County of Santa Cruz

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Matt Machado -Deputy CAO, Director of Community Development & Infrastructure

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)
INITIAL STUDY/ENVIRONMENTAL CHECKLIST

Date:	July 22, 2024	**Application Number:**	221332
Project Name:	Twelve Stones Winery 17300 Laurel Road	**Staff Planner:**	Evan Ditmars

I. OVERVIEW AND ENVIRONMENTAL DETERMINATION

APPLICANT:	Marta Marques	**APN(s):**	095-101-22
OWNERS:	Karen and Aaftab Munshi	**SUPERVISORIAL DISTRICT:**	1st District (Manu Koenig)

PROJECT LOCATION: The project site is located on the southeast side of Laurel Road, approximately one-half mile east of the intersection of the Laurel Road and Highway 17 intersection in the Summit Planning Area in unincorporated Santa Cruz County (Figure 1). Santa Cruz County is bound on the northwest by San Mateo County, on the north by Santa Clara County, on the southeast by San Benito County, and on the south by the Monterey County and the Pacific Ocean.

SUMMARY PROJECT DESCRIPTION:

Proposal to establish a new wine tasting and production facility on a site developed with a single-family dwelling. Winery and production facilities consisting of an approximately 3,000 square foot wine cave and 1,200 square foot tasting room. The project includes approximately 4,500 cubic yards of excavation, all of which would be stockpiled and retained on-site.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED: *All of the following potential environmental impacts are evaluated in this Initial Study. Categories that are marked have been analyzed in greater detail based on project specific information.*

- ☐ Aesthetics and Visual Resources
- ☐ Agriculture and Forestry Resources
- ☐ Air Quality
- ☒ Biological Resources
- ☒ Cultural Resources
- ☐ Energy
- ☐ Geology and Soils
- ☐ Greenhouse Gas Emissions
- ☐ Hazards and Hazardous Materials
- ☐ Hydrology/Water Supply/Water Quality
- ☐ Land Use and Planning
- ☐ Mineral Resources
- ☒ Noise
- ☐ Population and Housing
- ☐ Public Services
- ☐ Recreation
- ☐ Transportation
- ☐ Tribal Cultural Resources
- ☐ Utilities and Service Systems
- ☐ Wildfire
- ☐ Mandatory Findings of Significance

DISCRETIONARY APPROVAL(S) BEING CONSIDERED:

- ☐ General Plan Amendment
- ☐ Land Division
- ☐ Rezoning
- ☒ Development Permit
- ☐ Sewer Connection Permit
- ☐ Coastal Development Permit
- ☒ Grading Permit
- ☐ Riparian Exception
- ☐ LAFCO Annexation
- ☐ Other:

OTHER PUBLIC AGENCIES WHOSE APPROVAL IS REQUIRED (e.g., permits, financing approval, or participation agreement):

Permit Type/Action	Agency
Onsite Wastewater Treatment System Permit for Winery Production	Central Coast Regional Water Quality Control Board
Onsite Water Treatment System Upgrade Permit for non-winery use	Santa Cruz County Environmental Health Services
Less than 3-acre Conversion Exemption	Department of Forestry

CONSULTATION WITH NATIVE AMERICAN TRIBES: *Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, is there a plan for consultation that includes, for example, the determination of significance of impacts to tribal cultural resources, procedures regarding confidentiality, etc.?*

A representative from the Indian Canyon Mutsun Band of Costanoan indicted that they would be interested in consulting and voicing their concerns regarding this project and

recommended a Native American Monitor and an Archaeologist be present on-site at all times during any/all ground disturbing activities." The project has been mitigated and required as a condition of approval to adhere to this request.

DETERMINATION:

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Matthew Johnston — 7/22/2024

MATT JOHNSTON, Environmental Coordinator — Date

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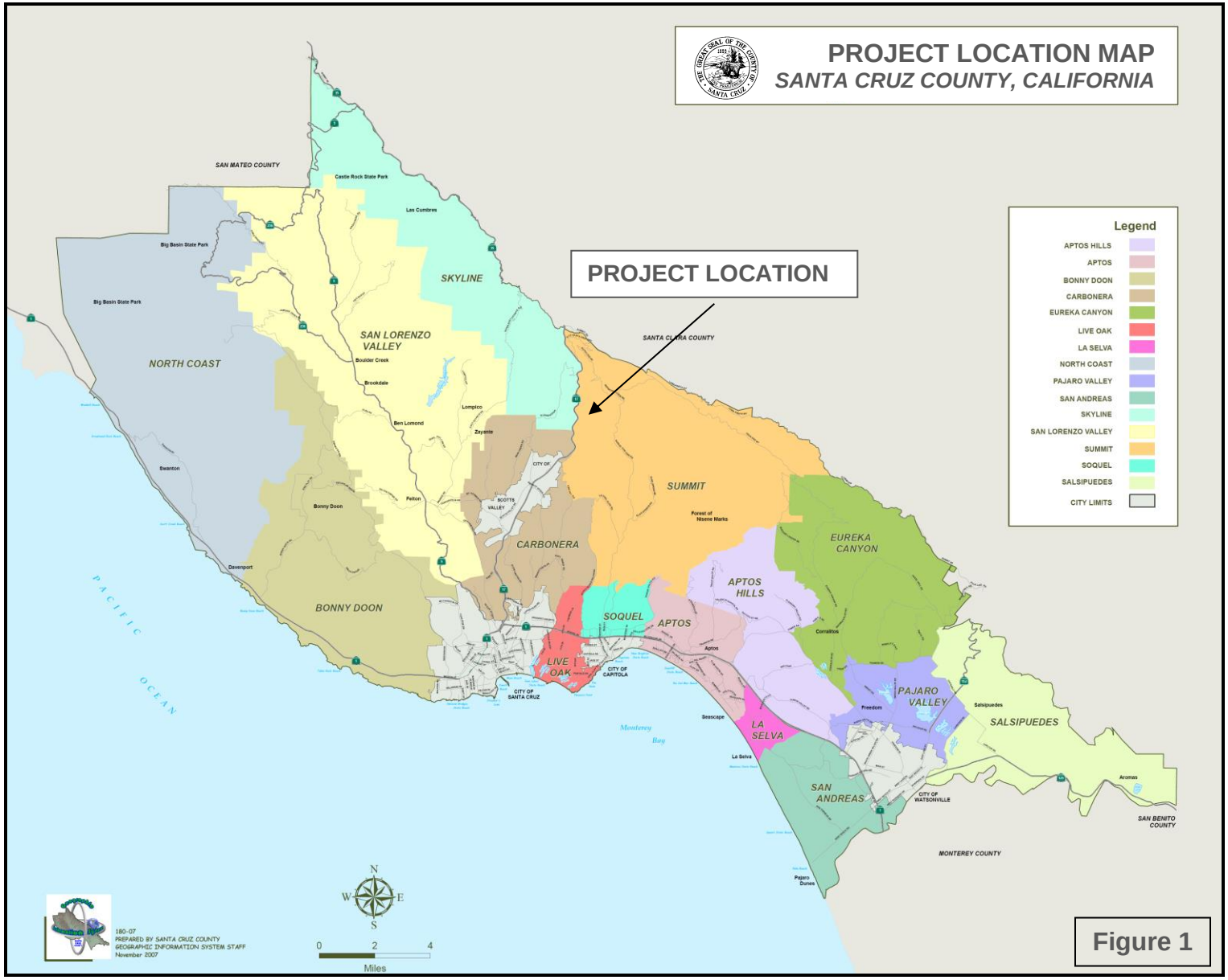
PROJECT LOCATION MAP
SANTA CRUZ COUNTY, CALIFORNIA
PROJECT LOCATION
Legend
APTOS HILLS
APTOS
BONNY DOON
CARBONERA
EUREKA CANYON
LIVE OAK
LA SELVA
NORTH COAST
PAJARO VALLEY
SAN ANDREAS
SKYLINE
SAN LORENZO VALLEY
SUMMIT
SOQUEL
SALSIPUEDES
CITY LIMITS
SAN MATEO COUNTY
SANTA CLARA COUNTY
MONTEREY COUNTY
SAN BENITO COUNTY
NORTH COAST
SKYLINE
SAN LORENZO VALLEY
SUMMIT
CARBONERA
EUREKA CANYON
APTOS HILLS
APTOS
SOQUEL
LIVE OAK
LA SELVA
PAJARO VALLEY
SALSIPUEDES
SAN ANDREAS
BONNY DOON
PACIFIC
OCEAN
Monterey Bay
CITY OF SANTA CRUZ
CITY OF CAPITOLA
CITY OF WATSONVILLE
Big Basin State Park
Castle Rock State Park
Las Cumbres
Boulder Creek
Brookdale
Lompico
Ben Lomond
Zayante
Felton
Bonny Doon
Davenport
Swanton
Aptos
Corralitos
Freedom
Seascape
La Selva
Salsipuedes
Aromas
Pajaro Dunes
180-07
PREPARED BY SANTA CRUZ COUNTY
GEOGRAPHIC INFORMATION SYSTEM STAFF
November 2007
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Figure 1

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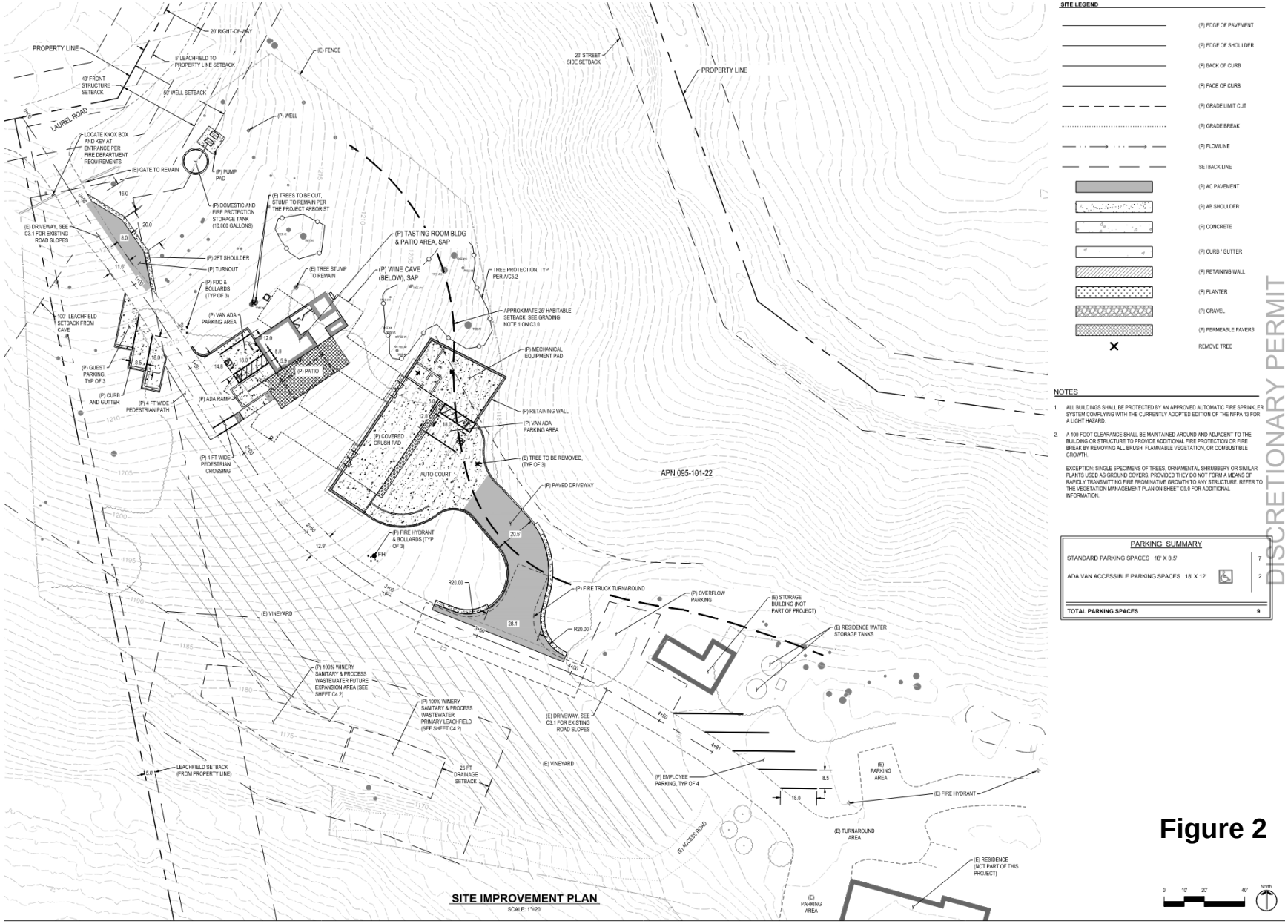

Figure 2

Project Site Plan

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II. BACKGROUND INFORMATION

EXISTING SITE CONDITIONS:

Parcel Size (acres):	19.58-acres
Existing Land Use:	Residential, Vineyards
Vegetation:	Grape vines, grasses, shrubs, trees
Slope in area affected by project:	☒ 0 - 30% ☐ 31 – 100% ☐ N/A
Nearby Watercourse:	West Branch Soquel Creek
Distance To:	Approximately 1,700-feet east of project site

ENVIRONMENTAL RESOURCES AND CONSTRAINTS:

Water Supply Watershed:	Yes	Fault Zone:	No
Groundwater Recharge:	No	Scenic Corridor:	No
Timber or Mineral:	No	Historic:	No
Agricultural Resource:	No	Archaeology:	Yes
Biologically Sensitive Habitat:	Yes	Noise Constraint:	No
Fire Hazard:	No	Electric Power Lines:	No
Floodplain:	No	Solar Access:	N/A
Erosion:	No	Solar Orientation:	South
Landslide:	No	Hazardous Materials:	No
Liquefaction:	No	Other:	No

SERVICES:

Fire Protection:	Scotts Valley FPD	Drainage District:	N/A
School District:	N/A	Project Access:	Laurel Road
Sewage Disposal:	Septic	Water Supply:	Domestic Well

PLANNING POLICIES:

Zone District:	Special Use (SU)	
General Plan:	Mountain Residential (R-M)	
Special Designation:	N/A	
Urban Services Line:	☐ Inside	☒ Outside
Coastal Zone:	☐ Inside	☒ Outside

ENVIRONMENTAL SETTING AND SURROUNDING LAND USES:

Natural Environment

Santa Cruz County is uniquely situated along the northern end of Monterey Bay approximately 55 miles south of the City of San Francisco along the Central Coast. The Pacific Ocean and Monterey Bay to the west and south, the mountains inland, and the prime agricultural lands

along both the northern and southern coast of the County create limitations on the style and amount of building that can take place. Simultaneously, these natural features create an environment that attracts both visitors and new residents every year. The natural landscape provides the basic features that set Santa Cruz apart from the surrounding counties and requires specific accommodations to ensure building is done in a safe, responsible and environmentally respectful manner.

The California Coastal Zone affects nearly one third of the land in the urbanized area of the unincorporated County with special restrictions, regulations, and processing procedures required for development within that area. Steep hillsides require extensive review and engineering to ensure that slopes remain stable, buildings are safe, and water quality is not impacted by increased erosion. The farmland in Santa Cruz County is among the best in the world, and the agriculture industry is a primary economic generator for the County. Preserving this industry in the face of population growth requires that soils best suited to commercial agriculture remain active in crop production rather than converting to other land uses.

PROJECT BACKGROUND:

The project site is an approximately 19.5-acre parcel located on the east side of Laurel Road, approximately 0.5 miles east of the Laurel Road/Highway 17 intersection and 3.75 miles north of Scotts Valley, in the Summit Planning area of rural Santa Cruz County. Development in the vicinity of the project site is primarily low-density rural residential development, comprised of large parcels with single-family dwellings. The project site is in the Mountain Residential (R-M) General Plan Land Use designation and maintains a Special Use (SU) zoning designation. Access to the site is provided via Laurel Road, a 20-foot right-of-way, then through a private 12-foot driveway on the north side of the property. The property follows a ridgeline sloping downhill eastward from Laurel Road, losing approximately 50-feet in elevation across the site. Development on the project site consists of a 2,444 square foot single-family dwelling, a 1,200 square foot ADU, and a 433 square foot habitable accessory structure, all of which are located on the western half of the property and roughly 200-feet south of the proposed wine production area.

DETAILED PROJECT DESCRIPTION:

The property owners currently live on the property and grow wine grapes for use in off-site production for their business, Twelve Stones Winery. The proposed project would move the production and tasting components of their winery onto their property and would establish an ancillary wine tasting facility on the west side of the property, just uphill of the existing residence and outbuilding and roughly 200-feet downhill from Laurel Road. The facility would consist of a 3,000 square foot wine cave with an exterior mechanical/equipment yard, approximately 1,200 square feet of tasting area with restrooms and food preparation facilities above the wine cave, and associated parking, hardscaping, and landscaping elements. The wine

tasting facilities, including the restroom and kitchen for food preparation, would be constructed directly above the wine cave.

Winery Operations

Proposed winery operations include wine making, wine storage, and private, by-appointment wine tasting. Under the applicant's proposed model, approximately 7,200 gallons of wine would be produced per year, with all of the grapes grown on-site. Over time, winery production could increase to the extent that a small amount of supplemental wine grapes would need to be brought on-site.

Winery operations would be managed by the two owners/residents of the project site, two part time employees, and up to one additional seasonal employee during harvesting and bottling. Wine processing would occur on a covered crush pad near the entrance of the proposed cave and production and storage would occur within the building.

Wine production and operations are proposed between 8:00am and 3:00pm, Monday through Friday. Wine tasting would be scheduled by appointment only, between 11:00am and 6:00pm, with appointments scheduled to avoid conflicts with operations (including deliveries and employee arrivals and departures) and would be limited during harvesting and bottling times to further prevent conflicts.

Wine tasting would be provided by appointment for up to twelve people. Ten designated parking spaces, including two accessible spaces, are provided adjacent to the tasting area and downhill from the wine cave, and a parking overflow area will be provided to accommodate larger vehicles, emergency parking, and general overflow. The wine tasting building includes facilities for light food preparation for guests of the winery and would be staffed by two part-time employees.

III. ENVIRONMENTAL REVIEW CHECKLIST

A. AESTHETICS AND VISUAL RESOURCES

Except as provided in Public Resources Code section 21099, would the project:

1.	*Have a substantial adverse effect on a scenic vista?*	☐	☐	☐	☒

Discussion: The project would not directly impact any public scenic vistas in the area. The project is located on the southeast side of Laurel Road, a narrow and winding through road extending off Highway 17. The topography and vegetation in the area screen the project site from view, and a substantial portion of the project would be integrated into the hillside using subterranean elements, further reducing visual impacts.

2.	*Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?*	☐	☐	☐	☒

Discussion: The project is located within a half-mile of the State designated scenic portions of Highway 17; however, topography and vegetation screen the site from view from the highway. No impacts are anticipated.

3.	*In nonurbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?*	☐	☐	☐	☒

Discussion: Impacts will be less than significant. The existing visual setting is characterized by low density rural residential development in a mountainous area, so public viewsheds in the vicinity are minimal. Views of the project site may be possible from distant vantage points along Laurel Road or Redwood Lodge Road, but the project is designed and landscaped to fit into the setting, with the majority of the proposed development being subterranean and hidden from view.

4.	*Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?*	☐	☐	☒	☐

Discussion: The project will include new lighting fixtures at the exterior of the structures and near parking areas. All the proposed lighting would be shielded and/or oriented downward to limit light leaving the project site. The incremental increase in lighting added to the project site would be screened by the existing vegetation and differences in topography.

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

B. AGRICULTURE AND FORESTRY RESOURCES

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

1.	*Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?*	☐	☐	☐	☒

Discussion: The project site does not contain any lands designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency. In addition, the project does not contain Farmland of Local Importance. Therefore, no Prime Farmland, Unique Farmland, Farmland of Statewide or Farmland of Local Importance would be converted to a non-agricultural use. No impact would occur from project implementation.

2.	*Conflict with existing zoning for agricultural use, or a Williamson Act contract?*	☐	☐	☐	☒

Discussion: The project site is zoned Special Use (SU), which is not considered to be an agricultural zone. The project site's is not under a Williamson Act contract. Therefore, the project does not conflict with existing zoning for agricultural use, or a Williamson Act contract. No impact is anticipated.

3.	*Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?*	☐	☐	☐	☒

***Discussion*:** Although the project is adjacent to land designated as Timber Resource, the project would not conflict with existing zoning for forest land. The project would not affect the adjacent resource or limit access to harvest the resource in the future.

4.	*Result in the loss of forest land or conversion of forest land to non-forest use?*	☐	☐	☒	☐

***Discussion*:** No forest land occurs on the project site or in the immediate vicinity. The arborist report for the project indicated that one significant tree (55" DBH) is proposed to be removed, the remainder of trees on-site will be retained and protected during construction (Attachment 7). The applicant is responsible for obtaining a Less than 3-acre Conversion Exemption from the California Department of Forestry. See discussion under B-3 above. No impact is anticipated.

5.	*Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?*	☐	☐	☐	☒

***Discussion*:** No impacts are anticipated. The project site and surrounding area do not contain any lands designated as forest land Prime Farmland, Unique Farmland, Farmland of Statewide Importance or Farmland of Local Importance as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency.

C. AIR QUALITY

The significance criteria established by the Monterey Bay Air Resources District (MBARD)[1] has been relied upon to make the following determinations.

Would the project:

1.	*Conflict with or obstruct implementation of the applicable air quality plan?*	☐	☐	☒	☐

Discussion: The project would not conflict with or obstruct any long-range air quality plans of the MBARD. General estimated basin-wide construction-related emissions are included in the MBARD emission inventory (which, in part, form the basis for the air quality plans) and are not expected to prevent long-term attainment or maintenance of the ozone and particulate matter standards within the North Central Coast Air Basin (NCCAB). Therefore, temporary construction impacts related to air quality plans for these pollutants from the

[1] Formerly known as the Monterey Bay Unified Air Pollution Control District (MBUAPCD).

project would be less than significant, and no mitigation would be required, since they are presently estimated and accounted for in the district's emission inventory, as described below. No stationary sources would be constructed that would be long-term permanent sources of emissions.

2.	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☐	☒	☐

***Discussion*:** The primary pollutants of concern for the NCCAB are ozone, PM_{10}, as those are the pollutants for which the district is in nonattainment (MBARD 2008). Project construction would have a limited and temporary potential to contribute to existing violations of California air quality standards for ozone and PM_{10}, primarily through diesel engine exhaust and fugitive dust. The criteria for assessing cumulative impacts on localized air quality are the same as those for assessing individual project impacts. Projects that do not exceed MBARD's construction or operational thresholds and are consistent with the AQMP would not have cumulatively considerable impacts on regional air quality (MBARD, 2016). Because the project would not exceed MBARD's thresholds and is consistent with the AQMP, there would not be cumulative impacts on regional air quality.

3.	*Expose sensitive receptors to substantial pollutant concentrations?*	☐	☐	☒	☐

***Discussion*:** The rural location of the project site limits proximity to known sensitive receptors. The nearest sensitive receptor is a single-family residence located approximately 0.2 miles north of the project site. C.T. English Middle School is approximately two miles north of the project site, and there are no known retirement communities or care homes within several miles of the project site. The proximity and concentrations of receptors near the project site result in minimal exposure to pollutants. Impacts would be less than significant.

4.	*Create objectionable odors affecting a substantial number of people?*	☐	☐	☐	☒

***Discussion*:** Odors from vehicle exhaust and construction equipment engines would occur during construction, but those activities are short-term and would cease upon completion of the project. Further, California ultralow sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight would be used in all diesel-powered equipment, which minimizes emissions of sulfurous gases (sulfur dioxide, hydrogen sulfide, carbon disulfide, and carbonyl sulfide). As the project site is in a coastal area that contains coastal breezes off the Monterey

Bay, construction-related odors would disperse and dissipate and would not cause substantial odors at the closest sensitive receptors.

The long-term operational phase of the project does not include any known sources of objectionable odors. Therefore, no impacts from odors are anticipated.

D. BIOLOGICAL RESOURCES

Would the project:

1.	*Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife, or U.S. Fish and Wildlife Service?*	☐	☒	☐	☐

Discussion: A query was conducted of the California Natural Diversity Database (CNDDB), maintained by the California Department of Fish and Wildlife, and a portion of the site is mapped as potential habitat for the Santa Cruz wallflower (Ersimum teretifolium), Ben Lomond spineflower (Chorizanthe pungens var. hartwegiana), Santa Cruz Black Salamander (Aneides niger*),* Foothill yellow-legged frog (Rana boylii), and Bonny Doon manzanita (Arctostaphylos silvicola) (CNDDB, 2019). Ben Lomond spineflower and Santa Cruz wallflower are Federally endangered plants.

The project site was evaluated by County Environmental Planning staff and the determination made that the site lacks suitable habitat for the species listed; records of the species were located in the Glenwood area west of the project site and separated by Highway 17. However, the yellow-legged frog has been found in the Soquel Creek watershed, the western branch of which is less than a half-mile from the project site. The following mitigation, implemented prior to ground disturbance, will ensure that impacts to the listed species (if found on-site) will be less than significant.

Mitigation Measures

BIO-1: Before construction activities begin, a qualified biologist will perform a preconstruction survey.

BIO-2: Before construction activities begin, a qualified project biologist will conduct a worker environmental awareness training session for all construction personnel. At a minimum, the training will include a description of protected biological resources, species descriptions and habitat requirements, and general measures being implemented to protect sensitive resources during construction. Informational handouts with photographs clearly illustrating species' appearances will be used in the training session.

Training topics will include special-status species with potential to occur on the project site. Species are expected to include Santa Cruz wallflower, Ben Lomond spineflower, and Bonny Doon manzanita. The training session will include information about steps to take if a special-status species is encountered, beginning with immediate cessation of all project activities, and will include contact information for the biological monitoring staff and measures to protect species during construction.

Additionally, a project biologist will be available to answer any questions about the special-status species. All new construction personnel will undergo this mandatory worker environmental awareness training when they start work on the project. Training will occur prior to the start of construction and periodically, as needed, if new construction personnel begin work at the project site. Each worker will sign a statement that they received training, and the statement will be posted or easily available for viewing at the project site.

BIO-3: The project biologist shall monitor the initial grading and clearing of the site.

2.	*Have a substantial adverse effect on any riparian habitat or sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?*	☐	☐	☐	☒

***Discussion*:** There is no mapped or designated riparian habitat or other sensitive natural community on or adjacent to the project site.

3.	*Have a substantial adverse effect on state or federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?*	☐	☐	☐	☒

***Discussion*:** There is no mapped or designated wetland on or adjacent to the project site.

4.	*Interfere substantially with the movement of any native resident or migratory fish or wildlife species or migratory wildlife corridors, or impede the use of native wildlife nursery sites?*	☐	☐	☐	☒

***Discussion*:** The project does not involve any activities that would interfere with the movements or migrations of fish or wildlife or impede use of a known wildlife nursery site.

5.	*Conflict with any local policies or ordinances protecting biological resources*	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

such as a tree preservation policy or ordinance?

Discussion: The project would not conflict with any local policies or ordinances.

6.	*Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?*	☐	☐	☐	☒

Discussion: The project would not conflict with the provisions of any adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. Therefore, no impact would occur.

E. CULTURAL RESOURCES

Would the project:

1.	*Cause a substantial adverse change in the significance of a historical resource pursuant to CEQA Guidelines Section 15064.5?*	☐	☐	☐	☒

Discussion: The existing structures on the property are not designated as a historic resource on any federal, state or local inventory. As a result, no impacts to historical resources would occur from project implementation.

2.	*Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?*	☐	☒	☐	☐

Discussion: According to the Archaeological Survey Report prepared by Archaeological Resource Service, dated February 21, 2023 (Attachment 6) historic resources exist within the vicinity of the project, but those resources would not present any significance to the proposed development. The report further concludes that no artifacts or potentially significant cultural features were observed at the site.

However, the California Native American Heritage Commission (NAHC) reports that the site is positive for Sacred Sites, and the Indian Canyon Mutsun Band of Costanoan indicated that the project site borders the management boundary of a potentially eligible cultural site. The tribal representative's recommendation to include a Native American Monitor and archaeologist on site during ground disturbing activities is include as mitigation CUL-1.

Pursuant to section 16.40.040 of the SCCC, if archaeological resources are uncovered during construction, the responsible persons shall immediately cease and desist from all further site excavation and comply with the notification procedures given in SCCC Chapter 16.40.

Mitigation Measures

CUL-1: Before construction activities begin, a qualified Native American Monitor will conduct a worker awareness training for all construction personnel.

CUL-2: A qualified Native American Monitor and a qualified archaeologist shall be present during excavation and grading activities.

CUL-3: If archaeological resources are uncovered during construction, the applicant's archaeologist shall ensure compliance with Santa Cruz County Code Chapter 16.40.035, including:

1) Cease and desist from all further excavations and disturbances within 200 feet of the discovery.

2) Arrange for staking completely around the area of discovery by visible stakes no more than 10 feet apart, forming a circle having a radius of no less than 100 feet from the point of discovery; provided, however, that such staking need not take place on adjoining property unless the owner of the adjoining property authorizes such staking.

3) Notify the Sheriff-Coroner of the discovery if human remains have been discovered. Notify the Planning Director if the discovery contains no human remains.

4)Grant all duly authorized representatives of the Coroner and the Planning Director permission to enter onto the property and to take all actions consistent with chapter 16.40 of the county code.

3.	*Disturb any human remains, including those interred outside of dedicated cemeteries?*	☐	☐	☒	☐

Discussion: No impacts are expected. However, pursuant to section 16.40.040 of the SCCC, and California Health and Safety Code sections 7050.5-7054, if at any time during site preparation, excavation, or other ground disturbance associated with this project, human remains are discovered, the responsible persons shall immediately cease and desist from all further site excavation and notify the Sheriff-Coroner and the Planning Director. If the coroner determines that the remains are not of recent origin, a full archaeological report shall be prepared, and representatives of local Native American Indian groups shall be contacted. If it is determined that the remains are Native American, the Native American Heritage Commission will be notified as required by law. The Commission will designate a Most Likely Descendant who will be authorized to provide recommendations for management of the Native American human remains. Pursuant to Public Resources Code section 5097, the descendants shall complete their inspection and make recommendations or preferences for treatment within 48 hours of being granted access to the site. Disturbance shall not resume

until the significance of the resource is determined and appropriate mitigations to preserve the resource on the site are established.

F. ENERGY

Would the project:

1.	*Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?*	☐	☐	☒	☐

Discussion: The project, like all development, would be responsible for an incremental increase in the consumption of energy resources during site grading and construction of the replacement dwelling. All project construction equipment would be required to comply with the California Air Resources Board (CARB) emissions requirements for construction equipment, which includes measures to reduce fuel-consumption, such as imposing limits on idling and requiring older engines and equipment to be retired, replaced, or repowered. As a result, impacts associated with the small temporary increase in consumption of fuel during construction are expected to be less than significant.

In addition, the County has strategies to help reduce energy consumption and greenhouse gas (GHG) emissions. These strategies are included in the County of Santa Cruz Climate Action Strategy (County of Santa Cruz, 2022). The project, like all new construction, would be conditioned to ensure construction activities comply with prevailing building technology, the California Building Code, and the County Building ordinance to ensure the conservation of energy and resources.

Operationally, the wine production at the site represents the relocation of an existing operation. Net energy usage for production will be unchanged before and after the project. Construction would occur with prevailing building and energy saving technologies.

Therefore, the project will not result in wasteful, inefficient, or unnecessary consumption of energy resources. Impacts are expected to be less than significant.

2.	*Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?*	☐	☐	☐	☒

Discussion: AMBAG's 2040 Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) recommends policies that achieve statewide goals established by CARB, the California Transportation Plan 2040, and other transportation-related policies and state senate bills. The SCS element of the MTP targets transportation-related greenhouse gas (GHG) emissions in particular, which can also serve to address energy use by coordinating

land use and transportation planning decisions to create a more energy efficient transportation system.

The Santa Cruz County Regional Transportation Commission (SCCRTC) prepares a County-specific regional transportation plan (RTP) in conformance with the latest AMBAG MTP/SCS. The 2040 RTP establishes targets to implement statewide policies at the local level, such as reducing vehicle miles traveled and improving speed consistency to reduce fuel consumption.

In 2022, Santa Cruz County adopted a Climate Action Strategy (CAS) focused on reducing the emission of greenhouse gases, which is dependent on increasing energy efficiency and the use of renewable energy. The strategy intends to reduce energy consumption and greenhouse gas emissions by implementing a number of measures such as reducing vehicle miles traveled through County and regional long-range planning efforts, increasing energy efficiency in new and existing buildings and facilities, increasing local renewable energy generation, improving the Green Building Program by exceeding minimum state standards, reducing energy use for water supply through water conservation strategies, and providing infrastructure to support zero and low emission vehicles that reduce gasoline and diesel consumption, such as plug in electric and hybrid plug in vehicles. (County of Santa Cruz, 2022)

In addition, the Santa Cruz County General Plan has historically placed a priority on "smart growth" by focusing growth in the urban areas through the creation and maintenance of an urban services line. Objective 2.1 (Urban/Rural Distinction) directs most residential development to the urban areas, limits growth, supports compact development, and helps reduce sprawl. The Circulation Element of the General Plan further establishes a more efficient transportation system through goals that promote the wise use of energy resources, reducing vehicle miles traveled, and transit and active transportation options. (County of Santa Cruz 1994).

Energy efficiency is a major priority throughout the County's General Plan. Measure C was adopted by the voters of Santa Cruz County in 1990 and explicitly established energy conservation as one of the County's objectives. The initiative was implemented by Objective 5.17 (Energy Conservation) and includes policies that support energy efficiency, conservation, and encourage the development of renewable energy resources. Goal 6 of the Housing Element also promotes energy efficient building code standards for residential structures constructed in the County (County of Santa Cruz 1994).

The project will be consistent with the AMBAG 2040 MTP/SCS and the SCCRTC 2040 RTP. The project would also be required to comply with the Santa Cruz County General Plan and any implemented policies and programs established through the CAS. In addition, the project

design would be required to comply with CALGreen, the state of California's green building code, to meet all mandatory energy efficiency standards. Therefore, the project would have no impact on the environment as it will not conflict with or obstruct any state or local plan for renewable energy or energy efficiency.

G. GEOLOGY AND SOILS

Would the project:

1.	*Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:*				
A.	*Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.*	☐	☐	☐	☒
B.	*Strong seismic ground shaking?*	☐	☐	☒	☐
C.	*Seismic-related ground failure, including liquefaction?*	☐	☐	☒	☐
D.	*Landslides?*	☐	☐	☐	☒

***Discussion (A through D)*:** All of Santa Cruz County is subject to some hazard from earthquakes, and there are several faults within the County. While the San Andreas fault is larger and considered more active, each fault can generate moderate to severe ground shaking from a major earthquake. Consequently, large earthquakes can be expected in the future. The October 17, 1989, Loma Prieta earthquake, magnitude 7.1, was the second largest earthquake in central California history.

The project site is located outside of the limits of the State Alquist-Priolo Special Studies Zone or any County-mapped fault zone. The site is approximately 2.5 miles south of the San Andreas fault zone, and approximately 0.5 miles north of the Zayante fault zone.

A geotechnical investigation for the project was performed by Cotton, Shires, and Associates, Inc. (Attachment 2). The report concluded that the proposed project, including the wine cave and above-ground tasting room, are feasible from a geologic and geotechnical standpoint. The report was reviewed and accepted by the County Geologist (Attachment 3). Recommendations of the geologic and geotechnical report, and the additional requirements included in the review letter prepared by Environmental Planning staff, are included as conditions of the proposed project. Impacts are less than significant.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
2. *Result in substantial soil erosion or the loss of topsoil?*	☐	☐	☒	☐

Discussion: The proposed project includes excavation of roughly 4,500 cubic yards of soil, which will be transported 800 feet across the project site and deposited in an existing open area. The spoils and excavated areas both have the potential for increased erosion during rain events.

The spoils area was evaluated by the applicant's engineering team by representatives from the County of Santa Cruz Stormwater Management, and by the County Geologist, and it was determined that following mitigations, which are incorporated as conditions of approval for the project, would render the project feasible and in compliance with County policies for managing stormwater runoff and erosion control pursuant to SCCC 7.79 and SCCC 16.20, therefore resulting in a project with less than significant impact with mitigations incorporated.

3. *Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?*	☐	☐	☒	☐

Discussion: The report cited above (see discussion under G-1) identifies three questionable, small landslides along the northeastern slopes of the property but concludes that the slides are old and that likelihood of the slope activating as a new landslide is low. The recommendations contained in the geotechnical report will be implemented to reduce this potential hazard to a less than significant level.

4. *Be located on expansive soil, as defined in section 1803.5.3 of the California Building Code (2016), creating substantial direct or indirect risks to life or property?*	☐	☐	☒	☐

Discussion: The geotechnical report for the project identified the site as having low to moderate expansive characteristics and recommends placing the tasting room on non-expansive bedrock and removing colluvium in areas proposed for flatwork and pavement. The recommendations of the report will be implemented as a condition of approval to reduce this potential hazard to a less than significant level.

5. *Have soils incapable of adequately supporting the use of septic tanks, leach*	☐	☐	☒	☐

fields, or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

Discussion: The project would use an onsite sewage disposal system, and County Environmental Health Services has determined that site conditions are appropriate to support such a system, provided that an Onsite Wastewater Treatment System is obtained. The Conditions of Approval for the proposed project would require the applicant to obtain the permit prior to building permit issuance. The project would not proceed without issuance of the permit. Impacts are less than significant.

6.	*Directly or indirectly destroy a unique paleontological resource or site of unique geologic feature?*	☐	☐	☐	☒

Discussion: No unique paleontological resources or sites or unique geologic features are known to occur in the vicinity of the project. A query was conducted of the mapping of identified geologic/paleontological resources maintained by the County of Santa Cruz Planning Department, and there are no records of paleontological or geological resources in the vicinity of the project parcel. No direct or indirect impacts are anticipated.

H. GREENHOUSE GAS EMISSIONS

Would the project:

1.	*Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?*	☐	☐	☒	☐

Discussion: The project, like all development, would be responsible for an incremental increase in greenhouse gas (GHG) emissions by usage of fossil fuels during the site grading and construction. The proposed development would comply with policies to limit site disturbance and minimize grading. As a result, impacts associated with the temporary increase in GHG emissions are expected to be less than significant.

2.	*Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?*	☐	☐	☒	☐

Discussion: See the discussion under H-1 above. No significant impacts are anticipated.

I. HAZARDS AND HAZARDOUS MATERIALS

Would the project:

1.	*Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?*	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

***Discussion*:** The project would not create a significant hazard to the public or the environment. No routine transport or disposal of hazardous materials is proposed. Fueling during construction would occur within the limits of the staging area, which is proposed to be located 400-feet southeast of the excavated area, adjacent to the existing residence. Best management practices would be used to ensure that impacts are less than significant.

2. *Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?*	☐	☐	☐	☒

***Discussion*:** See discussion in I-1 above. No hazardous materials are proposed to be used on-site. Project impacts would be considered less than significant.

3. *Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?*	☐	☐	☐	☒

***Discussion*:** C.T. English Middle School is located at 23800 Summit Road, approximately 2.5 miles northwest of the project site. Although fueling of equipment is likely to occur within the staging area, BMPs to contain spills would be implemented. No impacts are anticipated.

4. *Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?*	☐	☐	☐	☒

***Discussion*:** The project site is not included on the 12/3/2018 list of hazardous sites in Santa Cruz County compiled pursuant to Government Code section 65962.5. Additionally, GeoTracker, EnviroStor, and Environmental Health Services Laserfiche databases indicated no presence of hazardous sites in the project vicinity. No impacts are anticipated from project implementation.

5. *For a project located within 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 result in a safety hazard or excessive noise for people residing or working in the project area?*	☐	☐	☐	☒

Discussion: The project is not located within two miles of a public airport or public use airport. No impact is anticipated.

6.	*Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?*	☐	☐	☐	☒

Discussion: The project would not conflict with implementation of the County of Santa Cruz Local Hazard Mitigation Plan 2015-2026 (County of Santa Cruz, 2021). Therefore, no impacts to an adopted emergency response plan or evacuation plan would occur from project implementation.

7.	*Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?*	☐	☐	☐	☒

Discussion: See discussion under Wildfire question T-2. The project would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires. No impact would occur.

J. HYDROLOGY, WATER SUPPLY, AND WATER QUALITY

Would the project:

1.	*Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?*	☐	☐	☒	☐

Discussion: The project would not discharge runoff, either directly or indirectly, into a public or private water supply. No commercial or industrial activities are proposed that would generate substantial amounts of contaminants. The project is required to comply with County Environmental Health requirements, including a requirement for the wastewater flow to be approved by the Central Coast Regional Water Quality Control Board, and for the non-winery production wastewater to be treated by an approved on-site water treatment system (OWTS).

The new parking areas for employees and wine tasting visitors would incrementally contribute urban pollutants to the environment; however, the contribution would be minimal given the size of the driveway and parking area. Potential siltation from the proposed project would be addressed through implementation of erosion control best management practices (BMPs). No water quality standards or waste discharge requirements would be violated. Impacts would be less than significant.

2.	*Substantially decrease groundwater supplies or interfere substantially with*	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

groundwater recharge such that the project may impede sustainable groundwater management of the basin?

Discussion: The project site is presently supplied by an individual water system, which would be used for the winery (no new well would be drilled). The existing wine grapes are dry farmed and the additional water usage by employees, guests, and for wine production would not decrease groundwater supply in a substantial way. With an average daily water use of 60 gallons per capita per day, the site's two existing residents use approximately 120 gallons per day or approximately .13 acre-feet per year. Including water use from landscaping and irrigation for the existing vineyard, the total existing water use at the site is approximately 0.33 acre-feet per year.

Individual water use from the proposed project would be generated from the tasting room and wine production cave. Based on similar projects in Napa County, the applicant estimates tasting room guests to use three gallons per person per visit and employees use fifteen gallons per person per day. With three part time employees, one seasonal harvest employee, and a maximum of twelve guests on-site per day, the estimated water usage would be 96 gallons. With winery operations occurring about 255 days per year, the estimated annual flow would be 24,480 gallons (0.075 acre-feet) per year.

Calculations for water used for wine production provided by the applicant, based on the Regional Water Quality Control Board (RWQCB) General Waste Discharge Requirements for Winery Process Water, indicate that six gallons of water are used per gallon of wine produced. At a peak production level of 7,200 gallons of wine per year, the total annual flow for wine production is 43,200 gallons or 0.13 acre-feet.

The total new water use of the site (existing usage, guest and employee use, and production) is estimated to be approximately 0.54-acre feet per year, a 60% increase in use over existing conditions. Such an increase would not substantially deplete groundwater supplies.

The project is not located in a mapped groundwater recharge area or water supply watershed.

See Question J-5 (below) for further discussion of sustainable groundwater management.

3.	*Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:*				
	A. result in substantial erosion or siltation on- or off-site;	☐	☒	☐	☐
	B. substantially increase the rate or amount of surface runoff in a manner	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
which would result in flooding on- or offsite;				
C. *create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or;*	☐	☐	☒	☐
D. *impede or redirect flood flows?*	☐	☐	☒	☐

***Discussion*:** The proposed project includes excavation of roughly 4,500 cubic yards of soil, which will be transported 800 feet across the project site and deposited in an existing open area, affecting the drainage at both the excavated project area and the spoils area.

Drainage calculations prepared by Sherwood Design Engineers (Attachment 5) dated August 2023 have been reviewed for potential drainage impacts and accepted by the County Community Development and Infrastructure Stormwater Management Section staff, who determined the project feasible and in compliance with the County Stormwater Management Design Criteria. The project is conditioned to include a Stormwater Control Plan, Final Stormwater Management Report, and will require the owner to record a stormwater management maintenance agreement for permanent maintenance of drainage on the structure. The stockpiling of soil on the project site would be supervised by a representative of the geotechnical engineer and would implement best management practices to control runoff.

The project, as proposed and conditioned, would not increase erosion or siltation and would not result in an increase in turnoff from the site.

4. *In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?*	☐	☐	☐	☒

***Discussion*:** According to the Federal Emergency Management Agency (FEMA) National Flood Insurance Rate Map, dated September 2012, no portion of the project site lies within a flood hazard zone and there would be no impact (FEMA, 2012). The project site is located approximately 10 miles inland, approximately 9.5 miles beyond the effects of a tsunami. Lake Elsman is approximately 2.75 miles northwest of the project site, well beyond the area which would be affected by a seiche.

5. *Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?*	☐	☐	☐	☒

***Discussion*:** All County water agencies are experiencing a lack of sustainable water supply due to groundwater overdraft and diminished availability of streamflow. Because of this, coordinated water resource management has been of primary concern to the County and to the various water agencies. County Environmental Health evaluated the project and did not identify the proposal as in conflict with any current management plans for the Purisma Highlands groundwater basin.

The project would induce additional demand into the groundwater basin, but the level of proposed development would be within the development potential analyzed in the Sustainability Update EIR as described in Section IV.B. Because the project size is within the total amount of potential development related to groundwater impacts analyzed in the Sustainability Update EIR, which identified less-than-significant groundwater impacts, the proposed project would not result in new significant impacts or substantially more severe impacts than evaluated in the Sustainability Update EIR (County of Santa Cruz 2022) and would not result in impacts peculiar to the site or the project. Therefore, no further environmental analysis or review is required pursuant to Public Resources Code section 21083.3 and the State CEQA Guidelines section 15183.

K. LAND USE AND PLANNING

Would the project:

1.	*Physically divide an established community?*	☐	☐	☐	☒

***Discussion*:** The project does not include any element that would physically divide an established community. No impact would occur.

2.	*Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?*	☐	☐	☐	☒

***Discussion*:** The project would not cause a significant environmental impact due to a conflict with any land use plan, policies, or regulations adopted for the purpose of avoiding or mitigating an environmental effect. No impacts are anticipated.

L. MINERAL RESOURCES

Would the project:

1.	*Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?*	☐	☐	☐	☒

***Discussion*:** The site does not contain any known mineral resources that would be of value to the region and the residents of the state. Therefore, no impact is anticipated from project implementation.

2.	*Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?*	☐	☐	☐	☒

***Discussion*:** The project site is zoned SU (Special Use) which is not considered to be an Extractive Use Zone (M-3), nor does it have a land use designation with a Quarry Designation Overlay (Q) (County of Santa Cruz 1994). Therefore, no potentially significant loss of availability of a known mineral resource of locally important mineral resource recovery (extraction) site delineated on a local general plan, specific plan or other land use plan would occur as a result of this project.

M. NOISE

Would the project result in:

1.	*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 applicable standards of other agencies?*	☐	☒	☐	☐

***Discussion*:** The project is anticipated to have a temporary increase in the ambient noise levels during the construction phase of the project. During the operational phase of the project, the use of the site for winemaking and wine tasting would have the potential to periodically and briefly increase the ambient noise of the vicinity. Impacts from the construction and operational phases are mitigated through NOI-1 through NOI-6.

Sensitive Receptors

The nearest sensitive receptors are adjacent residential dwellings, located approximately 1,200-1,500 feet from the project area. No schools, hospitals, or parks are located in the vicinity of the project site.

County of Santa Cruz General Plan

Policy 9.2.6 of the Santa Cruz County General Plan specifies "mitigation and/or best management practices to reduce construction noise as a condition of project approvals, particularly if noise levels would exceed 75 dB at neighboring sensitive land uses or if construction would occur for more than 7 days".

The General Plan also contains the following tables which specify the acceptable through unacceptable ranges of noise exposure by land use (Table 9-2) and the maximum allowable

noise exposure, measured at the property line of the receiving land use) for stationary noise sources in their operational or permanent locations (Table 9-3)

The project site is zoned SU (Special Use) which is not considered to be an Extractive Use Zone (M-3), nor does it have a land use designation with a Quarry Designation Overlay (Q) (County of Santa Cruz 1994). Therefore, no potentially significant loss of availability of a known mineral resource of locally important mineral resource recovery (extraction) site delineated on a local general plan, specific plan or other land use plan would occur as a result of this project.

Table 9-2
Acceptable through Unacceptable Ranges of Noise Exposure by Land Use*
**Outdoor noise exposure measured at the property line of receiving land use*

	LAND USE	COMMUNITY NOISE EXPOSURE DNL or CNEL, dB					
		55	60	65	70	75	80
A	Residential/Lodging – Single Family, Duplex, Mobile Home, Multi Family,						
B	Schools, Libraries, Religious Institutions, Meeting Halls, Hospitals						
C	Outdoor Sports Arena or Facility, Playgrounds, Neighborhood Parks						
D	Office Buildings, Business Commercial and Professional						
E	Industrial, Manufacturing, Utilities, Agriculture						

NORMALLY ACCEPTABLE:
Specific land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements, and can meet the indoor noise standards.

CONDITIONALLY ACCEPTABLE:
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design to meet interior and exterior noise standards, where applicable.

NORMALLY UNACCEPTABLE:
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design to meet interior and exterior noise standards, where applicable.

CLEARLY UNACCEPTABLE: New construction or development should generally not be undertaken.

Based on Draft General Plan Guidelines published by the California State Office of Planning and Research, 2014.

Table 9-3: Maximum Allowable Noise Exposure for Stationary Noise Sources[1]		
	Daytime[5] (7:00 am to 10:00 pm)	Nighttime[2, 5] (10:00 pm to 7:00 am)
Hourly Leq average hourly noise level, dB[3]	50	45
Maximum Level, dB[3]	70	65
Maximum Level, dB – Impulsive Noise[4]	65	60

Notes:
1 As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied to 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 to 5 dB if the ambient hourly Leq is at least 10 dB lower than the allowable level.

Source: County of Santa Cruz 1994

Santa Cruz County Code

Santa Cruz County Code Chapter 13.15 regulates noise generation and noise exposures by applying standards through land use planning and permitting, incorporating mitigation into project design to prevent unhealthful conditions, and enforcement to address violation of permit conditions.

Construction-related noise is exempted under SCCC 13.15, provided that said "activities take place between the hours of 8:00 a.m. and 5:00 p.m. on weekdays, unless the Building Official has in advance authorized said activities to start at 7:00 a.m. and/or continue no later than 7:00 p.m. Such activities shall not take place on Saturdays unless the Building Official has in advance authorized said activities, and provided said activities take place between 9:00 a.m. and 5:00 p.m. and no more than three Saturdays per month. Such activities shall not take place on Sunday or a federal holiday unless the Building Official has in advance authorized such work on a Sunday or federal holiday, or during earlier morning or later evening hours of a weekday or Saturday."

New commercial and industrial developments are subject to the standards listed in Tables 9-2 and 9-3 of the General Plan. Increases in the ambient noise levels beyond those specified in those tables require acoustic studies to determine the noise reduction requirements to be included as conditions of approval.

Construction Phase Noise Impacts

Noise generating features of the construction phase of the project includes excavators, dump trucks, graders, pick-up trucks, and pneumatic tools. The noise generated from the construction phase of the project could periodically increase the ambient noise levels in adjacent areas. However, the increase would be temporary and the following mitigations, when implemented with the conditions of approval for construction operations, would result in less than significant impacts:

- NOI-1 Limit construction activity to between the hours of 8:00 a.m. to 5:00 p.m. Monday through Friday and prohibit construction activity on Saturdays and Sundays.

Operational Phase Noise Impacts

The wine tasting operation does not include any noise generating features which would result in noise levels above the maximums listed in Tables 9-2 and 9-3 of the General Plan. Noise generating features at the operational phase of the project include delivery trucks, bottling equipment, glycol chillers for wine aging and fermentation, an emergency backup generator (with a 75-decibel maximum noise level), and noises associated with the guests utilizing the wine tasting area (conversations, vehicular traffic, non-amplified music).

The harvesting and bottling phases of wine production (each of which occur once per year) could increase the ambient noise slightly as a result of increased employee activity and the use of specialized equipment at the exterior ("crush pad") of the wine cave. However, these activities would occur over 150-feet from the nearest property line, 1000-feet from the property line of the nearest developed property and are temporary. The wine cave would provide substantial noise attenuation for winemaking activities within the facility.

The twelve guests permitted for scheduled wine tasting could produce episodic increases in the ambient noise; the wine tasting area includes an outdoor patio which would be 300-feet from the nearest developed property line. The following mitigations, which are included as conditions of approval implemented for this project, would result in a less than significant noise impact.

- NOI-2 Prohibit the use of amplified music at the site.
- NOI-3 Property owner shall establish a point of contact for managing neighbor concerns and complaints and shall provide contact information for that person to all adjacent property owners.

3.	*Generation of excessive groundborne vibration or groundborne noise levels?*	☐	☐	☒	☐

***Discussion*:** The use of construction and grading equipment would potentially generate periodic vibration in the project area. This impact would be temporary, limited to the construction phase, and is not expected to cause damage; therefore, impacts are not expected to be significant.

4.	*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*	☐	☐	☐	☒

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

in the project area to excessive noise levels?

Discussion: The project is not in the vicinity of a private airstrip or within two miles of a public airport. Therefore, the project would not expose people residing or working in the project area. No impact is anticipated.

N. POPULATION AND HOUSING

Would the project:

1. *Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?*	☐	☐	☐	☒

Discussion: The project would not induce substantial population growth in an area because the project does not propose any physical or regulatory change that would remove a restriction to or encourage population growth. No impact would occur.

2. *Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?*	☐	☐	☐	☒

Discussion: The project would not displace any existing housing. No impact would occur.

O. PUBLIC SERVICES

Would the project:

1. *Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:*

a. *Fire protection?*	☐	☐	☒	☐
b. *Police protection?*	☐	☐	☒	☐
c. *Schools?*	☐	☐	☐	☒
d. *Parks?*	☐	☐	☐	☒
e. *Other public facilities; including the maintenance of roads?*	☐	☐	☒	☐

Discussion (a through e): While the project represents an incremental contribution to the need for services, the increase would be minimal. Moreover, the project meets all the standards and requirements identified by the local fire agency and school, park, and

transportation fees to be paid by the applicant would be used to offset the incremental increase in demand for school and recreational facilities and public roads. Impacts would be considered less than significant.

P. RECREATION

Would the project:

1.	*Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?*	☐	☐	☐	☒

Discussion: The project would not substantially increase the use of existing neighborhood and regional parks or other recreational facilities.

2.	*Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?*	☐	☐	☐	☒

Discussion: The project does not propose the expansion of, or require the construction of, additional recreational facilities. No impact would occur.

Q. TRANSPORTATION

Would the project:

1.	*Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?*	☐	☐	☒	☐

Discussion: The project consists of wine production and wine tasting with the number of guests limited to twelve by appointment only). As described in the program statement prepared by the applicant (Attachment 4) two employees would work part-time at the site, with up to one additional employee on-site during harvesting season. Wine tasting and wine production would be scheduled with minimal overlap to minimize conflicts between the two uses. Employees would arrive on-site around 8:00am and depart at 3:00pm and wine tasting would be scheduled from 11:00am to 6:00pm, resulting in no overlap of arrival and departure times for employees and visitors. Wine tasting would not be scheduled during harvesting and bottling.

The site is accessed off Highway 17 via Laurel Road, a 20-foot-wide County maintained road, then via a 12-foot private driveway. The road and driveway are conditionally accepted by the Scotts Valley Fire Protection District and by the Santa Cruz County Public Works Department.

The project would create a small incremental increase in traffic on nearby roads and intersections, generated from two new employees to the site and from twelve wine tasting customers, but would generate far fewer trips than the 110-trip per day threshold of significance established by the Office of Planning and Research (OPR) (OPR 2018). Traffic impacts are expected to be less than significant.

2. *Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)(1) (Vehicle Miles Traveled)?* ☐ ☐ ☒ ☐

Discussion: The proposed project would bring two part-time employees to the project site with the potential for one additional part-time employee during the harvest season. A maximum of 12 guests per day would be permitted at the site. In addition to the two owner/residents who already reside at the project site, a maximum total of 17 people would be present at the site during peak wine production and tasting. 17 people would not exceed the 110-daily trip threshold of significance indicated in the OPR (Office of Planning and Research) "Technical Advisory on Evaluating Transportation Impacts in CEQA" (OPR 2018). With tasting conditionally limited to 12 guests per day, impacts are expected to be less than significant.

3. *Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?* ☐ ☐ ☒ ☐

***Discussion*:** In the operational phase of the winery, some specialized equipment (bottling trucks, wine lee disposal trucks, and grape delivery trucks) would be brought on-site. The trucks (typically a 1-ton truck with a flatbed) would be larger than those typically associated with a single-family dwelling, but are not oversized or hazardous, and their presence would not represent an increase in hazards along roads in the area. Use of the equipment would be infrequent and scheduled so as not to conflict with the arrival and departure of employees and wine tasting customers. Impacts would be less than significant.

4. *Result in inadequate emergency access?* ☐ ☐ ☐ ☒

***Discussion*:** Laurel Road meets County access standards and the proposed on-site driveway and circulation plan has been approved by the local fire agency.

R. TRIBAL CULTURAL RESOURCES

1. *Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:*

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
A. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources Code section 5020.1(k), or	☐	☐	☐	☒
B. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☒	☐	☐

Discussion: The project proposes to establish a winery. Section 21080.3.1(b) of the California Public Resources Code (AB 52) requires a lead agency formally notify a California Native American tribe that is traditionally and culturally affiliated within the geographic area of the discretionary project when formally requested. As of this writing, no California Native American tribes traditionally and culturally affiliated with the Santa Cruz County region have formally requested a consultation with the County of Santa Cruz (as Lead Agency under CEQA) regarding Tribal Cultural Resources.

The Archaeological Report prepared for this project (Attachment 6) indicates that the California Native American Heritage Commission (NAHC) reports that the site is positive for Sacred Sites, and the Indian Canyon Mutsun Band of Costanoan indicated that the project site borders the management boundary of a potentially eligible cultural site. The tribal representative's recommendation to include a Native American Monitor and archaeologist on site during ground disturbing activities is include as CUL- 1.

S. UTILITIES AND SERVICE SYSTEMS

Would the project:

1. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☒	☐

***Discussion*:**

Water

The project would rely on an existing individual well for water supply. Public water facilities would not have to be expanded. Impacts from project construction would be less than significant.

Wastewater

The project would be served by a private on-site sewage disposal system, which would be adequate to accommodate the relatively light demands of the project. Impacts would be less than significant.

Stormwater

Drainage calculations prepared by Sherwood Design Engineers (Attachment 5), dated August 2023, have been reviewed for potential drainage impacts and accepted by the County Department of Public Works Stormwater Management Section staff, who determined the project feasible and in compliance with the County Stormwater Management Design Criteria. The project is also conditioned to include a Stormwater Control Plan, Final Stormwater Management Report, and will require the owner to record a stormwater management maintenance agreement for permanent maintenance of drainage on the structure. Therefore, no additional drainage facilities would be required for the project. Impacts generated from the project are expected to be less than significant.

Electric Power

Pacific Gas and Electric Company (PG&E) provides power to existing and new developments in the Santa Cruz County area. As of 2018, residents and businesses in the County were automatically enrolled in MBCP's community choice energy program, which provides locally controlled, carbon-free electricity delivered on PGE's existing lines.

The proposed site is already served by electric power, and no further improvements to serve the site are necessary; therefore, there will be no impact.

Natural Gas

PG&E serves the urbanized portions of Santa Cruz County with natural gas.

The proposed site will be served by propane tanks, and no improvements related to natural gas service will be required. No impacts are anticipated.

Telecommunications

The project does not include facilities which rely on telecommunication services; therefore, no impact is anticipated.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
2. *Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?*	☐	☐	☒	☐

***Discussion*:** The project would rely on an individual well for water supply. Public water delivery facilities would not have to be expanded.

The development is subject to the water conservation requirements in Chapter 7.69 (Water Conservation) and 13.13 (Water Conservation—Water Efficient Landscaping) of the County Code and the policies of section 7.18c (Water Conservation) of the General Plan. Therefore, existing water supplies would be sufficient to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years. Impacts would be less than significant.

3. *Result in determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?*	☐	☐	☐	☒

***Discussion*:** No wastewater would be connected to the municipal sewer collection system during construction of the project. No wastewater would be generated during the operational phase of the project. Therefore, no impacts would occur from project implementation.

4. *Generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?*	☐	☐	☒	☐

***Discussion*:** Organic waste generated from wine production, estimated to be 400 gallons annually, is collected by a specialized, third-party contractor for disposal. Due to the small incremental increase in solid waste generation by the project during construction and operations, the impact would be less than significant.

5. *Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?*	☐	☐	☐	☒

***Discussion*:** The project would comply with all federal, state, and local statutes and regulations related to solid waste disposal. No impact would occur.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

T. WILDFIRE

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:

1. *Substantially impair an adopted emergency response plan or emergency evacuation plan?*	☐	☐	☐	☒

Discussion: The project is in the State Responsibility Area-Moderate Fire Hazard. The *San Mateo – Santa Cruz Unit Strategic Fire Plan and the Community Wildfire Protection Plan* address areas with inadequate access and evacuation routes and identify risk to life and property from wildland fire and provide information on firefighter safety, community evacuation and recommended actions by first responders. The plans also address post-fire responsibilities for natural resource recovery, including watershed protection reforestation, and ecosystem restoration. In addition, a Local Hazard Mitigation Plan 2021-2026 (County of Santa Cruz, 2021) was adopted, as required by State law. The project will be developed consistent with County development standards and will not conflict with any of these plans. Therefore, impacts will be less than significant.

2. *Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?*	☐	☐	☒	☐

***Discussion*:** The proposed project does not propose components which would exacerbate wildfire risks in the area. The project design incorporates all applicable fire safety code requirements and includes fire protection devices as required by the local fire agency. In addition, the project will be required to meet the General Plan policies related to fire resilience and access in the Santa Cruz County General Plan, and standards for defensible spaces in the PRC and SCCC. Direct or indirect impacts would be less than significant.

3. *Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?*	☐	☐	☐	☒

Discussion: The proposal does not require installation or additional maintenance of infrastructure. No impacts are anticipated.

4. *Expose people or structures to significant risks, including downslope or downstream*	☐	☐	☒	☐

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

Discussion: Although the project is in a State Responsibility Moderate Fire Hazard area, the project design incorporates all applicable fire safety code requirements and includes fire protection devices as required by the local fire agency. Construction will be to prevailing building standards. The proposed project does not include any features that would result in an increased risk of post-fire slope instability, and the structures would not be built in a location which would be at risk for, or would induce additional risk, of runoff or flooding. Additionally, the drainage plan prepared by Sherwood Design Engineers (Attachment 5), was evaluated by County Stormwater Management staff, who determined the design adequate for the proposed site and consistent with the County Design Criteria Less than significant impacts are anticipated.

U. MANDATORY FINDINGS OF SIGNIFICANCE

1. *Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal community or eliminate important examples of the major periods of California history or prehistory?*	☐	☒	☐	☐

Discussion: The potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory were considered in the response to each question in Section III (A through T) of this Initial Study. Mitigations from that evaluation have been included to reduce potential impacts to less than significant. See Mitigation Measures BIO-1 through BIO-3 in Attachment 1.

There is no substantial evidence that significant effects associated with this project would result. Therefore, this project has been determined not to meet this Mandatory Finding of Significance.

2. *Does the project have impacts that are individually limited, but cumulatively considerable? ("cumulatively*	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?				

***Discussion*:** In addition to project specific impacts, this evaluation considered the project's potential for incremental effects that are cumulatively considerable. As a result of this evaluation, it was determined impacts would not be considered cumulatively considerable. Therefore, this project has been determined not to meet this Mandatory Finding of Significance.

3. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

***Discussion*:** In the evaluation of environmental impacts in this Initial Study, the potential for adverse direct or indirect impacts to human beings were considered in the response to specific questions in Section III (A through T). As a result of this evaluation, there were determined to be potentially significant effects to human beings related to the following: Biological Resources, Cultural Resources, and Noise. However, mitigation has been included that clearly reduces these effects to a level below significance. As a result of this evaluation, there is no substantial evidence that, after mitigation, there are adverse effects to human beings associated with this project. Therefore, this project has been determined not to meet this Mandatory Finding of Significance.

IV. REFERENCES USED IN THE COMPLETION OF THIS INITIAL STUDY

California Department of Conservation, 1980

Farmland Mapping and Monitoring Program Soil Candidate Listing for Prime Farmland and Farmland of Statewide Importance Santa Cruz County U.S. Department of Agriculture, Natural Resources Conservation Service, soil surveys for Santa Cruz County, California, August 1980.

California Department of Fish and Wildlife, 2019

California Natural Diversity Database 3712118, USGS 7.5-minute quadrangle; queried 3/19/2024

CalFIRE, 2010

Santa Cruz County-San Mateo County Community Wildfire Protection Plan. May 2010.

County of Santa Cruz, 1994

1994 General Plan and Local Coastal Program for the County of Santa Cruz, California. Adopted by the Board of Supervisors on May 24, 1994, and certified by the California Coastal Commission on December 15, 1994.

County of Santa Cruz, 2022

Final Environmental Impact Report Sustainability Policy and Regulatory Update. Certified by the Board of Supervisors November 2022. Available online at https://www.sccoplanning.com/Portals/2/County/Planning/policy/Sustainability%20Update%20Final%20EIR/Final%20EIR%20-%20Complete%20Document.pdf

County of Santa Cruz, 2021

County of Santa Cruz Local Hazard Mitigation Plan 2021-2026. Prepared by the County of Santa Cruz Office of Emergency Services.

County of Santa Cruz, 2022

County of Santa Cruz Climate Action Strategy. Approved by the Board of Supervisors, December 2022

FEMA, 2012

Flood Insurance Rate Maps 06087C0227E and 06087C0226E, Federal Emergency Management Agency. Effective May 16, 2012.

MBARD, 2008

Monterey Bay Air Resources District (MBARD) CEQA Air Quality Guidelines. Prepared by the MBUAPCD, Adopted October 1995, Revised: February 1997, August 1998, December 1999, September 2000, September 2002, June 2004, and February 2008. Available online at https://www.mbard.org/files/7b79ff940/WatermarkRemovedFebruary2016MBUAPCD_CEQA+Implementation+Guidelines%28update+to+1996+document%29.pdf

MBBARD, 2016

Monterey Bay Air Resources District (MBARD. Guidelines for Implementing the California Environmental Quality Act. Adopted October 1996, Revised: February 2016. Available online at https://www.mbard.org/files/0ce48fe68/CEQA+Guidelines.pdf

OPR, 2018

"Technical Advisory on Evaluating Transportation Impacts in CEQA." Available online at http://www.opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf.

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Attachment 1

Mitigation Monitoring and Reporting Program (MMRP)

County of Santa Cruz

Department of Community Development and Infrastructure

701 Ocean Street, Fourth Floor, Santa Cruz, CA 95060
Planning (831) 454-2580 Public Works (831) 454-2160
sccoplanning.com dpw.co.santa-cruz.ca.us
Matt Machado -Deputy CAO, Director of Community Development & Infrastructure

MITIGATION MONITORING AND REPORTING PROGRAM
for
Application No. 221332
(Twelve Stones Winery)
17300 Laurel Road, Los Gatos

No.	Mitigation Measures	Responsibility for Compliance	Method of Compliance	Timing of Compliance
Biological Resources				
BIO-1	Before construction activities begin, a qualified biologist will perform a preconstruction survey.	Applicant	Compliance monitored by the County Planning Department	Prior to site disturbance
BIO-2	Before construction activities begin, a qualified project biologist will conduct a worker environmental awareness training session for all construction personnel. At a minimum, the training will include a description of protected biological resources, species descriptions and habitat requirements, and general measures being implemented to protect sensitive resources during construction. Informational handouts with photographs clearly illustrating species appearances will be used in the training session. Training topics will include special-status species with potential to occur on the project site. Species are expected to include Santa Cruz wallflower, Ben Lomond spineflower, and Bonny Doon manzanita. The training session will include information about steps to take if a special- status species is encountered, beginning with immediate cessation of all project activities, and will including contact information for the biological monitoring staff and measures to protect species during construction. Additionally, a project biologist will be available to answer any questions about the special-status species. All new construction personnel will undergo this mandatory worker environmental awareness training when they start work on the project. Training will occur prior to the start of construction and periodically, as needed, if new construction personnel begin work at the project site. Each worker will sign a statement that they received training, and the	Applicant	Compliance monitored by the County Planning Department	Prior to site disturbance, during construction, site grading operations, and ongoing

No.	Mitigation Measures	Responsibility for Compliance	Method of Compliance	Timing of Compliance
	statement will be posted or easily available for viewing at the project site.			
BIO-3	The project biologist shall monitor the initial grading and clearing of the site.	Applicant	Compliance monitored by the Planning Department	During construction
Cultural Resources				
CUL-1	Before construction activities begin, a qualified Native American monitor will conduct a worker awareness training session for all construction personnel.	Applicant	Compliance monitored by the County Planning Department	Prior to site disturbance
CUL-2	A qualified Native American Monitor or archaeologist shall be present during excavation and grading activities.	Applicant	Compliance monitored by the County Planning Department	During site grading operations
CUL-3	If archaeological resources are uncovered during construction, the applicant's archaeologist shall ensure compliance with Santa Cruz County Code Chapter 16.40.035, including: 1) Cease and desist from all further excavations and disturbances within 200 feet of the discovery. 2) Arrange for staking completely around the area of discovery by visible stakes no more than 10 feet apart, forming a circle having a radius of no less than 100 feet from the point of discovery; provided, however, that such staking need not take place on adjoining property unless the owner of the adjoining property authorizes such staking. 3) Notify the Sheriff-Coroner of the discovery if human remains have been discovered. Notify the Planning Director if the discovery contains no human remains. 4) Grant all duly authorized representatives of the Coroner and the Planning Director permission to enter onto the property and to take all actions consistent with chapter 16.40 of the County Code.	Applicant	Compliance monitored by the County Planning Department	During construction, site grading operations, and ongoing
Noise				
NOI-1	Limit construction activity to between the hours of 8:00 a.m. to 5:00 p.m. Monday through Friday, 9:00 a.m. to 5:00 p.m. and prohibit	Applicant	Compliance monitored by the County Planning Department	Prior to site disturbance

No.	Mitigation Measures	Responsibility for Compliance	Method of Compliance	Timing of Compliance
	construction on Saturdays and Sundays.			
NOI-2	Prohibit the use of amplified music at the site.	Applicant	Compliance monitored by the County Planning Department	Ongoing during winery operations
NOI-3	Property owner shall establish a point of contact for managing neighbor concerns and complaints and shall provide contact information for that person to all adjacent property owners.	Applicant	Compliance monitored by the County Planning Department	Ongoing during winery operations

Attachment 2

Geotechnical and Geologic Reports

GEOLOGIC HAZARDS INVESTIGATION
12 Stones Winery, 17300 Laurel Road
Santa Cruz County, California
APN: 095-101-22

Prepared for:
Karen and Aaftab Munshi
17300 Laurel Road
Santa Cruz County, California
March 2022 (Revised September 12, 2022)

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

330 Village Lane, Los Gatos, California 95030 (408) 354-5542 Fax (408) 354-1852
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COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

March 14, 2022
Revised September 12, 2022 (Revised Tasting Room Location)
G6141

Aaftab and Karen Munshi
12 Stones Winery
17300 Laurel Road
Los Gatos, CA 95030

SUBJECT: **Engineering Geologic Hazards Investigation**
RE: 12 Stones Winery
17300 Laurel Road, Santa Cruz County
APN 095-101-22

Dear Aaftab and Karen Munshi:

Cotton, Shires and Associates, Inc. (CSA) is pleased to submit the following report in which we describe the findings, conclusions, and recommendations of our Engineering Geologic Hazards Investigation of the proposed 12 Stones Winery and associated improvements at your property located at 17300 Laurel Road, Santa Cruz County, California. In this report, we characterize the geologic hazards with the potential to impact the proposed winery facilities and associated improvements, and provide conclusions with regard to project feasibility. In addition, we provide engineering geologic recommendations to be considered as part of the overall winery development.

We appreciate the opportunity to have been of service to you on this project. If you have any questions regarding this report, please feel free to call us.

Very truly yours,

COTTON, SHIRES AND ASSOCIATES, INC.

PROFESSIONAL GEOLOGIST
JOHN MICHAEL WALLACE
No. 1923
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

John M. Wallace
Principal Engineering Geologist
CEG 1923

Cody Sanford
Senior Staff Geologist

JMW:CRS

ENGINEERING GEOLOGIC HAZARDS INVESTIGATION
Proposed 12 Stones Winery
17300 Laurel Road
Los Gatos, CA

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ENGINEERING GEOLOGIC HAZARDS INVESTIGATION

Proposed 12 Stones Winery

17300 Laurel Road, Santa Cruz County

1.0 INTRODUCTION

1.1 Project Description

In this report, Cotton, Shires and Associates, Inc. (CSA) is presenting the results of our engineering geologic hazards investigation at your property located at 17300 Laurel Road, Santa Cruz County, California. The 20-acre property is located 0.4 miles east of the intersection between Highway 17 and Laurel Road (Figure 1, Site Location Map). Our investigation is intended to support an application for a building permit to develop winery facilities at the site. We understand that the project is to include an underground winery and storage facility, and a separate above-ground tasting room located above the underground winery. Our investigation was performed in accordance with our proposal to you, dated November 11, 2021. We performed our field work between November and December, 2021.

1.2 Purpose and Scope of Work

The purpose of our investigation was to assess the geologic hazards at the subject property in the vicinity of the proposed winery facilities. Our objectives were to: 1) investigate the surface and subsurface geologic conditions; 2) evaluate the potential for geologic hazards to impact the proposed facilities; 3) determine site feasibility from a geologic standpoint; and 4) provide recommendations for reducing geologic risk to the proposed facilities. The specific scope of work performed for our investigation included the following tasks:

1) Review of published and unpublished geologic maps and reports;
2) Review of Google Earth aerial photographs and LiDAR imagery;
3) Engineering geologic mapping;
4) The generation of engineering geologic cross sections;
5) Excavation and logging of 5 exploratory trenches; and
6) Preparation of this report.

2.0 PHYSICAL AND GEOLOGIC SETTING

The physical parameters that influence the site include: topography (terrain), the geologic setting, and the seismic setting. The following sections present descriptions of each of these parameters, including discussions of the influence that each parameter has on the subject area.

2.1 Topography (Terrain)

The property is situated along a northwest-southeast-trending spur ridge on the western flank of the West Branch Soquel Creek drainage at an elevation range of approximately 1,120 to 1,235 feet. The proposed winery's coordinates are 37.106 Latitude, and -121.970 Longitude. The ridgetop is characterized by a broad, gently sloped (sub-horizontal to 20% inclination) upland surface, with a saddle at roughly the midpoint of the ridgeline (Figure 2, Regional LiDAR Hillshade Map). The ridgetop is straddled by northeast, east, and southwest facing slopes that are moderately steep to very steep (20% to 80% inclination). The coordinates at the site are 37.105 degrees latitude and -121.969 degrees longitude.

2.2 Geologic Setting

The subject property is located within the Coast Range Geomorphic Province, located structurally between the active strike-slip faults of the San Andreas to the northeast, and the active San Gregorio fault zone to the west, within the Salinian structural block. The property is centrally located within Santa Cruz Mountains, a rapidly uplifting mountain range extending from 19 miles south of San Francisco to Pajaro, east of Watsonville. The Santa Cruz Mountains trend northwest-southeast, and are composed of tightly folded, Cenozoic sedimentary rocks whose regional structure is defined by fault-bounded, northwest-southeast-oriented blocks with unique stratigraphic and structural histories.

According to published geologic maps (Dibblee, 2005, and Brabb, 1997), the subject property is underlain by massive to thick-bedded sandstone bedrock of the Purisima Formation (Figure 3, Regional Geologic Map). The Purisima Formation conformably overlies a medium to thickly bedded and faintly laminated mudstone (Santa Cruz

Mudstone) to the southwest and unconformably overlies thin to medium bedded shale and siltstone bedrock (Lambert Shale) to the northeast. The subject property is structurally located on the northeast limb of a northwest-southeast trending syncline. The regional geologic map reveals that the local bedrock structure dips moderately to the southwest near the property.

The published County of Santa Cruz Hazard Areas map (Cooper-Clark and Associates, 1975), identifies a probable landslide just northwest of the property, a very large probable landslide adjacent to the southwestern property boundary, three questionable small landslides located along northeastern slopes of the property, and a very large questionable landslide just north of the property boundary (Figure 4, Regional Landslide Map). The Dibblee Jr. (2005) map also shows Quaternary landslides present both northwest and southwest of the subject site, but no landslides are shown in the area of proposed facilities. The general direction of movement (displacement) of the Quaternary landslides is shown to the northeast and southeast respectively; however, analysis of more recently available LiDAR maps reveals that the probably landslide limits and movement directions are more likely as shown on our LiDAR Hillshade Landslide Map (Figure 5). None of the regional landslide maps, no our LiDAR Hillshade Landslide Map show the proposed winery facilities being underlain by, or potentially affected by landslides.

During the course of our engineering geologic mapping of the site, we investigated the questionable small landslides identified on the County Landslide Map located along the northeastern slopes of the property. These lobe-shaped features are steeply eroded drainages along the evacuated scarp areas of the larger, deep-seated landside to the north. It appears that very old, shallow landsliding evacuated these areas, creating topographic hollows that are now collection areas for colluvial soil.

2.3 Seismic Setting

The project site is situated in a very seismically active area. Historically, this area has been subjected to strong ground shaking from major earthquakes, and the site will continue to experience strong ground shaking in the future. Historic earthquakes

responsible for seismic shaking in this area include the 1906 M=7.9 San Francisco earthquake centered approximately 54.8 miles to the northwest, the 1989 M=6.9 Loma Prieta earthquake centered approximately 6.6 miles to the east, and a M=6.6 earthquake in 1911 thought to be located approximately 25 miles north along the Calaveras fault. Figure 6 (Regional Fault Map) and Table 1 illustrate the significant active faults located closest to the site, including the San Andreas fault zone (located 2.2 miles toward the northeast), the San Gregorio fault (located 15.3 miles to the southwest), the Monterey Bay/Tularcitos fault (located 16.5 miles to the southwest), and the nearby Zayante/Vergeles (located approximately 1.2 miles to the southwest). The site is not located within a State (California Geological Survey) Mapped Alquist-Priolo Fault Rupture Hazard Zone. Our review of regional geologic maps reveals that no active or potentially active faults have been mapped across the property.

TABLE 1

Fault Source	**Distance (mi.)**	**Moment Magnitude[1]**
Zayante/ Vergeles	1.2	6.8
San Andreas (1906)	2.2	7.9
San Andreas Santa Cruz Mtns	2.2	7.0
San Gregorio	15.3	7.0
Monterey Bay/ Tularcitos	16.5	7.1

2.3.1 Seismic Design

Based on our geotechnical investigation, the site location, our interpretation of the 2019 CBC and the ASCE/SEI 7-16 online tool and Hazard Report, a peak ground acceleration

of 1.108g should be anticipated for design purposes. We are providing the following parameter recommendations:

Table 2 - Seismic Design Parameters

Parameter	Value
Risk Category	II
Site Classification	C
Mapped Spectral Acc. 0.2 Sec. (g)	S_S = 2.191
Mapped Spectral Acc. 1 Sec. (g)	S_1 = 0.894
S_{MS} = FaSs	2.629
S_{M1} = F_vS_1	1.251
S_{DS}=2/3 S_{MS}	1.753
S_{D1}=2/3 S_{M1}	0.834
T_L	12
PGA_M	1.108g

Reference: ASCE 7 Hazards Report, ASCE/SEI 7-16

Taking into account the faults described above, the 2019 California Building Code (CBC), and the ASCE 7-22 code coefficients presented in Section 2.3.1 of this report, it is our opinion that the site could experience a peak horizontal ground acceleration (PGA_M) as high as **1.1g**.

3.0 SITE CONDITIONS

3.1 Surface Conditions

The property is situated along a gently sloped (sub-horizontal to 20% inclination) ridgetop with moderately steep to very steep (20% to 80% inclination) northeast, east, and southwest facing slopes. Along the ridgetop, a natural saddle is located at approximately the midpoint of the ridgeline between the proposed winery and the existing barn. Several defined topographic hollows are located on the northeast-facing slopes. Drainage across the site is primarily defined as sheetflow off the ridgetop to the northeast, east, and southwest.

The proposed winery is to be located underground in an area of gently to moderately sloping terrain, along the west side of a prominent topographic hollow. The proposed tasting room is located on gently inclined topography along the top of the hillside immediately above the winery (Figure 7, Engineering Geologic Map).

Access to the site is via an asphaltic concrete driveway that extends southeastward from Laurel Road and leads down to an existing barn, main residence, and two accessory structures. A vineyard is located along the south-southwest flank of the property. The proposed wine cave and associated improvements are located along the northwestern half of the property adjacent to the driveway on northeastern side. The property is vegetated with seasonal grasses, shrubs, and mature redwood, madrone, and oak trees.

3.2 Earth Materials

Earth materials present at the subject property include colluvial soil, regolith, and Purisima Formation bedrock materials.

3.2.1 Colluvial Soil – Colluvial soils at the site are derived from the weathering of Purisima Formation bedrock and consist of silty clay and clayey silt with rock fragments that are transported downslope under the influence of gravity and water.

3.2.2 Regolith – Regolith at the site consists of weathered-in-place Purisima Formation bedrock, and typically consists of rocky silty clay and clayey silt that has been completely weathered to a soil-like consistency.

3.2.3 Purisima Formation (Tp) – The Purisima Formation is described as a Pliocene and upper Miocene aged siltstone and sandstone, very thick bedded, yellowish grey, tuffaceous and diatomaceous (Brabb, 1997). The sandstone is massive to thick bedded, light brown to tan, fine-medium grained, weakly lithified, friable, arkosic, and locally fossiliferous (Dibblee, Jr., 2005). The bedrock materials encountered at the site are consistent with Purisima Formation bedrock, and consist primarily of weathered fine-grained sandstone.

3.3 Subsurface Conditions

We explored the subsurface conditions at the property by means of five exploratory trenches (T-1 through T-5) excavated by Lyons General Engineering utilizing a CAT 305.5E2 CR excavator. The exploratory trenches were logged by our geologists and engineering geologists between November 29 and December 08, 2021. Trench locations are shown on Figure 7 (Engineering Geologic Map), and detailed descriptions of the materials encountered in the excavations are presented in Appendix A of this report.

Exploratory Trench T-1 - In exploratory trench T-1, which was excavated in the northwestern portion of the property on the northeastern side of the driveway, we encountered approximately 0.5 to 1 foot colluvial soil materials. The soil materials consisted of soft to medium stiff, dry to moist, silty lean clay with abundant roots and rock fragments. Near the southeastern end of the trench at a depth from 1 to 2 feet, we encountered a pocket of moist to wet, rocky silty lean clay regolith that appeared to be weathered-in-place Purisima Formation bedrock, but soil-like. Underlying the soil and regolith, we encountered competent but closely to intensely fractured, deeply weathered Purisima Formation fine-grained sandstone bedrock. Prominent factures were exposed within this unit and mostly dip moderately to steeply to the east-southeast. At a depth of 5 to 6 feet along the northwestern (uphill) two-thirds of the trench, we encountered fractured, moderately weathered Purisima Formation sandstone bedrock. This test pit is located west of, and atop a portion of the proposed underground winery facility.

Exploratory Trench T-2 - In exploratory trench T-2, which was excavated in the northwestern portion of the property and southeast (downhill) of T-1, we encountered approximately 1.5 to 3 feet of colluvial soil materials. The soil materials consisted of soft to stiff, dry to moist, silty lean clay with abundant roots and rock fragments. At a depth of 1.5 to 3 feet and underlying the colluvial soil materials, we encountered 0.5 to 4 feet of moist to wet, rocky silty lean clay regolith that appeared to be weathered-in-place Purisima Formation bedrock, but soil-like. At a depth of 5 to 6.5 feet along the southeastern (downhill) two-thirds of the trench and underlying the regolith, we encountered competent but closely to intensely fractured, deeply weathered Purisima Formation fine-grained sandstone bedrock. At a depth of approximately 8 feet along the southeastern (downhill) half of the trench, we encountered fractured, moderately

weathered Purisima Formation sandstone bedrock. This trench is located immediately north of the proposed underground winery facility.

Exploratory Trench T-3 - In exploratory trench T-3, which was excavated in the northwestern portion of the property near the ridgetop saddle, we encountered approximately 6.5 to 10 feet of colluvial soil materials. The soil materials consisted of 3 to 5 feet of stiff to very stiff, dry to moist, sandy lean clay with abundant roots. At a depth of 3 to 5 feet and below the sandy lean clay, we encountered a stiff to hard, moist, silty clay with trace roots and rock fragments. At a depth of 6.5 to 10 feet along the southwestern (uphill) half of the trench, we encountered 0.5 to 1 foot of moist, rocky silty lean clay regolith that appeared to be weathered-in-place Purisima Formation bedrock, but soil-like. At a depth of 8 to 10 feet along the southwestern (uphill) half of the trench, we encountered competent but closely fractured, moderately weathered Purisima Formation sandstone bedrock.

Exploratory Trench T-4 - In exploratory trench T-4, which was excavated in the northwestern portion of the property near the existing barn, we encountered 1 to 2 feet of colluvial soil materials. The soil materials consisted of soft to medium stiff, dry to moist, silty lean clay with abundant roots and few rock fragments. At a depth of 1 to 2 feet underlying the soil materials, we encountered 1 to 3 feet of competent but closely to intensely fractured, deeply weathered Purisima Formation fine-grained sandstone bedrock. At a depth of 3 to 5 feet, we encountered closely fractured, moderately weathered Purisima Formation sandstone bedrock. This trench was located between the proposed tasting room and the northern slope.

Exploratory Trench T-5 - In exploratory trench T-5, which was excavated in the northwestern portion of the property northeast (downhill) of T-3, we encountered approximately 5 to 5.5 feet of colluvial soil materials. The soil materials consisted of 2.5 feet of soft to medium stiff, dry to moist, silty lean clay with abundant roots. At a depth of 2.5 feet underlying the silty lean clay, we encountered 2.5 to 3 feet a medium stiff to stiff, moist, sandy lean clay with rock fragments and trace roots. At a depth of 5 to 5.5 feet and underlying the soil materials, we encountered 1 to 1.5 feet of moist, rocky sandy lean clay regolith that appeared to be weathered-in-place Purisima Formation bedrock, but soil-like. At a depth of 6 to 6.5 feet, we encountered 1 to 1.5 feet of competent but closely fractured, deeply weathered Purisima Formation fine-grained sandstone

bedrock. At a depth of approximately 7 feet along the southwestern (uphill) half of the trench, we encountered fractured, moderately weathered Purisima Formation sandstone bedrock. This trench was located in the axis of the topographic hollow where regional maps show a questionable landslide. Our geologic logging of the test pit revealed that relatively shallow colluvium was observed over competent bedrock, with no evidence of landsliding (i.e., no deep soil accumulation, no landslide debris, no landslide shear planes, and competent bedrock at a depth of approximately 5 to 6 feet).

Engineering geologic mapping, aerial photograph analysis, and subsurface exploration reveal that the area of the proposed underground winery is characterized by gently sloping ridgeline topography with a thin accumulation of soil materials overlying competent Purisima Formation bedrock. The bedrock materials grade from regolith, consisting of a soil-like, clast-supported fine-grained sandstone with a matrix of silty lean clay, into fine-grained sandstone, and a fine- to medium-grained sandstone. The proposed tasting room is to be located atop the winery, on gently inclined slopes with very shallow soil cover (1to 2 feet thick). Our geologic interpretation of these areas is depicted on our Engineering Geologic Map (Figure 7) and Engineering Geologic Cross Sections A-A', B-B', and C-C' (Figures 8, 9, and 10, respectively).

3.4 Groundwater Conditions

We did not encounter groundwater in our exploratory trenches. Fluctuations in groundwater levels could occur from variations in rainfall, and thus, groundwater levels may be different at different times and locations. Heavy rainfall appears to result in temporary saturation of the near-surface soils, and should be anticipated regularly at this site.

4.0 POTENTIAL GEOLOGIC HAZARDS

Geologic hazards that may impact the site include the following: 1) slope movement (i.e., landslides, soil creep, erosion, and 2) seismic hazards, (i.e., surface fault rupture, seismically induced landsliding, ridgetop shattering, and ground lurching/ground cracking). In the following sections, we describe these hazards along with corresponding degrees of determined potential risk, and provide recommendations for mitigation measures.

4.1 Slope Movement

Based on our field mapping, aerial photograph and LiDAR analysis, and logging of exploratory trenches, we have evaluated the potential for slope movement hazards to impact the site, including: 1) landslides; 2) surficial soil creep; and 3) erosion.

4.1.1 Landsliding – The County Landslide map identifies three questionable small landslides located along northeastern slopes of the property. It appears that very old, shallow landslide evacuations may have been responsible for creating these topographic hollows. Test Pit 5, which excavated in the axis of the middle swale, encountered no landslide debris, indicating that these hollows were completely evacuated, leaving only the topographic hollow. These features appear to be very old, and surficial processes have degraded most of the landslide geomorphology. The likelihood of the slope activating as a new landslide, in our opinion, is **low**. A very small steep scarp was observed along the uphill side of the private access road located at the northeastern property boundary. This scarp is likely due to the steep cut slope during grading for the private access road. Hummocky topography was observed on the downhill side of the private access road on the adjacent property to the north, and is consistent with the mapped large landslide mass shown on Figure 5. No evidence of landsliding was observed within the proximity of the proposed winery or tasting room.

4.1.2 Soil Creep - The colluvial deposits in the upper several feet of the ridgeline and adjacent slopes are susceptible to surficial soil creep. We judge that the potential for soil creep to adversely impact the proposed winery and tasting room is low if foundations are supported sufficiently into competent bedrock.

4.1.3 Erosion – Controlling surface water in this area is imperative due to the erosion potential of the colluvial soil materials. Provided that concentrated runoff is strictly controlled, it is our opinion that the potential for erosion to adversely impact the winery and tasting room is **low**.

4.2 Seismic Hazards

Seismic ground shaking associated with a large earthquake on the San Andreas, San Gregorio, or Zayante/Vergeles faults, is considered to be a **high** potential hazard in the project area during the lifetime of the project. Peak ground accelerations of up to 1.1 should be anticipated at the site. Seismically-induced ground failure mechanisms present potential hazards to the site, including the hazards of fault rupture, lurching, landslides, liquefaction and lateral spreading.

4.2.1 Seismically Induced Landsliding - Our investigation of the area of the proposed winery has determined that the area is underlain by 1 to 10 feet of surficial soil deposits on the gently sloping ridgeline and adjacent slopes. This ridgeline presents a **low** potential for seismically induced landsliding. However, the steep slopes along the northeastern side of the ridgeline have a moderate potential for seismically-induced shallow landsliding. We recommended that an appropriate setback (minimum of 25 feet) be maintained from this break in slope for shallowly supported foundations.

4.2.2 Ground Rupture - No active faults have been recognized on, or mapped through the subject property. The San Andreas fault zone is located approximately 2.2 miles to the northeast, and the Zayante/Vergeles fault is located approximately 1.2 miles to the southwest. As part of our aerial imagery analysis, and geologic mapping, we have not observed evidence for faulting at the site. Therefore, the potential for surface fault rupture on the property is considered to be **low**.

4.2.3 Ridgetop Shattering – Ridgetop shattering is a phenomenon whereby earthquake energy becomes focused along ridgetops and becomes amplified due to topographic effects of the ridge that literally trap the seismic waves. This amplification can result in ridgetops experiencing ground rupture that is unrelated to faulting. Geologic exploration for ridgetop shattering includes geologic mapping to identify topographic furrow, and trenching to identify 'carrot structures', or other similar fractures in the rock that become filled with soil material. Our geologic mapping and trenching programs did not identify evidence for ridgetop shattering. Additionally, areas within the Santa Cruz Mountains that did experience ridgetop shattering were along ridges with a much narrower crest, and steeper side slopes. Therefore, it is our

opinion that the project site has a **low risk** of experiencing ridgetop shattering during a large earthquake.

4.2.4 Ground Lurching/Ground Cracking - Ground lurching and cracking occur during an earthquake where seismic energy results in ground movement toward the free face of a slope, or by pulling away of ground from the ridge as incipient landslides partially mobilize. These ground cracks are typically sub-parallel with the long axis of the ridge or slope break. An effort to document the ground cracks stemming from the 1989 Loma Prieta earthquake was performed by the County, and published by as the County Crack Map (Spittler and Harp, 1990). This map does not show any mapped ground cracks at the Munshi property. Our geologic mapping and trenching programs did not identify evidence for ground cracking at the site. Therefore, it is our opinion that the project site has a **low risk** of experiencing seismically induced ground cracks during a large earthquake. However, small ground cracks are difficult to identify in the surface and subsurface, and thus, it would be prudent for the design engineer to account for the possibility of small (1 to 2 inches) grounds cracks to occur during the lifetime of the structure.

5.0 CONCLUSIONS

Based upon our site geologic mapping, LiDAR imagery analysis, subsurface exploration, and experience with similar site conditions, it is our opinion that the proposed underground winery and above-ground tasting room are feasible from a geologic standpoint, provided our recommendations are followed. We evaluated the geologic hazards that could impact the site (landsliding, seismic shaking, earthquake-induced ground cracking, faulting, erosion, and soil creep), and while these potential hazards are typically more hazardous in mountainous settings, provided our recommendations are followed, these risks can be reduced to acceptable levels at this site.

6.0 RECOMMENDATIONS

1. The proposed winery and tasting room should be placed sufficiently away (i.e., approximately 25 feet) from the top of steep descending slopes so as to reduce the potential adverse impacts of soil creep, erosion, shallow landsliding, and seismically induced ground cracking. Engineered retaining

walls, or deep foundation systems may be considered if it is desired to encroach closer than 25 feet from the steep slopes.

2. A comprehensive geotechnical engineering investigation should be performed for the winery and tasting room to provide foundation and retaining wall design recommendations. Foundation recommendations should account for the possibility of small (1 to 2 inches) ground cracks at the site.

3. Drainage control will be essential for limiting erosion and maintaining stable slopes. All roof and site runoff should be collected in closed conduits and directed to appropriate discharge locations at the site. The Project Civil Engineer should consult with CSA to identify appropriate discharge locations. Concentrated runoff should not be discharged onto steep slopes, or slopes prone to erosion or landsliding.

4. The plans for the proposed improvements should be reviewed and approved by a representative of **Cotton, Shires and Associates, Inc.** in order to assure compliance with the recommendations of this report.

5. All excavations, including foundation excavations, shafts, and keyways, should be observed by a representative of **Cotton, Shires and Associates, Inc.** prior to placing steel, backfilling, and/or pouring of concrete. Any grading should also be observed and tested, as appropriate, to assure adequate stripping and compaction. Our office should be contacted with a minimum of 48 hours advance notice of construction activities requiring observation and/or testing services.

7.0 INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering geology principles and practices. No warranty, expressed or implied, or merchantability of fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings.

Any recommendations and/or design criteria presented in this report are contingent upon our firm being retained to review the final drawings and specifications, to be consulted when any questions arise with regard to the recommendations contained herein, and to provide testing and inspection services for earthwork and construction operations. Unanticipated soil and geologic conditions are commonly encountered during construction that cannot be fully determined from existing exposures or by limited subsurface investigation. Such conditions may require additional expenditures during construction to obtain a properly constructed project. Some contingency fund is recommended to accommodate these possible extra costs.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are called to the attention of the project architect and/or engineer and incorporated into the plans. Furthermore, it is also the responsibility of the owner, or of his representative, to ensure that the contractor and subcontractors carry out such recommendations in the field.

8.0 REFERENCES

8.1 Documents/Maps

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8.2 Aerial Imagery Analysis

LiDAR hillshade imagery was reviewed and utilized for photo-geologic mapping, as well as Google Earth images.

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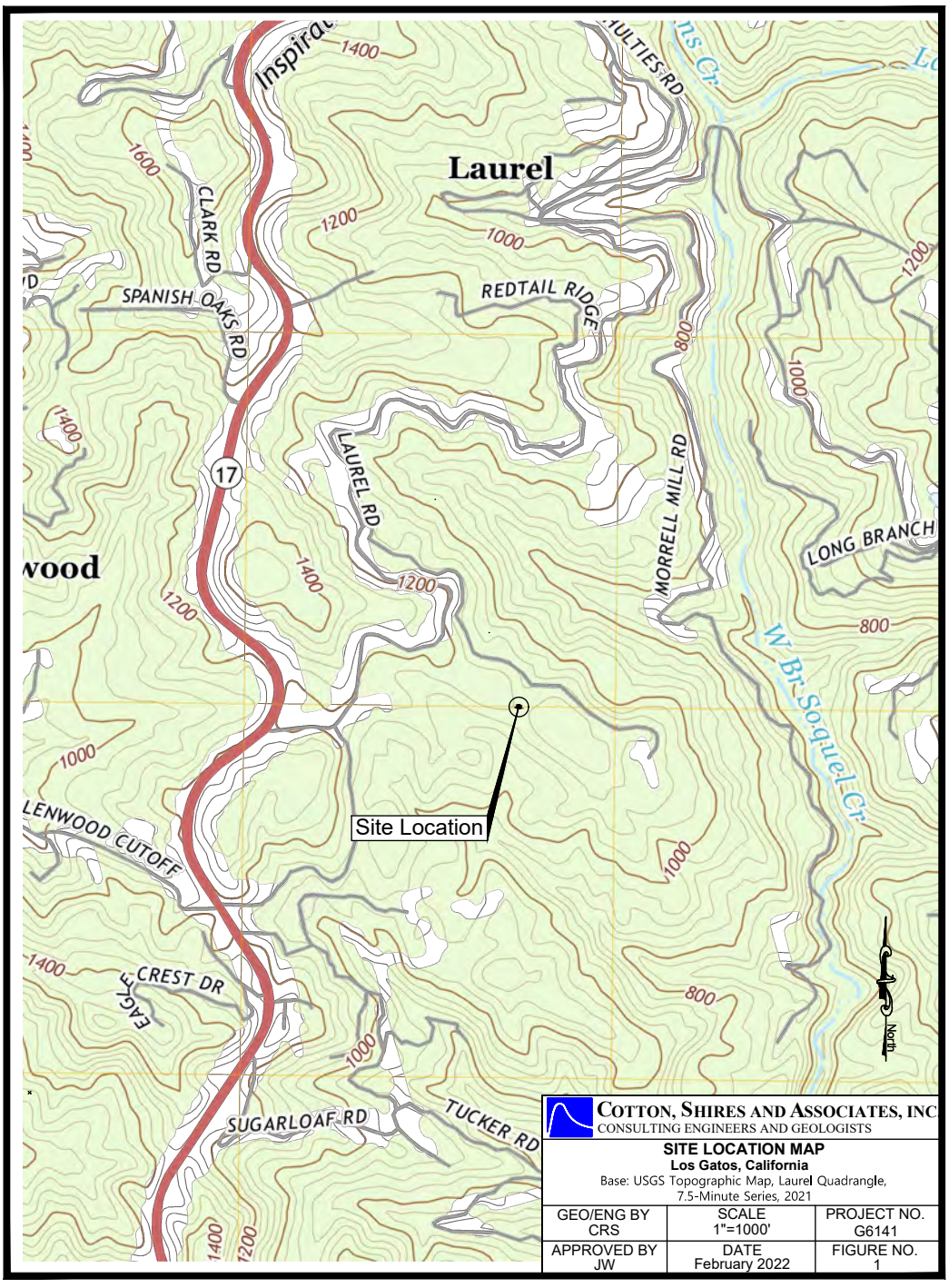
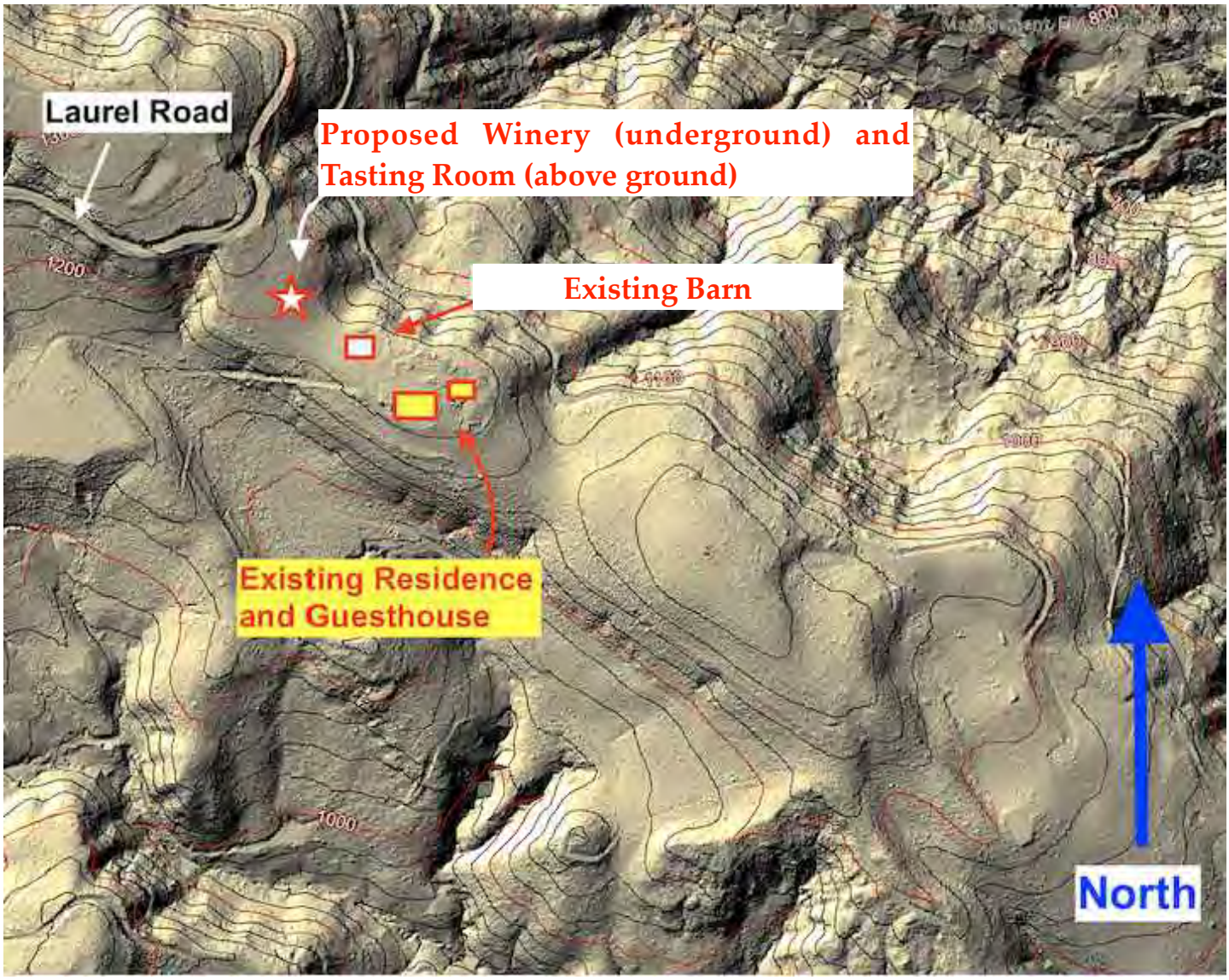
Figures


Laurel
CLARK RD
SPANISH OAKS RD
REDTAIL RIDGE
LAUREL RD
MORRELL MILL RD
LONG BRANCH
W Br Soquel Cr
Site Location
LENWOOD CUTOFF
CREST DR
SUGARLOAF RD
TUCKER RD
17
1400
1200
1000
800
1600
North
COTTON, SHIRES AND ASSOCIATES, INC
CONSULTING ENGINEERS AND GEOLOGISTS
SITE LOCATION MAP
Los Gatos, California
Base: USGS Topographic Map, Laurel Quadrangle, 7.5-Minute Series, 2021
GEO/ENG BY CRS
SCALE 1"=1000'
PROJECT NO. G6141
APPROVED BY JW
DATE February 2022
FIGURE NO. 1



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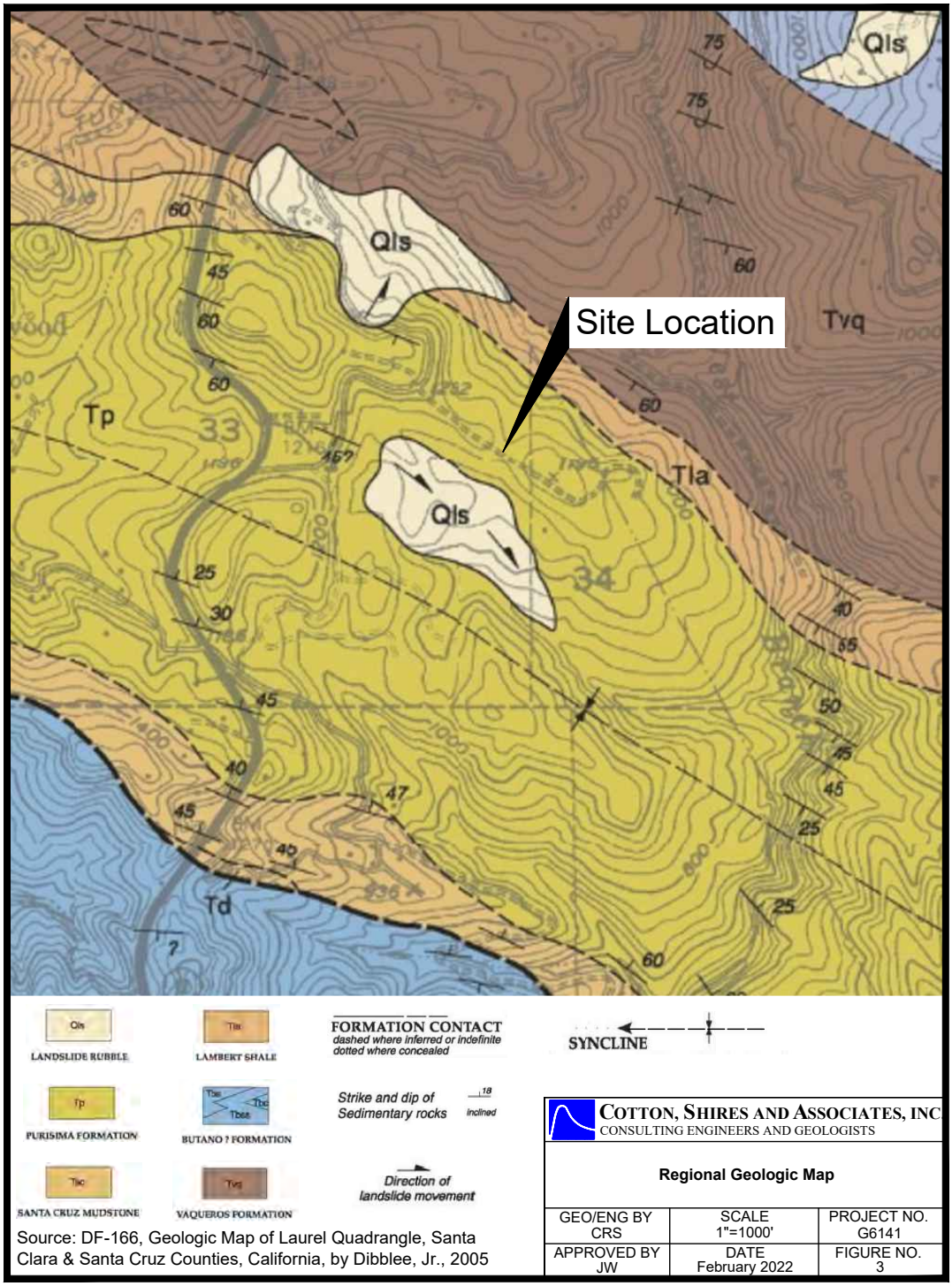
LIDAR HILLSHADE MAP

GEO/ENG BY	DATE	PROJECT NO.
CRS	September 2022	G6141
APPROVED BY		FIGURE NO.
JW		2



Source: DF-166, Geologic Map of Laurel Quadrangle, Santa Clara & Santa Cruz Counties, California, by Dibblee, Jr., 2005

COTTON, SHIRES AND ASSOCIATES, INC
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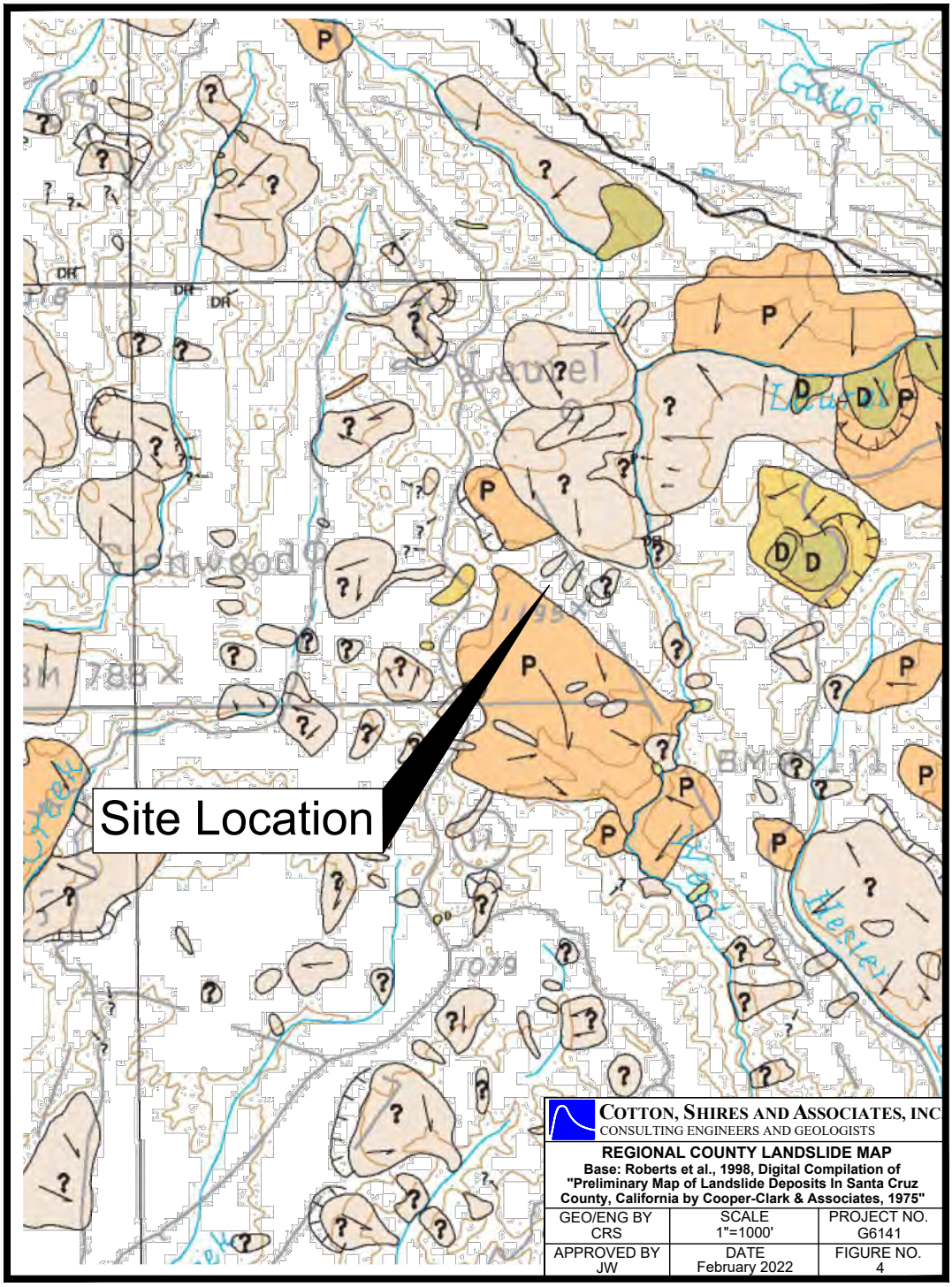
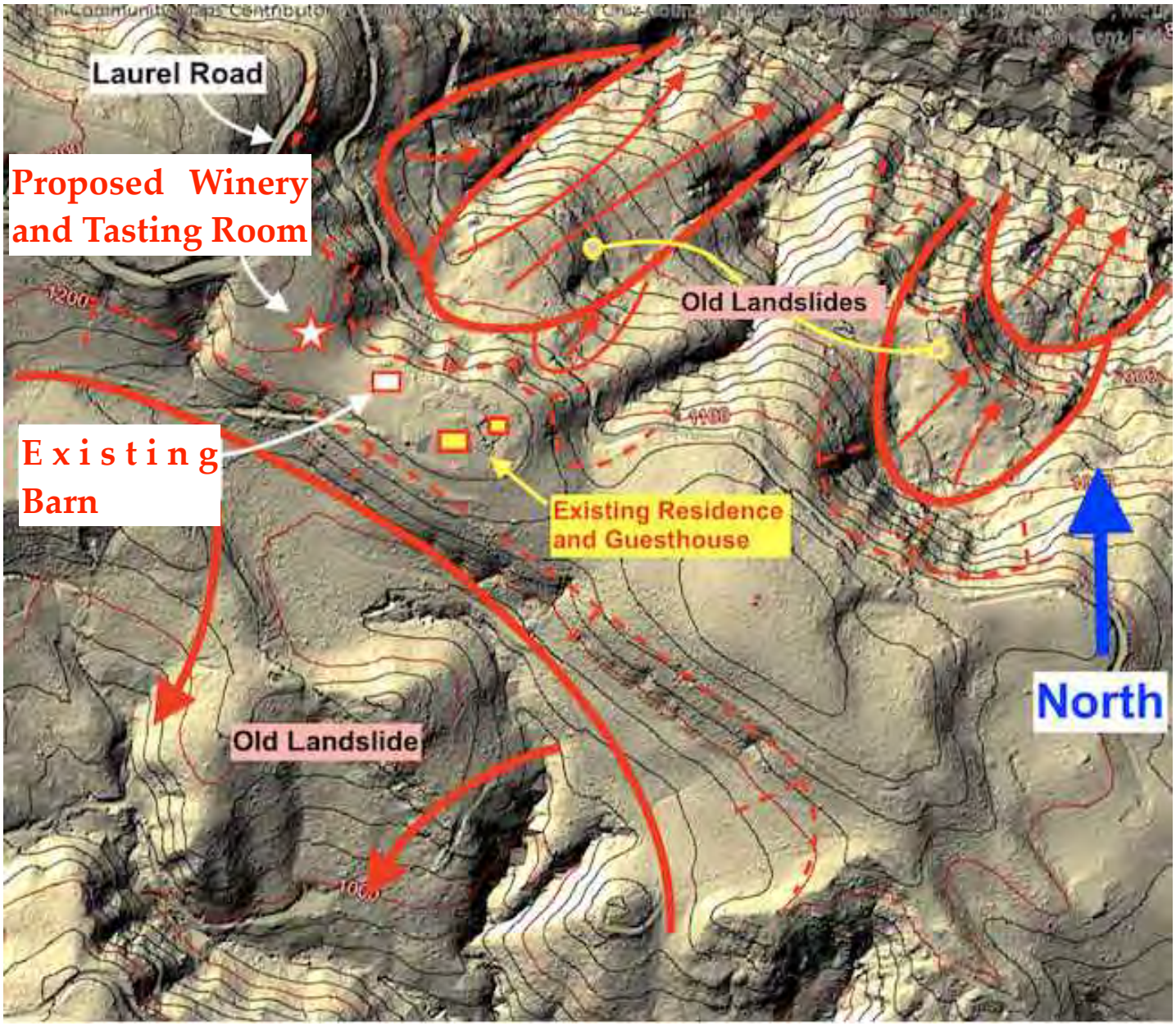
Regional Geologic Map

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=1000'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	February 2022	3


Site Location
COTTON, SHIRES AND ASSOCIATES, INC
CONSULTING ENGINEERS AND GEOLOGISTS
REGIONAL COUNTY LANDSLIDE MAP
Base: Roberts et al., 1998, Digital Compilation of "Preliminary Map of Landslide Deposits In Santa Cruz County, California by Cooper-Clark & Associates, 1975"
GEO/ENG BY CRS
SCALE 1"=1000'
PROJECT NO. G6141
APPROVED BY JW
DATE February 2022
FIGURE NO. 4



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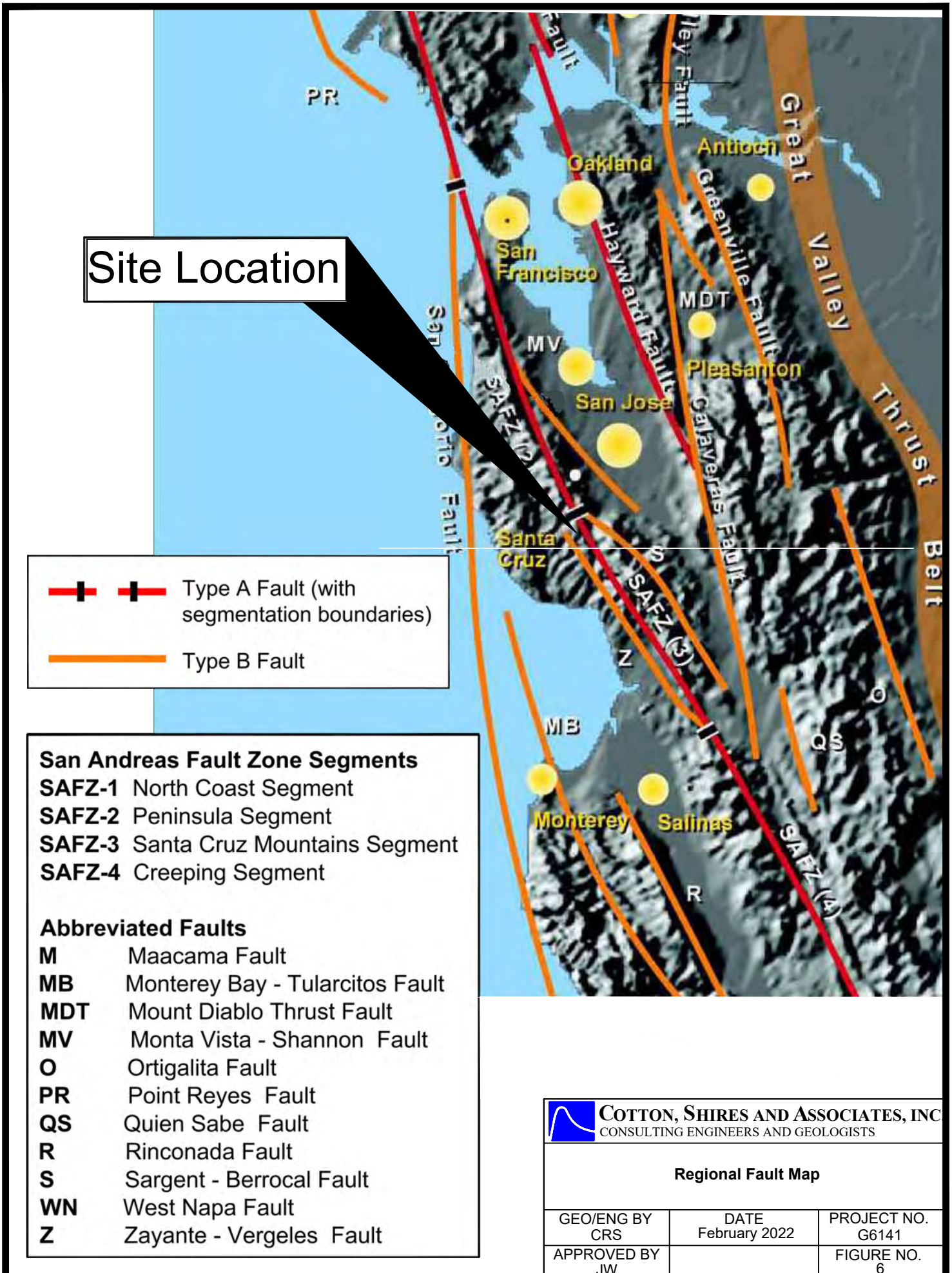
LIDAR HILLSHADE LANDSLIDE MAP

GEO/ENG BY	DATE	PROJECT NO.
CRS	September 2022	G6141
APPROVED BY		FIGURE NO.
JW		5



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Regional Fault Map

GEO/ENG BY CRS	DATE February 2022	PROJECT NO. G6141
APPROVED BY JW		FIGURE NO. 6

25-Foot Habitable Setback

Proposed Tasting Room (Approximate)

Proposed Underground Winery (Hatched)

Colluvial Hollow

Qc

Qls

Roadway

Colluvial Hollow

Colluvial Hollows

Tp

Existing Driveway

Existing Barn

Qc

Tp

A

A'

B

B'

C

C'

CSA/SD-1

CSA/SD-2

CSA/SD-3

CSA/SD-4

CSA/SD-5

CSA/SD-6

T1

T2

T3

T4

T5

1230

1220

1210

1200

1190

1180

1170

1160

1100

1090

1080

1190

North

0 10 20 40

(feet)

Explanation

Geologic Units:

Qc - Colluvium

Qls - Old landslide

Tp - Purisima Formation Sandstone at Shallow Depth (less than 3 feet)

T1 — **Geologic Trench**

CSA/SD-1 — **Location of Exploratory Boring**

A — A' — **Engineering Geologic Cross Section**

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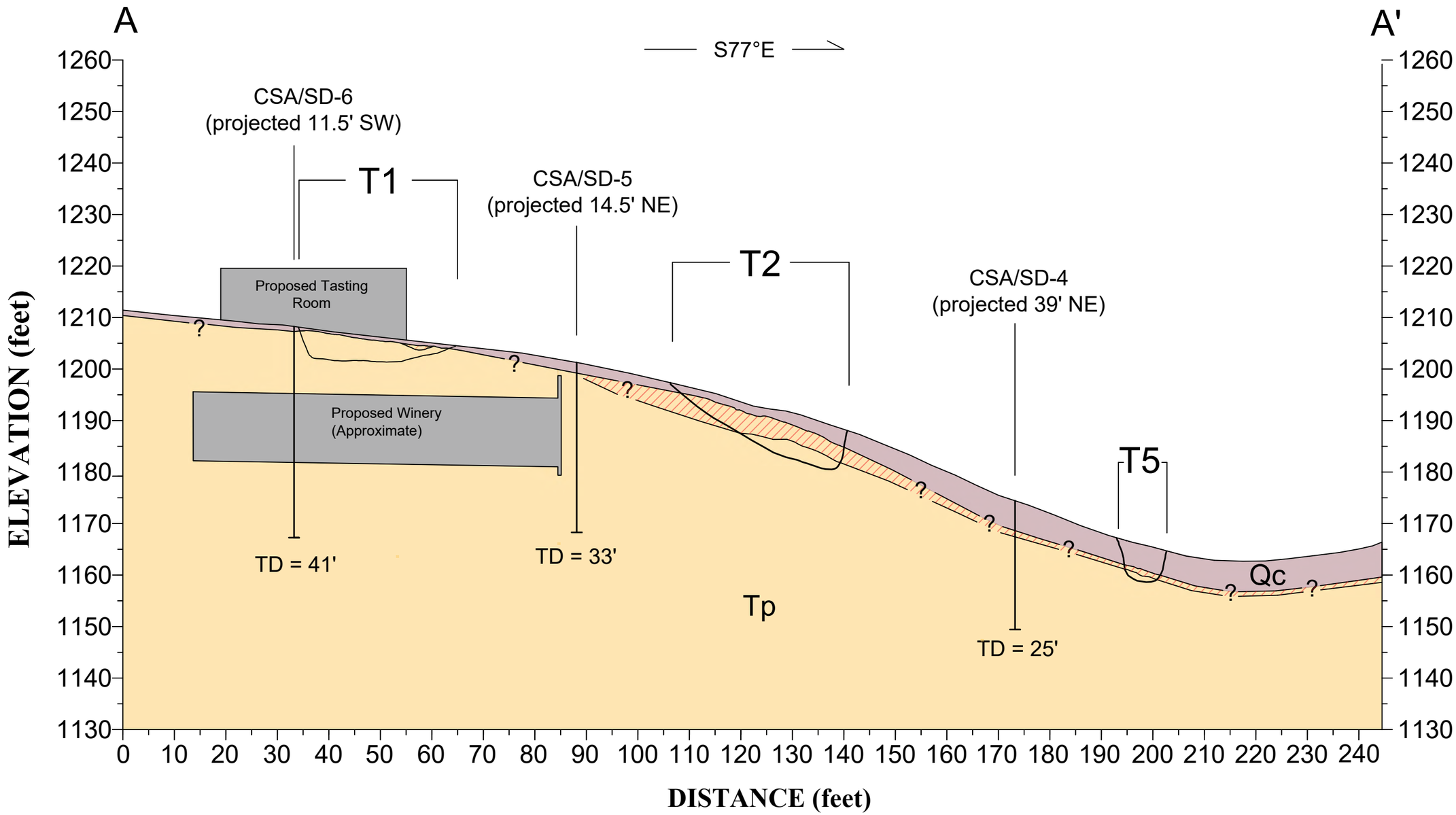
ENGINEERING GEOLOGIC MAP
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=40'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	August 2022	7



GEOLOGIC UNITS

- Qc - Colluvium
- Tp - Regolith
- Tp - Purisima Formation Sandstone

SYMBOLS

CSA/SD-6
TD = 41.0'
CSA Small-Diameter Exploratory Boring

?
Geologic Contact, dashed where approximate, queried where uncertain

0 5 10 20
(feet)

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ENGINEERING GEOLOGIC CROSS SECTION A-A'
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=20'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	September 2022	8

B

B'

N40°E

Existing Driveway

Proposed Driveway

T3

T5

Qc

Tp

Roadway

?

ELEVATION (feet)

1220
1210
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270

DISTANCE (feet)

GEOLOGIC UNITS

Qc - Colluvium

Tp - Purisima Formation Sandstone

Tp - Regolith

SYMBOLS

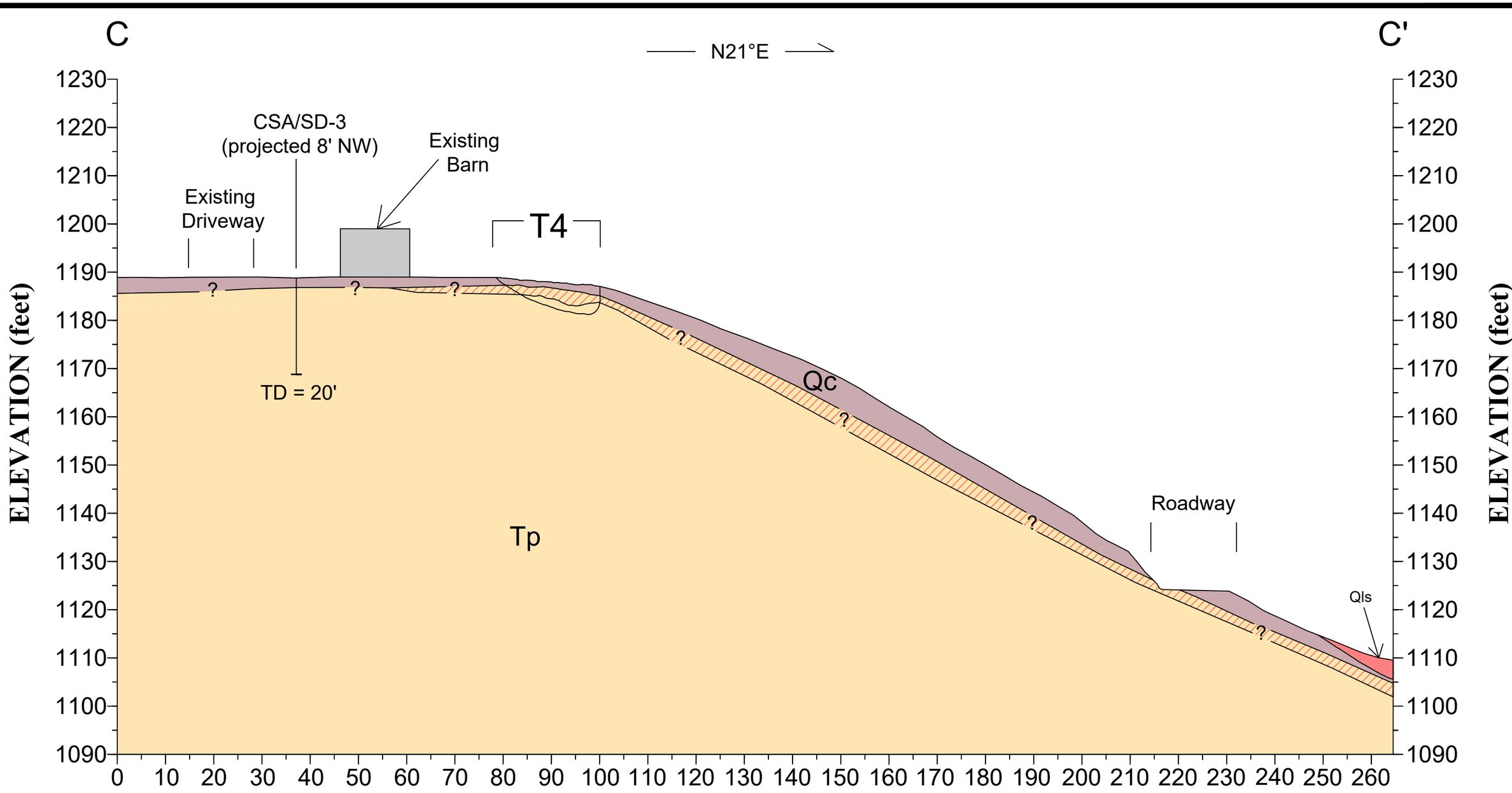
? Geologic Contact, dashed where approximate, queried where uncertain

0 5 10 20
(feet)

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

ENGINEERING GEOLOGIC CROSS SECTION A-A'
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=20'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	September 2022	9



GEOLOGIC UNITS

- Qc - Colluvium
- Tp - Regolith
- Qls - Landslide Deposits
- Tp - Purisima Formation Sandstone

SYMBOLS

- CSA/SD-3 / TD = 20.0' — CSA Small-Diameter Exploratory Boring
- ? — Geologic Contact, dashed where approximate, queried where uncertain

0 5 10 20 (feet)

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

ENGINEERING GEOLOGIC CROSS SECTION A-A'
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=20'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	September 2022	10

APPENDIX A – FIELD INVESTIGATION

Logs of CSA Exploratory Trenches

Figure 11 – Log of TP1

Figure 12 – Log of TP2

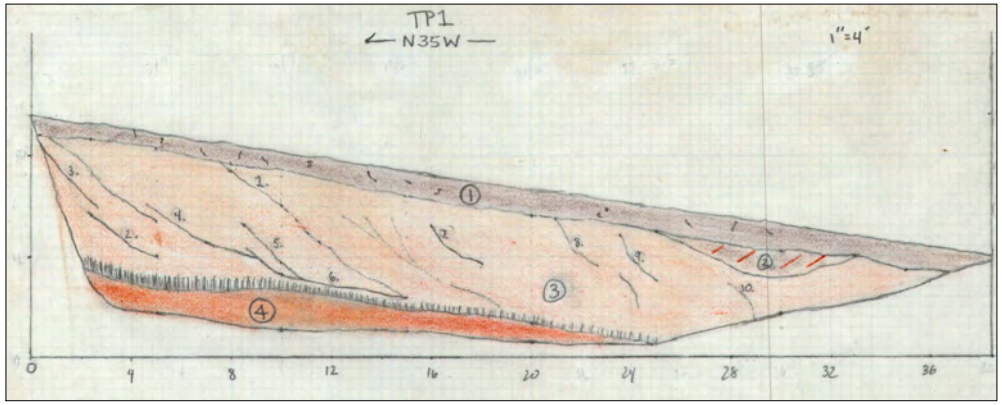
Figure 13 – Log of TP3

Figure 14 – Log of TP4 and TP5

APPENDIX A – FIELD INVESTIGATION

Subsurface exploration consisted of the excavation of five exploratory trenches by Lyons General Engineering between November 29 and December 8, 2021. The locations of the trenches are shown on our Engineering Geologic Map (Figure 7). The trenches were logged by geologists and engineering geologists who visually classified the soils in accordance with ASTM D-2487.

Descriptive logs of the trenches are presented in this appendix. These logs depict our interpretation of the subsurface conditions at the dates and locations indicated. It is not warranted that they are representative of subsurface conditions at other times and locations. The contacts on the logs represent the approximate boundaries between earth materials, and the transitions between these materials may be gradual.



Legend:

geologic contact:

gradational contact:

fracture plane: 1.

geologic unit: ①

rootlets:

Unit Descriptions:

① Colluvium: silty clay (CL), dark yellowish brown (moist) to greyish brown (dry), dry to moist, loose to medium stiff, low to moderate plasticity, homogeneous, abundant angular sandstone fragments, abundant rootlets, lower contact sharp/irregular and marked by change from matrix-supported to clast-supported.

② Regolith: clast supported fine-grained sandstone with a silty clay matrix, light yellowish tan (clasts), dark yellowish brown (matrix), iron oxide staining, moist to wet on isolated fracture faces, intensely fractured, no visible bedding, completely weathered, friable to weak sandstone, very soft matrix, trace rootlets, lower contact sharp and marked by change from clast-supported to fine-grained sandstone.

③ Purisima Formation Sandstone: olive brown to light yellow tan, brown along fracture faces, iron oxide staining, fine-grained, dry to moist, closely/intensely fractured, fractures are small (≤ 1/8") with a thin clayey film, blocky to seamy, no visible bedding, deeply to moderately weathered, friable to weak, trace rootlets, lower contact gradational and marked by a fine- to medium-grained sandstone.

④ Purisima Formation Sandstone: olive brown to yellow brown, iron oxide staining, fine- to medium-grained, moist, fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

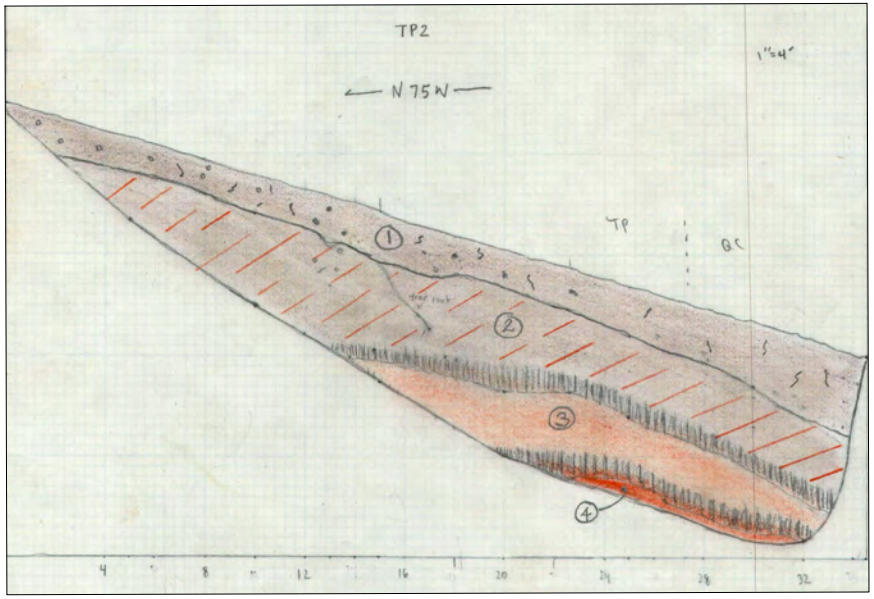
Fracture Planes - Strike and Dip:

1. N10°E 64°SE planar, clayey film
2. N6°E 48°SE planar, clayey film
3. N21°E 50°SE planar, slightly wavy, clayey film
4. N22°E 55°SE planar, clayey film
5. N20°W 53°NE planar, clayey film
6. N22°E 60°SE planar, clayey film
7. N15°E 85°SE planar, clayey film
8. N20°E 58°SE planar, clayey film
9. N2°E 62°SE planar, clayey film
10. N5°W 46°NE planar, clayey film

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

GEOLOGIC TRENCH LOG TP1

GEO/ENG BY CRS	SCALE 1"=4'	PROJECT NO. G6141
APPROVED BY JW	DATE March 2022	FIGURE NO. 11



Unit Descriptions:

① Colluvium: silty clay (CL), dark yellowish brown (moist) to greyish brown (dry), dry to moist, loose to stiff, low to moderate plasticity, homogeneous, abundant angular sandstone fragments, abundant rootlets, lower contact sharp/irregular and marked by change from matrix-supported to clast-supported.

② Regolith: clast supported fine-grained sandstone with a silty clay matrix, olive brown to light yellowish tan (clasts), dark yellowish brown (matrix), iron oxide staining, moist to wet on isolated fracture faces, intensely fractured, no visible bedding, completely weathered, friable to weak sandstone, soft matrix, trace rootlets, lower contact gradational (4-6") and marked by change from clast-supported to fine-grained sandstone.

③ Purisima Formation Sandstone: olive brown to light yellow tan, brown along fracture faces, iron oxide staining, fine-grained, dry to moist, closely/intensely fractured, fractures are small (≤ 1/8") with a thin clayey film, blocky to seamy, no visible bedding, deeply to moderately weathered, friable to weak, trace rootlets, lower contact gradational (4-6") and marked by a fine- to medium-grained sandstone.

④ Purisima Formation Sandstone: olive brown to yellow brown, iron oxide staining, fine- to medium-grained, moist, fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

Legend:

geologic contact:

gradational contact:

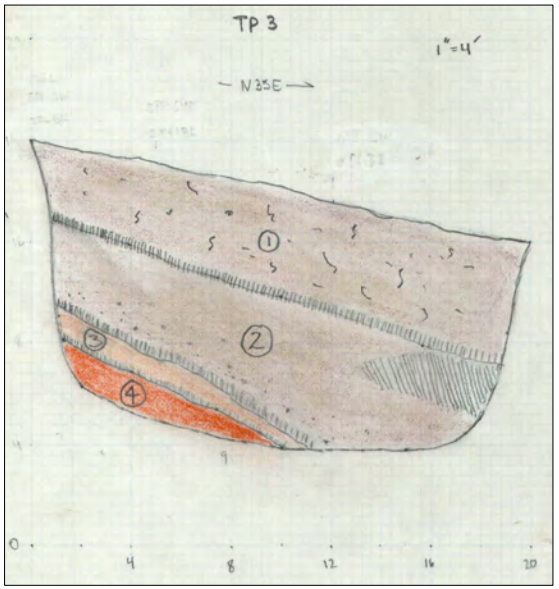
geologic unit: ①

rootlets:

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

GEOLOGIC TRENCH LOG TP2

GEO/ENG BY CRS	SCALE 1"=4'	PROJECT NO. G6141
APPROVED BY JW	DATE March 2022	FIGURE NO. 12



Unit Descriptions:

① Colluvium: sandy clay (CL), dark yellowish brown (moist) to greyish brown (dry), dry to moist, stiff to very stiff, moderate plasticity, homogeneous, very fine- to fine-grained sand, abundant rootlets, lower contact is gradational (4-6") and marked by increase in fines and stiffness.

② Older Colluvium: silty clay (CL), dark yellowish brown to light brown, moist, stiff to hard, moderate plasticity, heterogeneous, blocky texture, trace angular sandstone fragments, sparse rootlets, zone of caliche deposits, lower contact is gradational (4-6") and marked by a change from matrix-supported to clast-supported.

③ Regolith: clast-supported fine-grained sandstone with a silty clay matrix, olive brown to yellowish brown (clasts), dark yellowish brown (matrix), iron oxide staining, moist, highly/closely fractured, no visible bedding, completely weathered, friable to weak sandstone, very soft matrix, lower contact gradational (1-2") and marked by change from clast-supported to fine-grained sandstone.

④ Purisima Formation Sandstone: olive brown to yellow brown, iron oxide staining, fine-grained, dry to moist, closely fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

Notes:

Fracture planes within Purisima Formation Sandstone at uphill face of trench TP3 exhibit two orientation sets - prominent: N20°W 58°NE smooth, planar, clayey film, no shearing, platy texture, isolated polished surfaces; less prominent: N77°W 37°NE planar, clayey film.

Legend:

geologic contact:

gradational contact:

geologic unit: ①

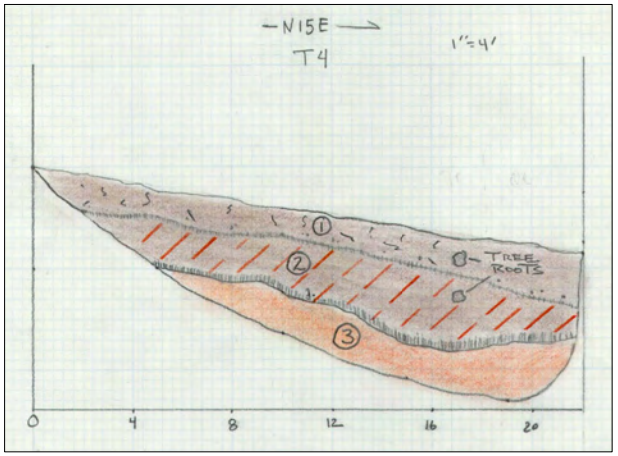
caliche zone:

rootlets:

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

GEOLOGIC TRENCH LOG TP3

GEO/ENG BY CRS	SCALE 1"=4'	PROJECT NO. G6141
APPROVED BY JW	DATE March 2022	FIGURE NO. 13



Unit Descriptions:

① Colluvium: silty clay (CL), dark yellowish brown (moist) to greyish brown (dry), dry to moist, soft to medium stiff, low to moderate plasticity, homogeneous, abundant rootlets and roots, trace fine-grained sand, trace angular sandstone fragments, lower contact is gradational (1-2") and marked by fine-grained sandstone.

② Purisima Formation Sandstone: olive brown to yellow brown, brown along isolated fracture faces, iron oxide staining, fine-grained, moist, highly/closely fractured, isolated polished surfaces with a thin clayey film, no visible bedding, deeply to moderately weathered, friable to weak, trace rootlets and roots, lower contact gradational (3-6") and marked by a fine- to medium-grained sandstone.

③ Purisima Formation Sandstone: olive brown to yellow brown, iron oxide staining, fine- to medium-grained, moist, closely fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

Fracture Plane Strike and Dip:

1. N10°E 69°SE planar, clayey film, prominent root growth

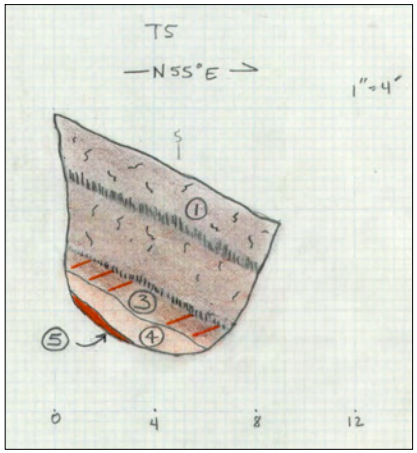
Legend:

geologic contact:

gradational contact:

geologic unit: ①

rootlets:



Unit Descriptions:

① Colluvium: silty clay (CL), dark brown (moist) to light greyish brown (dry), dry to moist, soft to medium stiff, moderate plasticity, homogeneous, abundant rootlets and roots, trace fine-grained sand, lower contact is gradational (4-6") and marked by increase in sand and stiffness.

② Colluvium: sandy clay (CL), dark yellowish brown to olive brown, moist, medium stiff to stiff, low to moderate plasticity, heterogeneous, angular sandstone fragments, trace rootlets and roots, lower contact is gradational (2-3") and marked by a change from matrix supported to clast supported.

③ Regolith: clast supported fine-grained sandstone with a sandy clay matrix, olive brown to yellowish brown (clasts), dark yellowish brown (matrix), iron oxide staining, moist, highly/closely fractured, blocky texture, isolated polished surfaces with thin clayey film, no visible bedding, completely weathered, friable to weak sandstone, very soft matrix, trace rootlets, lower contact sharp/irregular and marked by change from clast supported to fine-grained sandstone.

④ Purisima Formation Sandstone: olive brown to yellowish brown, dark yellowish brown along fracture faces, iron oxide staining, fine-grained, moist, closely/highly fractured, blocky texture, thin clayey film along fracture faces, no visible bedding, moderately to deeply weathered, friable to weak, lower contact is gradational (1-2") and marked by a fine- to medium-grained sandstone.

⑤ Purisima Formation Sandstone: olive brown, iron oxide staining, fine- to medium-grained, moist, fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

GEOLOGIC TRENCH LOG TP4 & TP5

GEO/ENG BY CRS	SCALE 1"=4'	PROJECT NO. G6141
APPROVED BY JW	DATE March 2022	FIGURE NO. 14

COTTON, SHIRES AND ASSOCIATES, INC.

GEOTECHNICAL INVESTIGATION
12 Stones Winery, 17300 Laurel Road
Santa Cruz County, California
APN: 095-101-22

Prepared for:
Karen and Aaftab Munshi
17300 Laurel Road
Santa Cruz County, California
September 2022

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

330 Village Lane, Los Gatos, California 95030 (408) 354-5542 Fax (408) 354-1852
6417 Dogtown Road, San Andreas, California 95249 (209) 736-4252 Fax (209) 736-1212
699 Hampshire Road, Suite 101, Thousand Oaks, California 91361-2352 (805) 370-8710

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

September 12, 2022
G6141A

Aaftab and Karen Munshi
12 Stones Winery
17300 Laurel Road
Los Gatos, CA 95030

SUBJECT: **Geotechnical Engineering Investigation**
RE: 12 Stones Winery
17300 Laurel Road, Santa Cruz County
APN 095-101-22

Dear Aaftab and Karen Munshi:

Cotton, Shires and Associates, Inc. (CSA) is pleased to submit the following report in which we describe the findings, conclusions, and recommendations of our Geotechnical Engineering Investigation of the proposed 12 Stones Winery and associated improvements at your property located at 17300 Laurel Road, Santa Cruz County, California. In this report, we characterize the geologic and geotechnical hazards with the potential to impact the proposed winery facilities and associated improvements, and provide geotechnical recommendations for the winery tasting room and associated facilities. A separate geotechnical investigation report will be provided by Provost and Pritchard Consulting Group for the underground winery facility and portal wall.

We appreciate the opportunity to have been of service to you on this project. If you have any questions regarding this report, please feel free to call us.

Very truly yours,
COTTON, SHIRES AND ASSOCIATES, INC.

John M. Wallace
Principal Engineering Geologist, CEG 1923

David T. Schrier
Principal Geotechnical Engineer, GE 2334

JMW:DTS:CRS

GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed 12 Stones Winery
17300 Laurel Road
Los Gatos, CA

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APPENDIX B – LABORATORY TESTING

GEOTECHNICAL ENGINEERING INVESTIGATION

Proposed 12 Stones Winery

17300 Laurel Road, Santa Cruz County

1.0 INTRODUCTION

1.1 Project Description

In this report, Cotton, Shires and Associates, Inc. (CSA) is presenting the results of our geotechnical engineering investigation at your property located at 17300 Laurel Road, Santa Cruz County, California. The 20-acre property is located 0.4 miles east of the intersection between Highway 17 and Laurel Road (Figure 1, Site Location Map). Our investigation is intended to support an application for a building permit to develop winery facilities at the site. We understand that the project is to include an underground winery and storage facility, and a separate above-ground tasting room that will be located above the underground winery. Our investigation was performed in accordance with our proposal to you, dated March 31, 2022. We performed our initial field work (trenching) between November and December, 2021, and exploratory drilling was performed in May, 2022.

1.2 Purpose and Scope of Work

The purpose of our investigation was to assess the geologic and geotechnical hazards at the subject property in the vicinity of the proposed winery facilities. Our objectives were to: 1) investigate the surface and subsurface geologic an geotechnical conditions; 2) evaluate the potential for geologic and geotechnical hazards to impact the proposed facilities; 3) analyze the geotechnical parameters; and 4) provide geotechnical design recommendations for the proposed tasting room and associated winery facilities (A separate geotechnical investigation report will be provided by Provost and Pritchard Consulting Group for the underground winery facility and portal wall). The specific scope of work performed for our investigation included the following tasks:

1) Review of published and unpublished geologic maps and reports;
2) Review of Google Earth aerial photographs and LiDAR imagery;
3) Engineering geologic mapping;
4) The generation of engineering geologic cross sections;

5) Excavation and logging of 5 exploratory boreholes;
6) Laboratory testing of representative subsurface earth materials;
7) Analysis of the collected data and generation of geotechnical design recommendations;
8) Performing downhole temperature and piezometer readings; and
9) Preparation of this report.

2.0 PHYSICAL AND GEOLOGIC SETTING

The physical parameters that influence the site include: topography (terrain), the geologic setting, and the seismic setting. The following sections present descriptions of each of these parameters, including discussions of the influence that each parameter has on the subject area.

2.1 Topography (Terrain)

The property is situated along a northwest-southeast-trending spur ridge on the western flank of the West Branch Soquel Creek drainage at an elevation range of approximately 1,120 to 1,235 feet. The proposed winery's coordinates are 37.106 Latitude, and -121.970 Longitude. The ridgetop is characterized by a broad, gently sloped (sub-horizontal to 20% inclination) upland surface, with a saddle at roughly the midpoint of the ridgeline (Figure 2, Regional LiDAR Hillshade Map). The ridgetop is straddled by northeast, east, and southwest facing slopes that are moderately steep to very steep (20% to 80% inclination). The coordinates at the site are 37.105 degrees latitude and -121.969 degrees longitude.

2.2 Geologic Setting

The subject property is located within the Coast Range Geomorphic Province, located structurally between the active strike-slip faults of the San Andreas to the northeast, and the active San Gregorio fault zone to the west, within the Salinian structural block. The property is centrally located within Santa Cruz Mountains, a rapidly uplifting mountain range extending from 19 miles south of San Francisco to Pajaro, east of Watsonville. The Santa Cruz Mountains trend northwest-southeast, and are composed of tightly folded,

Cenozoic sedimentary rocks whose regional structure is defined by fault-bounded, northwest-southeast-oriented blocks with unique stratigraphic and structural histories.

According to published geologic maps (Dibblee, 2005, and Brabb, 1997), the subject property is underlain by massive to thick-bedded sandstone bedrock of the Purisima Formation (Figure 3, Regional Geologic Map). The Purisima Formation conformably overlies a medium to thickly bedded and faintly laminated mudstone (Santa Cruz Mudstone) to the southwest and unconformably overlies thin to medium bedded shale and siltstone bedrock (Lambert Shale) to the northeast. The subject property is structurally located on the northeast limb of a northwest-southeast trending syncline. The regional geologic map reveals that the local bedrock structure dips moderately to the southwest near the property.

The published County of Santa Cruz Hazard Areas map (Cooper-Clark and Associates, 1975), identifies a probable landslide just northwest of the property, a very large probable landslide adjacent to the southwestern property boundary, three questionable small landslides located along northeastern slopes of the property, and a very large questionable landslide just north of the property boundary (Figure 4, Regional Landslide Map). The Dibblee Jr. (2005) map also shows Quaternary landslides present both northwest and southwest of the subject site, but no landslides are shown in the area of proposed facilities. The general direction of movement (displacement) of the Quaternary landslides is shown to the northeast and southeast respectively; however, analysis of more recently available LiDAR maps reveals that the probably landslide limits and movement directions are more likely as shown on our LiDAR Hillshade Landslide Map (Figure 5). None of the regional landslide maps, no our LiDAR Hillshade Landslide Map show the proposed winery facilities being underlain by, or potentially affected by landslides.

During the course of our engineering geologic mapping of the site, we investigated the questionable small landslides identified on the County Landslide Map located along the northeastern slopes of the property. These lobe-shaped features are steeply eroded drainages along the evacuated scarp areas of the larger, deep-seated landside to the

north. It appears that very old, shallow landsliding evacuated these areas, creating topographic hollows that are now collection areas for colluvial soil.

2.3 Seismic Setting

The project site is situated in a very seismically active area. Historically, this area has been subjected to strong ground shaking from major earthquakes, and the site will continue to experience strong ground shaking in the future. Historic earthquakes responsible for seismic shaking in this area include the 1906 M=7.9 San Francisco earthquake centered approximately 54.8 miles to the northwest, the 1989 M=6.9 Loma Prieta earthquake centered approximately 6.6 miles to the east, and a M=6.6 earthquake in 1911 thought to be located approximately 25 miles north along the Calaveras fault. Figure 6 (Regional Fault Map) and Table 1 illustrate the significant active faults located closest to the site, including the San Andreas fault zone (located 2.2 miles toward the northeast), the San Gregorio fault (located 15.3 miles to the southwest), the Monterey Bay/Tularcitos fault (located 16.5 miles to the southwest), and the nearby Zayante/Vergeles (located approximately 1.2 miles to the southwest). The site is not located within a State (California Geological Survey) Mapped Alquist-Priolo Fault Rupture Hazard Zone. Our review of regional geologic maps reveals that no active or potentially active faults have been mapped across the property.

TABLE 1

Fault Source	Distance (mi.)	Moment Magnitude[1]
Zayante/ Vergeles	1.2	6.8
San Andreas (1906)	2.2	7.9
San Andreas Santa Cruz Mtns	2.2	7.0
San Gregorio	15.3	7.0
Monterey Bay/ Tularcitos	16.5	7.1

3.0 SITE CONDITIONS

3.1 Surface Conditions

The property is situated along a gently sloped (sub-horizontal to 20% inclination) ridgetop with moderately steep to very steep (20% to 80% inclination) northeast, east, and southwest facing slopes. Along the ridgetop, a natural saddle is located at approximately the midpoint of the ridgeline between the proposed winery and tasting room sites. Several defined topographic hollows are located on the northeast-facing slopes. Drainage across the site is primarily defined as sheetflow off the ridgetop to the northeast, east, and southwest.

The proposed winery is to be located underground in an area of gently to moderately sloping terrain, along the west side of a prominent topographic hollow. The proposed tasting room is located atop the winery on gently inclined topography near the top of the hillside (Figure 7, Engineering Geologic Map).

Access to the site is via an asphaltic concrete driveway that extends southeastward from Laurel Road and leads down to an existing barn, main residence, and two accessory structures. A vineyard is located along the south-southwest flank of the property. The proposed wine cave and associated improvements are located along the northwestern half of the property adjacent to the driveway on northeastern side. The property is vegetated with seasonal grasses, shrubs, and mature redwood, madrone, and oak trees.

3.2 Earth Materials

Earth materials present at the subject property include colluvial soil, regolith, and Purisima Formation bedrock materials.

3.2.1 Colluvial Soil – Colluvial soils at the site are derived from the weathering of Purisima Formation bedrock and consist of silty clay and clayey silt with rock fragments that are transported downslope under the influence of gravity and water.

3.2.2 Regolith – Regolith at the site consists of weathered-in-place Purisima Formation bedrock, and typically consists of rocky silty clay and clayey silt that has been completely weathered to a soil-like consistency.

3.2.3 Purisima Formation (Tp) – The Purisima Formation is described as a Pliocene and upper Miocene aged siltstone and sandstone, very thick bedded, yellowish grey, tuffaceous and diatomaceous (Brabb, 1997). The sandstone is massive to thick bedded, light brown to tan, fine-medium grained, weakly lithified, friable, arkosic, and locally fossiliferous (Dibblee, Jr., 2005). The bedrock materials encountered at the site are consistent with Purisima Formation bedrock, and consist primarily of weathered fine-grained sandstone.

3.3 Subsurface Conditions

We explored the subsurface conditions at the property by means of five exploratory trenches (T-1 through T-5) excavated by Lyons General Engineering utilizing a CAT 305.5E2 CR excavator. The exploratory trenches were logged by our geologists and engineering geologists between November 29 and December 08, 2021. Trench locations are shown on Figure 7 (Engineering Geologic Map), and detailed descriptions of the materials encountered in the excavations are presented in Appendix A of this report. Small-diameter borehole exploration was performed by Paul Britton/Geo-Ex Subsurface Exploration using a track-mounted drill rig. A total of six exploratory boreholes were excavated on April 25 and April 26th, 2022 with maximum depths ranging from 20 to 41 feet (see Figure 7, Engineering Geologic Map).

3.3.1 Exploratory Trenches

Exploratory Trench T-1 - In exploratory trench T-1, which was excavated in the northwestern portion of the property on the northeastern side of the driveway, we encountered approximately 0.5 to 1 foot colluvial soil materials. The soil materials consisted of soft to medium stiff, dry to moist, silty lean clay with abundant roots and rock fragments. Near the southeastern end of the trench at a depth from 1 to 2 feet, we encountered a pocket of moist to wet, rocky silty lean clay regolith that appeared to be weathered-in-place Purisima Formation bedrock, but soil-like. Underlying the soil and regolith, we encountered competent but closely to intensely fractured, deeply weathered

Purisima Formation fine-grained sandstone bedrock. Prominent factures were exposed within this unit and mostly dip moderately to steeply to the east-southeast. At a depth of 5 to 6 feet along the northwestern (uphill) two-thirds of the trench, we encountered fractured, moderately weathered Purisima Formation sandstone bedrock. This test pit is located west of, and atop a portion of the proposed underground winery facility.

Exploratory Trench T-2 - In exploratory trench T-2, which was excavated in the northwestern portion of the property and southeast (downhill) of T-1, we encountered approximately 1.5 to 3 feet of colluvial soil materials. The soil materials consisted of soft to stiff, dry to moist, silty lean clay with abundant roots and rock fragments. At a depth of 1.5 to 3 feet and underlying the colluvial soil materials, we encountered 0.5 to 4 feet of moist to wet, rocky silty lean clay regolith that appeared to be weathered-in-place Purisima Formation bedrock, but soil-like. At a depth of 5 to 6.5 feet along the southeastern (downhill) two-thirds of the trench and underlying the regolith, we encountered competent but closely to intensely fractured, deeply weathered Purisima Formation fine-grained sandstone bedrock. At a depth of approximately 8 feet along the southeastern (downhill) half of the trench, we encountered fractured, moderately weathered Purisima Formation sandstone bedrock. This trench is located immediately north of the proposed underground winery facility.

Exploratory Trench T-3 - In exploratory trench T-3, which was excavated in the northwestern portion of the property near the ridgetop saddle, we encountered approximately 6.5 to 10 feet of colluvial soil materials. The soil materials consisted of 3 to 5 feet of stiff to very stiff, dry to moist, sandy lean clay with abundant roots. At a depth of 3 to 5 feet and below the sandy lean clay, we encountered a stiff to hard, moist, silty clay with trace roots and rock fragments. At a depth of 6.5 to 10 feet along the southwestern (uphill) half of the trench, we encountered 0.5 to 1 foot of moist, rocky silty lean clay regolith that appeared to be weathered-in-place Purisima Formation bedrock, but soil-like. At a depth of 8 to 10 feet along the southwestern (uphill) half of the trench, we encountered competent but closely fractured, moderately weathered Purisima Formation sandstone bedrock.

Exploratory Trench T-4 - In exploratory trench T-4, which was excavated in the northwestern portion of the property near the existing barn, we encountered 1 to 2 feet of colluvial soil materials. The soil materials consisted of soft to medium stiff, dry to

moist, silty lean clay with abundant roots and few rock fragments. At a depth of 1 to 2 feet underlying the soil materials, we encountered 1 to 3 feet of competent but closely to intensely fractured, deeply weathered Purisima Formation fine-grained sandstone bedrock. At a depth of 3 to 5 feet, we encountered closely fractured, moderately weathered Purisima Formation sandstone bedrock. This trench was located between the proposed tasting room and the northern slope.

Exploratory Trench T-5 - In exploratory trench T-5, which was excavated in the northwestern portion of the property northeast (downhill) of T-3, we encountered approximately 5 to 5.5 feet of colluvial soil materials. The soil materials consisted of 2.5 feet of soft to medium stiff, dry to moist, silty lean clay with abundant roots. At a depth of 2.5 feet underlying the silty lean clay, we encountered 2.5 to 3 feet a medium stiff to stiff, moist, sandy lean clay with rock fragments and trace roots. At a depth of 5 to 5.5 feet and underlying the soil materials, we encountered 1 to 1.5 feet of moist, rocky sandy lean clay regolith that appeared to be weathered-in-place Purisima Formation bedrock, but soil-like. At a depth of 6 to 6.5 feet, we encountered 1 to 1.5 feet of competent but closely fractured, deeply weathered Purisima Formation fine-grained sandstone bedrock. At a depth of approximately 7 feet along the southwestern (uphill) half of the trench, we encountered fractured, moderately weathered Purisima Formation sandstone bedrock. This trench was located in the axis of the topographic hollow where regional maps show a questionable landslide. Our geologic logging of the test pit revealed that relatively shallow colluvium was observed over competent bedrock, with no evidence of landsliding (i.e., no deep soil accumulation, no landslide debris, no landslide shear planes, and competent bedrock at a depth of approximately 5 to 6 feet).

Engineering geologic mapping, aerial photograph analysis, and subsurface exploration reveal that the area of the proposed underground winery is characterized by gently sloping ridgeline topography with a thin accumulation of soil materials overlying competent Purisima Formation bedrock. The bedrock materials grade from regolith, consisting of a soil-like, clast-supported fine-grained sandstone with a matrix of silty lean clay, into fine-grained sandstone, and a fine- to medium-grained sandstone. The proposed tasting room is to be located on mostly level topography, and will be approximately 25 to 50 feet from the steep northeast-facing slope. Our geologic interpretation of these areas is depicted on our Engineering Geologic Map (Figure 7) and

Engineering Geologic Cross Sections A-A', B-B', and C-C' (Figures 8, 9, and 10, respectively).

3.3.2 Exploratory Drilling

Exploratory Borehole SD-1 – Exploratory borehole SD-1 was excavated near the northwest corner of the existing barn. The borehole was drilled utilizing solid-stem auger techniques, and in this borehole we encountered 3.25 feet of colluvial soil consisting of dark yellowish brown, lean silty clay. The colluvial soil was stiff, contained abundant roots and rootlets, and contained angular clasts of Purisima Formation sandstone. The colluvial soil material was underlain by competent weathered bedrock materials of the Purisima Formation. The upper approximately three feet of the bedrock was deeply weathered and highly fractured, with abundant iron oxide staining of the fracture faces. The rock quickly increased in strength below this deeply weathered zone, and blow counts increased. No groundwater was encountered to the bottom of the boring at 20 feet below the ground surface.

Exploratory Borehole SD-2 – Exploratory borehole SD-2 was excavated near the top of the colluvial hollow near the proposed entry driveway to the proposed underground winery facility. A retaining wall is being postulated for this area. The borehole was drilled utilizing solid-stem auger techniques, and in this borehole we encountered 3.0 feet of an upper colluvial soil consisting of dark yellowish brown, lean silty clay. The upper colluvial soil was stiff, contained abundant roots and rootlets, and contained angular clasts of Purisima Formation sandstone. Below the upper colluvium, we encountered an older colluvial soil consisting of hard silty clay with few roots. The lower colluvial soil material was underlain by competent weathered bedrock materials of the Purisima Formation. The upper approximately 6 inches of the bedrock was deeply weathered to regolith and highly fractured, with abundant iron oxide staining of the fracture faces. The rock quickly increased in strength below this deeply weathered zone, and blow counts increased. No groundwater was encountered to the bottom of the boring at 23.5 feet below the ground surface.

Exploratory Borehole SD-3 – Exploratory borehole SD-3 was excavated near the existing barn on its southern side. We hand-augered the upper 3 feet to assure that we did not encounter utilities. The remainder of the borehole was drilled utilizing solid-stem auger

techniques, and in this borehole we encountered 2.0 feet of colluvial soil consisting of dark yellowish brown, lean silty clay. The colluvial soil was stiff, contained abundant roots and rootlets, and contained angular clasts of Purisima Formation sandstone. The colluvial soil material was underlain by competent weathered bedrock materials of the Purisima Formation. The Purisima Formation bedrock was deeply weathered and highly fractured, with abundant iron oxide staining of the fracture faces. The rock remained deeply to moderately weathered without a dramatic increase in blow counts that was experienced in SD-1 and SD-2. No groundwater was encountered to the bottom of the boring at 20 feet below the ground surface.

Exploratory Borehole SD-4 – Exploratory borehole SD-4 was excavated near the top of the colluvial hollow near the proposed entry driveway to the proposed underground winery facility. A retaining wall is being postulated for this area, and this boring is near the western end of this retaining wall. The borehole was drilled utilizing solid-stem auger techniques, and in this borehole we encountered 3.0 feet of an upper colluvial soil consisting of dark yellowish brown, lean silty clay. The upper colluvial soil was stiff, contained abundant roots and rootlets, and contained angular clasts of Purisima Formation sandstone. Below the upper colluvium, we encountered an older colluvial soil approximately 3 feet thick consisting of hard silty clay with few roots. The lower colluvial soil material was underlain by competent weathered bedrock materials of the Purisima Formation. The upper approximately 10 feet of the bedrock was deeply weathered and highly fractured, with abundant iron oxide staining of the fracture faces. The rock quickly increased in strength below this deeply weathered zone, and blow counts increased. No groundwater was encountered to the bottom of the boring at 25.0 feet below the ground surface.

Exploratory Borehole SD-5 – Exploratory borehole SD-5 was excavated near the proposed portal wall for the underground winery. The borehole was drilled utilizing solid-stem auger techniques for the first 8 feet, then HQ continuous coring was performed below 8 feet. In this borehole we encountered 3.0 feet of colluvial soil consisting of dark yellowish brown, lean silty clay. The colluvial soil was stiff, contained abundant roots and rootlets, and contained angular clasts of Purisima Formation sandstone. Below the colluvium, we encountered competent weathered bedrock materials of the Purisima Formation. The upper approximately 1.25 feet of the bedrock was deeply weathered to regolith and highly fractured, with abundant iron oxide

staining of the fracture faces. The rock gradually increased in strength and competency below this deeply weathered zone, and blow counts increased. No groundwater was encountered to the bottom of the boring at 33 feet below the ground surface.

Exploratory Borehole SD-6 – Exploratory borehole SD-6 was excavated near the proposed tasting room that is to be located atop the knoll that will contain the underground winery. The borehole was drilled utilizing solid-stem auger techniques for the first 8 feet, then HQ continuous coring was performed below 8 feet. In this borehole we encountered 1.0 foot of colluvial soil consisting of dark yellowish brown, lean silty clay. The colluvial soil was stiff, contained abundant roots and rootlets, and contained angular clasts of Purisima Formation sandstone. Below the colluvium, we encountered competent weathered bedrock materials of the Purisima Formation. The bedrock was deeply weathered and highly fractured, with abundant iron oxide staining of the fracture faces. The rock gradually increased in strength and competency below this deeply weathered zone, and recovery increased. No groundwater was encountered during drilling; however, our piezometer reading taken in May detected groundwater at the very bottom of the hole at 41 feet below the ground surface.

3.4 Groundwater Conditions

We did not encounter groundwater in our exploratory trenches nor during our borehole exploration; however, as mentioned above, our piezometer reading taken in May detected groundwater at the very bottom of the hole at 41 feet below the ground surface. Fluctuations in groundwater levels could occur from variations in rainfall, and thus, groundwater levels may be different at different times and locations. Heavy rainfall appears to result in temporary saturation of the near-surface soils, and should be anticipated regularly at this site.

4.0 POTENTIAL GEOLOGIC HAZARDS

Geologic hazards that may impact the site include the following: 1) slope movement (i.e., landslides, soil creep, erosion, and 2) seismic hazards, (i.e., surface fault rupture, seismically induced landsliding, ridgetop shattering, ground lurching/ground cracking, and liquefaction). In the following sections, we describe these hazards along with

corresponding degrees of determined potential risk, and provide recommendations for mitigation measures.

4.1 Slope Movement

Based on our field mapping, aerial photograph and LiDAR analysis, and logging of exploratory trenches and boreholes, we have evaluated the potential for slope movement hazards to impact the site, including: 1) landslides; 2) surficial soil creep; and 3) erosion.

4.1.1 Landsliding – The County Landslide map identifies three questionable small landslides located along northeastern slopes of the property. It appears that very old, shallow landslide evacuations may have been responsible for creating these topographic hollows. Test Pit 5, which excavated in the axis of the middle swale, encountered no landslide debris, indicating that these hollows were completely evacuated, leaving only the topographic hollow. These features appear to be very old, and surficial processes have degraded most of the landslide geomorphology. The likelihood of the slope activating as a new landslide, in our opinion, is **low**. A very small steep scarp was observed along the uphill side of the private access road located at the northeastern property boundary. This scarp is likely due to the steep cut slope during grading for the private access road. Hummocky topography was observed on the downhill side of the private access road on the adjacent property to the north, and is consistent with the mapped large landslide mass shown on Figure 5. No evidence of landsliding was observed within the proximity of the proposed winery or tasting room.

4.1.2 Soil Creep - The colluvial deposits in the upper several feet of the ridgeline and adjacent slopes are susceptible to surficial soil creep. We judge that the potential for soil creep to adversely impact the proposed winery and tasting room is **low** if foundations are supported sufficiently into competent bedrock. Retaining walls should be designed to resist loading from soil creep.

4.1.3 Erosion – Controlling surface water in this area is imperative due to the erosion potential of the colluvial soil materials. Provided that concentrated runoff is strictly controlled, it is our opinion that the potential for erosion to adversely impact the winery and tasting room is **low**.

4.2 Seismic Hazards

Seismic ground shaking associated with a large earthquake on the San Andreas, San Gregorio, or Zayante/Vergeles faults, is considered to be a **high** potential hazard in the project area during the lifetime of the project. Peak ground accelerations of up to 1.1 should be anticipated at the site. Seismically-induced ground failure mechanisms present potential hazards to the site, including the hazards of fault rupture, lurching, landslides, liquefaction and lateral spreading.

4.2.1 Seismically Induced Landsliding - Our investigation of the area of the proposed winery has determined that the area is underlain by 1 to 10 feet of surficial soil deposits on the gently sloping ridgeline and adjacent slopes. This ridgeline presents a **low** potential for seismically induced landsliding. However, the steep slopes along the northeastern side of the ridgeline have a moderate potential for seismically-induced shallow landsliding. We recommended that an appropriate setback (minimum of 25 feet) be maintained from this break in slope for shallowly supported foundations.

4.2.2 Ground Rupture - No active faults have been recognized on, or mapped through the subject property. The San Andreas fault zone is located approximately 2.2 miles to the northeast, and the Zayante/Vergeles fault is located approximately 1.2 miles to the southwest. As part of our aerial imagery analysis, and geologic mapping, we have not observed evidence for faulting at the site. Therefore, the potential for surface fault rupture on the property is considered to be **low**.

4.2.3 Ridgetop Shattering – Ridgetop shattering is a phenomenon whereby earthquake energy becomes focused along ridgetops and becomes amplified due to topographic effects of the ridge that literally trap the seismic waves. This amplification can result in ridgetops experiencing ground rupture that is unrelated to faulting. Geologic exploration for ridgetop shattering includes geologic mapping to identify topographic furrow, and trenching to identify 'carrot structures', or other similar fractures in the rock that become filled with soil material. Our geologic mapping and trenching programs did not identify evidence for ridgetop shattering. Additionally, areas within the Santa Cruz Mountains that did experience ridgetop shattering were along ridges with a much narrower crest, and steeper side slopes. Therefore, it is our

opinion that the project site has a **low risk** of experiencing ridgetop shattering during a large earthquake.

4.2.4 Ground Lurching/Ground Cracking - Ground lurching and cracking occur during an earthquake where seismic energy results in ground movement toward the free face of a slope, or by pulling away of ground from the ridge as incipient landslides partially mobilize. These ground cracks are typically sub-parallel with the long axis of the ridge or slope break. An effort to document the ground cracks stemming from the 1989 Loma Prieta earthquake was performed by the County, and published by as the County Crack Map (Spittler and Harp, 1990). This map does not show any mapped ground cracks at the Munshi property. Our geologic mapping and trenching programs did not identify evidence for ground cracking at the site. Therefore, it is our opinion that the project site has a **low risk** of experiencing seismically induced ground cracks during a large earthquake. However, small ground cracks are difficult to identify in the surface and subsurface, and thus, it would be prudent for the design engineer to account for the possibility of small (1 to 2 inches) grounds cracks to occur during the lifetime of the structure.

4.2.5 Liquefaction and Lateral Spreading – The potential for liquefaction and lateral spreading at the proposed tasting room and winery is considered to be **low** due to the shallow depth to bedrock, and absence of shallow groundwater.

4.3 Settlement Behavior of the Building

For our foundation settlement analysis of the tasting room, we assumed that the static dead-plus-long-term live load for the structure would be less than 4,000 pounds per square foot (psf) and supported on a 1.25-foot wide or less footing, bearing in at least 6 inches of undisturbed bedrock at least 30 inches below current grade. Based on these assumptions, we estimate that total static settlement for the tasting room, should be roughly 3/4 inch, and differential settlements should be about 1/2 inch over 30 feet. If loads in excesses of 4,000 psf are anticipated, we should be notified so that we can revise our settlement calculations.

4.4 Expansive Soils

Expansive soils could be subjected to volume changes due to seasonal fluctuations in moisture content of the surficial materials. Based on the results of our laboratory testing, the near-surface colluvial soils are classified as having low and moderate plasticity (PI=9 and 20) and having potentially **low** and **moderate** expansive characteristics.

In order to reduce the potential for differential ground movement due to seasonal expansive soil movement, we have provided recommendations to support the tasting room on non-expansive bedrock. We have also recommended that the colluvium be excavated in areas proposed for flatwork and pavement, and replaced with compacted engineered fill comprised of well blended excavated soil and bedrock.

4.5 Sulfate Attack on Concrete

We recommend that corrosivity testing be completed on the near-surface site earth materials prior to completing the concrete mix design in order to determine the potential for corrosion of metallic and concrete structures at the selected sites. Alternatively, an assumption could be made that site soils are corrosive and the concrete designed accordingly.

5.0 CONCLUSIONS

Based upon our site geologic mapping, LiDAR imagery analysis, subsurface exploration, and experience with similar site conditions, it is our opinion that the proposed underground winery and above-ground tasting room are feasible from a geologic and geotechnical standpoint, provided our recommendations are followed. We evaluated the geologic and geotechnical hazards that could impact the site (landsliding, seismic shaking, earthquake-induced ground cracking, faulting, erosion, expansive soils, settlement, and soil creep), and while these potential hazards are typically more hazardous in mountainous settings, provided our recommendations are followed, these risks can be reduced to acceptable levels at this site.

The primary geotechnical constraints to the property include potentially expansive surficial soil materials, surficial soil creep, and very strong to violent seismic ground

shaking. The proposed winery and tasting room should be placed sufficiently away (i.e., approximately 25 feet) from the top of steep descending slopes so as to reduce the potential adverse impacts of soil creep, erosion, shallow landsliding, and seismically induced ground cracking. Engineered retaining walls, or deep foundation systems may be considered if it is desired to encroach closer than 25 feet from the steep slopes. The following section outlines the geotechnical design recommendations for site development:

6.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

6.1 Foundations for the Tasting Room

6.1.1 Shallow Foundation – The proposed tasting room can be supported on a spread footing foundation bearing at least 6 inches into undisturbed bedrock, as determined by CSA field staff. In order to reduce the potential adverse impacts from soil creep, erosion and shallow landsliding, the closest tasting room foundation should be located at least 25 feet, or more, from the closest top of the nearby steep descending slope. The footings should be a minimum of 15-inch wide, and bear approximately 3 feet to 4 feet below existing grade, based on the depth of bedrock encountered in our borings (actual footing depths could be deeper based on field conditions). Isolated interior footings should be avoided, and interior grade beams can be used where necessary to support interior loads. The footings should be sized for an allowable bearing pressure of 4,000 pounds per square foot (psf) for dead-plus-live loads, and 6,000 psf for total design loads (dead-plus-live plus wind or seismic loads). Resistance to lateral forces should be calculated using a passive resistance of 330 pounds-per-cubic foot (pcf) for that portion of the footing embedded in bedrock, and a base coefficient of friction of 0.31 along the bottom of the footing (both values include a 1.5 Factor of Safety). If required, higher lateral resistance can be achieved by removing and replacing outboard colluvium and replacing it with engineered fill, but that will need to be confirmed through supplemental analysis.

Slabs-on-grade floor and concrete flatwork subgrades should be prepared as recommended in the Site Grading section. For damp-proofing of the slab, a layer of 15 mil Stegowrap or Moistop Underslab Vapor Retarder should be provided over the capillary break (gravel or crushed rock). For additional moisture control, floors can be

directly underlain by at least 6 inches of clean, free-draining gravel or crushed rock (100% passing the 3/4-inch sieve; 0-3% passing the No. 4 sieve).

6.2 Site Grading

Based on our field investigation, site grading should be within the capabilities of moderate excavation equipment (i.e., dozers, backhoes and excavators); however, heavy duty drilling equipment will likely be required to drill pier holes. We don't anticipate that excavations will require significant dewatering, provided that construction takes place during the dry season.

6.2.1 Site Preparation - All loose material, **colluvium (roughly 2.5 to 3.5 foot thick)**, vegetation, any old concrete foundations, abandoned utilities, asphalt, debris, and other deleterious material should be stripped and removed from the areas planned for slab-on-grad floors, and areas to receive engineered fill (walkways, pavement, retaining fill). This material should be disposed of in a suitable location on- or off-site.

After removing the colluvium in areas for slab-on-grade floors and areas to receive fill (including Caltrans Class 2 baserock for walkways, flatwork, and pavement) the excavation should extend 18 inches out horizontally beyond the fill limits. The excavation should expose undisturbed bedrock across the subgrade surface.

In areas proposed for foundations, excavate to remove all the colluvium and to embed the foundation at least 6 inches into bedrock.

We recommend that the exposed materials in the bottom of the excavation be kept at a uniform moisture content and not allowed to dry out.

6.2.2 Compacted Fill – The excavated on-site material can be reused for compacted fill provided it is free of organic materials, materials larger than 4 inches, and the colluvium is well blended with the bedrock material. Imported fill should be free of organic material, it should contain no material larger than 4 inches; it should have a plasticity index (PI) of less than 18; it should be free of hazardous contamination (per State of California requirements); and it should be free of Asphaltic Concrete grindings. The fill should be placed in horizontal lifts not exceeding 8 inches in loose thickness,

moisture conditioned to at least optimum moisture content, and compacted to at least 90 percent Relative Compaction (RC) based on ASTM D-1557-12 below structures (flatwork, pavement, etc.).

6.2.3 **Utility Trench Backfill** - Planned pipelines (not irrigation lines) should be placed at least 3 feet below final ground surface. Utility trenches should be backfilled with approved on-site soil compacted per the recommendations for engineered fill above and below. Bedding materials for pipes should be graded and placed in accordance with the manufacturer's recommendations. The backfill should be compacted to at least 90 percent relative compaction based on ASTM D-1557-12. Equipment and methods should be used that are suitable for work in confined areas without damaging trench walls or conduits.

Where pipelines are located on slopes or roadways steeper than 12° (21 percent gradient), impervious clay (or low slump, 5-sack concrete) trench plugs (minimum 3 feet horizontal dimension) should be provided at minimum 50-foot intervals to avoid pop-outs due to high hydrostatic pressures developing in pervious trench bedding.

6.2.4 **Pavement/Flatwork Subgrade Preparation** - After general compaction and compaction of the utility trench backfills, areas proposed for pavement and flatwork subgrade should be excavated to expose bedrock. The exposed bedrock surface should be checked for yielding areas by proof-rolling with a piece of heavy equipment. Any yielding areas should be excavated and replaced with drier compacted fill. Compacted fill should then be placed in accordance with Section 6.2.2. Areas that will be improved with flatwork/walkways should include a base consisting of a minimum 6-inch thick Baserock layer placed and compacted to at least 95 percent relative compaction (ASTM D1557-12).

6.2.5 **Fill Slope Design** – Permanent fill slopes constructed with on-site or imported fill (PI less than 18) should have a maximum inclination of 2:1 (H:V).

6.2.6 **Keyway Design** - Fill materials placed on slopes should have a keyway at the toe bearing entirely in bedrock, and no less than 6 feet wide and be continuously benched (with horizontal and vertical steps) into the bedrock material. The resulting

subgrade should be inspected by our representative for firmness prior to placement of any new fill materials.

6.2.7 Cut Slope Design – While we don't anticipate that the project will include permanent unretained cut slopes, but if included, all permanent unbraced cuts should not exceed 2:1 (H:V) in colluvium, and 1.75:1 in bedrock. All permanent cuts should be evaluated by a field representative of CSA during construction, to evaluate the stability and determine whether the slope inclination will need to be reduced to an appropriate inclination based on exposed site conditions.

During the dry season, temporary cut slopes of 1.5:1 (H:V) in bedrock should generally be satisfactory for construction purposes, provided that they are inspected and approved by our field representative at the time of construction and monitored daily during construction. Excavation methods, shoring, bracing and safety of excavations are the responsibility of the contractor. All excavations should comply with applicable local, State and Federal safety regulations.

6.3 Pavement Design

For pavement areas that will receive vehicle traffic, we understand that a Traffic Index (TI) of 6 was selected by the Project Civil Engineer. Based on an assumed R-value of 20, and a TI of 6, we recommend at least a 3.5-inch thick layer of asphaltic concrete (AC) over a 9.5-inch thick layer of Caltrans Class 2 baserock (base) compacted to 95% RC.

Asphaltic concrete should be placed and compacted in accordance with the requirements of Section 39 of the Caltrans Standard Specifications; aggregate base rock should conform to the provisions of Section 26 (Caltrans) for 3/4-inch maximum Class 2 Aggregate Base, and should be compacted to at least 95 percent relative compaction based on ASTM D-1557-12 rather than Caltrans Method 216.

6.4 Surface Drainage

We recommend that all surface drainage should be permanently diverted away from the planned structures at a minimum 2% grade into an appropriate catch basin/storm drain system or appropriate discharge locations on site. The Project Civil Engineer should

consult with CSA to identify appropriate discharge locations. Concentrated runoff should not be discharged onto steep slopes, or slopes prone to erosion or landsliding.

6.5 Seismic Design

Based on our geotechnical investigation, the site location, our interpretation of the ASCE 7 Hazards Report for ASCE/SEI 7-16 and ASCE/SEI 7-22 related to Earthquake Loads and using the online tool, we are providing the following parameter recommendations from the corresponding figures and tables:

Parameter	ASCE 7-16 Value	ASCE 7-22 Value
Risk Category	II	II
Site Classification	C	C
Mapped Spectral Acc. 0.2 Sec. (g)	S_S = 2.193	S_S = 2.49
Mapped Spectral Acc. 1 Sec. (g)	S_1 = 0.895	S_1 = 0.96
Fa – Site Coefficient	1.2	
Fv – Site Coefficient	1.4	
S_{MS} = FaSs	2.632	2.58
S_{M1} = FvS_1	1.254	1.38
S_{DS}=2/3 S_{MS}	1.755	1.72
S_{D1}=2/3 S_{M1}	0.836	0.92
T_L	12	12
PGA	0.925	
PGA_M	1.11	0.93
F_{PGA}	1.2	
Ie	1	
Cv	1.3	
Vs_{30}		468 m/s (1,535 ft/s)

6.6 Retaining Wall Design

The following section presents our recommendations for pier supported site retaining wall design criteria.

6.6.1 Cast-in-Place Pier Foundations – Site retaining walls, if located along the north side of the winery access road, should be supported on cast-in-place drilled piers

(soldier piles) that derive vertical support from adhesion (skin friction) in the undisturbed bedrock material beginning at depths of 3.5 feet up to approximately 8 feet below the existing ground surface along the proposed wall alignment. Due to the difficulties of satisfactorily cleaning pier holes, we recommend neglecting end bearing for vertical support.

Based on the results of our geotechnical foundation investigation, we have developed the following design criteria for cast-in-place drilled piers:

Vertical Capacity

Minimum hole diameter	18 inches
Minimum pier penetration into bedrock	8 feet

Allowable compression (skin friction), for dead plus live loads:

In the upper 8 foot	0 psf
Below a depth of 8 foot	500 psf

Allowable tension/uplift (skin friction), for dead plus live loads:

In the upper 8 foot	0 psf
Below a depth of 8 foot	400 psf

Lateral Passive Resistance - Piers [equivalent fluid pressure applied over an effective width of two (2) cast-in-place drilled pier diameters]

Between ground surface and a depth of 8 feet	0 pcf
Between depths of 8 feet and 10 feet	330 pcf
Below a depth of 10 feet	475 pcf

These design criteria include a Factor of Safety of 1.5 for passive resistance and 3.0 for skin friction.

Pier Design - The above adhesion value (skin friction) can be increased by 1/3 for just seismic loading. The upper portion of the piers should be formed to create vertical surfaces, and "mushrooming" of pier tops should be prevented. Drilled holes should be machine cleaned of all loose material prior to the placement of steel and concrete.

Water in Pier Holes - While we don't anticipate that water will accumulate in the holes, any water that is present should be pumped out until the holes are dry, or the concrete should be poured by tremie methods to displace the water.

Caving - We anticipate that drilled pier holes could cave during or shortly after drilling due to the sandy bedrock material underlying the site. Consequently, the Contractor should be prepared to case all cast-in-place pier holes during drilling to prevent caving. The casing should be removed during concrete pouring. We also recommend that pier holes be poured the same day they are drilled to reduce the potential for caving and accumulation of water over time.

Hard Rock Drilling - The Contractor should anticipate hard rock drilling in the bedrock material, and he should use a dedicated drill rig with a high-torque capacity (not an auger mounted on an excavator) and come equipped with rock bits and core barrels. Pilot holes should also be considered when the drilling gets hard.

6.6.2 Cast-in-Place Pier Supported Retaining Walls – The retaining wall should be designed to resist an active lateral equivalent fluid earth pressure of 49 pounds per cubic foot (pcf) for 2:1 sloping backfill, 37 pcf for 3:1 sloping backfill and 30 pcf for level backfill. The lateral loads on the retaining wall can be resisted by passive pressure against the side of the piers as indicated in Section 6.6.1. No seismic loading is required for site retaining walls, and walls under 11 feet high.

6.6.3 Backdrain – Backdrains should be constructed behind walls taller than 4 feet. The backdrains should be a minimum 12-inch wide continuous blanket of either Caltrans Class 2 Permeable Material or 3/4-inch x 1/2-inch clean crushed drainrock enclosed in Mirafi 140N (or approved equivalent) filter fabric, and extended to within 1 to 1-1/2 feet of the ground surface where an impervious fill should be placed. A minimum 4-inch diameter PVC Schedule 40 perforated drain pipe should be placed near the bottom of the drainrock (perforations down), surrounded by a minimum of 4 inches of drainrock with at least 2 inches of drainrock underlying the pipe. All backdrain pipes should be sloped to drain at a minimum of 1/2 percent and collected in 4-inch diameter non-perforated Schedule 40 PVC pipes that are sloped a minimum of 2 percent and discharged into the site storm drain system, or an appropriate natural swale.

Retaining walls shorter than 4 feet can be equipped with a drain panel such as Mirafi G100W (or approved equivalent) that is hydraulically connected to a 4-inch diameter PVC Schedule 40 perforated drain pipe placed near the bottom of the drainrock (perforations down). The perforated pipe should be collected by a non-perforated pipe, as described above.

6.7 Technical Review

Supplemental geotechnical design recommendations should be provided by our firm based on specific design needs developed by the other project design professionals. This report, and any supplemental recommendations, should be reviewed by the contractor as part of the bid process. It is strongly recommended that no construction be started nor grading undertaken until the final drawings, specifications, and calculations have been reviewed and approved in writing by a representative of **Cotton, Shires and Associates, Inc.**

6.8 Earthwork Construction Inspection and Testing

All excavations should be inspected by a representative of **Cotton, Shires and Associates, Inc.** prior to filling or pouring of concrete foundations. Any grading should also be inspected and tested as appropriate to assure adequate stripping and compaction. Our office should be contacted with a minimum of 48 hours advance notice of construction activities requiring inspection and/or testing services and a minimum of 72 hours advance notice and provision of representative laboratory compaction curve samples for testing of fill.

7.0 INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering geology principles and practices. No warranty, expressed or implied, or merchantability of fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings.

Any recommendations and/or design criteria presented in this report are contingent upon our firm being retained to review the final drawings and specifications, to be consulted when any questions arise with regard to the recommendations contained herein, and to provide testing and inspection services for earthwork and construction operations. Unanticipated soil and geologic conditions are commonly encountered during construction that cannot be fully determined from existing exposures or by limited subsurface investigation. Such conditions may require additional expenditures during construction to obtain a properly constructed project. Some contingency fund is recommended to accommodate these possible extra costs.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are called to the attention of the project architect and/or engineer and incorporated into the plans. Furthermore, it is also the responsibility of the owner, or of his representative, to ensure that the contractor and subcontractors carry out such recommendations in the field.

8.0 REFERENCES

8.1 Documents/Maps

Bauldry Engineering, 2008, Geotechnical Investigation, Proposed Accessory Dwelling Unit, 17300 Laurel Road.

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8.2 Aerial Imagery Analysis

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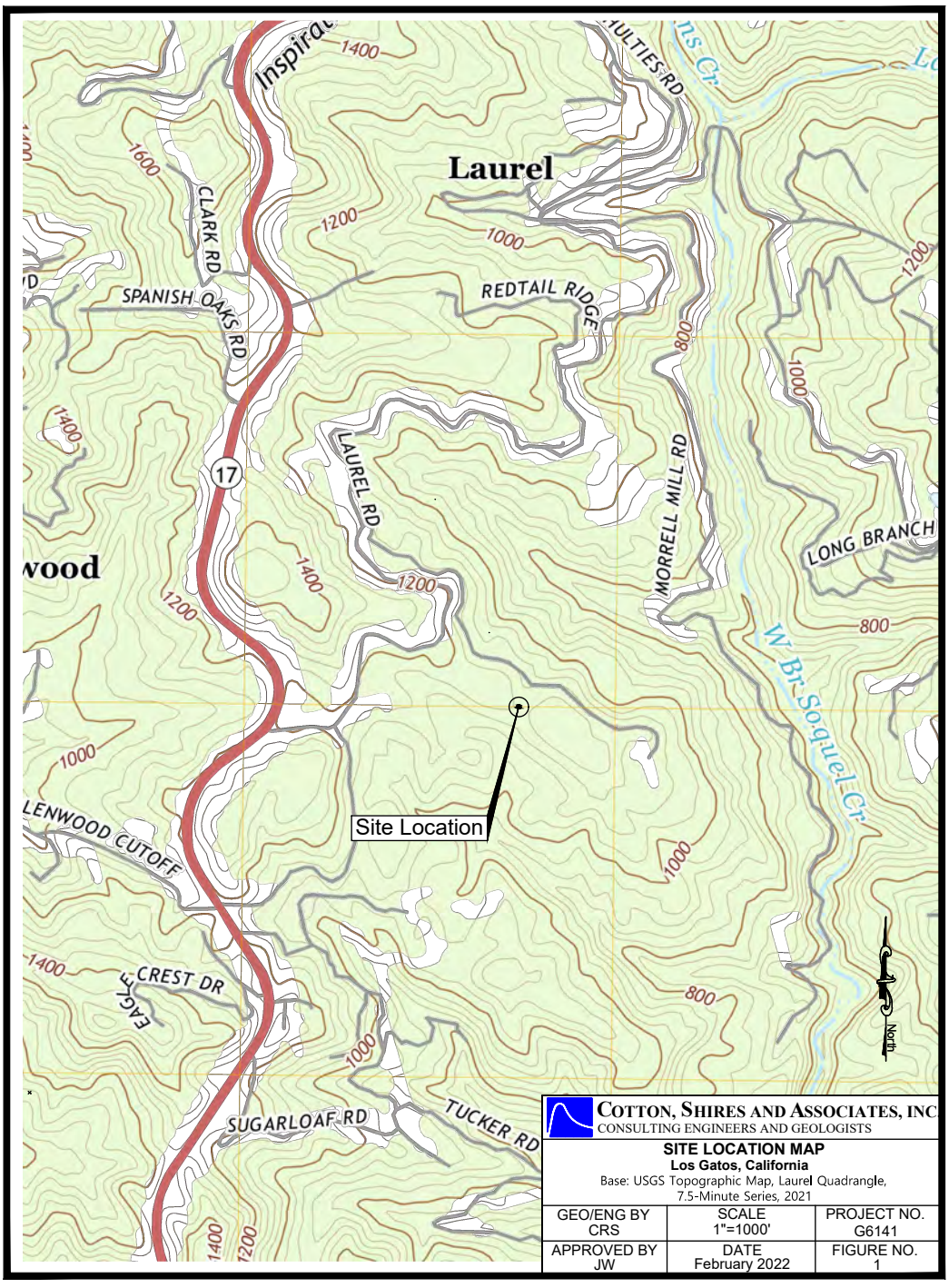
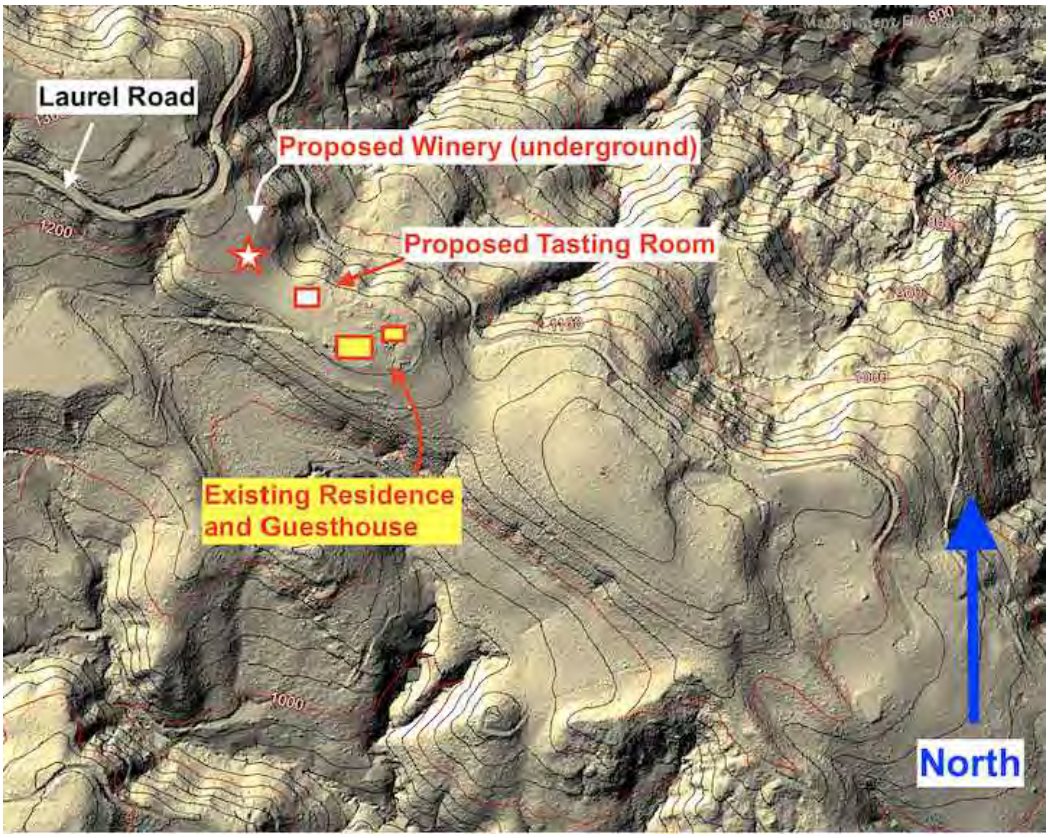
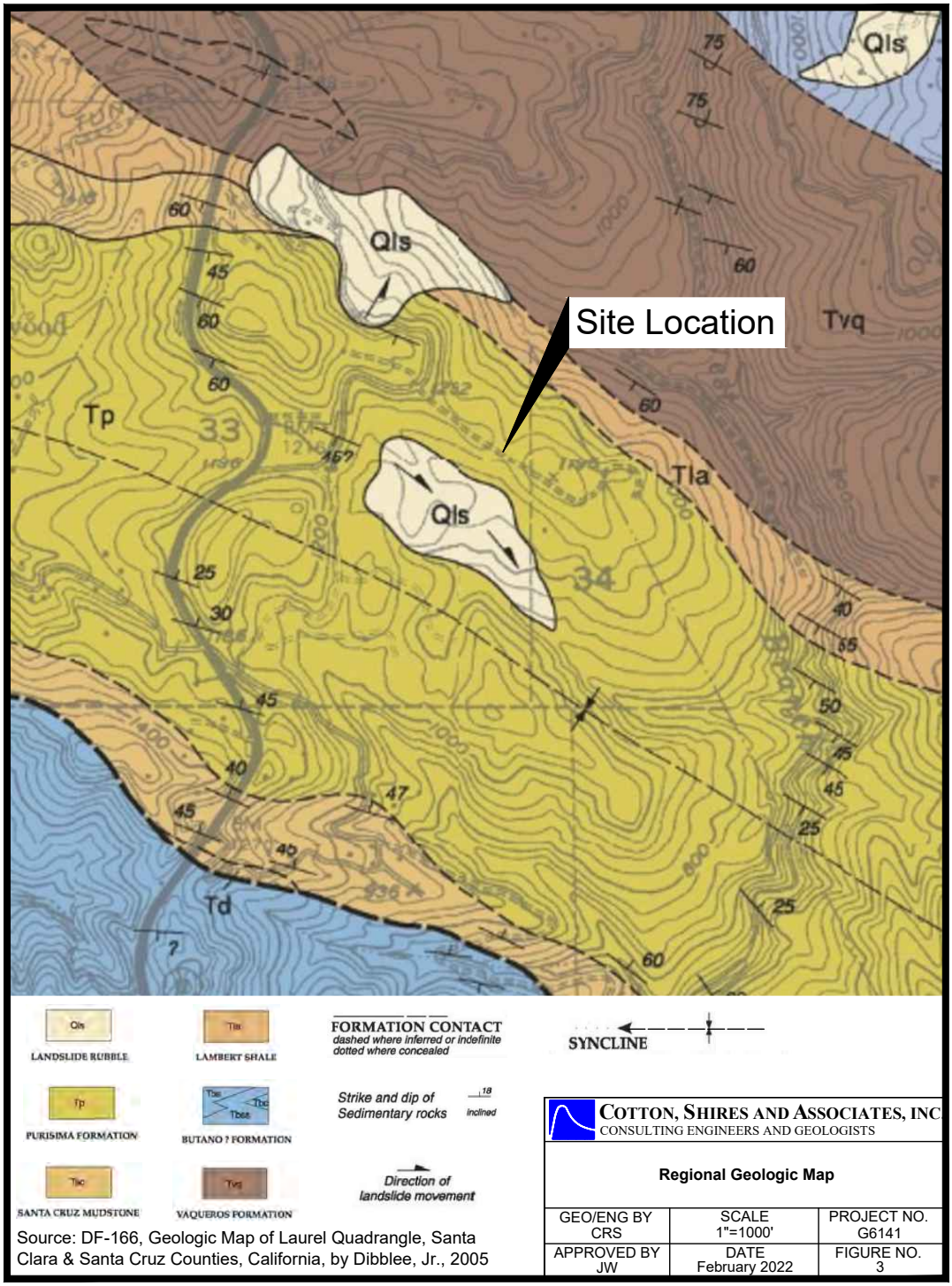
FIGURES


Laurel
CLARK RD
SPANISH OAKS RD
REDTAIL RIDGE
LAUREL RD
MORRELL MILL RD
LONG BRANCH
W Br Soquel Cr
Site Location
LENWOOD CUTOFF
CREST DR
SUGARLOAF RD
TUCKER RD
17
1400
1200
1000
800
1600
North
COTTON, SHIRES AND ASSOCIATES, INC
CONSULTING ENGINEERS AND GEOLOGISTS
SITE LOCATION MAP
Los Gatos, California
Base: USGS Topographic Map, Laurel Quadrangle, 7.5-Minute Series, 2021
GEO/ENG BY CRS
SCALE 1"=1000'
PROJECT NO. G6141
APPROVED BY JW
DATE February 2022
FIGURE NO. 1



COTTON, SHIRES AND ASSOCIATES, INC CONSULTING ENGINEERS AND GEOLOGISTS		
LIDAR HILLSHADE MAP		
GEO/ENG BY CRS	DATE February 2022	PROJECT NO. G6141
APPROVED BY JW		FIGURE NO. 2



Source: DF-166, Geologic Map of Laurel Quadrangle, Santa Clara & Santa Cruz Counties, California, by Dibblee, Jr., 2005

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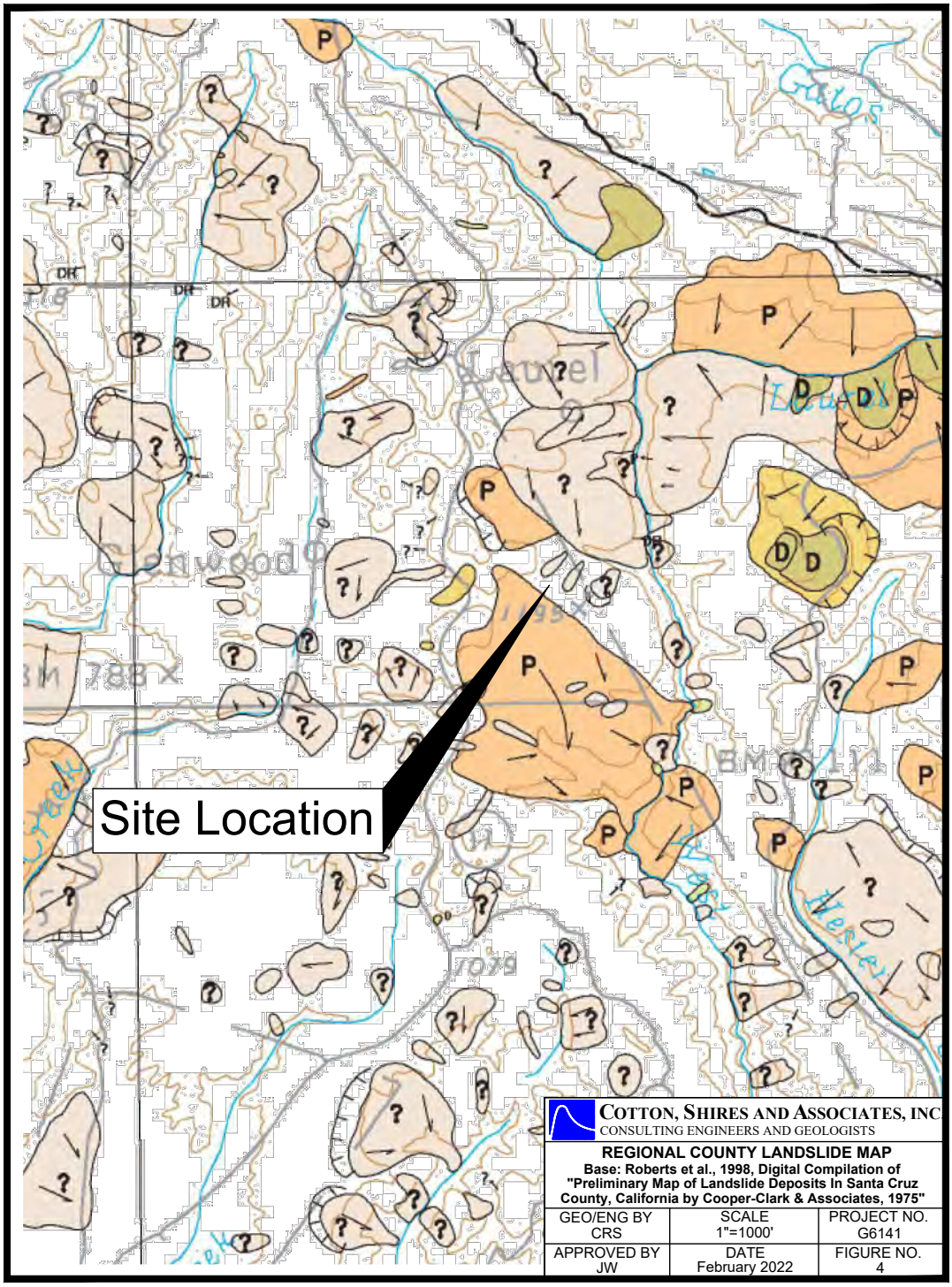
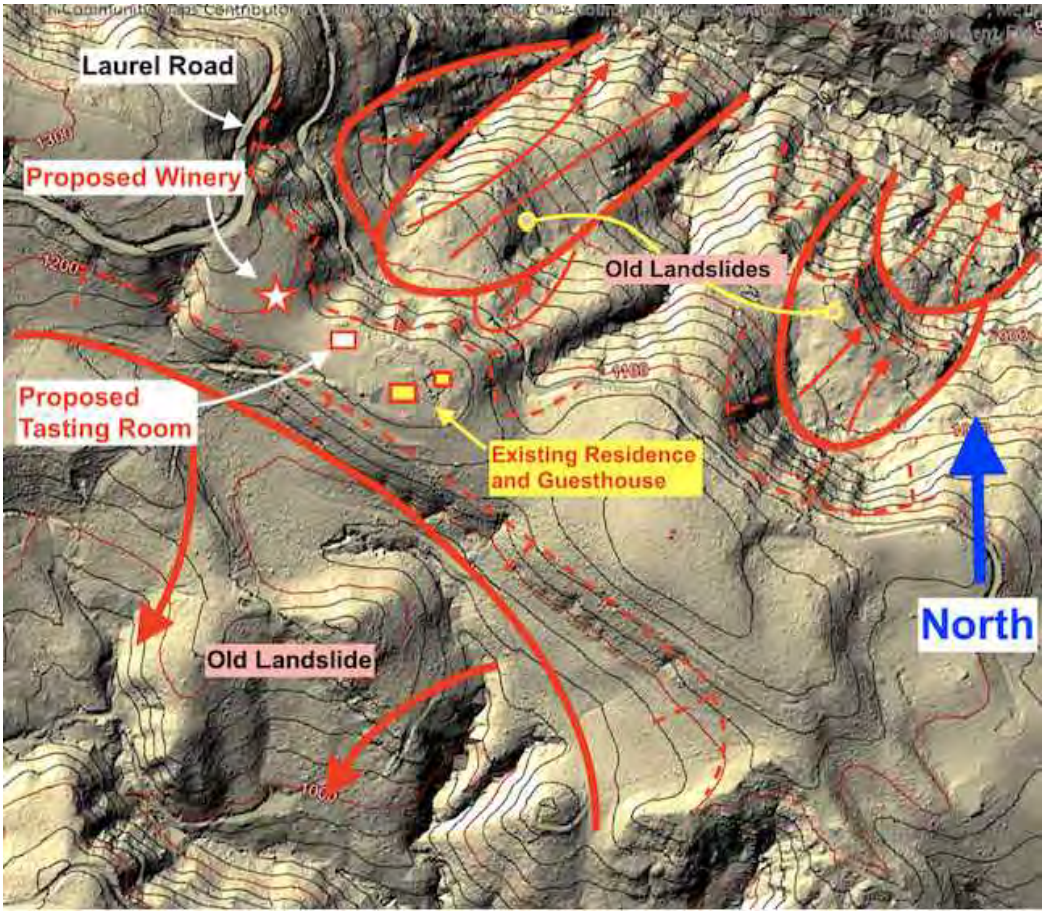
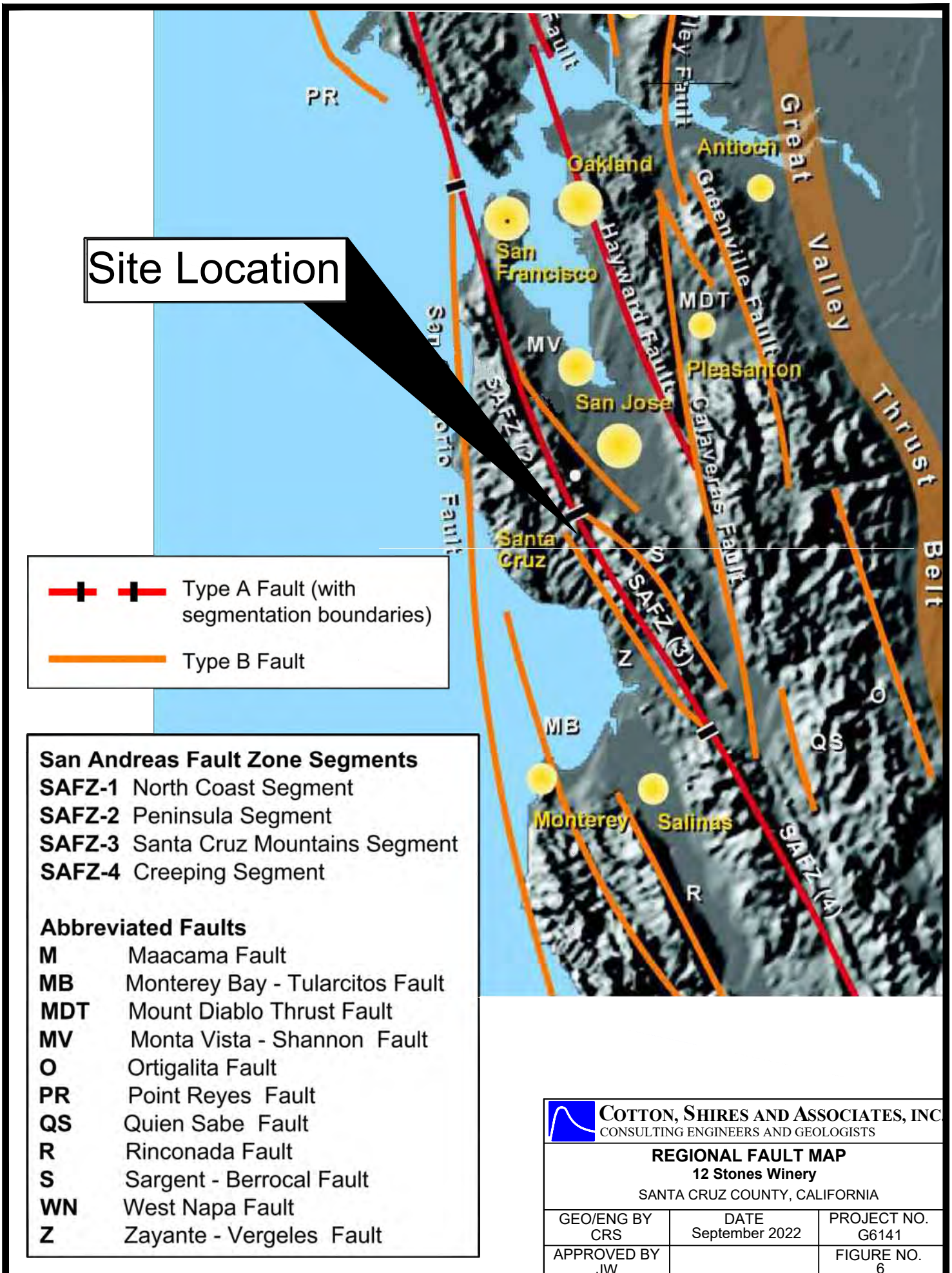
Regional Geologic Map

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=1000'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	February 2022	3


Site Location
COTTON, SHIRES AND ASSOCIATES, INC
CONSULTING ENGINEERS AND GEOLOGISTS
REGIONAL COUNTY LANDSLIDE MAP
Base: Roberts et al., 1998, Digital Compilation of "Preliminary Map of Landslide Deposits In Santa Cruz County, California by Cooper-Clark & Associates, 1975"
GEO/ENG BY CRS
SCALE 1"=1000'
PROJECT NO. G6141
APPROVED BY JW
DATE February 2022
FIGURE NO. 4



COTTON, SHIRES AND ASSOCIATES, INC CONSULTING ENGINEERS AND GEOLOGISTS		
LIDAR HILLSHADE LANDSLIDE MAP		
GEO/ENG BY CRS	DATE February 2022	PROJECT NO. G6141
APPROVED BY JW		FIGURE NO. 5



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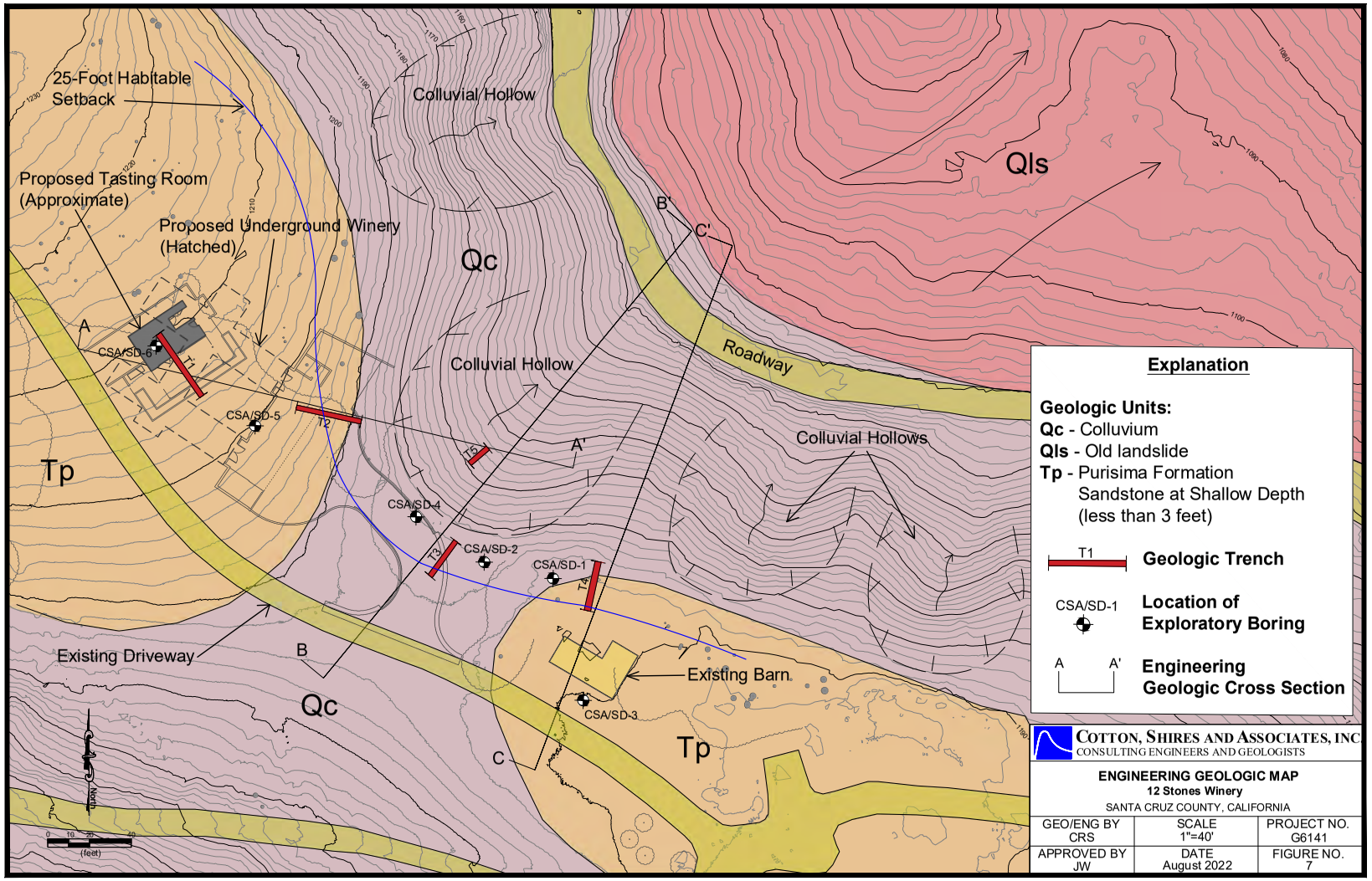
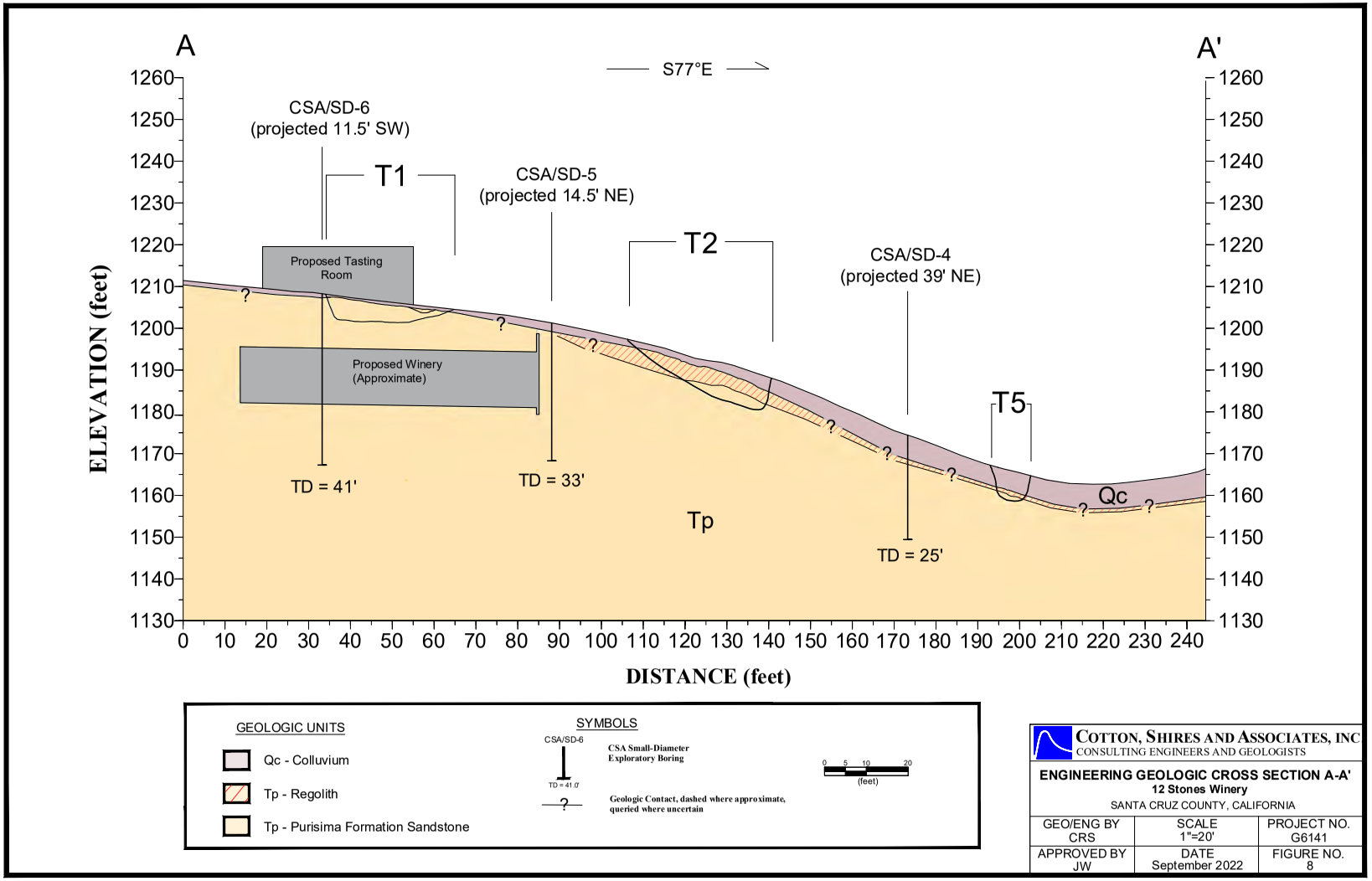
REGIONAL FAULT MAP
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA

GEO/ENG BY	DATE	PROJECT NO.
CRS	September 2022	G6141
APPROVED BY		FIGURE NO.
JW		6


25-Foot Habitable Setback
Proposed Tasting Room (Approximate)
Proposed Underground Winery (Hatched)
Colluvial Hollow
Qc
Qls
Roadway
Colluvial Hollow
Colluvial Hollows
Tp
Existing Driveway
Existing Barn
Qc
Tp
A
A'
B
B'
C
C'
CSA/SD-6
CSA/SD-5
CSA/SD-4
CSA/SD-2
CSA/SD-1
CSA/SD-3
T1
T2
T3
T4
T5
North
0 10 20 40
(feet)
Explanation
Geologic Units:
Qc - Colluvium
Qls - Old landslide
Tp - Purisima Formation
Sandstone at Shallow Depth
(less than 3 feet)
T1 Geologic Trench
CSA/SD-1 Location of Exploratory Boring
A A' Engineering Geologic Cross Section
COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS
ENGINEERING GEOLOGIC MAP
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA
GEO/ENG BY CRS
SCALE 1"=40'
PROJECT NO. G6141
APPROVED BY JW
DATE August 2022
FIGURE NO. 7



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ENGINEERING GEOLOGIC CROSS SECTION A-A'
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=20'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	September 2022	8

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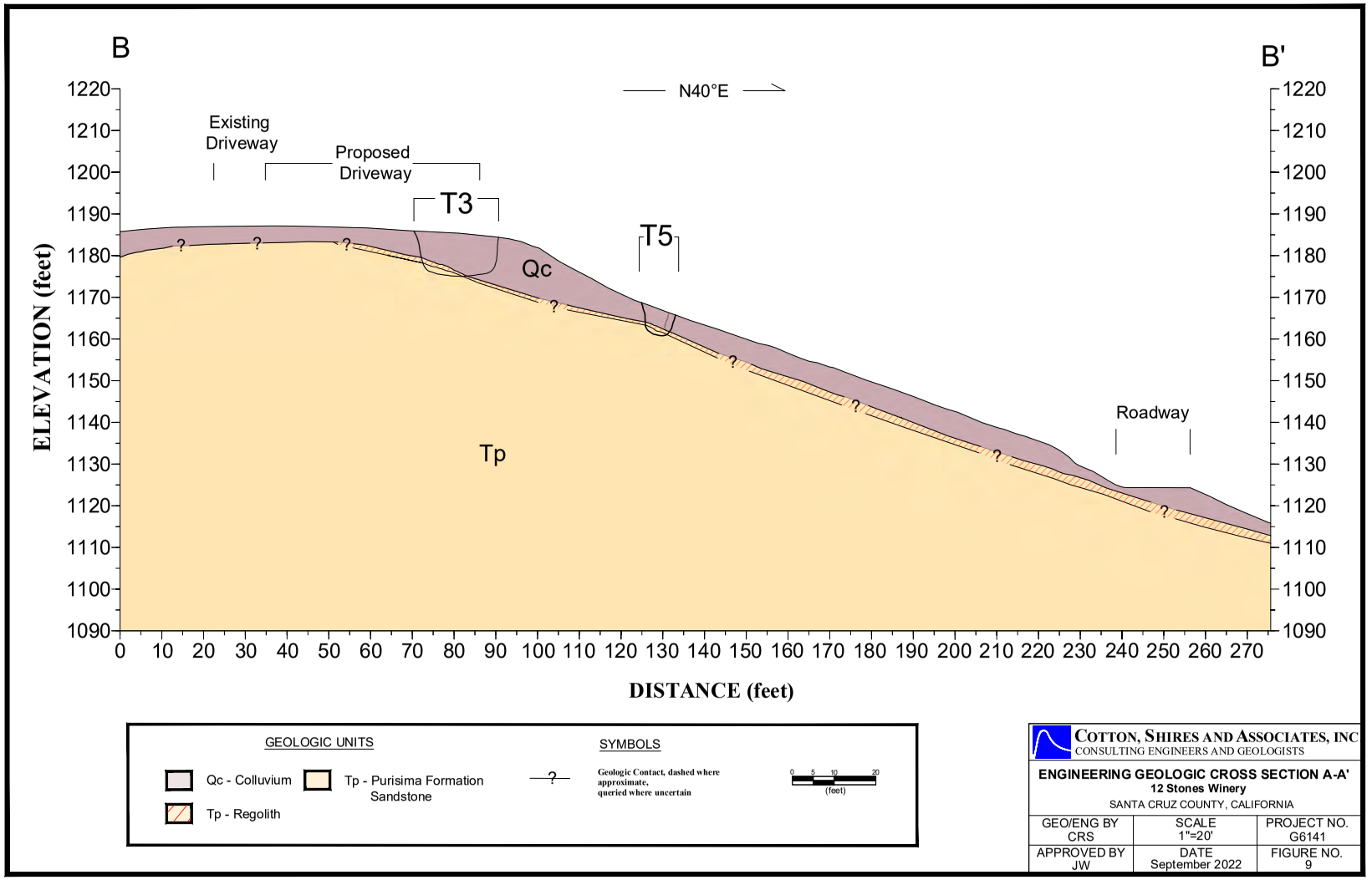

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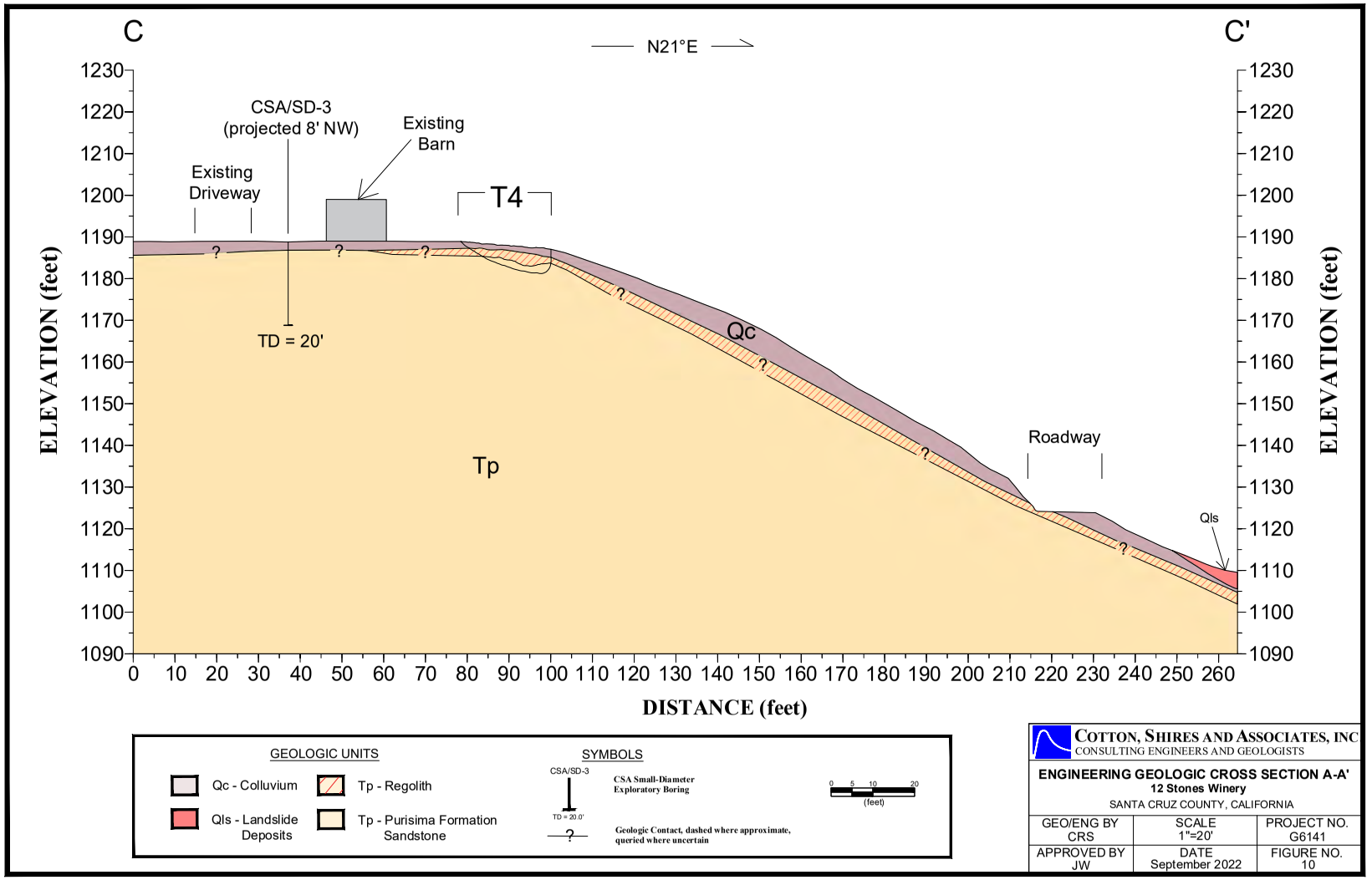
ENGINEERING GEOLOGIC CROSS SECTION A-A'
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=20'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	September 2022	9

COTTON, SHIRES AND ASSOCIATES, INC.



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ENGINEERING GEOLOGIC CROSS SECTION A-A'
12 Stones Winery
SANTA CRUZ COUNTY, CALIFORNIA

GEO/ENG BY	SCALE	PROJECT NO.
CRS	1"=20'	G6141
APPROVED BY	DATE	FIGURE NO.
JW	September 2022	10

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APPENDIX A – FIELD INVESTIGATION

Logs of CSA Exploratory Trenches

Figure 11 – Log of TP1

Figure 12 – Log of TP2

Figure 13 – Log of TP3

Figure 14 – Log of TP4 and TP5

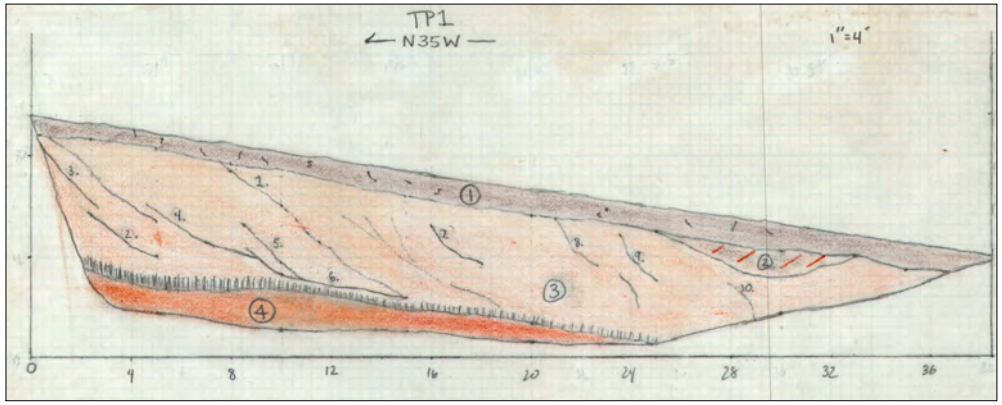
Logs of Exploratory Boreholes SD-1 Through SD-6

APPENDIX A – FIELD INVESTIGATION

Subsurface exploration consisted of the excavation of five exploratory trenches by Lyons General Engineering between November 29 and December 8, 2021. The locations of the trenches are shown on our Engineering Geologic Map (Figure 7). The trenches were logged by geologists and engineering geologists who visually classified the soils in accordance with ASTM D-2487. Descriptive logs of the trenches are presented in this appendix. These logs depict our interpretation of the subsurface conditions at the dates and locations indicated. It is not warranted that they are representative of subsurface conditions at other times and locations. The contacts on the logs represent the approximate boundaries between earth materials, and the transitions between these materials may be gradual.

We also explored subsurface conditions in the vicinity of the proposed winery and tasting room Between April 25 and 26, 2022, by means of six exploratory borings drilled to depths of 20 feet to 41 feet using track-mounted solid stem drilling equipment, and HQ Core. The locations of the borings are shown on Figure 7 (Engineering Geologic Map). The geologist who logged the borings visually classified the soils in accordance with ASTM D-2487. We obtained samples of representative earth materials at selected depths in 2- inch diameter by 6-inch long samples from liners that were placed inside a 3-inch diameter modified split-barrel California Sampler. The track-mounted drill rig sampler was driven with a 140-pound hammer that was raised by an automatic hammer and allowed to freely fall 30 inches. We also performed Standard Penetration Tests at selected depths. The depths of the sampling are shown on the boring logs. The **circled** number at the conclusion of the sampling interval represents the corrected blow count from a modified California sampler to Standard Penetration Test value accomplished by multiplying the blow count by a factor of 0.68.

Descriptive logs of the borings are presented in this appendix. These logs depict our interpretation of the subsurface conditions at the dates and locations indicated, based on representative samples collected at roughly five-foot sampling intervals. It is not warranted that they are representative of subsurface conditions at other times and locations. The contacts on the logs represent the approximate boundaries between earth materials, and the transitions between these materials may be gradual.



Legend:

geologic contact:

gradational contact:

fracture plane: 1.

geologic unit: ①

rootlets:

Unit Descriptions:

① Colluvium: silty clay (CL), dark yellowish brown (moist) to greyish brown (dry), dry to moist, loose to medium stiff, low to moderate plasticity, homogeneous, abundant angular sandstone fragments, abundant rootlets, lower contact sharp/irregular and marked by change from matrix-supported to clast-supported.

② Regolith: clast supported fine-grained sandstone with a silty clay matrix, light yellowish tan (clasts), dark yellowish brown (matrix), iron oxide staining, moist to wet on isolated fracture faces, intensely fractured, no visible bedding, completely weathered, friable to weak sandstone, very soft matrix, trace rootlets, lower contact sharp and marked by change from clast-supported to fine-grained sandstone.

③ Purisima Formation Sandstone: olive brown to light yellow tan, brown along fracture faces, iron oxide staining, fine-grained, dry to moist, closely/intensely fractured, fractures are small (≤ 1/8") with a thin clayey film, blocky to seamy, no visible bedding, deeply to moderately weathered, friable to weak, trace rootlets, lower contact gradational and marked by a fine- to medium-grained sandstone.

④ Purisima Formation Sandstone: olive brown to yellow brown, iron oxide staining, fine- to medium-grained, moist, fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

Fracture Planes - Strike and Dip:

1. N10°E 64°SE planar, clayey film
2. N6°E 48°SE planar, clayey film
3. N21°E 50°SE planar, slightly wavy, clayey film
4. N22°E 55°SE planar, clayey film
5. N20°W 53°NE planar, clayey film
6. N22°E 60°SE planar, clayey film
7. N15°E 85°SE planar, clayey film
8. N20°E 58°SE planar, clayey film
9. N2°E 62°SE planar, clayey film
10. N5°W 46°NE planar, clayey film

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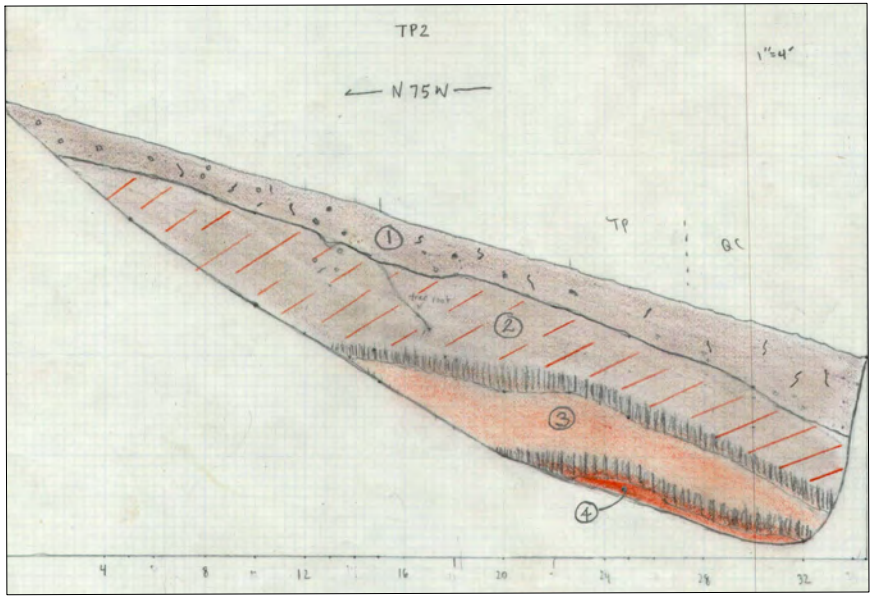
GEOLOGIC TRENCH LOG TP1

GEO/ENG BY CRS	SCALE 1"=4'	PROJECT NO. G6141
APPROVED BY JW	DATE March 2022	FIGURE NO. 11



Unit Descriptions:

① Colluvium: silty clay (CL), dark yellowish brown (moist) to greyish brown (dry), dry to moist, loose to stiff, low to moderate plasticity, homogeneous, abundant angular sandstone fragments, abundant rootlets, lower contact sharp/irregular and marked by change from matrix-supported to clast-supported.

② Regolith: clast supported fine-grained sandstone with a silty clay matrix, olive brown to light yellowish tan (clasts), dark yellowish brown (matrix), iron oxide staining, moist to wet on isolated fracture faces, intensely fractured, no visible bedding, completely weathered, friable to weak sandstone, soft matrix, trace rootlets, lower contact gradational (4-6") and marked by change from clast-supported to fine-grained sandstone.

③ Purisima Formation Sandstone: olive brown to light yellow tan, brown along fracture faces, iron oxide staining, fine-grained, dry to moist, closely/intensely fractured, fractures are small (≤ 1/8") with a thin clayey film, blocky to seamy, no visible bedding, deeply to moderately weathered, friable to weak, trace rootlets, lower contact gradational (4-6") and marked by a fine- to medium-grained sandstone.

④ Purisima Formation Sandstone: olive brown to yellow brown, iron oxide staining, fine- to medium-grained, moist, fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

Legend:

geologic contact:

gradational contact:

geologic unit: ①

rootlets:

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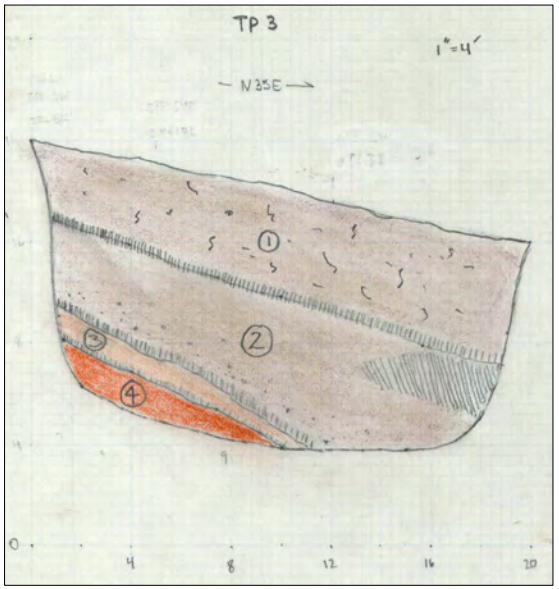
CONSULTING ENGINEERS AND GEOLOGISTS

GEOLOGIC TRENCH LOG TP2

GEO/ENG BY CRS	SCALE 1"=4'	PROJECT NO. G6141
APPROVED BY JW	DATE March 2022	FIGURE NO. 12



Unit Descriptions:

① Colluvium: sandy clay (CL), dark yellowish brown (moist) to greyish brown (dry), dry to moist, stiff to very stiff, moderate plasticity, homogeneous, very fine- to fine-grained sand, abundant rootlets, lower contact is gradational (4-6") and marked by increase in fines and stiffness.

② Older Colluvium: silty clay (CL), dark yellowish brown to light brown, moist, stiff to hard, moderate plasticity, heterogeneous, blocky texture, trace angular sandstone fragments, sparse rootlets, zone of caliche deposits, lower contact is gradational (4-6") and marked by a change from matrix-supported to clast-supported.

③ Regolith: clast-supported fine-grained sandstone with a silty clay matrix, olive brown to yellowish brown (clasts), dark yellowish brown (matrix), iron oxide staining, moist, highly/closely fractured, no visible bedding, completely weathered, friable to weak sandstone, very soft matrix, lower contact gradational (1-2") and marked by change from clast-supported to fine-grained sandstone.

④ Purisima Formation Sandstone: olive brown to yellow brown, iron oxide staining, fine-grained, dry to moist, closely fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

Notes:

Fracture planes within Purisima Formation Sandstone at uphill face of trench TP3 exhibit two orientation sets - prominent: N20°W 58°NE smooth, planar, clayey film, no shearing, platy texture, isolated polished surfaces; less prominent: N77°W 37°NE planar, clayey film.

Legend:

geologic contact:

gradational contact:

geologic unit: ①

caliche zone:

rootlets:

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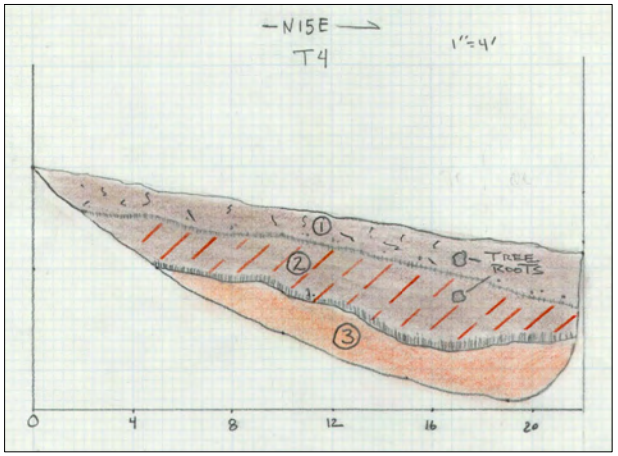
GEOLOGIC TRENCH LOG TP3

GEO/ENG BY CRS	SCALE 1"=4'	PROJECT NO. G6141
APPROVED BY JW	DATE March 2022	FIGURE NO. 13



Unit Descriptions:

① Colluvium: silty clay (CL), dark yellowish brown (moist) to greyish brown (dry), dry to moist, soft to medium stiff, low to moderate plasticity, homogeneous, abundant rootlets and roots, trace fine-grained sand, trace angular sandstone fragments, lower contact is gradational (1-2") and marked by fine-grained sandstone.

② Purisima Formation Sandstone: olive brown to yellow brown, brown along isolated fracture faces, iron oxide staining, fine-grained, moist, highly/closely fractured, isolated polished surfaces with a thin clayey film, no visible bedding, deeply to moderately weathered, friable to weak, trace rootlets and roots, lower contact gradational (3-6") and marked by a fine- to medium-grained sandstone.

③ Purisima Formation Sandstone: olive brown to yellow brown, iron oxide staining, fine- to medium-grained, moist, closely fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

Fracture Plane Strike and Dip:

1. N10°E 69°SE planar, clayey film, prominent root growth

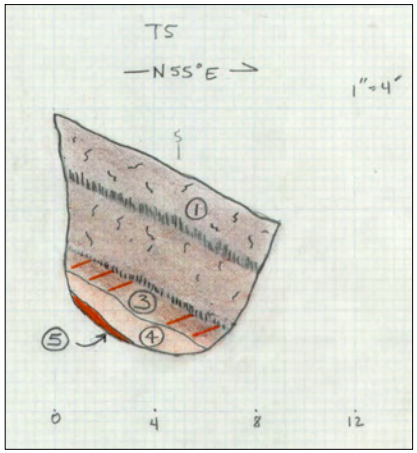
Legend:

geologic contact:

gradational contact:

geologic unit: ①

rootlets:



Unit Descriptions:

① Colluvium: silty clay (CL), dark brown (moist) to light greyish brown (dry), dry to moist, soft to medium stiff, moderate plasticity, homogeneous, abundant rootlets and roots, trace fine-grained sand, lower contact is gradational (4-6") and marked by increase in sand and stiffness.

② Colluvium: sandy clay (CL), dark yellowish brown to olive brown, moist, medium stiff to stiff, low to moderate plasticity, heterogeneous, angular sandstone fragments, trace rootlets and roots, lower contact is gradational (2-3") and marked by a change from matrix supported to clast supported.

③ Regolith: clast supported fine-grained sandstone with a sandy clay matrix, olive brown to yellowish brown (clasts), dark yellowish brown (matrix), iron oxide staining, moist, highly/closely fractured, blocky texture, isolated polished surfaces with thin clayey film, no visible bedding, completely weathered, friable to weak sandstone, very soft matrix, trace rootlets, lower contact sharp/irregular and marked by change from clast supported to fine-grained sandstone.

④ Purisima Formation Sandstone: olive brown to yellowish brown, dark yellowish brown along fracture faces, iron oxide staining, fine-grained, moist, closely/highly fractured, blocky texture, thin clayey film along fracture faces, no visible bedding, moderately to deeply weathered, friable to weak, lower contact is gradational (1-2") and marked by a fine- to medium-grained sandstone.

⑤ Purisima Formation Sandstone: olive brown, iron oxide staining, fine- to medium-grained, moist, fractured, no visible bedding, moderately weathered, friable to weak, lower contact not seen.

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GEOLOGIC TRENCH LOG TP4 & TP5

GEO/ENG BY CRS	SCALE 1"=4'	PROJECT NO. G6141
APPROVED BY JW	DATE March 2022	FIGURE NO. 14

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Logs of Exploratory Boreholes
SD-1 through SD-6

COTTON, SHIRES AND ASSOCIATES, INC.

COTTON, SHIRES AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project 12 Stones Winery — Boring CSA/SD-1

Location 17300 Laurel Road, Los Gatos, CA — Project No. G6141

Drilling Contractor/Rig Geo-Ex Subsurface Exploration/ Track Rig CME 75 — Date of Drilling 04/25/2022

Ground Surface Elev. 0' — Logged By CRS — Hole Diameter 4" Solid Stem Auger

Surface Colluvium — Weather Sunny, 60's

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight (pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
			0.0' - 3.25' COLLUVIUM							Driller: Nick
										8:45 AM - START
		CL	0.0'-3.25' **Silty Clay**, dark yellow brown, stiff, moist, low to moderate plasticity, homogeneous, abundant roots and rootlets, angular sandstone fragments, trace fine-grained sand	T-1 T-2			5 10 17	MC		
2							(18)			
				T-3 T-4			8 17 25	MC		
4										
		SANDSTONE	**3.25' - BOH PURISIMA FORMATION SANDSTONE**				(29)			
6			3.25'-BOH **Sandstone**, olive brown to yellow brown to light yellow tan, brown along isolated fracture faces, iron oxide staining, fine grained, highly/closely fractured, no visible bedding, deeply to moderately weathered, friable to weak	T-5 T-6			12 29 45	MC		
							(50)			
8				B1			13 30 50/5"	SPT		
							(50/11")			
10										9:16 AM
12										
										9:23 AM
14				B2			13 21 28	SPT		
							(49)			9:29 AM
16										
18										9:39 AM
				B3			18 31 50/6"	SPT		
20			BOH at 20.0'				(81)			9:42 AM - END
			Groundwater not encountered during drilling							
22			Hole backfilled with grout							
24										
26										
28										

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LOG OF EXPLORATORY DRILLING

Project 12 Stones Winery | Boring CSA/SD-2

Location 17300 Laurel Road, Los Gatos, CA | Project No. G6141

Drilling Contractor/Rig Geo-Ex Subsurface Exploration/ Track Rig CME 75 | Date of Drilling 04/25/2022

Ground Surface Elev. 0' | Logged By CRS | Hole Diameter 4" Solid Stem Auger

Surface Colluvium | Weather Sunny, 60's

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight (pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
			0.0' - 3.0' COLLUVIUM							Driller: Nick
		CL	0.0'-3.0' **Sandy Clay**, dark yellow brown, stiff to very stiff, moist, moderate plasticity, homogeneous, abundant rootlets, fine-grained sand							10:04 AM - START
2				T-1 T-2			4 8 12	MC		
							(14)			
		CL	**3.0' - 6.25' OLDER COLLUVIUM**	T-3 T-4			6 11 19	MC		
4			3.0'-6.25' **Silty Clay**, dark yellow brown, stiff to hard, moist, moderate plasticity, heterogeneous, blocky texture, angular sandstone fragments, sparse rootlets, trace fine-grained sand							
							(20)			
6				T-5 T-6			7 15 24	MC		
		SANDSTONE	**6.25' - BOH PURISIMA FORMATION SANDSTONE**							
8			6.25'-6.75' **Regolith**, clast-supported fine-grained sandstone with a silty clay matrix, olive brown to yellow brown clasts, dark yellow brown (matrix), iron oxide staining, moist, fine grained sandstone, highly/closely fractured, no visible bedding, completely weathered, friable to weak sandstone, very soft matrix				(27)			
				T-7 T-8			10 25 37	MC		
10							(42)			
12			6.75'-BOH **Sandstone**, olive brown to yellow brown to light yellow tan, brown along isolated fracture faces, iron oxide staining, fine grained, highly/closely fractured, isolated fracture faces contain clayey film, no visible bedding, deeply to moderately weathered, friable to weak							
14				B1			10 24 38	SPT		
							(62)			
16										
18				B2			31 50/6"	SPT		
							(50/6")			
20										
22				B3			28 50/6"	SPT		
24			BOH at 23.5'				(50/6")			11:30 AM - END
			Groundwater not encountered during drilling							
26			Hole backfilled with grout							
28										

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LOG OF EXPLORATORY DRILLING

Project 12 Stones Winery — Boring CSA/SD-3

Location 17300 Laurel Road, Los Gatos, CA — Project No. G6141

Drilling Contractor/Rig Geo-Ex Subsurface Exploration/ Track Rig CME 75 — Date of Drilling 04/25/2022

Ground Surface Elev. 0' — Logged By CRS — Hole Diameter 4" Solid Stem Auger

Surface Colluvium — Weather Sunny, 60's

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight (pct)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
0		CL	**0.0' - 2.0' COLLUVIUM** 0.0'-2.0' **Silty Clay**, dark yellow brown, stiff, moist, low to moderate plasticity, homogeneous, abundant rootlets, angular sandstone fragments, trace fine-grained sand	B1						Driller: Nick 12:27 PM - START
2				B2						Hand auger upper 3 feet possible utility lines
4		SANDSTONE	**3.25' - BOH PURISIMA FORMATION SANDSTONE** 3.25'-BOH **Sandstone**, olive brown to yellow brown to light yellow tan, brown along isolated fracture faces, iron oxide staining, fine grained, highly/closely fractured, isolated fracture faces contain clayey film, no visible bedding, deeply to moderately weathered, friable to weak	B3			16 20 26	SPT		
							(46)			
6				B4			6 16 23	SPT		12:38 PM
8							(39)			12:42 PM
				B5			13 22 27	SPT		
10							(49)			
12										
14				B6			9 11 16	SPT		12:55 PM
16							(27)			
18				B7			13 16 21	SPT		
20			BOH at 20.0' Groundwater not encountered during drilling Hole backfilled with grout				(37)			1:06 PM - END
22										
24										
26										
28										

Sheet 1 of 1

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LOG OF EXPLORATORY DRILLING

Project 12 Stones Winery — Boring CSA/SD-4

Location 17300 Laurel Road, Los Gatos, CA — Project No. G6141

Drilling Contractor/Rig Geo-Ex Subsurface Exploration/ Track Rig CME 75 — Date of Drilling 04/25/2022

Ground Surface Elev. 0' — Logged By CRS — Hole Diameter 4" Solid Stem Auger

Surface Colluvium — Weather Sunny, 60's

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight (pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
			0.0' - 3.0' COLLUVIUM							Driller: Nick
		CL	0.0'-3.0' **Sandy Clay**, dark yellow brown, stiff to very stiff, moist, moderate plasticity, homogeneous, abundant rootlets, fine-grained sand	T-1			5 7 10	MC		1:26 PM - START
2				T-2			(12)			
			3.25' - 6.0' OLDER COLLUVIUM	T-3			6 6 10	MC		
4		CL	3.25'-6.0' **Silty Clay**, dark yellow brown, stiff to hard, moist, moderate plasticity, heterogeneous, blocky texture, angular sandstone fragments, sparse rootlets, trace fine-grained sand	T-4						
							(11)			
6			**6.0' - BOH PURISIMA FORMATION SANDSTONE**	T-5			7 13 21	MC		
		SANDSTONE	6.0'-BOH **Sandstone**, olive brown to yellow brown to light yellow tan, brown along isolated fracture faces, iron oxide staining, fine grained, highly/closely fractured, isolated fracture faces contain clayey film, no visible bedding, deeply to moderately weathered, friable to weak	T-6						
8							(23)			
				B1			7 13 14	SPT		
10							(27)			1:45PM
12										
				B2			7 10 13	SPT		1:56 PM
14										
							(23)			1:58 PM
16										
18										2:06 PM
				B3			16 23 38	SPT		
20							(61)			2:10 PM
22										
				B4			16 21 31	SPT		2:22 PM
24										
26			BOH at 25.0'				(52)			2:24 PM - END
			Groundwater not encountered during drilling							
28			Hole backfilled with grout							

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LOG OF EXPLORATORY DRILLING

Project 12 Stones Winery — Boring CSA/SD-5

Location 17300 Laurel Road, Los Gatos, CA — Project No. G6141

Drilling Contractor/Rig Geo-Ex Subsurface Exploration/ Track Rig CME 75 — Date of Drilling 04/25/2022, 04/26/2022

Ground Surface Elev. 0' — Logged By CRS — Hole Diameter 4" Solid Stem Auger, HQ Core

Surface Colluvium — Weather Sunny, 70's

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight (pct)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
		CL	**0.0' - 3.0' COLLUVIUM** 0.0'-2.0' **Silty Clay**, dark yellow brown, stiff, dry to moist, low to moderate plasticity, homogeneous, abundant angular sandstone fragments, abundant rootlets							Driller: Nick 3:00 PM - START (4/25/22)
2				T-1 T-2			4 8 12	MC		
							(14)			
4				T-3 T-4			6 11 19	MC		
6			**6.25' - BOH PURISIMA FORMATION SANDSTONE** 2.0'-3.25' **Regolith**, clast-supported fine-grained sandstone with a silty clay matrix, olive brown to light yellow tan (clasts), dark yellow brown (matrix), iron oxide staining, moist, fine grained sandstone, intensely fractured, no visible bedding, completely weathered, friable to weak sandstone, very soft matrix				(20)			
		SANDSTONE		B1			7 15 24	MC		3:22 PM - END (4/25/22)
8				BOX 1						8:29 AM - START (4/26/22) Switch to coring @ 8'
10			3.25'-BOH **Sandstone**, olive brown to yellow brown to light yellow tan, brown along isolated fracture faces, iron oxide staining, fine grained, highly/closely fractured, isolated fracture faces contain clayey film, no visible bedding, deeply to moderately weathered, friable to weak							Run time: 8:29 - 8:36 AM 120 PSI 36" Recovery (poor sample) 0 RQD
12										
14				BOX 1						Run time: 8:42 - 8:52 AM 150-200 PSI 44" Recovery ¾₄₄" RQD
16										
18				BOX 1						Run time: 8:57 - 9:12 AM 200 PSI 19" Recovery ⅘₁₉" RQD
20										
22				BOX 1						Run time: 9:23 - 9:33 AM 300 PSI 33" Recovery 6.5/33" RQD
24										
26										
28				BOX 2						

Project 12 Stones Winery Date 04/25/22, 04/26/22 Boring CSA/SD-5

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight (pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
32		SANDSTONE	3.25'-BOH **Sandstone**, olive brown to yellow brown to light yellow tan, brown along isolated fracture faces, iron oxide staining, fine grained, highly/closely fractured, isolated fracture faces contain clayey film, no visible bedding, deeply to moderately weathered, friable to weak	BOX 2						Run time: 9:44 - 9:54 AM 500 PSI 59" Recovery 41/59" RQD
34			BOH at 33.0' Groundwater not encountered during drilling Hole backfilled with grout							9:54 AM - END
36										
38										
40										
42										
44										
46										
48										
50										
52										
54										
56										
58										
60										
62										

Sheet 2 of 2

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LOG OF EXPLORATORY DRILLING

Project 12 Stones Winery — Boring CSA/SD-6

Location 17300 Laurel Road, Los Gatos, CA — Project No. G6141

Drilling Contractor/Rig Geo-Ex Subsurface Exploration/ Track Rig CME 75 — Date of Drilling 04/26/2022

Ground Surface Elev. 0' — Logged By CRS — Hole Diameter 4" Solid Stem Auger, HQ Core

Surface Colluvium — Weather Sunny, 70's

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight (pct)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
0		CL	**0.0' - 3.0' COLLUVIUM** 0.0'-2.0' **Silty Clay**, dark yellow brown, stiff, dry to moist, low to moderate plasticity, homogeneous, abundant angular sandstone fragments, abundant rootlets							Driller: Nick 11:13 PM - START
2				T-1 T-2			11 29 36	MC		
							(44)			
4			**6.25' - BOH PURISIMA FORMATION SANDSTONE** 3.25'-BOH **Sandstone**, olive brown to yellow brown to light yellow tan, brown along isolated fracture faces, iron oxide staining, fine grained, highly/closely fractured, isolated fracture faces contain clayey film, no visible bedding, deeply to moderately weathered, friable to weak	B1			10 15 20	SPT		
6		SANDSTONE					(35)			
				B2			7 10 15	SPT		11:38 AM
8				BOX 2			(25)			Switch to coring @ 8' Run time: 11:59 - 12:07 PM 150 PSI 16.5" Recovery 0 RQD
10										
12				BOX 2						Run time: 12:17 - 12:24 AM 200 PSI 23" Recovery 0 RQD
14										
16				BOX 2						Run time: 12:31 - 12:39 PM 200 PSI: from 16 - 18.75' 500 PSI: from 18.75' - 21' 52" Recovery $^{12}/_{52}$" RQD
18										
20										
22				BOX 3						Run time: 12:46 - 12:56 PM 500 PSI: from 21' - 23.5' 23.5-25': lost pressure, burned through zone in seconds, water drained rapidly 200 PSI: from 25 - 26' 28" Recovery 0" RQD
24										
26				BOX 3						Run time: 1:03 - 1:13 PM 400 PSI 50" Recovery $^{16.6}/_{50}$" RQD
28										

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Project 12 Stones Winery Date 04/25/22, 04/26/22 Boring CSA/SD-6

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Unit Weight (pct)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recov. (%)	Remarks
32		SANDSTONE	3.25'-BOH **Sandstone**, olive brown to yellow brown to light yellow tan, brown along isolated fracture faces, iron oxide staining, fine grained, highly/closely fractured, isolated fracture faces contain clayey film, no visible bedding, deeply to moderately weathered, friable to weak	BOX 3						Run time: 1:19 - 1:26 PM 400 PSI 32" Recovery 4/32" RQD
34										
36				BOX 4						Run time: 1:32 - 1:41 PM 500 PSI 51" Recovery 11/51" RQD
38										
40										
42			BOH at 41.0' Groundwater not encountered during drilling Vibrating wire piezometer installed							1:41 PM - END
44										
46										
48										
50										
52										
54										
56										
58										
60										
62										

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APPENDIX B

Laboratory Testing
Unconsolidated Undrained Triaxial Test
Atterberg Limits Tests

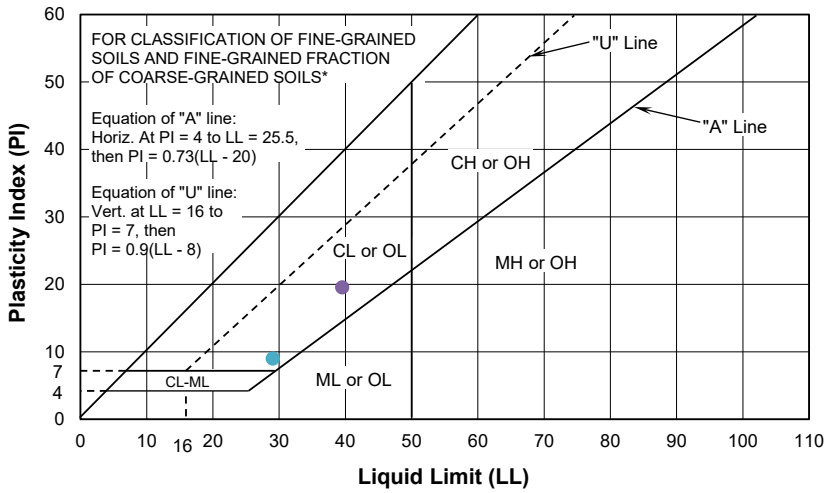
APPENDIX B
LABORATORY TESTING

The laboratory analysis performed for the investigation consisted of limited testing of the principal soil types sampled during the field investigation to evaluate index properties and strength parameters of subsurface materials. The soil descriptions and the field and laboratory test results were used to assign parameters to the various materials at the site. The results of the laboratory testing program are presented in this appendix and on the boring logs.

The following laboratory tests were performed as part of this investigation:

1. Detailed soil description, ASTM D2487;
2. Natural moisture content of the soil, ASTM D2216;
3. In-situ unit weight of the soil (wet and dry);
4. Atterberg limits determination: ASTM D 4318; and
5. Unconsolidated undrained triaxial shear test ASTM D2850.

SUMMARY OF ATTERBERG LIMITS



SAMPLE DESCRIPTION	BORING No./ SAMPLE No.	DEPTH, Ft.	LIQUID LIMIT, %	PLASTICITY INDEX, %	USCS SYMBOL
Silty Clay	SD2/T3	3-3.5	39.5	20	CL
Sandy Clay	SD4/T2	1.5-2	29	9	CL

*Reference: 1995 Annual Book of ASTM Standards; ASTM Designation D4318: Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

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Figure B-2

Seismic Earth Pressures on Deep Building Basements

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Abstract

The International Building Code and ASCE 7-05 require that earth retaining structures and basement walls be designed for seismic earth pressures. Although there are many documented failures of retaining structures during earthquakes, almost all are associated with some form of soil-related failure in loose or poorly compacted soils in waterfront or marine locations or associated with embankments, slope instability or liquefaction. On the other hand, there have been no reports of damage to building basement walls as a result of seismic earth pressures in recent United States earthquakes including the 1971 San Fernando, 1987 Whittier Narrows, 1989 Loma Prieta and 1994 Northridge earthquakes, or in the 1995 Kobe, Japan or 1999 Chi Chi, Taiwan earthquakes. However, despite the absence of compelling damage or failure due to seismic earth pressures, inclusion of seismic earth pressures is required in the design of earth retaining structures and basement walls in the current United States building code. Most geotechnical engineers estimate seismic earth pressures using the Mononobe-Okabe method of analysis developed in the 1920s based on model tests of walls with sand backfill on a small shake table. The results from the original Mononobe-Okabe method have been compared to more recent tests which allow superior geometric and material property scaling using wall and soil models shaken in a centrifuge. The centrifuge tests strongly suggest that the Mononobe-Okabe methodology does not properly model full scale conditions and may be extremely conservative in the predicted seismic earth pressures. In addition, many geotechnical engineers are uncertain about the various inputs to the Mononobe-Okabe method which adds more unpredictability in the reported results. The applicability of the Mononobe-Okabe method to non-sandy backfill is also an issue. Based on the recent research, provisional recommendations for the design of building basement walls are presented, and the impact on the structural design of the basements is discussed.

Introduction

The building code is generally a set of model code regulations that are designed to safeguard the public health

and safety in all communities, large and small. The building code establishes minimum regulations for building systems using both prescriptive and performance-based provisions. For structural design, the building code prescribes minimum structural loading requirements for use in the design and construction of buildings and structural components. In dealing with soils and foundations, the building code provides criteria for the geotechnical and structural considerations in the selection and installation of adequate support for the loads transferred from the structure above and from the soil onto the structure (if applicable). The building code provisions are based on years of experience, observation, and judgment. In the case of seismic provisions, observations of damage or failure usually bring new regulations to prevent and mitigate such conditions in future construction. Although there is little or no evidence that significant damage or failure has occurred in deep building basements, the building code has evolved to require that building basements be designed for seismic earth pressures.

Performance of Deep Basement Walls in Recent Earthquakes

A summary of reports of damage to walls in recent earthquakes has been presented in Lew, Sitar and Al Atik (2010). Although there are reports of damage and failure of retaining walls due to earthquakes in the United States, the distress has been attributed to some form of soil or foundation failure, such as slope instability or soil liquefaction. There have been no reports of damage to building basement walls as a result of seismic earth pressures in recent U.S. earthquakes including the 1971 San Fernando, 1987 Whittier Narrows, 1989 Loma Prieta and 1994 Northridge earthquakes.

Similarly, while there are many failures of walls during foreign earthquakes outside of the United States, almost all are associated with some form of soil-related failure with many in marine or waterfront structures (Whitman, 1991; Huang, 2000; Tokida et al., 2001; Abrahamson et al., 1999). There was significant damage to subway stations in Kobe, Japan in the 1995 Hyogoken-Nambu earthquake (Iida, Hiroto, Yoshida and Iwafuji, 1996); however, there was no reported damage to building basements. The damage to and collapse of the Daikai Subway Station in Kobe appears related to the soil and high ground-water conditions at the site which strongly suggest that soil liquefaction had a significant role in the failure (Lew, Sitar and Al Atik, 2010). Also, Iida et al. reported that the subway station was not designed for racking conditions due to earthquake loading and information presented in the paper indicates that the concrete subway structure did not have sufficient ductility as columns had very minimal lateral ties. There were reports of damage to basements in two recent earthquakes in Turkey. Gur et al. reported that basement damage occurred in a half-buried basement of a school building during 1999 Düzce earthquake; the half-buried basement was surrounded by partial height earth-retaining concrete walls and there were windows between the top of the earth-retaining walls and the beams at the top of the basement. The exterior basement columns failed in shear at the level of the windows; although Gur et al. reported that damage occurred to masonry infill walls in the basement of the building, there was no mention of damage to the earth-retaining concrete walls of the basement. Gur et al. also reported on light damage to lateral basement walls of a building in the 2003 Bingöl, Turkey earthquake; the buildings experienced significant structural damage and collapse above the basement and the maximum horizontal ground accelerations in Bingöl were reported as being 0.55g.

Although not building basement walls, Clough and Fragaszy (1977) reported on a study of floodway channels in the San Fernando Valley that experienced strong ground motions from the February 9, 1971 San Fernando earthquake. They reported that no damage occurred to cantilever channel walls until accelerations of about 0.5g were reached, which was a surprisingly large value of acceleration in view of the fact that the walls were not explicitly designed for seismic loadings.

Observations were also made of a few deep basement walls in Chile after the February 27, 2010 magnitude 8.8 Offshore Maule earthquake. No damage was observed by the first author. Figure 1 shows a portion of the undamaged basement wall of the 55-story Torre Titanium La Portada in Santiago at its lowest subterranean level of -7. There was no observed or reported damage in any of the seven subterranean levels.

Figure 1 Level -7 Basement Wall of Torre Titanium La Portada in Santiago, Chile after February 27, 2010 earthquake

Figure 2 shows the undamaged basement wall of the Echeverria Izquierdo building, also in Santiago, after the

February 27, 2010 earthquake; this building has nine subterranean levels below grade. There was no observed or reported damage to any of the nine subterranean levels.

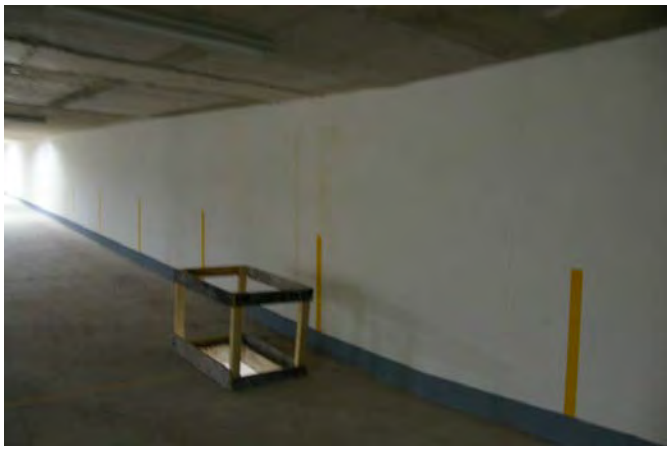

Figure 2 Level -9 Basement Wall of Echeverria Izquierdo Building in Santiago, Chile after February 27, 2010 earthquake

It was reported by Professor G. Rodolfo Saragoni of the University of Chile that there were no observations of damage to basement walls in any major buildings in Chile in the earthquake (Saragoni, 2010).

Building Code Provisions Requiring Design for Seismic Earth Pressures in the United States

The current edition of the International Building Code (IBC, 2009) adopts by reference the seismic requirements of the Minimum Design Loads for Buildings and Other Structures (commonly known as "ASCE 7-05") published by the American Society of Civil Engineers (2006). ASCE 7-05 states that all earth retaining structures assigned to Seismic Design Category D, E or F should determine the lateral earth pressures due to earthquake ground motion in accordance with Section 11.8.3, which simply states that the geotechnical investigation report should include "…the determination of lateral pressures on basement and retaining walls due to earthquake motions."

Despite the lack of compelling evidence that seismic earth pressures are a major concern to deep building basements, how is it that the building code in the United States now requires consideration of seismic earth pressures?

The answer may go back to a Specialty Conference on Lateral Stresses in the Ground and Design of Earth-Retaining Structures held in 1970 containing state-of-the-art papers. One of these papers was the landmark paper on "Design of Earth Retaining Structures for Dynamic Loads" by Seed and Whitman (1970) which brought awareness of seismic earth pressures to the geotechnical community.

The first regulatory document that incorporated the concept of seismic earth pressures was the California Building Code (CBC), which was based on the Uniform Building Code. The CBC had jurisdiction over hospitals and public schools (K-12 and community colleges), as well as state-owned public buildings, but did not apply to other buildings and structures in California. The CBC did have provisions that included the consideration of the seismic increment of active earth pressure. As early as the 1980s, the California amendments to the Uniform Building Code (UBC) had provisions mandating that the seismic increment of active earth pressure should be applied to buildings with walls that retain earth having exterior grades on opposite sides differing by more than 6 feet; this provision is shown below from Section 2312 (e) 1 E of the California amendments to the 1988 UBC:

> *Seismic increment of active earth pressure. Where buildings provide lateral support for walls retaining earth, and the exterior grades on opposite sides of the building differ by more than 6 feet, the load combination of the seismic increment of active earth pressure due to earthquake acting on the higher side, as determined by a civil engineer qualified in soil engineering plus the difference in active earth pressures shall be added to the lateral forces provided in this section.*

The identical language was still present in the 2001 edition of the CBC (California amendments to the 1997 UBC) (California Building Standards Commission, 2002 and International Conference of Building Officials, 1997). In addition, the 2001 edition of the CBC had the following amendment to Section 1611.6 of the 1997 UBC regarding retaining walls:

> *Retaining walls higher than 12 feet (3658 mm), as measured from the top of the foundation, shall be designed to resist the additional earth pressure caused by seismic ground shaking.*

From the context of these two CBC amendments to the UBC, the former amendment clearly refers to building basement walls and the latter amendment refers to free-standing retaining walls as UBC Section 1611.6 describes the features of a retaining wall in some detail.

The California consideration of seismic earth pressures, despite its limited reach, probably had an influence on the

development of national guidelines being developed under the National Earthquake Hazards Reduction Program (NEHRP). The "NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures (FEMA 450)," 2003 Edition, Part 1 – Provisions, also known as the FEMA 450 report (Building Seismic Safety Council, 2004a), was intended to form the framework for future model building codes in the United States. The provisions did not contain any explicit recommended provisions for accounting of seismic earth pressures for design of retaining walls in the recommended provisions. However, Part 2 – Commentary of the FEMA 450 report (Building Seismic Safety Council, 2004b) contains almost four pages of commentary on the consideration of lateral pressures on earth retaining structures. Section 7.5.1 of the commentary states that "In addition to the potential site hazards discussed in *Provisions* Sec. 7.4.1, consideration of lateral pressures on earth retaining structures shall be included in investigations for Seismic Design Categories D, E, and F." The NEHRP provisions were an important resource to the development of ASCE 7-05, which is referenced in the IBC.

State of Practice for Evaluation of Seismic Earth Pressures on Building Basement Walls

As mentioned above, the initial impetus for ultimate inclusion of seismic earth pressures into the present building code provisions probably dates back to the Seed and Whitman (1970) paper which essentially brought to the forefront the concept of designing for loads on walls due to earthquakes. In this paper, they highlighted the so-called Mononobe-Okabe seismic coefficient analysis (Mononobe and Matsuo, 1929 and Okabe, 1926). This method has been the predominant method used by geotechnical engineers to evaluate seismic earth pressures.

The Mononobe-Okabe (M-O) method is based on Mononobe and Matsuo's (1929) experimental studies of a small scale cantilever bulkhead hinged at the base with a dry, medium dense cohesionless granular backfill excited by a one gravity (1g) sinusoidal excitation on a shaking table. The test set up is shown in Figure 3. Note that the walls are hinged at the base and are not allowed to move laterally.

The M-O method assumes that the Coulomb theory of static earth pressures on a retaining wall can be modeled to include the inertial forces due to ground motion (in the form of horizontal and vertical acceleration) in the retained earth as shown in Figure 4.

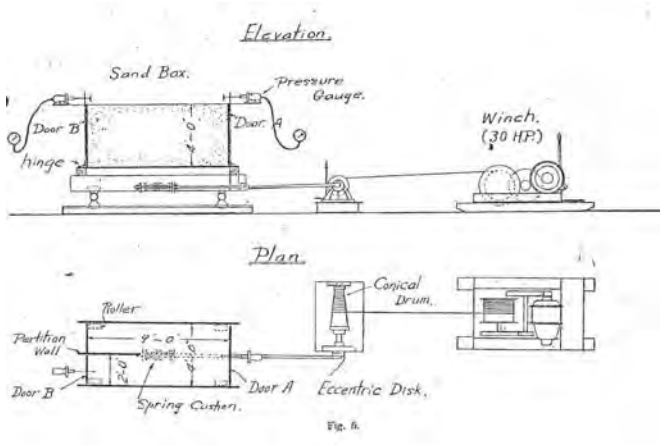

Figure 3 Test Setup for Shake Table Test (After Mononobe and Matsuo, 1929)

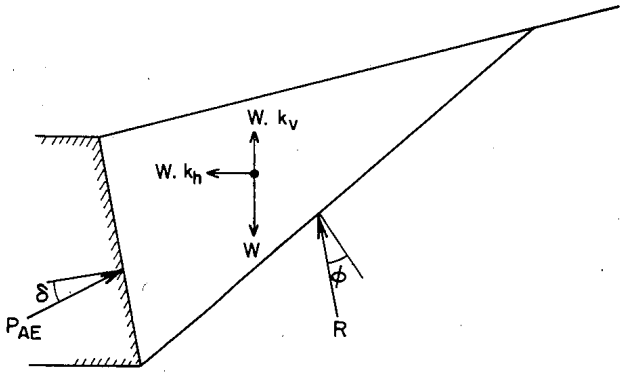

Figure 4 Forces considered in the Mononobe-Okabe Analysis (after Seed and Whitman, 1970)

The M-O method was developed for dry cohesionless materials with the following assumptions:

1. The wall yields sufficiently to produce minimum active pressures.
2. When the minimum active pressure is attained, a soil wedge behind the wall is at a point of incipient failure and the maximum shear strength is mobilized along the potential sliding surface.
3. The soil behind the wall behaves as a rigid body so that accelerations are uniform throughout the mass. The effect of the earthquake motions is represented by inertia forces $W \cdot k_h$ and $W \cdot k_v$, where W is the weight of the wedge of soil and k_h and k_v are the horizontal and vertical components of the earthquake accelerations at the base of the wall.

Thus, the active pressure during the earthquake, P_{AE}, is computed by the Coulomb theory except that the additional forces, $W \cdot k_h$ and $W \cdot k_v$, are included. For the critical sliding surface, the active pressure is expressed in the following equation:

$$P_{AE} = (1/2)\,\gamma H^2\,(1-k_v)\,K_{AE} \qquad (1)$$

where

$$K_{AE} = \frac{\cos^2(\phi-\theta-\beta)}{\cos\theta\,\cos^2\beta\,\cos(\delta+\beta+\theta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\theta-i)}{\cos(\delta+\beta+\theta)\cos(i-\beta)}}\right]^2}$$

$\theta = \tan^{-1}[k_h / (1-k_v)]$

γ = unit weight of soil

H = height of wall

ϕ = angle of internal friction of soil

δ = angle of wall/soil friction

i = slope of ground surface behind wall

β = slope of back of wall with respect to vertical

k_h = horizontal ground acceleration/g

k_v = vertical ground acceleration/g

Seed and Whitman state that Mononobe and Okabe apparently considered that the total pressure computed by their analytical approach would act on the wall as the same location as the initial static pressure; i.e., the resultant would act at a height of H/3 above the base.

Seed and Whitman also state in their state-of-the-art paper that for most earthquakes, "…the horizontal acceleration components are considerably greater than the vertical acceleration components…" Thus they concluded that k_v could be neglected for practical purposes. For practical purposes, Seed and Whitman proposed to separate the total maximum earth pressure into two components – the initial static pressure on the wall and the dynamic pressure increment due to the base motion. The total dynamic earth pressure coefficient, K_{AE}, could be written as:

$$K_{AE} = K_A + \Delta K_{AE} \qquad (2)$$

and the dynamic lateral force component would be:

$$\Delta P_{AE} = (1/2)\,\gamma H^2\,\Delta K_{AE} \qquad (3)$$

Seed and Whitman gave an approximation for ΔK_{AE} as:

$$\Delta K_{AE} \sim (3/4)\,k_h \qquad (4)$$

Then the simplified dynamic lateral force component on yielding walls is given by:

$$\Delta P_{AE} \sim (1/2)\,(3/4)\,k_h\,\gamma H^2 = (3/8)\,k_h\,\gamma H^2 \qquad (5)$$

where k_h is the "horizontal ground acceleration divided by gravitational acceleration." This simplified equation is also presented in the FEMA 450 report commentary (BSSC, 2004b). It is recommended that k_h be taken as equal to the site acceleration that is consistent with the design ground motions as defined in the provisions of FEMA 450 (i.e., $k_h = S_{DS}/2.5$); where S_{DS} is the design, 5-percent-damped, spectral response acceleration parameter at short periods (i.e., period of 0.2 seconds). Seed and Whitman recommended that the resultant dynamic thrust be applied at 0.6H above the base of the wall (i.e., similar to an inverted triangular pressure distribution).

In contrast to the M-O method which is a limit-equilibrium force approach, other methods of analysis based on tolerable displacements are also available. These methodologies, however, are not as widely used. For nonyielding walls, Whitman (1991) recommended the approach of Wood (1973) who analyzed the response of a rigid nonyielding wall retaining a homogeneous linear elastic soil and connected to a rigid base. Whitman recommended that the point of application of the dynamic thrust also be taken at a height of 0.6H above the base of the wall with the dynamic thrust on a nonyielding wall, ΔP_E, taken as:

$$\Delta P_E = k_h\,\gamma H^2 \qquad (6)$$

The present state-of-practice for evaluation of seismic earth pressures on building basement walls by geotechnical engineers in the United States is generally to rely upon an analysis based on the Mononobe-Okabe (M-O) method of analysis regardless of whether the wall is considered yielding or nonyielding. It could be argued that deep building basement walls are constructed in open excavations that generally are shored which cause the retained soils to be in a yielded (active) condition already. The reasons for using the M-O method appear to be the simplicity of the method requiring only knowledge of the wall and backfill geometry,

the soil's angle of internal friction, and the horizontal and vertical ground acceleration.

Is the Mononobe-Okabe Method Applicable to Building Basement Walls?

Although the Mononobe-Okabe method appears simple to use, the validity of the method for evaluation of seismic earth pressures has been questioned by some. Also, the M-O method contains some limiting assumptions and there are questions about the proper input into the method.

The original tests that formed the basis for the M-O method were conducted on a sand filled box shaking table with hinged doors (which were the "walls") as shown in Figure 3. One of the basic questions that arise is: Do the conditions in the M-O test properly model a real building basement wall?

The configuration of the "walls" in the Mononobe and Matsuo (1929) test apparatus do not model the building basement wall condition properly. Listed below are some of the physical incongruities:

1. The walls in the Mononobe and Matsuo test are hinged at the bottom of the wall, thus allowing only for rotation and not for horizontal movement.
2. The walls in the Mononobe and Matsuo test have a free edge at the top, not a fixed or a pinned edge as is the case in the intermediate or top levels of a building basement wall.
3. The physical scaling of the test wall may not be applicable to a full size basement wall.

Ostadan and White (1998) have stated that "…the M-O method is one of the most abused methods in the geotechnical practice." Ostadan and White listed some reasons why they believe the M-O method is abused:

1. The walls of buildings are often of the non-yielding type. Wall movement may be limited due to the presence of floor diaphragms and displacements to allow limit-state conditions are unlikely to develop during the design earthquake.
2. The frequency content of the design ground motion is not fully considered since a single parameter (peak ground acceleration) may misrepresent the energy content of the motion at frequencies important for soil amplifications.
3. Appropriate soil properties are not considered as they are for soil dynamic problems, the most important property is the shear wave velocity, followed by the material damping, Poisson's ratio, and then the density of the soil.
4. Soil nonlinearity effects are not considered.
5. Soil-structure interaction (SSI) is not considered, such as building rocking motion, amplification and variation of the motion in the soil, geometry, and embedment depth of the building.

Despite the differences between the model cantilevered wall and actual building basement walls, the Mononobe-Okabe method continues to be used in practice and its use is actually encouraged by documents such as FEMA 450.

Areas of Confusion in Using the Mononobe-Okabe Method

A major area of confusion to geotechnical consultants is what to specify as the ground acceleration in the M-O method. Whitman (1991) had recommended that except where structures were founded at a sharp interface between soil and rock, the M-O method should be used with the actual expected peak acceleration. In keeping with this view, the seismic coefficient, k_h, is being recommended in future NEHRP documents to be equal to the site peak ground acceleration that is consistent with the design earthquake ground motions. In high seismic regions, such as California, these peak ground motions could easily exceed 0.5g. However, Kramer (1996) refers to the M-O method as a "pseudostatic procedure" and these accelerations as "pseudostatic accelerations." Arulmoli (2001) comments on the use of the M-O method and states that it has limitations, including the observation that the M-O method "blows up" for cases of large ground acceleration. In practice, many geotechnical engineers have been using a seismic coefficient that is less than the expected peak ground acceleration for the design of building basement walls and other walls. The reasons for the reduced value of the seismic coefficient compared to the peak ground acceleration are due to the following considerations:

1. The M-O method is a pseudo-static method of analysis, similar to many traditional slope stability methods that use a pseudo-static coefficient to represent earthquake loading.
2. There should be an intuitive reduction based upon the use of an effective ground acceleration rather than an isolated peak ground acceleration (to take into effect the "repeatable" ground motion).
3. There should be a reduction to account for the averaging of the lateral forces on the retaining wall over the height of the wall (because of the potentially out-of-phase nature of the ground movement as shear waves propagate vertically through the backfill soil; this effect increases with increasing height of the wall and reduced stiffness of the retained soils).

The justification for many geotechnical engineers for the use of a reduced seismic coefficient comes from a Federal Highway Administration (FHWA) design guidance document

for design of highway structures (Kavazanjian, Matasović, Hadj-Hamou, and Sabatini, 1997). In this document, it is stated that "…for critical structures with rigid walls that cannot accommodate any deformation and partially restrained abutments and walls restrained against lateral movements by batter piles, use of the peak ground acceleration divided by the acceleration of gravity as the seismic coefficient may be warranted." The document goes on to further state that "…however, for retaining walls wherein limited amounts of seismic deformation are acceptable…, use of a seismic coefficient between one-half to two-thirds of the peak horizontal ground acceleration divided by gravity would appear to provide a wall design that will limit deformations in the design earthquake to small values." Thus many geotechnical engineers have been using a seismic coefficient of one-half of the horizontal peak ground acceleration.

Another area of confusion for geotechnical engineers is how to account for cohesion in the backfill or retained earth behind the building basement wall. The assumption in the M-O method is that the backfill material is a medium dense cohesionless soil. However, it is commonplace to have backfill material or retained earth that has some cohesion and the M-O method simply does not account for any cohesion at all following Coulomb's assumptions. All geotechnical engineers know that cohesion in the soil can reduce the static lateral earth pressures and that some excavations can stand vertically without support if there is sufficient cohesion in the soil. It seems logical that since soil cohesion reduces the active lateral earth pressure, it would also reduce the lateral seismic pressures. A very recent National Cooperative Highway Research Program (NCHRP) report (Anderson, Martin, Lam and Wang, 2008) provides guidance for use of the M-O method for soils with cohesion. Anderson et al. state that most natural cohesionless soils have some fines content that often contributes to cohesion, particularly for short-term loading conditions. Similarly, cohesionless backfills (for highway structures) are rarely fully saturated, and partial saturation would provide for some apparent cohesion, even for clean sands.

Figures 5 through 8 present active earth pressure coefficient charts for four different soil friction angles with different values of cohesion for horizontal backfill, assuming no tension cracks and wall adhesion. These charts show that a small amount of cohesion would have a significant effect in reducing the dynamic active earth pressure for design. Figures 5 and 6 were provided by Dr. Geoffrey R. Martin (2010) and Figures 7 and 8 are found in Anderson et al. (2008).

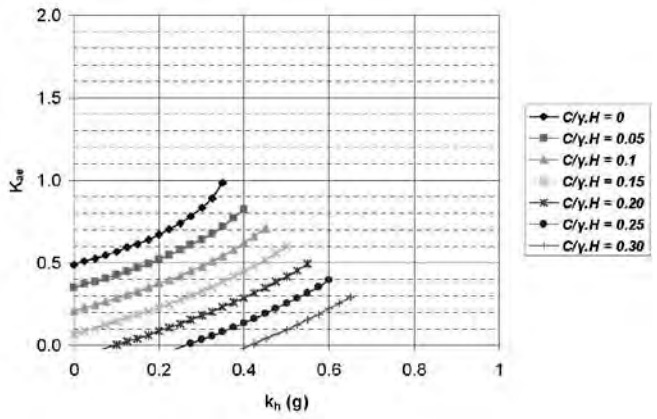

Figure 5 Seismic coefficient chart for c-ϕ soils for angle of internal friction of 20 degrees (Courtesy of Dr. Geoffrey R. Martin)

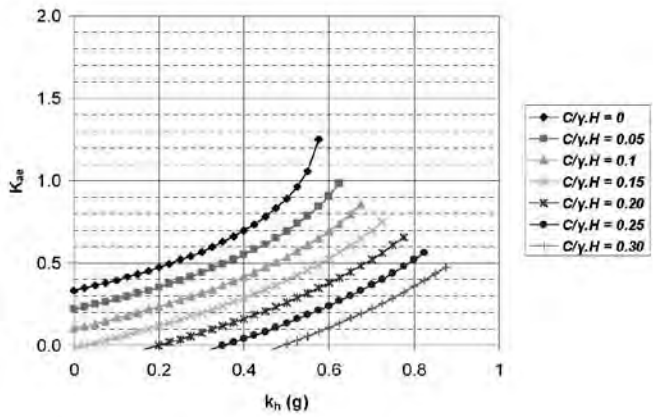

Figure 6 Seismic coefficient chart for c-ϕ soils for angle of internal friction of 30 degrees (Courtesy of Dr. Geoffrey R. Martin)

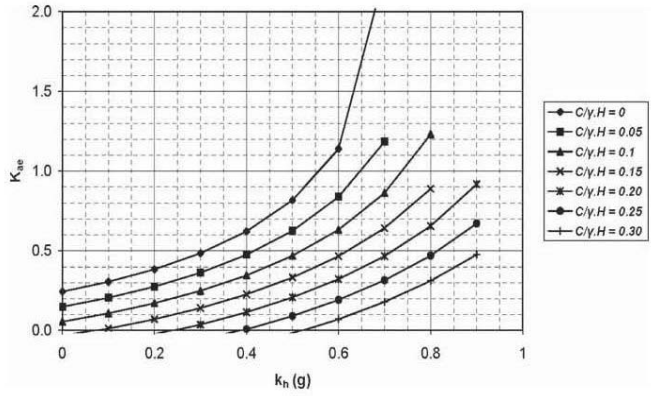

Figure 7 Seismic coefficient chart for c-ϕ soils for angle of internal friction of 35 degrees (after Anderson et al., 2008).

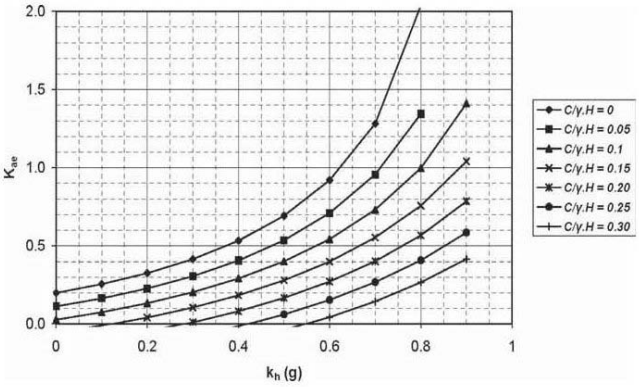

Figure 8 Seismic coefficient chart for c-ϕ soils for angle of internal friction of 40 degrees (after Anderson et al., 2008).

Validity of the Mononobe-Okabe Method

The Mononobe-Okabe method is based on the response of a small scale cantilever bulkhead that is hinged at the bottom which retained a dry, medium dense cohesionless backfill, and was excited by a one gravity (1g) sinusoidal input on a shaking table that was 4 feet high, 4 feet wide, and 9 feet long, as shown in Figure 3. It is natural to ask the following questions: Can the M-O method be applied to large building basement walls that may be an order of magnitude larger (or greater) in height? Were the conclusions in developing the M-O method based on observations that can be extrapolated to larger structures? Was the backfill material the suitable material to use in the test? Questions can be raised regarding the validity using the M-O method for basement walls.

Concerned about proper scaling of results in smaller model tests, researchers have turned to centrifuge testing which can simulate correct boundary and load conditions on large prototype structures. Centrifuge testing allows for creating a stress field in a model that simulates prototype conditions in that proper scaling will provide correct strength and stiffness in granular soils. The granular soils, when having a scale model with dimensions of 1/N of the prototype and a gravitational acceleration during spinning of the centrifuge at N times the acceleration of gravity, will have the same strength, stiffness, stress and strain of the prototype (Kutter, 1995).

An early centrifuge test of a cantilever retaining wall subjected to a model acceleration history similar to the characteristics of real earthquake ground shaking was conducted by Ortiz, Scott and Lee (1983) to verify the M-O theory. An important conclusion was that "it is difficult or impossible to achieve in a (one-g) shaking table a pressure distribution which can be related quantitatively to that of the full-scale situation." Ortiz et al. also use dimensional analysis to show that "true representation of the dynamic prototype behavior cannot be attained in a (one-g) shaking table experiment, utilizing a reduced scale model and same soil as the prototype." An important finding of Ortiz et al. was that "…under dynamic loading, the resultant acts very near to the where the static one acted." They also concluded that "…the earth pressure distributions are not linear with distance down the wall although a linear earth pressure distribution seems to be a reasonable "average" for the actual."

In Japan, Nakamura (2006) also sought to reexamine the M-O theory by centrifuge testing. An important finding by Nakamura was that the earth pressure distribution on the model gravity retaining wall is not triangular (as assumed by M-O), and that its size and shape will change with time. Nakamura also found that the earth pressure distribution for an input motion that was based on actual earthquake ground shaking was different from the distribution for sinusoidal shaking. The earth pressure in the bottom part of the wall, which greatly contributes to the total earth pressure, is not as great in earthquake loading as it is for sinusoidal loading. Nakamura stated that the earth pressure increment is around zero when considering earthquake-type motions, with the earth pressure nearly equal to the initial value prior to shaking when the inertia force is maximum. Nakamura's tests show that the earth pressure distributions at the time of maximum moment in the gravity wall generally increases with depth.

Another centrifuge study was conducted by Al Atik and Sitar (2007) on model cantilever walls with medium dense dry sand backfill. Al Atik and Sitar found that the maximum dynamic earth pressures increase with depth and can be reasonably approximated by a triangular distribution analogous to that used to represent static earth pressure. They also found that the seismic earth pressures can be neglected at accelerations below 0.4g and stated that the data suggest that even higher seismic loads could be resisted by cantilever walls designed to an adequate factor of safety. As the tests were conducted with medium sand backfill, they state that a severe loading condition may not occur in denser granular materials or materials with some degree of cohesion. Al Atik and Sitar also found that the maximum moment in the wall and the maximum earth pressure were out of phase and did not occur at the same time. Based on their research, Al Atik and Sitar (2009, 2010) developed relationships for the "Dynamic Increment in Earth Pressure Coefficient, ΔK_{ae}," as defined by Seed and Whitman (1970) computed from the dynamic earth pressures at the time that maximum wall moments based on strain gauge data occur as shown in Figure 9. This research illustrates that the seismic earth pressures in the M-O method are very conservative if the actual peak ground acceleration is used.

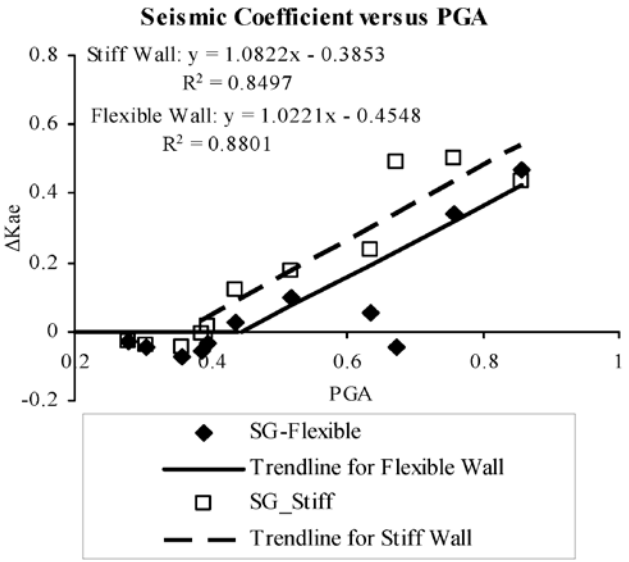

Figure 9 Dynamic Increment in Earth Pressure Coefficient, ΔK_{ae}, computed at maximum dynamic wall moments based on strain gauge data (after Al Atik and Sitar, 2009)

One issue that needs to be addressed is the moment of inertia of the wall which can contribute to dynamic wall moments. This should not be a concern for building basement walls as they generally are very constrained by floor systems and interior walls that prevent much movement of the walls that would contribute to inertial forces. However, this should be a concern for free standing walls and should be accounted for in the design.

Thus the validity of the Mononobe-Okabe method is severely questioned by the results of these various centrifuge studies. These studies also strongly suggest that the seismic earth pressures predicted by the M-O method can be very conservative. Also the location of the resultant of the static and seismic earth pressures is closer to the one-third height from the base of the wall and not in the upper wall as recommended by many researchers.

Provisional Recommendations for Design of Building Basement Walls

Although there is evidence that seismic earth pressures may not actually develop as predicted by the M-O method, it may be premature to recommend that seismic earth pressures be neglected in design altogether. It would be prudent to wait upon further research that may be conducted to confirm the observations and conclusions that have been made by recent researchers. In the interim, presented below are provisional recommendations for the evaluation of seismic earth pressures for building basement walls.

It should be noted that the current International Building Code requires that basement walls be designed for at-rest earth pressures for static conditions. The M-O method on the other hand is based on computing active lateral earth pressures in combination with the seismic lateral earth pressure. Thus, the seismic increment of lateral earth pressure computed by the M-O method is intended to be the increased earth pressure above the active lateral earth pressure and not the at-rest pressure. As such, any computed seismic increment of lateral earth pressure should not be added to the static (at-rest) lateral earth pressures. For seismic conditions, the M-O method may be used to evaluate the seismic earth pressures; however, the combination should be made with the active pressures. These pressures should be treated as a separate condition for earthquake loading whereas the at-rest earth pressures are strictly for static loading only. Recent research suggests that the earth pressure distribution under seismic loading is very similar to a fluid distribution (i.e., triangular distribution), like static earth pressure.

Presented below are general provisional recommendations for building basement walls founded in non-saturated conditions with level ground or retained earth conditions:

- If the depth of the basement wall is less than 12 feet, the evaluation of seismic earth pressures is not necessary provided the walls are designed for a static factor of safety of at least 1.5. As described in the following section, this static factor of safety is satisfied when a load factor of 1.6 is used in loading combination for lateral earth pressures as is currently prescribed by the code.
- The seismic increment of earth pressure may be neglected if the maximum ground acceleration is 0.4g or less.
- If a seismic increment of earth pressure is determined separately by the M-O method, it should be added to the active earth pressure and not to the at-rest static earth pressure.
- If the backfill or retained earth materials are cohesive (including cemented soils and stiff clays), the NCHRP design charts (shown in Figures 5 to 8) may be used to determine the seismic coefficient, K_{AE}, in the M-O method. The horizontal ground acceleration, k_h, may be taken as one-half of the PGA, where PGA is the maximum ground acceleration in gravity.
- If the backfill or retained earth materials are cohesionless, the "Dynamic Increment in Earth Pressure Coefficient," ΔK_{AE}, may be determined directly from the Figure 9 for use in Equation (3). As an alternative, the horizontal ground acceleration may be conservatively estimated from Table 1.

- The location of the resultant of the active and seismic earth pressures may be taken at the one-third point from the base of the wall.

Table 1 Horizontal Ground Acceleration for Cohesionless Backfill or Retained Earth (1)

Peak Ground Acceleration (g)	Recommended k_h
< 0.4	**0**
0.4	**0.25 PGA**
0.6	**0.5 PGA**
1.0	**0.67 PGA**

(1) For other levels of peak ground acceleration, interpolation of the tabulated values may be used.

Comments on Factored Loads Using Strength Design or Load and Resistance Factor Design

The International Building Code prescribes basic load combinations for structures, components and foundations with the intention that their design strength equals or exceeds the effects of the factored loads. With respect to the load from lateral earth pressure and ground water pressure, the IBC prescribes the basic combinations shown in equations (7) and (8) below. Equation (9) indicates the IBC loading combination including earthquake and live load components:

$$1.2(D + F + T) + 1.6(L + H) + 0.5(L_r \text{ or } S \text{ or } R) \quad \text{[IBC Eq. 16-2]} \quad (7)$$

$$0.9D + 1.0E + 1.6H \quad \text{[IBC Eq. 16-7]} \quad (8)$$

$$1.2D + 1.0E + f_1 L + f_2 S \quad \text{[IBC Eq. 16-5]} \quad (9)$$

where

D = dead load
E = earthquake load
F = load due to fluids with well-defined pressures and maximum heights
f_1 = 1 for floors in public assemblies, live loads exceeding 100 psf and garage live load and
= 0.7 for other live loads
f_2 = 0.7 for roof configurations that do not shed snow and,
= 0.2 for other roof configurations
H = load due to lateral earth pressure, ground water pressure, or pressure of bulk materials
L = live load
L_r = roof live load
R = rain load
S = snow load
T = self-straining force arising from contraction or expansion resulting from temperature change, shrinkage, moisture change, creep in component materials, movement due to differential settlement or combinations thereof
W = wind load

From equation (7) it is evident that H, when due to lateral earth pressure, is treated in the same manner as the live load with a load factor of 1.6 for static loading conditions. The intent is to use a static lateral earth pressure in this equation which for most building basement walls will be the at-rest earth pressure. Therefore, from a static design perspective, the building basement walls have a factor of safety of at least 1.6 on the at-rest earth pressure. This satisfies the recommendation made in the previous section with regards to a minimum safety factor of 1.5.

Eq. (8) gives the load combination for seismic loading and lateral soil pressure while Equation (9) depicts the load combination including seismic and live loads. In comparing Eqs. (7) and (9) it is evident that a reduced live load factor (0.5 for typical range of live load and 1.0 for large live loads) is considered when live load combination with seismic loading is considered. The reason for this is the transitory nature of the seismic loading and the low likelihood of the two load maxima occurring simultaneously. A similar type of approach is warranted for load combinations including both the static soil pressures and the seismic increment of the soil.

If the Mononobe-Okabe analysis is used to determine the lateral seismic earth pressure, the lateral earth pressure should consist of the static active earth pressure and the seismic increment of earth pressure as discussed in the previous section. Presumably, the load factor of 1.6 in Eq. (8) would be applicable to the total earth pressure in this case. However, as noted above, a reduced load factor would be appropriate when considering the transitory nature of the seismic component and the low likelihood of the load maxima occurring simultaneously. Accordingly a lower load factor of 1.0 is proposed to be applied to the seismic increment component of earth pressure while the 1.6 load factor is applied to the static active pressure component. To facilitate such loading combination the geotechnical engineers would have to separate earth pressure components attributable to the active earth pressure condition and the seismic increment of earth pressure when using the M-O method.

Conclusions and Summary

When considering the load conditions given in IBC, it appears that building basement walls analyzed and designed using at rest pressures in accordance with the load combination in Eq. (7) may be adequate for seismic earth pressure loading without further analysis. The reason is the different types of earth pressures that must be considered for static versus seismic conditions. As noted above for the seismic load condition represented by Eq. (8), the active earth pressure combined with the seismic increment of earth pressure needs to be considered. Active earth pressures are typically much smaller than at-rest pressures which are commonly on the order of 1.6 to 2.0 times more. Thus as basement walls are conservatively designed for at-rest static pressures using loading combination in Eq. (7) it is very likely that the loading combination in Eq. (8) which is based on active pressures will be automatically satisfied unless the seismic increment of earth pressure is unusually large. With recent research (reported above) indicating that the seismic earth pressures are not as great as indicated by current practice, it would appear that building basement walls retaining level unsaturated earth materials may be considered adequate when just designed for at-rest earth pressures as stipulated in the IBC. Consequently, the current requirement in the seismic provisions to consider seismic earth pressures for such walls may be unnecessary. In retaining walls designed with active pressures, the addition of the seismic increment of soil using loading combination Eq. (8) should still be a consideration and will likely dictate the design of the wall, However, when applying Eq. (8) in this condition, it is recommended that a reduced load factor of 1.0 be used for the seismic increment component of soil in combination with a 1.6 load factor applied to the active pressure component These load factors will more appropriately represent the transitory nature of seismic loading and the low likelihood of load maxima occurring at the same time. To facilitate such loading combinations, the geotechnical engineers would have to separate earth pressure components attributable to the active earth pressure condition and the seismic increment of earth pressure when using the Mononobe-Okabe method.

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Attachment 3

Soils and Geological Report Acceptance Letter

County of Santa Cruz

Department of Community Development and Infrastructure

701 Ocean Street, Fourth Floor, Santa Cruz, CA 95060
Planning (831) 454-2580 Public Works (831) 454-2160
sccoplanning.com dpw.co.santa-cruz.ca.us

7 March 2023

Aaftab and Karen Munshi
17300 Laurel Road
Los Gatos, CA 95033

Subject: Review of Geotechnical Investigation, 12 Stones Winery, 17300 Laurel Road, Santa Cruz County, California, APN 095-101-22 dated 12 September 2022 by Cotton, Shires, and Associates, Inc.; and the

Review of Geologic Hazards Investigation, 12 Stones Winery, 17300 Laurel Road, Santa Cruz County, California, APN 095-101-22 dated March 2022, Revision of 12 September 2022, by Cotton, Shires and Associates, Inc.

Project Site: 17300 Laurel Road
APN 095-101-22
Application No. REV221270

Dear Applicants:

The purpose of this letter is to inform you that the Planning Department has accepted the subject reports and the following items shall be required:

1. All project design and construction shall comply with the recommendations of the reports.

2. Final plans shall reference the reports by titles, authors, and dates. Final Plans should also include a statement that the project shall conform to the reports' recommendations.

3. After plans are prepared that are acceptable to all reviewing agencies, please submit a completed Soils (Geotechnical) Engineer Plan Review Form and a completed Geologist Plan Review Form to Environmental Planning. The authors of the soils and geology reports shall sign and stamp their respective completed forms. Please note that the plan review forms must reference the final plan set by last revision date.

Any updates to report recommendations necessary to address conflicts between the reports and plans must be provided via a separate addendum to the soils report and/or geology report.

Electronic copies of all forms required to be completed by the Geotechnical Engineer may be found on our website: www.sccoplanning.com, under "Environmental", "Geology & Soils", and "Assistance & Forms".

After building permit issuance the soils engineer and engineering geologist *must remain involved with the project* during construction. Please review the Notice to Permits Holders (attached).

Our acceptance of the reports is limited to its technical content. Other project issues such as zoning, fire safety, septic or sewer approval, etc. may require resolution by other agencies.

Please note that this determination may be appealed within 14 calendar days of the date of service. Additional information regarding the appeals process may be found online at: http://www.sccoplanning.com/html/devrev/plnappeal_bldg.htm

Please contact Rick Parks at (831) 454-3168/email: Rick.Parks@santacruzcounty.us or Jeff Nolan at (831) 454-3175/Jeffrey.Nolan@santacruzcounty.us if we can be of any further assistance.

Sincerely,

Rick Parks, GE 2603
Civil Engineer – Environmental Planning
County of Santa Cruz Planning Department

Jeffrey Nolan, CEG 2247
County Geologist– Environmental Planning
County of Santa Cruz Planning Department

Cc: Cotton, Shires and Associates, Inc. Attn: John Wallace
Planning Dept., Attn: Jessica deGrassi

Attachments: Notice to Permit Holders

NOTICE TO PERMIT HOLDERS WHEN SOILS AND GEOLOGY REPORTS HAVE BEEN PREPARED, REVIEWED AND ACCEPTED FOR THE PROJECT

After issuance of the building permit, the County requires your soils engineer and engineering geologist to be involved during construction.

1. **At the completion of construction,** a *Soils (Geotechnical) Engineer Final Inspection Form* and a *Geologist Final Inspection Form* are required to be submitted to Environmental Planning that includes copies of all observations made during construction and is stamped and signed, certifying that the project was constructed in conformance with the recommendations of the soils and geology reports.

   If the *Final Inspection Form* identifies any portions of the project that were not observed by the soils engineer and/or geologist, you may be required to perform destructive testing in order for your permit to obtain a final inspection. The soils engineer and/or geologist then must complete and initial an *Exceptions Addendum Form* that certifies that the features not observed will not pose a life safety risk to occupants.

Attachment 4

Twelve Stones Winery Operational/Programmatic Statement

Karen and Affie Munshi

13700 Laurel Road,
Los Gatos, CA 95033

March 24th, 2023

County of Santa Cruz Planning Department
701 Ocean Street, 4th Floor
Santa Cruz, CA 95060

DISCRETIONARY USE PERMIT TYPE 3

OPERATIONAL CHARACTERISTICS
Twelve Stones Winery,
17300 Laurel Road, Los Gatos CA 95033

Project Introduction and objective

Twelve Stones Winery is conceived as a low-volume (7,200 gallon, 3,000 cases), artisanal, family-owned winery in keeping with the property's tradition of dry farming the vines. The size and location of the winery and the tasting area, with minimal above ground presence at the top of the existing driveway, are designed to minimize interference with the residential activities, and are consistent with the intent of the Type 3 Use Permit requirements: access will be limited and pre-arranged, and the tasting will be by appointment only, with a maximum of 12 persons at any one time.

Current operations

Although Twelve Stones Winery has been in existence since 2014, the owners currently grow their grapes on the property and produce their wine off site. They would like to be able to have their processing capabilities on the property to be more involved in the process of wine-making. No visitors are allowed on the property at the moment, and the owners are planning on being able to share their beautiful property with their customers.

Number of employees

The small size of the winery will require two part-time employees in the winery during normal working hours of work. That number may increase by one person during special times such as harvest or bottling, which only occur once a year each.

The tasting room will be operated by the owners, Karen and Affie Munshi with one additional employee that may be part-time.

Proposed operations and management

The day-to-day operation of the winery and the tasting room will be managed by the owners, Karen and Affie Munshi, with some support from part -time wine makers, Greg and Chris Vita.

As the managers of the winery and the tasting room they will schedule all operations of the winery in a manner aimed at lowering negative impact on the road and the neighbors, as well as potential noise disturbances along the property gate. This will be done by ensuring there is always only one truck coming in and out of the driveway at a time, and scheduling those trips at off-peak employee access hours. Because of the small volumes of production, and the primarily residential nature of the property, the expectation is that any trucks accessing the property will be small in size, and therefore less noisy. Deliveries will be scheduled in the same manner, and they are not expected to be more than two per month.

The tasting visits will be scheduled to work around the winery traffic requirements, with fewer or no visits planned during times of more intense winery traffic (such as harvest and bottling times), which will minimize congestion on the driveway.

The intended hours of operation for the winery may vary with the seasons and the required activities of the production process. They will be from 8:00 am to 3:00 pm, Monday to Friday. Employee arrival and departure times will happen approximately in the first and last half hour of the operating times.

The tasting area will operate Monday through Sunday, and tastings will be offered to the public from 11:00 am to 6:00 pm. The peak tasting hours are expected to be 11:00 am to 6:00 pm Thursday through Sunday. Tasting hours will be limited during harvest and bottling times, to prevent traffic conflicts and congestion at the gate.

Guests will be given the option to do a guided winery tour, which will be scheduled when no activity is happening at the winery.

Special events

A Type 3 Use Permit does not allow special events, and they are not part of the operations plan; the prep kitchen in the tasting area is not intended to be a fully equipped kitchen to cook meals, only to provide small, cold plates for guests to pair with the wine.

Parking

The parking for employees and guests is proposed to be separate, with guests being required to park at the tasting area location, directly across from the building; and employees being able to park near the existing storage building, which has direct access to the winery level. In both instances, the objective is to be close to the area of activity and removed enough from the residence to not cause disturbances.

The number of parking spaces provided for the winery will be four, to account for two part-time employees and one employee in the tasting area, and one additional staff at times of higher needs. The residential guest parking area could be used as overflow parking in the unlikely event of higher needs.

The number of parking spaces proposed for the tasting room will be four; three will be standard size, and one will be an ADA van parking space. This is calculated as an average of three persons per car, to account for the maximum allowed number of visitors of 12 at any given time. Some overflow space is provided on the side of the road.

One ADA van parking space is proposed at the winery level for guest access, when winery tours are scheduled. Other guests will be driven down.

Tastings will be by appointment only and booked in advance. This will allow the owners to know the number of cars expected at each tasting slot, and the number of people in each car, and they will cap the visitors for each tasting slot once the available parking spaces have been filled, even if the number of visitors is lower than their maximum allowed. At times of greater demand, such as the summer months, the owners may require visitors to carpool, to keep the number of cars to the available parking spaces; the location to meet for carpool parties will be determined at the time of booking.

In addition, the tastings will be scheduled with a 30-minute interval between groups to account for delays, and to minimize congestion at the gate and the driveway. Arrival times for tastings will not be scheduled between 3:00-3:30 pm, so as to not coincide with winery employee’s departing time.

Because the tastings will be scheduled in advance, and no events are allowed for Type 3 Use Permits, there is no anticipated need for overflow parking, however certain areas have been identified on the plans, adjacent to the proposed parking areas, as noted above, which could serve this function, should the need arise.

Noise

Other than the expected noise from delivery vans and bottling or fruit trucks, additional sources of potential noise will be the emergency generator, the PG&E transformer, and the glycol chillers for the wine aging and fermentation, none of which operate continuously. Most of this equipment will be located at the winery level, which is several feet below the tasting and the residence elevations, and surrounded by a retaining wall and existing foliage, that will block the sound from travelling to other areas. This mechanical equipment area is located 192 feet from Laurel Road, a little over 50 feet below it, and approximately 900 feet from the nearest neighbor to the south.

Use/storage/disposal of hazardous materials

No hazardous materials are expected to be used either at the winery or the tasting area.

Trash collection is expected to be weekly, following the current pick-up pattern. The owners and winery staff will bring all required receptacles to the outside of the property gate, as it is currently done for the residential trash.

Restrooms

There is one proposed ADA-compliant restroom for employees and guests at the tasting area, and one outside of the winery.

Lighting and signage

The proposed lighting will meet code requirements to conduct activities safely and all light fixtures will be compliant with dark-skies requirements.

No permanent sign is proposed at the gate to be in compliance with the requirements of a Type 3 Use Permit. Non-illuminated signage is proposed at the guest and employee parking areas and at the top of the winery driveway, in addition to road markings for directionality and turnaround locations.

Sincerely,

Karen Munshi

Twelve Stones Winery

Attachment 5

Drainage Plans and Calculations

SHERWOOD
DESIGN ENGINEERS

625 2ND STREET SUITE 202, PETALUMA, CA 94952
(415) 677-7300 | WWW.SHERWOODENGINEERS.COM

Stormwater Management Plan

for

Twelve Stones Winery

17300 Laurel Road
Los Gatos, CA 95033

Sherwood Design Engineers
Project No. 21-294

Date: August 2023 Revised

625 2ND STREET SUITE 202, PETALUMA, CA 94952
(415) 677-7300 | WWW.SHERWOODENGINEERS.COM

List of Contents

List of Appendices

625 2ND STREET SUITE 202, PETALUMA, CA 94952
(415) 677-7300 | WWW.SHERWOODENGINEERS.COM

1.0 PROJECT DESCRIPTION

The proposed development is located at 17300 Laurel Road in Santa Cruz County, CA. The project proposes the development of an underground wine cave, a covered crush pad, and a tasting room building. Additional onsite improvements include parking areas, access driveway to the wine cave, a water storage tank, and onsite septic systems. As part of the improvements, the drainage system will be designed and installed per Santa Cruz County standards. The proposed development is classified as large, that proposes new impervious areas over 5,000 square feet. The *Stormwater Management Division Project Information & Threshold Determination Form (Appendix A)* is included with this report in Appendix A for project reference. Table 1 summarizes the post development conditions for the project.

Table 1 Proposed Project Areas (*P*ost-*D*evelopment)

Development Drainage Area Summary Table

Description	Area (sqft)	Area (AC)
Impervious Area	8,660	0.20
Permeable Area	2,045	0.05
Total	10,858	0.25

1.1 Existing Site Conditions & Drainage

The subject parcel spans approximately 20-acres and is located 0.4 miles east of the intersection between California State Highway 17 and Laurel Road. The property varies in slope and the proposed project is proposed on slopes that are less than 20% in longitudinal slopes. The existing project site includes an asphaltic concrete (AC) driveway that extends southeastward from Laurel Road and leads down to an existing barn, main residence, and two accessory structures. A vineyard is located along the south-westerly side of the parcel.

Drainage across the site is primarily defined as sheet flow with the highpoint being off Laurel Road that flows across the subject parcel. The existing watershed is small and doesn't include run-on from neighboring parcels. The existing drainage pattern is being maintained throughout the project. The post construction drainage modifications are consistent with the existing drainage flow paths and outfall locations.

1.2 Proposed Site Conditions & Drainage

The proposed wine cave and tasting room are proposed adjacent to the existing driveway between the entrance to the property and the existing residence. The tasting room will be located above ground and the wine cave will be located underneath the tasting room with an access driveway that connects the cave portals to the existing driveway. The existing drainage pattern will be preserved on the site and include swales to capture runoff on to the site as well as drainage inlets and storm drains to capture runoff from new impervious areas. Collected stormwater will be directed to outfall locations and level spreaders (LSP) onto vegetated areas.

A couple site visits have been conducted by Sherwood Design Engineers (SDE) to assess existing site conditions and the proposed drainage design conditions. The Geotechnical Engineer for the project has reviewed the drainage design and provided recommendations on outfall locations. A letter of drainage review provided by the Geotechnical Engineer is included in Appendix F.

625 2ND STREET SUITE 202, PETALUMA, CA 94952
(415) 677-7300 | WWW.SHERWOODENGINEERS.COM

2.0 DESIGN STORM EVENT CRITERIA

The proposed drainage system is sized per the Santa Cruz County Public Works Department Design Criteria (the Design Criteria) Quantification demonstrating that mitigations have been designed to maintain the pre-development discharge rates for a 10-year, 15-minute storm event and treat runoff from a 2-year, 2-hour storm event. The developed areas are divided into two drainage management areas (DMA) that are shown Civil Improvement Plans submitted with the Building Permit Application and included in Appendix B. The stormdrain system design is included on the Utility Plan. The DMA's are the same for both existing (pre-development) and proposed (post-development) design conditions. The sub watersheds included in the DMAs are less than 20 acres and therefore the modified Rational Method is used for stormwater calculations for pipe conveyance and sizing.

2.1 DMA Summary

DMA 1 consists of runoff from the tasting room area, parking areas, tasting room patio area, and surrounding pathways. Below is a summary of the sub areas within DMA 1.

DMA 1				
DMA	**Area (sf)**	**Cpost**	**Description**	
1A	855	0.90	Roof	*New Impervious Area*
1B	605	0.90	ADA Parking	*New Impervious Area*
1C	235	0.90	Concrete ADA Ramp	*New Impervious Area*
1D	770	0.30	Rockpave (permeable)	*New Pervious Area*
1E	94	0.90	Concrete Walkway	*New Impervious Area*
1F	615	0.90	Concrete Guest Parking	*New Impervious Area*
1G	413	0.90	AC Turnout	*New Impervious Area*
1H	260	0.90	Tank Pad	*New Impervious Area*
Total (sf)			3,847	*New Impervious Area*
Weighted Average, Cpost				0.78

DMA 2 consists of runoff from the cave driveway and crush pad area. Below is a summary of DMA 2.

DMA 2				
DMA	**Area (sf)**	**Cpost**	**Description**	
2A	4,325	0.90	Driveway	*New Impervious Area*
2B	130	0.60	Gravel Shoulder	*New Impervious Area*
2C	1,428	0.30	Green Roof	*New Pervious Area*
2D	1,073	0.90	Concrete Pad	*New Impervious Area*
2E	55	0.60	Gravel Shoulder	*New Impervious Area*
Total (sf)			7,011	
Weighted Average, Cpost				0.77

3.0 STORMWATER DESIGN

Stormwater from each DMA flows to a junction box for flow splitting when flows greater than the 10-year predevelopment rate are directed to a detention basin. An orifice is located at the bottom of the junction box to send flows to the water quality treatment system for flows under the predevelopment 10-year flow rate. The water quality treatment system includes a level tee spreader sixed for the 2-year storm event.

3.1 Infiltration

The soil permeability rate per for the project is based on onsite percolation testing performed t on the site. The testing protocol for the percolation method is based on the County of Santa Cruz Environmental Health Site Evaluation and Testing Procedures. The locations of the percolation holes are shown on the plans as well as the attached Stormwater Control Plan Exhibit. The percolation test results are converted to infiltration rates using the Porchet Method. A discussion of the Porchet Method and calculations are summarized in Appendix E.

3.2 Rainfall

Below is a summary of the rainfall for the site from the Design Criteria per Figure SWM-3

Rainfall Intensity (in/hr)			
Duration (hr)	**Duration (min)**	**10-yr Intensity (in/hr)**	**2-yr Intensity (in/hr)***
2 yr, 2-hour	120	1.01	0.65
10 yr, 15-min	15	2.22	

3.3 Runoff

The predevelopment runoff rate for DMA 1 is sized per the Design Criteria as summarized below. Cpre is 0.3 and Cpost is summarized of each DMA in Section 2.1.

		Q =	C x i x A	
Post Runoff				
DMA1	**Q 10 YR =**		0.15	CFS
DMA2	**Q 10 YR =**		0.28	CFS
Pre Runoff				
DMA1	**Q 10 YR =**		0.06	CFS
DMA2	**Q 10 YR =**		0.11	CFS

3.4 Orifice Sizing

Orifice sizing for each DMA is based on the 10-year predevelopment rate. The formula for orifice sizing is shown below:

$$d = \left(\frac{4Q_{WQ}}{C\pi(2gh)^{0.5}} \right)^{0.5}$$

Where:

Q_{WQ} = water quality flow rate in cubic feet per second
C = orifice loss coefficient = 0.60
d = diameter of circular orifice opening, in feet
g = gravitational constant = 32.2 feet per second squared
h = effective head (E_{Top} - E_{TW}) in feet

DMA1	**DB#1**	h=	2.50	ft
		d=	0.05	ft
	outlet orifice size		0.58	in
DMA2	**DB#2**	h=	2.50	ft
	outlet orifice size	d=	0.09	ft
			1.06	in

The orifices include pipes with equivalent diameters to the orifice sizing shown above and summarized on the detail on sheet C6.3. The height to the invert of the orifice is to the top of detention basin volume. An influent screen is located in each flow splitting junction box to prevent clogging within the orifice.

3.5 Detention Basin

The detention basin for each DMA is calculated using SWM17 for Runoff Detention by the Modified Rational Method per the Design Criteria. The worksheet for each basin is attached in Appendix C. Stromtech Chambers will be used to meet the detention requirements calculated per the Design Criteria. Stormtech is the industry leader for onsite detention through a chamber storage system. The Stormtech cut sheet showing the total volume stored is included in Appendix C and the detail for construction is included on the Civil Engineering Building Permit Plans sheet C6.3.

DB#1 - 2 x chambers = 149.8 cf storage provided (145 cf minimum calculated), 14.2 lf total
DB#2 - 4 x chamber = 299.6 cf storage provided (255 cf minimum calculated), 28.5 lf total

Each detention basin is designed to drain back to the junction box so it can be drained to the water quality treatment system.

3.6 Level Tee Spreader

Each DMA described above flows to a level spreader for dispersal and treatment of stormwater by slope infiltration. Each level spreader is sized per the Runoff Retention by the Slope Infiltration Method described in the County of Santa Cruz Design Criteria (per Figure SWM-21). A copy of Figure SWM-21 is included in Appendix C along with the sizing calculations based on the stormwater quality treatment requirements for a 2-year, 2-hour storm event.

Infiltration rates for the site are based on onsite percolation testing performed by Sherwood Design Engineers and per the County of Santa Cruz Environmental Health Requirements. The percolation rates have been converted to an infiltration rate and the average infiltration rate is used to size the level spreader. A copy of the percolation tests and corresponding infiltration rates are included in Appendix E. The level spreader sizing for DMA 1 is calculated to be 10 lf and for DMA 2 the level spreader is 11 lf. Details for the level spreader are included in the Civil Engineering Building Permit set.

4.0 PIPE & SWALE SIZING

Pipe sizing was determined using the Modified Rational Method per the Design Criteria. The site is defined as a Minor Waterway since the contributing watershed is less than a square mile. The design storm for the pipe capacity is a 100-year, 24-hour storm event.

The peak flow rate is calculated per the following equation and input parameters.

$$Q = CACiA$$

Where:

Per SCWA

$Q=C_aCiA$

A=Tributary Watershed Area (acres), See Drainage Map

C= Runoff Coefficient, County of Santa Cruz Design Criteria SWM-1

I= Intensity of Rainfall, County of Santa Cruz Design Criteria SWM-2 & SWM-3
National Oceanic and Atmospheric Administration Point Precipitation Frequency (NOAA PPF) Charts for the 100-year, 24-hour storm event

C_a= Antecedent Moisture Factor, County of Santa Cruz Design Criteria SWM-1

Calculating Q for a watershed < 1 square mile

The peak runoff at each node was assumed to be the summation of the peak runoff from each contributing DMA. A summary of the calculated peak runoff rate (Q) for each pipe structure from the contributing watershed is included in Appendix D. The DMAs are included in the Stormwater Control Plan in Appendix B.

The full flow capacity of each pipe and swale was calculated using Manning's equation and the continuity equation.

$$Q = VA \qquad V = \frac{k}{n}\left(\frac{A}{P}\right)^{2/3} S^{1/2}$$

A=Flow area of the pipe, culvert, or channel.
P=Wetted perimeter which is the portion of the circumference that is in contact with water.
Q=Discharge (flow rate).
S=Downward (longitudinal) slope of the culvert.
V=Average velocity in the pipe, culvert, or channel.

This analysis uses the 100-year, 24-hour storm event to size the capacity of the pipes and swales for the proposed improvements. All pipe capacities are verified when comparing the peak runoff rate to the maximum pipe capacity. The pipe sizing is reflected on the pipe sizing included on the Utility Plan included with the Civil Engineering Building Permit Set.

APPENDIX A: Santa Cruz County Stormwater Management Division Project Information & Threshold Determination Form (Appendix A)

Stormwater Management Division

Project Information & Threshold Determination Form (APPENDIX A)

Completion of this form shall be used as guidance by the applicant
All projects shall maintain pre-development runoff rates & patterns
For any questions on this form, please contact DPW Stormwater Management at 831-454-2160

PROJECT & CONTACT INFORMATION

17300 Laurel Rd
ProjectStreetAddress

Aaftab and Karen Munshi
Property Owner's/Representative Name

095-101-22
Assessor'sParcelNo(APN)

Christina Nicholson
Applicant's Name (i.e. design professional)

Not Located in a Flood Control District
Flood Control District (if applicable):

Building Permit No. / Discretionary Application

Twelve Stones Winery
Project Name (Alias)

Twelve Stones Winery
Property Owner/Representative's Firm

408-206-0240
Property Owner/Representative's Phone No.

Karen Munshi
Applicant's Firm Name

408-206-0240
Applicant's Phone No.

PROJECT DESCRIPTION

Lot Coverage	Actual		Adjusted	
A. Total lot size:	873,027	sq.ft.		
B. Existing Permitted Impervious Area:	22,889	sq.ft.		
C. Replaced Permitted Impervious Area:	209	sq.ft.		
D. Replaced Permitted Semi-Impervious* Area:	0	sq.ft.	0	sq.ft.
E. Total proposed Self-mitigating Area:	2,045	sq.ft.		
F. Proposed Impervious Area:	8,660	sq.ft.		
G. Proposed Semi-Impervious* Area:	0	sq.ft.	0	sq.ft.

Total **REPLACED** impervious & semi- impervious area: 209 sq.ft.

Total **NEW** impervious & semi-impervious area: 8,660 sq.ft.

Project Threshold Classification 8,869

☐ **Small Project** (less than 500 sq.ft. created and/or replaced **) - Use *Appendix B 'Small Project Submittal Requirements'* for submittal requirement guidance.

☐ **Medium Project** (more than 500 sq.ft. but less than 5,000 sq.ft. created and/or replaced **) - Use *Appendix C 'Medium Project Submittal Requirements'* for submittal requirement guidance.

☑ **Large Project** (more than 5,000 sq.ft. created and/or replaced **) - Use *Appendix D 'Large Project Submittal Requirements'* for submittal requirement guidance.

Application is part of a phased project OR master plan?	Yes ☐	No ☑
Application will maintain pre-development runoff patterns?	Yes ☑	No ☐
Application is unable to comply with Part 3 of the Design Criteria requirements & is electing to request a waiver(s) Please provide a brief description (below):	Yes ☐	No ☑

*Form will apply a 50% credit for semi-impervious areas as final count. Applicant shall not apply the credit.
** Projects that add more than 50% impervious area coverage (if **Project Threshold Classification Area** > 50% of Existing Permitted Impervious Area) are required to mitigate the entire site at the threshold calculated above.
***Disclaimer: Permit review is based the information provided, additional clarification may be required for undisclosed/unidentified areas. Unaccounted areas may reclassify the project threshold.

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APPENDIX B: Stormwater Control Plan

STORMWATER CONTROL PLAN MASTER LEGEND

- STORM DRAIN PIPE
- DRAINAGE SWALE
- UNDER DRAIN PIPE (PERFORATE
- ROCK SLOPE PROTECTION OUTF
- FLOW DIRECTION
- DOWNSPOUT

STORMWATER CONTROL PLAN NOTES

1. ALL RUNOFF MEASUREMENTS SHALL COMPLY WITH SANTA CRUZ COUNTY REQUIREMENTS. REFER TO THE STORMWATER MANAGEMENT PLAN REPORT FOR ADDITIONAL INFORMATION.
2. REFER TO GRADING PLAN AND UTILITY PLAN FOR INFORMATION ON THE SURFACE AND SUBSURFACE DRAINAGE SYSTEM.
3. REFER TO THE GRADING PLAN FOR FEATURE DESCRIPTIONS AND GRADING DIRECTIONS.

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San Francisco, CA 94110
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REGISTERED PROFESSIONAL ENGINEER
CHRISTINA GRAZIANO SORO
C. No. 84703
CIVIL
STATE OF CALIFORNIA

SCALE:
0 1"
Note: If this graphic scale does not equal 1", this sheet has been modified from its original size.

NO	DATE	REVISION
1	3/23/23	DISCRETIONARY PERMIT RESUBMITTAL
2	6/16/23	DISCRETIONARY PERMIT RESUBMITTAL

PROJECT NO. 21-294
DATE 03/24/23
DRAWN VHT/DNA
DESIGNED CN
CHECKED MH

DISCRETIONARY PERMIT

KAREN & AAFTAB MUNSHI
TWELVE STONES WINERY
17300 LAUREL RD
LOS GATOS, CALIFORNIA 95033

STORMWATER MANAGEMENT PLAN

0 10' 20' 40'
North

DRAWING NO.
C8.0
18 OF 19

P:\2021\21-294_12_Stones_Winery\03_Design\01_CAD\SheetSet\02_Building Permit\C8.0 - STORMWATER CONTROL PLAN.dwg,C8.0 STORMWATER CONTROL PLAN,dwg,Christina Soro,6/16/2023 3:01:16 PM,ARCH full bleed D (24.00 x 36.00 inches),1:1

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APPENDIX C: Detention & Retention Calculations

PROJECT: 12 Stones Winery - DB #1

RUNOFF DETENTION BY THE MODIFIED RATIONAL METHOD

Data Entry: PRESS TAB & ENTER DESIGN VALUES Ver: 6.14.21

Site Location P60 Isopleth:	2.00		Fig. SWM-2 in County Design Criteria
Rational Coefficients Cpre:	0.30		See note # 2
Cpost:	0.78		See note # 2
Impervious Area:	3,847	ft^2	See note # 2 and # 4

STRUCTURE DIMENSIONS FOR DETENTION

145	ft^3 storage volume calculated			
100	% void space assumed			
145	ft^3 excavated volume needed			
Structure	Length	Width*	Depth*	*For pipe, use the square
Ratios	21.00	2.50	2.50	root of the sectional area
Dimen. (ft)	**21.71**	**2.58**	**2.58**	

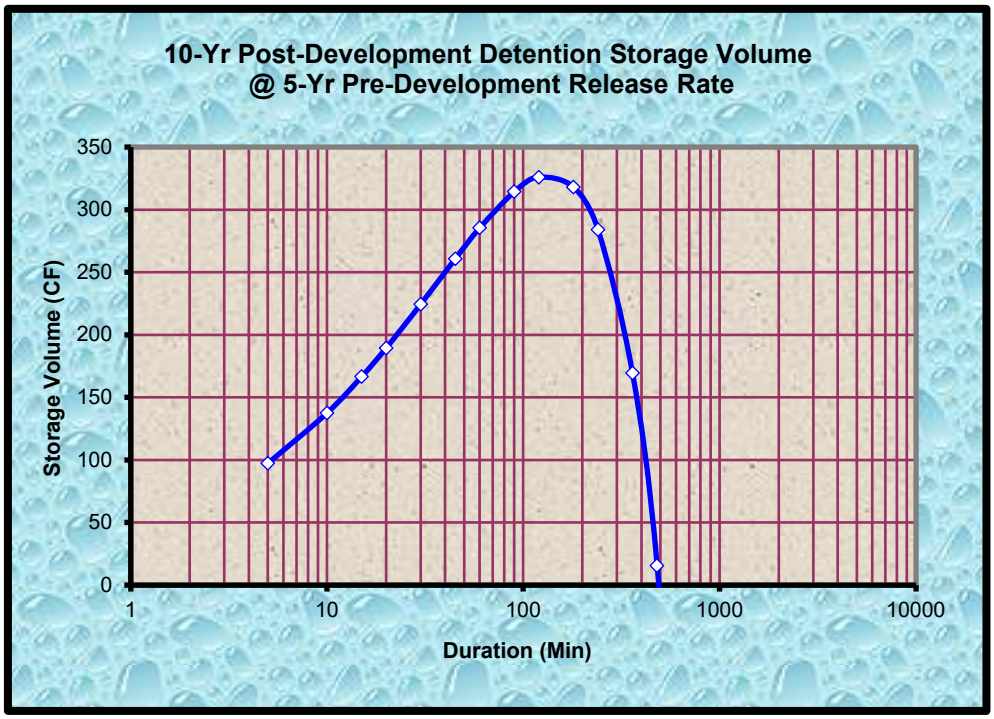
Stormtech chamber used per attachment

10 - YEAR DESIGN STORM				DETENTION @ 15 MIN.	
Storm Duration (min)	10 - Year Intensity (in/hr)	10 - Yr. Release Qpre (cfs)	10 - Year Qpost (cfs)	Detention Rate To Storage (cfs)	Specified Storage Volume (cf)
1440	0.40	0.011	0.028	-0.031	-3402
1200	0.43	0.011	0.030	-0.030	-2658
960	0.46	0.012	0.032	-0.027	-1940
720	0.52	0.014	0.036	-0.023	-1256
480	0.60	0.016	0.042	-0.017	-624
360	0.67	0.018	0.047	-0.013	-339
240	0.78	0.021	0.054	-0.005	-88
180	0.87	0.023	0.061	0.001	18
120	1.01	0.027	0.070	0.011	101
90	1.13	0.030	0.079	0.019	130
60	1.32	0.035	0.091	0.032	**145**
45	1.47	0.039	0.102	0.043	144
30	1.71	0.046	0.119	0.059	134
20	1.99	0.053	0.138	0.079	118
15	2.22	**0.059**	0.154	0.095	107
10	2.58	0.069	0.179	0.120	90
5	3.35	0.089	**0.233**	0.173	65

This method is available from the County Public Works web site in a computerized Exce

The spreadsheet formulas and format are copy protected to prevent alteration.
Any modified submittals may be rejected, unless the changes made and the author are c

Calc by: CN/DN **Date:** 6/8/2023



Notes & Limitations on Use:

1) The modified rational method, and therefore the standard calculations are applicable in watersheds up to 20 acres in size.
2) Required detention volume determinations shall be based on all net new impervious areas, both on and off-site, resulting from the proposed project. Pervious areas shall not be included in detention volume sizing; an exception may be made for incidental pervious areas less than 10% of the total area.
3) Gravel packed detention chambers shall specify on the plans, aggregate that is washed, angular, and uniformly graded (of single size), assuring void space not less than 35%.
4) A map showing boundaries of both regulated impervious areas and actual drainage areas routed to the hydraulic control structure of the detention facility is to be provided, clearly distinguishing between the two areas, and noting the square footage.
5) The EPA defines a class V injection well as any bored, drilled, or driven shaft, or dug hole that is deeper than its widest surface dimension, or an improved sinkhole, or a subsurface fluid distribution system. Such storm water drainage wells are "authorized by rule". For more information on these rules, contact the EPA. A web site link is provided from the County DPW Stormwater Management web page.
6) Refer to the County of Santa Cruz Design Criteria, for complete method criteria.

l spreadsheet format to simplify usage. http://www.dpw.co.santa-cruz.ca.us/drainage.htm

clearly identified, and the format is recognizably different.

PROJECT: 12 Stones Winery - DB #2

RUNOFF DETENTION BY THE MODIFIED RATIONAL METHOD

Data Entry: PRESS TAB & ENTER DESIGN VALUES Ver: 6.14.21

Site Location P60 Isopleth:	2.00		Fig. SWM-2 in County Design Criteria
Rational Coefficients Cpre:	0.30		See note # 2
Cpost:	0.77		See note # 2
Impervious Area:	7,011	ft^2	See note # 2 and # 4

STRUCTURE DIMENSIONS FOR DETENTION

255	ft^3 storage volume calculated			
100	% void space assumed			
255	ft^3 excavated volume needed			
Structure	Length	Width*	Depth*	*For pipe, use the square
Ratios	33.00	3.00	3.00	root of the sectional area
Dimen. (ft)	**31.35**	**2.85**	**2.85**	

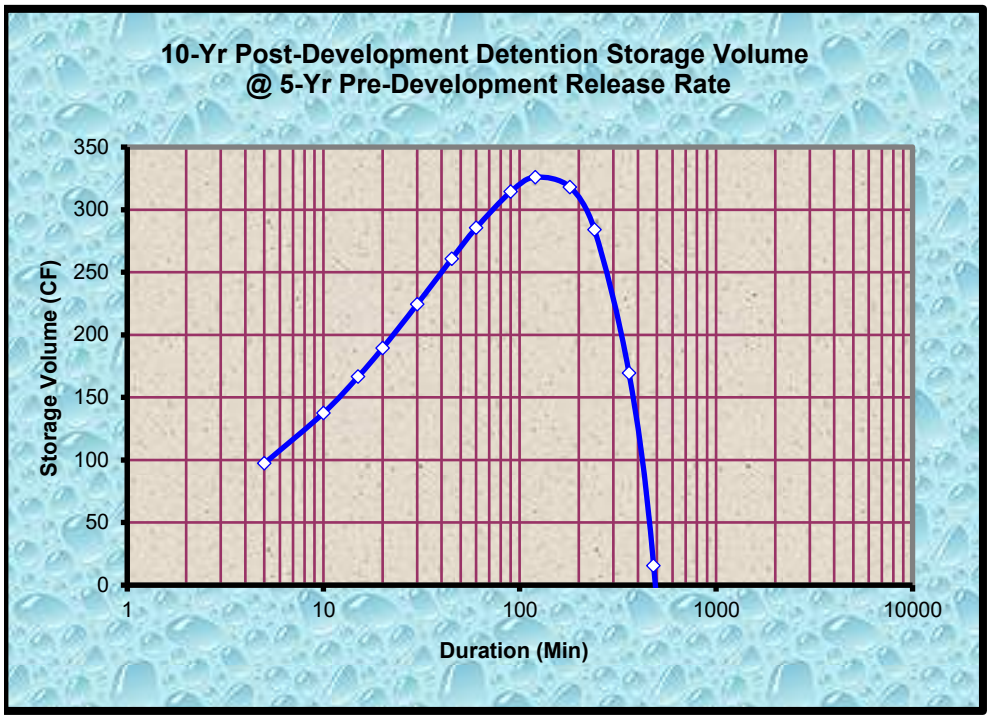
Stormtech chamber used per attachment

10 - YEAR DESIGN STORM				DETENTION @ 15 MIN.	
Storm Duration (min)	10 - Year Intensity (in/hr)	10 - Yr. Release Qpre (cfs)	10 - Year Qpost (cfs)	Detention Rate To Storage (cfs)	Specified Storage Volume (cf)
1440	0.40	0.019	0.050	-0.058	-6270
1200	0.43	0.021	0.053	-0.055	-4907
960	0.46	0.023	0.058	-0.050	-3589
720	0.52	0.025	0.065	-0.043	-2334
480	0.60	0.029	0.075	-0.033	-1173
360	0.67	0.033	0.084	-0.024	-648
240	0.78	0.038	0.098	-0.010	-183
180	0.87	0.042	0.109	0.001	13
120	1.01	0.049	0.127	0.019	170
90	1.13	0.055	0.141	0.033	225
60	1.32	0.064	0.165	0.057	**255**
45	1.47	0.071	0.183	0.075	254
30	1.71	0.083	0.213	0.106	237
20	1.99	0.097	0.249	0.141	211
15	2.22	**0.108**	0.277	0.169	190
10	2.58	0.126	0.322	0.215	161
5	3.35	0.163	**0.418**	0.311	116

This method is available from the County Public Works web site in a computerized Excel s

The spreadsheet formulas and format are copy protected to prevent alteration.
Any modified submittals may be rejected, unless the changes made and the author are cle

Calc by: CN/DN **Date:** 6/8/2023



Notes & Limitations on Use:

1) The modified rational method, and therefore the standard calculations are applicable in watersheds up to 20 acres in size.
2) Required detention volume determinations shall be based on all net new impervious areas, both on and off-site, resulting from the proposed project. Pervious areas shall not be included in detention volume sizing; an exception may be made for incidental pervious areas less than 10% of the total area.
3) Gravel packed detention chambers shall specify on the plans, aggregate that is washed, angular, and uniformly graded (of single size), assuring void space not less than 35%.
4) A map showing boundaries of both regulated impervious areas and actual drainage areas routed to the hydraulic control structure of the detention facility is to be provided, clearly distinguishing between the two areas, and noting the square footage.
5) The EPA defines a class V injection well as any bored, drilled, or driven shaft, or dug hole that is deeper than its widest surface dimension, or an improved sinkhole, or a subsurface fluid distribution system. Such storm water drainage wells are "authorized by rule". For more information on these rules, contact the EPA. A web site link is provided from the County DPW Stormwater Management web page.
6) Refer to the County of Santa Cruz Design Criteria, for complete method criteria.

preadsheet format to simplify usage. http://www.dpw.co.santa-cruz.ca.us/drainage.htm

arly identified, and the format is recognizably different.

StormTech® SC-740 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

Nominal Chamber Specifications
(not to scale)

Size (L x W x H)
85.4" x 51" x 30"
2,170 mm x 1,295 mm x 762 mm

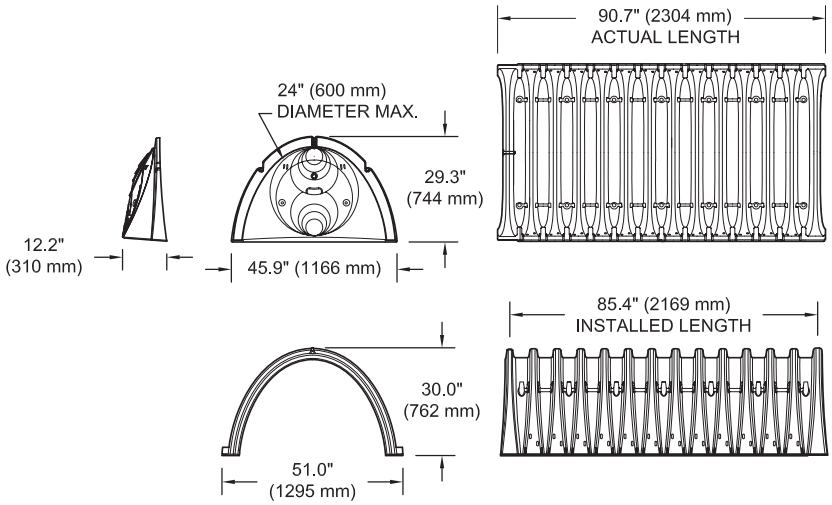
Chamber Storage
45.9 ft³ (1.30 m³)

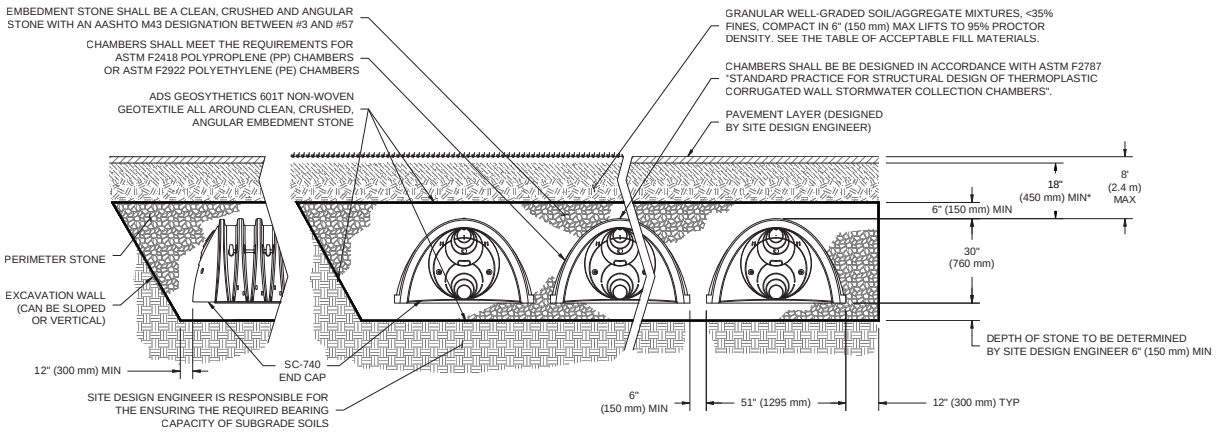
Min. Installed Storage*
74.9 ft³ (2.12 m³)

Weight
74.0 lbs (33.6 kg)

Shipping
30 chambers/pallet
60 end caps/pallet
12 pallets/truck

*Assumes 6" (150 mm) stone above, below and between chambers and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

ADS StormTech™

StormTech SC-740 Specifications

Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6” (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
42 (1067)	45.90 (1.300)	74.90 (2.121)
41 (1041)	45.90 (1.300)	73.77 (2.089)
40 (1016)	45.90 (1.300)	72.64 (2.057)
39 (991)	45.90 (1.300)	71.52 (2.025)
38 (965)	45.90 (1.300)	70.39 (1.993)
37 (940)	45.90 (1.300)	69.26 (1.961)
36 (914)	45.90 (1.300)	68.14 (1.929)
35 (889)	45.85 (1.298)	66.98 (1.897)
34 (864)	45.69 (1.294)	65.75 (1.862)
33 (838)	45.41 (1.286)	64.46 (1.825)
32 (813)	44.81 (1.269)	62.97 (1.783)
31 (787)	44.01 (1.246)	61.36 (1.737)
30 (762)	43.06 (1.219)	59.66 (1.689)
29 (737)	41.98 (1.189)	57.89 (1.639)
28 (711)	40.80 (1.155)	56.05 (1.587)
27 (686)	39.54 (1.120)	54.17 (1.534)
26 (660)	38.18 (1.081)	52.23 (1.479)
25 (635)	36.74 (1.040)	50.23 (1.422)
24 (610)	35.22 (0.977)	48.19 (1.365)
23 (584)	33.64 (0.953)	46.11 (1.306)
22 (559)	31.99 (0.906)	44.00 (1.246)
21 (533)	30.29 (0.858)	1.85 (1.185)
20 (508)	28.54 (0.808)	39.67 (1.123)
19 (483)	26.74 (0.757)	37.47 (1.061)
18 (457)	24.89 (0.705)	35.23 (0.997)
17 (432)	23.00 (0.651)	32.96 (0.939)
16 (406)	21.06 (0.596)	30.68 (0.869)
15 (381)	19.09 (0.541)	28.36 (0.803)
14 (356)	17.08 (0.484)	26.03 (0.737)
13 (330)	15.04 (0.426)	23.68 (0.670)
12 (305)	12.97 (0.367)	21.31 (0.608)
11 (279)	10.87 (0.309)	18.92 (0.535)
10 (254)	8.74 (0.247)	16.51 (0.468)
9 (229)	6.58 (0.186)	14.09 (0.399)
8 (203)	4.41 (0.125)	11.66 (0.330)
7 (178)	2.21 (0.063)	9.21 (0.264)
6 (152)	0 (0)	6.76 (0.191)
5 (127)	0 (0)	5.63 (0.160)
4 (102)	0 (0)	4.51 (0.128)
3 (76)	0 (0)	3.38 (0.096)
2 (51)	0 (0)	2.25 (0.064)
1 (25)	0 (0)	1.13 (0.032)

Stone Cover

Stone Foundation

Note: Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-740 Chamber	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6” (150 mm) stone above chambers, 6” (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

English Tons (yds³)	Stone Foundation Depth		
	6”	12”	16”
SC-740	3.8 (2.8)	4.6 (3.3)	5.5 (3.9)
Metric Kilograms (m³)	**150 mm**	**300 mm**	**450 mm**
SC-740	3,450 (2.1)	4,170 (2.5)	4,490 (3.0)

Note: Assumes 6” (150 mm) of stone above and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

Note: Assumes 6” (150 mm) of row separation and 18” (450 mm) of cover. The volume of excavation will vary as depth of cover increases.

DB#1 - 2 x chambers = 149.8 cf storage, 14.2 lf
DB#2 - 4 x chamber = 299.6 cf storage, 28.5 lf

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PROJECT: 12 Stones Winery - DMA 1 **Calc by:** CN/DNA **Date:** 6/10/2023

RUNOFF RETENTION BY THE SLOPE INFILTRATION METHOD

Notes & Limitations on Use:

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.
Projects with saturated soil permeability less than 120% of the design storm intensity should consider storage methods to percolate runoff.
Maximum sheet flow length is 100 ft., with 30 ft. typical. This requires site observation by the designer to determine.
Minimum length of perforated pipe is 6 ft., maximum length 40 ft., or 60 ft. if tee'd, per outfall.
Minimum perforated pipe diameter is 3 inches.
Perforated pipe is to be laid parallel to the slope contour, preferably secured at the surface, or with minimal burial and protective cover. *
This method may be used on smooth and uniform vegetated or mulched slopes under 15%, without special provisions.
Slopes greater than 15%, or that are irregular, require site specific erosion consideration, and possibly surface improvements.
For any slopes greater than 25% occurring nearby at lower elevation, consult a geotechnical engineer.
A 75% efficiency factor is applied to the determined infiltration surface area.
Table is based on computations using the Rational Equation for a 2-yr. return, 2-hr. duration storm.
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria and example calculations.

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES SS Ver: 1.0

Mitigation Area

Saturated Soil Permeability:	3.91	in/hr
Estimated Distance for Sheet Flow:	50	ft

Development Area

Site Location P60 Isopleth:		2.00	Fig. SWM-2
Rational Coefficients	Pre:	0.30	
	Post:	0.78	

Table Value to Interpolate

Design Storm Intensity:	0.65	in/hr

Required Length of Perforated Pipe (ft)

Impervious Area $(ft)^2$	Design Storm Intensity (in/hr)													
	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90
500														
750														
1000														
1250														
1500														6
1750												6	6	7
2000										6	6	7	7	8
2250									6	6	7	7	8	9
2500								6	6	7	8	8	9	10
2750							6	6	7	8	8	9	10	11
3000						6	6	7	8	8	9	10	11	11
3250						6	7	8	8	9	10	11	12	12
3500					6	7	7	8	9	10	11	12	12	13
3750					6	7	8	9	10	10	11	12	13	14
4000				6	7	8	8	9	10	11	12	13	14	15
4250				6	7	8	9	10	11	12	13	14	15	16
4500			6	7	7	8	9	10	11	13	14	15	16	17
4750			6	7	8	9	10	11	12	13	14	16	17	18
5000			6	7	8	9	10	12	13	14	15	16	18	19

PROJECT: 12 Stones Winery - DMA 2 **Calc by:** CN/DNA **Date:** 6/10/2023

RUNOFF RETENTION BY THE SLOPE INFILTRATION METHOD

Notes & Limitations on Use:

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.
Projects with saturated soil permeability less than 120% of the design storm intensity should consider storage methods to percolate runoff.
Maximum sheet flow length is 100 ft., with 30 ft. typical. This requires site observation by the designer to determine.
Minimum length of perforated pipe is 6 ft., maximum length 40 ft., or 60 ft. if tee'd, per outfall.
Minimum perforated pipe diameter is 3 inches.
Perforated pipe is to be laid parallel to the slope contour, preferably secured at the surface, or with minimal burial and protective cover. *
This method may be used on smooth and uniform vegetated or mulched slopes under 15%, without special provisions.
Slopes greater than 15%, or that are irregular, require site specific erosion consideration, and possibly surface improvements.
For any slopes greater than 25% occurring nearby at lower elevation, consult a geotechnical engineer.
A 75% efficiency factor is applied to the determined infiltration surface area.
Table is based on computations using the Rational Equation for a 2-yr. return, 2-hr. duration storm.
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria and example calculations.

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES SS Ver: 1.0

Mitigation Area

Saturated Soil Permeability:	3.91	in/hr
Estimated Distance for Sheet Flow:	80	ft

Development Area

Site Location P60 Isopleth:		2.00	Fig. SWM-2
Rational Coefficients	Pre:	0.30	
	Post:	0.78	

Table Value to Interpolate

Design Storm Intensity:	0.65	in/hr

Required Length of Perforated Pipe (ft)

Impervious Area (ft)^2	Design Storm Intensity (in/hr)													
	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90
500														
750														
1000														
1250														
1500														
1750														
2000														
2250														
2500													6	6
2750												6	6	7
3000											6	6	7	7
3250										6	6	7	7	8
3500									6	6	7	7	8	8
3750									6	7	7	8	8	9
4000								6	6	7	8	8	9	10
4250							6	6	7	7	8	9	9	10
4500							6	7	7	8	9	9	10	11
4750						6	6	7	8	8	9	10	11	11
5000						6	7	7	8	9	9	10	11	12
7250									11					

Figure SWM-3: Rainfall Intensity - Duration Curves

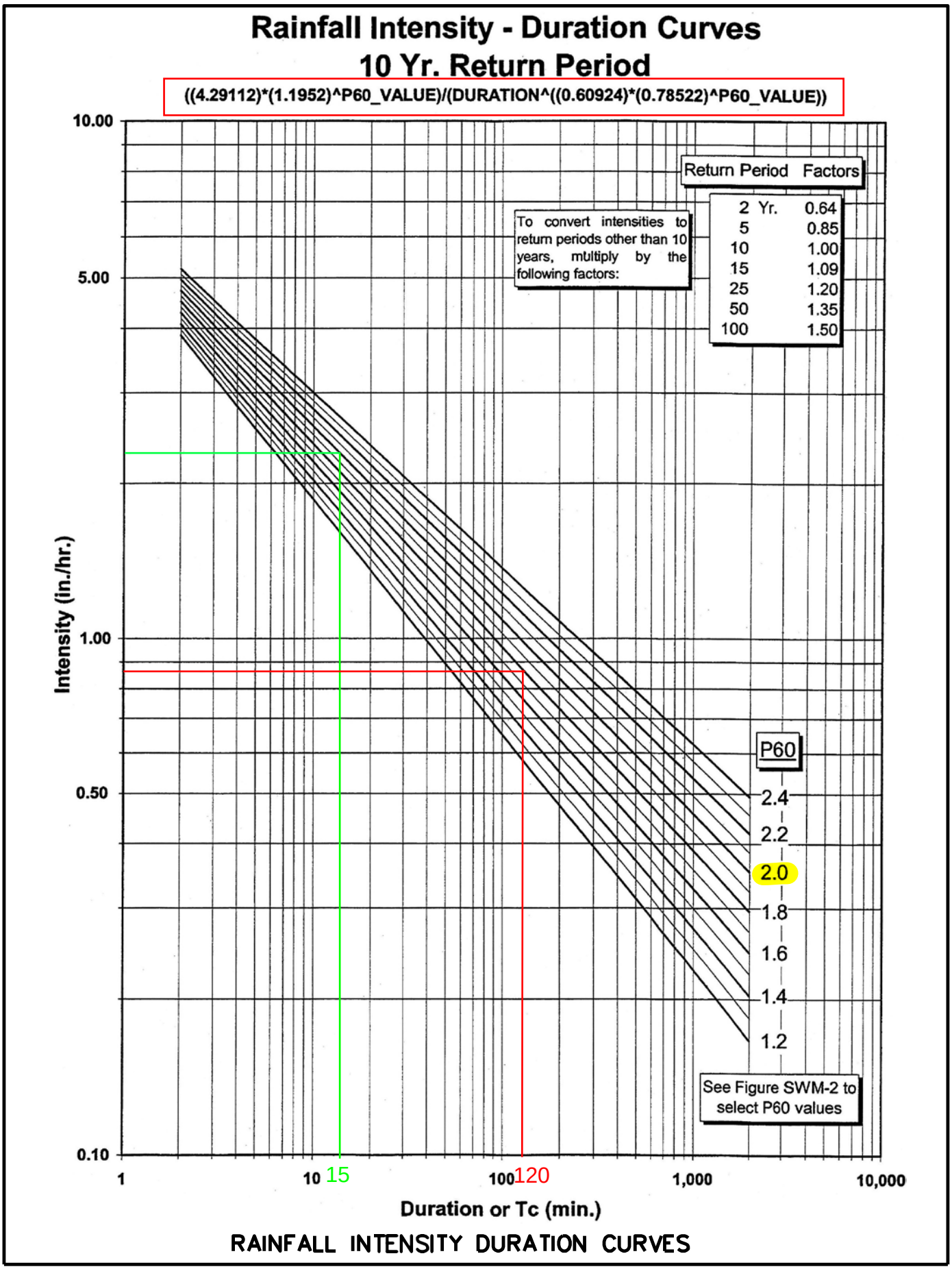


Figure SWM-1: 10-Year Runoff Coefficients

Type of Area	10-Year Runoff Coefficients
Rural, park, forested; agricultural	0.10 – 0.30 undeveloped vegetated areas
Low residential (Single family dwellings)	0.45 – 0.60 semi-pervious areas
High residential (Multiple family dwellings)	0.65 – 0.75
Business and commercial	0.80
Industrial	0.70
Impervious	0.90 impervious areas

REQUIRED ANTECEDENT MOISTURE FACTORS (Ca) FOR THE RATIONAL METHOD*

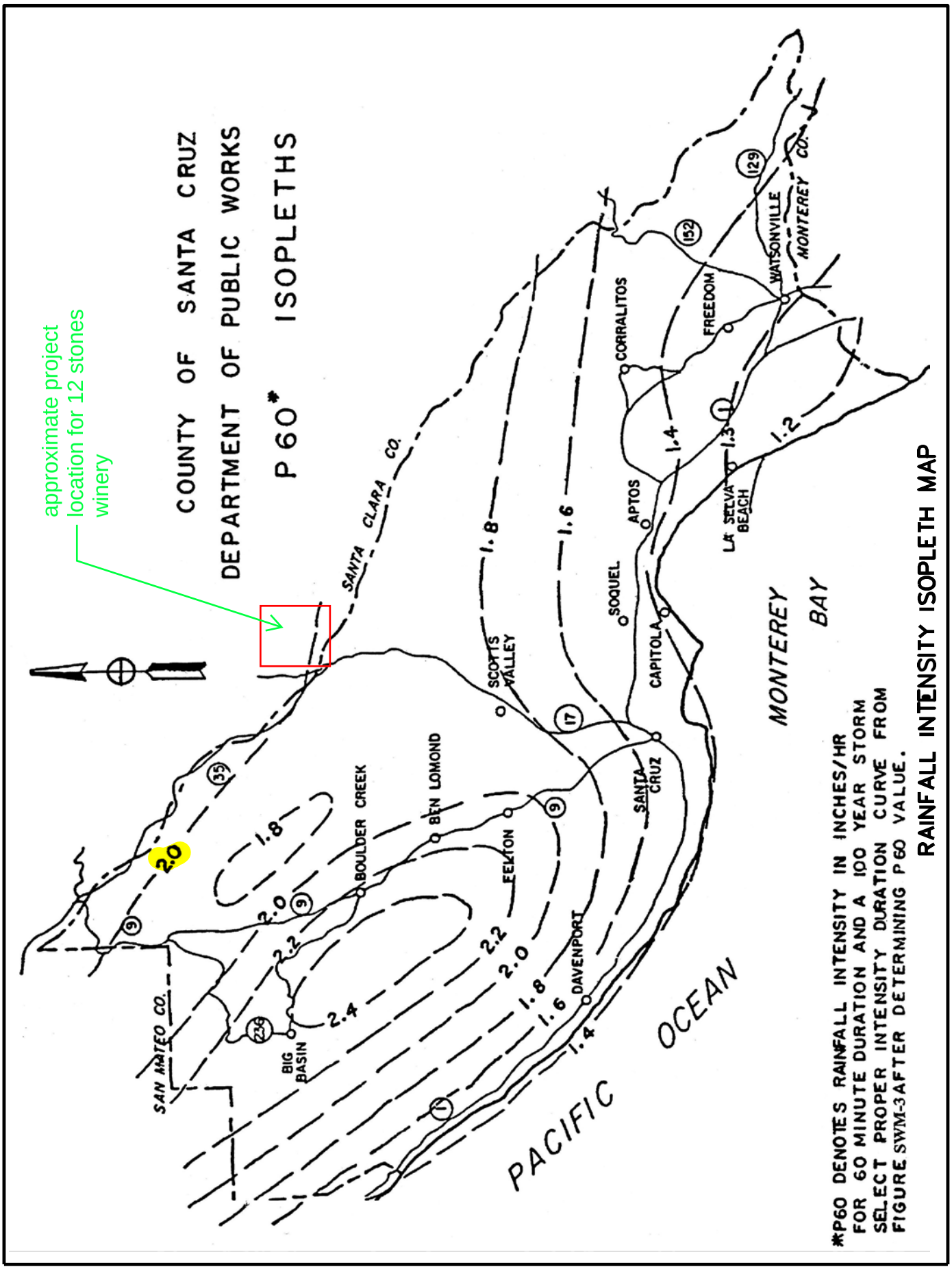
Recurrence Interval (Years)	Ca
2 to 10	1.0 minimum design storm event is 2 yr for treatment sizing and 10 year for retention sizing
25	1.1
50	1.2
100	1.25 minimum design storm event is 100 yr for hydraulic pipe capacity sizing

Note: Application of antecedent moisture factors (Ca) should not result in an adjusted runoff coefficient (C) exceeding a value of 1.00

*APWA Publication “Practices in Detention of Stormwater Runoff”

Rev. 11-06

Figure SWM-2: Rainfall Intensity Isopleths



REV 12/05

FIG. SWM-2

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APPENDIX D: Pipe & Swale Capacity Calculations

Hydraulic Calculations

Pipe Sizing

Structure#	Area	Peak Runoff (10yr)	Peak Runoff (100yr)	Pipe Length	Pipe Slope	Manning's n^1	Minimum Pipe Size	Pipe Area	Pipe Perimeter	Full Flow Velocity	Full Flow Capacity	Travel Time	10 yr Capacity?	100 yr Capacity?
	(Acre)	(ft^3/s)	(ft^3/s)	(ft)	(ft/ft)		(in)	(ft^2)	(ft)	(ft/s)	(cfs)	(min)		
SD to DI#1	0.02	0.04	0.18	75	0.005	0.012	6	0.196	1.57	2.19	**0.43**	0.57	OK	OK
UD to DI#3	0.03	0.02	0.12	49	0.005	0.012	6	0.196	1.57	2.19	**0.43**	0.37	OK	OK
TD#1 to JB#1	0.02	0.04	0.20	49	0.031	0.012	6	0.196	1.57	5.46	**1.07**	0.15	OK	OK
DI#2 TO JB#1	0.04	0.07	0.38	19	0.170	0.012	4	0.087	1.05	9.76	**0.85**	0.03	OK	OK
DI#3 TO JB#1	0.05	0.06	0.32	58	0.005	0.012	6	0.196	1.57	2.19	**0.43**	0.44	OK	OK
JB#1 TO LSP#1	0.10	0.17	0.90	23	0.005	0.012	8	0.349	2.09	2.66	**0.93**	0.14	OK	OK
TD#2	0.13	0.26	1.36	55	0.151	0.012	6	0.196	1.57	12.05	**2.37**	0.08	OK	OK
DI#11	0.14	0.03	0.17	68	0.139	0.012	4	0.087	1.05	8.82	**0.77**	0.13	OK	OK
TD#2 & DI#10 TO LSP#2	0.26	0.29	1.53	20	0.139	0.012	6	0.196	1.57	11.57	**2.27**	0.03	OK	OK

Swales

ASSOCIATED DA	Area	Peak Runoff (10yr)	Peak Runoff (100yr)	Side Slope	Bottom Width	Channel Slope	Manning's n	Depth	X-Section Area	Wetted Perimeter	Hydraulic Radius	Velocity	Top Width	Flow Capacity	100 yr Capacity?
	(Acre)	(ft^3/s)	(ft^3/s)	(ft/ft) (H:V)		(ft)	(ft/ft)	(in)	(ft^2)	(ft)	(ft)	(ft/s)	(ft)	(ft^3/s)	
TASTING ROOM SWALE (rock)	0.18	0.06	0.31	0.333	0.500	0.043	0.033	6.000	0.333	1.554	0.214	3.354	3	**1.12**	OK
CAVE SWALE (EAST, rock)	0.02	0.00	0.03	0.333	0.500	0.273	0.033	6.000	0.333	1.554	0.214	8.441	3	**2.81**	OK
CAVE SWALE (WEST, rock)	0.14	0.03	0.17	0.333	0.500	0.085	0.033	6.000	0.333	1.554	0.214	4.725	3	**1.57**	OK

[1] For a pipe with a smooth interior

NOAA Atlas 14, Volume 6, Version 2
Location name: Los Gatos, California, USA*
Latitude: 37.1049°, Longitude: -121.9675°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.253** (0.223-0.288)	**0.316** (0.280-0.362)	**0.401** (0.353-0.461)	**0.471** (0.410-0.547)	**0.568** (0.472-0.690)	**0.643** (0.520-0.804)	**0.721** (0.563-0.931)	**0.802** (0.604-1.08)	**0.914** (0.651-1.30)	**1.00** (0.683-1.49)
10-min	**0.362** (0.320-0.413)	**0.454** (0.401-0.519)	**0.575** (0.506-0.660)	**0.675** (0.588-0.784)	**0.814** (0.677-0.989)	**0.922** (0.745-1.15)	**1.03** (0.808-1.34)	**1.15** (0.866-1.54)	**1.31** (0.934-1.86)	**1.44** (0.979-2.13)
15-min	**0.438** (0.387-0.500)	**0.549** (0.485-0.627)	**0.696** (0.612-0.798)	**0.817** (0.711-0.948)	**0.984** (0.818-1.20)	**1.12** (0.901-1.39)	**1.25** (0.977-1.61)	**1.39** (1.05-1.86)	**1.58** (1.13-2.25)	**1.74** (1.18-2.58)
30-min	**0.606** (0.536-0.692)	**0.759** (0.671-0.868)	**0.963** (0.848-1.11)	**1.13** (0.984-1.31)	**1.36** (1.13-1.66)	**1.54** (1.25-1.93)	**1.73** (1.35-2.23)	**1.92** (1.45-2.58)	**2.19** (1.56-3.11)	**2.41** (1.64-3.57)
60-min	**0.856** (0.757-0.976)	**1.07** (0.947-1.23)	**1.36** (1.20-1.56)	**1.60** (1.39-1.85)	**1.92** (1.60-2.34)	**2.18** (1.76-2.72)	**2.44** (1.91-3.15)	**2.72** (2.05-3.64)	**3.10** (2.21-4.39)	**3.40** (2.32-5.04)
2-hr	**1.28** (1.13-1.46)	**1.59** (1.41-1.82)	**2.02** (1.78-2.32)	**2.37** (2.06-2.75)	**2.86** (2.38-3.48)	**3.25** (2.62-4.06)	**3.65** (2.85-4.71)	**4.07** (3.06-5.45)	**4.65** (3.32-6.59)	**5.11** (3.49-7.58)
3-hr	**1.61** (1.43-1.84)	**2.01** (1.78-2.30)	**2.54** (2.24-2.92)	**2.99** (2.60-3.47)	**3.61** (3.00-4.39)	**4.10** (3.32-5.13)	**4.61** (3.61-5.96)	**5.15** (3.88-6.91)	**5.90** (4.21-8.36)	**6.50** (4.43-9.63)
6-hr	**2.28** (2.02-2.60)	**2.85** (2.51-3.25)	**3.61** (3.17-4.14)	**4.24** (3.69-4.92)	**5.13** (4.27-6.24)	**5.84** (4.72-7.30)	**6.57** (5.14-8.49)	**7.35** (5.54-9.86)	**8.44** (6.01-12.0)	**9.31** (6.34-13.8)
12-hr	**3.06** (2.71-3.50)	**3.84** (3.39-4.39)	**4.88** (4.30-5.60)	**5.76** (5.01-6.68)	**6.98** (5.80-8.48)	**7.95** (6.42-9.94)	**8.96** (7.00-11.6)	**10.0** (7.55-13.4)	**11.5** (8.20-16.3)	**12.7** (8.65-18.8)
24-hr	**4.03** (3.69-4.49)	**5.09** (4.66-5.68)	**6.52** (5.94-7.29)	**7.70** (6.98-8.68)	**9.36** (8.22-10.9)	**10.7** (9.19-12.6)	**12.0** (10.1-14.5)	**13.4** (11.0-16.7)	**15.4** (12.2-19.8)	**17.0** (13.0-22.5)
2-day	**5.24** (4.80-5.84)	**6.68** (6.11-7.46)	**8.61** (7.86-9.64)	**10.2** (9.25-11.5)	**12.4** (10.9-14.4)	**14.2** (12.2-16.8)	**16.0** (13.5-19.3)	**17.8** (14.7-22.1)	**20.4** (16.2-26.3)	**22.5** (17.2-29.9)
3-day	**6.11** (5.60-6.82)	**7.85** (7.18-8.77)	**10.2** (9.28-11.4)	**12.1** (10.9-13.6)	**14.7** (12.9-17.1)	**16.8** (14.5-19.9)	**18.9** (16.0-22.9)	**21.1** (17.4-26.2)	**24.2** (19.1-31.1)	**26.6** (20.4-35.3)
4-day	**6.70** (6.14-7.47)	**8.65** (7.91-9.65)	**11.2** (10.2-12.6)	**13.4** (12.1-15.1)	**16.3** (14.3-18.9)	**18.6** (16.0-22.0)	**20.9** (17.6-25.3)	**23.4** (19.2-29.0)	**26.7** (21.2-34.4)	**29.4** (22.5-39.0)
7-day	**8.30** (7.59-9.25)	**10.8** (9.83-12.0)	**14.0** (12.8-15.7)	**16.7** (15.1-18.8)	**20.3** (17.9-23.6)	**23.2** (20.0-27.4)	**26.1** (22.0-31.6)	**29.2** (24.0-36.2)	**33.3** (26.4-42.9)	**36.6** (28.1-48.6)
10-day	**9.17** (8.39-10.2)	**11.9** (10.9-13.3)	**15.6** (14.2-17.4)	**18.5** (16.8-20.9)	**22.5** (19.8-26.2)	**25.7** (22.1-30.4)	**28.8** (24.3-34.9)	**32.1** (26.4-39.8)	**36.6** (29.0-47.1)	**40.1** (30.8-53.2)
20-day	**11.5** (10.5-12.8)	**15.1** (13.8-16.9)	**19.7** (18.0-22.1)	**23.4** (21.2-26.4)	**28.3** (24.9-32.9)	**32.0** (27.6-37.8)	**35.6** (30.0-43.1)	**39.3** (32.3-48.8)	**44.2** (35.0-56.9)	**47.9** (36.8-63.7)
30-day	**13.9** (12.7-15.5)	**18.3** (16.7-20.4)	**23.8** (21.7-26.6)	**28.1** (25.4-31.6)	**33.7** (29.6-39.1)	**37.8** (32.6-44.7)	**41.9** (35.3-50.7)	**45.9** (37.8-56.9)	**51.2** (40.5-65.9)	**55.1** (42.3-73.2)
45-day	**17.2** (15.7-19.1)	**22.4** (20.5-25.0)	**28.9** (26.4-32.4)	**33.9** (30.7-38.2)	**40.3** (35.4-46.8)	**44.9** (38.7-53.1)	**49.3** (41.6-59.7)	**53.7** (44.1-66.6)	**59.2** (46.9-76.2)	**63.2** (48.5-84.0)
60-day	**20.2** (18.5-22.6)	**26.2** (24.0-29.3)	**33.5** (30.5-37.4)	**39.0** (35.3-43.9)	**45.8** (40.3-53.2)	**50.7** (43.7-60.0)	**55.4** (46.7-67.0)	**59.8** (49.2-74.2)	**65.4** (51.8-84.3)	**69.5** (53.3-92.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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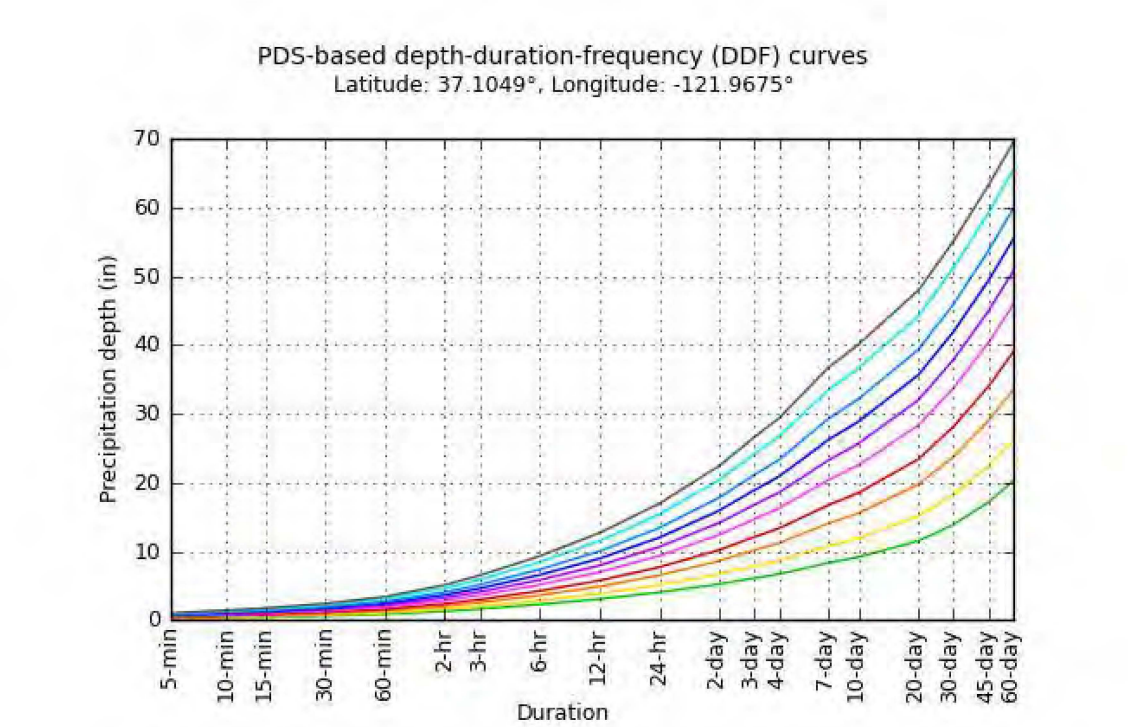
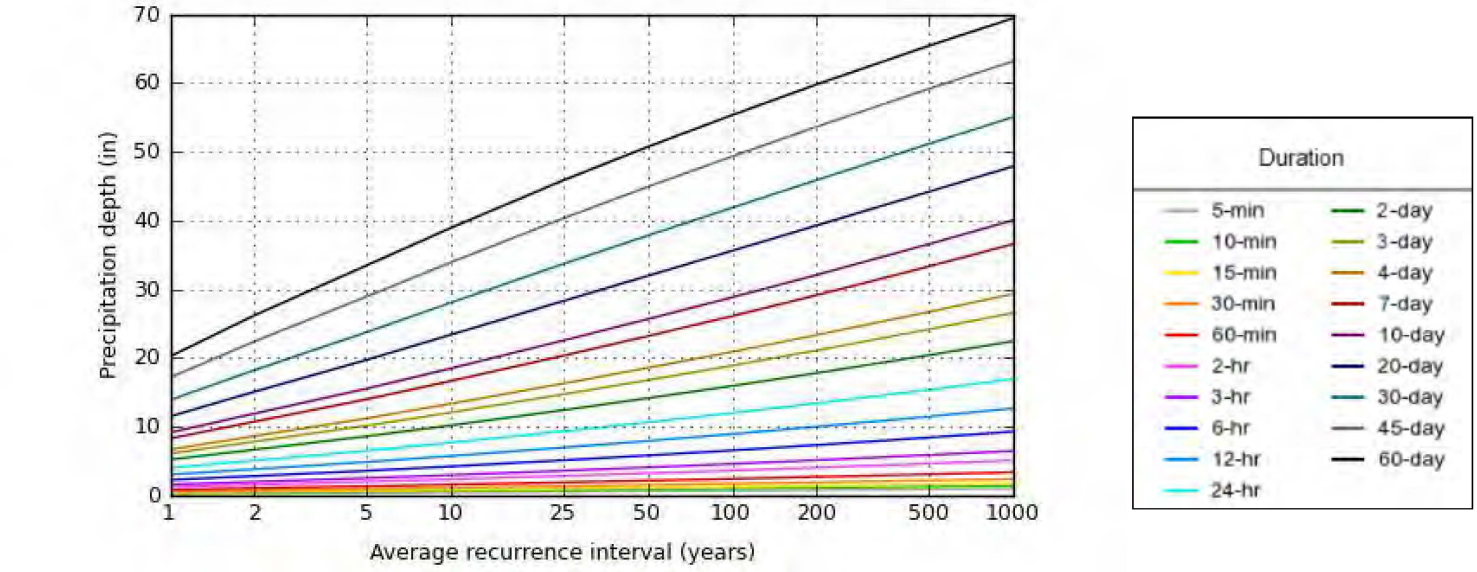
PF graphical





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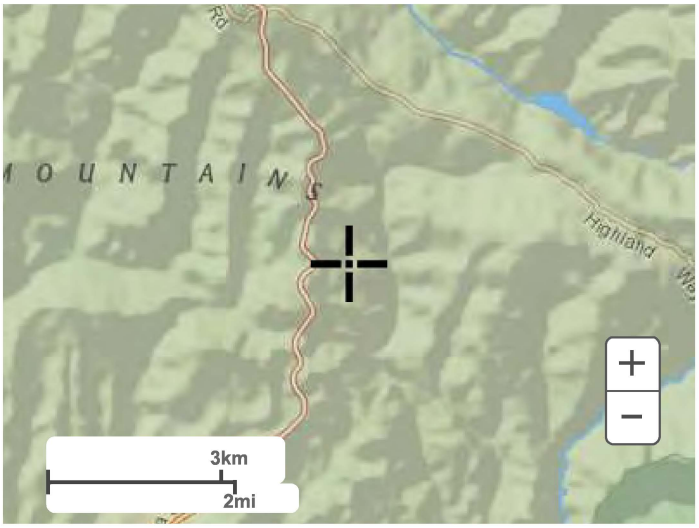
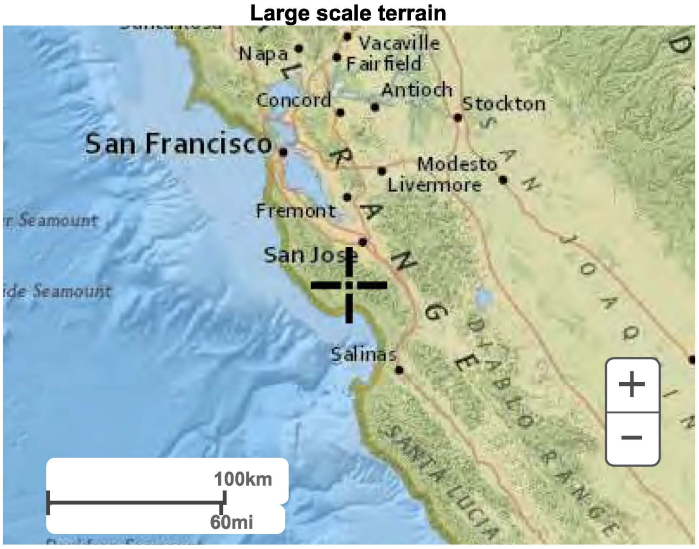
Maps & aerials

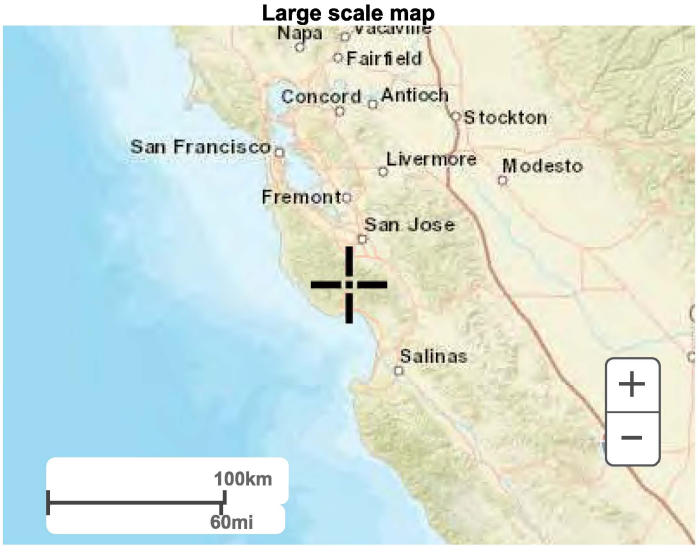
Small scale terrain



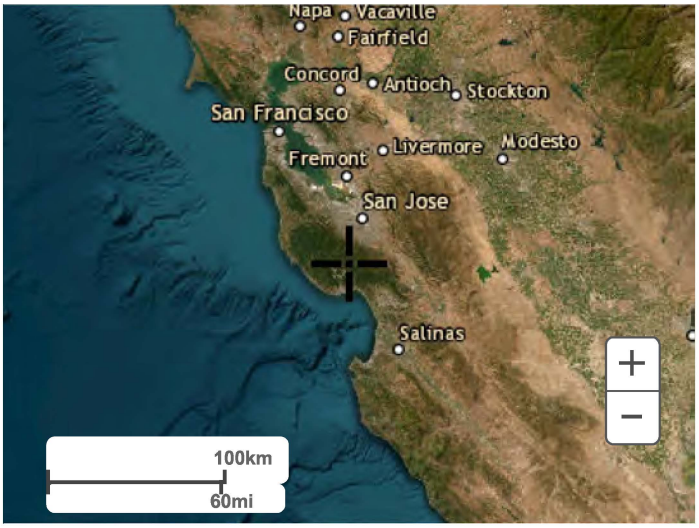
Large scale terrain



Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

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(415) 677-7300 | WWW.SHERWOODENGINEERS.COM

APPENDIX E: Percolation Results & Infiltration Calculations

Percolation Rate Conversion to Infiltration Rate

Equation: $\frac{\text{Change in Water Height (in) x 60 min/hr x pipe radius (in)}}{\text{Time interval x (pipe radius + 2(Average Height))}}$

Pipe Diameter = 6 in
Pipe Radius = 3 in

Percolation Test Results

Perc Hole Final Result	Start Time	End Time	Time Interval (Min)	Depth to Water at Start (in)	Depth to Water at End (in)	Drop (inches)	Percolation Rate (min/in)	Avg Height (in)	Infiltration Rate (in/hr)
P-1	12:36	13:06	30	7.4	3.5	3.9	7.69	5.45	1.68
P-2	13:16	13:46	30	6	5.625	0.375	80	5.8125	0.15
P-3	12:17	12:47	30	6.3	4.5	1.8	16.67	5.4	0.78
P-4	12:18	12:48	30	6.5	4.875	1.625	18.46	5.6875	0.68
P-5	12:22	12:52	30	6.5	4.375	2.125	14.12	5.4375	0.92
P-6	10:59	11:04	5	5.5	0.625	4.875	1.03	3.0625	19.23
								Average	3.91

2.3 - Percolation Tests

The ***percolation test*** is widely used for assessing the suitability of a soil for onsite wastewater disposal. Depending on the required depth of testing, there are two versions of the percolation test. For shallow depth testing (less than 10 feet), the procedure would be as shown in Figure 8 (Photo 6). For deep testing (10 feet to 40 feet), the procedure is as shown in Figure 9. For deep testing, special care must be taken to ensure that caving of the sidewalls does not occur.

This test measures the length of time required for a quantity of water to infiltrate into the soil and is often called a "percolation rate". It should be noted that the percolation rate is related to, but not equal to, the infiltration rate. While an infiltration rate is a measure of the speed at which water progresses downward into the soil, the percolation rate measures not only the downward progression but the lateral progression through the soil as well. This reflects the fact that the surface area for infiltration testing would include only the horizontal surface while the percolation test includes both the bottom surface area and the sidewalls of the test hole. However, there is a relationship between the values obtained by a percolation test and infiltration rate. Based on the [1]"Porchet Method", the following equation may be used to convert percolation rates to the tested infiltration rate, I_t:

$$I_t = \frac{\Delta H\, \pi r^2 60}{\Delta t(\pi r^2 + 2\pi r H_{avg})} = \frac{\Delta H\, 60\, r}{\Delta t(r + 2H_{avg})}$$

Where:

I_t = tested infiltration rate, inches/hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
r = effective radius of test hole
H_{avg} = average head over the time interval, inches

Attachment 6

Memo regarding
Confidential Archaeological Resources Report

COUNTY OF SANTA CRUZ | Planning Department

CONFIDENTIAL MEMORANDUM

Date: March 21, 2024

To: 221332 Project File

From: Evan Ditmars

Re: Cultural Resources

The following represents a summary of the findings of the Archaeological Resource Management Report, dated February 2023, for application 221332 was prepared by Brehn Erskine of Archaeological Resource Service (ARS).

The report included a review previously recorded historic or prehistoric cultural resources available as in-office information, a review of the Regional Office of the California Historical Resources Information System, a check of appropriate historic references to determine the potential for historic era archaeological deposits, Contact with the Native American Heritage Commission to determine the presence or absence of listed Sacred Lands within the project area, contact with all appropriate Native American organizations or individuals designated by the Native American Heritage Commission as interested parties for the project area, and a surface reconnaissance of all accessible parts of the project area to locate any visible signs of potentially significant historic or prehistoric cultural deposits.

It was determined that there were historic locations within 1-mile of the project site, but the resources did not have a direct relation to the project site and would not be impacted by the proposed development. Review of the six historic resource studies which had been prepared for nearby sites resulted in a determination that those resources would not be affected by the proposed development.

The cultural resource evaluation of the project resulted in a negative finding, and no artifacts or potentially significant cultural features were observed. The report recommends no further archaeological subsurface testing or monitoring.

The site returned positive for Sacred Sites as part of a check with the Native American Heritage Commission's inventory, and in subsequent contact with tribal representatives, ARS received a letter from the Indian Canyon Band of Costanoan Ohlone People indicating that the project area is near a potentially eligible cultural site, and indicated that they would be interested in consulting and voicing their concerns regarding this project, and that they "recommend that a Native American Monitor and an Archaeologist be present on-site at all times during any/all ground disturbing activities."

The Archaeological Report will be retained confidentially on-file with the Planning Department.

Attachment 7

Arborist Report

Tree Inventory, Assessment, and Protection Report

7300 Laurel Road, Los Gatos, CA 95033

Prepared for:

Karen Munshi

February 27, 2023

Prepared By:

Monarch Consulting Arborists

Richard Gessner
P.O. Box 1010 - Felton, CA 95018
1 831 331 8982
www.monarcharborists.com

Table of Content

Summary

The plans are to construct a new winery and tasting room. The inventory contains fourteen trees comprised of three different species (one madrone, twelve coast redwood, one tanoak). Ten trees are in good condition and four fair. Five trees have good suitability, three fair, and are six poorly suited for retention within the context of construction in the area.

The trees closest to the proposed plans that could be impacted are as follows:

- **#1:** Limits of grading two (2') feet from #1 retaining wall about ten (10') feet
- **#8:** limits of grading five (5') feet and retaining wall and structure about 8-10 feet
- **#9:** Limits of grading seven (7') feet and retaining wall about fifteen (15') feet.

All the trees highly impacted have encroachment within six times their trunk diameter distance in radius (ft.). The most significant encroachment is around tree #1 which would typically require a zone of no disturbance of approximately 27 feet. The encroachment around trees #8 and #9 could be managed to some extent with tree protection or minor plan alterations (limits of grading). It would be prudent to remove tree #1, which is more likely to sustain structural damage to the roots compromising its integrity in an attempt to retain it, and it has poor suitability for retention within a construction context.

The tree could meet the findings for removal as indicated in subsections "b" and "d".

Tree protection for this project would include fence at the limits of grading to exclude equipment and personnel from the root zones of the trees retained. Trees #8 and #9 (not "Significant" trees) if retained should be monitored during initial site work to prevent unnecessary damage. Best practices would include staking the grading limits and placing chain link fence adjacent to the trees prior to equipment arriving.

Introduction

Background

Karen Munshi asked me to assess the site, trees, and proposed footprint plan, and to provide a report with my findings and recommendations to help satisfy planning requirements.

Assignment

- Provide an arborist's report including an assessment of the trees within the project area and on the adjacent sites. The assessment is to include the species, size (trunk diameter), condition (health, structure, and form), and suitability for preservation ratings..
- Provide tree protection specifications, guidelines, and impact ratings for those affected by the project.

Limits of the assignment

- The information in this report is limited to the condition of the trees during my inspection on February 8, 2023. No tree risk assessments were performed.
- Tree heights and canopy diameters are estimates.The plans reviewed for this assignment were as follows (Table 1)

Table 1: Plans Reviewed Checklist

Plan	Date	Sheet	Reviewed	Source
Existing Site Topographic			No	
Proposed Site Plan	11/23/22	C3	Yes	Sherwood Design Engineers
Erosion Control			No	
Grading and Drainage	11/23/22	C3	Yes	Sherwood Design Engineers
Utility Plan and Hook-up locations			No	
Exterior Elevations			No	
Landscape Plan			No	
Irrigation Plan			No	
T-1 Tree Protection Plan			No	

Purpose and use of the report

The report is intended to identify all the trees within the plan area that could be affected by a project. The report is to be used by the County of Santa Cruz and the property owners as a reference for existing tree conditions to help satisfy planning requirements.

Observations

Tree Inventory

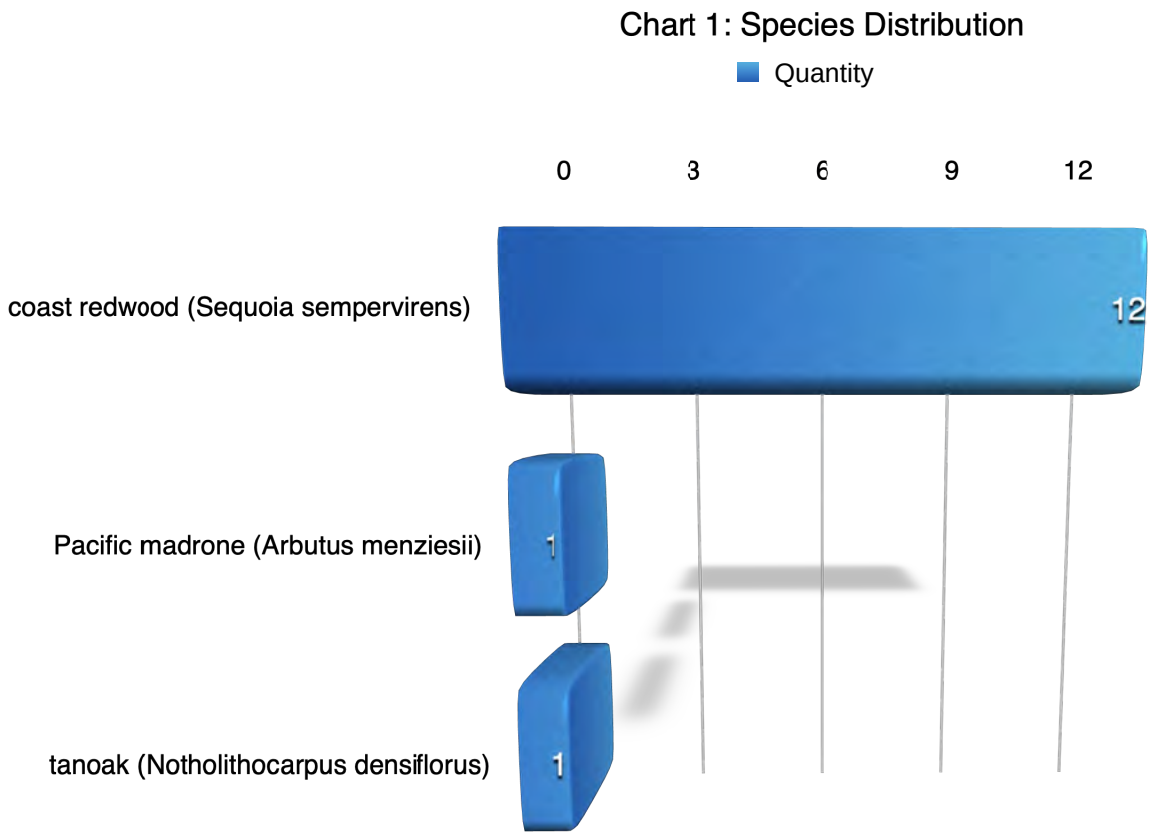
Santa Cruz County considered significant trees:

A. Outside the urban services line or rural services line, where visible from a scenic road, any beach, or within a designated scenic resource area, any tree which is equal to or greater than 40 inches d.b.h. (approximately 10 feet in circumference); any sprout clump of five or more stems, each of which is greater than 20 inches d.b.h. (approximately five feet in circumference); or, any group consisting of 10 or more trees on one parcel, each greater than 20 inches d.b.h. (approximately five feet in circumference).”

B. Outside the urban services line or rural services line, where visible from a scenic road, any beach, or within a designated scenic resource area, any tree which is equal to or greater than 40 inches d.b.h. (approximately 10 feet in circumference); any sprout clump of five or more stems, each of which is greater than 20 inches d.b.h. (approximately five feet in circumference); or, any group consisting of 10 or more trees on one parcel, each greater than 20 inches d.b.h. (approximately five feet in circumference).

C. Any tree located in a sensitive habitat as defined in Chapter 16.32 SCCC. Also see SCCC 16.34.090(C), exemption of projects with other permits.

The inventory contained fourteen trees comprised of three different species (madrone, coast redwood, tanoak (Chart 1).



Plans

The plans are to construct a new winery and tasting room.

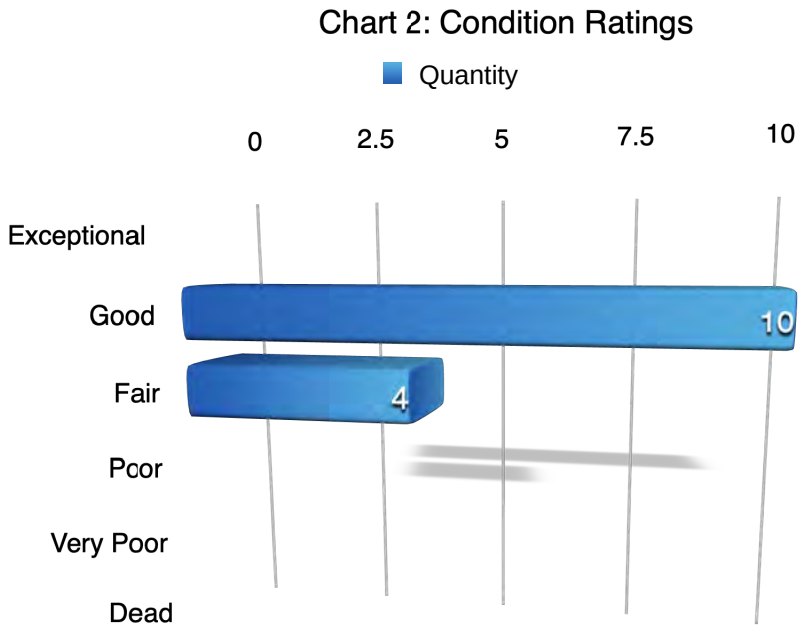
Discussion

Condition Rating

A tree's condition is a determination of its overall health, structure, and form. The assessment considered all three criteria for a combined condition rating.

- 100% - Exceptional = Good health and structure with significant size, location or quality.
- 61-80% - Good = Normal vigor, well-developed structure, function and aesthetics not compromised with good longevity for the site.
- 41-60 % - Fair = Reduced vigor, damage, dieback, or pest problems, at least one significant structural problem or multiple moderate defects requiring treatment. Major asymmetry or deviation from the species normal habit, function and aesthetics compromised.
- 21-40% - Poor = Unhealthy and declining appearance with poor vigor, abnormal foliar color, size or density with potential irreversible decline. One serious structural defect or multiple significant defects that cannot be corrected and failure may occur at any time. Significant asymmetry and compromised aesthetics and intended use.
- 6-20% - Very Poor = Poor vigor and dying with little foliage in irreversible decline. Severe defects with the likelihood of failure being probable or imminent. Aesthetically poor with little or no function in the landscape.
- 0-5% - Dead/Unstable = Dead or imminently ready to fail.

Ten trees are in good condition and four fair, including tree #1 which is the largest in the assessment (Chart 2). Tree #1 is one of three coast redwood considered "significant" based on the ordinance and has poor architecture. The tree has two trunks or codominant stems which is a known and well studied structural defect. Although the tree's overall condition is fair it does have poor structure.

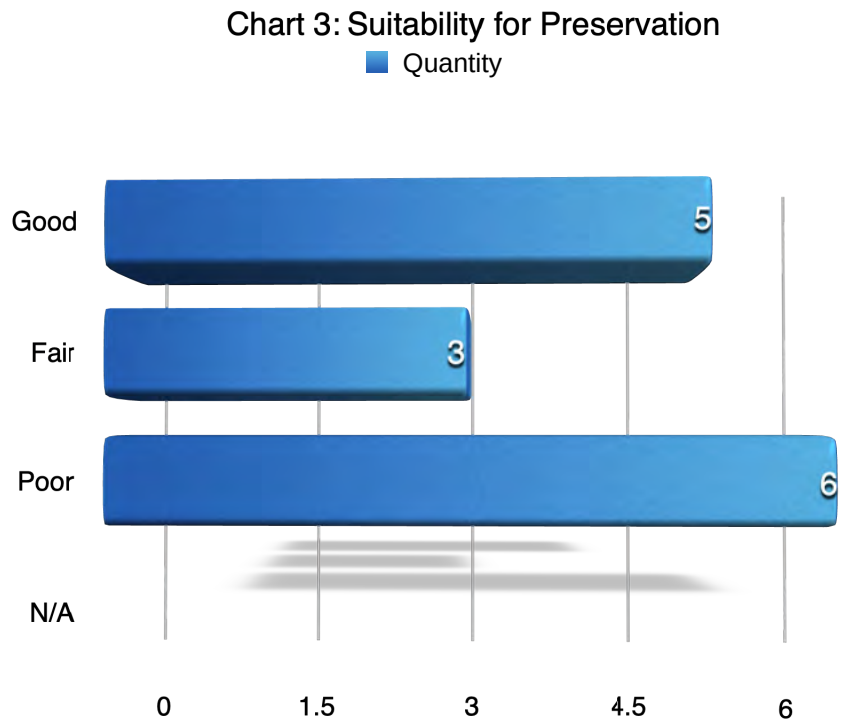


Suitability for Preservation

A tree's suitability for preservation is determined based on Functional and External Limitations[1] (ISA, 2019).

- Good = Trees with good health, structural stability and longevity.
- Fair = Trees with fair health and/or structural defects that may be mitigated through treatment. These trees require more intense management and monitoring, and may have shorter life spans than those in the good category.
- Poor = Trees in poor health with significant structural defects that cannot be mitigated and will continue to decline regardless of treatment. The species or individual may possess characteristics that are incompatible or undesirable in landscape settings or unsuited for the intended use of the site.

I considered six trees to be poorly suited for preservation and include tree #1 which has codominant stems and is directly adjacent to proposed excavations. The remaining trees with fair or poor suitability include the tanoak and the small redwoods directly adjacent to the proposed construction. Only tree #1 has a trunk diameter greater than 40 inches. Five trees have good suitability, three fair, and are six poorly suited for retention within the context of construction in the area (Chart 3).



[1] Functional Limitations are based on factors associated with the tree's interaction to its planting site affecting plant condition, limiting plant development, or reducing the utility in the future and include genetics, placement, and site conditions for the individual tree (ISA, 2019). External Limitations are outside the property, out of control of the owner and also affect plant condition, limit plant development, or reduce the utility in the future (i.e power lines, municipal restrictions, drought adaptations, or species susceptibility to pests) (ISA, 2019).

Expected Impact Level

Impact level defines how a tree may be affected by construction activity and proximity to the tree, and is described as low, moderate, or high. The following scale defines the impact rating:

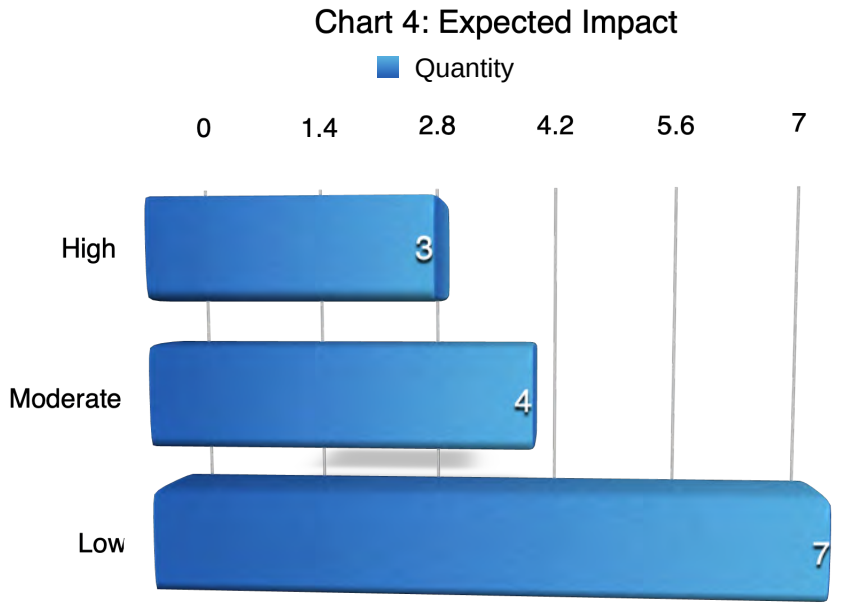
- Low = The construction activity will have little influence on the tree.
- Moderate = The construction may cause future health or structural problems, and steps must be taken to protect the tree to reduce future problems.
- High = Tree structure and health will be compromised and removal is recommended, or other actions must be taken for the tree to remain. The tree is located in the building envelope.

The trees closest to the proposed plans that could be impacted are as follows:

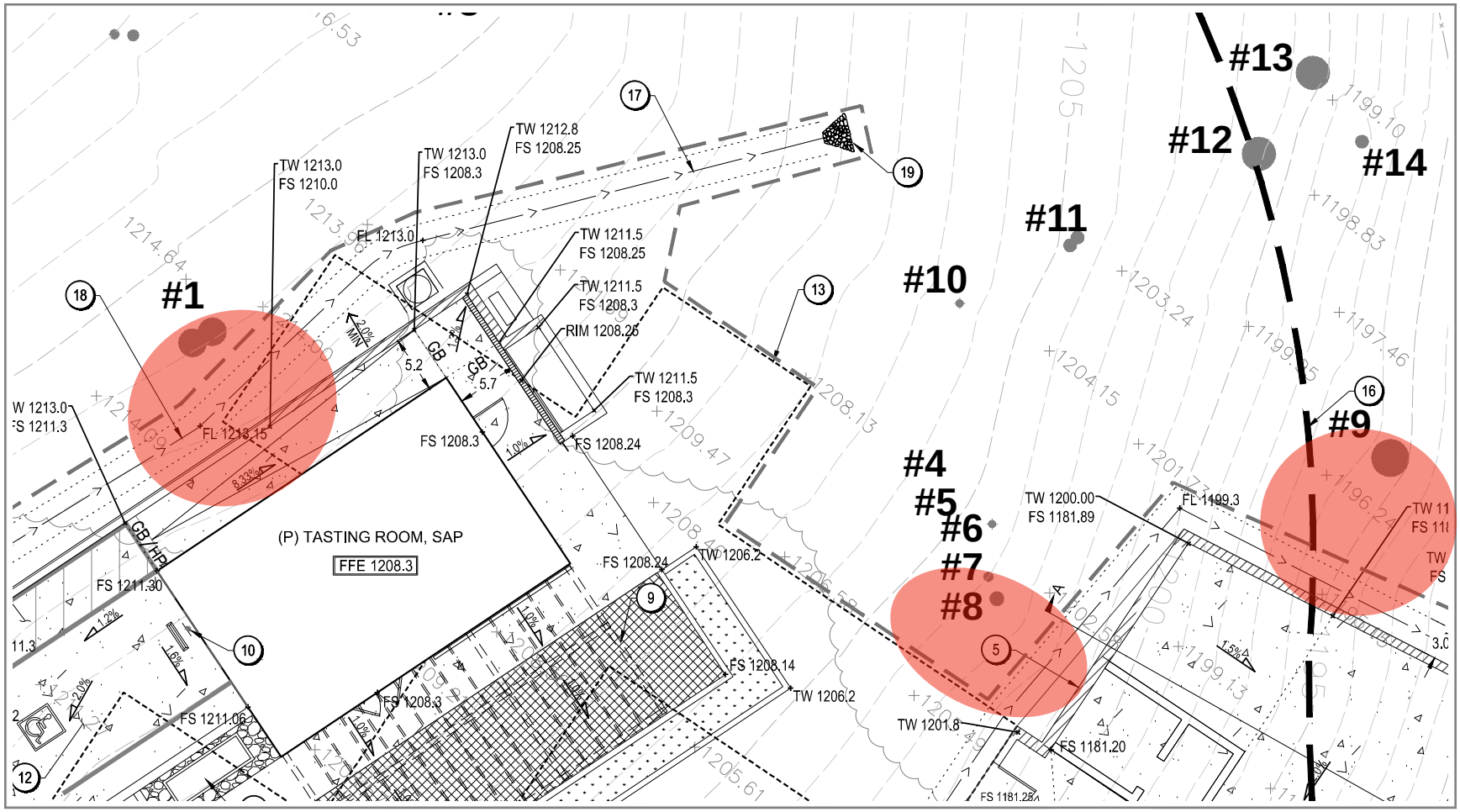
- **#1:** Limits of grading two (2') feet from #1 retaining wall about ten (10') feet
- **#8:** limits of grading five (5') feet and retaining wall and structure about 8-10 feet
- **#9:** Limits of grading seven (7') feet and retaining wall about fifteen (15') feet.

All the trees highly impacted have encroachment within six times their trunk diameter distance in radius (ft.). The most significant encroachment is around tree #1 which would typically require a zone of no disturbance of approximately 27 feet. The encroachment around trees #8 and #9 could be managed to some extent with tree protection or minor plan alterations. It would be prudent to remove tree #1, which is more likely to sustain structural damage to the roots compromising its integrity in an attempt to retain it.

Three trees will be highly impacted, one of which (#1) has a trunk diameter greater that 40 inches and is considered "Significant", four moderate, and the remaining seven are not expected to be affected (Chart 4).



The image below indicates the trees most likely affected with red ovals around them (Image 1).



County Findings for Removal

One or more of the following "Findings" need to be made by County staff in order to approve an application request.

a. That the significant tree is dead or is likely to promote the spread of insects or disease.
b. That removal is necessary to protect health, safety, and welfare.
c. That removal of a non-native tree is part of a plan approved by the County to restore native vegetation and landscaping to an area.
d. That removal will not involve a risk of adverse environmental impacts such as degrading scenic resources.
e. That removal is necessary for operation of active or passive solar facilities, and that mitigation of visual impacts will be provided.
f. That removal is necessary in conjunction with another permit to allow the property owner an economic use of the property consistent with the land use designation of the Local Coastal Program Land Use Plan.
g. That removal is part of a project involving selective harvesting for the purpose of enhancing the visual qualities of the landscape or for opening up the display of important views from public places
h. That removal is necessary for new or existing agricultural purposes consistent with other county policies and that mitigation of visual impacts will be provided. Also see Section 16.34.090(d), exemption of tree crops.

Tree #1 could meet the findings for removal as indicated in subsections “b” due to compromised structure and “d” since the property contains a significant amount of trees including all those found naturally in the Santa Cruz Mountains, and the site is not visible to the public.

Tree Protection

Typically there are three different tree protection schemes which are called Type I (Appendix D1), Type II and Type III (Appendix D2) trunk protection only. Tree protection focuses on avoiding damage to the roots, trunk, or scaffold branches (Appendix D). The most current accepted method for determining the TPZ is to use a formula based on species tolerance, tree age/vigor, and trunk diameter (Matheny, N. and Clark, J. 1998) (Fite, K, and Smiley, E. T., 2016). Preventing mechanical damage to the trunk from equipment or hand tools can be accomplished by wrapping the main stem with straw wattle or using vertical timbers (Appendix D).

Tree protection for this project would include fence at the limits of grading to exclude equipment and personnel from the root zones of the trees retained. Trees #8 and #9 if retained should be monitored during initial site work to prevent unnecessary damage. Best practices would include staking the grading limits and placing chain link fence adjacent to the trees prior to equipment arriving.

Conclusion

The plans are to construct a new winery and tasting room. The inventory contained fourteen trees comprised of three different species (madrone, coast redwood, tanoak). Ten trees are in good condition and four fair. Tree #1 is one of three coast redwood considered “Significant” based on the ordinance and has poor architecture. The tree has two trunks or codominant stems which is a known and well studied structural defect. Although the tree’s overall condition is fair it does have poor structure. I considered six trees to be poorly suited for preservation and include tree #1 directly adjacent to proposed excavations. The remaining trees with fair or poor suitability include the tanoak and the small redwoods directly adjacent to the proposed construction. Five trees have good suitability, three fair, and are six poorly suited for retention within the context of construction in the area.

The trees closest to the proposed plans that could be impacted are as follows:

- **#1:** Limits of grading two (2’) feet from #1 retaining wall about ten (10’) feet
- **#8:** limits of grading five (5’) feet and retaining wall and structure about 8-10 feet
- **#9:** Limits of grading seven (7’) feet and retaining wall about fifteen (15’) feet.

All the trees highly impacted have encroachment within six times their trunk diameter distance in radius (ft.). The most significant encroachment is around tree #1 which would typically require a zone of no disturbance of approximately 27 feet. The encroachment around trees #8 and #9 could be managed to some extent with tree protection or minor plan alterations (limits of grading). It would be prudent to remove tree #1, which is more likely to sustain structural damage to the roots compromising its integrity in an attempt to retain it, and due to poor structure is poorly suited for retention. Overall three trees will be highly impacted, one of which has a trunk diameter greater that 40 inches (#1), four moderate, and the remaining seven are not expected to be affected.

Tree #1 could meet the findings for removal as indicated in subsections “b” due to compromised structure and “d” since the property contains a significant amount of trees including all those found naturally in the Santa Cruz Mountains, and the site is not visible to the public.

Tree protection for this project would include fence at the limits of grading to exclude equipment and personnel from the root zones of the trees retained. Trees #8 and #9 if retained should be monitored during initial site work to prevent unnecessary damage. Best practices would include staking the grading limits and placing chain link fence adjacent to the trees prior to equipment arriving.

Recommendations

1. Place tree numbers on all the plans including the Grading and Drainage plans.

2. Obtain the necessary permits and remove tree #1.

3. Place tree protection fence along the limits of grading adjacent to tree #2 through #9. Monitor the excavation around trees #8 and #9.

4. Install temporary irrigation or soaker hoses in all tree protection zones and provide supplemental watering during construction within all TPZ areas. Infrequent deeper watering is preferred.

5. All tree maintenance and care shall be performed by a qualified arborist with a C-61/D-49 California Contractors License. Tree maintenance and care shall be specified in writing according to American National Standard for Tree Care Operations: *Tree, Shrub and Other Woody Plant Management: Standard Practices* parts 1 through 10 and adhere to ANSI Z133.1 safety standards and local regulations. All maintenance is to be performed according to ISA Best Management Practices.

6. Refer to Appendix D for general tree protection guidelines including recommendations for arborist assistance while working under trees, trenching, or excavation within a trees drip line or designated TPZ/CRZ.

7. Place all the tree protection fence locations and guidelines on the plans including the grading, drainage, and utility plans. Create a separate plan sheet that includes all three protection measures labeled “T-1 Tree Protection Plan.”

8. Provide a copy of this report to all contractors and project managers, including the architect, civil engineer, and landscape designer or architect. It is the responsibility of the owner to ensure all parties are familiar with this document.

9. Arrange a pre-construction meeting with the project arborist or landscape architect to verify tree protection is in place, with the correct materials, and at the proper distances.

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Matheny, Nelda P., Clark, James R. Trees and development: A technical guide to preservation of trees during land development. Bedminster, PA: International Society of Arboriculture 1998.

Smiley, E, Matheny, N, Lilly, S, ISA. *Best Management Practices: Tree Risk Assessment:* International Society of Arboriculture, 2017. Print

Glossary of Terms

Basic Tree Cost: The cost of replacement for a perfect specimen of a particular species and cross sectional area prior to location and condition depreciation.

Cost Approach: An indication of value by adding the land value to the depreciated value of improvements.

Defect: An imperfection, weakness, or lack of something necessary. In trees defects are injuries, growth patterns, decay, or other conditions that reduce the tree's structural strength.

Diameter at breast height (DBH): Measures at 1.4 meters (4.5 feet) above ground in the United States, Australia (arboriculture), New Zealand, and when using the Guide for Plant Appraisal, 9th edition; at 1.3 meters (4.3 feet) above ground in Australia (forestry), Canada, the European Union, and in UK forestry; and at 1.5 meters (5 feet) above ground in UK arboriculture.

Drip Line: Imaginary line defined by the branch spread or a single plant or group of plants. The outer extent of the tree crown.

Form: describes a plant's habit, shape or silhouette defined by its genetics, environment, or management.

Health: Assessment is based on the overall appearance of the tree, its leaf and twig growth, and the presence and severity of insects or disease.

Mechanical damage: Physical damage caused by outside forces such as cutting, chopping or any mechanized device that may strike the tree trunk, roots or branches.

Scaffold branches: Permanent or structural branches that for the scaffold architecture or structure of a tree.

Straw wattle: also known as straw worms, bio-logs, straw noodles, or straw tubes are man made cylinders of compressed, weed free straw (wheat or rice), 8 to 12 inches in diameter and 20 to 25 feet long. They are encased in jute, nylon, or other photo degradable materials,
and have an average weight of 35 pounds.

Structural evaluation: focused on the crown, trunk, trunk flare, above ground roots and the site conditions contributing to conditions and/or defects that may contribute to failure.

Tree Protection Zone (TPZ): Defined area within which certain activities are prohibited or restricted to prevent or minimize potential injury to designated trees, especially during construction or development.

Tree Risk Assessment: Process of evaluating what unexpected things could happen, how likely it is, and what the likely outcomes are. In tree management, the systematic process to determine the level of risk posed by a tree, tree part, or group of trees.

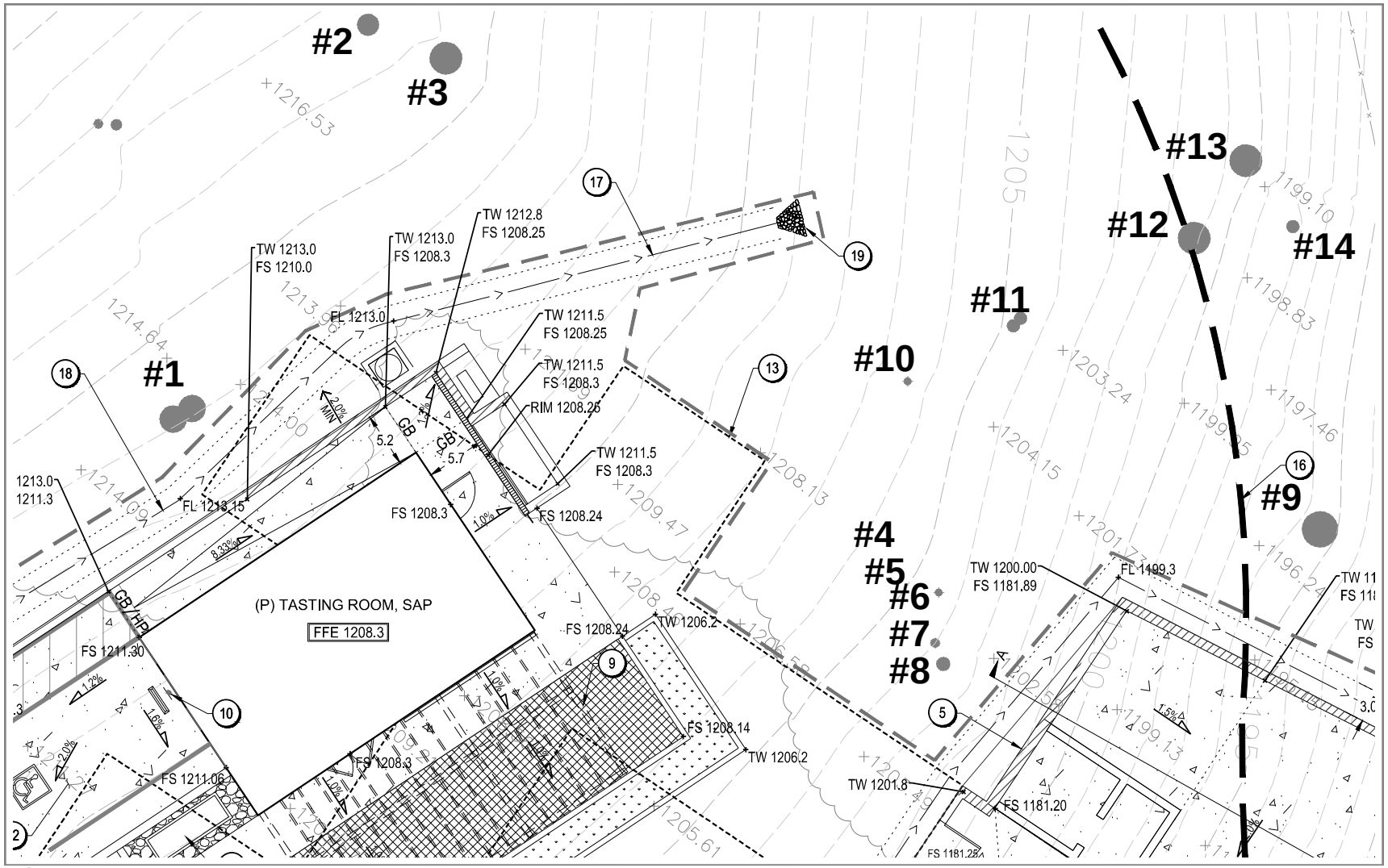
Trunk: Stem of a tree.

Trunk Formula Technique: Method to appraise the monetary value of trees considered too large to be replaced with nursery or field grown stock. Based on developing a representative unit cost for replacement with the same or comparable species of the same size and in the same place, subject to depreciation for various factors. Contrast with replacement cost method.

Volunteer: A tree, not planted by human hands, that begins to grow on residential or commercial property. Unlike trees that are brought in and installed on property, volunteer trees usually spring up on their own from seeds placed onto the ground by natural causes or accidental transport by people. Normally, volunteer trees are considered weeds and removed, but many desirable and attractive specimens have gone on to become permanent residents on many public and private grounds.

Appendix A: Tree Inventory Map and Site Plan

A1: Grading and Drainage Plan With Tree Number



Appendix B: Tree Inventory and Assessment Tables

Table 3: Inventory and Assessment Summary

Tree Species	I.D. #	Trunk Diameter (in.)	~ Canopy Diameter (ft.)	Condition	Suitability	Expected Impact	Protection Status
coast redwood (*Sequoia sempervirens*)	1	55	45	Fair	Poor	High	Significant
coast redwood (*Sequoia sempervirens*)	2	27	30	Fair	Fair	Low	N/A
coast redwood (*Sequoia sempervirens*)	3	17	30	Fair	Fair	Low	N/A
coast redwood (*Sequoia sempervirens*)	4	7	20	Good	Poor	Moderate	N/A
coast redwood (*Sequoia sempervirens*)	5	9	20	Good	Poor	Moderate	N/A
coast redwood (*Sequoia sempervirens*)	6	10	20	Good	Poor	Moderate	N/A
coast redwood (*Sequoia sempervirens*)	7	16	20	Good	Poor	Moderate	N/A
coast redwood (*Sequoia sempervirens*)	8	16	20	Good	Good	High	N/A
coast redwood (*Sequoia sempervirens*)	9	27	35	Good	Good	High	N/A
coast redwood (*Sequoia sempervirens*)	10	8	20	Good	Good	Low	N/A
Pacific madrone (*Arbutus menziesii*)	11	12, 14	20	Fair	Fair	Low	N/A

Tree Species	I.D. #	Trunk Diameter (in.)	~ Canopy Diameter (ft.)	Condition	Suitability	Expected Impact	Protection Status
coast redwood (*Sequoia sempervirens*)	12	48	45	Good	Good	Low	Significant
coast redwood (*Sequoia sempervirens*)	13	43	45	Good	Good	Low	Significant
tanoak (*Notholithocarpus densiflorus*)	14	18	30	Good	Poor	Low	N/A

Appendix C: Photographs

C1: Tree #1

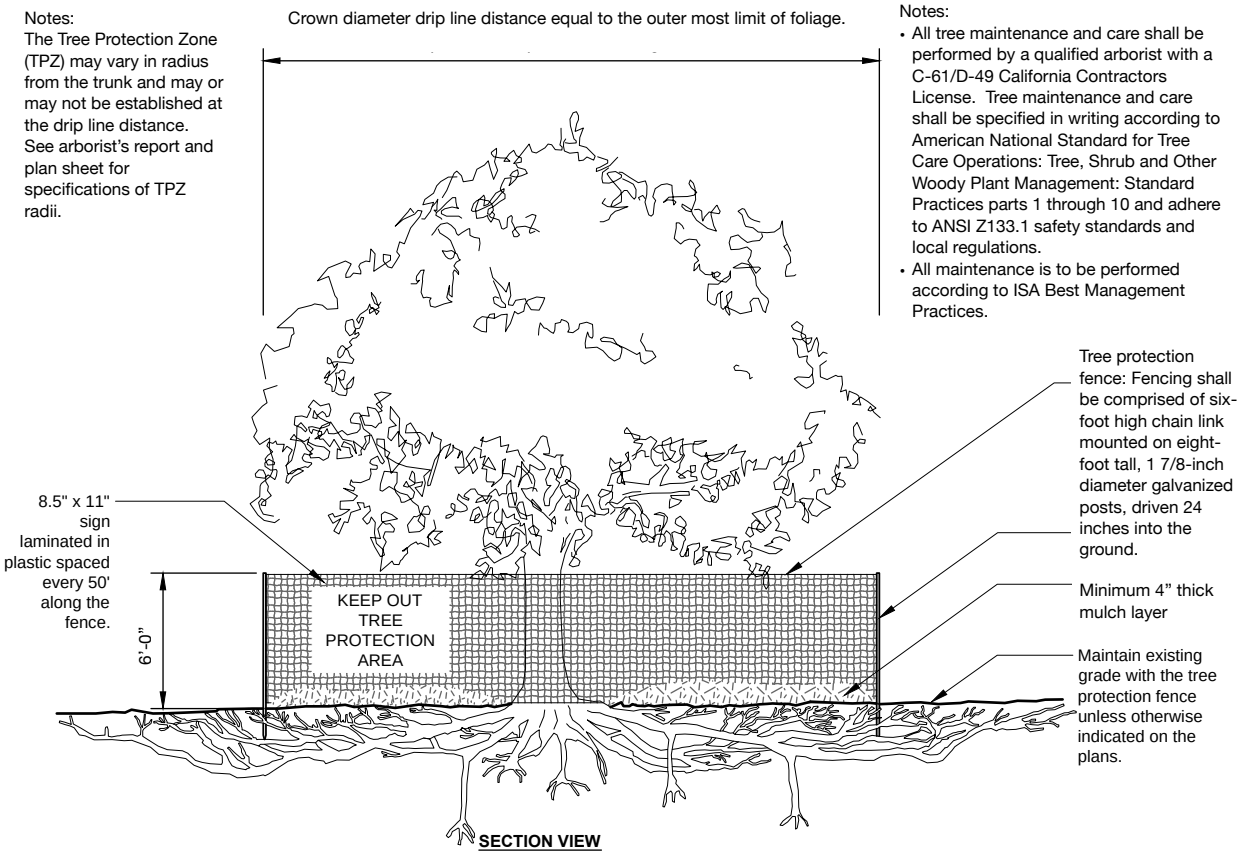
C2: Trees #4 through #8

C3: Tree #9

C5: Area of proposed construction

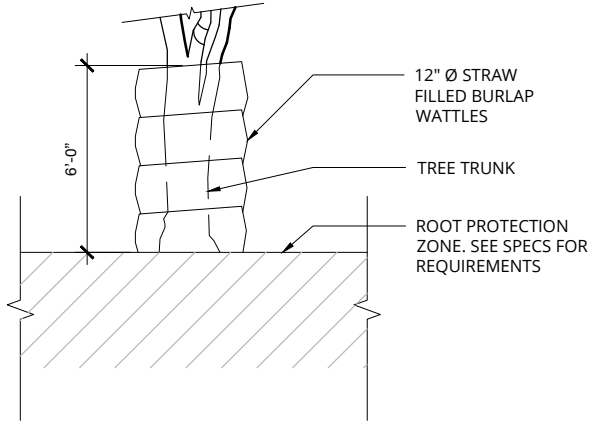
Appendix D: Tree Protection Guidelines

D1: Plan Sheet Detail S-X (Type I)



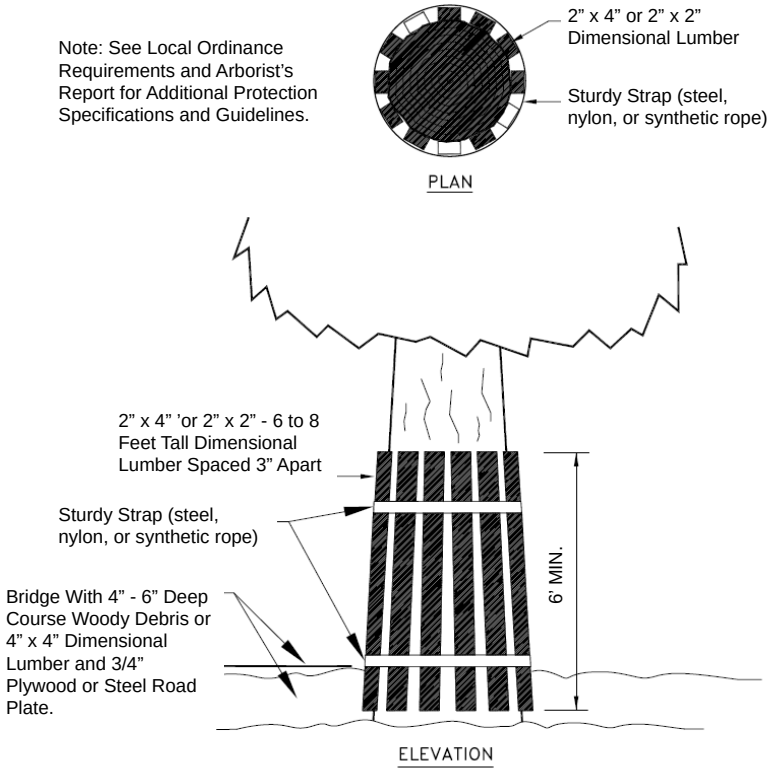
S-X TREE PROTECTION

D2: Plan Sheet Detail S-Y (Type III)



SECTION VIEW

S-Y TRUNK PROTECTION WITH WATTLE



Trunk Protection Vertical Timber Detail

16.34.105 Violations.

A. It shall be unlawful for any person to do, cause, permit, aid, abet or furnish equipment or labor to remove, cut down, trim more than one-third of the foliage of, poison, or otherwise kill or destroy any significant tree as defined in SCCC 16.34.030 within the Coastal Zone unless: (1) a development permit has been obtained and is in effect which authorizes such activity; or (2) the activity is exempt from the requirement for such a permit by reason of the provisions of SCCC 16.34.090; or (3) there was an emergency caused by the hazardous or dangerous condition of the tree which required the action to be taken immediately for the safety of life or property.
B. It shall be unlawful for any person to exercise any development permit which authorizes actions affecting significant trees without complying with all of the conditions of such permit. [Ord. 3451-A § 24, 1983].

Pre-Construction Meeting with the Project Arborist

Tree protection locations should be marked before any fencing contractor arrives.

Prior to beginning work, all contractors involved with the project should attend a pre construction meeting with the project arborist to review the tree protection guidelines. Access routes, storage areas, and work procedures will be discussed.

Tree Protection Zones and Fence Specifications

Tree protection fence should be established prior to the arrival of construction equipment or materials on site. Fence should be comprised of six-foot high chain link fence mounted on eight-foot tall, 1 7/8-inch diameter galvanized posts, driven 24 inches into the ground and spaced no more than 10 feet apart. Once established, the fence must remain undisturbed and be maintained throughout the construction process until final inspection.

The fence should be maintained throughout the site during the construction period and should be inspected periodically for damage and proper functions. Fence should be repaired, as necessary, to provide a physical barrier from construction activities.

Prohibited Activities

The following are prohibited activities within the TPZ:

- Grade changes (e.g. soil cuts, fills);
- Trenches;
- Root cuts;
- Pedestrian and equipment traffic that could compact the soil or physically damage roots;
- Parking vehicles or equipment;
- Burning of brush and woody debris;
- Storing soil, construction materials, petroleum products, water, or building refuse; and,
- Disposing of wash water, fuel or other potentially damaging liquids.

Monitoring

Any trenching, construction or demolition that is expected to damage or encounter tree roots should be monitored by the project arborist or a qualified ISA Certified Arborist and should be documented.

The site should be evaluated by the project arborist or a qualified ISA Certified Arborist after construction is complete, and any necessary remedial work that needs to be performed should be noted.

Root Pruning

Roots greater than two inches in diameter shall not be cut. When roots over two inches in diameter are encountered and are authorized to be cut or removed, they should be pruned by hand with loppers, handsaw, reciprocating saw, or chain saw rather than left crushed or torn. Roots should be cut beyond sinker roots or outside root branch junctions and be supervised by the project arborist. When completed, exposed roots should be kept moist with burlap or backfilled within one hour.

Boring or Tunneling

Boring machines should be set up outside the drip line or established Tree Protection Zone. Boring may also be performed by digging a trench on both sides of the tree until roots one inch in diameter are encountered and then hand dug or excavated with an Air Spade® or similar air or water excavation tool. Bore holes should be adjacent to the trunk and never go directly under the main stem to avoid oblique (heart) roots. Bore holes should be a minimum of three feet deep.

Tree Pruning and Removal Operations

All tree pruning or removals should be performed by a qualified arborist with a C-61/D-49 California Contractors License. Treatment, including pruning, shall be specified in writing according to the most recent ANSI A-300A Standards and Limitations and performed according to ISA Best Management Practices while adhering to ANSI Z133.1 safety standards. Trees that need to be removed or pruned should be identified in the pre-construction walk through.

Appendix E: Tree Protection Signs

E1: English

WARNING
Tree Protection Zone

This Fence Shall not be moved without approval. Only authorized personnel may enter this area!

Project Arborist

E2: Spanish

CUIDADO
Zona De Arbol Pretejido

Esta cerca no sera removida sin aprobacion. Solo personal autorizado entrara en esta area!

Project Arborist

Qualifications, Assumptions, and Limiting Conditions

Any legal description provided to the consultant is assumed to be correct. Any titles or ownership of properties are assumed to be good and marketable. All property is appraised or evaluated as though free and clear, under responsible ownership and competent management.

All property is presumed to be in conformance with applicable codes, ordinances, statutes, or other regulations.

Care has been taken to obtain information from reliable sources. However, the consultant cannot be responsible for the accuracy of information provided by others.

The consultant shall not be required to give testimony or attend meetings, hearings, conferences, mediations, arbitration, or trials by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services.

This report and any appraisal value expressed herein represent the opinion of the consultant, and the consultant’s fee is not contingent upon the reporting of a specified appraisal value, a stipulated result, or the occurrence of a subsequent event.

Sketches, drawings, and photographs in this report are intended for use as visual aids, are not necessarily to scale, and should not be construed as engineering or architectural reports or surveys. The reproduction of information generated by architects, engineers, or other consultants on any sketches, drawings, or photographs is only for coordination and ease of reference. Inclusion of said information with any drawings or other documents does not constitute a representation as to the sufficiency or accuracy of said information.

Unless otherwise expressed: a) this report covers only examined items and their condition at the time of inspection; and b) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that structural problems or deficiencies of plants or property may not arise in the future.

Certification of Performance

I Richard Gessner, Certify:

That I have personally inspected the tree(s) and/or the property referred to in this report, and have stated my findings accurately. The extent of the evaluation and/or appraisal is stated in the attached report and Terms of Assignment;

That I have no current or prospective interest in the vegetation or the property that is the subject of this report, and I have no personal interest or bias with respect to the parties involved;

That the analysis, opinions and conclusions stated herein are my own;

That my analysis, opinions, and conclusions were developed and this report has been prepared according to commonly accepted Arboricultural practices;

That no one provided significant professional assistance to the consultant, except as indicated within the report.

That my compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party, nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any other subsequent events;

I further certify that I am a Registered Consulting Arborist® with the American Society of Consulting Arborists, and that I acknowledge, accept and adhere to the ASCA Standards of Professional Practice. I am an International Society of Arboriculture Board Certified Master Arborist®. I have been involved with the practice of Arboriculture and the care and study of trees since 1998.

Richard J. Gessner

ASCA Registered Consulting Arborist® #496
ISA Board Certified Master Arborist® WE-4341B

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