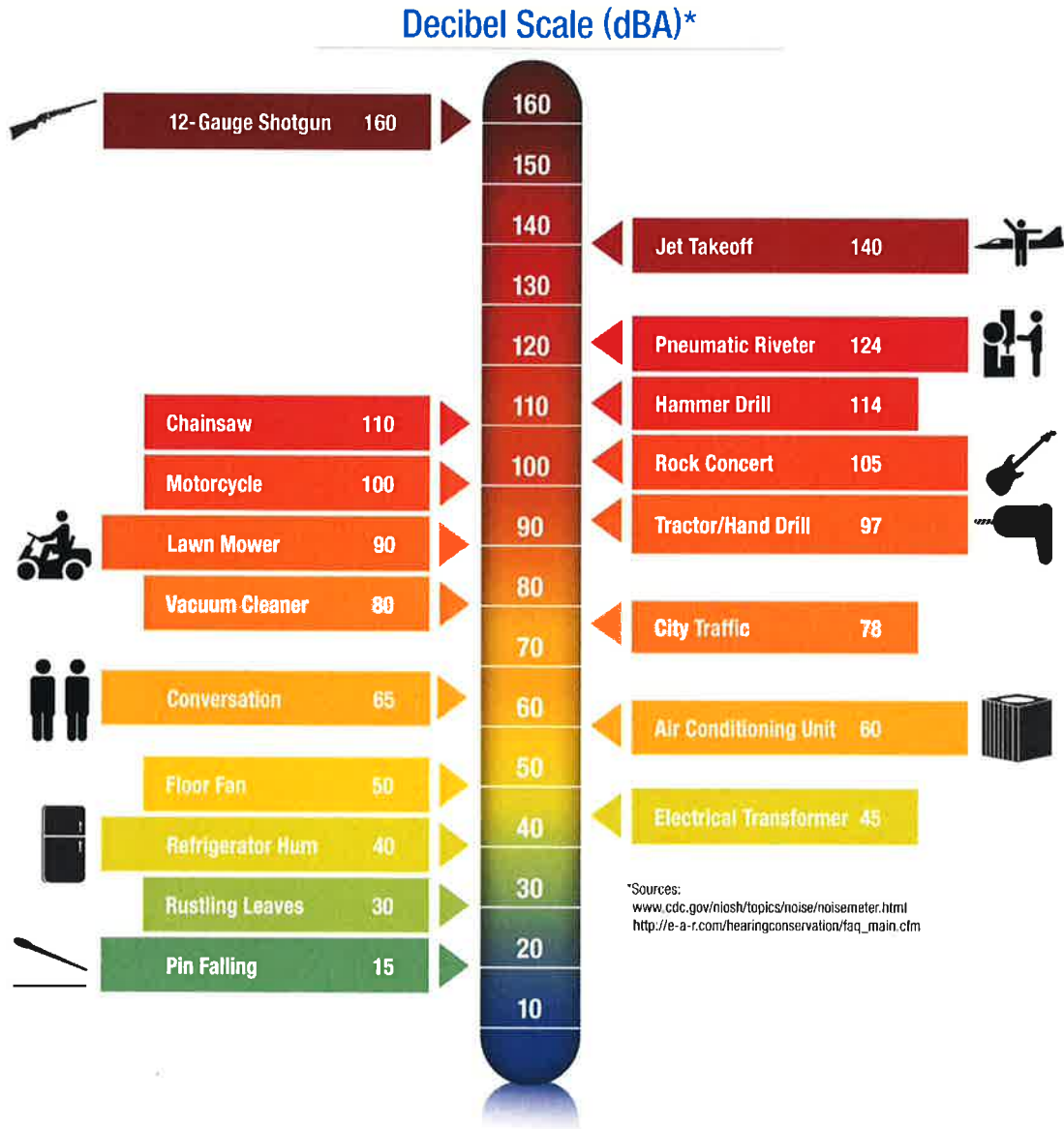
Pinole Square Redevelopment
 Phases 1-3
 Pinole, California

Project Site Plan

Figure 2



Figure 3
Noise Levels Associated with Common Noise Sources



Regulatory Setting: Criteria for Acceptable Noise and Vibration Exposure

Federal

There are no federal noise or vibration criteria which would be directly applicable to this project. However, the City of Pinole does not currently have a policy for assessing noise impacts associated with increases in ambient noise levels from project-generated noise sources. As a result, the following federal noise criteria was applied to the project.

Federal Interagency Commission on Noise (FICON)

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for use in the assessment of project-related noise level increases. The criteria shown in Table 1 was developed by FICON as a means of developing thresholds for impact identification for project-related noise level increases. The FICON standards have been used extensively in recent years by the authors of this section in the preparation of the noise sections of Environmental Impact Reports that have been certified in many California cities and counties.

The use of the FICON standards are considered conservative relative to thresholds used by other agencies in the State of California. For example, the California Department of Transportation (Caltrans) requires a project-related traffic noise level increase of 12 dB for a finding of significance, and the California Energy Commission (CEC) considers project-related noise level increases between 5 to 10 dB significant, depending on local factors. Therefore, the use of the FICON standards, which set the threshold for finding of significant noise impacts as low as 1.5 dB, provides a very conservative approach to impact assessment for this project.

Table 1
Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level Without Project (L_{dn} or CNEL)	Change in Ambient Noise Level Due to Project
<60 dB	+5.0 dB or more
60 to 65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more
Source: Federal Interagency Committee on Noise (FICON)	

Based on the FICON research, as shown in Table 1, a 5 dB increase in noise levels due to a project is required for a finding of significant noise impact where ambient noise levels without the project are less than 60 dB. Where pre-project ambient conditions are between 60 and 65 dB, a 3 dB increase is applied as the standard of significance. Finally, in areas already exposed to higher noise levels, specifically pre-project noise levels in excess of 65 dB, a 1.5 dB increase is considered by FICON as the threshold of significance.

State of California

California Environmental Quality Act (CEQA)

The State of California has established regulatory criteria that are applicable to this assessment. Specifically, Appendix G of the State of California Environmental Quality Act (CEQA) Guidelines are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. According to Appendix G of the CEQA guidelines, the project would result in a significant noise or vibration impact if the following occur:

- A. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies?
- B. Generation of excessive groundborne vibration or groundborne noise levels?
- C. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

It should be noted that audibility is not a test of significance according to CEQA. If this were the case, any project which added any audible amount of noise to the environment would be considered significant according to CEQA. Because every physical process creates noise, the use of audibility alone as significance criteria would be unworkable. CEQA requires a substantial increase in noise levels before noise impacts are identified, not simply an audible change.

California Department of Transportation (Caltrans)

The City of Pinole does not currently have adopted standards for groundborne vibration. As a result, the vibration impact criteria developed by the California Department of Transportation (Caltrans) was applied to the project. The Caltrans criteria applicable to damage and annoyance from transient and continuous vibration typically associated with construction activities are presented in Tables 2 and 3. Equipment or activities typical of continuous vibration include: excavation equipment, static compaction equipment, tracked vehicles, traffic on a highway, vibratory pile drivers, pile-extraction equipment, and vibratory compaction equipment. Equipment or activities typical of single-impact (transient) or low-rate repeated impact vibration include: impact pile drivers, blasting, drop balls, "pogo stick" compactors, and crack-and-seat equipment (California Department of Transportation 2013).

Table 2
Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (inches/second)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial buildings	2.00	0.50
<p>Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.</p> <p>PPV = Peak Particle Velocity</p> <p>Source: California Department of Transportation, Transportation and Construction Vibration Guidance Manual (2013).</p>		

Table 3
Guideline Vibration Annoyance Potential Criteria

Human Response	Maximum PPV (inches/second)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.40	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.90	0.10
Severe	2.00	0.40
<p>Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.</p> <p>PPV = Peak Particle Velocity</p> <p>Source: California Department of Transportation, Transportation and Construction Vibration Guidance Manual (2013).</p>		

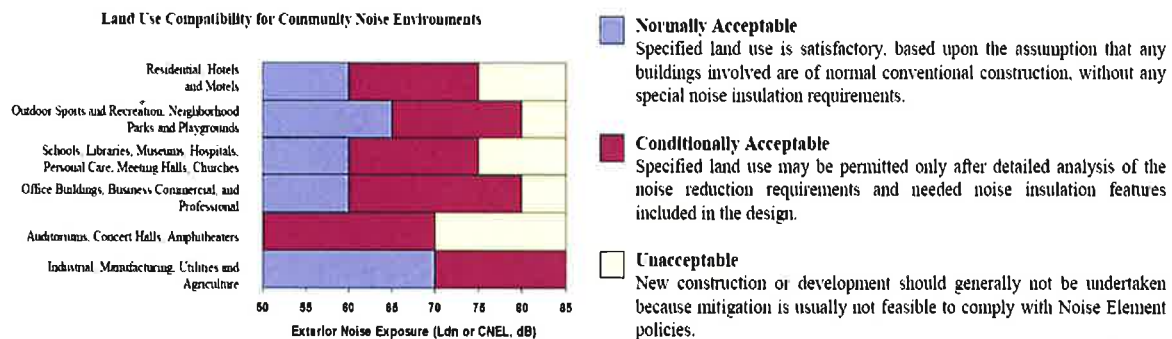
Local

City of Pinole General Plan

The Health and Safety Element (Chapter 9) of the City of Pinole General Plan contains goals, policies and actions to ensure that City residents are not subjected to noise beyond acceptable levels. The General Plan goals, policies and actions which are applicable to the project are reproduced below.

GOAL H.8 Ensure all new development complies with the noise standards established in the Pinole Health and Safety Element, and prevent all new noise sources from increasing the existing noise levels above acceptable standards.

Policy HS.8.1 New development projects should meet acceptable exterior noise level standards. The normally acceptable noise standards for new land uses are established in Land Use Compatibility for Community Exterior Noise Environments (as shown below).



Action HS.8.1.1

Adopt a noise ordinance with noise level performance standards, including maximum allowable noise exposure, ambient versus nuisance noise, method of measuring noise, and enforcement procedures.

Action HS.8.1.2

Review development proposals to assure consistency with noise standards. Require new development of noise-creating uses to conform to the City's noise level standards.

Action HS.8.1.3

Require a combination of design features to reduce noise impacts on adjacent properties through the following and other means, as appropriate:

- Screen and control noise sources such as parking, outdoor activities and mechanical equipment.
- Increase setbacks for noise sources from adjacent dwellings.
- Modify building designs and site planning to reduce noise exposure through a combination of sound attenuation (e.g., sound-rated windows and ventilation systems, insulation, physical and landscape buffers) and site planning (e.g., increased separation and private open area buffers) to reduce noise exposure.
- Control hours of operation, including deliveries and trash pickup, to minimize noise impacts.
- Require additional landscaping to assist with buffering where feasible.

Action HS.8.1.5

Require the use of temporary construction noise control measures including the use of temporary noise barriers, temporary relocation of noise-sensitive land uses, or other appropriate measures as mitigation for noise generated during construction of public and/or private projects.

Action HS.8.2.1

Require an acoustical analysis as part of the environmental review process when noise-sensitive land uses are proposed in areas where current or projected exterior noise levels exceed the City's standards.

Action HS.9.1

Noise created by commercial or industrial sources associated with new projects or developments should be controlled so as not to exceed the noise level standards set forth in the table below (Maximum Allowable Noise Exposure for Stationary Noise Sources), as measured at any affected residential land use.

Maximum Allowable Noise Exposure for Stationary Noise Sources¹

Noise Descriptor	Daytime (7 AM to 10 PM) ⁵	Nighttime (10 PM to 7 AM) ^{2,5}
Hourly Leq, dB ³	55	45
Maximum Level, dB ³	70	65
Maximum Level, dB – Impulsive ⁴	65	60
¹ As determined at the property line of the receiving land use. When determining effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures. ² Applies only where the receiving land use operates or is occupied during nighttime hours. ³ Sound level measurements shall be made with "slow" meter response. ⁴ Sound level measurements shall be made with "fast" meter response. ⁵ Allowable levels shall be raised to the ambient noise levels where the ambient levels exceed the allowable levels. Allowable levels shall be reduced by 5 dB if the ambient hourly Leq is at least 10 dB lower than the allowable level.		

Pinole Municipal Code

The Pinole Municipal Code does not include noise standards applicable to transportation or non-transportation noise sources. However, the Municipal Code does include hourly restrictions and nuisance provisions pertaining to construction activities, which have been reproduced below.

15.02.070 Permitted hours and condition of construction; penalties.

- A. Work is allowed from 7:00 a.m. to 5:00 p.m. on non-federal holidays. Work is allowed on holidays recognized by the City of Pinole, but not acknowledged federally which include Cesar Chavez's Birthday and the Day After Thanksgiving, but no inspections will be performed.
- B. Saturday work is allowed in commercial zones only, from 9:00 a.m. to 6:00 p.m., as long as it is interior work and does not generate significant noise.

- D. Exceptions for commercial construction. The City Council designates the City Manager (or his/her designee) to further modify on a case-by-case basis the hours of construction in commercial zones. Additionally, the City Manager (or his/her designee) has the ability to modify the construction hours on a case-by-case basis based on inclement weather conditions or certain construction procedures (such as setting up for a concrete pour) and construction project characteristics that may require working beyond 5:00 p.m. on weekdays or 6:00 p.m. on Saturday.
- E. The minimum fine for a citation or penalty for violating construction hours is \$1,000 dollars, and escalates in \$1,000 increments.

Environmental Setting - Existing Ambient Noise and Vibration Environment

Noise-Sensitive Land Uses in the Project Vicinity

Noise-sensitive land uses are generally defined as locations where people reside or where the presence of unwanted sound could adversely affect the primary intended use of the land. Places where people live, sleep, recreate, worship, and study are generally considered to be sensitive to noise because intrusive noise can be disruptive to these activities.

The noise-sensitive land uses which would potentially be affected by the project consist of residential uses. Specifically, single-family residential land uses are located to the west of the project site. Existing commercial uses are located to the east of the project site, which are typically not considered to be noise-sensitive. The project area and surrounding land uses are shown on Figure 1.

Existing Traffic Noise Levels along Project Area Roadway Network

The FHWA Traffic Noise Model (FHWA-RD-77-108) was used to develop existing noise contours expressed in terms of L_{dn} for major roadways within the project study area. The FHWA model predicts hourly L_{eq} values for free-flowing traffic conditions. Estimates of the hourly distribution of traffic for a typical 24-hour period were used to develop L_{dn} values from L_{eq} values.

Traffic data in the form of AM and PM peak hour movements for existing conditions were obtained from the client (prepared by TJKM Traffic Consultants). Average daily traffic volumes were conservatively estimated by applying a factor of 5 to the sum of AM and PM peak hour conditions. Using these data and the FHWA model, traffic noise levels were calculated. The traffic noise level at 50 feet from the roadway centerline and distances from the centerlines of selected roadways to the 60 dB, 65 dB, and 70 dB L_{dn} contours are summarized in Table 4.

In many cases, the actual distances to noise level contours may vary from the distances predicted by the FHWA model. Factors such as roadway curvature, roadway grade, shielding from local topography or structures, elevated roadways, or elevated receivers may affect actual sound propagation.

It is also recognized that existing sensitive land uses within the project vicinity are located varying distances from the centerlines of the local roadway network. The 50 foot reference distance is utilized in this analysis to provide a reference position at which changes in existing and future traffic noise levels resulting from the project can be evaluated. Appendix B contains the FHWA model inputs for existing conditions.

Table 4
Existing (2019) Traffic Noise Modeling Results

Seg.	Intersection	Direction	L _{dn} 50 Feet from Roadway	Distance to Contour (feet)		
				70 dB L _{dn}	65 dB L _{dn}	60 dB L _{dn}
1	Project Driveway / Tara Hills Drive	North	56	6	13	27
2		South	58	8	17	36
3		East	65	24	52	112
4		West	64	20	44	95
5	Appian Way / Tara Hills Drive	North	65	21	46	100
6		South	69	45	97	209
7		East	57	6	14	29
8		West	65	24	52	113
9	Appian Way / I-80 WB Ramps	North	69	45	98	210
10		South	69	44	94	203
11		East	67	34	72	156
12		West	67	30	65	140
13	Appian Way / I-80 EB Ramps	North	69	44	95	205
14		South	70	48	104	224
15		East	67	33	71	152
16		West	67	30	64	139

Source: FHWA-RD-77-108 with inputs from TJKM. Appendix B contains the FHWA model inputs.

Existing Overall Ambient Noise Environment within the Project Vicinity

The existing ambient noise environment within the project vicinity is defined primarily by noise from traffic on Interstate 80, Tara Hills Drive and Appian Way. To generally quantify existing ambient noise environment at the nearest existing sensitive uses to the project site, short-term (15-minute) ambient noise surveys were conducted at four locations on July 8, 2019. The noise survey locations are shown on Figure 1. Photographs of the noise survey locations are provided in Appendix C.

A Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meter was used to complete the noise level measurement surveys. The meter was calibrated immediately before and after use with an LDL Model CA200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all specifications of the American National Standards Institute requirements for Type 1 sound level meters (ANSI S1.4). A summary of the measurement results is provided in Table 5.

Table 5
Short-Term Ambient Noise Monitoring Results – July 8, 2019

Site	Description	Time	Measured Noise Levels, dB	
			L _{eq}	L _{max}
ST-1	Centrally located along the western project boundary	2:58 PM	54	68
ST-2	Located along the northwest project boundary	3:15 PM	60	81
ST-3	Located along the southwest project boundary	3:32 PM	62	82
ST-4	North of project site, adjacent to Tara Hills Drive	3:57 PM	66	75
Source: Bollard Acoustical Consultants, Inc. (2019)				

The Table 5 indicate that measured average ambient noise levels ranged from 54 dB to 66 dB while maximum noise levels ranged from 68 dB to 82 dB.

Adjustments to General Plan Non-Transportation Noise Standards Based on Ambient Conditions

Footnote 5 of Table 3 (Maximum Allowable Noise Exposure for Stationary Noise Sources) indicates that allowable noise levels shall be increased to the ambient noise level where ambient noise levels exceed the standards shown above. The City of Pinole General Plan establishes baseline noise level limits of 55 dB L_{eq} and 70 dB L_{max} during daytime hours (7:00 a.m. to 10:00 p.m.), and 45 dB L_{eq} and 65 dB L_{max} during nighttime hours (10:00 p.m. to 7:00 a.m.).

A noise assessment was previously prepared for the project by Charles M. Salter Associates, Inc. on July 18, 2019 (noise study provided as Appendix D). The noise assessment included ambient noise level measurements conducted on the western end of the project site from May 3-6, 2019. Results from this monitoring effort indicate that the lowest hourly average (L_{eq}) was measured to be 54 dB at that location during the monitoring period (at 2:00 a.m. on two days). Based on the above-mentioned measured ambient nighttime (10:00 p.m. to 7:00 a.m.) noise level, the General Plan nighttime hourly average (L_{eq}) noise level standard applicable to the project would be 54 dB L_{eq}. Because measured nighttime maximum (L_{max}) noise level data from this monitoring effort was not available, the unadjusted (baseline) General Plan 65 dB L_{max} nighttime noise level standard was applied to the project.

Ambient daytime noise level surveys were conducted on the project site by BAC on July 8, 2019. The noise measurement locations are shown on Figure 1 – the results of the noise level survey are summarized in Table 5. BAC noise survey locations ST-1 through ST-3 were selected to be representative of ambient noise conditions at various existing residences adjacent to the project site. Specifically, noise measurements at site ST-1 are believed to be representative of the existing ambient noise environment at the nearest residences centrally located along the western project boundary. Noise survey sites ST-2 and ST-3 were selected to be representative of the existing ambient noise environment at the nearest residences along the northwestern and southwestern project boundary, respectively. Based on the results from the Charles M Salter Associates, Inc. and BAC noise level surveys, the General Plan daytime and nighttime noise level limits applicable to the project are summarized in Table 6.

Table 6
Adjusted General Plan Noise Level Standards Applicable to the Project

Adjacent Residential Locations	Measured Noise Levels				Unadjusted Standards				Adjustment for Measured Ambient?				Applicable Standards ¹			
	Daytime		Nighttime		Daytime		Nighttime		Daytime		Nighttime		Daytime		Nighttime	
	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}
West	54	68	54	--	55	70	45	65	N	N	Y	N	55	70	54	65
Northwest	60	81	54	--	55	70	45	65	Y	Y	Y	N	60	81	54	65
Southwest	62	82	54	--	55	70	45	65	Y	Y	Y	N	62	82	54	65

¹ Applicable noise levels at adjacent residence locations are based upon measurements from the Salter and BAC ambient noise level surveys.

Existing Ambient Vibration Environment

During a site visit on July 8, 2019, vibration levels were below the threshold of perception at the project site. Nonetheless, to quantify existing vibration levels at the project site, BAC conducted short-term (15-minute) vibration measurements at the four locations identified on Figure 1. Photographs of the vibration survey locations are provided in Appendix C.

A Larson-Davis Laboratories Model LxT precision integrating sound level meter equipped with a vibration transducer was used to complete the measurements. The results are summarized below in Table 7.

Table 7
Summary of Ambient Vibration Level Survey Results – July 8, 2019

Site	Description	Time	Average Measured Vibration Level, PPV (in. sec) ¹
ST-1	West end of project site	2:46 PM	<0.001
ST-2	Northwest end of the project site	3:19 PM	<0.001
ST-3	Southwest end of the project site	3:34 PM	0.027
ST-4	North of project site, adjacent to Tara Hills Drive	3:58 PM	<0.001

¹ PPV = Peak Particle Velocity (inches/second)
Source: Bollard Acoustical Consultants, Inc. (2019)

The Table 7 data indicate that the measured average vibration levels during the monitoring period ranged from less than 0.001 to 0.027 in/sec PPV. Upon further analysis of BAC field notes and the vibration measurement data, it was determined that the measured average vibration level of 0.027 in/sec PPV at site ST-3 included two heavy truck passbys within close proximity to the vibration monitoring equipment.

Impacts and Mitigation Measures

Thresholds of Significance

For the purposes of this report, a noise and vibration impact is considered significant if the project would result in:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies; or
- Generation of excessive groundborne vibration or groundborne noise levels; or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

The project site is not within the vicinity of a private airstrip, an airport land use plan, or within two miles of a public airport. Therefore, the last threshold listed above is not discussed further.

The following criteria based on standards established by the Federal Interagency Commission on Noise (FICON), California Department of Transportation (Caltrans), City of Pinole General Plan and Pinole Municipal Code were used to evaluate the significance of environmental noise and vibration resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the City of Pinole General Plan or Pinole Municipal Code.
- A significant impact would be identified if off-site traffic noise exposure or on-site activities generated by the project would substantially increase noise levels at existing sensitive receptors in the vicinity. A substantial increase would be identified relative to the FICON standards provided in Table 1.
- A significant impact would be identified if project construction activities or proposed on-site operations would expose noise-sensitive receptors to excessive groundborne vibration levels. Specifically, an impact would be identified if groundborne vibration levels due to these sources would exceed the Caltrans vibration impact criteria.

Noise Impacts Associated with Project-Generated Increases in Off-Site Traffic

With development of the project, traffic volumes on the local roadway network will increase. Those increases in daily traffic volumes will result in a corresponding increase in traffic noise levels at existing uses located along those roadways. The FHWA Model was used with traffic input data from the traffic impact analysis (prepared by TJKM Traffic Consultants) to predict project traffic noise level increases relative to Existing and Cumulative conditions.

Impact 1: Increases in Existing Traffic Noise Levels due to the Project

Traffic data in the form of AM and PM peak hour movements for Existing and Existing Plus Project conditions in the project area roadway network were obtained from the project transportation impact analysis completed by TJKM Traffic Consultants. Average daily traffic (ADT) volumes were conservatively estimated by applying a factor of 5 to the sum of AM and PM peak hour conditions.

Existing versus Existing Plus Project traffic noise levels on the local roadway network are shown in Table 8. The following section includes an assessment of predicted traffic noise levels relative to the FICON increase significance noise criteria identified in Table 1. The Table 8 data are provided in terms of L_{dn} at a standard distance of 50 feet from the centerlines of the project-area roadways. Appendix B contains the FHWA model inputs.

Table 8
Traffic Noise Modeling Results and Project-Related Traffic Noise Increases
Existing vs. Existing Plus Project Conditions

Segment	Intersection	Direction	Traffic Noise Level at 50 feet, dB L_{dn}			Substantial Increase?
			E	E+P	Increase	
1	Project Drive / Tara Hills Drive	North	56.0	56.0	0.0	No
2		South	57.8	59.2	1.4	No
3		East	65.2	65.6	0.4	No
4		West	64.2	64.3	0.1	No
5	Appian Way / Tara Hills Drive	North	64.5	64.6	0.1	No
6		South	69.3	69.4	0.1	No
7		East	56.5	56.7	0.2	No
8		West	65.3	65.6	0.3	No
9	Appian Way / I-80 WB Ramps	North	69.4	69.4	0.0	No
10		South	69.1	69.2	0.1	No
11		East	67.4	67.5	0.1	No
12		West	66.7	66.7	0.0	No
13	Appian Way / I-80 EB Ramps	North	69.2	69.2	0.0	No
14		South	69.8	69.8	0.0	No
15		East	67.2	67.2	0.0	No
16		West	66.7	66.7	0.0	No

Source: FHWA-RD-77-108 with inputs from TJKM. Appendix B contains the FHWA model inputs.

The data in Table 8 indicate that traffic generated by the project would not result in an increase of traffic noise levels on the local roadway network. Relative to the FICON significance criteria identified in Table 1, the increases would not be considered substantial. As a result, off-site traffic noise impacts related to increases in traffic resulting from the implementation of the project (Existing vs. Existing Plus Project conditions) are identified as being ***less than significant***.

Impact 2: Increases in Cumulative Traffic Noise Levels due to the Project

Traffic data in the form of AM and PM peak hour movements for Cumulative and Cumulative Plus Project conditions in the project area roadway network were obtained from the project transportation impact analysis completed by TJKM Traffic Consultants. Average daily traffic (ADT) volumes were conservatively estimated by applying a factor of 5 to the sum of AM and PM peak hour conditions.

Cumulative versus Cumulative Plus Project traffic noise levels on the local roadway network are shown in Table 9. The following section includes an assessment of predicted traffic noise levels relative to the FICON increase significance noise criteria identified in Table 1. The Table 9 data are provided in terms of L_{dn} at a standard distance of 50 feet from the centerlines of the project-area roadways. Appendix B contains the FHWA model inputs.

Table 9
Traffic Noise Modeling Results and Project-Related Traffic Noise Increases
Cumulative vs. Cumulative Plus Project Conditions

Segment	Intersection	Direction	Traffic Noise Level at 50 feet, dB L_{dn}			Substantial Increase?
			C	C+P	Increase	
1	Project Drive / Tara Hills Drive	North	56.3	56.4	0.1	No
2		South	58.2	59.5	1.3	No
3		East	65.6	65.9	0.3	No
4		West	64.5	64.6	0.1	No
5	Appian Way / Tara Hills Drive	North	64.8	64.9	0.1	No
6		South	69.7	69.8	0.1	No
7		East	56.9	57.1	0.2	No
8		West	65.7	66.0	0.3	No
9	Appian Way / I-80 WB Ramps	North	69.7	69.8	0.1	No
10		South	69.5	69.5	0.0	No
11		East	67.8	67.8	0.0	No
12		West	67.0	67.1	0.1	No
13	Appian Way / I-80 EB Ramps	North	69.5	69.6	0.1	No
14		South	70.1	70.1	0.0	No
15		East	67.6	67.6	0.0	No
16		West	67.0	67.1	0.1	No

Source: FHWA-RD-77-108 with inputs from TJKM. Appendix B contains the FHWA model inputs.

The data in Table 9 indicate that traffic generated by the project would not result in an increase of traffic noise levels on the local roadway network. Relative to the FICON significance criteria identified in Table 1, the increases would not be considered substantial. As a result, off-site traffic noise impacts related to increases in traffic resulting from the implementation of the project (Cumulative vs. Cumulative Plus Project conditions) are identified as being **less than significant**.

Off-Site Noise Impacts Associated with On-Site Commercial Operations

The project proposes the demolition of existing retail uses and the construction/redevelopment of new commercial uses within three phases. The primary noise sources associated with the project have been identified on-site delivery truck circulation, loading dock activities, rooftop mechanical equipment (HVAC), restaurant drive-through operations, and parking lot movements. An assessment of each project-related noise source follows. The locations of the on-site noise sources included in this assessment are shown on Figure 2.

It should be noted that the site plans indicate that a 6-foot tall solid wood fence is proposed to be constructed along the entire western project property boundary. However, it is unclear whether or not the proposed wood fence would be constructed such that it would provide the necessary attenuation needed to perform as a noise barrier. As a result, the following analyses of project-generated noise exposure at the nearest existing residential uses (west) do not include offsets associated with a 6-foot tall noise barrier.

Impact 3: On-Site Delivery Truck Circulation Noise at Existing Off-Site Sensitive Uses

The project site plans indicate that delivery trucks will access the project site from Tara Hills Drive. Figure 2 shows the proposed on-site delivery truck routes.

According to the project applicant, it is estimated that the project could receive daily deliveries from up to 5 heavy trucks (3 Safeway trucks, 2 fuel tankers) and 15 medium trucks (combination of project tenants). Although the truck delivery hours are currently unknown, it has been the experience of BAC in similar projects that commercial uses typically can have deliveries during both daytime and nighttime hours.

Based on the information above and site design constraints (e.g., building capacities, orientation, site access points), the following conservative assumptions were made regarding deliveries at the businesses of the development:

- Fuel station: 1 heavy truck / 2 medium trucks during worst-case hour
- Shops 1, 2E & 3E: 2 medium trucks during worst-case hour
- Safeway and adjacent shops: 3 heavy trucks / 5 medium trucks during worst-case hour
- Drive-through restaurant: 1 medium truck during worst-case hour

Truck deliveries are expected to be relatively brief, and will occur at low speeds. To predict noise levels generated by truck deliveries, BAC utilized file data obtained from measurements conducted by BAC of heavy and medium duty truck passbys. According to BAC file data, single-event heavy truck passby noise levels are approximately 74 dB L_{max} and 83 dB SEL at a reference distance of 50 feet. BAC file data also indicate that single-event medium truck passby noise levels are approximately 66 dB L_{max} and 76 SEL at a reference distance of 50 feet.

Because the City of Pinole General Plan noise standards are provided in terms of both individual maximum noise levels and hourly average noise levels, it is necessary to identify the number of truck movements occurring during a typical busy hour of operations to assess compliance with the L_{eq} -based standards. Based on the worst-case hour truck delivery assumptions discussed

above, the following delivery truck hourly average (L_{eq}) reference noise levels at a distance of 50 feet from the truck passby route were computed:

- Fuel station: 48 dB L_{eq} (maximum of 74 dB L_{max})
- Shops 1, 2E & 3E: 43 dB L_{eq} (maximum of 66 dB L_{max})
- Safeway and adjacent shops: 53 dB L_{eq} (maximum of 74 dB L_{max})
- Drive-through restaurant: 40 dB L_{eq} (maximum of 66 dB L_{max})

Based the reference noise levels above, and assuming standard spherical spreading loss (-6 dB per doubling of distance), on-site delivery truck circulation noise exposure at the property lines of the nearest existing residential uses to the west, northwest and southwest of the project site was calculated and the results of those calculations are presented in Table 10.

Table 10
Predicted On-Site Truck Circulation Noise Levels at Nearest Existing Sensitive Uses

Nearest Residential Property Lines	Distance from Truck Lane (ft) ¹	Predicted Noise Level, (dB)		Applicable City Noise Standards ²			
				Daytime		Nighttime	
		L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
West	25	59	80	55	70	54	65
Northwest	25	61	80	60	81	54	65
Southwest	35	57	77	62	82	54	65

¹ Distances measured from center nearest truck circulation lane to nearest residential property lines.
² Applicable noise levels based upon measurements from the Salter and BAC ambient noise level surveys.
Source: Bollard Acoustical Consultants, Inc. (2020)

As indicated in Table 10, on-site delivery truck circulation noise levels are predicted to exceed the applicable City of Pinole General Plan hourly average (L_{eq}) and maximum (L_{max}) daytime and nighttime noise level standards at a portion of the nearest existing residences to the west, northwest and southwest of the project. In addition, it is possible that project delivery truck circulation noise exposure could be above ambient daytime and nighttime noise levels at those existing sensitive uses. As a result, this impact is considered to be **potentially significant**.

Mitigation Impact 3:

In order to satisfy applicable City of Pinole General Plan noise level limits at the nearest adjacent existing residential uses to the project, and subsequently result in truck circulation noise levels at or below ambient noise conditions at those residential uses, the following on-site delivery truck circulation noise mitigation measures should be implemented:

- MM 3A:** The construction of a solid noise barrier measuring 7-feet in height along the project property boundary, as indicated in Figure 2. The construction of a 7-foot solid noise barrier at the location indicated in Figure 2 will result in the satisfaction of the applicable General Plan daytime noise level limits at the nearest existing residential uses adjacent to the project. The resulting noise levels at the nearest residential uses, after construction of the recommended 7-foot tall barrier, includes consideration of a shielding offset to account for the substantial difference in

elevations between the elevated truck lane and depressed sensitive areas of the of the adjacent residential uses, which is estimated to be approximately -3 dB.

Table 11 shows the calculated on-site truck circulation noise levels after implementation of a 7-foot tall noise barrier and shielding offset, as discussed above.

Table 11
Predicted On-Site Truck Circulation Noise Levels – Mitigated

Nearest Residential Property Lines	Predicted Noise Levels, (dB) ¹		Applicable City Daytime Noise Standards ²	
	L _{eq}	L _{max}	L _{eq}	L _{max}
West	49	70	55	70
Northwest	51	70	60	81
¹ Predicted noise levels take into consideration the screening provided by a 7-foot tall noise barrier along the property line (as indicated in Figure 2), as well as for a shielding offset to account for a difference in elevations between the elevated truck lane and depressed sensitive areas of adjacent residential uses below. ² Applicable noise levels based upon measurements from ambient noise level surveys. Source: Bollard Acoustical Consultants, Inc. (2020)				

In addition to implementation of the mitigation discussed in above in MM 3A, the following mitigation measure should also be implemented:

MM 3B: The limitation of project truck deliveries to daytime hours only (7:00 a.m. to 10:00 p.m.).

Significance of Impact 3 after Mitigation: *Less than Significant*

Impact 4: Loading Dock Activity Noise at Existing Sensitive Uses

The project proposes one primary loading dock at the rear (south end) of the Safeway grocery store. Figure shows the location of the proposed loading dock. The primary noise sources associated with loading dock areas is the heavy trucks stopping (air brakes), backing into the loading docks (back-up alarms), and pulling out of the loading docks. The primary noise sources associated with delivery activities are trucks stopping (air brakes), trucks backing into position (back-up alarms), and pulling away from the dock area (revving engines).

To quantify the noise generated by truck loading dock operations, BAC utilized noise level data obtained from BAC field measurements of a commercial warehouse facility. According to BAC measurement data, loading dock average and maximum noise levels are approximately 63 dB L_{eq} and 75 dB L_{max} at a reference distance of 50 feet.

Based on the project site plans, the existing residential uses to the west and northwest of the project site (located farthest away) would be completely shielded from view of the loading dock area by the proposed grocery store building itself. The worst-case loading dock noise exposure would be at the nearest existing residential uses to the southwest of the project site. Assuming

standard spherical spreading loss (-6 dB per doubling of distance), loading dock noise exposure at the property line of the nearest existing residential use to the southwest of the project site was calculated and the results of those calculations are presented in Table 12.

Table 12
Predicted Loading Dock Activity Noise Levels at Nearest Existing Sensitive Use

Nearest Residential Property Lines	Distance from Loading Dock (ft) ¹	Predicted Noise Level, (dB)		Applicable City Noise Standards ²			
				Daytime		Nighttime	
		Leq	Lmax	Leq	Lmax	Leq	Lmax
Southwest	180	52	64	62	82	54	65

¹ Distances measured from center of loading dock area to property line of the nearest residential use.
² Applicable noise levels based upon measurements from the Salter and BAC ambient noise level surveys.
Source: Bollard Acoustical Consultants, Inc. (2020)

The Table 12 data indicate that noise levels generated by project loading dock activities are predicted to satisfy the applicable City of Pinole General Plan daytime and nighttime noise level standards at the property lines of the nearest existing residential uses (southwest of the project site). The predicted average hourly (L_{eq}) and maximum (L_{max}) noise levels shown in Table 12 are also below measured ambient daytime and nighttime noise levels measured at the nearest existing residential uses to the southwest (Table 6).

Because project loading dock activity noise level exposure is predicted to satisfy the applicable City of Pinole General Plan daytime and nighttime noise level limits, and because loading dock noise levels are not predicted to significantly increase ambient noise levels at existing sensitive uses, this impact is identified as being ***less than significant***.

Impact 5: Rooftop Mechanical Equipment Noise at Existing Sensitive Uses

According to the project site plans, the project is proposing the installation of rooftop mechanical equipment for maintaining comfortable temperatures within the future commercial buildings of the development. Such mechanical equipment would be shielded from view of nearby existing residential uses by the building parapets on top of the proposed commercial buildings. Figure 2 shows the proposed locations of the rooftop mechanical equipment.

Because mechanical equipment operation typically generates sustained, steady-state, noise levels, impacts of project rooftop mechanical equipment are assessed in this study relative to the City of Pinole General Plan hourly average (L_{eq}) noise level standards.

Noise from rooftop mechanical equipment has been measured by BAC to be 45-50 dB at a reference distance of 100 feet from the building facades of similar commercial uses, including shielding by the building parapet. When projected to the property line of the nearest existing residential use located approximately 120 feet from any project-related rooftop mechanical equipment, noise levels are calculated to be approximately 43 dB L_{eq} (including shielding from the building parapet). The predicted rooftop mechanical equipment noise level of 43 dB L_{eq} at the property line of the nearest existing residential use (southwest of the project site) would satisfy the applicable City of Pinole daytime and nighttime hourly average noise level limits of 62 and 54

dB Leq, respectively. The predicted average hourly (Leq) noise level of 43 dB Leq is also below measured ambient daytime and nighttime noise levels measured at the nearest existing residential uses to the southwest (Table 6).

Because project rooftop mechanical equipment noise exposure is predicted to satisfy the applicable City of Pinole General Plan daytime and nighttime noise level limits, and because mechanical equipment noise levels are not predicted to significantly increase ambient noise levels at existing sensitive uses, this impact is identified as being **less than significant**.

Impact 6: Restaurant Drive-Through Operations Noise at Existing Sensitive Uses

The site plans indicate that the project proposes the construction of a restaurant that will include a drive-through lane. The location of the restaurant and drive-through lane are shown on Figure 2.

To quantify the noise exposure of proposed drive-through vehicle passages and speaker usage at the nearest existing residential uses, BAC utilized noise measurement data collected for similar drive-through operations. According to BAC file data, drive-through speaker and vehicle idling noise levels are approximately 50 dB Leq and 55 dB Lmax at a reference distance of 50 feet. The nearest existing residential uses to the proposed restaurant drive-through lane are located to the west and northwest of the project site. Using the above-mentioned measured reference noise levels, and assuming standard spherical spreading loss (-6 dB per doubling of distance), restaurant drive-through noise exposure at the property lines of the nearest existing residential uses was calculated and the results of those calculations are presented in Table 13.

Table 13
Predicted Restaurant Drive-Through Noise Levels at Nearest Existing Sensitive Uses

Nearest Residential Property Lines	Distance from Drive-Through Lane (ft) ¹	Predicted Noise Level, (dB)		Applicable City Noise Standards ²			
				Daytime		Nighttime	
		Leq	Lmax	Leq	Lmax	Leq	Lmax
West	430	31	36	55	70	54	65
Northwest	420	32	37	60	81	54	65

¹ Distances measured from the drive-through lane to the property lines of the nearest residential uses.
² Applicable noise levels based upon measurements from the Salter and BAC ambient noise level surveys.
Source: Bollard Acoustical Consultants, Inc. (2020)

As indicated in Table 13, noise levels generated by restaurant drive-through operations are predicted to satisfy the applicable City of Pinole General Plan daytime and nighttime noise level standards at the property lines of the nearest existing residential uses (west and northwest of the project site). The predicted average hourly (Leq) and maximum (Lmax) noise levels shown in Table 13 are also below measured ambient daytime and nighttime noise levels measured at the nearest existing residential uses to the west and northwest (Table 6).

Because project restaurant drive-through operations noise level exposure is predicted to satisfy the applicable City of Pinole General Plan daytime and nighttime noise level limits, and because

restaurant drive-through noise levels are not predicted to significantly increase ambient noise levels at existing sensitive uses, this impact is identified as being ***less than significant***.

Impact 7: Parking Lot Activity Noise at Existing Sensitive Uses

As a means of determining potential noise exposure due to project parking lot activities, Bollard Acoustical Consultants, Inc. (BAC) utilized specific parking lot noise level measurements conducted by BAC. Specifically, a series of individual noise measurements were conducted of multiple vehicle types arriving and departing a parking area, including engines starting and stopping, car doors opening and closing, and persons conversing as they entered and exited the vehicles. The results of those measurements revealed that individual parking lot movements generated mean noise levels of approximately 70 dB SEL at a reference distance of 50 feet. The maximum noise level associated with parking lot activity typically did not exceed 65 dB L_{max} at the same reference distance.

To compute hourly average (L_{eq}) noise levels generated by parking lot activities, the approximate number of hourly operations in any given area and distance to the effective noise center of those activities is required. The parking areas proposed nearest to existing residential uses are located on the west and northwest sides of the project area – which are identified as Parking Areas 1 and 2 on Figure 2. According to the project site plans, Parking Areas 1 and 2 will accommodate approximately 150 and 50 parking spaces, respectively. It was conservatively assumed for the purposes of this analysis that all of the parking stalls could fill or empty during any given peak hour (worst-case). However, it is likely that parking area activity would be more spread out. The hourly average noise level generated by parking lot movements is computed using the following formula:

$$\text{Peak Hour } L_{eq} = 70 + 10 \cdot \log(N) - 35.6$$

Where 70 is the mean Sound Exposure Level (SEL) for an automobile parking lot arrival or departure, N is the number of parking lot operations in a given hour, and 35.6 is 10 times the logarithm of the number of seconds in an hour.

Using the information provided above, and assuming standard spherical spreading loss (-6 dB per doubling of distance), worst-case parking area noise exposure at the property lines of the nearest existing residential uses to the west and northwest of the project site was calculated and the results of those calculations are presented in Table 14.

Table 14
Predicted Worst-Case Parking Area Noise Levels at Nearest Existing Sensitive Uses

Nearest Residential Property Lines	Nearest Parking Area	Distance from Noise Center of Parking Area (ft) ¹	Predicted Noise Levels, (dB)		Applicable City Noise Standards ²			
			Leq	L _{max}	Daytime		Nighttime	
					Leq	L _{max}	Leq	L _{max}
West	1	250	42	51	55	70	54	65
Northwest	2	100	45	59	60	81	54	65

¹ Distances measured from effective noise center of parking areas to property lines of nearest residential uses.
² Applicable noise levels based upon measurements from the Salter and BAC ambient noise level surveys.
Source: Bollard Acoustical Consultants, Inc. (2020)

The Table 14 data indicate that noise levels generated by project parking lot movements are predicted to satisfy the applicable City of Pinole General Plan daytime and nighttime noise level standards at the property lines of the nearest existing residential uses (west and northwest of the project site). The predicted average hourly (Leq) and maximum (L_{max}) noise levels shown in Table 14 are also below measured ambient daytime and nighttime noise levels measured at the nearest existing residential uses to the west and northwest (Table 6).

Because project parking area noise level exposure is predicted to satisfy the applicable City of Pinole General Plan daytime and nighttime noise level limits, and because parking area noise levels are not predicted to significantly increase ambient noise levels at existing sensitive uses, this impact is identified as being ***less than significant***.

Impact 8: Cumulative (Combined) Noise Levels from On-Site Operations at Existing Sensitive Uses

The calculated unmitigated and mitigated cumulative noise levels of project on-site commercial operations at the nearest existing residential uses is presented are Tables 15 and 16, respectively. The mitigated cumulative noise levels shown in Table 16 include consideration of the shielding provided by a 7-foot tall property line noise barrier as discussed in MM 3A, and as illustrated on Figure 2.

It should be noted that due to the logarithmic nature of the decibel scale, the sum of two noise values which differ by 10 dB equates to an overall increase in noise levels of 0.4 dB. When the noise sources are equivalent, the sum would result in an overall increase in noise levels of 3 dB.

Table 15
Predicted Cumulative Project Noise Levels at Nearest Existing Sensitive Uses – Unmitigated

Residential Property	Predicted Project Operations Noise Levels, (dB) ¹										Applicable City Noise Standards ²				
	Truck Circulation		Loading Dock		HVAC	Drive Through		Parking Area		Cumulative		Daytime		Nighttime	
	Leq	Lmax	Leq	Lmax	Leq	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
West	59	80	31	43	39	31	36	42	51	59	80	55	70	54	65
Northwest	61	80	27	39	33	32	37	45	59	61	80	60	81	54	65
Southwest	57	77	52	64	43	<20	<20	26	34	58	77	62	82	54	65

¹ Predicted noise levels include shielding provided by intervening on-site buildings (where applicable), and a screening offset to account for the difference in elevations between the elevated project site and depressed sensitive areas of the adjacent residential uses.

² Applicable noise levels based upon measured ambient conditions from both the Salter and BAC ambient noise level surveys.

Source: Bollard Acoustical Consultants, Inc. (2020)

Table 16
Predicted Cumulative Project Noise Levels at Nearest Existing Sensitive Uses – Mitigated (7-Foot Tall Noise Barrier)

Residential Property	Predicted Project Operations Noise Levels, (dB) ¹										Applicable City Noise Standards ²				
	Truck Circulation		Loading Dock		HVAC	Drive Through		Parking Area		Cumulative		Daytime		Nighttime	
	Leq	L _{max}	Leq	L _{max}	Leq	Leq	L _{max}	Leq	L _{max}	Leq	L _{max}	Leq	L _{max}	Leq	L _{max}
West	49	70	20	32	29	20	25	30	40	49	70	55	70	54	65
Northwest	51	70	<20	28	23	21	26	34	48	51	70	60	81	54	65
Southwest	57	77	52	64	43	<20	<20	26	34	58	77	62	82	54	65

¹ Predicted noise levels include the implementation of mitigation as outlined in this report (MM 3A – 7-foot tall noise barrier), shielding provided by intervening on-site buildings (where applicable), and a screening offset to account for the difference in elevations between the elevated project site and depressed sensitive areas of the adjacent residential uses.

² Applicable noise levels based upon measured ambient conditions from both the Salter and BAC ambient noise level surveys.

Source: Bollard Acoustical Consultants, Inc. (2020)

The Table 15 data indicate that cumulative unmitigated on-site project-related noise levels are predicted to exceed the City of Pinole General Plan daytime and nighttime hourly average (L_{eq}) and maximum (L_{max}) noise level standards at a portion of the nearest residential property lines. However, after implementation of mitigation measure MM 3A (construction of a 7-foot tall solid noise barrier as indicated in Figure 2), cumulative mitigated on-site project noise levels are predicted to satisfy the applicable City of Pinole General Plan daytime hourly average (L_{eq}) and maximum (L_{max}) noise level standards at the property lines of the nearest existing residential uses (Table 16). The predicted mitigated cumulative noise levels shown in Table 16 are also below measured ambient daytime noise levels measured at the nearest existing residential uses (Table 6).

Although the cumulative mitigated noise levels from on-site project operations are predicted to satisfy the applicable City of Pinole General Plan daytime noise level criteria, they would still exceed the City's nighttime noise level criteria at the nearest residential uses (Table 16). In addition, it is possible that cumulative noise exposure could be above ambient nighttime noise levels at those existing sensitive uses. As a result, this impact is considered to be ***potentially significant***.

Mitigation Impact 8:

In order to avoid a potential exceedance of City of Pinole General Plan nighttime noise level criteria at the nearest adjacent existing residential uses, the following noise mitigation measure should be implemented by the project:

MM 8: The limitation of project truck deliveries to daytime hours only (7:00 a.m. to 10:00 p.m.).

Significance of Impact 8 after Mitigation: *Less than Significant*

Noise Impacts Associated with Project Construction Activities

Impact 9: Project Construction Noise Levels at Existing Sensitive Uses

During project construction, heavy equipment would be used for grading excavation, paving, and building construction, which would increase ambient noise levels when in use. Noise levels would vary depending on the type of equipment used, how it is operated, and how well it is maintained. Noise exposure at any single point outside the project work area would also vary depending upon the proximity of equipment activities to that point. The property lines of the nearest existing residential uses are located approximately 30 feet away from where construction activities would occur on the project site.

Table 16 includes the range of maximum noise levels for equipment commonly used in general construction projects at full-power operation at a distance of 50 feet. Not all of these construction activities would be required of this project. The Table 16 data also include predicted maximum equipment noise levels at the property lines of the nearest sensitive uses located approximately 30 feet away, which assume a standard spherical spreading loss of 6 dB per doubling of distance.

Table 16
Construction Equipment Reference Noise Levels and Predicted Noise Levels 30 Feet

Equipment Description	Maximum Noise Level at 50 Feet, dBA	Predicted Maximum Noise Level at 30 feet, dBA
Air compressor	80	84
Backhoe	80	84
Ballast equalizer	82	86
Ballast tamper	83	87
Compactor	82	86
Concrete mixer	85	89
Concrete pump	82	86
Concrete vibrator	76	80
Crane, mobile	83	87
Dozer	85	89
Generator	82	86
Grader	85	89
Impact wrench	85	89
Jack hammer	88	92
Loader	80	84
Paver	85	89
Pneumatic tool	85	89
Pump	77	81
Rail saw	90	94
Saw	76	80
Scarifier	83	87
Scraper	85	89
Shovel	82	86
Spike driver	77	81
Tie cutter	84	88
Tie handler	80	84
Tie inserter	85	89
Truck	84	88

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, Table 7-1 (2018)

Based on the equipment noise levels in Table 16, worst-case on-site project construction equipment noise levels at the property lines of the nearest existing residential uses located 30 feet away are expected to range from approximately 80 to 94 dB. Thus, it is possible that a portion of the project construction equipment could result in substantial short-term increases over ambient maximum noise levels at the nearest existing sensitive uses. Further, it is possible that those noise levels could exceed the applicable City of Pinole General Plan noise level limits. As a result, noise impacts associated with construction activities are identified as being ***potentially significant***.

Mitigation Impact 9: Construction Noise Control Measures

- MM 9:** To the maximum extent practical, the following measures should be incorporated into the project construction operations:

- Pursuant to City of Pinole General Plan Action HS.8.1.5, the project shall utilize temporary construction noise control measures including the use of temporary noise barriers, or other appropriate measures as mitigation for noise generated during construction of projects.
- Pursuant to Pinole Municipal Code Section 15.02.070(A), construction work is allowed from 7:00 a.m. to 5:00 p.m. on non-federal holidays. Construction work is allowed on holidays recognized by the City of Pinole, but not acknowledged federally which include Cesar Chavez's Birthday and the Day after Thanksgiving, but no inspections will be performed.
- Pursuant to Pinole Municipal Code Section 15.02.070(B), construction work on Saturdays is allowed in commercial zones only, from 9:00 a.m. to 6:00 p.m. as long as it is interior work and does not generate significant noise.
- All noise-producing project equipment and vehicles using internal-combustion engines shall be equipped with manufacturers-recommended mufflers and be maintained in good working condition.
- All mobile or fixed noise-producing equipment used on the project site that are regulated for noise output by a federal, state, or local agency shall comply with such regulations while in the course of project activity.
- Electrically powered equipment shall be used instead of pneumatic or internal-combustion-powered equipment, where feasible.
- Material stockpiles and mobile equipment staging, parking, and maintenance areas shall be located as far as practicable from noise-sensitive receptors.
- Project area and site access road speed limits shall be established and enforced during the construction period.
- Nearby residences shall be notified of construction schedules so that arrangements can be made, if desired, to limit their exposure to short-term increases in ambient noise levels.

Significance of Impact 9 after Mitigation: *Less than Significant*

Vibration Impacts Associated with Project Activities

Impact 10: Project Construction Vibration at Existing Sensitive Uses

During project construction, heavy equipment would be used for grading, excavation, paving, and building construction, which would generate localized vibration in the immediate vicinity of the construction. The nearest existing sensitive uses are residential structures located approximately 50 feet from construction activities which would occur within the project site.

Table 17 includes the range of vibration levels for equipment commonly used in general construction projects at a distance of 25 feet. The Table 17 data also include predicted equipment vibration levels at the nearest existing residences to the project site located approximately 50 feet away.

Table 17
Vibration Source Levels for Construction Equipment and Predicted Levels at 50 Feet

Equipment	Maximum PPV (inches/second) ¹	
	Maximum PPV at 25 Feet ²	Predicted PPV at 50 Feet
Hoe ram	0.089	0.032
Large bulldozer	0.089	0.032
Caisson drilling	0.089	0.032
Loaded trucks	0.076	0.027
Jackhammer	0.035	0.012
Small bulldozer	0.003	0.011

¹ PPV = Peak Particle Velocity
² Reference vibration level obtained from the Federal Transit Administration (FTA), Transit Noise and Vibration Impact Assessment Manual (2018).

As indicated in Table 17, vibration levels generated from on-site construction activities at the nearest existing residences are predicted to be well below the strictest Caltrans thresholds for damage to residential structures of 0.30 in/sec PPV shown in Table 2. Further, the predicted vibration levels are also below the Caltrans thresholds for annoyance presented in Table 3. Therefore, on-site construction within the project area would not result in excessive groundborne vibration levels at nearby existing residential uses.

Because vibration levels due to the proposed project will satisfy the applicable Caltrans groundborne impact vibration criteria at the nearest existing sensitive uses, this impact is considered to be ***less than significant***.

Impact 11: Project Commercial Operations Vibration

The project proposes the redevelopment and operation of commercial uses would include on-site operations such as delivery truck circulation, loading and unloading activities, parking lot movements, and mechanical equipment. It is the experience of BAC that operations associated with limited loading dock operations do not typically have equipment that generates appreciable vibration. In addition, it is our understanding that the project does not propose on-site equipment that will produce appreciable vibration. Lastly, vibration levels from heavy trucks traveling on a roadway, such as those generated from project heavy truck traffic, rarely generate vibration amplitudes high enough to cause structural or cosmetic damage.

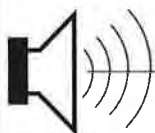
The Table 7 data indicate that measured average vibration levels at the project site were below the strictest Caltrans thresholds for damage to structures and thresholds for annoyance, which included heavy truck passbys within close proximity to the measurement equipment. Therefore, it is expected that the project would not result in the exposure of persons to excessive groundborne vibration levels at existing sensitive uses or proposed uses of the project.

Because vibration levels due to and upon the proposed project are expected to be below the strictest Caltrans thresholds for damage to structures and thresholds for annoyance at sensitive receptors, this impact is considered to be ***less than significant***.

This concludes BAC's noise and vibration assessment of the Pinole Square Redevelopment Phases 1-3 project in Pinole, California. Please contact BAC at (916) 663-0500 or dariog@bacnoise.com if you have any comments or questions regarding this report.

Appendix A Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
Loudness	A subjective term for the sensation of the magnitude of sound.
Masking	The amount (or the process) by which the threshold of audibility for one sound is raised by the presence of another (masking) sound.
Noise	Unwanted sound.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the Maximum level, which is the highest RMS level.
RT₆₀	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.
SEL	A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy of the event into a 1-s time period.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.



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Appendix B-1

FHWA Highway Traffic Noise Prediction Model Data Inputs

Pinole Square Redevelopment Phases 1-3

File Name: 2019-120 01 Existing

Model Run Date: 11/19/2019



Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	Project Driveway / Tara Hills Drive	North	2,100	80	20	2	1	25	50
2		South	3,220	80	20	2	1	25	50
3		East	12,290	80	20	2	1	30	50
4		West	9,640	80	20	2	1	30	50
5	Appian Way / Tara Hills Drive	North	14,880	80	20	2	1	25	50
6		South	24,625	80	20	2	1	35	50
7		East	2,360	80	20	2	1	25	50
8		West	12,525	80	20	2	1	30	50
9	Appian Way / I-80 WB Ramps	North	24,845	80	20	2	1	35	50
10		South	23,595	80	20	2	1	35	50
11		East	8,745	80	20	2	1	45	50
12		West	7,385	80	20	2	1	45	50
13	Appian Way / I-80 EB Ramps	North	23,870	80	20	2	1	35	50
14		South	27,260	80	20	2	1	35	50
15		East	8,400	80	20	2	1	45	50
16		West	7,330	80	20	2	1	45	50

Appendix B-2

FHWA Highway Traffic Noise Prediction Model Data Inputs

Pinole Square Redevelopment Phases 1-3

File Name: 2019-120 02 Existing Plus Project

Model Run Date: 11/19/2019



Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	Project Driveway / Tara Hills Drive	North	2,130	80	20	2	1	25	50
2		South	4,390	80	20	2	1	25	50
3		East	13,265	80	20	2	1	30	50
4		West	9,905	80	20	2	1	30	50
5	Appian Way / Tara Hills Drive	North	15,210	80	20	2	1	25	50
6		South	25,150	80	20	2	1	35	50
7		East	2,485	80	20	2	1	25	50
8		West	13,505	80	20	2	1	30	50
9	Appian Way / I-80 WB Ramps	North	25,370	80	20	2	1	35	50
10		South	23,915	80	20	2	1	35	50
11		East	8,850	80	20	2	1	45	50
12		West	7,485	80	20	2	1	45	50
13	Appian Way / I-80 EB Ramps	North	24,190	80	20	2	1	35	50
14		South	27,440	80	20	2	1	35	50
15		East	8,400	80	20	2	1	45	50
16		West	7,470	80	20	2	1	45	50

Appendix B-3

FHWA Highway Traffic Noise Prediction Model Data Inputs

Pinole Square Redevelopment Phases 1-3

File Name: 2019-120 03 Cumulative

Model Run Date: 11/19/2019



Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	Project Driveway / Tara Hills Drive	North	2,280	80	20	2	1	25	50
2		South	3,495	80	20	2	1	25	50
3		East	13,355	80	20	2	1	30	50
4		West	10,480	80	20	2	1	30	50
5	Appian Way / Tara Hills Drive	North	16,170	80	20	2	1	25	50
6		South	26,765	80	20	2	1	35	50
7		East	2,565	80	20	2	1	25	50
8		West	13,620	80	20	2	1	30	50
9	Appian Way / I-80 WB Ramps	North	27,000	80	20	2	1	35	50
10		South	25,645	80	20	2	1	35	50
11		East	9,505	80	20	2	1	45	50
12		West	8,030	80	20	2	1	45	50
13	Appian Way / I-80 EB Ramps	North	25,945	80	20	2	1	35	50
14		South	29,630	80	20	2	1	35	50
15		East	9,130	80	20	2	1	45	50
16		West	7,965	80	20	2	1	45	50

Appendix B-4

FHWA Highway Traffic Noise Prediction Model Data Inputs

Pinole Square Redevelopment Phases 1-3

File Name: 2019-120 04 Cumulative Plus Project

Model Run Date: 11/19/2019



Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	Project Driveway / Tara Hills Drive	North	2,310	80	20	2	1	25	50
2		South	4,680	80	20	2	1	25	50
3		East	14,330	80	20	2	1	30	50
4		West	10,660	80	20	2	1	30	50
5	Appian Way / Tara Hills Drive	North	16,500	80	20	2	1	25	50
6		South	27,275	80	20	2	1	35	50
7		East	2,690	80	20	2	1	25	50
8		West	14,585	80	20	2	1	30	50
9	Appian Way / I-80 WB Ramps	North	27,525	80	20	2	1	35	50
10		South	25,965	80	20	2	1	35	50
11		East	9,610	80	20	2	1	45	50
12		West	8,130	80	20	2	1	45	50
13	Appian Way / I-80 EB Ramps	North	26,265	80	20	2	1	35	50
14		South	29,810	80	20	2	1	35	50
15		East	9,130	80	20	2	1	45	50
16		West	8,105	80	20	2	1	45	50



Legend

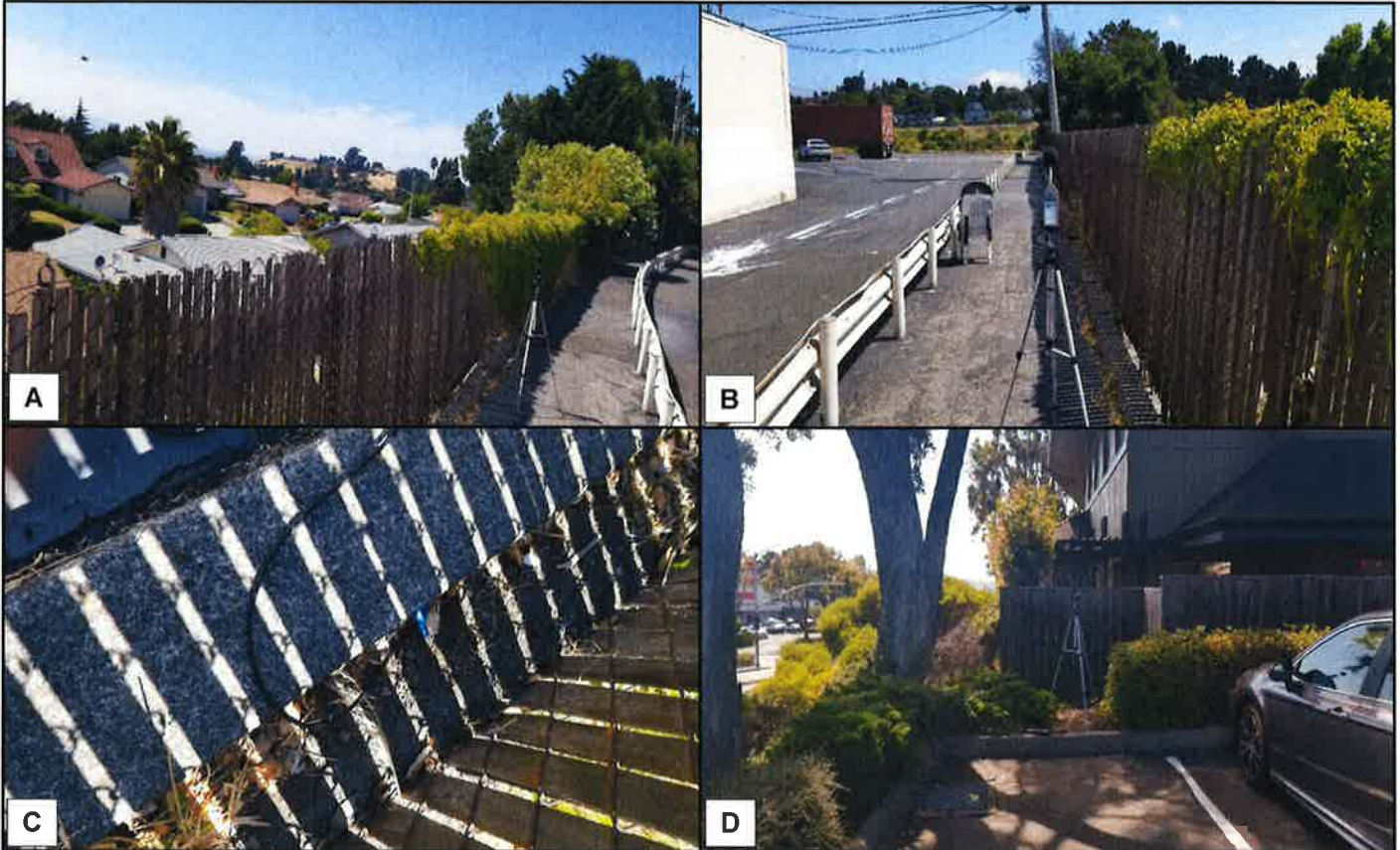
- A: ST-1: Noise survey equipment along west end of project area, looking north towards Tara Hills Drive (37°59'42.01" N, 122°18'20.76" W)
 B: ST-1: Vibration survey equipment along west end of project area, looking north towards Tara Hills Drive (37°59'42.01" N, 122°18'20.76" W)
 C: ST-2: Noise survey equipment along west end of project area, looking north towards Tara Hills Drive (37°59'43.60" N, 122°18'20.70" W)
 D: ST-2: Vibration survey equipment along west end of project area, looking north towards Tara Hills Drive (37°59'43.60" N, 122°18'20.70" W)

Pinole Square Redevelopment Phases 1-3 Pinole, California

Photographs of Noise & Vibration Survey Locations

Appendix C-1





Legend

- A: ST-3: Noise survey equipment along west end of project area, looking northwest towards residences (37°59'39.44" N, 122°18'20.95" W)
 B: ST-3: Noise survey equipment along west end of project area, looking south towards Interstate 80 (37°59'39.44" N, 122°18'20.95" W)
 C: ST-3: Vibration survey equipment along west end of project area (37°59'39.44" N, 122°18'20.95" W)
 D: ST-4: Noise and vibration survey equipment at 1500 Tara Hills Drive facing west (37°59'44.27" N, 122°18'12.91" W)

Pinole Square Redevelopment Phases 1-3 Pinole, California

Photographs of Noise & Vibration Survey Locations

Appendix C-2



Appendix D-1



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18 July 2019

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Subject: **Appian 80 Shopping Center**
Project-Related Noise Assessment
Salter Project: 19-0261

Dear Todd:

As required by the project COA, we have analyzed noise emissions from the proposed shopping center update. An analysis was made with regards to expected noise levels at the property line of the nearest neighbors (to the west). This letter summarizes our assessment.

ACOUSTICAL CRITERIA

City of Pinole Health and Safety Element

The City's Health and Safety Element has noise criteria for "stationary noise sources". The criteria are average noise levels of 55 dBA during the day and 45 dBA at night, and maximum noise levels of 70 dBA during the day and 65 dBA at night. The allowable levels are adjusted up or down depending on whether the ambient noise level is above or below the criteria.

These criteria would apply to HVAC noise and amplification systems, but not truck or construction activity.

MEASURED NOISE LEVELS

We measured the current ambient noise environment at the project site from 3 to 6 May 2019. The lowest (i.e., quietest) hourly L_{eq} ¹ was measured to be 54 dBA (at 2 am on two days). Since this noise level is above the "base" criterion of 45 dBA, the criterion is increased to 54 dBA.

See **Appendix A** for a summary of the hourly noise levels during the measurement period (the quietest hours are noted in **bold text**). See **Figure 1** for the measurement location.

¹ L_{eq} – The equivalent steady-state A-weighted sound level that, in a stated period of time, would contain the same acoustic energy as the time-varying sound level during the same period.

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Sister Corrine
Aidan Nelson
Kenny Cheng
Andraia Rodriguez
Michelle Hoelt

Appendix D-2

Applan 80 Shopping Center
18 July 2019

Project-Related Noise Assessment
Page 2

ANALYSIS

Based on the provided site plan and preliminary HVAC equipment selections (see **Figure 2**), we calculated the expected noise levels at the nearest residential property line. Published data for the amplification system at a typical drive-thru restaurant was not provided. However, we have measured these systems on other projects and have used that data for this analysis.

HVAC Equipment

The closest HVAC equipment to the western property line (a packaged air-conditioner unit) is approximately 100 feet away. The overall sound level when all equipment is operating is calculated to be up to 53 dBA at the property line.

Therefore, the calculated noise level is lower than the criterion (54 dBA) at the western property line and is expected to meet the criterion.

Drive-Thru

The project includes a proposed fast-food restaurant with a drive-thru lane. Based on our measured data, the amplification system from a typical drive-thru window can be up to 74 dBA at 25 feet. The project drive-thru speaker is approximately 450 feet from the western residential property line. Based on this information, we calculated noise levels to be approximately 50 dBA at the western property line, which meets the criterion.

Truck Activity and Construction Noise

We have not received information about typical trucking activity (e.g., number of deliveries per day, hours of deliveries) or a construction plan/schedule (e.g., type of equipment, duration, location). Once we receive this information, we can update our calculations and assessment of the project-related noise.

*

*

*

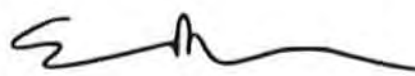
This concludes our assessment of the project-related noise for the Applan 80 project. Should you have any questions or comments, please give us a call.

Sincerely,

CHARLES M. SALTER ASSOCIATES, INC.



Blake M. Wells, LEED® Green Associate
Senior Consultant




Eric Mori, PE
Senior Vice President

Enclosures as noted

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ASSOCIATES, INC.

Appendix D-3

Applan 80 Shopping Center
18 July 2019

Project-Related Noise Assessment
Page 3

APPENDIX A: MEASURED HOURLY AVERAGE NOISE LEVELS

Date	Time	Duration	Leq (dBA)
3-May-19	20:00:00	1:00:00	62
3-May-19	21:00:00	1:00:00	61
3-May-19	22:00:00	1:00:00	61
3-May-19	23:00:00	1:00:00	59
4-May-19	0:00:00	1:00:00	56
4-May-19	1:00:00	1:00:00	56
4-May-19	2:00:00	1:00:00	57
4-May-19	3:00:00	1:00:00	56
4-May-19	4:00:00	1:00:00	57
4-May-19	5:00:00	1:00:00	58
4-May-19	6:00:00	1:00:00	59
4-May-19	7:00:00	1:00:00	60
4-May-19	8:00:00	1:00:00	61
4-May-19	9:00:00	1:00:00	60
4-May-19	10:00:00	1:00:00	60
4-May-19	11:00:00	1:00:00	64
4-May-19	12:00:00	1:00:00	64
4-May-19	13:00:00	1:00:00	60
4-May-19	14:00:00	1:00:00	63
4-May-19	15:00:00	1:00:00	61
4-May-19	16:00:00	1:00:00	62
4-May-19	17:00:00	1:00:00	62
4-May-19	18:00:00	1:00:00	62
4-May-19	19:00:00	1:00:00	61
4-May-19	20:00:00	1:00:00	61
4-May-19	21:00:00	1:00:00	60
4-May-19	22:00:00	1:00:00	58
4-May-19	23:00:00	1:00:00	58

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Appendix D-4

Applan 80 Shopping Center
18 July 2019

Project-Related Noise Assessment
Page 4

5-May-19	0:00:00	1:00:00	57
5-May-19	1:00:00	1:00:00	56
5-May-19	2:00:00	1:00:00	54
5-May-19	3:00:00	1:00:00	55
5-May-19	4:00:00	1:00:00	55
5-May-19	5:00:00	1:00:00	56
5-May-19	6:00:00	1:00:00	60
5-May-19	7:00:00	1:00:00	61
5-May-19	8:00:00	1:00:00	59
5-May-19	9:00:00	1:00:00	60
5-May-19	10:00:00	1:00:00	60
5-May-19	11:00:00	1:00:00	62
5-May-19	12:00:00	1:00:00	62
5-May-19	13:00:00	1:00:00	63
5-May-19	14:00:00	1:00:00	63
5-May-19	15:00:00	1:00:00	64
5-May-19	16:00:00	1:00:00	64
5-May-19	17:00:00	1:00:00	63
5-May-19	18:00:00	1:00:00	63
5-May-19	19:00:00	1:00:00	63
5-May-19	20:00:00	1:00:00	62
5-May-19	21:00:00	1:00:00	61
5-May-19	22:00:00	1:00:00	61
5-May-19	23:00:00	1:00:00	59
6-May-19	0:00:00	1:00:00	57
6-May-19	1:00:00	1:00:00	56
6-May-19	2:00:00	1:00:00	54
6-May-19	3:00:00	1:00:00	56
6-May-19	4:00:00	1:00:00	59
6-May-19	5:00:00	1:00:00	61

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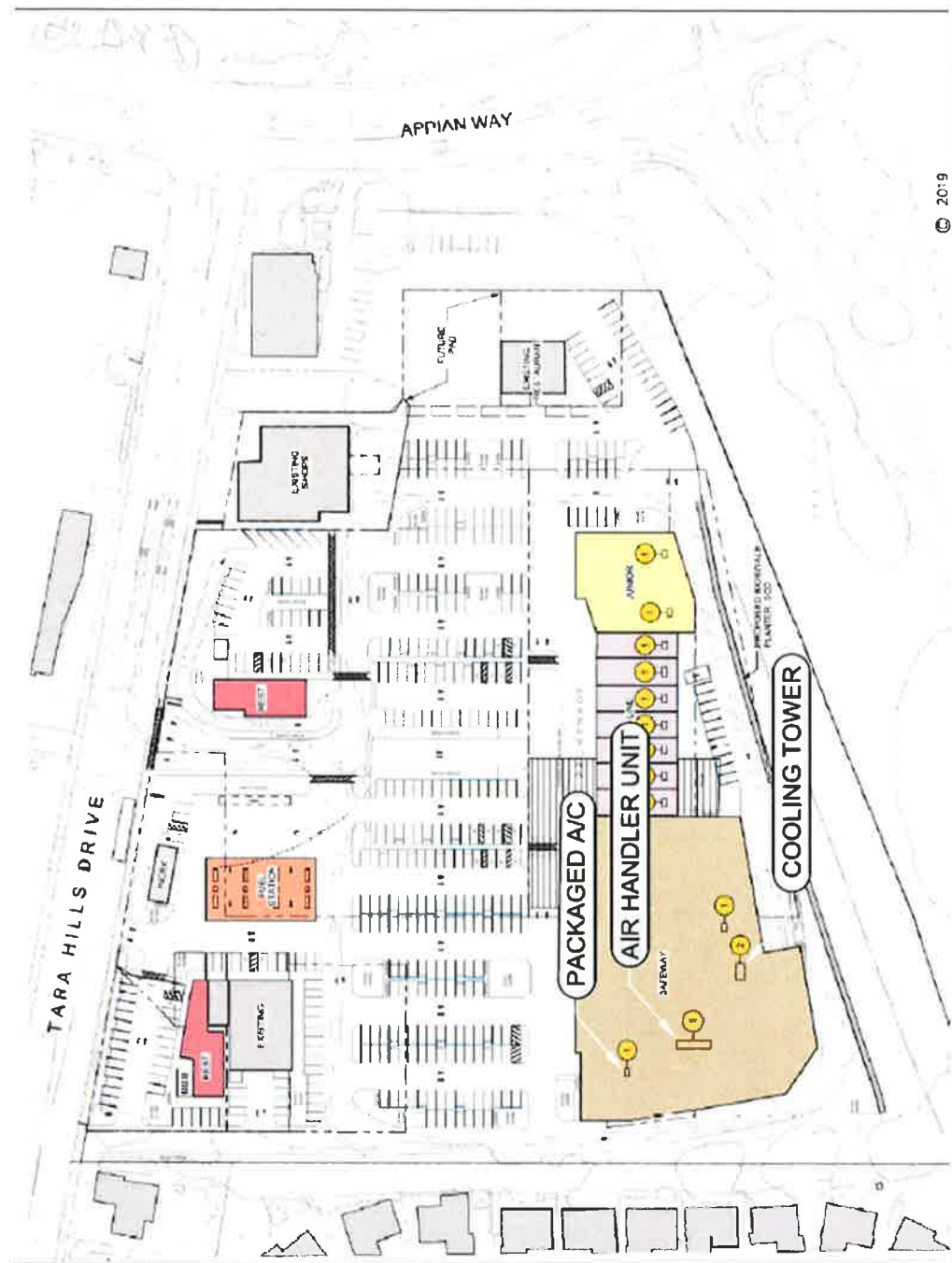


APPLAN 80 SHOPPING CENTER
MEASUREMENT LOCATIONS AND MEASURED
NOISE LEVELS

FIGURE 1

Salter #
19-0261

BMW/EBM
07.19.19



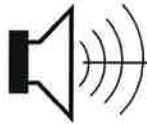
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FIGURE 2

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19-0261

BMW/EBM
07/19/19

APPLAN 80 SHOPPING CENTER SITE PLAN HVAC EQUIPMENT LOCATIONS



BOLLARD ACOUSTICAL CONSULTANTS, INC.

Acoustics ► Vibration ► Noise Control Engineering

February 18, 2020

Angela DaRosa
Raney Planning & Management, Inc.
1501 Sports Drive Suite A
Sacramento, CA 95834

Transmitted via email: adarosa@raneymanagement.com

Subject: Changes in noise levels associated with revised building square footages for the proposed Pinole Square Redevelopment project in Pinole, California.

Dear Angela,

Bollard Acoustical Consultants, Inc. (BAC) previously prepared a noise and vibration assessment for the Pinole Square Redevelopment project in Pinole, California (dated January 13, 2020). On February 12, 2020, it was brought to the attention of BAC that the project had revised square footages for a portion of the proposed buildings. In response to those changes, the project traffic consultant (TJKM Transportation Consultants) identified that, although the changes in square footage would result in a slight increase in new net trips, the increase would not change the conclusions presented in the project traffic impact analysis. In other words, the changes in building square footage and associated trips did not warrant a revision to the project traffic impact analysis. Similarly, noise levels associated with a slight increase in net trips would not be appreciable and would not change the conclusions presented in the noise and vibration assessment previously prepared by BAC. Based on the information above, a revision to the noise and vibration study prepared by BAC dated January 13, 2020 would not be warranted.

Please contact me at (916) 663-0500 or dariog@bacnoise.com if you have any questions or require additional information.

Sincerely,

Dario Gotchet
Consultant

APPENDIX G

TRANSPORTATION IMPACT STUDY

Pinole Square

Transportation Impact Study

City of Pinole, California

February 21, 2020



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Appendix B – Existing Condition LOS

Appendix C – Existing Plus Project Condition LOS

Appendix D – Growth Rate Calculation

Appendix E – Cumulative Condition LOS

Appendix F – Cumulative Plus Project Condition LOS

EXECUTIVE SUMMARY

This report summarizes the results of the Transportation Impact Study (TIS) conducted for a proposed mixed use development at Pinole Square Shopping Center on Tara Hills Drive. The TIS evaluated potential transportation impacts resulting from the proposed project based on City of Pinole, Contra Costa Transportation Agency (CCTA) and Caltrans significance criteria. Traffic operations were evaluated at four study intersections during the weekday morning (a.m.) peak hour and evening (p.m.) peak hour under four study scenarios. The study intersections were evaluated under *No Project* and *plus Project* scenarios for Existing and Cumulative Conditions.

Project Trip Generation

The project consists of updating or replacing many of the stores in an existing 93,193 square feet shopping center. The new shopping center will have 105,149 square feet including a gasoline station and a drive through restaurant. A total of 11,854 square feet remains unaltered as a part of the new development. The proposed project is expected to generate a net increase of approximately 87 weekday a.m. peak hour trips (44 inbound trips, 43 outbound trips), and 150 weekday p.m. peak hour trips (76 inbound trips, 74 outbound trips), with a total of 2,919 additional daily trips.

It is noted that the existing and proposed project square footage was adjusted slightly after the traffic calculations in this report were completed. TJKM has verified that these changes do not change the levels of service or queuing calculations at any of the study intersections and do not change any of the conclusions of this report.

Existing Conditions

Under this scenario, all of the study intersections are operating within acceptable jurisdictional standards of level of service (LOS) D/C or better during the a.m. and p.m. peak hours.

Existing plus Project Conditions

Project-generated traffic was added to existing conditions volumes at the study intersections, under this scenario. With the addition of project traffic, all of the study intersections are operating within acceptable jurisdictional standards of level of service (LOS) D/C or better during the a.m. and p.m. peak hours.

Cumulative Conditions

Under this scenario, all of the study intersections are operating within acceptable jurisdictional standards of level of service (LOS) D/C or better during the a.m. and p.m. peak hours.

Cumulative plus Project Conditions

Project-generated traffic was added to cumulative conditions volumes at the study intersections, under this scenario. With the addition of project traffic, all of the study intersections are operating within acceptable jurisdictional standards of level of service (LOS) D/C or better during the a.m. and p.m. peak hours.

Pedestrian, Bicycle, and Transit Impacts

The proposed project does not conflict with any existing or planned pedestrian bicycle, or transit facilities in the vicinity of the project area.

Site Access and On-Site Circulation

Access to the site is provided via three locations on Tara Hills Drive, one through a signalized intersection, and the other two through right-in and right-out driveways. The site circulation works well for truck traffic with direct access to the back of Safeway and other stores on the site. Ample queue length is provided for vehicular traffic anticipated at the drive-through restaurant. The circulation around the gasoline station ensures no hindrance to the traffic approaching or exiting other stores and restaurants on the site in the event of a traffic back-up for fueling.

Queueing Analysis at Study Intersections

As per queueing analysis, sufficient storage length was observed for all study intersections.

Vehicle Miles Traveled (VMT)

Most of the trips for this project will be made by customers and shoppers. The project grows in daily and peak hour traffic but a commensurate reduction in traffic in similar locations such as other shopping centers in the region can be assumed. For these reasons State of California VMT guidelines indicate that locally serving neighborhood shopping centers produce impacts that are presumed to be not significant.

1.0 INTRODUCTION

This report summarizes the results of the Transportation Impact Study (TIS) for the proposed upgrade of a commercial and retail development at Pinole Square Shopping Center located on Tara Hills Drive in the City of Pinole.

1.1 STUDY PURPOSE

The purpose of the TIS is to evaluate the impacts on the transportation infrastructure due to the addition of the traffic from the proposed upgrade of the commercial and retail development, Pinole Shopping Center, located on Tara Hills Drive in the City of Pinole. The existing development totals an area of 93,193 square feet. Of the 93,193 square feet, two buildings comprising a total of 11,854 square feet (Shops 15E and Shop 16E) remain unaltered as a part of the new development. The proposed development upgrades the remaining 81,339 square feet of project area. The upgrade adds an additional 11,956 square feet of commercial/retail space post expansion resulting in a proposed total project area of 105,149 square feet.

The proposed development consists of 9,336 square feet of restaurant area (Shop 1, Drive-Through restaurant, and Shop 16E), 55,044 square feet of grocery store (Safeway), a gas station with 16 fueling positions, and 40,769 square feet of retail area (Shops 2E, 3E, and 15E, Junior Anchor, Shops 4-10, and Kiosk).

It should be noted that the existing project size and proposed project size were adjusted slightly (a decrease in 1,521 square feet for existing area, and an increase of 178 square feet for proposed area) after the traffic calculations in this report were completed. TJKM has verified that these changes do not change the levels of service or queuing calculations at any of the study intersections and do not change any of the conclusions of this report.

1.2 STUDY INTERSECTIONS

TJKM evaluated traffic conditions at four study intersections during the a.m. and p.m. peak hours for a typical weekday. The peak periods observed were between 7:00-10:00 a.m. and 4:00-7:00 p.m. The highest single one hour recorded for each peak period was used in the analysis. The study intersections and associated traffic controls are as follows:

1. Tara Hills Drive at project entrance (Signalized)
2. Appian Way and Tara Hills Drive (Signalized)
3. Appian Way and I-80 WB Ramps (Signalized)
4. Appian Way and I-80 EB (Signalized)

Figure 1 illustrates the study intersections and the vicinity map of the proposed project. **Figure 2** shows the proposed project site plan.

1.4 ANALYSIS SCENARIOS

This study assess potential impacts based on the following four scenarios:

- **Existing Conditions** – This scenario describes existing transportation conditions relevant to the study area, including characteristics of key roadways and transit service, and existing conditions for walking and bicycling.
- **Existing plus Project Conditions** – This scenario describes the anticipated effects of the proposed project on Existing Conditions, including the addition of traffic from the proposed project to study intersections.
- **Cumulative No Project Conditions** – This scenario describes anticipated transportation conditions in 2040 using a growth rate based on the volumes obtained from the CCTA 2040 travel demand model.
- **Cumulative Plus Project Conditions** – This scenario describes anticipated transportation conditions in 2040 that includes the proposed project. Cumulative impacts resulting from the project are assessed based on the net change from Cumulative No Project Conditions.

Figure 1: Vicinity Map



LEGEND

- Project Site
- Study Intersection



The site plan illustrates a proposed retail center layout. Key features include:

- Anchor Store:** A large orange-colored building labeled "SAFeway" and "ANCHOR" located along Highway 80.
- Shops:** A row of ten smaller red-colored buildings labeled "SHOP 4" through "SHOP 13" situated between the anchor store and Highway 80.
- Other Structures:** A blue-colored "FUEL STATION" and three red-colored "DRIVE THRU" buildings are located in the upper portion of the site.
- Parking:** Numerous yellow circles representing parking spaces are distributed throughout the site, particularly in the central and lower portions.
- Boundaries and Access:** The site is bounded by "TARA HILLS DRIVE" to the north and "HIGHWAY 80" to the east. A "REAR YARD" is indicated to the south of the main building complex.
- Existing Structures:** Several existing buildings are shown in grey, including "SHOP 1", "SHOP 2", "SHOP 3", "SHOP 11", and "SHOP 12".
- Orientation and Scale:** A north arrow is located in the bottom right corner, and the TJKM logo is positioned below it. The plan includes various dimension lines and labels for different areas like "FRONT YARD", "SIDE YARD", and "REAR YARD".

2.0 STUDY METHODOLOGY

This chapter discusses the level of service analysis methodology for study intersections and criteria used to identify significant impacts.

2.1 LEVEL OF SERVICE ANALYSIS METHODOLOGY

LOS is a qualitative measure that describes operational conditions as they relate to the traffic stream and perceptions by motorists and passengers. The LOS generally describes these conditions in terms of such factors as speed and travel time, delays, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. The operational LOS are given letter designations from A to F, with A representing the best operating conditions (free-flow) and F the worst (severely-congested flow with high delays). Intersections generally are the capacity-controlling locations with respect to traffic operations on arterial and collector streets. **Table 1** summarizes the relationship between the control delay and LOS for signalized intersections.

Table 1: Level of Service Definitions for Signalized Intersections

Level of Service	Description
A	Very low control delay, up to 10 seconds per vehicle. Progression is extremely favorable, and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.
B	Control delay greater than 10 and up to 20 seconds per vehicle. There is good progression or short cycle lengths or both. More vehicles stop causing higher levels of delay.
C	Control delay greater than 20 and up to 35 seconds per vehicle. Higher delays are caused by fair progression or longer cycle lengths or both. Individual cycle failures may begin to appear. Cycle failure occurs when a given green phase does not serve queued vehicles, and overflow occurs. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.
D	Control delay greater than 35 and up to 55 seconds per vehicle. The influence of congestions becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volumes. Many vehicles stop, the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Control delay greater than 55 and up to 80 seconds per vehicle. The limit of acceptable delay. High delays usually indicate poor progression, long cycle lengths, and high volumes. Individual cycle failures are frequent.

- F Control delay in excess of 80 seconds per vehicle. Unacceptable to most drivers. Oversaturation, arrival flow rates exceed the capacity of the intersection. Many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to higher delay.

Source: Highway Capacity Manual

2.2 SIGNIFICANT IMPACT CRITERIA

City of Pinole Traffic Impact Criteria

City of Pinole LOS standard specify that the minimum acceptable operation for signalized intersections is LOS D or better. The Pinole General Plan mentions increase in daily volumes on San Pablo Avenue, Appian Way and Pinole Valley Road would slowly begin to exceed the capacity of roadway due to growth in adjacent areas.

Caltrans Traffic Impact Criteria

Per Caltrans guidelines, Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" on State highway facilities, however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than the appropriate target LOS, the existing Measure of Effectiveness should be maintained.

For the purposes of this report, LOS thresholds were considered to be LOS D for those within both the City and Caltrans jurisdiction.

Pedestrian & Bicycle Impact Criteria

Significant impacts to pedestrian and bicycle circulation would be considered potentially significant if the project would:

- Creates a hazardous condition that currently does not exist for pedestrians or bicyclists; or otherwise interferes with pedestrian accessibility to the project and adjoining areas; or
- Conflicts with an existing or planned pedestrian or bicycle facility; or
- Conflicts with policies related to bicycle and pedestrian activity adopted by the City of Pinole.

Transit Impact Criteria

Project impacts to transit would be considered potentially significant if:

- The project conflicts with existing or planned transit services; or
- The project creates demand for public transit services above the capacity that is provided or planned; or
- The project conflicts with transit policies adopted by the City of Pinole or CCTA.

3.0 EXISTING CONDITIONS

This section describes existing conditions in the immediate project site vicinity, including roadway facilities, bicycle and pedestrian facilities, and available transit service. In addition, existing traffic volumes and operations are presented for the study intersections, including the results of LOS calculations.

3.1 EXISTING SETTING AND ROADWAY SYSTEM

Regional roadway access to the proposed mixed use development is provided via I-80. Access to the project site is provided via Tara Hills Drive, a four-lane arterial street that connects to regionally significant arterials of Appian Way on the east and San Pablo Avenue on the west. Descriptions of the existing roadways are as follows:

Tara Hills Drive is four lane east-west roadway parallel to I-80 that extends between Appian Way and San Pablo Avenue. No bicycle lanes are provided in the immediate vicinity of the project site. The sidewalk network on Tara Hills Drive provides good connection to the project site from nearby areas. Tara Hills Drive is a designated arterial in the City of Pinole with roughly 1,182 a.m. and 1,000 p.m. peak hour vehicle trips near the project site. Tara Hills Drive borders the project site to the north and connects the project site with several local streets such as Kilkenny Way, Shawn Drive, Canyon Drive, etc. apart from Appian Way and San Pablo Avenue. The speed limit on the road is 30 miles per hour.

Appian Way is four lane north-south roadway perpendicular to I-80 that extends between San Pablo Avenue to the north and San Pablo Dam Road in El Sobrante to the south beyond the southern border of Pinole City. The bicycle network on Appian Way begins from the intersection of Appian Way and Mann Drive and extends north but does not provide connections to the project site. The sidewalk network on Appian Way connects to Tara Hills Drive and provides good connection to the project site. Appian Way is designated as an arterial of regional significance in the City of Pinole. Appian Way lies to the east of the project site with a speed limit of 35 miles per hour. A speed limit of 25 miles per hour is also posted for a school zone on this roadway.

Canyon Drive is a two lane east-west local street which connects to several residences on the east of the project side. The sidewalk network on Canyon Drive connects to Tara Hills Drive and provides good connection to the project site. There are no bike lanes on this street. The speed limit on Canyon Drive is 25 miles per hour.

I-80 is an east-west, eight-lane freeway with four mixed-flow lanes in each direction in the vicinity of the project. I-80 is located to the south of the project site and provides regional freeway access between San Francisco on the west and Sacramento and beyond on the east. Nearby, it connects with SR-4 to the north. Access from I-80 to the project site is provided via eastbound and westbound on and off ramps at Appian Way.

3.2 EXISTING PEDESTRIAN FACILITIES

Walkability is defined as the ability to travel easily and safely between various origins and destinations without having to rely on automobiles or other motorized travel. The ideal “walkable” community includes wide sidewalks, a mix of land uses such as residential, employment, and shopping opportunities, a limited number of conflict points with vehicle traffic, and easy access to transit facilities and services. Pedestrian facilities are comprised of crosswalks, sidewalks, pedestrian signals, and off-street paths, which provide safe and convenient routes for pedestrians to access destinations such as institutions, businesses, public transportation, and recreation facilities.

The existing sidewalk network provides good connection to the project site from all nearby areas. All study intersections are signalized and are well equipped with marked crosswalks, push buttons, and pedestrian countdown heads. Existing pedestrian facilities in the study area are shown in **Figure 3**. Existing peak-hour pedestrian volumes at each study intersection are provided in **Appendix A**.

3.3 EXISTING BICYCLE FACILITIES

The 2018 draft Bicycle and Pedestrian Plan Update by Contra Costa Transportation Authority describes the following classes of bicycle infrastructure described below-

- **Shared-Use Path (Class I Bikeway):** Bike paths provide a completely separate right-of-way that is designated for the exclusive use of people riding bicycles and walking with minimal cross-flow traffic. Such paths are often located along creeks, canals, and rail lines. Class I Bikeways can also offer opportunities not provided by the road system by serving as both recreational areas and desirable commuter routes. This City of Pinole currently has approximately 1.8 miles of existing Class I bikeways with additional Class I bikeways proposed in the future as per the City of Pinole General Plan.
- **Bike Lane (Class II Bikeway):** Using special lane markings, pavement legends, and signage, bike lanes provide designated street space for bicyclists, typically adjacent to the outer vehicle travel lanes. This City of Pinole currently has approximately one mile of existing Class II bike lanes with additional Class II bike lanes proposed in the future as per the City of Pinole General Plan.
- **Buffered Bicycle Lane (Class II Bikeway):** Buffered bike lanes increase separation through painted buffers between vehicle lanes and/or parking, and green paint at conflict zones (such as driveways or intersections). This increased separation is most often added along medium volume collectors or arterials. Buffered bike lanes are often used where full vertical separation is not feasible, for example, where on-street parking or frequent driveways would block the visibility of cyclists to motorists. There are currently no existing buffered Class II bikeways in the City of Pinole.
- **Bike Route (Class III Bikeway):** Bike routes provide enhanced mixed-traffic conditions for bicyclists through signage, sharrows, and/or traffic calming treatments, and provide continuity to a bikeway network. Bike routes are typically designated along gaps between bike

trails or bike lanes, or along low-volume, low-speed streets. There are currently no existing Class III bike routes in the City of Pinole.

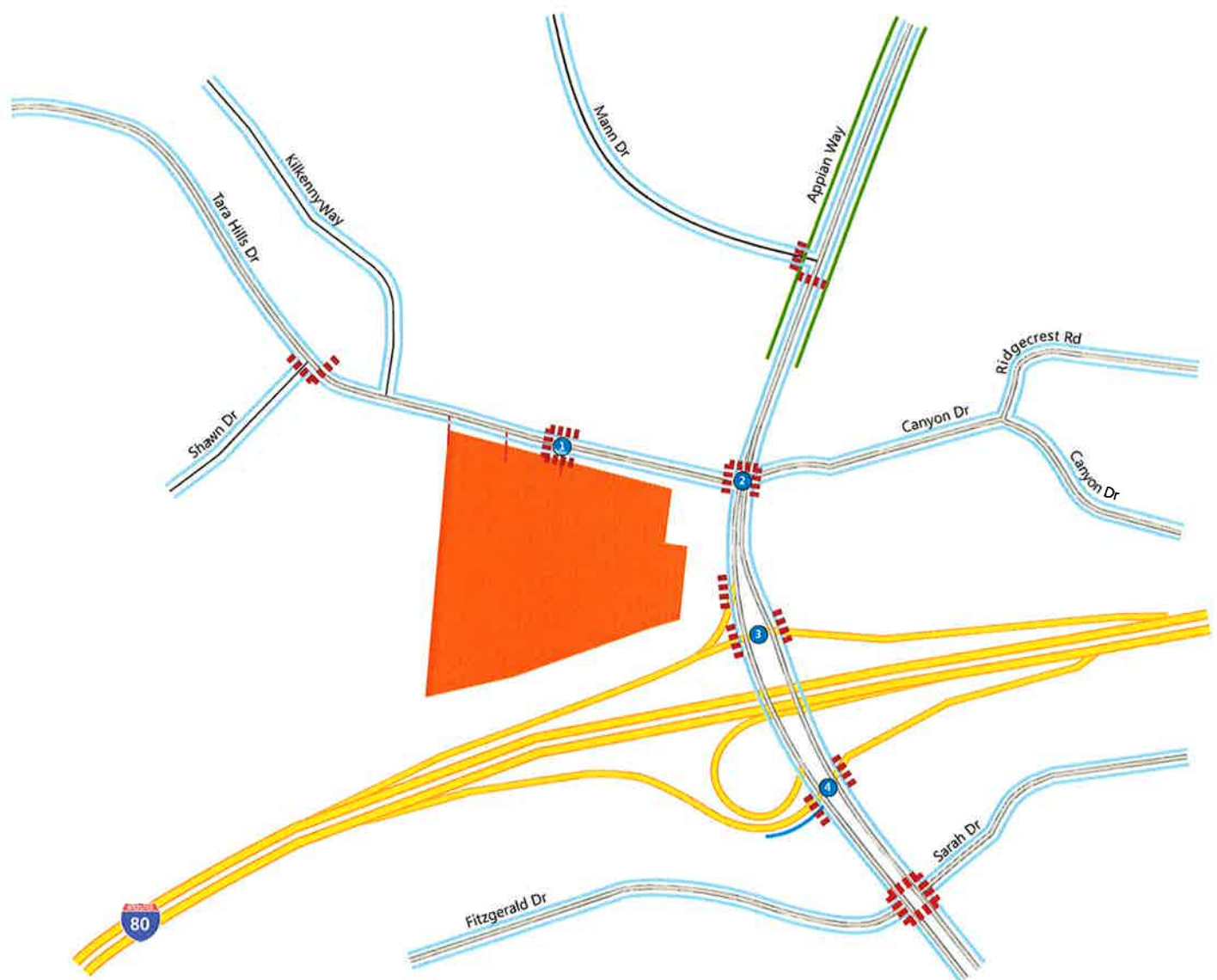
- **Bicycle Boulevards (Class III Bikeway):** These bike routes are further enhanced by encouraging slower speeds and discouraging non-local vehicle traffic using traffic diverters, chicanes, traffic circles, and speed tables. They are always located on low auto volume and low speed residential streets. Bicycle boulevards can also feature special wayfinding signage to nearby destinations or other bikeways. They are an important element of the low-stress CBN and often provide important safe routes to school connections for children. There are currently no existing Class III bicycle boulevards in the City of Pinole.
- **Protected Bikeway (Class IV Bikeway):** Also referred to as cycle tracks or separated bikeways, and are set aside for the exclusive use of bicycles and physically separated from vehicle traffic. Separated Bikeways were recently adopted by Caltrans in 2015. Types of separation may include, but are not limited to, grade separation, flexible posts, physical barriers, or on-street parking. The City of Pinole currently has no existing Class IV bikeways.

There is no existing bicycle infrastructure in the immediate vicinity of the project site. The only bicycle infrastructure in the vicinity of the project site is a Class II bike lane which begins 200 feet south of Appian Way and Mann Drive and continues north without providing any connection to the project site. This bike lane lies about 0.25 miles away from the project entrance. The existing bicycle facilities in the study area are shown in **Figure 3**. Existing peak-hour traffic bicycle volumes at each study intersection are provided in **Appendix A**.

3.4 EXISTING TRANSIT FACILITIES

Bus service in the City of Pinole is provided by WestCAT, which operates local fixed routes, Express and transbay routes, and Paratransit within its service area. Five local fixed routes, 16, 17, 18, 19, and C3-Connection serve the Pinole residential and commercial areas. The closest bus stop to the project entrance is about 0.2 miles away on Appian Way, serving bus route 17. At the present, there exists inactive WestCAT bus stops on Tara Hills drive at the project area which the agency will consider activating in the future based on ridership turnout. The existing transit facilities in the study area are shown in **Figure 4**.

Figure 3: Existing Pedestrian and Bicycle Facilities



LEGEND






-  Project Site
-  Study Intersection
-  Existing Sidewalks
-  Crosswalks
-  Existing Class II Bike Lane



Figure 4: Existing Transit Facilities



3.5 EXISTING PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS

The existing operations of the study intersections were evaluated for the highest one-hour volumes during weekday morning and evening peak periods. Recent turning movement counts for vehicles, bicycles, and pedestrians were conducted during the weekday a.m. peak period (7:00-9:00 a.m.) and p.m. peak period (4:00-6:00 p.m.) at the study intersections on typical weekdays in June of 2019 when school was in session.

Figure 5 illustrates the existing lane geometry and traffic controls at each of the study intersections.

Figure 6 illustrates the existing a.m. and p.m. peak hour vehicle turning movement volumes at the study intersections. **Appendix A** includes all data sheets and count dates for the collected vehicle, bicycle, and pedestrian counts.

3.6 INTERSECTION LEVEL OF SERVICE ANALYSIS – EXISTING CONDITIONS

The existing operations of the study intersections were evaluated for the highest one-hour volume during the weekday morning and evening peak periods. The a.m. and p.m. peak hour turning movement counts were conducted on typical weekdays in June of 2019. The a.m. and p.m. peak periods observed were between 7:00-9:00 a.m. and 4:00-6:00 p.m. Turning movement count sheets are in **Appendix A**.

Existing intersection lane configurations and peak-hour turning movement volumes were used to calculate the level of service (LOS) at the study intersections during peak hours. **Figure 5** illustrates the existing lane geometry, traffic controls, and turning movement volumes at the study intersections. Existing Conditions intersection LOS worksheets are provided in **Appendix B**. The results of the LOS analysis for Existing Conditions are summarized in **Table 2**.

City Intersections

- The intersection of Tara Hills Drive at project entrance operates acceptably at LOS B in both the a.m. and p.m. peak hours.
- The intersection of Appian Way and Tara Hills Drive operates at LOS D in the a.m. peak hour and LOS C in the p.m. peak hour.

Caltrans Intersections

- The intersection of Appian Way and I-80 WB Ramps operates acceptably at LOS D in the a.m. peak hour and LOS C in the p.m. peak hour.
- The intersection of Appian Way and I-80 EB Ramps operates acceptably at LOS A in both the a.m. and p.m. peak hour.

Table 2: Intersection Level of Service Analysis – Existing Conditions

ID #	Intersection	Control	Peak Hour	Existing Conditions		
				LOS ¹	Average Delay ²	V/C Ratio ³
1	Tara Hills Drive at project entrance	Signal	A.M.	B	12.1	0.44
			P.M.	B	15.5	0.42
2	Appian Way and Tara Hills Drive	Signal	A.M.	D	37.5	0.61
			P.M.	C	34.4	0.57
3	Appian Way and I-80 WB Ramps	Signal	A.M.	D	36.6	0.87
			P.M.	C	31.4	0.74
4	Appian Way and I-80 EB Ramps	Signal	A.M.	A	8.6	0.54
			P.M.	A	7.8	0.63

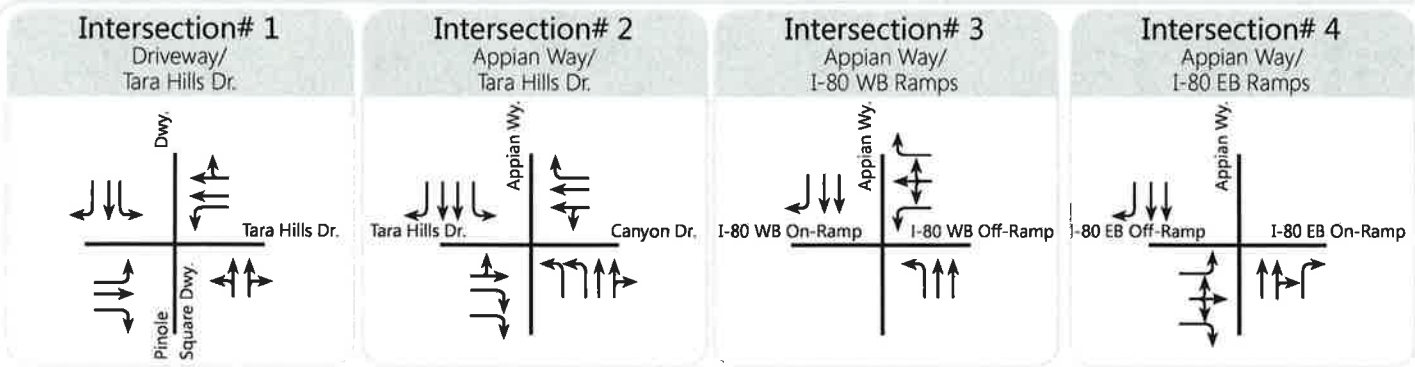
Notes:

1. LOS – Level of Service

2. Delay – Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections

3. V/C ratio- Volume to Capacity ratio

Figure 5: Existing Lane Geometry



LEGEND



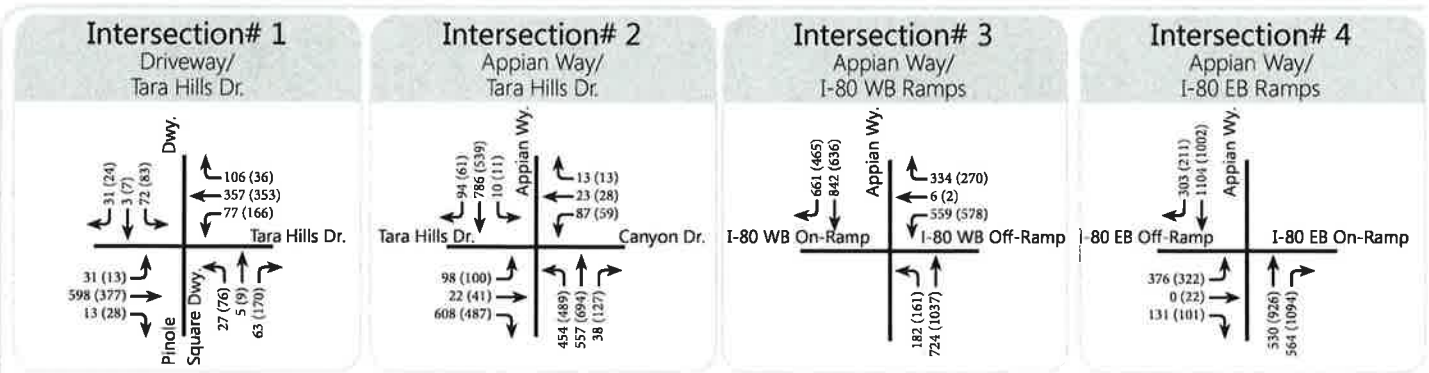
-  Project Site
-  Study Intersection



Figure 6: Existing Conditions Volumes



LEGEND

- Project Site
- ⊗ Study Intersection
- XX AM Peak Hour Project Trips
- (XX) PM Peak Hour Project Trips



4.0 PROJECT CONDITIONS

The impacts of the proposed project on the multi-modal transportation system are discussed in this chapter. Motor vehicle traffic impacts are assessed based on the volume of motor vehicle traffic generated by the project. A comparison of intersection LOS with and without the project is conducted to assess potential impacts.

The volume of peak-hour motor vehicle traffic added to the roadway system and study intersections is forecasted using a three-step process.

- Trip Generation – Forecasts the amount of traffic added to the roadway network,
- Trip Distribution – Predicts the direction of travel to and from the project site
- Trip Assignment – The new vehicle trips are assigned to specific street segments and intersection turning movements

4.1 PROJECT VEHICLE TRIP GENERATION

TJKM developed estimated project trip generation for the proposed project based on published trip generation rates from the *Institute of Transportation Engineers' (ITE) publication Trip Generation (10th Edition)*. TJKM used published trip rates for the ITE land use Shopping Center (ITE Code 820). Published trip rates from land use of Gasoline/Service Station (ITE Code 944) were utilized to obtain project trips for the proposed Safeway gasoline station, and the trip rate from land use of Fast-Food Restaurant with Drive-Through Window (ITE Code 934) were utilized to obtain project trips for drive-through restaurant.

It should be noted that trip generation calculations do not include Shops 15E and Shop 16E which remain unaltered as a part of the proposed project. Existing traffic volumes from these buildings do use the main driveway and are included in both the existing and future scenarios based on existing field counts. These two buildings total 11,854 square feet.

Table 3 shows the trip generation was based on the difference between the number of vehicle trips generated by the proposed building areas and the existing building areas. The proposed project is expected to generate a net increase of approximately 87 weekday a.m. peak hour trips (44 inbound trips, 43 outbound trips), and 150 weekday p.m. peak hour trips (76 inbound trips, 74 outbound trips), with a total of 2,919 additional daily trips.

Also, the existing project size and proposed project size were adjusted slightly (a decrease in 1,521 square feet for existing area, and an increase of 178 square feet for proposed area) after the traffic calculations in this report were completed. TJKM has verified that these changes do not change the levels of service or queuing calculations at any of the study intersections and do not change any of the conclusions of this report.

Table 3: Project Vehicle Trip Generation Forecast

Land Use	ITE Code	Size	Daily		AM Peak Hour						PM Peak Hour					
			Rate	Trips	Rate	In %	Out %	In	Out	Total	Rate	In %	Out %	In	Out	Total
EXISTING BUILDING AREAS																
Shopping Center ¹ (Excludes parcel 15e + 16e)	820	82,860	63.85	5,290	2.33	62	38	120	73	193	5.71	48	52	227	246	473
Pass-By Trip Reduction (PM Peak Hour-34%) ²														-77	-84	-161
Total Vehicle Trips				5,290				120	73	193				150	162	312
Total Vehicle Trips				5,290				120	73	193				150	162	312
PROPOSED BUILDING AREAS																
Shopping Center ¹ (See note 9)	820	89,190 sq. ft.	62.36	5,562	2.20	62	38	122.0	74.4	196.4	5.6	48.0	52.0	240	259	499
Pass-By Trip Reduction (PM Peak Hour-34%) ²														-81	-89	-170
Total Trips for Shopping Center				5,562				122.0	74.4	196.4				159	170	329
Gasoline/Service Station ³	944	16 Fueling Positions	172.01	2,752	10.28	50	50	82	82	164	14.03	50	50	112	112	224
Internal Trip Reduction (AM Peak Hour-50%, PM Peak Hour-50%) ⁴				-1,376				-41	-41	-82				-56	-56	-112
Pass-by Trip Reduction (AM Peak Hour-58%, PM Peak Hour-42%) ⁵								-24	-24	-48				-24	-23	-47
Total Trips for Gasoline Station				1,376				17	17	34				32	33	65
Drive Through Restaurant ⁶	934	3,005 sq. ft.	470.95	1,413	40.2	51.0	49.0	62	59	121	33	52	48	51	47	98
Internal Trip Reduction (AM Peak Hour-10%, PM Peak Hour-10%) ⁷				-141.3				-6	-6	-12				-5	-5	-10
Pass-by Trip Reduction (AM Peak Hour-49%, PM Peak Hour-21%) ⁸								-31	-29	-59				-11	-9	-20
Total Trips for Drive Through Restaurant				1,272				25	24	50				35	33	68
Total Vehicle Trips				8,210				164	116	280				226	237	462
TRIP DIFFERENCE																
Total Vehicle Trips From Proposed Building Areas				8,210				164	116	280				226	237	462
Total Vehicle Trips From Existing Building Areas				5,290				120	73	193				150	162	312
Net New Vehicle Trips (Proposed-Existing)				2,919				44	43	87				76	74	150

Source - Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition, 2017.

¹ Shopping Center (ITE Land Use Code 820) fitted curve equations are based upon number of thousand square feet gross leasable area. Fitted curve equation for Daily: $\ln(T) = 0.68 \ln(X) + 5.57$; AM Peak: $T = 0.50(X) + 151.78$; PM Peak: $\ln(T) = 0.74 \ln(X) + 2.89$. Where T = Average Vehicle Trip Ends; X = Land Use Size in ksf (One Thousand Square Feet).

² ITE Pass-By reduction rate of 34% in the PM peak hour for Retail Land Use.

³ Gasoline/Service Station (ITE Land Use Code 944) vehicle trip rates are based upon number of fueling positions.

⁴ Internal trip reduction of 50% applied to reflect internal trips between the Safeway Grocery Store and Safeway Gasoline Pump.

⁵ ITE Pass-By reduction rate of 58% in the AM peak hour and 42% in the PM peak hour was applied to internal trips for From Safeway Grocery Store to Safeway Gasoline Pump.

⁶ Drive Through Restaurant or Fast-Food Restaurant with Drive-Through Window (ITE Land Use Code 934) vehicle trip rates are based upon number of thousand square feet gross leasable area.

⁷ Internal trip reduction of 10% applied to reflect internal trips between Shopping Center and Drive Through Restaurant.

⁸ ITE Pass-By reduction rate of 49% in the AM peak hour and 21% in the PM peak hour for Drive Through Restaurant.

⁹ Site Plan shows total of 105,149 square feet. Excluding sites 15e+16e (11,854 square feet), service station kiosk (1,100 square feet), and Drive-Through (3,005 square feet) yields 89,190 square feet.

¹⁰ It should be noted that the existing project area was reduced by 1,521 square feet (resulting in 81,339 square feet of analysis area), and the proposed project area increased by 178 square feet (resulting in 89,368 square feet of analysis area) post completion of traffic analysis of this report. However, these changes do not change the conclusions of the Traffic Impact Analysis.

4.2 PROJECT VEHICLE TRIP DISTRIBUTION AND ASSIGNMENT

Trip distribution is a process that determines in what proportion vehicles would be expected to travel between the project site and various origins and destinations outside the project study area and also determines the various routes that vehicles would take from the project site to each destination using the calculated trip distribution. Trip distribution assumptions for the proposed project were developed based on existing travel patterns, and knowledge of the study area.

Figure 7 illustrates the predicted distribution of project vehicle trips and **Figure 8** illustrates the anticipated trip assignment at each study intersection, based on existing travel patterns in the area. The assigned project trips were then added to traffic volumes under Existing Conditions to generate Existing plus Project Conditions traffic volumes.

4.3 TRAFFIC IMPACT FINDINGS – EXISTING PLUS PROJECT CONDITIONS

The analysis of Existing plus Project LOS at study intersections is based on the addition of project vehicle trips to existing traffic volumes. The anticipated volume of motor vehicle traffic under Existing plus Project Conditions during the a.m. and p.m. peak hours at each study intersection is illustrated on **Figure 9**. The intersection LOS analysis results for Existing plus Project Conditions are summarized in **Table 4**. Detailed calculation sheets for Existing plus Project Conditions are contained in **Appendix C**.

City Intersections

- The intersection of Tara Hills Drive at the project entrance operates acceptably at LOS B during both the a.m. and p.m. peak hours. Traffic impacts resulting from the project would be considered **less than significant**.
- The intersection of Appian Way and Tara Hills Drive operates at LOS D in both the a.m. and p.m. peak hour. Traffic impacts resulting from the project would be considered **less than significant**.

Caltrans Intersections

- The intersection of Appian Way and I-80 WB Ramps operates acceptably at LOS D in the a.m. peak hour and LOS C in the p.m. peak hour. Traffic impacts resulting from the project would be considered **less than significant**.
- The intersection of Appian Way and I-80 EB Ramps operates acceptably at LOS A in both the a.m. and p.m. peak hour. Traffic impacts resulting from the project would be considered **less than significant**.

Table 4: Intersection Level of Service Analysis – Existing plus Project Conditions

	Intersection	Control	Peak Hour	Existing Conditions			Existing Plus Project Conditions		
				LOS ¹	Average Delay ²	V/C Ratio ³	LOS ¹	Average Delay ²	V/C Ratio ³
1	Tara Hills Drive at project entrance	Signal	A.M.	B	12.1	0.44	B	14.0	0.47
			P.M.	B	15.5	0.42	B	18.2	0.49
2	Appian Way and Tara Hills Drive	Signal	A.M.	D	37.5	0.61	D	38.4	0.63
			P.M.	C	34.4	0.57	D	35.8	0.60
3	Appian Way and I-80 WB Ramps	Signal	A.M.	D	36.6	0.87	D	37.4	0.88
			P.M.	C	31.4	0.74	C	31.8	0.75
4	Appian Way and I-80 EB Ramps	Signal	A.M.	A	8.6	0.54	A	8.7	0.54
			P.M.	A	7.8	0.63	A	8.0	0.63

Notes:

1. LOS – Level of Service

2. Delay – Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections

3. V/C ratio- Volume to Capacity ratio

Figure 7: Trip Distribution



LEGEND




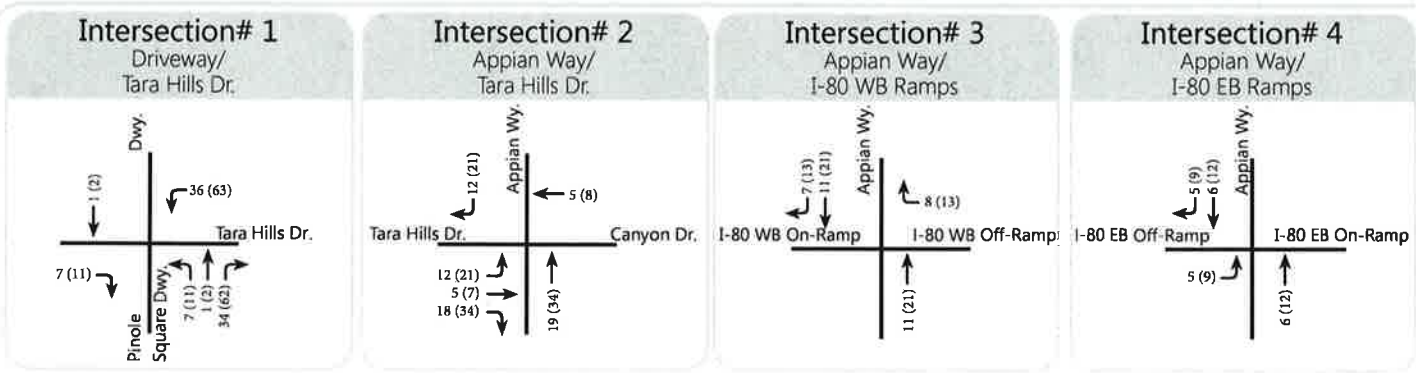
-  Project Site
-  Study Intersection
-  Proposed Trip Distribution



Figure 8: Trip Assignment

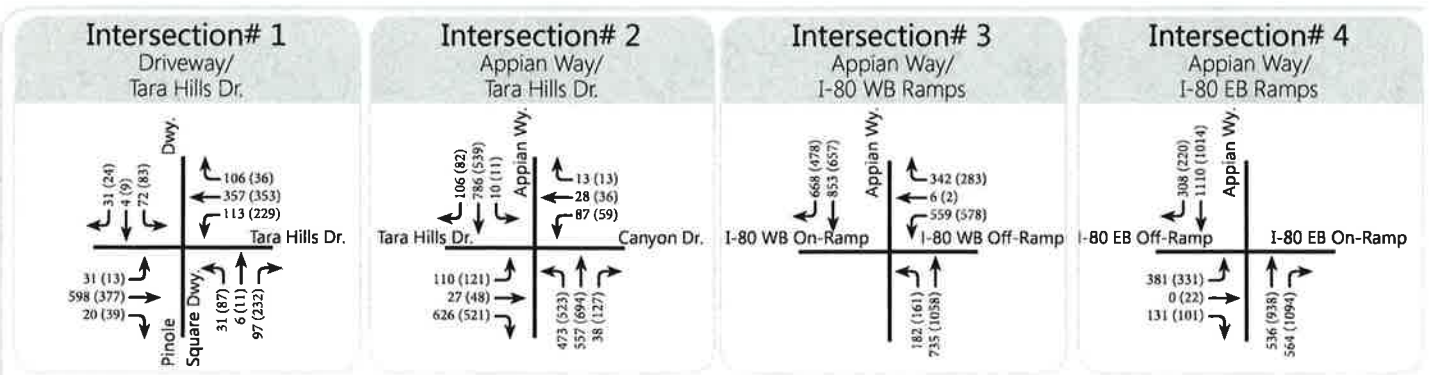


LEGEND

- Project Site
- Study Intersection
- XX AM Peak Hour Project Trips
- (XX) PM Peak Hour Project Trips



Figure 9: Existing Plus Project Condition Volumes



LEGEND

- Project Site
- ⊗ Study Intersection
- XX AM Peak Hour Project Trips
- (XX) PM Peak Hour Project Trips



4.4 PEDESTRIAN, BICYCLE, AND TRANSIT IMPACT FINDINGS

Pedestrian Impacts

There is a good sidewalk network which connects nearby locations to the project area. An impact to pedestrians occurs if the proposed project disrupts existing pedestrian facilities; or creates inconsistencies with planned facilities or adopted system plans, guidelines, policies, or standards. The proposed project would not conflict with an existing or planned pedestrian facility; nor would the project conflict with policies related to pedestrian travel adopted by the City of Pinole. The impact to pedestrian facilities is considered ***less than significant***.

Although there are no existing deficiencies in pedestrian connectivity and no significant impacts due to the proposed project, TJKM notes that the existing sidewalk fronting the Pinole Square is about six feet wide, which is less than the eight feet width recommended by authorities such as NACTO (National Association of City Transportation Officials).

Bicycle Impacts

There are no existing bike lanes in the immediate vicinity of the project area. As per the Circulation chapter in the Pinole General Plan, existing Class I and Class II bicycles facilities are planned in the vicinity of the project area on Appian Way. The addition of two right-in, right-out driveways offers bicyclists the opportunity to safely access the site. The shopping center also provides bike racks to encourage active transportation. The project is expected to add a few trips to the existing and planned facilities but is not anticipated to create a hazardous condition that currently does not exist for bicyclists; or otherwise interfere with bicycle accessibility to the project and adjoining areas; or conflict with an existing or planned bicycle facility; or conflict with policies related to bicycle activity adopted by the City of Pinole. Therefore, the project impact to bicycle facilities is ***less than significant***.

Transit Impacts

The closest bus stop is located approximately 0.2 miles away from the project entrance on Appian Way. This bus stop serves WestCAT route 16 and 17 which operate below capacity. Additional trips generated by the project can be accommodated by the existing transit service and is not anticipated to create significant demand for public transit services above the capacity that is provided or planned. WestCAT will consider activating the currently inactive bus stops on Tara Hills Drive near the project location in the future based on ridership turnout of the proposed project. The project would not conflict with transit policies adopted by the City of Pinole or WestCAT for their respective facilities in the study area. Therefore, impacts to transit service are expected to be ***less than significant***.

5.0 CUMULATIVE CONDITIONS

This section details provides an assessment of potential cumulative transportation impacts resulting from the project for the year 2040.

5.1 CUMULATIVE TRAFFIC VOLUMES WITH GROWTH RATE

TJKM forecasted cumulative volumes using an annual growth factor of 0.38 percent for the year 2040 based on the volumes obtained from the current version of the CCTA Travel Demand Model. The Cumulative plus Project traffic volumes were based on the trip generation, distribution and assignment as applied to the analysis of Existing plus Project Conditions.

The growth rate from 2018 to 2040 was calculated for four locations on Appian Way namely between Tara Hills Drive and I-80 WB Ramps, I-80 WB and EB Ramps, I-80 EB Ramps and Fitzgerald Drive, Fitzgerald Drive and Michael Drive. The average growth rate for the AM peak hour was found to be 0.38 percent and for PM peak hour was found to be 0.33 percent. The higher growth rate of 0.38 percent was assumed for both AM and PM peak hours for the project. The growth rate calculations are contained in **Appendix D**.

Figure 10 shows projected peak hour turning movement volumes at all of the study intersections for Cumulative No Project Conditions without the proposed project. **Figure 11** displays projected turning movement volumes at all the study intersections for Cumulative plus Project Conditions.

5.2 CUMULATIVE IMPACT FINDINGS WITH PROPOSED PROJECT

The intersection LOS analysis results for Cumulative Conditions are summarized in **Table 5**. Detailed LOS reports for Cumulative No Project Conditions are contained in **Appendix E**. Detailed LOS reports for Cumulative plus Project Conditions are contained in **Appendix F**. The intersection LOS analysis results for Cumulative No Project and Cumulative plus Project Conditions are summarized in **Table 5**.

Based on the findings summarized above, cumulative traffic impacts resulting from the project would be considered ***less than significant***.

City Intersections

- The intersection of Tara Hills Drive at the project entrance operates acceptably at LOS B at both a.m. and p.m. peak hour. Traffic impacts resulting from the project would be considered ***less than significant***.
- The intersection of Appian Way and Tara Hills Drive operates at LOS D in both the a.m. and p.m. peak hour. Traffic impacts resulting from the project would be considered ***less than significant***.

Caltrans Intersections

- The intersection of Appian Way and I-80 WB Ramps at operates acceptably at LOS D in the a.m. and LOS C in the p.m. peak hour. Traffic impacts resulting from the project would be considered ***less than significant***.

- The intersection of Appian Way and I-80 EB Ramps operates acceptably at LOS A in both the a.m. and p.m. peak hour. Traffic impacts resulting from the project would be considered ***less than significant***.

Table 5: Intersection Level of Service Analysis – Cumulative Conditions

	Intersection	Control	Peak Hour	Cumulative Conditions			Cumulative Plus Project Conditions		
				LOS ¹	Average Delay ²	V/C Ratio ³	LOS ¹	Average Delay ²	V/C Ratio ³
1	Tara Hills Drive at project entrance	Signal	A.M.	B	12.9	0.47	B	14.9	0.50
			P.M.	B	16.6	0.45	B	19.4	0.52
2	Appian Way and Tara Hills Drive	Signal	A.M.	D	39.1	0.67	D	40.3	0.68
			P.M.	D	35.5	0.61	D	36.9	0.65
3	Appian Way and I-80 WB Ramps	Signal	A.M.	D	50.3	0.95	D	52.9	0.96
			P.M.	C	33.4	0.80	C	33.7	0.82
4	Appian Way and I-80 EB Ramps	Signal	A.M.	A	9.3	0.59	A	9.5	0.59
			P.M.	A	8.7	0.68	A	8.8	0.69

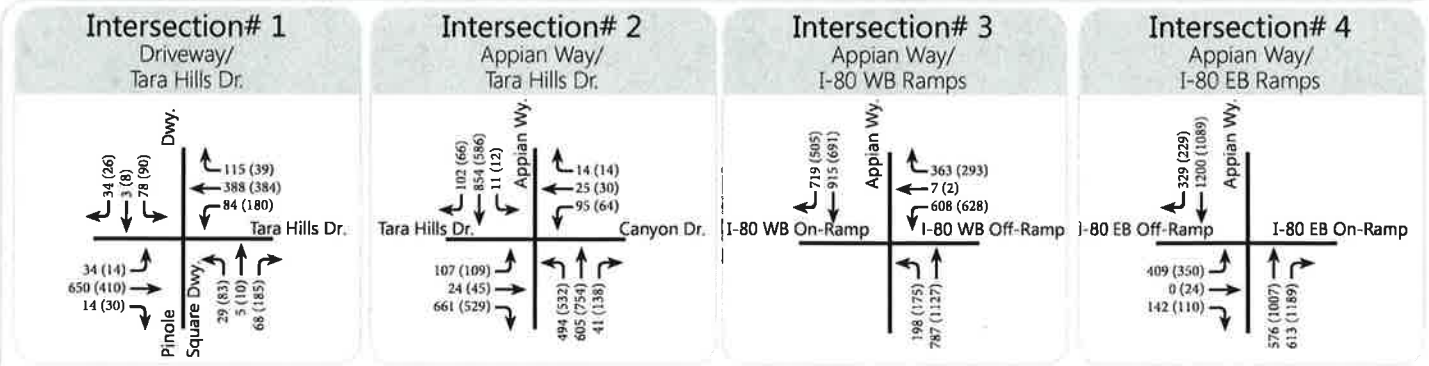
Notes:

1. LOS – Level of Service

2. Delay – Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections.

3. V/C ratio- Volume to Capacity ratio

Figure 10: Cumulative Condition Volumes

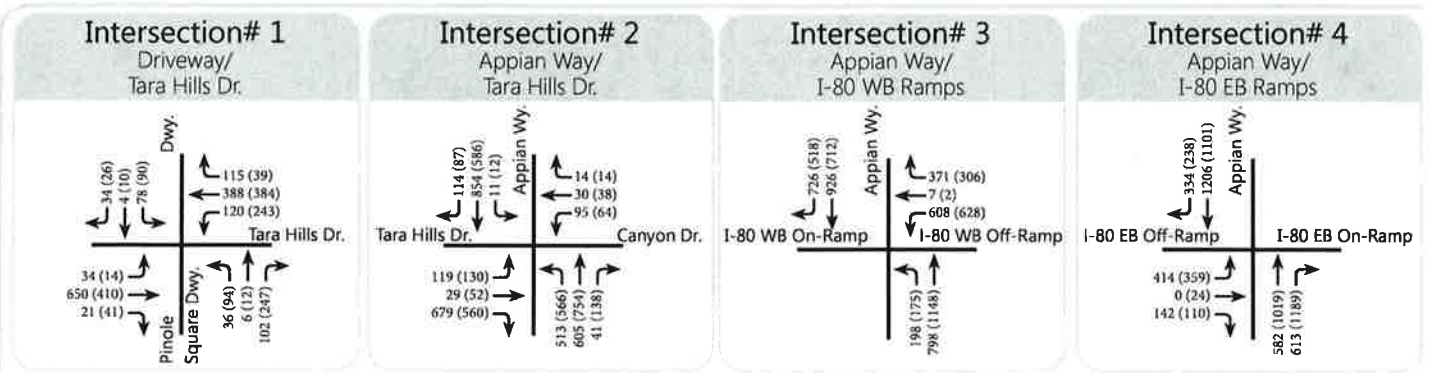


LEGEND

- Project Site
- X Study Intersection
- XX AM Peak Hour Project Trips
- (XX) PM Peak Hour Project Trips



Figure 11: Cumulative Plus Project Condition Volumes



LEGEND

- Project Site
- ⊗ Study Intersection
- XX AM Peak Hour Project Trips
- (XX) PM Peak Hour Project Trips



6.0 ADDITIONAL ANALYSIS

The following sections provide additional analyses of other transportation issues associated with the project site, including:

- Site access and onsite circulation;
- Queueing analysis;
- Vehicle miles traveled.

The analyses in these sections are based on professional judgment in accordance with the standards and methods employed by traffic engineers. Although operational issues are not considered CEQA impacts, they do describe traffic conditions that are relevant to describing the project environment.

6.1 SITE ACCESS AND ON-SITE CIRCULATION

This section analyzes site access and internal circulation for vehicles, pedestrians, and bicycles, based on the site plan presented in **Figure 2** (dated August 30, 2019). TJKM reviewed internal and external access for the project site for vehicles, pedestrians, and bicycles and on-site vehicle circulation. The site is accessible via three locations on Tara Hills Drive, one through a signalized intersection which features the main entrance into the site, and the other two through driveways which provide right in and right out access to the site. The site circulation works well for truck traffic with direct access to the back of Safeway and other stores on the site. A convenient access to the Safeway gasoline station is provided directly from Tara Hills Drive. In the event that traffic might back-up to fuel at the gasoline station, the circulation around the gasoline station ensures no hindrance to traffic approaching or exiting other stores and restaurants on the site. Ample queue length is provided for vehicular traffic anticipated at the drive-through restaurant. As per the site plan, a queue length of twelve vehicles is provided at the restaurant with a provision to accommodate an additional of three more vehicles prior to blocking any internal circulation isles. As per TJKM's experience, the estimated maximum vehicular traffic that will queue up at most drive-through restaurants is 15 vehicles. Given this, the queue length provided for the drive-through restaurant is adequate. Pedestrian access is provided via adequate sidewalks on Tara Hills Drive and within the project site. There is separate existing bicycle access to the site, although the mixed flow vehicle lanes accommodate bicycles.

6.2 QUEUEING ANALYSIS AT STUDY INTERSECTIONS

TJKM conducted a vehicle queuing and storage analysis for all exclusive left turn or right-turn pockets at the study intersections where project traffic is added under Existing and Existing plus Project scenarios. The 95th percentile (maximum) queues were analyzed using the HCM 2000 Queue methodology contained in Synchro software. Detailed calculations are included in the LOS appendices corresponding to each analysis scenario. **Table 6** summarizes the 95th percentile queue lengths at the study intersections under Existing and Existing plus Project scenarios. None of the queues were observed to exceed capacity under existing and existing plus project conditions at any of the study intersections.

Table 6: 95th Percentile Queues at Turn Pockets Affected by Project Traffic

	Study Intersections	Lane Group	Storage Length	Existing		Existing plus Project		Change	
				AM	PM	AM	PM	AM	PM
1	Tara Hills Drive at Project Entrance	EBL	95	40	25	40	25	0	0
		WBL	235	70	135	100	215	30	80
2	Appian Way and Tara Hills Drive	NBL	640	500	580	520	630	20	50
		SBL	170	30	30	30	30	0	0
		SBR	150	25	0	35	20	10	20
3	Appian Way and I-80 WB Ramps	WBL	480	375	405	375	405	0	0
		WBR	240	130	215	140	240	10	25
		NBL	310	220	230	220	230	0	0
4	Appian Way and I-80 EB Ramps	EBL	380	155	130	160	130	5	0
		EBR	185	45	35	45	35	0	0

Notes: Storage length and 95th percentile queue is expressed in feet per lane, **Bold** indicates overflow.

6.3 VEHICLES MILES TRAVELLED

The Technical Advisory on Evaluating Transportation Impacts in CEQA from the Office of Planning and Research (OPR) (December 2018) states, "If the project leads to a net increase in provision of locally-serving retail, transportation impacts from the retail portion of the development should be presumed to be less than significant. If the project consists of regionally-serving retail, and increases overall VMT compared to with existing uses, then the project would lead to a significant transportation impact." A neighborhood shopping center typically ranges from 30,000 square feet to 125,000 square feet. Larger neighborhood centers, also known as community centers range from 125,000 square feet to 400,000 square feet, whereas regional shopping centers range from 400,000 square feet to 800,000 square feet. The Pinole Shopping Center anchored by Safeway, with a total area of 105,149 square feet is a locally-serving retail facility for Pinole residents and the communities outside of but near the City of Pinole north of I-80 - Tara Hills, Bayview and Montalvin Manor.

Most of the trips for this project will be made by customers and shoppers in these communities To the extent that this project grows in daily and peak hour traffic, one can assume that there will be a commensurate reduction in traffic in other similar locations in the region. This could either result from Pinole Square being located closer for its new customers or because it has newer and more attractive facilities.. The only other shopping center as anchored by a major grocery store near the project area, is the Pinole Vista Shopping Center on Fitzgerald Drive south of I-80. With a total area of 245,002 square feet, Pinole Vista is a community shopping center anchored by Lucky. Making trips for groceries to Pinole Vista Shopping Center requires community members, especially in the community of Tara Hills, to traverse local streets in Tara Hills to San Pablo Avenue, connect to Richmond Parkway, and finally reach Fitzgerald

Drive. The revitalization of the Pinole Square Shopping Center with the convenience of a major grocery store, several restaurants and other retail facilities will discourage these extra miles travelled to access grocery stores and retail facilities far off, and help reduce the VMT in the area. Given these factors and the guideline for retail redevelopment project mentioned in the OPR, the impacts from the redevelopment of Pinole Square Shopping Center will be less than significant.

Appendix A

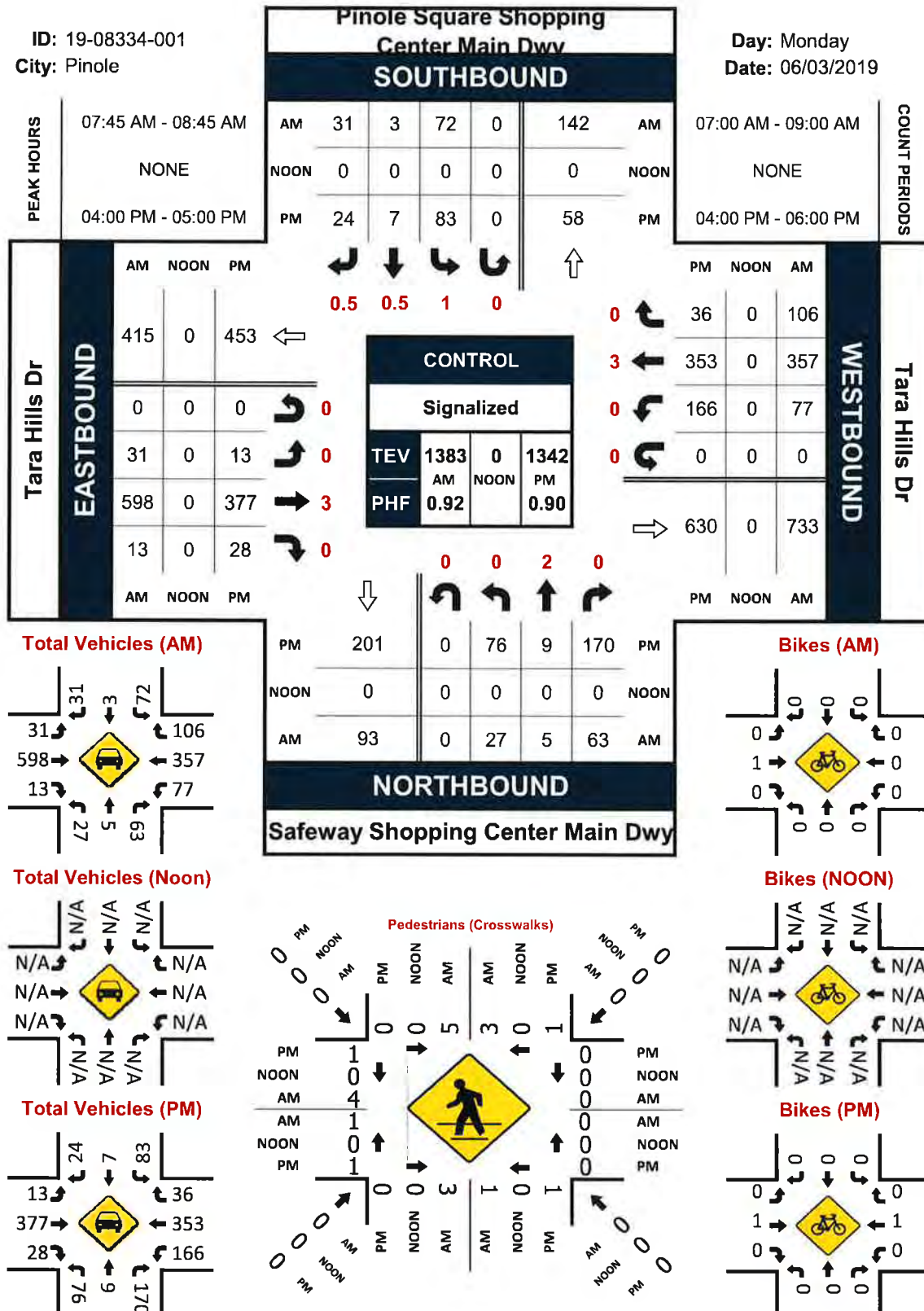
Turning Movement Counts

Pinole Square Shopping Center Main Dwy & Tara Hills Dr

Peak Hour Turning Movement Count

ID: 19-08334-001
City: Pinole

Day: Monday
Date: 06/03/2019



Note:

TEV- Total Entering Volume
PHF- Peak Hour Factor

Appian Way & Tara Hills Dr/Canyon Dr

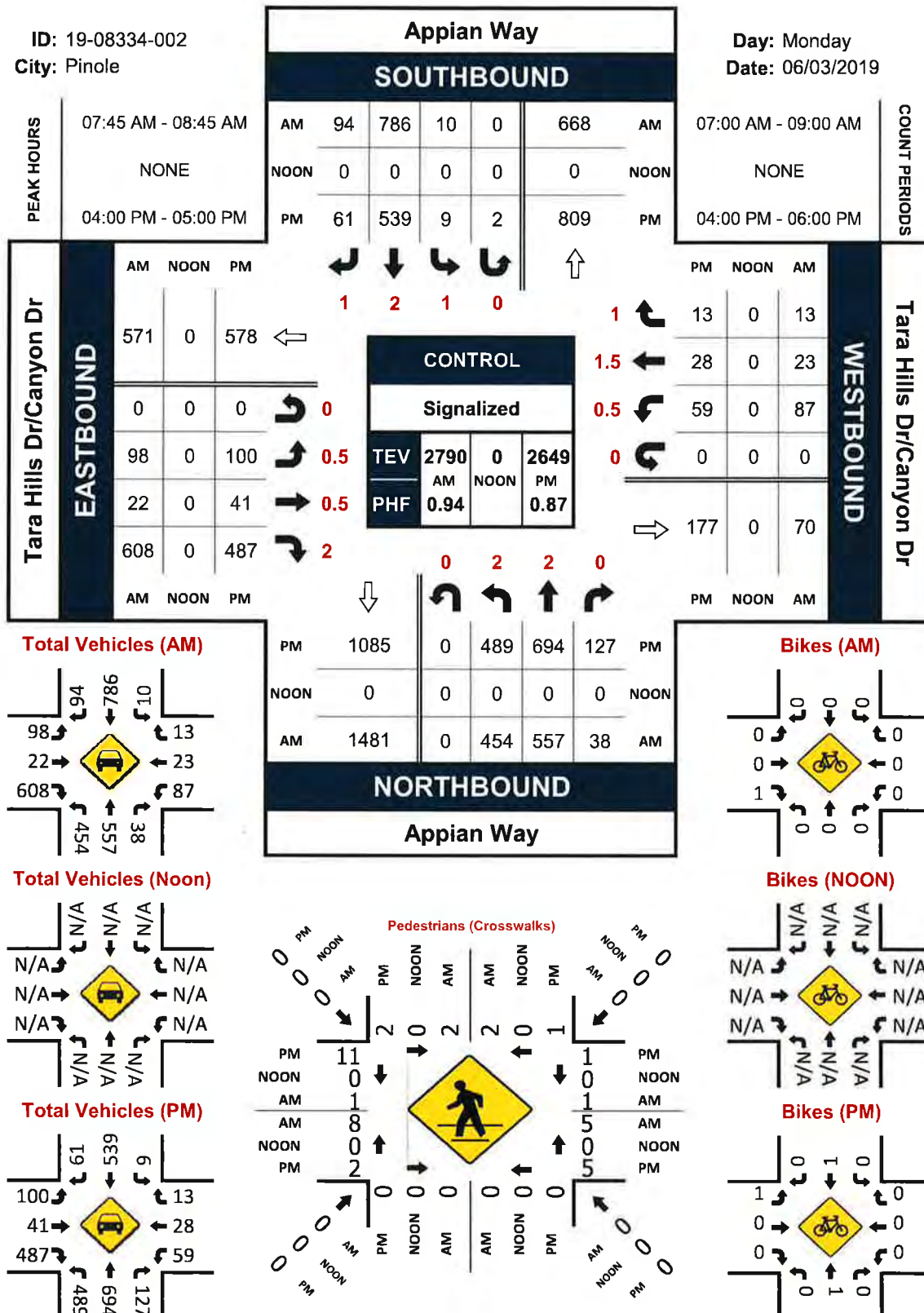
Peak Hour Turning Movement Count

ID: 19-08334-002

City: Pinole

Day: Monday

Date: 06/03/2019



Appian Way & I-80 WB Ramps

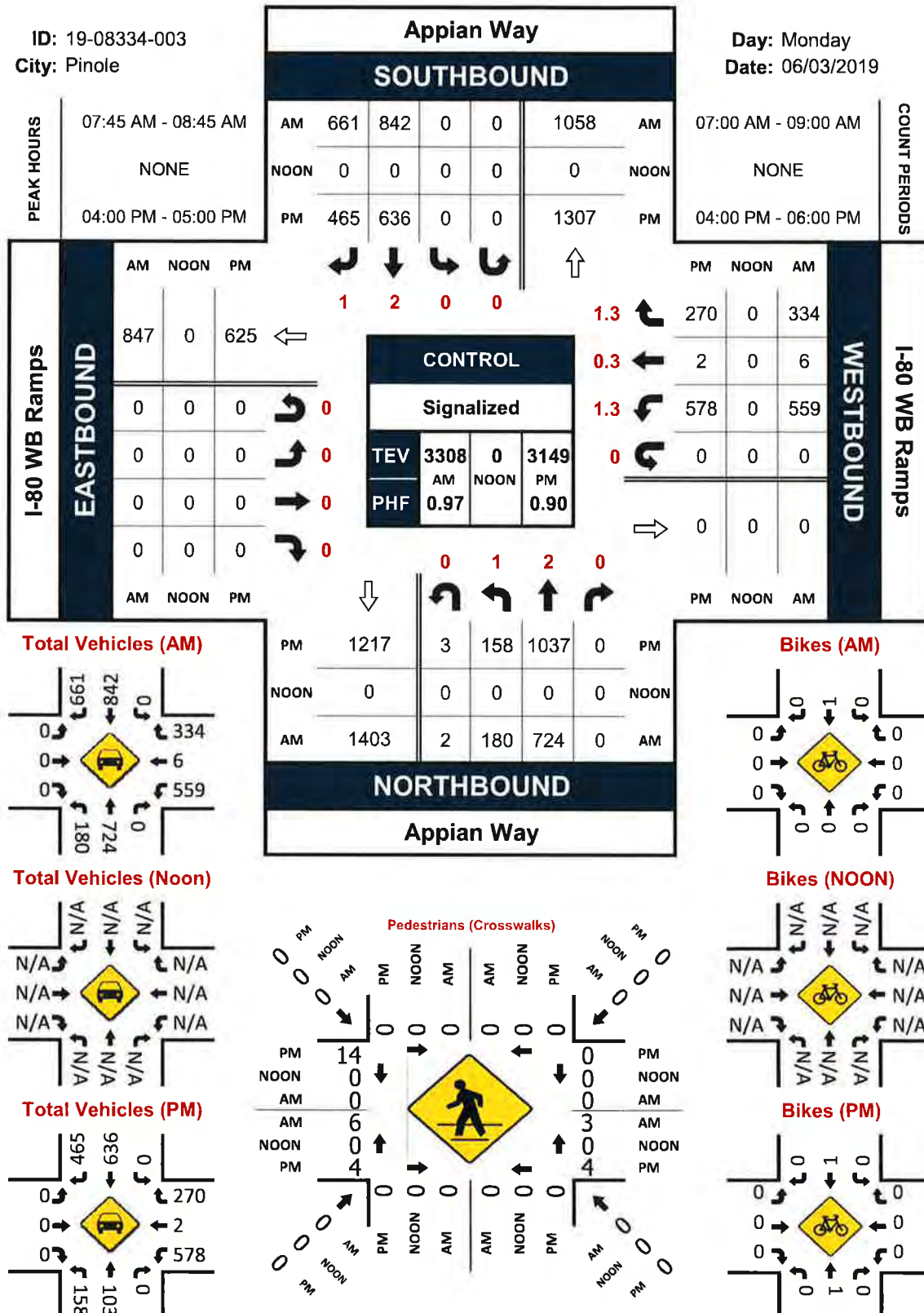
Peak Hour Turning Movement Count

ID: 19-08334-003

City: Pinole

Day: Monday

Date: 06/03/2019



Note:

TEV- Total Entering Volume

PHF- Peak Hour Factor

Appian Way & I-80 EB Ramps

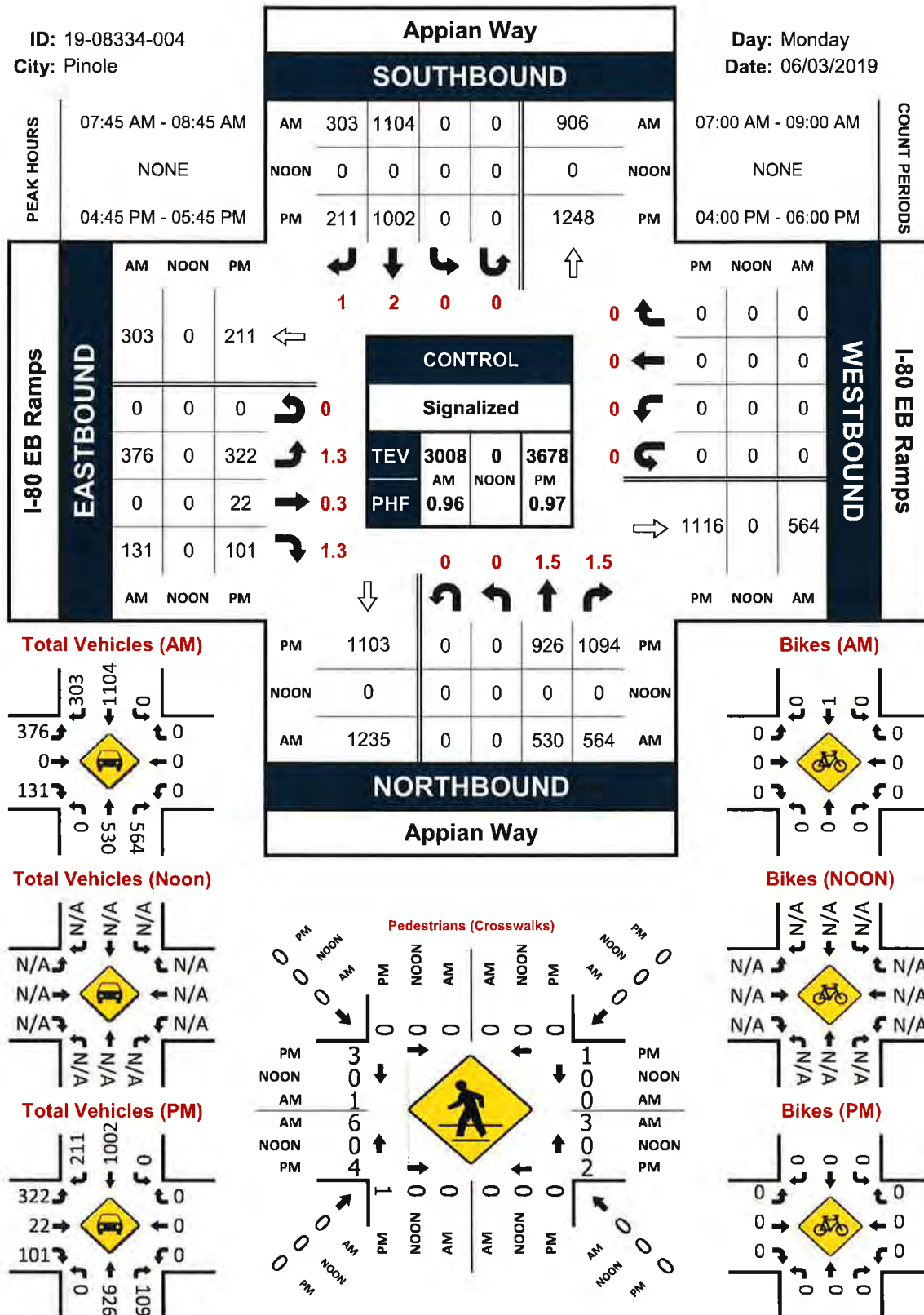
Peak Hour Turning Movement Count

ID: 19-08334-004

City: Pinole

Day: Monday

Date: 06/03/2019






















Appendix B
Existing Condition LOS

HCM 2000 Signalized Intersection Summary

Exisitng Plus Project Condition AM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

Timing Plan: A.M. Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	598	16	93	357	106	30	6	78	72	4	31
Future Volume (vph)	31	598	16	93	357	106	30	6	78	72	4	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97			0.90		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3523		1770	3402			3132		1770	1594	
Flt Permitted	0.95	1.00		0.95	1.00			0.88		0.66	1.00	
Satd. Flow (perm)	1770	3523		1770	3402			2803		1229	1594	
Peak-hour factor, PHF	0.79	0.79	0.79	0.75	0.75	0.75	0.79	0.79	0.79	0.85	0.85	0.85
Adj. Flow (vph)	39	757	20	124	476	141	38	8	99	85	5	36
RTOR Reduction (vph)	0	2	0	0	18	0	0	79	0	0	29	0
Lane Group Flow (vph)	39	775	0	124	599	0	0	66	0	85	12	0
Confl. Peds. (#/hr)			4			8	5					5
Confl. Bikes (#/hr)			1									
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	3.7	25.8		8.3	30.4			11.7		11.7	11.7	
Effective Green, g (s)	3.7	25.8		8.3	30.4			11.7		11.7	11.7	
Actuated g/C Ratio	0.06	0.45		0.14	0.53			0.20		0.20	0.20	
Clearance Time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	113	1572		254	1789			567		248	322	
v/s Ratio Prot	0.02	c0.22		c0.07	0.18						0.01	
v/s Ratio Perm								0.02		c0.07		
v/c Ratio	0.35	0.49		0.49	0.33			0.12		0.34	0.04	
Uniform Delay, d1	25.9	11.4		22.8	7.9			18.8		19.8	18.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.3		1.5	0.2			0.1		1.1	0.1	
Delay (s)	26.6	11.7		24.3	8.0			19.0		20.9	18.6	
Level of Service	C	B		C	A			B		C	B	
Approach Delay (s)		12.4			10.8			19.0			20.1	
Approach LOS		B			B			B			C	

Intersection Summary

HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	57.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 2000 Queueing Summary

Existing Condition AM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/30/2019



Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT
Lane Group Flow (vph)	39	773	103	617	120	85	40
v/c Ratio	0.20	0.49	0.34	0.32	0.19	0.33	0.11
Control Delay	29.4	13.9	26.9	8.0	10.3	25.0	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.4	13.9	26.9	8.0	10.3	25.0	10.1
Queue Length 50th (ft)	12	92	29	33	5	23	1
Queue Length 95th (ft)	39	157	70	93	22	66	22
Internal Link Dist (ft)		537		492	298		312
Turn Bay Length (ft)	95		235				
Base Capacity (vph)	1083	3415	541	2917	1536	674	862
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.23	0.19	0.21	0.08	0.13	0.05








Intersection Summary

HCM 2000 Signalized Intersection Summary

Existing Condition PM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/21/2019








Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	377	28	166	353	36	76	9	170	83	7	24
Future Volume (vph)	13	377	28	166	353	36	76	9	170	83	7	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99			0.90		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3497		1770	3486			3137		1770	1627	
Flt Permitted	0.95	1.00		0.95	1.00			0.86		0.55	1.00	
Satd. Flow (perm)	1770	3497		1770	3486			2726		1016	1627	
Peak-hour factor, PHF	0.83	0.83	0.83	0.90	0.90	0.90	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	16	454	34	184	392	40	89	11	200	97	8	28
RTOR Reduction (vph)	0	6	0	0	5	0	0	152	0	0	21	0
Lane Group Flow (vph)	16	482	0	184	427	0	0	148	0	97	15	0
Confl. Peds. (#/hr)			1			1	2					2
Confl. Bikes (#/hr)			1			1						
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	1.0	23.6		12.5	35.1			15.1		15.1	15.1	
Effective Green, g (s)	1.0	23.6		12.5	35.1			15.1		15.1	15.1	
Actuated g/C Ratio	0.02	0.37		0.20	0.56			0.24		0.24	0.24	
Clearance Time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	28	1305		350	1936			651		242	388	
v/s Ratio Prot	0.01	c0.14		c0.10	0.12						0.01	
v/s Ratio Perm								0.05		c0.10		
v/c Ratio	0.57	0.37		0.53	0.22			0.23		0.40	0.04	
Uniform Delay, d1	30.9	14.4		22.7	7.1			19.4		20.2	18.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	16.3	0.2		1.4	0.1			0.2		1.5	0.1	
Delay (s)	47.2	14.6		24.1	7.2			19.6		21.7	18.5	
Level of Service	D	B		C	A			B		C	B	
Approach Delay (s)		15.7			12.3			19.6			20.9	
Approach LOS		B			B			B			C	
Intersection Summary												
HCM 2000 Control Delay		15.5			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.42										
Actuated Cycle Length (s)		63.2			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		52.8%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM 2000 Queueing Summary

Existing Condition PM





















1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/30/2019

							
Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT
Lane Group Flow (vph)	16	488	184	432	300	97	36
v/c Ratio	0.10	0.41	0.50	0.21	0.36	0.38	0.08
Control Delay	31.0	18.0	28.0	8.2	8.0	23.7	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.0	18.0	28.0	8.2	8.0	23.7	9.2
Queue Length 50th (ft)	5	67	58	30	14	29	2
Queue Length 95th (ft)	23	126	135	98	38	66	19
Internal Link Dist (ft)		537		492	298		312
Turn Bay Length (ft)	95		235				
Base Capacity (vph)	957	3382	478	2828	1394	480	783
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.14	0.38	0.15	0.22	0.20	0.05
Intersection Summary							

HCM 2000 Signalized Intersection Summary 2: Appian Way & Tara Hills Drive/Canyon Drive

Existing Plus Project Condition AM
Timing Plan: A.M. Peak


												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	24	616	87	25	13	454	565	38	10	786	100
Future Volume (vph)	103	24	616	87	25	13	454	565	38	10	786	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6	4.6		5.1		4.7	5.0		4.0	5.1	5.1
Lane Util. Factor		1.00	0.88		0.95		0.97	0.95		1.00	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1790	2787		3361		3433	3497		1770	3539	1546
Flt Permitted		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1790	2787		3361		3433	3497		1770	3539	1546
Peak-hour factor, PHF	0.91	0.91	0.91	0.75	0.75	0.75	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	113	26	677	116	33	17	493	614	41	11	836	106
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	0	0	0	61
Lane Group Flow (vph)	0	139	677	0	158	0	493	655	0	11	836	45
Confl. Peds. (#/hr)						4			6			9
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4	4 5	3	3		5	2		1	6	
Permitted Phases												6
Actuated Green, G (s)		14.0	38.1		17.8		24.1	77.7		1.8	54.6	54.6
Effective Green, g (s)		14.0	38.1		17.8		24.1	77.7		1.8	54.6	54.6
Actuated g/C Ratio		0.11	0.29		0.14		0.19	0.60		0.01	0.42	0.42
Clearance Time (s)		4.6			5.1		4.7	5.0		4.0	5.1	5.1
Vehicle Extension (s)		2.5			2.0		2.0	4.5		2.0	3.0	3.0
Lane Grp Cap (vph)		192	816		460		636	2090		24	1486	649
v/s Ratio Prot		0.08	c0.24		c0.05		0.14	0.19		0.01	c0.24	
v/s Ratio Perm												0.03
v/c Ratio		0.72	0.83		0.34		0.78	0.31		0.46	0.56	0.07
Uniform Delay, d1		56.1	42.9		50.8		50.4	12.9		63.6	28.6	22.5
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		11.9	6.9		0.2		5.4	0.4		5.0	1.5	0.2
Delay (s)		68.1	49.8		51.0		55.7	13.3		68.6	30.2	22.7
Level of Service		E	D		D		E	B		E	C	C
Approach Delay (s)		52.9			51.0			31.5			29.8	
Approach LOS		D			D			C			C	

Intersection Summary

HCM 2000 Control Delay	37.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM 2000 Queueing Summary
 2: Appian Way & Tara Hills Drive/Canyon Drive

Existing Condition AM
 10/30/2019


								
Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	132	668	164	493	646	11	836	100
v/c Ratio	0.71	0.83	0.35	0.78	0.30	0.09	0.56	0.14
Control Delay	76.8	40.6	48.8	59.0	13.7	58.5	32.3	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	76.8	40.6	48.8	59.0	13.7	58.5	32.3	3.2
Queue Length 50th (ft)	109	216	65	206	106	9	261	0
Queue Length 95th (ft)	#195	194	69	251	252	29	#491	25
Internal Link Dist (ft)	492		509		406		608	
Turn Bay Length (ft)				310		170		150
Base Capacity (vph)	192	973	869	842	2185	134	1499	729
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.69	0.19	0.59	0.30	0.08	0.56	0.14

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

HCM 2000 Signalized Intersection Summary 2: Appian Way & Tara Hills Drive/Canyon Drive

Existing Condition PM
10/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔↔		↔↔		↔↔	↔↔		↔	↔↔	↔
Traffic Volume (vph)	100	41	487	59	28	13	489	694	127	11	539	61
Future Volume (vph)	100	41	487	59	28	13	489	694	127	11	539	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Lane Util. Factor		1.00	0.88		0.95		0.97	0.95		1.00	0.95	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	0.99		1.00	1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1799	2787		3365		3433	3435		1770	3539	1534
Flt Permitted		0.97	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1799	2787		3365		3433	3435		1770	3539	1534
Peak-hour factor, PHF	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.72	0.72	0.72
Adj. Flow (vph)	112	46	547	69	33	15	532	754	138	15	749	85
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	49
Lane Group Flow (vph)	0	158	547	0	107	0	532	892	0	15	749	36
Confl. Peds. (#/hr)							3			6		13
Confl. Bikes (#/hr)									1			1
Turn Type	Split	NA	pm+ov	Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)		16.8	43.4		17.8		26.6	83.2		3.5	59.3	59.3
Effective Green, g (s)		16.8	43.4		17.8		26.6	83.2		3.5	59.3	59.3
Actuated g/C Ratio		0.12	0.31		0.13		0.19	0.59		0.02	0.42	0.42
Clearance Time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Vehicle Extension (s)		2.5	2.0		2.0		2.0	4.5		2.0	3.0	3.0
Lane Grp Cap (vph)		215	863		427		652	2041		44	1499	649
v/s Ratio Prot		c0.09	0.12		c0.03		c0.15	0.26		0.01	c0.21	
v/s Ratio Perm			0.08									0.02
v/c Ratio		0.73	0.63		0.25		0.82	0.44		0.34	0.50	0.06
Uniform Delay, d1		59.5	41.5		55.1		54.4	15.6		67.1	29.5	23.8
Progression Factor		1.00	1.00		1.00		0.86	0.74		1.00	1.00	1.00
Incremental Delay, d2		11.6	1.1		0.1		6.7	0.6		1.7	1.2	0.2
Delay (s)		71.0	42.6		55.2		53.6	12.1		68.8	30.7	24.0
Level of Service		E	D		E		D	B		E	C	C
Approach Delay (s)		49.0			55.2		27.6				30.7	
Approach LOS		D			E		C				C	
Intersection Summary												
HCM 2000 Control Delay			34.4				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)		19.5			
Intersection Capacity Utilization			66.8%				ICU Level of Service		C			
Analysis Period (min)			15									

c Critical Lane Group

HCM 2000 Queueing Summary
 2: Appian Way & Tara Hills Drive/Canyon Drive

Existing Condition PM
 10/30/2019

	→	↘	←	↙	↑	↗	↓	↘
Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	158	547	117	532	892	15	749	85
v/c Ratio	0.73	0.63	0.27	0.82	0.42	0.14	0.50	0.12
Control Delay	78.7	28.7	49.9	56.3	13.2	65.1	33.7	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Total Delay	78.7	28.7	49.9	56.3	13.4	65.1	33.7	2.7
Queue Length 50th (ft)	141	177	47	173	93	13	248	0
Queue Length 95th (ft)	213	131	64	291	394	30	318	0
Internal Link Dist (ft)	492		509		406		608	
Turn Bay Length (ft)				310		170		150
Base Capacity (vph)	257	1045	810	877	2100	111	1497	718
Starvation Cap Reductn	0	0	0	0	468	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	10	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.52	0.14	0.61	0.55	0.14	0.50	0.12
Intersection Summary								

HCM 2000 Signalized Intersection Summary

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

Existing Plus Project Condition AM

Timing Plan: A.M. Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	559	6	337	182	729	0	0	847	664
Future Volume (vph)	0	0	0	559	6	337	182	729	0	0	847	664
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	3.0	4.0				4.0
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95				0.95
Frpb, ped/bikes				1.00	1.00	1.00	1.00	1.00				0.99
Flpb, ped/bikes				1.00	1.00	1.00	1.00	1.00				1.00
Frt				1.00	0.97	0.85	1.00	1.00				0.93
Flt Protected				0.95	0.96	1.00	0.95	1.00				1.00
Satd. Flow (prot)				1681	1585	1504	1770	3539				3270
Flt Permitted				0.95	0.96	1.00	0.95	1.00				1.00
Satd. Flow (perm)				1681	1585	1504	1770	3539				3270
Peak-hour factor, PHF	0.25	0.25	0.25	0.89	0.89	0.89	0.98	0.98	0.98	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	628	7	379	186	744	0	0	931	730
RTOR Reduction (vph)	0	0	0	0	7	182	0	0	0	0	99	0
Lane Group Flow (vph)	0	0	0	352	340	133	186	744	0	0	1562	0
Confl. Peds. (#/hr)									3			6
Confl. Bikes (#/hr)												1
Turn Type				Perm	NA	Perm	Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8		8						
Actuated Green, G (s)				29.6	29.6	29.6	17.4	82.4			62.0	
Effective Green, g (s)				29.6	29.6	29.6	17.4	82.4			62.0	
Actuated g/C Ratio				0.25	0.25	0.25	0.14	0.69			0.52	
Clearance Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Vehicle Extension (s)				2.0	2.0	2.0	2.5	4.0			4.0	
Lane Grp Cap (vph)				414	390	370	256	2430			1689	
v/s Ratio Prot							c0.11	0.21			c0.48	
v/s Ratio Perm				0.21	0.21	0.09						
v/c Ratio				0.85	0.87	0.36	0.73	0.31			0.92	
Uniform Delay, d1				43.1	43.4	37.4	49.0	7.5			26.8	
Progression Factor				1.00	1.00	1.00	1.12	1.21			1.00	
Incremental Delay, d2				14.8	18.3	0.2	8.3	0.3			10.1	
Delay (s)				57.9	61.7	37.6	63.4	9.3			36.9	
Level of Service				E	E	D	E	A			D	
Approach Delay (s)		0.0			52.9			20.1			36.9	
Approach LOS		A			D			C			D	

Intersection Summary

HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM 2000 Queueing Summary

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

Existing Condition AM

10/30/2019

Lane Group	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	352	343	315	186	739	1651
v/c Ratio	0.86	0.87	0.57	0.73	0.30	0.92
Control Delay	62.8	63.8	13.3	69.0	9.9	34.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	42.4
Total Delay	62.8	63.8	13.3	69.0	9.9	76.7
Queue Length 50th (ft)	268	268	44	147	141	566
Queue Length 95th (ft)	374	380	130	219	175	#850
Internal Link Dist (ft)		673			371	406
Turn Bay Length (ft)	230		230	310		
Base Capacity (vph)	476	456	601	354	2436	1794
Starvation Cap Reductn	0	0	0	0	0	283
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.75	0.52	0.53	0.30	1.09

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 2000 Signalized Intersection Summary

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

Existing Condition PM

10/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	578	2	270	161	1037	0	0	636	465
Future Volume (vph)	0	0	0	578	2	270	161	1037	0	0	636	465
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			0.98	
Flpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			1.00	
Frt				1.00	0.99	0.85	1.00	1.00			0.94	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1600	1504	1770	3539			3237	
Flt Permitted				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1600	1504	1770	3539			3237	
Peak-hour factor, PHF	0.25	0.25	0.25	0.88	0.88	0.88	0.95	0.95	0.95	0.86	0.86	0.86
Adj. Flow (vph)	0	0	0	657	2	307	169	1092	0	0	740	541
RTOR Reduction (vph)	0	0	0	0	3	85	0	0	0	0	69	0
Lane Group Flow (vph)	0	0	0	348	339	191	169	1092	0	0	1212	0
Confl. Peds. (#/hr)									4			18
Confl. Bikes (#/hr)									1			1
Turn Type				Perm	NA	Perm	Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8		8						
Actuated Green, G (s)				34.6	34.6	34.6	18.3	97.4			76.1	
Effective Green, g (s)				34.6	34.6	34.6	18.3	97.4			76.1	
Actuated g/C Ratio				0.25	0.25	0.25	0.13	0.70			0.54	
Clearance Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Vehicle Extension (s)				2.0	2.0	2.0	2.5	4.0			4.0	
Lane Grp Cap (vph)				415	395	371	231	2462			1759	
v/s Ratio Prot							c0.10	0.31			c0.37	
v/s Ratio Perm				0.21	0.21	0.13						
v/c Ratio				0.84	0.86	0.51	0.73	0.44			0.69	
Uniform Delay, d1				50.0	50.4	45.5	58.5	9.4			23.3	
Progression Factor				1.00	1.00	1.00	1.04	1.11			0.89	
Incremental Delay, d2				13.2	16.1	0.5	9.1	0.5			2.0	
Delay (s)				63.3	66.4	46.0	69.8	10.9			22.7	
Level of Service				E	E	D	E	B			C	
Approach Delay (s)		0.0			59.4			18.8			22.7	
Approach LOS		A			E			B			C	
Intersection Summary												
HCM 2000 Control Delay			31.4	HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			140.0	Sum of lost time (s)					11.0			
Intersection Capacity Utilization			71.0%	ICU Level of Service					C			
Analysis Period (min)			15									

c Critical Lane Group

HCM 2000 Queueing Summary

Existing Condition PM

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

10/30/2019



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	348	342	276	169	1092	1281
v/c Ratio	0.84	0.86	0.61	0.73	0.44	0.70
Control Delay	67.4	70.0	31.7	75.9	11.9	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.3	0.1
Total Delay	67.4	70.0	31.7	75.9	12.2	22.3
Queue Length 50th (ft)	315	321	136	153	237	286
Queue Length 95th (ft)	406	417	216	230	307	263
Internal Link Dist (ft)		673			371	406
Turn Bay Length (ft)	230		230	310		
Base Capacity (vph)	504	482	530	429	2462	1830
Starvation Cap Reductn	0	0	0	0	717	59
Spillback Cap Reductn	0	0	1	0	59	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.71	0.52	0.39	0.63	0.72

Intersection Summary







HCM 2000 Signalized Intersection Summary

Exisitng Plus Project Condition AM

4: Appian Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

Timing Plan: A.M. Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	378	0	131	0	0	0	0	533	564	0	1107	0
Future Volume (vph)	378	0	131	0	0	0	0	533	564	0	1107	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91	0.91		0.95	
Frbp, ped/bikes	1.00	1.00	1.00					1.00	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00	1.00		1.00	
Frt	1.00	0.99	0.85					0.96	0.85		1.00	
Flt Protected	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1681	1603	1504					3225	1419		3539	
Flt Permitted	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1681	1603	1504					3225	1419		3539	
Peak-hour factor, PHF	0.83	0.83	0.83	0.25	0.25	0.25	0.98	0.98	0.98	0.95	0.95	0.95
Adj. Flow (vph)	455	0	158	0	0	0	0	544	576	0	1165	0
RTOR Reduction (vph)	0	14	84	0	0	0	0	71	115	0	0	0
Lane Group Flow (vph)	237	220	58	0	0	0	0	703	231	0	1165	0
Confl. Peds. (#/hr)									3			7
Confl. Bikes (#/hr)												1
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2			
Actuated Green, G (s)	12.0	12.0	12.0					40.0	40.0		40.0	
Effective Green, g (s)	12.0	12.0	12.0					40.0	40.0		40.0	
Actuated g/C Ratio	0.20	0.20	0.20					0.67	0.67		0.67	
Clearance Time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Vehicle Extension (s)	2.0	2.0	2.0					4.0	4.0		4.0	
Lane Grp Cap (vph)	336	320	300					2150	946		2359	
v/s Ratio Prot								0.22			c0.33	
v/s Ratio Perm	c0.14	0.14	0.04						0.16			
v/c Ratio	0.71	0.69	0.19					0.33	0.24		0.49	
Uniform Delay, d1	22.4	22.3	20.0					4.3	4.0		5.0	
Progression Factor	1.00	1.00	1.00					1.00	1.00		0.63	
Incremental Delay, d2	5.4	4.8	0.1					0.4	0.6		0.4	
Delay (s)	27.8	27.1	20.1					4.7	4.6		3.5	
Level of Service	C	C	C					A	A		A	
Approach Delay (s)		25.7			0.0			4.6			3.5	
Approach LOS		C			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			8.6									
HCM 2000 Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			60.0									
Intersection Capacity Utilization			85.7%									
Analysis Period (min)			15									
c Critical Lane Group												
HCM 2000 Level of Service				A								
Sum of lost time (s)				8.0								
ICU Level of Service				E								

						
Lane Group	EBL	EBT	EBR	NBT	NBR	SBT
Lane Group Flow (vph)	236	233	142	771	346	1162
v/c Ratio	0.70	0.70	0.37	0.35	0.33	0.49
Control Delay	35.3	33.1	10.4	3.7	1.5	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.3	33.1	10.4	3.7	1.5	3.7
Queue Length 50th (ft)	82	78	11	39	0	106
Queue Length 95th (ft)	#153	#150	46	57	21	m137
Internal Link Dist (ft)		752		715		57
Turn Bay Length (ft)	380		185			
Base Capacity (vph)	365	362	408	2272	1080	2422
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.64	0.35	0.34	0.32	0.48

Intersection Summary









95th percentile volume exceeds capacity, queue may be longer.







Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 2000 Signalized Intersection Summary
4: Appian Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

Existing Condition PM
10/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	322	22	101	0	0	0	0	926	1094	0	1002	0
Future Volume (vph)	322	22	101	0	0	0	0	926	1094	0	1002	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91	0.91		0.95	
Frpb, ped/bikes	1.00	1.00	0.99					0.99	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00	1.00		1.00	
Frt	1.00	0.99	0.85					0.95	0.85		1.00	
Flt Protected	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1681	1613	1484					3202	1418		3539	
Flt Permitted	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1681	1613	1484					3202	1418		3539	
Peak-hour factor, PHF	0.98	0.98	0.98	0.25	0.25	0.25	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	329	22	103	0	0	0	0	985	1164	0	1089	0
RTOR Reduction (vph)	0	3	74	0	0	0	0	56	189	0	0	0
Lane Group Flow (vph)	181	177	19	0	0	0	0	1430	474	0	1089	0
Confl. Peds. (#/hr)			1						3			7
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2			
Actuated Green, G (s)	12.0	12.0	12.0					50.0	50.0		50.0	
Effective Green, g (s)	12.0	12.0	12.0					50.0	50.0		50.0	
Actuated g/C Ratio	0.17	0.17	0.17					0.71	0.71		0.71	
Clearance Time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Vehicle Extension (s)	2.0	2.0	2.0					4.0	4.0		4.0	
Lane Grp Cap (vph)	288	276	254					2287	1012		2527	
v/s Ratio Prot								c0.45			0.31	
v/s Ratio Perm	0.11	0.11	0.01						0.33			
v/c Ratio	0.63	0.64	0.08					0.63	0.47		0.43	
Uniform Delay, d1	26.9	27.0	24.3					5.2	4.3		4.1	
Progression Factor	1.00	1.00	1.00					1.00	1.00		0.41	
Incremental Delay, d2	3.1	3.8	0.0					1.3	1.6		0.4	
Delay (s)	30.0	30.8	24.4					6.5	5.8		2.1	
Level of Service	C	C	C					A	A		A	
Approach Delay (s)		29.2			0.0			6.3			2.1	
Approach LOS		C			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		7.8										
HCM 2000 Volume to Capacity ratio		0.63										
Actuated Cycle Length (s)		70.0							8.0			
Intersection Capacity Utilization		100.4%										
Analysis Period (min)		15										
c Critical Lane Group												

						
Lane Group	EBL	EBT	EBR	NBT	NBR	SBT
Lane Group Flow (vph)	181	180	93	1486	663	1089
v/c Ratio	0.63	0.64	0.28	0.63	0.55	0.43
Control Delay	36.0	36.3	8.6	6.6	2.4	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.0	36.3	8.6	6.6	2.4	2.3
Queue Length 50th (ft)	76	79	1	120	0	20
Queue Length 95th (ft)	128	131	35	241	36	147
Internal Link Dist (ft)		752		715		57
Turn Bay Length (ft)	380		185			
Base Capacity (vph)	504	487	507	2341	1202	2526
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.37	0.18	0.63	0.55	0.43
Intersection Summary						


Appendix C
Existing Plus Project Condition LOS

HCM 2000 Signalized Intersection Summary

Existing Plus Project Condition AM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/30/2019








												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	598	20	113	357	106	31	6	97	72	4	31
Future Volume (vph)	31	598	20	113	357	106	31	6	97	72	4	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97			0.89		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3519		1770	3401			3116		1770	1593	
Flt Permitted	0.95	1.00		0.95	1.00			0.89		0.64	1.00	
Satd. Flow (perm)	1770	3519		1770	3401			2805		1200	1593	
Peak-hour factor, PHF	0.79	0.79	0.79	0.75	0.75	0.75	0.79	0.79	0.79	0.85	0.85	0.85
Adj. Flow (vph)	39	757	25	151	476	141	39	8	123	85	5	36
RTOR Reduction (vph)	0	2	0	0	17	0	0	99	0	0	29	0
Lane Group Flow (vph)	39	780	0	151	600	0	0	71	0	85	12	0
Confl. Peds. (#/hr)			4			8	5					5
Confl. Bikes (#/hr)			1									
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	3.8	26.6		11.3	34.1			12.4		12.4	12.4	
Effective Green, g (s)	3.8	26.6		11.3	34.1			12.4		12.4	12.4	
Actuated g/C Ratio	0.06	0.43		0.18	0.55			0.20		0.20	0.20	
Clearance Time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	107	1502		321	1861			558		238	317	
v/s Ratio Prot	0.02	c0.22		c0.09	0.18						0.01	
v/s Ratio Perm								0.03		c0.07		
v/c Ratio	0.36	0.52		0.47	0.32			0.13		0.36	0.04	
Uniform Delay, d1	28.1	13.1		22.8	7.7			20.5		21.5	20.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.4		1.1	0.1			0.1		1.3	0.1	
Delay (s)	28.9	13.5		23.9	7.9			20.6		22.8	20.2	
Level of Service	C	B		C	A			C		C	C	
Approach Delay (s)		14.3			11.0			20.6			21.9	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay		14.0			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.47										
Actuated Cycle Length (s)		62.3			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		45.2%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM 2000 Queueing Summary

Exisitng Plus Project Condition AM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/30/2019









							
Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT
Lane Group Flow (vph)	39	782	151	617	170	85	41
v/c Ratio	0.22	0.54	0.46	0.32	0.26	0.35	0.12
Control Delay	32.5	16.2	29.7	9.0	9.4	27.2	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.5	16.2	29.7	9.0	9.4	27.2	10.7
Queue Length 50th (ft)	13	107	48	62	6	26	1
Queue Length 95th (ft)	42	174	102	98	26	70	24
Internal Link Dist (ft)		537		492	298		312
Turn Bay Length (ft)	95		235				
Base Capacity (vph)	967	3331	484	2770	1403	574	777
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.23	0.31	0.22	0.12	0.15	0.05
Intersection Summary							

HCM 2000 Signalized Intersection Summary

Existing Plus Project Condition PM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	377	39	229	353	36	87	11	232	83	9	24
Future Volume (vph)	13	377	39	229	353	36	87	11	232	83	9	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99			0.89		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3482		1770	3486			3123		1770	1639	
Flt Permitted	0.95	1.00		0.95	1.00			0.86		0.44	1.00	
Satd. Flow (perm)	1770	3482		1770	3486			2725		829	1639	
Peak-hour factor, PHF	0.83	0.83	0.83	0.90	0.90	0.90	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	16	454	47	254	392	40	102	13	273	97	10	28
RTOR Reduction (vph)	0	9	0	0	5	0	0	203	0	0	21	0
Lane Group Flow (vph)	16	492	0	254	427	0	0	185	0	97	17	0
Confl. Peds. (#/hr)			1			1	2					2
Confl. Bikes (#/hr)			1			1						
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	1.1	23.7		16.2	38.8			17.8		17.8	17.8	
Effective Green, g (s)	1.1	23.7		16.2	38.8			17.8		17.8	17.8	
Actuated g/C Ratio	0.02	0.34		0.23	0.56			0.26		0.26	0.26	
Clearance Time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	27	1183		411	1940			695		211	418	
v/s Ratio Prot	0.01	c0.14		c0.14	0.12						0.01	
v/s Ratio Perm							0.07			c0.12		
v/c Ratio	0.59	0.42		0.62	0.22		0.27			0.46	0.04	
Uniform Delay, d1	34.1	17.7		24.0	7.8		20.7			21.9	19.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00			1.00	1.00	
Incremental Delay, d2	21.0	0.3		2.8	0.1		0.3			2.2	0.1	
Delay (s)	55.1	18.0		26.7	7.9		21.0			24.1	19.6	
Level of Service	E	B		C	A		C			C	B	
Approach Delay (s)		19.2			14.9		21.0				22.8	
Approach LOS		B			B		C				C	
Intersection Summary												
HCM 2000 Control Delay		18.2					HCM 2000 Level of Service		B			
HCM 2000 Volume to Capacity ratio		0.49										
Actuated Cycle Length (s)		69.7					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		58.7%					ICU Level of Service		B			
Analysis Period (min)		15										








c Critical Lane Group

HCM 2000 Queueing Summary

Existing Plus Project Condition PM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/30/2019

							
Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT
Lane Group Flow (vph)	16	501	254	432	388	97	38
v/c Ratio	0.12	0.46	0.59	0.21	0.42	0.44	0.08
Control Delay	33.8	20.9	31.7	9.0	7.4	26.4	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.8	20.9	31.7	9.0	7.4	26.4	9.2
Queue Length 50th (ft)	6	82	90	35	18	32	3
Queue Length 95th (ft)	24	135	#217	104	43	71	21
Internal Link Dist (ft)		537		492	298		312
Turn Bay Length (ft)	95		235				
Base Capacity (vph)	857	3264	429	2536	1311	351	710
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.15	0.59	0.17	0.30	0.28	0.05





















Intersection Summary

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 2000 Signalized Intersection Summary 2: Appian Way & Tara Hills Drive/Canyon Drive

Existing Plus Project Condition AM

10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	27	626	87	28	13	473	557	38	10	786	106
Future Volume (vph)	110	27	626	87	28	13	473	557	38	10	786	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6	4.6		5.1		4.7	5.0		4.0	5.1	5.1
Lane Util. Factor		1.00	0.88		0.95		0.97	0.95		1.00	0.95	1.00
Frbp, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1791	2787		3366		3433	3497		1770	3539	1546
Flt Permitted		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1791	2787		3366		3433	3497		1770	3539	1546
Peak-hour factor, PHF	0.91	0.91	0.91	0.75	0.75	0.75	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	121	30	688	116	37	17	514	605	41	11	836	113
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	0	0	0	66
Lane Group Flow (vph)	0	151	688	0	162	0	514	646	0	11	836	47
Confl. Peds. (#/hr)							4		6			9
Turn Type	Split	NA	pt+ov	Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4	4 5	3	3		5	2		1	6	
Permitted Phases												6
Actuated Green, G (s)		14.0	38.8		17.8		24.8	77.7		1.8	53.9	53.9
Effective Green, g (s)		14.0	38.8		17.8		24.8	77.7		1.8	53.9	53.9
Actuated g/C Ratio		0.11	0.30		0.14		0.19	0.60		0.01	0.41	0.41
Clearance Time (s)		4.6			5.1		4.7	5.0		4.0	5.1	5.1
Vehicle Extension (s)		2.5			2.0		2.0	4.5		2.0	3.0	3.0
Lane Grp Cap (vph)		192	831		460		654	2090		24	1467	640
v/s Ratio Prot		0.08	c0.25		c0.05		0.15	0.18		0.01	c0.24	
v/s Ratio Perm												0.03
v/c Ratio		0.79	0.83		0.35		0.79	0.31		0.46	0.57	0.07
Uniform Delay, d1		56.5	42.5		50.9		50.1	12.9		63.6	29.2	23.0
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		18.2	6.7		0.2		5.7	0.4		5.0	1.6	0.2
Delay (s)		74.8	49.2		51.0		55.8	13.3		68.6	30.8	23.2
Level of Service		E	D		D		E	B		E	C	C
Approach Delay (s)		53.8			51.0		32.1			30.3		
Approach LOS		D			D		C			C		
Intersection Summary												
HCM 2000 Control Delay			38.4				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			130.0				Sum of lost time (s)		19.5			
Intersection Capacity Utilization			72.0%				ICU Level of Service		C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2000 Queueing Summary
 2: Appian Way & Tara Hills Drive/Canyon Drive

Exisitng Plus Project Condition AM
 10/30/2019

	→	↘	←	↙	↑	↗	↓	↘
Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	151	688	170	514	646	11	836	113
v/c Ratio	0.79	0.83	0.36	0.79	0.30	0.09	0.57	0.16
Control Delay	83.9	39.3	49.1	58.8	13.8	58.5	33.1	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	83.9	39.3	49.1	58.8	13.8	58.5	33.1	4.8
Queue Length 50th (ft)	126	221	67	214	106	9	265	0
Queue Length 95th (ft)	#236	202	72	259	252	29	#500	37
Internal Link Dist (ft)	492		509		406		608	
Turn Bay Length (ft)				310		170		150
Base Capacity (vph)	192	986	871	842	2175	134	1468	716
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.70	0.20	0.61	0.30	0.08	0.57	0.16





















Intersection Summary

- # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

HCM 2000 Signalized Intersection Summary 2: Appian Way & Tara Hills Drive/Canyon Drive

Existing Plus Project Condition PM


10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	48	521	59	36	13	523	694	127	11	539	82
Future Volume (vph)	121	48	521	59	36	13	523	694	127	11	539	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Lane Util. Factor		1.00	0.88		0.95		0.97	0.95		1.00	0.95	1.00
Frpb, ped/bikes		1.00	1.00		1.00		1.00	0.99		1.00	1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1798	2787		3377		3433	3435		1770	3539	1534
Flt Permitted		0.97	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1798	2787		3377		3433	3435		1770	3539	1534
Peak-hour factor, PHF	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.72	0.72	0.72
Adj. Flow (vph)	136	54	585	69	42	15	568	754	138	15	749	114
RTOR Reduction (vph)	0	0	0	0	9	0	0	0	0	0	0	68
Lane Group Flow (vph)	0	190	585	0	117	0	568	892	0	15	749	46
Confl. Peds. (#/hr)							3			6		13
Confl. Bikes (#/hr)										1		1
Turn Type	Split	NA	pm+ov	Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)		18.0	46.3		17.8		28.3	82.0		3.5	56.4	56.4
Effective Green, g (s)		18.0	46.3		17.8		28.3	82.0		3.5	56.4	56.4
Actuated g/C Ratio		0.13	0.33		0.13		0.20	0.59		0.02	0.40	0.40
Clearance Time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Vehicle Extension (s)		2.5	2.0		2.0		2.0	4.5		2.0	3.0	3.0
Lane Grp Cap (vph)		231	921		429		693	2011		44	1425	617
v/s Ratio Prot		c0.11	0.13		c0.03		c0.17	0.26		0.01	c0.21	
v/s Ratio Perm			0.08									0.03
v/c Ratio		0.82	0.64		0.27		0.82	0.44		0.34	0.53	0.07
Uniform Delay, d1		59.4	39.7		55.3		53.4	16.2		67.1	31.7	25.7
Progression Factor		1.00	1.00		1.00		0.86	0.76		1.00	1.00	1.00
Incremental Delay, d2		20.1	1.1		0.1		6.5	0.6		1.7	1.4	0.2
Delay (s)		79.5	40.8		55.4		52.6	12.9		68.8	33.1	26.0
Level of Service		E	D		E		D	B		E	C	C
Approach Delay (s)		50.3			55.4		28.4			32.7		
Approach LOS		D			E		C			C		
Intersection Summary												
HCM 2000 Control Delay			35.8				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)			19.5		
Intersection Capacity Utilization			68.0%				ICU Level of Service			C		
Analysis Period (min)			15									

c Critical Lane Group

HCM 2000 Queueing Summary
 2: Applan Way & Tara Hills Drive/Canyon Drive

Existing Plus Project Condition PM
 10/30/2019

								
Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	190	585	126	568	892	15	749	114
v/c Ratio	0.82	0.64	0.29	0.82	0.43	0.14	0.53	0.17
Control Delay	86.1	26.9	51.0	55.1	13.9	65.1	35.9	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Total Delay	86.1	26.9	51.0	55.1	14.1	65.1	35.9	6.3
Queue Length 50th (ft)	168	180	52	210	98	13	263	0
Queue Length 95th (ft)	#269	135	70	315	395	30	325	19
Internal Link Dist (ft)	492		509		406		608	
Turn Bay Length (ft)				310		170		150
Base Capacity (vph)	256	1069	812	877	2071	111	1423	688
Starvation Cap Reductn	0	0	0	0	454	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.55	0.16	0.65	0.55	0.14	0.53	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

HCM 2000 Signalized Intersection Summary

Existing Plus Project Condition AM

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

10/30/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	559	6	342	182	735	0	0	853	668
Future Volume (vph)	0	0	0	559	6	342	182	735	0	0	853	668
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			0.99	
Flpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			1.00	
Frt				1.00	0.97	0.85	1.00	1.00			0.93	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1585	1504	1770	3539			3270	
Flt Permitted				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1585	1504	1770	3539			3270	
Peak-hour factor, PHF	0.25	0.25	0.25	0.89	0.89	0.89	0.98	0.98	0.98	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	628	7	384	186	750	0	0	937	734
RTOR Reduction (vph)	0	0	0	0	8	180	0	0	0	0	99	0
Lane Group Flow (vph)	0	0	0	352	340	139	186	750	0	0	1572	0
Confl. Peds. (#/hr)									3			6
Confl. Bikes (#/hr)												1
Turn Type				Perm	NA	Perm	Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8		8						
Actuated Green, G (s)				29.6	29.6	29.6	17.4	82.4			62.0	
Effective Green, g (s)				29.6	29.6	29.6	17.4	82.4			62.0	
Actuated g/C Ratio				0.25	0.25	0.25	0.14	0.69			0.52	
Clearance Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Vehicle Extension (s)				2.0	2.0	2.0	2.5	4.0			4.0	
Lane Grp Cap (vph)				414	390	370	256	2430			1689	
v/s Ratio Prot							c0.11	0.21			c0.48	
v/s Ratio Perm				0.21	0.21	0.09						
v/c Ratio				0.85	0.87	0.38	0.73	0.31			0.93	
Uniform Delay, d1				43.1	43.4	37.5	49.0	7.5			27.0	
Progression Factor				1.00	1.00	1.00	1.12	1.20			1.00	
Incremental Delay, d2				14.8	18.4	0.2	8.3	0.3			10.7	
Delay (s)				57.9	61.8	37.8	63.2	9.3			37.7	
Level of Service				E	E	D	E	A			D	
Approach Delay (s)		0.0			52.9			20.0			37.7	
Approach LOS		A			D			B			D	
Intersection Summary												
HCM 2000 Control Delay			37.4	HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			120.0	Sum of lost time (s)						11.0		
Intersection Capacity Utilization			84.5%	ICU Level of Service						E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2000 Queueing Summary

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

Exisitng Plus Project Condition AM

10/30/2019



Lane Group	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	352	348	319	186	750	1671
v/c Ratio	0.85	0.87	0.58	0.73	0.31	0.93
Control Delay	61.8	64.2	14.3	68.9	10.0	36.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	44.8
Total Delay	61.8	64.2	14.3	68.9	10.0	80.9
Queue Length 50th (ft)	267	270	50	147	143	587
Queue Length 95th (ft)	374	#389	138	219	178	#867
Internal Link Dist (ft)		673			371	406
Turn Bay Length (ft)	230		230	310		
Base Capacity (vph)	476	456	597	354	2430	1788
Starvation Cap Reductn	0	0	0	0	0	275
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.76	0.53	0.53	0.31	1.10




















Intersection Summary


- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM 2000 Signalized Intersection Summary
 3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

Existing Plus Project Condition PM

10/30/2019



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	578	2	283	161	1058	0	0	657	478
Future Volume (vph)	0	0	0	578	2	283	161	1058	0	0	657	478
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			0.98	
Flpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			1.00	
Frt				1.00	0.99	0.85	1.00	1.00			0.94	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1599	1504	1770	3539			3237	
Flt Permitted				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1599	1504	1770	3539			3237	
Peak-hour factor, PHF	0.25	0.25	0.25	0.88	0.88	0.88	0.95	0.95	0.95	0.86	0.86	0.86
Adj. Flow (vph)	0	0	0	657	2	322	169	1114	0	0	764	556
RTOR Reduction (vph)	0	0	0	0	3	81	0	0	0	0	69	0
Lane Group Flow (vph)	0	0	0	348	340	209	169	1114	0	0	1251	0
Confl. Peds. (#/hr)									4			18
Confl. Bikes (#/hr)									1			1
Turn Type				Perm	NA	Perm	Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8		8						
Actuated Green, G (s)				34.6	34.6	34.6	18.3	97.4			76.1	
Effective Green, g (s)				34.6	34.6	34.6	18.3	97.4			76.1	
Actuated g/C Ratio				0.25	0.25	0.25	0.13	0.70			0.54	
Clearance Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Vehicle Extension (s)				2.0	2.0	2.0	2.5	4.0			4.0	
Lane Grp Cap (vph)				415	395	371	231	2462			1759	
v/s Ratio Prot							c0.10	0.31			c0.39	
v/s Ratio Perm				0.21	0.21	0.14						
v/c Ratio				0.84	0.86	0.56	0.73	0.45			0.71	
Uniform Delay, d1				50.0	50.4	46.1	58.5	9.5			23.8	
Progression Factor				1.00	1.00	1.00	1.04	1.11			0.91	
Incremental Delay, d2				13.2	16.6	1.2	9.1	0.5			2.2	
Delay (s)				63.3	67.0	47.2	69.8	11.0			23.7	
Level of Service				E	E	D	E	B			C	
Approach Delay (s)		0.0			59.9			18.7			23.7	
Approach LOS		A			E			B			C	
Intersection Summary												
HCM 2000 Control Delay			31.8	HCM 2000 Level of Service					C			
HCM 2000 Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			140.0	Sum of lost time (s)					11.0			
Intersection Capacity Utilization			72.1%	ICU Level of Service					C			
Analysis Period (min)			15									
c Critical Lane Group												

						
Lane Group	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	348	343	290	169	1114	1320
v/c Ratio	0.84	0.86	0.64	0.73	0.45	0.72
Control Delay	67.3	70.1	34.7	75.8	12.0	23.4
Queue Delay	0.0	0.0	0.0	0.0	0.4	0.1
Total Delay	67.3	70.1	34.7	75.8	12.3	23.5
Queue Length 50th (ft)	315	323	155	153	244	298
Queue Length 95th (ft)	406	417	238	230	315	276
Internal Link Dist (ft)		673			371	406
Turn Bay Length (ft)	230		230	310		
Base Capacity (vph)	504	482	526	429	2461	1829
Starvation Cap Reductn	0	0	0	0	705	56
Spillback Cap Reductn	0	0	1	0	61	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.71	0.55	0.39	0.63	0.74
Intersection Summary						

HCM 2000 Signalized Intersection Summary 4: Appian Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

Exisitng Plus Project Condition AM

10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	381	0	131	0	0	0	0	536	564	0	1110	0
Future Volume (vph)	381	0	131	0	0	0	0	536	564	0	1110	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91	0.91		0.95	
Frbp, ped/bikes	1.00	1.00	1.00					1.00	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00	1.00		1.00	
Frt	1.00	0.99	0.85					0.96	0.85		1.00	
Flt Protected	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1681	1603	1504					3225	1419		3539	
Flt Permitted	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1681	1603	1504					3225	1419		3539	
Peak-hour factor, PHF	0.83	0.83	0.83	0.25	0.25	0.25	0.98	0.98	0.98	0.95	0.95	0.95
Adj. Flow (vph)	459	0	158	0	0	0	0	547	576	0	1168	0
RTOR Reduction (vph)	0	14	83	0	0	0	0	70	115	0	0	0
Lane Group Flow (vph)	239	222	59	0	0	0	0	707	231	0	1168	0
Confl. Peds. (#/hr)									3			7
Confl. Bikes (#/hr)												1
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2			
Actuated Green, G (s)	12.0	12.0	12.0					40.0	40.0		40.0	
Effective Green, g (s)	12.0	12.0	12.0					40.0	40.0		40.0	
Actuated g/C Ratio	0.20	0.20	0.20					0.67	0.67		0.67	
Clearance Time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Vehicle Extension (s)	2.0	2.0	2.0					4.0	4.0		4.0	
Lane Grp Cap (vph)	336	320	300					2150	946		2359	
v/s Ratio Prot								0.22			c0.33	
v/s Ratio Perm	c0.14	0.14	0.04						0.16			
v/c Ratio	0.71	0.69	0.20					0.33	0.24		0.50	
Uniform Delay, d1	22.4	22.3	20.0					4.3	4.0		5.0	
Progression Factor	1.00	1.00	1.00					1.00	1.00		0.63	
Incremental Delay, d2	5.8	5.2	0.1					0.4	0.6		0.4	
Delay (s)	28.2	27.4	20.1					4.7	4.6		3.5	
Level of Service	C	C	C					A	A		A	
Approach Delay (s)		26.0			0.0			4.7			3.5	
Approach LOS		C			A			A			A	

Intersection Summary

HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM 2000 Queueing Summary

Exisitng Plus Project Condition AM

4: Appian Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

10/30/2019



Lane Group	EBL	EBT	EBR	NBT	NBR	SBT
Lane Group Flow (vph)	239	236	142	777	346	1168
v/c Ratio	0.71	0.70	0.37	0.35	0.33	0.50
Control Delay	35.8	33.6	10.5	3.8	1.5	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	33.6	10.5	3.8	1.5	3.7
Queue Length 50th (ft)	83	79	11	40	0	110
Queue Length 95th (ft)	#158	#158	47	57	21	m133
Internal Link Dist (ft)		752		715		57
Turn Bay Length (ft)	380		185			
Base Capacity (vph)	365	362	408	2271	1079	2418
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.65	0.35	0.34	0.32	0.48

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.




















Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 2000 Signalized Intersection Summary 4: Appian Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

Existing Plus Project Condition PM

10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	331	22	101	0	0	0	0	938	1094	0	1014	0
Future Volume (vph)	331	22	101	0	0	0	0	938	1094	0	1014	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91	0.91		0.95	
Frpb, ped/bikes	1.00	1.00	1.00					0.99	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00	1.00		1.00	
Frt	1.00	0.99	0.85					0.95	0.85		1.00	
Flt Protected	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1681	1615	1504					3206	1418		3539	
Flt Permitted	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1681	1615	1504					3206	1418		3539	
Peak-hour factor, PHF	0.98	0.98	0.98	0.25	0.25	0.25	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	338	22	103	0	0	0	0	998	1164	0	1102	0
RTOR Reduction (vph)	0	3	72	0	0	0	0	53	195	0	0	0
Lane Group Flow (vph)	186	181	21	0	0	0	0	1434	480	0	1102	0
Confl. Peds. (#/hr)									3			7
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2			
Actuated Green, G (s)	12.2	12.2	12.2					49.8	49.8		49.8	
Effective Green, g (s)	12.2	12.2	12.2					49.8	49.8		49.8	
Actuated g/C Ratio	0.17	0.17	0.17					0.71	0.71		0.71	
Clearance Time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Vehicle Extension (s)	2.0	2.0	2.0					4.0	4.0		4.0	
Lane Grp Cap (vph)	292	281	262					2280	1008		2517	
v/s Ratio Prot								c0.45			0.31	
v/s Ratio Perm	0.11	0.11	0.01						0.34			
v/c Ratio	0.64	0.64	0.08					0.63	0.48		0.44	
Uniform Delay, d1	26.8	26.9	24.2					5.3	4.4		4.2	
Progression Factor	1.00	1.00	1.00					1.00	1.00		0.42	
Incremental Delay, d2	3.3	3.7	0.0					1.3	1.6		0.4	
Delay (s)	30.2	30.6	24.3					6.6	6.0		2.2	
Level of Service	C	C	C					A	A		A	
Approach Delay (s)		29.2			0.0			6.4			2.2	
Approach LOS		C			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		8.0		HCM 2000 Level of Service				A				
HCM 2000 Volume to Capacity ratio		0.63										
Actuated Cycle Length (s)		70.0		Sum of lost time (s)				8.0				
Intersection Capacity Utilization		101.3%		ICU Level of Service				G				
Analysis Period (min)		15										
c Critical Lane Group												

HCM 2000 Queueing Summary

Existing Plus Project Condition PM

4: Aprian Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

10/30/2019

Lane Group	EBL	EBT	EBR	NBT	NBR	SBT
Lane Group Flow (vph)	186	184	93	1487	675	1102
v/c Ratio	0.64	0.65	0.28	0.64	0.56	0.44
Control Delay	36.1	36.3	8.7	6.7	2.5	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.1	36.3	8.7	6.7	2.5	2.4
Queue Length 50th (ft)	78	80	2	124	0	20
Queue Length 95th (ft)	130	134	35	246	36	157
Internal Link Dist (ft)		752		715		57
Turn Bay Length (ft)	380		185			
Base Capacity (vph)	504	487	512	2335	1203	2517
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.38	0.18	0.64	0.56	0.44
Intersection Summary						

Appendix D

Growth Rate Calculation

Volume on Appian Way between	Year	AM	PM	AM Growth Rate	PM Growth Rate
Tara Hills Drive and I-80 WB Ramps	2018 2040	3221 3421	3548 3658	0.3%	0.1%
I-80 WB Ramps and I-80 EB Ramps	2018 2040	3064 3264	3217 3509	0.3%	0.4%
I-80 EB Ramps and Fitzgerald Way	2018 2040	3110 3408	3284 3552	0.4%	0.4%
Fitzgerald Drive and Michael Drive	2018 2040	2754 3108	2866 3159	0.6%	0.4%
Average Growth Rate				0.38%	0.33%




















Appendix E
Cumulative Condition LOS

HCM 2000 Signalized Intersection Summary

Cumulative Condition AM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/21/2019


												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	650	14	84	388	115	29	5	68	78	3	34
Future Volume (vph)	34	650	14	84	388	115	29	5	68	78	3	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97			0.90		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3526		1770	3402			3136		1770	1584	
Flt Permitted	0.95	1.00		0.95	1.00			0.88		0.67	1.00	
Satd. Flow (perm)	1770	3526		1770	3402			2794		1248	1584	
Peak-hour factor, PHF	0.79	0.79	0.79	0.75	0.75	0.75	0.79	0.79	0.79	0.85	0.85	0.85
Adj. Flow (vph)	43	823	18	112	517	153	37	6	86	92	4	40
RTOR Reduction (vph)	0	2	0	0	18	0	0	68	0	0	32	0
Lane Group Flow (vph)	43	839	0	112	652	0	0	61	0	92	12	0
Confl. Peds. (#/hr)			4			8	5					5
Confl. Bikes (#/hr)			1									
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	3.8	27.3		8.1	31.6			12.3		12.3	12.3	
Effective Green, g (s)	3.8	27.3		8.1	31.6			12.3		12.3	12.3	
Actuated g/C Ratio	0.06	0.46		0.14	0.53			0.21		0.21	0.21	
Clearance Time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	112	1612		240	1800			575		257	326	
v/s Ratio Prot	0.02	c0.24		c0.06	0.19						0.01	
v/s Ratio Perm								0.02		c0.07		
v/c Ratio	0.38	0.52		0.47	0.36			0.11		0.36	0.04	
Uniform Delay, d1	26.8	11.5		23.8	8.2			19.2		20.3	19.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.4		1.4	0.2			0.1		1.2	0.1	
Delay (s)	27.6	11.9		25.2	8.4			19.3		21.5	19.0	
Level of Service	C	B		C	A			B		C	B	
Approach Delay (s)		12.7			10.8			19.3			20.7	
Approach LOS		B			B			B			C	
Intersection Summary												
HCM 2000 Control Delay		12.9			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.47										
Actuated Cycle Length (s)		59.7			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		45.1%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM 2000 Signalized Intersection Summary

Cumulative Condition PM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↶↷		↰	↶↷			↶↷		↰	↶↷	
Traffic Volume (vph)	14	410	30	180	384	39	83	10	185	90	8	26
Future Volume (vph)	14	410	30	180	384	39	83	10	185	90	8	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99			0.90		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3498		1770	3486			3137		1770	1630	
Flt Permitted	0.95	1.00		0.95	1.00			0.85		0.51	1.00	
Satd. Flow (perm)	1770	3498		1770	3486			2714		952	1630	
Peak-hour factor, PHF	0.83	0.83	0.83	0.90	0.90	0.90	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	17	494	36	200	427	43	98	12	218	105	9	30
RTOR Reduction (vph)	0	6	0	0	5	0	0	163	0	0	22	0
Lane Group Flow (vph)	17	524	0	200	465	0	0	165	0	105	17	0
Confl. Peds. (#/hr)			1			1	2					2
Confl. Bikes (#/hr)			1			1						
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	1.1	24.2		13.7	36.8			16.8		16.8	16.8	
Effective Green, g (s)	1.1	24.2		13.7	36.8			16.8		16.8	16.8	
Actuated g/C Ratio	0.02	0.36		0.21	0.55			0.25		0.25	0.25	
Clearance Time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	29	1269		363	1923			683		239	410	
v/s Ratio Prot	0.01	c0.15		c0.11	0.13						0.01	
v/s Ratio Perm								0.06		c0.11		
v/c Ratio	0.59	0.41		0.55	0.24			0.24		0.44	0.04	
Uniform Delay, d1	32.6	15.9		23.7	7.7			19.9		21.0	18.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	18.0	0.3		1.8	0.1			0.3		1.8	0.1	
Delay (s)	50.5	16.2		25.6	7.8			20.1		22.7	18.9	
Level of Service	D	B		C	A			C		C	B	
Approach Delay (s)		17.3			13.1			20.1			21.7	
Approach LOS		B			B			C			C	
Intersection Summary												
HCM 2000 Control Delay		16.6			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.45										
Actuated Cycle Length (s)		66.7			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		54.7%			ICU Level of Service			A				
Analysis Period (min)		15										

c Critical Lane Group

HCM 2000 Signalized Intersection Summary 2: Appian Way & Tara Hills Drive/Canyon Drive


Cumulative Condition AM
10/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔↔		↔↔		↔↔	↔↔		↔	↔↔	↔
Traffic Volume (vph)	107	24	661	95	25	14	494	605	41	11	854	102
Future Volume (vph)	107	24	661	95	25	14	494	605	41	11	854	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Lane Util. Factor		1.00	0.88		0.95		0.97	0.95		1.00	0.95	1.00
Frbp, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1789	2787		3358		3433	3496		1770	3539	1546
Flt Permitted		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1789	2787		3358		3433	3496		1770	3539	1546
Peak-hour factor, PHF	0.91	0.91	0.91	0.75	0.75	0.75	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	118	26	726	127	33	19	537	658	45	12	909	109
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	0	0	0	64
Lane Group Flow (vph)	0	144	726	0	171	0	537	703	0	12	909	45
Confl. Peds. (#/hr)						4			6			9
Turn Type	Split	NA	pm+ov	Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)		13.7	39.4		17.8		25.7	76.2		3.6	53.3	53.3
Effective Green, g (s)		13.7	39.4		17.8		25.7	76.2		3.6	53.3	53.3
Actuated g/C Ratio		0.11	0.30		0.14		0.20	0.59		0.03	0.41	0.41
Clearance Time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Vehicle Extension (s)		2.5	2.0		2.0		2.0	4.5		2.0	3.0	3.0
Lane Grp Cap (vph)		188	844		459		678	2049		49	1450	633
v/s Ratio Prot		0.08	c0.17		c0.05		0.16	0.20		0.01	c0.26	
v/s Ratio Perm			0.09									0.03
v/c Ratio		0.77	0.86		0.37		0.79	0.34		0.24	0.63	0.07
Uniform Delay, d1		56.6	42.7		51.0		49.6	13.9		61.9	30.5	23.3
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		16.2	8.6		0.2		5.9	0.5		1.0	2.1	0.2
Delay (s)		72.8	51.3		51.2		55.5	14.4		62.8	32.5	23.5
Level of Service		E	D		D		E	B		E	C	C
Approach Delay (s)		54.9			51.2		32.2			31.9		
Approach LOS		D			D		C			C		
Intersection Summary												
HCM 2000 Control Delay		39.1			HCM 2000 Level of Service		D					
HCM 2000 Volume to Capacity ratio		0.67										
Actuated Cycle Length (s)		130.0			Sum of lost time (s)		19.5					
Intersection Capacity Utilization		73.4%			ICU Level of Service		D					
Analysis Period (min)		15										
c Critical Lane Group												

HCM 2000 Signalized Intersection Summary 2: Appian Way & Tara Hills Drive/Canyon Drive

Cumulative Condition PM

10/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔↔		↔↔		↔↔	↔↔		↔	↔↔	↔
Traffic Volume (vph)	109	45	529	64	30	14	532	754	138	12	586	66
Future Volume (vph)	109	45	529	64	30	14	532	754	138	12	586	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Lane Util. Factor		1.00	0.88		0.95		0.97	0.95		1.00	0.95	1.00
Frbp, ped/bikes		1.00	1.00		1.00		1.00	0.99		1.00	1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1799	2787		3365		3433	3435		1770	3539	1534
Flt Permitted		0.97	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1799	2787		3365		3433	3435		1770	3539	1534
Peak-hour factor, PHF	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.72	0.72	0.72
Adj. Flow (vph)	122	51	594	74	35	16	578	820	150	17	814	92
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	55
Lane Group Flow (vph)	0	173	594	0	115	0	578	970	0	17	814	37
Confl. Peds. (#/hr)							3			6		13
Confl. Bikes (#/hr)									1			1
Turn Type	Split	NA	pm+ov	Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)		17.4	46.1		17.8		28.7	82.6		3.5	56.6	56.6
Effective Green, g (s)		17.4	46.1		17.8		28.7	82.6		3.5	56.6	56.6
Actuated g/C Ratio		0.12	0.33		0.13		0.20	0.59		0.02	0.40	0.40
Clearance Time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Vehicle Extension (s)		2.5	2.0		2.0		2.0	4.5		2.0	3.0	3.0
Lane Grp Cap (vph)		223	917		427		703	2026		44	1430	620
v/s Ratio Prot		c0.10	0.13		c0.03		c0.17	0.28		0.01	c0.23	
v/s Ratio Perm			0.08									0.02
v/c Ratio		0.78	0.65		0.27		0.82	0.48		0.39	0.57	0.06
Uniform Delay, d1		59.4	40.0		55.2		53.2	16.4		67.2	32.3	25.5
Progression Factor		1.00	1.00		1.00		0.88	0.77		1.00	1.00	1.00
Incremental Delay, d2		14.9	1.2		0.1		6.5	0.7		2.0	1.6	0.2
Delay (s)		74.3	41.2		55.4		53.4	13.4		69.2	33.9	25.6
Level of Service		E	D		E		D	B		E	C	C
Approach Delay (s)		48.7			55.4		28.3			33.7		
Approach LOS		D			E		C			C		
Intersection Summary												
HCM 2000 Control Delay			35.5			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)				19.5		
Intersection Capacity Utilization			68.3%			ICU Level of Service				C		
Analysis Period (min)			15									



















c Critical Lane Group

HCM 2000 Signalized Intersection Summary

Cumulative Condition AM

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

10/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	608	7	363	198	787	0	0	915	719
Future Volume (vph)	0	0	0	608	7	363	198	787	0	0	915	719
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			0.99	
Flpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			1.00	
Frt				1.00	0.97	0.85	1.00	1.00			0.93	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1587	1504	1770	3539			3269	
Flt Permitted				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1587	1504	1770	3539			3269	
Peak-hour factor, PHF	0.25	0.25	0.25	0.89	0.89	0.89	0.98	0.98	0.98	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	683	8	408	202	803	0	0	1005	790
RTOR Reduction (vph)	0	0	0	0	7	158	0	0	0	0	103	0
Lane Group Flow (vph)	0	0	0	382	367	185	202	803	0	0	1692	0
Confl. Peds. (#/hr)									3			6
Confl. Bikes (#/hr)												1
Turn Type				Perm	NA	Perm	Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8		8						
Actuated Green, G (s)				31.2	31.2	31.2	18.2	80.8			59.6	
Effective Green, g (s)				31.2	31.2	31.2	18.2	80.8			59.6	
Actuated g/C Ratio				0.26	0.26	0.26	0.15	0.67			0.50	
Clearance Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Vehicle Extension (s)				2.0	2.0	2.0	2.5	4.0			4.0	
Lane Grp Cap (vph)				437	412	391	268	2382			1623	
v/s Ratio Prot							c0.11	0.23			c0.52	
v/s Ratio Perm				0.23	0.23	0.12						
v/c Ratio				0.87	0.89	0.47	0.75	0.34			1.04	
Uniform Delay, d1				42.5	42.8	37.5	48.8	8.3			30.2	
Progression Factor				1.00	1.00	1.00	1.11	1.21			1.00	
Incremental Delay, d2				16.9	20.3	0.3	9.5	0.3			34.3	
Delay (s)				59.4	63.1	37.8	63.7	10.4			64.5	
Level of Service				E	E	D	E	B			E	
Approach Delay (s)		0.0			53.9			21.1			64.5	
Approach LOS		A			D			C			E	
Intersection Summary												
HCM 2000 Control Delay			50.3	HCM 2000 Level of Service				D				
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			120.0	Sum of lost time (s)				11.0				
Intersection Capacity Utilization			90.3%	ICU Level of Service				E				
Analysis Period (min)			15									
c Critical Lane Group												

c Critical Lane Group

HCM 2000 Signalized Intersection Summary

Cumulative Condition PM

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

10/21/2019



















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	628	2	293	175	1127	0	0	691	505
Future Volume (vph)	0	0	0	628	2	293	175	1127	0	0	691	505
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			0.98	
Flpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			1.00	
Frt				1.00	0.99	0.85	1.00	1.00			0.94	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1600	1504	1770	3539			3237	
Flt Permitted				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1600	1504	1770	3539			3237	
Peak-hour factor, PHF	0.25	0.25	0.25	0.88	0.88	0.88	0.95	0.95	0.95	0.86	0.86	0.86
Adj. Flow (vph)	0	0	0	714	2	333	184	1186	0	0	803	587
RTOR Reduction (vph)	0	0	0	0	3	69	0	0	0	0	73	0
Lane Group Flow (vph)	0	0	0	378	368	231	184	1186	0	0	1317	0
Confl. Peds. (#/hr)									4			18
Confl. Bikes (#/hr)									1			1
Turn Type				Perm	NA	Perm	Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8		8						
Actuated Green, G (s)				36.7	36.7	36.7	19.4	95.3			72.9	
Effective Green, g (s)				36.7	36.7	36.7	19.4	95.3			72.9	
Actuated g/C Ratio				0.26	0.26	0.26	0.14	0.68			0.52	
Clearance Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Vehicle Extension (s)				2.0	2.0	2.0	2.5	4.0			4.0	
Lane Grp Cap (vph)				440	419	394	245	2409			1685	
v/s Ratio Prot							c0.10	0.34			c0.41	
v/s Ratio Perm				0.22	0.23	0.15						
v/c Ratio				0.86	0.88	0.59	0.75	0.49			0.78	
Uniform Delay, d1				49.2	49.5	45.0	58.0	10.7			27.1	
Progression Factor				1.00	1.00	1.00	1.03	1.03			0.88	
Incremental Delay, d2				14.8	17.9	1.4	9.5	0.6			3.1	
Delay (s)				64.0	67.4	46.5	69.2	11.7			27.1	
Level of Service				E	E	D	E	B			C	
Approach Delay (s)		0.0			60.2			19.4			27.1	
Approach LOS		A			E			B			C	
Intersection Summary												
HCM 2000 Control Delay			33.4	HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			140.0	Sum of lost time (s)						11.0		
Intersection Capacity Utilization			76.2%	ICU Level of Service						D		
Analysis Period (min)			15									

c Critical Lane Group

HCM 2000 Signalized Intersection Summary 4: Appian Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

Cumulative Condition AM

10/21/2019



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	409	0	142	0	0	0	0	576	613	0	1200	0
Future Volume (vph)	409	0	142	0	0	0	0	576	613	0	1200	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91	0.91		0.95	
Frpb, ped/bikes	1.00	1.00	1.00					1.00	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00	1.00		1.00	
Frt	1.00	0.99	0.85					0.96	0.85		1.00	
Flt Protected	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1681	1603	1504					3224	1419		3539	
Flt Permitted	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1681	1603	1504					3224	1419		3539	
Peak-hour factor, PHF	0.83	0.83	0.83	0.25	0.25	0.25	0.98	0.98	0.98	0.95	0.95	0.95
Adj. Flow (vph)	493	0	171	0	0	0	0	588	626	0	1263	0
RTOR Reduction (vph)	0	14	68	0	0	0	0	72	127	0	0	0
Lane Group Flow (vph)	256	240	86	0	0	0	0	766	249	0	1263	0
Confl. Peds. (#/hr)									3			7
Confl. Bikes (#/hr)												1
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2			
Actuated Green, G (s)	12.2	12.2	12.2					39.8	39.8		39.8	
Effective Green, g (s)	12.2	12.2	12.2					39.8	39.8		39.8	
Actuated g/C Ratio	0.20	0.20	0.20					0.66	0.66		0.66	
Clearance Time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Vehicle Extension (s)	2.0	2.0	2.0					4.0	4.0		4.0	
Lane Grp Cap (vph)	341	325	305					2138	941		2347	
v/s Ratio Prot								0.24			c0.36	
v/s Ratio Perm	c0.15	0.15	0.06						0.18			
v/c Ratio	0.75	0.74	0.28					0.36	0.27		0.54	
Uniform Delay, d1	22.5	22.4	20.2					4.5	4.1		5.3	
Progression Factor	1.00	1.00	1.00					1.00	1.00		0.68	
Incremental Delay, d2	8.0	7.3	0.2					0.5	0.7		0.3	
Delay (s)	30.5	29.7	20.4					4.9	4.8		3.9	
Level of Service	C	C	C					A	A		A	
Approach Delay (s)		27.9			0.0			4.9			3.9	
Approach LOS		C			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		9.3		HCM 2000 Level of Service				A				
HCM 2000 Volume to Capacity ratio		0.59										
Actuated Cycle Length (s)		60.0		Sum of lost time (s)				8.0				
Intersection Capacity Utilization		92.1%		ICU Level of Service				F				
Analysis Period (min)		15										
c Critical Lane Group												

c Critical Lane Group

HCM 2000 Signalized Intersection Summary 4: Applan Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

Cumulative Condition PM

10/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	350	24	110	0	0	0	0	1007	1189	0	1089	0
Future Volume (vph)	350	24	110	0	0	0	0	1007	1189	0	1089	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91	0.91		0.95	
Frpb, ped/bikes	1.00	1.00	0.99					0.99	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00	1.00		1.00	
Frt	1.00	0.99	0.85					0.95	0.85		1.00	
Flt Protected	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1681	1613	1484					3202	1418		3539	
Flt Permitted	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1681	1613	1484					3202	1418		3539	
Peak-hour factor, PHF	0.98	0.98	0.98	0.25	0.25	0.25	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	357	24	112	0	0	0	0	1071	1265	0	1184	0
RTOR Reduction (vph)	0	3	58	0	0	0	0	58	213	0	0	0
Lane Group Flow (vph)	196	193	43	0	0	0	0	1557	508	0	1184	0
Confl. Peds. (#/hr)			1						3		7	
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2			
Actuated Green, G (s)	12.7	12.7	12.7					49.3	49.3		49.3	
Effective Green, g (s)	12.7	12.7	12.7					49.3	49.3		49.3	
Actuated g/C Ratio	0.18	0.18	0.18					0.70	0.70		0.70	
Clearance Time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Vehicle Extension (s)	2.0	2.0	2.0					4.0	4.0		4.0	
Lane Grp Cap (vph)	304	292	269					2255	998		2492	
v/s Ratio Prot								c0.49			0.33	
v/s Ratio Perm	0.12	0.12	0.03						0.36			
v/c Ratio	0.64	0.66	0.16					0.69	0.51		0.48	
Uniform Delay, d1	26.6	26.6	24.2					6.0	4.8		4.6	
Progression Factor	1.00	1.00	1.00					1.00	1.00		0.48	
Incremental Delay, d2	3.5	4.3	0.1					1.8	1.9		0.4	
Delay (s)	30.1	30.9	24.3					7.7	6.6		2.6	
Level of Service	C	C	C					A	A		A	
Approach Delay (s)		29.2			0.0			7.4			2.6	
Approach LOS		C			A			A			A	
Intersection Summary												
HCM 2000 Control Delay		8.7		HCM 2000 Level of Service				A				
HCM 2000 Volume to Capacity ratio		0.68										
Actuated Cycle Length (s)		70.0		Sum of lost time (s)				8.0				
Intersection Capacity Utilization		108.3%		ICU Level of Service				G				
Analysis Period (min)		15										
c Critical Lane Group												




















Appendix F
Cumulative Plus Project Condition LOS

HCM 2000 Signalized Intersection Summary

Cumulative Plus Project Condition AM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive

10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	650	21	120	388	115	36	6	102	78	4	34
Future Volume (vph)	34	650	21	120	388	115	36	6	102	78	4	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97			0.89		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3519		1770	3401			3122		1770	1589	
Flt Permitted	0.95	1.00		0.95	1.00			0.88		0.64	1.00	
Satd. Flow (perm)	1770	3519		1770	3401			2782		1186	1589	
Peak-hour factor, PHF	0.79	0.79	0.79	0.75	0.75	0.75	0.79	0.79	0.79	0.85	0.85	0.85
Adj. Flow (vph)	43	823	27	160	517	153	46	8	129	92	5	40
RTOR Reduction (vph)	0	2	0	0	17	0	0	103	0	0	32	0
Lane Group Flow (vph)	43	848	0	160	653	0	0	80	0	92	13	0
Confl. Peds. (#/hr)			4			8	5					5
Confl. Bikes (#/hr)			1									
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	4.0	29.0		12.1	37.1			13.5		13.5	13.5	
Effective Green, g (s)	4.0	29.0		12.1	37.1			13.5		13.5	13.5	
Actuated g/C Ratio	0.06	0.44		0.18	0.56			0.20		0.20	0.20	
Clearance Time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	106	1532		321	1894			563		240	322	
v/s Ratio Prot	0.02	c0.24		c0.09	0.19						0.01	
v/s Ratio Perm							0.03			c0.08		
v/c Ratio	0.41	0.55		0.50	0.34		0.14			0.38	0.04	
Uniform Delay, d1	30.2	14.0		24.5	8.1		21.8			23.0	21.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00			1.00	1.00	
Incremental Delay, d2	0.9	0.5		1.2	0.2		0.2			1.4	0.1	
Delay (s)	31.1	14.5		25.7	8.2		22.0			24.3	21.4	
Level of Service	C	B		C	A		C			C	C	
Approach Delay (s)		15.3			11.6		22.0				23.4	
Approach LOS		B			B		C				C	

Intersection Summary

HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	66.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		




















c Critical Lane Group

HCM 2000 Signalized Intersection Summary

Cumulative Plus Project Condition PM

1: Safeway Driveway/Parking Lot Driveway & Tara Hills Drive


10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	410	41	243	384	39	94	12	247	90	10	26
Future Volume (vph)	14	410	41	243	384	39	94	12	247	90	10	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99			0.90		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	3484		1770	3486			3124		1770	1646	
Flt Permitted	0.95	1.00		0.95	1.00			0.86		0.43	1.00	
Satd. Flow (perm)	1770	3484		1770	3486			2715		799	1646	
Peak-hour factor, PHF	0.83	0.83	0.83	0.90	0.90	0.90	0.85	0.85	0.85	0.86	0.86	0.86
Adj. Flow (vph)	17	494	49	270	427	43	111	14	291	105	12	30
RTOR Reduction (vph)	0	9	0	0	5	0	0	208	0	0	21	0
Lane Group Flow (vph)	17	534	0	270	465	0	0	208	0	105	21	0
Confl. Peds. (#/hr)			1			1	2					2
Confl. Bikes (#/hr)			1			1						
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		
Actuated Green, G (s)	1.2	24.0		16.2	39.0			20.7		20.7	20.7	
Effective Green, g (s)	1.2	24.0		16.2	39.0			20.7		20.7	20.7	
Actuated g/C Ratio	0.02	0.33		0.22	0.53			0.28		0.28	0.28	
Clearance Time (s)	3.5	4.5		3.5	4.5			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	29	1146		393	1864			770		226	467	
v/s Ratio Prot	0.01	c0.15		c0.15	0.13						0.01	
v/s Ratio Perm								0.08		c0.13		
v/c Ratio	0.59	0.47		0.69	0.25			0.27		0.46	0.04	
Uniform Delay, d1	35.6	19.4		26.0	9.1			20.2		21.5	18.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	18.0	0.4		4.9	0.1			0.3		2.1	0.1	
Delay (s)	53.6	19.8		31.0	9.2			20.5		23.6	19.0	
Level of Service	D	B		C	A			C		C	B	
Approach Delay (s)		20.8			17.1			20.5			22.3	
Approach LOS		C			B			C			C	
Intersection Summary												
HCM 2000 Control Delay		19.4										
HCM 2000 Volume to Capacity ratio		0.52										
Actuated Cycle Length (s)		72.9							12.0			
Intersection Capacity Utilization		60.6%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM 2000 Signalized Intersection Summary 2: Appian Way & Tara Hills Drive/Canyon Drive

Cumulative Plus Project Condition AM

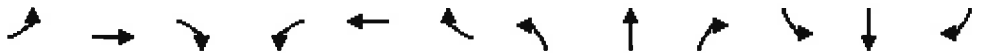
10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔		↔	↔		↔	↔	↔
Traffic Volume (vph)	119	29	679	95	30	14	513	605	41	11	854	114
Future Volume (vph)	119	29	679	95	30	14	513	605	41	11	854	114
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Lane Util. Factor		1.00	0.88		0.95		0.97	0.95		1.00	0.95	1.00
Frbp, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1791	2787		3364		3433	3496		1770	3539	1546
Flt Permitted		0.96	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1791	2787		3364		3433	3496		1770	3539	1546
Peak-hour factor, PHF	0.91	0.91	0.91	0.75	0.75	0.75	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	131	32	746	127	40	19	558	658	45	12	909	121
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	0	0	0	72
Lane Group Flow (vph)	0	163	746	0	178	0	558	703	0	12	909	49
Confl. Peds. (#/hr)							4			6		9
Turn Type	Split	NA	pm+ov	Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)		13.8	40.2		17.8		26.4	76.1		3.6	52.5	52.5
Effective Green, g (s)		13.8	40.2		17.8		26.4	76.1		3.6	52.5	52.5
Actuated g/C Ratio		0.11	0.31		0.14		0.20	0.59		0.03	0.40	0.40
Clearance Time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Vehicle Extension (s)		2.5	2.0		2.0		2.0	4.5		2.0	3.0	3.0
Lane Grp Cap (vph)		190	861		460		697	2046		49	1429	624
v/s Ratio Prot		0.09	c0.18		c0.05		0.16	0.20		0.01	c0.26	
v/s Ratio Perm			0.09									0.03
v/c Ratio		0.86	0.87		0.39		0.80	0.34		0.24	0.64	0.08
Uniform Delay, d1		57.1	42.4		51.1		49.3	14.0		61.9	31.1	23.9
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		29.4	8.8		0.2		6.2	0.5		1.0	2.2	0.2
Delay (s)		86.5	51.2		51.3		55.5	14.4		62.8	33.3	24.1
Level of Service		F	D		D		E	B		E	C	C
Approach Delay (s)		57.5			51.3			32.6			32.5	
Approach LOS		E			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			40.3				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			130.0				Sum of lost time (s)			19.5		
Intersection Capacity Utilization			74.0%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2000 Signalized Intersection Summary 2: Appian Way & Tara Hills Drive/Canyon Drive

Cumulative Plus Project Condition PM

10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔		↔	↔		↔	↔	↔
Traffic Volume (vph)	130	52	560	64	38	14	566	754	138	12	586	87
Future Volume (vph)	130	52	560	64	38	14	566	754	138	12	586	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Lane Util. Factor		1.00	0.88		0.95		0.97	0.95		1.00	0.95	1.00
Frbp, ped/bikes		1.00	1.00		1.00		1.00	0.99		1.00	1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1798	2787		3376		3433	3435		1770	3539	1534
Flt Permitted		0.97	1.00		0.97		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1798	2787		3376		3433	3435		1770	3539	1534
Peak-hour factor, PHF	0.89	0.89	0.89	0.86	0.86	0.86	0.92	0.92	0.92	0.72	0.72	0.72
Adj. Flow (vph)	146	58	629	74	44	16	615	820	150	17	814	121
RTOR Reduction (vph)	0	0	0	0	9	0	0	0	0	0	0	74
Lane Group Flow (vph)	0	204	629	0	125	0	615	970	0	17	814	47
Confl. Peds. (#/hr)							3			6		13
Confl. Bikes (#/hr)										1		1
Turn Type	Split	NA	pm+ov	Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4									6
Actuated Green, G (s)		18.6	48.6		17.8		30.0	81.4		3.5	54.1	54.1
Effective Green, g (s)		18.6	48.6		17.8		30.0	81.4		3.5	54.1	54.1
Actuated g/C Ratio		0.13	0.35		0.13		0.21	0.58		0.02	0.39	0.39
Clearance Time (s)		4.6	4.7		5.1		4.7	5.0		4.0	5.1	5.1
Vehicle Extension (s)		2.5	2.0		2.0		2.0	4.5		2.0	3.0	3.0
Lane Grp Cap (vph)		238	967		429		735	1997		44	1367	592
v/s Ratio Prot		c0.11	0.14		c0.04		c0.18	0.28		0.01	c0.23	
v/s Ratio Perm			0.09									0.03
v/c Ratio		0.86	0.65		0.29		0.84	0.49		0.39	0.60	0.08
Uniform Delay, d1		59.4	38.5		55.4		52.7	17.1		67.2	34.2	27.2
Progression Factor		1.00	1.00		1.00		0.87	0.78		1.00	1.00	1.00
Incremental Delay, d2		24.6	1.2		0.1		6.9	0.7		2.0	1.9	0.3
Delay (s)		84.0	39.7		55.5		52.4	14.1		69.2	36.1	27.5
Level of Service		F	D		E		D	B		E	D	C
Approach Delay (s)		50.6			55.5		29.0			35.6		
Approach LOS		D			E		C			D		
Intersection Summary												
HCM 2000 Control Delay			36.9				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)			19.5		
Intersection Capacity Utilization			69.3%				ICU Level of Service			C		
Analysis Period (min)			15									




















c Critical Lane Group

HCM 2000 Signalized Intersection Summary

Cumulative Plus Project Condition AM

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

10/30/2019



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	608	7	371	198	798	0	0	926	726
Future Volume (vph)	0	0	0	608	7	371	198	798	0	0	926	726
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			0.99	
Flpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			1.00	
Frt				1.00	0.97	0.85	1.00	1.00			0.93	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1585	1504	1770	3539			3270	
Flt Permitted				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1585	1504	1770	3539			3270	
Peak-hour factor, PHF	0.25	0.25	0.25	0.89	0.89	0.89	0.98	0.98	0.98	0.91	0.91	0.91
Adj. Flow (vph)	0	0	0	683	8	417	202	814	0	0	1018	798
RTOR Reduction (vph)	0	0	0	0	7	154	0	0	0	0	104	0
Lane Group Flow (vph)	0	0	0	382	373	192	202	814	0	0	1712	0
Confl. Peds. (#/hr)									3			6
Confl. Bikes (#/hr)												1
Turn Type				Perm	NA	Perm	Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8		8						
Actuated Green, G (s)				31.4	31.4	31.4	18.2	80.6			59.4	
Effective Green, g (s)				31.4	31.4	31.4	18.2	80.6			59.4	
Actuated g/C Ratio				0.26	0.26	0.26	0.15	0.67			0.49	
Clearance Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Vehicle Extension (s)				2.0	2.0	2.0	2.5	4.0			4.0	
Lane Grp Cap (vph)				439	414	393	268	2377			1618	
v/s Ratio Prot							c0.11	0.23			c0.52	
v/s Ratio Perm				0.23	0.24	0.13						
v/c Ratio				0.87	0.90	0.49	0.75	0.34			1.06	
Uniform Delay, d1				42.4	42.8	37.5	48.8	8.4			30.3	
Progression Factor				1.00	1.00	1.00	1.11	1.21			1.00	
Incremental Delay, d2				16.4	21.7	0.3	9.4	0.3			39.6	
Delay (s)				58.8	64.5	37.8	63.6	10.5			69.9	
Level of Service				E	E	D	E	B			E	
Approach Delay (s)		0.0			54.2			21.0			69.9	
Approach LOS		A			D			C			E	
Intersection Summary												
HCM 2000 Control Delay			52.9	HCM 2000 Level of Service					D			
HCM 2000 Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			120.0	Sum of lost time (s)					11.0			
Intersection Capacity Utilization			90.9%	ICU Level of Service					E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM 2000 Signalized Intersection Summary

Cumulative Plus Project Comdition PM

3: Appian Way & I-80 WB On-Ramp/I-80 WB Off-Ramp

10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	628	2	306	175	1148	0	0	712	518
Future Volume (vph)	0	0	0	628	2	306	175	1148	0	0	712	518
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Lane Util. Factor				0.95	0.91	0.95	1.00	0.95			0.95	
Frpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			0.98	
Flpb, ped/bikes				1.00	1.00	1.00	1.00	1.00			1.00	
Frt				1.00	0.99	0.85	1.00	1.00			0.94	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1599	1504	1770	3539			3238	
Flt Permitted				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1599	1504	1770	3539			3238	
Peak-hour factor, PHF	0.25	0.25	0.25	0.88	0.88	0.88	0.95	0.95	0.95	0.86	0.86	0.86
Adj. Flow (vph)	0	0	0	714	2	348	184	1208	0	0	828	602
RTOR Reduction (vph)	0	0	0	0	3	65	0	0	0	0	73	0
Lane Group Flow (vph)	0	0	0	378	370	248	184	1208	0	0	1357	0
Confl. Peds. (#/hr)									4			18
Confl. Bikes (#/hr)									1			1
Turn Type				Perm	NA	Perm	Prot	NA			NA	
Protected Phases					8		5	2			6	
Permitted Phases				8		8						
Actuated Green, G (s)				36.9	36.9	36.9	19.4	95.1			72.7	
Effective Green, g (s)				36.9	36.9	36.9	19.4	95.1			72.7	
Actuated g/C Ratio				0.26	0.26	0.26	0.14	0.68			0.52	
Clearance Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	
Vehicle Extension (s)				2.0	2.0	2.0	2.5	4.0			4.0	
Lane Grp Cap (vph)				443	421	396	245	2403			1681	
v/s Ratio Prot							c0.10	0.34			c0.42	
v/s Ratio Perm				0.22	0.23	0.17						
v/c Ratio				0.85	0.88	0.63	0.75	0.50			0.81	
Uniform Delay, d1				49.0	49.4	45.5	58.0	10.9			27.9	
Progression Factor				1.00	1.00	1.00	1.03	1.03			0.87	
Incremental Delay, d2				14.2	17.9	2.2	9.5	0.6			3.6	
Delay (s)				63.2	67.3	47.7	69.3	11.9			27.9	
Level of Service				E	E	D	E	B			C	
Approach Delay (s)		0.0			60.1			19.5			27.9	
Approach LOS		A			E			B			C	
Intersection Summary												
HCM 2000 Control Delay			33.7	HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			140.0	Sum of lost time (s)						11.0		
Intersection Capacity Utilization			77.3%	ICU Level of Service						D		
Analysis Period (min)			15									
c Critical Lane Group												

Cumulative Plus Project Condition AM
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HCM 2000 Signalized Intersection Summary

Cumulative Plus Project Condition PM

4: Appian Way & I-80 EB Off-Ramp/I-80 EB On-Ramp

10/30/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	359	24	110	0	0	0	0	1019	1189	0	1101	0
Future Volume (vph)	359	24	110	0	0	0	0	1019	1189	0	1101	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Lane Util. Factor	0.95	0.91	0.95					0.91	0.91		0.95	
Frpb, ped/bikes	1.00	1.00	0.99					0.99	0.98		1.00	
Flpb, ped/bikes	1.00	1.00	1.00					1.00	1.00		1.00	
Frt	1.00	0.99	0.85					0.95	0.85		1.00	
Flt Protected	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1681	1613	1484					3206	1418		3539	
Flt Permitted	0.95	0.96	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1681	1613	1484					3206	1418		3539	
Peak-hour factor, PHF	0.98	0.98	0.98	0.25	0.25	0.25	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	366	24	112	0	0	0	0	1084	1265	0	1197	0
RTOR Reduction (vph)	0	3	56	0	0	0	0	55	219	0	0	0
Lane Group Flow (vph)	201	197	45	0	0	0	0	1560	515	0	1197	0
Confl. Peds. (#/hr)			1						3			7
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						2			6	
Permitted Phases	4		4						2			
Actuated Green, G (s)	12.9	12.9	12.9					49.1	49.1		49.1	
Effective Green, g (s)	12.9	12.9	12.9					49.1	49.1		49.1	
Actuated g/C Ratio	0.18	0.18	0.18					0.70	0.70		0.70	
Clearance Time (s)	4.0	4.0	4.0					4.0	4.0		4.0	
Vehicle Extension (s)	2.0	2.0	2.0					4.0	4.0		4.0	
Lane Grp Cap (vph)	309	297	273					2248	994		2482	
v/s Ratio Prot								c0.49			0.34	
v/s Ratio Perm	0.12	0.12	0.03						0.36			
v/c Ratio	0.65	0.66	0.16					0.69	0.52		0.48	
Uniform Delay, d1	26.5	26.5	24.0					6.1	4.9		4.7	
Progression Factor	1.00	1.00	1.00					1.00	1.00		0.51	
Incremental Delay, d2	3.7	4.3	0.1					1.8	1.9		0.4	
Delay (s)	30.2	30.8	24.1					7.9	6.8		2.8	
Level of Service	C	C	C					A	A		A	
Approach Delay (s)		29.2			0.0			7.5			2.8	
Approach LOS		C			A			A			A	
Intersection Summary												
HCM 2000 Control Delay			8.8	HCM 2000 Level of Service					A			
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			70.0	Sum of lost time (s)					8.0			
Intersection Capacity Utilization			109.1%	ICU Level of Service					H			
Analysis Period (min)			15									
c Critical Lane Group												