County of Santa Cruz

PLANNING DEPARTMENT
701 Ocean Street, 4th Floor, Santa Cruz, CA 95060
(831) 454-2580 Fax: (831) 454-2131
KATHLEEN MOLLOY, PLANNING DIRECTOR
www.sccoplanning.com

NOTICE OF INTENT TO ADOPT A MITIGATED NEGATIVE DECLARATION

NOTICE OF PUBLIC REVIEW AND COMMENT PERIOD

Pursuant to the California Environmental Quality Act, the following project has been reviewed by the County Environmental Coordinator to determine if it has a potential to create significant impacts to the environment and, if so, how such impacts could be solved. A Negative Declaration is prepared in cases where the project is determined not to have any significant environmental impacts. Either a Mitigated Negative Declaration or Environmental Impact Report (EIR) is prepared for projects that may result in a significant impact to the environment.

Public review periods are provided for these Environmental Determinations according to the requirements of the County Environmental Review Guidelines. The environmental document is available for review at the County Planning Department located at 701 Ocean Street, in Santa Cruz. You may also view the environmental document on the web at www.sccoplanning.com under the Planning Department menu. If you have questions or comments about this Notice of Intent, please contact Matt Johnston of the Environmental Review staff at (831) 454-5357.

The County of Santa Cruz does not discriminate on the basis of disability, and no person shall, by reason of a disability, be denied the benefits of its services, programs or activities. If you require special assistance in order to review this information, please contact Bernice Shawver at (831) 454-3137 to make arrangements.

PROJECT: Oakmont Senior Living **APP #: 191031** **APN: 037-191-14 & 037-191-15**

PROJECT DESCRIPTION: This is a proposal to demolish an existing church (Inner Light Ministries) and associated structures and construct a new 85,447 square foot three-story assisted living facility with 82 units (89 beds) and transfer approximately 20,000 square feet of land from APN: 037-191-15 to 037-191-14. Project requires a Commercial Development Permit, Lot Line Adjustment, and Riparian Exception.

PROJECT LOCATION: The project is located on the south side of Soquel Drive within the community of Soquel in unincorporated Santa Cruz County (5630 Soquel Drive). Santa Cruz County is bounded on the north by San Mateo County, on the south by Monterey and San Benito counties, on the east by Santa Clara County, and on the south and west by the Monterey Bay and the Pacific Ocean. Santa Cruz County is bounded on the north by San Mateo County, on the south by Monterey and San Benito counties, on the east by Santa Clara County, and on the south and west by the Monterey Bay and the Pacific Ocean.

APPLICANT/OWNER: Oakmont Senior Living for Inner Light Ministries
PROJECT PLANNER: Nathan MacBeth, (831) 454-3118
EMAIL: Nathan.MacBeth@santacruzcounty.us
ACTION: Negative Declaration with Mitigations
REVIEW PERIOD: December 18, 2019 through January 16, 2020

This project will be considered at a public hearing before the Planning Commission. The time, date and location have not been set. When scheduling does occur, these items will be included in all public hearing notices for the project.

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MITIGATED NEGATIVE DECLARATION

Project: Oakmont Senior Living **APPLICATION #: 191031** **APN: 037-191-14 & 037-191-15**

Project Description: This is a proposal to demolish an existing church (Inner Light Ministries) and associated structures and construct a new 85,447 square foot three-story assisted living facility with 82 units (89 beds) and transfer approximately 20,000 square feet of land from APN: 037-191-15 to 037-191-14. Project requires a Commercial Development Permit, Lot Line Adjustment, and Riparian Exception.

Project Location: The project is located on the south side of Soquel Drive within the community of Soquel in unincorporated Santa Cruz County (5630 Soquel Drive). Santa Cruz County is bounded on the north by San Mateo County, on the south by Monterey and San Benito counties, on the east by Santa Clara County, and on the south and west by the Monterey Bay and the Pacific Ocean.

Owner: Inner Light Ministries

Applicant: Oakmont Senior Living

Staff Planner: Nathan MacBeth, (831) 454-3118

Email: Nathan.MacBeth@santacruzcounty.us

This project will be considered at a public hearing before the Planning Commission. The time, date and location have not been set. When scheduling does occur, these items will be included in all public hearing notices for the project

California Environmental Quality Act Negative Declaration Findings:

Find, that this Mitigated Negative Declaration reflects the decision-making body's independent judgment and analysis, and; that the decision-making body has reviewed and considered the information contained in this Mitigated Negative Declaration and the comments received during the public review period, and; on the basis of the whole record before the decision-making body (including this Mitigated Negative Declaration) that there is no substantial evidence that the project will have a significant effect on the environment. The expected environmental impacts of the project are documented in the attached Initial Study on file with the County of Santa Cruz Clerk of the Board located at 701 Ocean Street, 5th Floor, Santa Cruz, California.

Review Period Ends: January 16, 2020

Date:____________________________

____
MATT JOHNSTON, Environmental Coordinator
(831) 454-5357

Updated 6/29/11

County of Santa Cruz

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

Date: November 20, 2019

Application Number: 191031

Project Name: Oakmont Senior Living

Staff Planner: Nathan MacBeth

I. OVERVIEW AND ENVIRONMENTAL DETERMINATION

APPLICANT: Oakmont Senior Living

APN(s): 037-191-14 & 037-191-15

OWNER: Inner Light Ministries

SUPERVISORAL DISTRICT: First District

PROJECT LOCATION: The project is located on the south side of Soquel Drive within the community of Soquel in unincorporated Santa Cruz County. Santa Cruz County is bounded on the north by San Mateo County, on the south by Monterey and San Benito counties, on the east by Santa Clara County, and on the south and west by the Monterey Bay and the Pacific Ocean.

From the City of Santa Cruz, take Highway 1 south the Park Avenue exist, head north on Park Avenue, at Soquel Drive turn west. Property is located on the south side of Soquel Drive approximately 1/3 of a mile west of the intersection with Park Avenue (5630 Soquel Drive).

SUMMARY PROJECT DESCRIPTION:

This is a proposal to demolish and existing church (Inner Light Ministries) and associated structures and construct a new 85,447 square foot three-story assisted living facility with 82 units (89 beds) and transfer approximately 20,000 square feet of land from APN 037-191-15 to 037-191-14. Project requires a Commercial Development Permit, Lot Line Adjustment, and Riparian Exception.

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
☐ Mineral Resources
☒ Noise
☐ Population and Housing
☐ Public Services

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.*

- ☐ Cultural Resources
- ☐ Energy
- ☒ Geology and Soils
- ☐ Greenhouse Gas Emissions
- ☐ Hazards and Hazardous Materials
- ☒ Hydrology/Water Supply/Water Quality
- ☐ Land Use and Planning
- ☐ 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):

<u>Permit Type/Action</u>	<u>Agency</u>
Clean Water Act Section 404 and 401	U. S. Army Corps of Engineers (USACE) Regional Water Quality Control Board (RWQCB)

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.?*

No California Native American tribes traditionally and culturally affiliated with the area of Santa Cruz County have requested consultation pursuant to Public Resources Code section 21080.3.1.

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.

Matt Johnston

MATT JOHNSTON, Environmental Coordinator

12/13/19

Date

THE COUNTY OF SANTA CRUZ
1850

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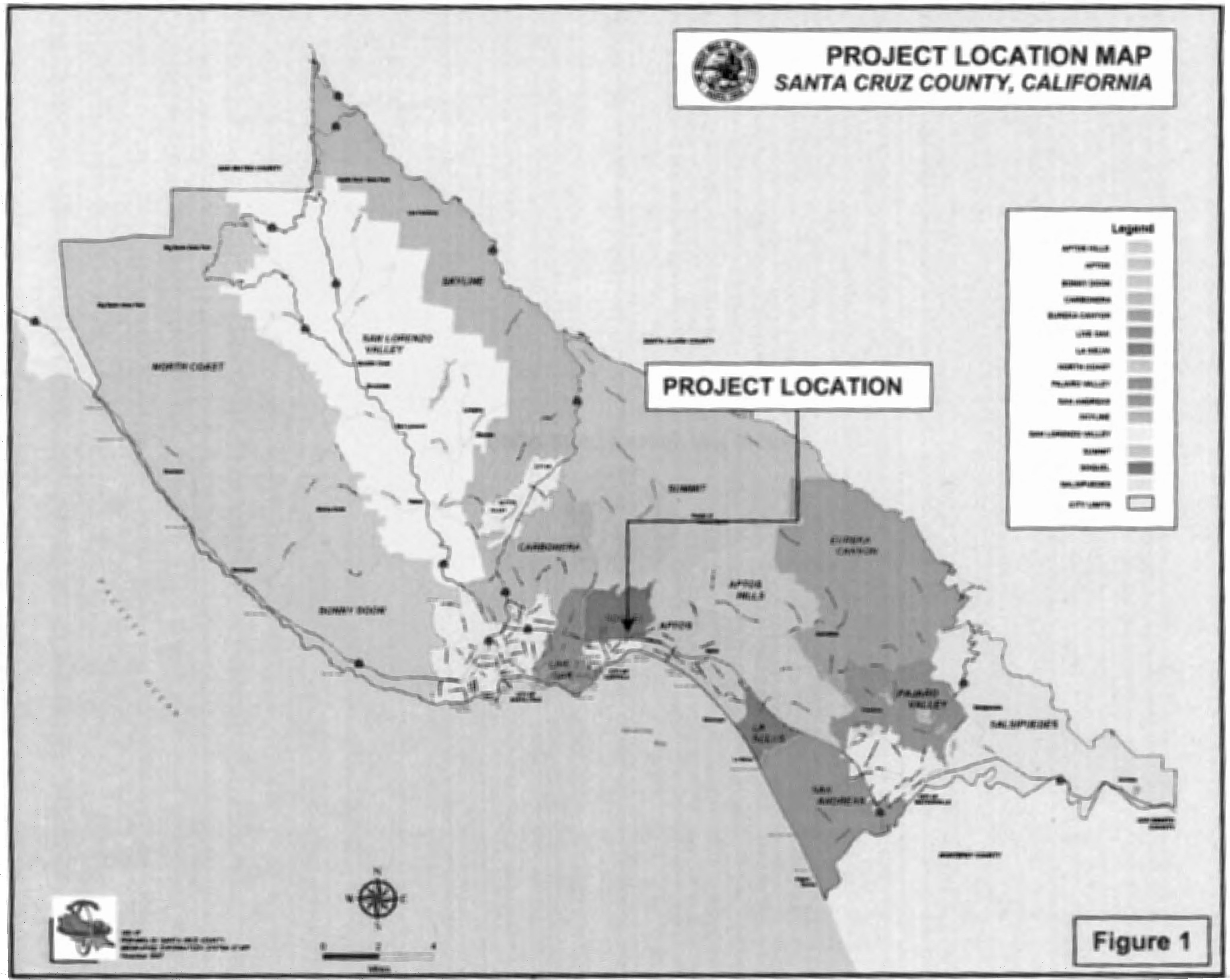
PROJECT LOCATION MAP
SANTA CRUZ COUNTY, CALIFORNIA
PROJECT LOCATION
Legend
NORTH COAST
SAN LORENZO VALLEY
SKYLINE
BONNY DOON
CARBONERA
SUMMIT
APTOS HILLS
EUREKA CANYON
APTOS
PAJARO VALLEY
SALSIPUEDES
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Figure 1

THE COUNTY OF SANTA CRUZ
1850

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Project Site Plan

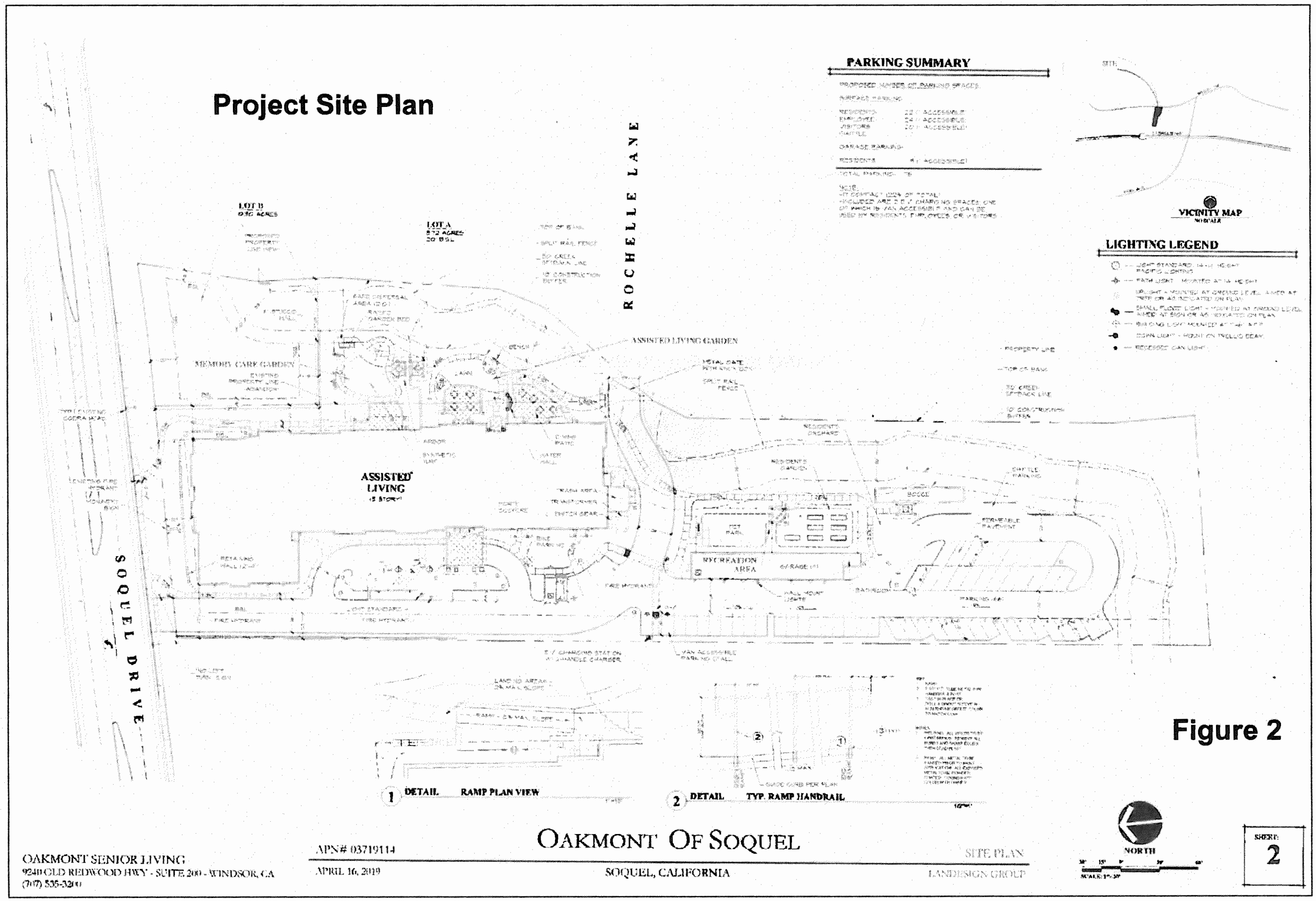

Figure 2

THE COUNTY OF SANTA CRUZ
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II. BACKGROUND INFORMATION

EXISTING SITE CONDITIONS:

Parcel Size (acres):	Approximately 3.5 Acres
Existing Land Use:	Public Facility
Vegetation:	Mixed vegetation along east and south property boundary
Slope in area affected by project:	☒ 0 - 30% ☐ 31 – 100% ☐ N/A
Nearby Watercourse:	Noble Gulch
Distance To:	Along east property line

ENVIRONMENTAL RESOURCES AND CONSTRAINTS:

Water Supply Watershed:	N/A	Fault Zone:	N/A
Groundwater Recharge:	Portion	Scenic Corridor:	Portion
Timber or Mineral:	N/A	Historic:	N/A
Agricultural Resource:	N/A	Archaeology:	N/A
Biologically Sensitive Habitat:	Mapped	Noise Constraint:	N/A
Fire Hazard:	N/A	Electric Power Lines:	Soquel Drive (overhead)
Floodplain:	N/A	Solar Access:	Full exposure
Erosion:	N/A	Solar Orientation:	South Facing
Landslide:	N/A	Hazardous Materials:	N/A
Liquefaction:	Low Potential	Other:	N/A

SERVICES:

Fire Protection:	Central Fire	Drainage District:	Flood Control District 5
School District:	Soquel Union	Project Access:	Soquel Drive & Rochelle
Sewage Disposal:	County Sanitation	Water Supply:	Soquel Creek

PLANNING POLICIES:

Zone District: Public Facilities (PF)

Special Designation: N/A

General Plan: Public Facilities (P), Urban Open Space (O-U)

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 require 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 subject property is approximately 3.5 acres in size and fronts on Soquel Drive. The parcel is developed with an existing church (Inner Light Ministries) located at the northwest portion of the property and a daycare facility located behind the church to the south. Much or the rear portion of the property remains undeveloped and is used primarily for vehicle storage. Noble Gulch stream parallels the east property boundary of the project site which is bisected by a secondary means of access (Rochelle Lane). Rochelle Lane is a privately maintained right of way which is gated at the property line. A 48-inch concrete culvert runs under Rochelle Lane and provides a downstream path for Noble Gulch.

DETAILED PROJECT DESCRIPTION:

This is a proposal to demolish an existing church and associated buildings, including daycare facility and construct a three-story 85,000 square foot assisted living facility with detached nine car garage with attached restroom and recreation area which include Alzheimer memory garden, pet park, community garden bocce ball court. Associated site improvements include accessibility improvements, site lighting, pervious parking lot containing 76 spaces, and onsite underground utilities. The project proposes to grade approximately 4,000 cubic yards of material over the project site. Eight existing trees will be removed to accommodate the proposed development and several mature oak and redwood trees will be retained and incorporated into a comprehensive landscape plan.

The project will provide a full range of assisted living services. The facility will be licensed by the State of California Department of Social Services as a Residential Care Facility for the elderly, classified as "Assisted Living". The facility will provide 24-hour onsite management and services seven days a week. Services provided would include transportation via a small bus or driver along with town car, housekeeping services, groundskeeping, and a variety of activities and meals. The facility will accommodate sixteen employees during the day and six at night.

A lot line adjustment between the adjoining property to the east (APN 037-191-15) will include a transfer of approximately 20,000 square feet to APN 037-191-14. The proposed boundary adjustment would result in two parcels of approximately .3 acres and 3.7 acres respectively. The area to be transferred is located west of an intermittent drainage located to the east of the project site.

The intermittent drainage along the eastern portion of the project site is regulated under the Clean Water Act Section 404 by U. S. Army Corps of Engineers (USACE), and Section 401 by the Regional Water Quality Control Board (RWQCB). The associated channel banks and riparian habitat are subject to regulation under the Porter-Cologne Water Quality Act as "Waters of the State", and under California Fish and Game Code Section 1602.

Any proposed development activity within areas identified as Riparian Corridor (as defined by Santa Cruz County Code Section 16.30.030) would require a Riparian Exception from County Environmental Planning. Riparian corridors are granted protections under the County's Riparian Corridor and Wetlands Protection ordinances. Development activities are prohibited within lands extending 30 feet from an intermittent stream, or within a riparian woodland, unless a riparian exception is granted. Work within the riparian corridor will include tree removal, repair of the culvert outfall running under Rochelle Lane (potentially replacement of existing 48-inch diameter culvert), and removal of all manmade debris in the drainage way.

The project proponent is responsible for obtaining all necessary approvals and permits from the USACE, RWQCB, and CDFW and for complying with all measures and conditions included in those permit approvals.

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 is located in an area developed at an urban density. The project area is surrounded by a mix of one and two-story development and would not directly impact any public scenic vistas in the area.

No scenic vistas are in the vicinity of the project area and the sited is not within a designated scenic corridor. The project will not be visible from any public viewpoint and will have no impact on scenic vistas in this location

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 ¼ mile of Highway One, a designated scenic road in the County of Santa Cruz General Plan. However, the project will not be visible from public viewpoints within the Highway One corridor, and impacts will be less than significant.

3. *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: The project is designed to be consistent with County Code sections that regulate height, bulk, density, setback, landscaping, and design of new structures in the County, including County Code Chapter 13.11, Site, Architectural and Landscape Design Review, including all applicable design guidelines. No impact is anticipated.

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

Discussion: The project would contribute an incremental amount of night lighting to the visual environment. However, the following project conditions will reduce this potential impact to a less than significant level: All outdoor areas, parking and circulation areas shall be lighted with low-rise lighting fixtures that do not exceed 15 feet in height. The construction plans shall indicate the location, intensity and variety of all exterior lighting fixtures. SCCC 13.11.074(D) requires the following criteria to be implemented to ensure the project would not result in significant impacts associated with lighting:

1. All lighting shall meet energy code requirements of the California Building Code.
2. All lighting shall be directed downward onto the site and shielded such that there is not overspill onto adjacent properties.
3. In the event that site lighting results in off-site glare as determined by the Planning Director, the following measures shall be implemented to the extent necessary to reduce glare:
    a. Reduction in the total effective light emitted (change in wattage or bulb intensity,
    b. change in the type or method of lighting (change in bulb or illumination type),
    c. Removal of lighting creating the off-site glare
    d. Installation of additional shielding.

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.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
2. *Conflict with existing zoning for agricultural use, or a Williamson Act contract?*	☐	☐	☐	☒

Discussion: The project site is zoned Public Facilities (PF), which is not considered to be an agricultural zone. Additionally, the project site's land 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.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
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: The project is not located near land designated as Timber Resource. Therefore, the project would not affect the resource or access to harvest the resource in the future. The timber resource may only be harvested in accordance with California Department of Forestry timber harvest rules and regulations.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
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. See discussion under B-3 above. No impact is anticipated.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
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: The project site and surrounding area within a radius of 1/2 mile does not contain any lands designated as 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. Therefore, no Prime Farmland, Unique Farmland, Farmland of Statewide, or Farmland of Local Importance would be converted to a non-agricultural use. In addition, the project site contains no forest land, and no forest land occurs within 1/2 mile of the project site. Therefore, no impacts are anticipated.

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. Because general construction activity related emissions (i.e., temporary sources) are accounted for in the emission inventories included in the air quality plans, impacts to air quality plan objectives are less than significant.

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 cited below) 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 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.

The project would result in new long-term operational emissions from vehicle trips (mobile emissions), the use of natural gas (energy source emissions), and consumer products, architectural coatings, and landscape maintenance equipment (area source emissions). Mobile source emissions constitute most operational emissions from this type of land use development project. However, emissions associated with buildout of this type of project is not expected to exceed any applicable MBARD thresholds. No stationary sources would be constructed that would be long-term permanent sources of emissions. Therefore, impacts to regional air quality as a result of long-term operation of the project would be less than significant.

Santa Cruz County is located within the NCCAB. The NCCAB does not meet state standards for ozone (reactive organic gases [ROGs] and nitrogen oxides [NOx]) and fine

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

particulate matter (PM_{10}). Therefore, the regional pollutants of concern that would be emitted by the project are ozone precursors and PM_{10}.

The primary sources of ROG within the air basin are on- and off-road motor vehicles, petroleum production and marketing, solvent evaporation, and prescribed burning. The primary sources of NOx are on- and off-road motor vehicles, stationary source fuel combustion, and industrial processes. In 2010, daily emissions of ROGs were estimated at 63 tons per day. Of this, area-wide sources represented 49%, mobile sources represented 36%, and stationary sources represented 15%. Daily emissions of NOx were estimated at 54 tons per day with 69% from mobile sources, 22% from stationary sources, and 9% from area-wide sources. In addition, the region is “NOx sensitive,” meaning that ozone formation due to local emissions is more limited by the availability of NOx as opposed to the availability of ROGs (MBUAPCD, 2013b).

PM_{10} is the other major pollutant of concern for the NCCAB. In the NCCAB, highest particulate levels and most frequent violations occur in the coastal corridor. In this area, fugitive dust from various geological and man-made sources combines to exceed the standard. The majority of NCCAB exceedances occur at coastal sites, where sea salt is often the main factor causing exceedance. In 2005 daily emissions of PM_{10} were estimated at 102 tons per day. Of this, entrained road dust represented 35% of all PM_{10} emission, windblown dust 20%, agricultural tilling operations 15%, waste burning 17%, construction 4%, and mobile sources, industrial processes, and other sources made up 9% (MBUAPCD, 2008).

Given the modest amount of new traffic that would be generated by the project there is no indication that new emissions of ROGs or NOx would exceed MBARD thresholds for these pollutants; and therefore, there would not be a significant contribution to an existing air quality violation.

Project construction may result in a short term, localized decrease in air quality due to generation of PM_{10}. However, standard dust control best management practices (BMPs), such as periodic watering, would be implemented during construction to avoid significant air quality impacts from the generation of PM_{10}.

Emissions from construction activities represent temporary impacts that are typically short in duration, depending on the size, phasing, and type of project. Air quality impacts can nevertheless be acute during construction periods, resulting in significant localized impacts to air quality. Table 1 summarizes the threshold of significance for construction activities.

Table 1: Construction Activity with Potentially Significant Impacts from Pollutant PM_{10}

Activity	Potential Threshold*
Construction site with minimal earthmoving	8.1 acres per day
Construction site with earthmoving (grading, excavation)	2.2 acres per day

*Based on Midwest Research Institute, Improvement of Specific Emission Factors (1995). Assumes 21.75 working weekdays per month and daily watering of site.

Note: Construction projects below the screening level thresholds shown above are assumed to be below the **82 lb/day threshold of**

significance, while projects with activity levels higher than those above may have a significant impact on air quality. Additional mitigation and analysis of the project impact may be necessary for those construction activities.

Source: Monterey Bay Unified Air Pollution Control District, 2008.

Impacts

Construction

As required by the MBARD, construction activities (e.g., excavation, grading, on-site vehicles) which directly generate 82 pounds per day or more of PM_{10} would have a significant impact on local air quality when they are located nearby and upwind of sensitive receptors such as the community of Soquel (Table 1). Construction projects below the screening level thresholds shown in Table 1 are assumed to be below the 82 lb/day threshold of significance, while projects with activity levels higher than those thresholds may have a significant impact on air quality. The proposed project would require minimal grading. Although the project would produce PM_{10}, it would be far below the 82 pounds per day threshold. This would result in less than significant impacts on air quality from the generation of PM_{10}.

Construction projects using typical construction equipment such as dump trucks, scrapers, bulldozers, compactors, and front-end loaders that temporarily emit precursors of ozone (i.e., volatile organic compounds [VOC] or oxides of nitrogen [NOx]), are accommodated in the emission inventories of state- and federally-required air plans and would not have a significant impact on the attainment and maintenance of ozone ambient air quality standard (AAQS) (MBUAPCD 2008).

Although not a mitigation measure per se (i.e., required by law), California ultralow sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight will be used in all diesel-powered equipment, which minimizes sulfur dioxide and particulate matter.

Operation

The following BMPs will be implemented during all site excavation and grading.

- No mitigation is required. However, MBARD recommends the use of the following BMPs for the control of short-term construction generated emissions: Water all active construction areas at least twice daily as necessary and indicated by soil and air conditions.
- Prohibit all grading during periods of high wind (over 15 mph).
- Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days)
- Apply non-toxic binders (e.g., latex acrylic copolymer) to exposed areas after cut and fill operations and hydroseed areas.
- Haul trucks shall maintain at least 2’ 0” freeboard.

- Cover all trucks hauling soil, sand, and other loose materials.
- Plant tree windbreaks on the windward perimeter of construction projects if adjacent to open land.
- Plant vegetative ground cover in disturbed areas as quickly as possible.
- Cover inactive storage piles.
- Install wheel washers at the entrance to construction sites for all existing trucks.
- Pave all roads on construction sites.
- Sweep streets, if visible soil material is carried out from the construction site.
- Post a publicly visible sigh which specifies the telephone number and person to contact regarding dust complaints. This person shall respond to complaints and corrective action within 48 hours. The phone number of the Monterey Bay Air Resources District shall be visible to ensure compliance with Rule 402 (Nuisance),
- Limit the area under construction at any one time.

Implementation of the above recommended BMPs for the control of construction-related emissions would further reduce construction-related particulate emissions. These measures are not required by MBARD or as mitigation measures, as the impact would be less than significant without mitigation. These types of measures are commonly included as conditions of approval associated with development permits approved by the County.

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 and PM$_{10}$, as those are the pollutants for which the district is in nonattainment. 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, 2008). 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 project is situated in an area developed at an urban density and adjacent to a main thoroughfare (Soquel Drive). Properties to the south, west, and east contain residential development with commercial establishments located across Soquel Drive to the north of the project site. Sensitive receptors in the vicinity include residents and patrons of nearby commercial establishments and located approximately 10 feet from the property boundaries of the proposed development.

Diesel exhaust contains substances (diesel particulate matter [DPM], toxic air contaminants [TACs], mobile source air toxics [MSATs]) that are suspected carcinogens, along with pulmonary irritants and hazardous compounds, which may affect sensitive receptors such as young children, senior citizens, or those susceptible to respiratory disease. Where construction activity occurs in proximity to long-term sensitive receptors, a potential could exist for unhealthful exposure of those receptors to diesel exhaust, including residential receptors.

Impacts

The project is located in the community of Soquel and sensitive receptors would be as close as 10 feet from the project area. Since construction is anticipated to occur over a 24 week period, the sensitive receptors would be affected for a maximum of 24 weeks, which is less than the 70-year maximum exposed individual criteria used for assessing public health risk due to emissions of certain air pollutants (MBUAPCD 2008).

Due to the intermittent and short-term temporary nature of construction activities (i.e., 24 weeks), emissions of DPM, TACs, or MSATs would not be sufficient to pose a significant risk to sensitive receptors from construction equipment operations during the course of the project.

The project would not be expected to expose sensitive receptors to substantial pollutant concentrations. Impacts would be less than significant.

4. Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people? ☐ ☐ ☒ ☐

Discussion: Land uses typically producing objectionable odors include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies, and fiberglass molding. The proposed project does not include any uses that would be associated with objectionable odors. Odor emissions from the proposed project would be limited to odors associated with vehicle and engine exhaust and idling from cars entering, parking, and exiting the facility. The project does not include any known sources of objectionable odors associated with the long-term operations phase.

During construction activities, only short-term, temporary odors from vehicle exhaust and construction equipment engines would occur. 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 of the Monterey Bay, construction-related odors would disperse and dissipate and would not cause substantial odors at the closest sensitive receptors (located approximately 10 feet to the east of the project site). Construction-related odors would be short-term and would cease upon completion. Therefore, no objectionable odors are anticipated from construction activities associated with the project.

The project would not create objectionable odors affecting a substantial number of people; therefore, the project is not expected to result in significant impacts related to objectionable odors during construction or operation.

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. The site is mapped for Obscure bumble bee *Bombus caliginosus* and the Western Bumble bee *Bombus occidentalis* which occur in open, grassy coastal prairies and Coast Range meadows. Nesting occurs underground as well as above ground in abandoned bird nests. There is no potential to occur on the project site in that the site does not support open, grassy coastal prairies or Coast Range meadows or suitable habitat for these species. Species was not observed during field surveys and is not expected to occur due to the lack of suitable habitat. Last know sightings were in 1935 and the 1950. No impact is anticipated.

2. *Have a substantial adverse effect on any riparian habitat or sensitive natural community identified in local or regional plans, policies, regulations (e.g., wetland, native grassland, special forests, intertidal* ☐ ☒ ☐ ☐

zone, etc.) or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Discussion: An intermittent drainage along the eastern portion of the project site is regulated under the Clean Water Act Section 404 by U. S. Army Corps of Engineers (USACE), and Section 401 by the Regional Water Quality Control Board (RWQCB). The associated channel banks and riparian habitat are subject to regulation under the Porter-Cologne Water Quality Act as "Waters of the State", and under California Fish and Game Code Section 1602.

Any proposed development activity within areas identified as Riparian Corridor (as defined by Santa Cruz County Code Section 16.30.030) would require a Riparian Exception from County Environmental Planning. Riparian corridors are granted protections under the County's Riparian Corridor and Wetlands Protection ordinances. Development activities are prohibited within lands extending 30 feet from an intermittent stream, or within a riparian woodland, unless a riparian exception is granted. Work within the riparian corridor will include tree removal, repair of the culvert outfall running under Rochelle Lane (potentially replacement of existing 48-inch diameter culvert), and removal of all manmade debris in the drainage way.

The project applicant is responsible for obtaining all necessary approvals and permits from the USACE, RWQCB, and CDFW and for complying with all measures and conditions included in those permit approvals.

Riparian Woodland

Riparian woodland occurs along the banks of the Noble Gulch, an intermittent stream, located on the east side of the project area. The woodland is dominated by oak woodland along the higher edge of the banks. The shrub layer is dominated by grass and willow woodland. Riparian woodland is considered a sensitive natural community by the California Department of Fish and Wildlife (CDFW) and is regulated under the California Fish and Game Code section 1600 regarding lake and streambed alteration agreements. The riparian woodland in the project area falls within the CDFW stream zone, which extends laterally to the outer edge of riparian vegetation.

Impacts

The project would not permanently impact riparian woodland. Construction disturbance would temporarily impact approximately 7,500 square feet of riparian woodland. The project would involve in-water work for replacement/repair of an existing 48-inch diameter culvert running under Rochelle Lane.

It is estimated that four native trees (Coast Live Oaks) and several nonnative trees (Holly, African Yellow Pine, Brazilian Pepper Tree, Mulberry, and plum), would be removed by the project as identified in a Tree Assessment prepared by Nigel Belton, Arborist, dated September 26, 2018 (Attachment 2). Temporarily impacted areas would be revegetated with native species.

In order to conduct work within a County-defined riparian corridor, the project must be granted a riparian exception by the County. Conditions of approval listed in the riparian exception must be adhered to. Prior to the approval of any riparian exception, a specific set of findings must be met. Preliminary analysis has determined that the project meets these findings, and the conditions of approval for the riparian exception shall incorporate the following mitigation measures.

The development area is adjacent to a riparian corridor, which could be adversely affected by a new or additional source of light that is not adequately deflected or minimized. As stated above, work within the riparian corridor will include removal of several trees, repair and or replacement of the 48-inch diameter culvert running under Rochelle Lane, and removal of all manmade debris in the drainage way. The following conditions will be added to the project, such that any potential impact will be reduced to a less than significant level:

<u>Mitigation Measures</u>

BIO-1: Riparian woodland cannot be avoided during construction. The removal of riparian woodland and native trees will be minimized with the following environmental commitments:

- Prior to construction, the Project Applicant and the Project Biologist will identify the limits of construction so as to maximize native tree and shrub retention. Temporary fencing will be placed along the limits of construction to avoid unnecessary disturbance to riparian woodland.
- Where possible, native vegetation that cannot be avoided will be cut at ground level rather than removed by the roots.
- The property owner, applicant or other responsible party shall contact Environmental Planning at (831) 454-3163 four working days prior to site disturbance in order to arrange a pre-construction meeting. The meeting shall be attended by the: project geotechnical engineer and arborist.
- All work shall be performed according to the approved arborist report. A copy of the riparian exception and associated conditions along with the arborist report shall be provided to the contractor prior to commencement of any construction.
- If tree removal is proposed within the timeframes listed below the following reports will need to be provided to the Resource Planner (Robert Loveland 831 454-3163) one week prior to commencement of work:
- A bird survey, completed by a qualified wildlife biologist, shall be provided for review and approval if the trees are scheduled to be removed between February

15th and August 31st. The report shall not be more than one week old at time of submittal.

- A bat survey, completed by a qualified wildlife biologist, shall be provided for review and approval if the trees are scheduled to be removed between April 1st and October 1st. The report shall not be more than one week old at time of submittal.
- All manmade debris shall be completely removed from the riparian corridor. Placement of cut and/or chipped vegetation shall not be dispersed within the riparian area.
- No vehicular parking or construction staging allowed within the riparian corridor or setbacks. An exception to this condition would be work completed to repair culvert and/or culvert outlet and debris removal. The majority of work shall be completed from Rochelle Lane.
- All lighting shall be directed downward onto the site and shielded such that there is not overspill into the riparian area.
- Contact County Resource Planner (Robert Loveland 454-3163) upon project completion for final inspection and permit clearance.

The mitigation measures would reduce significant impacts to a less than significant level.

3. *Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?* ☐ ☐ ☐ ☒

Discussion: There are no mapped or designated federally protected wetlands on or adjacent to the project site. Therefore, no impacts would occur from project implementation.

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 (such as the Sensitive Habitat Ordinance, Riparian and Wetland Protection* ☐ ☒ ☐ ☐

Ordinance, and the Significant Tree Protection Ordinance)?

Discussion: The project is located within a County-defined riparian corridor. See discussions and mitigation measures specified under D-1 and D-2 above. The project must be granted a Riparian Exception in order to be consistent with the County of Santa Cruz Riparian Corridor and Wetlands Protection Ordinance. In order for a project to qualify for a Riparian Exception (SCCC Section 16.30.060), a specific set of findings must be made. Preliminary analysis has determined that the project complies with these findings.

The project is therefore consistent with the County of Santa Cruz Riparian Corridor and Wetlands Protection Ordinance, and impacts from project implementation would be less than significant with mitigation incorporated.

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: No archaeological resources have been identified in the project area. Pursuant to SCCC section 16.40.040, if at any time in the preparation for or process of excavating or otherwise disturbing the ground, or any artifact or other evidence of a Native

American cultural site which reasonably appears to exceed 100 years of age are discovered, the responsible persons shall immediately cease and desist from all further site excavation and comply with the notification procedures given in SCCC Chapter 16.40.040.

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

Discussion: Impacts are expected to be less than significant. 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 due to the use of construction equipment onsite during the construction phase. 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. In addition, the project would comply with General Plan policy 8.2.2, which requires all new development to be sited and designed to minimize site disturbance and grading. 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 included in the *County of Santa Cruz Climate Action Strategy* (County of Santa Cruz, 2013) are outlined below.

<u>Strategies for the Reduction of Energy Use and GHG Emissions</u>

- Develop a Community Choice Aggregation (CCA) Program, if feasible.[2]
- Increase energy efficiency in new and existing buildings and facilities.
- Enhance and expand the Green Business Program.
- Increase local renewable energy generation.
- Public education about climate change and impacts of individual actions.
- Continue to improve the Green Building Program by exceeding the minimum standards of the state green building code (Cal Green).
- Form partnerships and cooperative agreements among local governments, educational institutions, nongovernmental organizations, and private businesses as a cost-effective way to facilitate mitigation and adaptation.
- Reduce energy use for water supply through water conservation strategies.

<u>Strategies for the Reduction of Energy Consumption and GHG Emissions from Transportation</u>

- Reduce vehicle miles traveled (VMT) through County and regional long-range planning efforts.
- Increase bicycle ridership and walking through incentive programs and investment in bicycle and pedestrian infrastructure and safety programs.
- Provide infrastructure to support zero and low emissions vehicles (plug in, hybrid plug-in vehicles).
- Increase employee use of alternative commute modes: bus transit, walking, bicycling, carpooling, etc.
- Increase the number of electric and alternative fuels vehicles in the County fleet.
- Therefore, the project will not result in wasteful, inefficient, or unnecessary consumption of energy resources. Impacts are expected to be less than significant.

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[2] Monterey Bay Community Power (MBCP) was formed in 2017 to provide carbon-free electricity. All Pacific Gas & Electric Company (PG&E) customers in unincorporated Santa Cruz County were automatically enrolled in the MBCP in 2018.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
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 2013, 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.

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.

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.

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 not conflict with or obstruct any state or local plan for renewable energy or energy efficiency.

G. GEOLOGY AND SOILS

Would the project:

1. Directly or indirectly cause 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 is capable of generating 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 (County of Santa Cruz GIS Mapping, California Division of Mines and Geology, 2001). The project site is located approximately seven miles southwest of the San Andreas fault zone, and approximately four miles southwest of the Zayante fault zone. A geotechnical investigation for the project was performed by CMAG Engineering, Inc (Attachment 3). The report concluded that the site has a low to moderate potential for expansion and that installation of adequate drainage features are necessary to ensure that ponding does not occur during the rainy season or accumulate beneath structure which are lower to surround exterior grades. See discussion under J-3.

Implementation of the additional requirements included in the review letter prepared by Environmental Planning staff (Attachment 4) will serve to further reduce the potential risk of seismic shaking. Therefore, impacts will be less than significant.

2. *Result in substantial soil erosion or the loss of topsoil?* ☐ ☐ ☒ ☐

Discussion: Some potential for erosion exists during the construction phase of the project, however, this potential is minimal because the project site is relatively flat in topography and standard erosion controls are a required condition of the project. Prior to approval of a grading or building permit, the project must have an approved stormwater pollution control plan (SCCC Section 7.79.100), which would specify detailed erosion and sedimentation control measures. The plan would include provisions for disturbed areas to be planted with ground cover and to be maintained to minimize surface erosion. Impacts from soil erosion or loss of topsoil would be considered less than significant.

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 geotechnical reports cited above (see discussion under G-1) did not identify a significant potential for damage caused by any of these hazards.

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: According to the geotechnical report for the project there are indications of expansive soils in the project area. The recommendations contained in the geotechnical report, shall be implemented to adequately 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: No septic systems are proposed. The project would connect to the Santa Cruz County Sanitation District, and the applicant would be required to pay standard sewer connection and service fees that fund sanitation improvements within the district as a Condition of Approval for the project.

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. In 2013, Santa Cruz County adopted a Climate Action Strategy (CAS) intended to establish specific emission reduction goals and necessary actions to reduce greenhouse gas levels to pre-1990 levels as required under Assembly Bill (AB) 32 legislation. The strategy intends to reduce GHG emissions and energy consumption by implementing measures such as reducing vehicle miles traveled through the County and regional long-range planning efforts and increasing energy efficiency in new and existing buildings and facilities. Implementing the CAS, the MBCP was formed in 2017 to provide carbon-free electricity. All PG&E customers in unincorporated Santa Cruz County were automatically enrolled in the MBCP in 2018. All project construction equipment would be required to comply with the CARB emissions requirements for construction equipment. Further, all new buildings are required to meet the State's CalGreen building code. 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?* ☐ ☐ ☒ ☐

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. However, during construction, fuel would be used at the project site. In addition, fueling may occur within the limits of the staging area. Best management practices would be used to ensure that no impacts would occur. Impacts are expected to be 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 under I-1 above. 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: The Santa Cruz Montessori is located 6230 Soquel Drive, approximately 1/2 mile to the east 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.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
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 December 3, 2018 list of hazardous sites in Santa Cruz County compiled pursuant to Government Code section 65962.5. Additionally, a Phase One Environmental Site Assessment prepared by First Carbon Solutions dated June 19, 2018 (Attachment 12) found no evidence of recognized environmental conditions (as defined by American Society of Testing Materials (ASTM) standards) in connection with the subject property. 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 2015-2020 (County of Santa Cruz, 2020). 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 a substantial amount of contaminants. However, runoff from this project may contain small amounts of chemicals and other contaminants, such as pathogens, pesticides, trash, and nutrients. The parking and driveway associated with the project would incrementally contribute urban pollutants to the environment; however, the contribution would be small, given the size of the driveway and parking area. Potential siltation from the project would be addressed through implementation of erosion control BMPs. No water quality standards or waste discharge requirements would be violated and surface or ground water quality would not otherwise be substantially degraded. Impacts would be less than significant.

The project is located adjacent to Noble Gulch and has the potential to generate water quality impacts during construction. An erosion control plan is required per section 16.22.060 of the SCCC.

The following water quality protection and erosion and sediment control BMPs will be implemented, based on standard County requirements, to minimize construction-related contaminants and mobilization of sediment to the Noble Gulch stream.

The BMPs will be selected to achieve maximum sediment removal and represent the best available technology that is economically achievable and are subject to review and approval by the County. The County will perform routine inspections of the construction area to verify the BMPs are properly implemented and maintained. The County will notify contractors immediately if there is a noncompliance issue and will require compliance.

The BMPs will include, but are not limited to, the following.

- All earthwork or foundation activities involving rivers, ephemeral drainages, and culverts, will occur in the dry season (generally between June 1 and October 15).
- Equipment used in and around drainages and wetlands will be in good working order and free of dripping or leaking engine fluids. All vehicle maintenance will be performed at least 300 feet from all drainages and wetlands. Any necessary equipment washing will be carried out where the water cannot flow into drainages

or wetlands.

- Develop a hazardous material spill prevention control and countermeasure plan before construction begins that will minimize the potential for and the effects of hazardous or toxic substances spills during construction. The plan will include storage and containment procedures to prevent and respond to spills and will identify the parties responsible for monitoring the spill response. During construction, any spills will be cleaned up immediately according to the spill prevention and countermeasure plan. The County will review and approve the contractors' toxic materials spill prevention control and countermeasure plan before allowing construction to begin. Prohibit the following types of materials from being rinsed or washed into the streets, shoulder areas, or gutters: concrete; solvents and adhesives; thinners; paints; fuels; sawdust; dirt; gasoline; asphalt and concrete saw slurry; heavily chlorinated water.

- *May be required.* Measure baseline turbidity, pH, specific conductance, and temperatures in the Noble Gulch when flow is present. As required by the Regional Water Quality Control Board (RWQCB), avoid exceeding water quality standards specified in the Basin Plan standards over the natural in-situ conditions. If dewatering activities are required, water samples would be taken periodically during construction.

- Any surplus concrete rubble, asphalt, or other rubble from construction will be taken to a local landfill.

- An erosion and sediment control plan will be prepared and implemented for the project. It will include the following provisions and protocols. The Storm Water Pollution Prevention Plan (SWPPP) for the project will detail the applications and type of measures and the allowable exposure of unprotected soils.

    - Discharge from dewatering operations, if needed, and runoff from disturbed areas will be made to conform to the water quality requirements of the waste discharge permit issued by the RWQCB.

    - Temporary erosion control measures, such as sandbagged silt fences, will be applied throughout construction of the project and will be removed after the working area is stabilized or as directed by the engineer. Soil exposure will be minimized through use of temporary BMPs, groundcover, and stabilization measures. Exposed dust-producing surfaces will be sprinkled daily, if necessary, until wet; this measure will be controlled to avoid producing runoff. Paved streets will be swept daily following construction activities.

    - The contractor will conduct periodic maintenance of erosion and sediment control measures.

- An appropriate seed mix of native species will be planted on disturbed areas upon completion of construction.
- Cover or apply nontoxic soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more) that could contribute sediment to waterways.
- Enclose and cover exposed stockpiles of dirt or other loose, granular construction materials that could contribute sediment to waterways. Material stockpiles will be located in non-traffic areas only. Side slopes will not be steeper than 2:1. All stockpile areas will be surrounded by a filter fabric fence and interceptor dike.
- Contain soil and filter runoff from disturbed areas by berms, vegetated filters, silt fencing, straw wattle, plastic sheeting, catch basins, or other means necessary to prevent the escape of sediment from the disturbed area.
- Use other temporary erosion control measures (such as silt fences, staked straw bales/wattles, silt/sediment basins and traps, check dams, geofabric, sandbag dikes, and temporary re-vegetation or other ground cover) to control erosion from disturbed areas as necessary.
- Avoid earth or organic material from being deposited or placed where it may be directly carried into the channel.
- Ensure all areas that are disturbed/compacted during construction are stabilized, vegetated, and de-compacted as necessary, so that runoff rates from landscaped and pervious areas do not exceed those from pre-disturbed/natural conditions.

Implementation of the above BMPs would ensure that water quality impacts to the Nobel Gulch and its tributaries are less than significant.

2. *Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?*	☐	☐	☒	☐

Discussion: The project would obtain water from Soquel Creek Water District and would not rely on private well water. Although the project would incrementally increase water demand, Soquel Creek has indicated that adequate supplies are available to serve the project with implementation of a Water Demand Offset Program (Attachment 5). The project is not located in a mapped groundwater recharge area or water supply watershed and will not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.

Impacts would be less than significant.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
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 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 County Department of Public Works Stormwater Management Section staff has reviewed and approved the proposed drainage plan prepared for the project. The project is consistent with SCCC section 7.79.070, which states, "No person shall make any unpermitted alterations to drainage patterns or modifications to the storm drain system or any channel that is part of receiving waters of the county. No person shall deposit fill, debris, or other material in the storm drain system, a drainage channel, or on the banks of a drainage channel where it might enter the storm drain system or receiving waters and divert or impede flow." The Project will not substantially alter the existing drainage pattern of the site in a manner that would result in erosion or siltation, or an increase in runoff from the site. Impacts would be less than significant.

Drainage calculations prepared by Ifland Engineers dated January 2019 (Attachment 6) and Stormwater Infiltration Study prepared by CMAG Engineering Inc (Attachment 7), have been reviewed for potential drainage impacts and accepted by the County Department of Public Works Stormwater Management Section staff. The runoff rate from the property would be controlled by retention and detention pits, and a number of LID measures to reduce runoff and pollutants from the proposed development. Staff have determined that existing storm water facilities are adequate to handle the increase in drainage associated with the project though replacement of the 48-inch diameter culvert running under Rochelle Lane may be required in order to reduce potential for overtopping of the culvert during large storm events. Impacts would be considered less than significant.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
4. *In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?*	☐	☐	☒	☐

***Discussion*:**

Flood Hazards:

According to the Federal Emergency Management Agency (FEMA) National Flood Insurance Rate Map, dated September 29, 2017 (Attachment 8), no portion of the project site lies within a flood hazard zone. A Hydrologic Modeling report prepared by Balance Hydrologics dated April 19, 2019 concluded that water surface elevations were shown to be contained within the stream channel along the modeled sections however a small amount of overtopping can be expected at the culvert crossing on the left bank of Rochelle Lane. It was further concluded that the overtopping would have no impact on the proposed development. Impacts would be less than significant.

Tsunami and Seiche Zones:

There are two primary types of tsunami vulnerability in Santa Cruz County. The first is a teletsunami or distant source tsunami from elsewhere in the Pacific Ocean. This type of tsunami is capable of causing significant destruction in Santa Cruz County. However, this type of tsunami would usually allow time for the Tsunami Warning System for the Pacific Ocean to warn threatened coastal areas in time for evacuation (County of Santa Cruz 2010).

A greater risk to the County of Santa Cruz is a tsunami generated as the result of an earthquake along one of the many earthquake faults in the region. Even a moderate earthquake could cause a local source tsunami from submarine landsliding in Monterey Bay. A local source tsunami generated by an earthquake on any of the faults affecting Santa Cruz County would arrive just minutes after the initial shock. The lack of warning time from such a nearby event would result in higher causalities than if it were a distant tsunami (County of Santa Cruz 2010).

Seiches are recurrent waves oscillating back and forth in an enclosed or semi-enclosed body of water. They are typically caused by strong winds, storm fronts, or earthquakes.

The project site is located approximately 0.5 miles inland, approximately 0.4 to 0.5 miles beyond the effects of a tsunami. The project site is located approximately 0.67 miles from Tannery Gulch and would not be affected by a seiche. Therefore, there would be no impact.

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

Discussion: 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. As required by state law, each of the County's water agencies serving more than 3,000 connections must update their Urban Water Management Plans (UWMPs) every five years, with the most recent updates completed in 2016.

County staff are working with the water agencies on various integrated regional water management programs to provide for sustainable water supply and protection of the environment. Effective water conservation programs have reduced overall water demand in the past 15 years, despite continuing growth. In August 2014, the Board of Supervisors and other agencies adopted the Santa Cruz Integrated Regional Water Management (IRWM) Plan Update 2014, which identifies various strategies and projects to address the current water resource challenges of the region. Other efforts underway or under consideration are stormwater management, groundwater recharge enhancement, increased wastewater reuse, and transfer of water among agencies to provide for more efficient and reliable use.

The County is also working closely with water agencies to implement the Sustainable Groundwater Management Act (SGMA) of 2014. By January 2020, Groundwater Sustainability Plans will be developed for two basins in Santa Cruz County that are designated as critically overdrafted, Santa Cruz Mid-County and Corralitos - Pajaro Valley. These plans will require management actions by all users of each basin to reduce pumping, develop supplemental supplies, and take management actions to achieve groundwater sustainability by 2040. A management plan for the Santa Margarita Basin will be completed by 2022, with sustainability to be achieved by 2042.

The project is located in Santa Cruz Mid-County Water Basin. In 2016, Soquel Creek Water District (SqCWD), Central Water District (CWD), County, and City of Santa Cruz adopted a Joint Powers Agreement to form the Santa Cruz Mid-County Groundwater Agency for management of the Mid-County Basin under SGMA. SqCWD developed its own Community Water Plan and has been actively evaluating supplemental supply and demand reduction options.

Since the sustainable groundwater management plan is still being developed, the project will comply with SCCC Chapters 13.13 (Water Conservation – Water Efficient Landscaping), 7.69 (Water Conservation) and 7.70 (Water Wells), as well as Chapter 7.71

(Water Systems) section 7.71.130 (Water use measurement and reporting), to ensure that it will not conflict with or obstruct implementation of current water quality control plans or sustainable groundwater management plans such as the Santa Cruz IRWMP and UWMP for Soquel Creek Water District.

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.

Pursuant to SCCC 13.10.552 (schedule of offstreet parking) the proposed development is required to provide 41 parking spaces. As proposed, the project would provide 76 parking spaces. SCCC 13.10.552(D) limits the amount of excess parking to 10% of the requirement unless a special circumstance exists. In response to concerns raised by neighbors during a community meeting, the project has been designed to accommodate future overflow parking demands. The location of the proposed development, along an arterial roadway which does not contain on street parking, does not provide an opportunity for offsite public parking. It is anticipated that holiday visitation and associated events such as held onsite could result in increased parking demand. Inclusion of parking in excess of the requirement will ensure that impacts associated with the proposed development will be less than significant.

General Plan policy 5.2.3 (Activities Within Riparian Corridors and Wetlands) states: “Development activities, land alterations and vegetation disturbance within riparian corridors and wetlands and required buffers shall be prohibited unless an exception is granted per the Riparian Corridor and Wetlands Protection ordinance”. Please see complete discussion under Question D-5. Impacts would be considered less than significant.

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 Public and Community Facilities (PF), 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:

County of Santa Cruz General Plan

The County of Santa Cruz has not adopted noise thresholds for construction noise. The following applicable noise related policy is found in the Public Safety and Noise Element of the Santa Cruz County General Plan (Santa Cruz County 1994).

- Policy 6.9.7 Construction Noise. Require mitigation of construction noise as a condition of future project approvals.

The General Plan also contains the following table, which specifies the maximum allowable noise exposure for stationary noise sources (operational or permanent noise sources) (Table 2).

Table 2: 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

County of Santa Cruz Code

There are no County of Santa Cruz ordinances that specifically regulate operational noise levels associated with land uses however, County of Santa Cruz ordinance 13.15 (Noise Planning) specifically exempts construction activities stating: Noise sources normally and reasonably associated with construction, repair, remodeling, or grading of any real property, provided a permit has been obtained from the County as required, and provided said activities take place between the hours of 8 a.m. and 5:00 p.m. on weekdays unless the Building Official has in advance authorized said activities to start wait 7:00 a.m. and/or continue no late than 7 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 perm month. Such activities shall not take place on Sunday or a federal holiday unless the Building Official has in advance authorized such work on Sunday or federal holiday, or during earlier morning of later evening hours of a weekday or Saturday.

Additionally, Section 8.30.010 (Curfew—Offensive noise) of the SCCC contains the following language regarding noise impacts:

(A) No person shall make, cause, suffer, or permit to be made any offensive noise.

(B) "Offensive noise" means any noise which is loud, boisterous, irritating, penetrating, or unusual, or that is unreasonably distracting in any other manner such that it is likely to disturb people of ordinary sensitivities in the vicinity of such noise, and includes, but is not limited to, noise made by an individual alone or by a group of people engaged in any business, activity, meeting, gathering, game, dance, or amusement, or by any appliance, contrivance, device, tool, structure, construction, vehicle, ride, machine, implement, or instrument.

(C) The following factors shall be considered when determining whether a violation of the provisions of this section exists:

(1) Loudness (Intensity) of the Sound.

(a) Day and Evening Hours. For purposes of this factor, a noise shall be automatically considered offensive if it occurs between the hours of 8:00 a.m. and 10:00 p.m. and it is:

(i) Clearly discernible at a distance of 150 feet from the property line of the property from which it is broadcast; or

(ii) In excess of 75 decibels at the edge of the property line of the property from which the sound is broadcast, as registered on a sound measuring instrument meeting the American National Standard Institute's Standard S1.4-1971 (or more recent revision thereof) for Type 1 or Type 2 sound level meters, or an instrument which provides equivalent data.

A noise not reaching this intensity of volume may still be found to be offensive depending on consideration of the other factors outlined below.

(b) Night Hours. For purposes of this factor, a noise shall be automatically considered offensive if it occurs between the hours of 10:00 p.m. and 8:00 a.m. and it is:

(i) Clearly discernible at a distance of 100 feet from the property line of the property from which it is broadcast; or

(ii) In excess of 60 decibels at the edge of the property line of the property from which the sound is broadcast, as registered on a sound measuring instrument meeting the American National Standard Institute's Standard S1.4-1971 (or more recent revision thereof) for Type 1 or Type 2 sound level meters, or an instrument which provides equivalent data.

A noise not reaching this intensity of volume may still be found to be offensive depending on consideration of the other factors outlined below.

(2) Pitch (frequency) of the sound, e.g., very low bass or high screech;

(3) Duration of the sound;

(4) Time of day or night;

(5) Necessity of the noise, e.g., garbage collecting, street repair, permitted construction activities;

(6) The level of customary background noise, e.g., residential neighborhood, commercial zoning district, etc.; and

(7) The proximity to any building regularly used for sleeping purposes. [Ord. 5205 § 1, 2015; Ord. 4001 § 1, 1989]

Sensitive Receptors

Some land uses are generally regarded as being more sensitive to noise than others due to the type of population groups or activities involved. Sensitive population groups generally include children and the elderly. Noise sensitive land uses typically include all residential uses (single- and multi-family, mobile homes, dormitories, and similar uses), hospitals, nursing homes, schools, and parks.

The nearest sensitive receptors are residents, located approximately 20-50 feet to the west and east of the project area.

Impacts

Potential Temporary Construction Noise Impacts

The use of construction equipment to accomplish the project would result in noise in the project area, i.e., construction zone. Table 3 shows typical noise levels for common construction equipment. The sources of noise that are normally measured at 50 feet, are used to determine the noise levels at nearby sensitive receptors by attenuating 6 dB for each doubling of distance for point sources of noise such as operating construction equipment. Noise levels at the nearest sensitive receptors for each site were analyzed on a worst-case basis, using the equipment with the highest noise level expected to be used.

Table 3: Typical Noise Levels for Common Construction Equipment (at 50 feet)

Equipment	L_{max} (dBA)
Air Compressor	80
Backhoe	80
Chain Saw	85
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Saw	90
Crane	83
Dozer	85
Dump Truck	84
Excavator	85
Flat Bed Truck	84
Fork Lift	75
Generator	82
Grader	85
Hoe-ram	90
Jack Hammer	88
Loader	80
Paver	85
Pick-up Truck	55
Pneumatic Tool	85
Roller	85
Tree Chipper	87
Truck	84

Source: Federal Transit Authority, 2006, 2018.

Although construction activities would likely occur during daytime hours, noise may be audible to nearby residents. However, periods of noise exposure would be temporary. Noise from construction activity may vary substantially on a day-to-day basis.

Construction activity would be expected to use equipment listed in Table 3. Based on the activities proposed for the project, the equipment with the loudest operating noise level that would be used often during activity would be an excavator or cement mixer, which would produce noise levels of 85 dBA at a distance of 50 feet. The nearest sensitive receptor is located approximately 20 feet from the construction site. At that distance, the decibel level will not be reduced. However, these impacts would be temporary (24 weeks) and short in duration due to time restrictions on building and grading permits issued by the County of Santa Cruz. All construction activities would be restricted to the hours of 8am to 5pm Monday through Friday.

Noise generated during project construction would increase the ambient noise levels in adjacent areas. Construction would be temporary, and construction hours would be limited as a condition of approval. Given the limited duration of construction and the limited hours of construction activity, this impact is considered to be less than significant.

2. *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 and periodic and is not expected to cause damage; therefore, impacts are not expected to be significant.

3. *For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?*	☐	☐	☐	☒

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 in an area including, but limited to the following: new or extended infrastructure or public facilities; new commercial or industrial facilities; large-scale residential development; accelerated conversion of homes to commercial or multi-family use; or regulatory changes including General Plan amendments, specific plan amendments, zone reclassifications, sewer or water annexations; or LAFCO annexation actions. No impact would occur.

The project is designed at the density and intensity of development allowed by the General

Plan and zoning designations for the parcel. Additionally, the project does not involve extensions of utilities (e.g., water, sewer, or new road systems) into areas previously not served. Consequently, it is not expected to have a significant growth-inducing effect. Impacts would be less than significant.

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 of the standards and requirements identified by the local fire agency or California Department of Forestry, as applicable, 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. Impacts would be considered less than significant.

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 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 would create a small incremental increase in traffic on nearby roads and intersections. A traffic study prepared by Crane Transportation Group (CTG) dated April 11, 2019 (Attachment 9) and VMT analysis prepared by CTG dated October 8, 2019 (Attachment 10) concluded, based on ITE Trip Generation 10th Edition trip rates, the project would produce 232 daily two-way trips. The project would replace the 146 daily two-way trips generated by the existing church resulting in a potential 86 net new trips. The increase would not cause the LOS at any nearby intersection to drop below LOS D, consistent with General Plan Policy 3.12.1.

The project design would comply with current road requirements, including the regulations under section 13.11.074 of the County Code, "Access, circulation and parking" to prevent potential hazards to motorists, bicyclists, and/or pedestrians, as well as the County of Santa Cruz Department of Public Works design criteria. In addition, the primary access to the project site would be restricted to right turns in and out to reduce potential vehicle conflicts and the striping along the property frontage would be modified to restrict left turns into the project site. Therefore, impacts would 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: In response to the passage of Senate Bill 743 in 2013 and other climate change strategies, the Governor's Office of Planning and Research (OPR) amended the CEQA Guidelines to replace LOS with vehicle miles traveled (VMT) as the measurement for traffic impacts. The "Technical Advisory on Evaluating Transportation Impacts in CEQA," prepared by OPR (2018) provides recommended thresholds and methodologies for assessing impacts of new developments on VMT. Tying significance thresholds to the State's GHG reduction goals, the guidance recommends a threshold reduction of 15% under current average VMT levels for residential projects (per capita) and office projects (per employee), and a tour-based reduction from current trips for retail projects. Based on the latest estimates compiled from the Highway Performance Monitoring System, the average daily VMT in Santa Cruz County is 18.3 miles per capita (Department of Finance [DOF] 2018; Caltrans 2018). The guidelines also recommend a screening threshold for residential and office projects—trip generation under 110 trips per day is generally considered a less-than-significant impact.

As indicated in VMT analysis prepared by CTG (Attachment 10), the project consists of construction of an assisted living facility with 89 beds which is anticipated to generate 86 net new trips per day. The anticipated number of trips is considered a less than significant increase in VMT. In addition, it is expected that many employees would be dropped off at work and others would ride share of use public transit to and from work thereby reducing vehicle emissions. The project is expected to encourage employees to use public transit, carpooling and ridesharing by providing sign-up sheets and secure bike storage. The project would provide car service for its residents. While there is automobile usage associated with the project, the VMT generated by the project is less than the 15% reduction threshold. Therefore, impacts would 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: The project consists of a new three story Assisted living facility with 89 beds. No increase in hazards would occur from project design or from incompatible uses. No impact would occur from project implementation.

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

Discussion: The project's road access meets County standards and has been approved by the local fire agency or California Department of Forestry, as appropriate.

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 an assisted living facility with 89 beds. 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. However, no Tribal Cultural Resources are known to occur in or near the project area. Therefore, no impact to the significance of a Tribal Cultural Resource is anticipated from project implementation.

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 connect to an existing municipal water supply. Soquel Creek Water District has determined that adequate supplies are available to serve the project (Attachment 5), and no new facilities are required to serve the project. No impact would occur from project implementation.

Wastewater

County Sanitation District has indicated that wastewater treatment facilities are available and have capacity to serve the project (Attachment 11). No new wastewater facilities are required to serve the project. No impact would occur from project implementation.

Stormwater

The drainage analysis for the project Oakmont Senior Living, prepared by Ifland Engineers, dated January 2019 concluded that the project will meet the Department of Public Works Design Criteria through installation of detention systems, biofiltration and porous parking areas. (Attachment 6). The County Department of Public Works Stormwater Management staff have reviewed the drainage information and have determined that downstream storm facilities are adequate to handle the increase in drainage associated with the project. Therefore, no additional drainage facilities would be required for the project. No impacts are expected to occur from the project.

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, but additional improvements are necessary to serve the site. However, no substantial environmental impacts will result from the additional improvements; impacts will be less than significant.

Natural Gas

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

The proposed site is already served by natural gas, but additional improvements are necessary to serve the site. However, no environmental impacts will result from the additional improvements; impacts will be less than significant.

Telecommunications

Telecommunications, including telephone, wireless telephone, internet, and cable, are provided by a variety of organizations. AT&T is the major telephone provider, and its subsidiary, DirectTV provides television and internet services. Cable television services in Santa Cruz County are provided by Charter Communications in Watsonville and Comcast in other areas of the county. Wireless services are also provided by AT&T, as well as other service providers, such as Verizon. No improvements related to telecommunications are required, and there will be 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: All the main aquifers in this County, the primary sources of the County's potable water, are in some degree of overdraft. Overdraft is manifested in several ways including 1) declining groundwater levels, 2) degradation of water quality, 3) diminished stream base flow, and/or 4) seawater intrusion. Surface water supplies, which are the primary source of supply for the northern third of the County, are inadequate during drought periods and will be further diminished as a result of the need to increase stream baseflows to restore habitat for endangered salmonid populations. In addition to overdraft, the use of water resources is further constrained by various water quality issues.

The Soquel Creek Water District has indicated that adequate water supplies are available to serve the project and has issued a will-serve letter for the project, subject to the payment of fees and charges in effect at the time of service (Attachment 5). The development would also be 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: The County of Santa Cruz Sanitation District has indicated that adequate capacity in the sewer collection system is available to serve the project and has issued a sewer service availability letter for the project, subject to the payment of fees and charges in effect at the time of service (Attachment 11). Therefore, existing wastewater collection/treatment capacity would be sufficient to serve the project. No impact 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: Due to the small incremental increase in solid waste generation by the project during construction and operations, the impact would not be 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.

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 not located in a State Responsibility Area, a Very High Fire Hazard Severity Zone, or a County-mapped Critical Fire Hazard Area and will not conflict with emergency response or evacuation plans. Therefore, no impact would occur.

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 project is not located in a State Responsibility Areas, a Very High Fire Hazard Severity Zone, or a County-mapped Critical Fire Hazard Area. However, the project design incorporates all applicable fire safety code requirements and includes fire protection devices as required by the local fire agency and is unlikely to exacerbate wildfire risks. Impacts would be less than significant.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
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 project is not located in a State Responsibility Areas, a Very High Fire Hazard Severity Zone, or a County-mapped Critical Fire Hazard Area. Improvements associated with the project are unlikely to exacerbate wildfire risks. Impacts would be less than significant.

4. *Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?*	☐	☐	☒	☐

Discussion: The project is not located within a State Responsibility Areas, a Very High Fire Hazard Severity Zone, or a County-mapped Critical Fire Hazard Area. Downslope and downstream impacts associated with wildfires are unlikely to result from the project. Regardless, the project design incorporates all applicable fire safety code requirements and includes fire protection devices as required by the local fire agency. Impacts would be less than significant.

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. Resources that have been evaluated as significant would be potentially impacted by the project, particularly the Riparian corridor (Noble Gulch). However, mitigation has been included that clearly reduces these effects to a level below significance. This mitigation includes various mitigation measures to protect the riparian corridor. As a result of this evaluation, there is no substantial evidence that, after mitigation, 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 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, there were determined to be no potentially significant cumulative effects associated with this project. 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, no potentially adverse effects to human beings associated with this project were identified. 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 SOQUEL USGS 7.5 minute quadrangle; queried November 20, 2019

CalFIRE, 2010

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

Caltrans, 2018

California Public Road Data 2017: Statistical Information Derived from the Highway Performance Monitoring System. Released by the State of California Department of Transportation November 2018.

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, 2013

County of Santa Cruz Climate Action Strategy. Approved by the Board of Supervisors on February 26, 2013.

County of Santa Cruz, 2015

County of Santa Cruz Local Hazard Mitigation Plan 2015-2020. Prepared by the County of Santa Cruz Office of Emergency Services.

DOF, 2018

E-5 Population and Housing Estimates for Cities, Counties and the State—January 1, 2011-2018. Released by the State of California Department of Finance May 2018.

Federal Transit Administration, 2006

Transit Noise and Vibration Impact Assessment Manual.

Federal Transit Administration, 2018

Transit Noise and Vibration Impact Assessment Manual. September 2018.

FEMA, 2017

Flood Insurance Rate Map 0352 Federal Emergency Management Agency. Effective on September 29, 2017.

MBUAPCD, 2008

Monterey Bay Unified Air Pollution Control District (MBUAPCD), 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.

MBUAPCD, 2013a

Monterey Bay Unified Air Pollution Control District, NCCAB (NCCAB) Area Designations and Attainment Status – January 2013. Available online at http://www.mbuapcd.org/mbuapcd/pdf/Planning/Attainment_Status_January_2013_2.pdf

MBUAPCD, 2013b

Triennial Plan Revision 2009-2011. Monterey Bay Unified Air Pollution Control District. Adopted April 17, 2013.

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

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County of Santa Cruz

PLANNING DEPARTMENT
701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060
(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123

MITIGATION MONITORING AND REPORTING PROGRAM
for
Application No. 191031
Oakmont Senior Living

No.	Mitigation Measures	Responsibility for Compliance	Method of Compliance	Timing of Compliance
Biological Resources				

BIO-1	To minimize impacts to riparian woodland:
	• Prior to construction, the Project Applicant and the Project Biologist will identify the limits of construction so as to maximize native tree and shrub retention. Temporary fencing will be placed along the limits of construction to avoid unnecessary disturbance to riparian woodland.
	• Where possible, native vegetation that cannot be avoided will be cut at ground level rather than removed by the roots.
	• The property owner, applicant or other responsible party shall contact Environmental Planning at (831) 454-3163 four working days prior to site disturbance in order to arrange a pre-construction meeting. The meeting shall be attended by the: project geotechnical engineer and arborist.
	• All work shall be performed according to the approved arborist report. A copy of the riparian exception and associated conditions along with the arborist report shall be provided to the contractor prior to commencement of any construction.
	• If tree removal is proposed within the timeframes listed below the following reports will need to be provided to the Resource Planner (Robert Loveland 831 454-3163) one week prior to commencement of work:
	    • A bird survey, completed by a qualified wildlife biologist, shall be provided for review and approval if the trees are scheduled to be removed between February 15th and August 31st. The report shall not be more than one week old at time of submittal.
	    • A bat survey, completed by a qualified wildlife biologist, shall be provided for review and approval if the trees are scheduled to be removed between April 1st and October 1st. The report shall not be more than one week old at time of submittal.
	• All manmade debris shall be completely removed from the riparian corridor. Placement of cut and/or chipped vegetation shall not be dispersed within the riparian area.
	• No vehicular parking or construction staging allowed within the riparian corridor or setbacks. An exception to this condition would be work completed to repair culvert and/or culvert outlet and debris removal. The majority of work shall be completed from Rochelle Lane.
	• All lighting shall be directed downward onto the site and shielded such that there is not overspill into the riparian area.
	• Contact County Resource Planner upon project completion for final inspection and permit clearance.
		Applicant	Compliance monitored by the County Planning Department	During construction and site grading operations

Attachment 2

Arborist Report

September 26, 2018

THE COUNTY OF SANTA CRUZ
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Nigel Belton
Consulting Arborist

AN ASSESSMENT OF THE TREES WITHIN THE OAKMONT SENIOR LIVING DEVELOPMENT SITE SOQUEL DRIVE - SOQUEL -CALIFORNIA

Prepared at the request of:
Hanna Daugherty
Project Development
Oakmont Senior Living
9240 Old Redwood Highway - Suite 200
Windsor, CA 95492
hanna.dougherty@oakmontsl.com

Site inspection by:
Nigel Belton - ISA Certified Arborist WE-0410A
September 26, 2018

Job - Oakmont SL - 10.2018

Ph / Fax (831) 688-1239
P.O. Box 1744 ~ Aptos, CA 95001 ~ CCL # 657930 ~ beltonnigel@gmail.com

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AN ASSESSMENT OF THE TREES WITHIN THE OAKMONT SENIOR LIVING DEVELOPMENT SITE SOQUEL DRIVE - SOQUEL -CALIFORNIA

SUMMARY:

Fifty-two trees were surveyed within the proposed development site. All of these trees are identified within the accompanying Tree Survey Matrix and on a Tree Location Map, both of which are attached to this report. The majority of the surveyed trees within the project area comprise of native Coast Live Oaks, Willows and Coast Redwoods.

Forty-four of these trees are recommended for preservation based upon their health and structural condition ratings. Eight trees are recommended for removal at this time because of their poor health or structural conditions. A limited number of trees will have to be removed to facilitate the design and construction of the facility. It is my understanding that one large Coast Redwood (identified as Tree #46), will have to be removed because of the impacts of proposed grading and construction activities within its Critical Root Zone Area.

A review of the site plan for this development revealed that it is compatible with the preservation the great majority of the established trees during the design and construction phases of this project. It is crucial that the Critical Root Zones of these trees are protected, otherwise they will not thrive. The project arborist must work in collaboration the design team to protect established trees and minimize root loss and damage. Tree Protection Zones must be identified on development plans and underground utilities, drains and services must be located carefully to avoid excessive root loss. Grade changes must also be undertaken carefully within close proximity to existing trees.

The trees identified for preservation must also be protected from damage and excessive root loss during the demolition and construction phases of this project. Tree Protection Zone Fences must be installed before any equipment comes on site and must be maintained in good order throughout the entire construction period. All grading and underground work that encroaches within close proximity to Critical Root Zone Areas must be supervised by the project arborist in the field.

The project arborist must provide inspections, supervision and oversight during the construction period, as prescribed within the Inspection Schedule in this report.

BACKGROUND:

Hanna Daugherty contacted me on behalf of the Oakmont Senior Management Group concerning the need for a tree survey and an arborist's report regarding the proposed senior living facility in Soquel, which is located within an unincorporated area of Santa Cruz County. The development site comprises of a former church property. Approximately 50% of the total land area has been built upon for this purpose. The southern portion of this property is relatively undeveloped and comprises of an open field, upon which there are some temporary structures and trailers. It is my understanding that the proposed development area will also include the rear portion of the adjacent residential property to the east and that the lot boundary will be line will be changed for this purpose. The project area is surrounded by riparian areas on its east side. This riparian area comprises of an intermittent stream. Native Coast Live Oaks and Native Willows are the predominant trees growing within these areas. The northeastern portion of this property includes a number of significant native trees including mature Coast Live Oaks and Coast Redwood Trees.

A review of the preliminary site plan for this project shows that the location of the Assisted Living Building should not require the removal of many significant trees, the great majority of which are located well beyond its footprint. I also noted that the proposed improvements in the southern area of the project area are well setback from the existing trees and the adjacent riparian area. The improvements within this area should have little impact on the health of the existing trees around the property perimeter, as long as sufficient care is taken during the design and construction phases of this project.

ASSIGNMENT:

This assignment entails the provision of a tree resource survey and the preparation of an arborist's report on behalf of the Oakmont Senior Group.
- The surveyed trees within this report have trunk diameters equivalent to or exceeding six-inches diameter at 54-inches above grade (Standard DBH Measurements).
- The 52 surveyed trees within the project area are identified with numbered tags affixed to their trunks. The tag numbers correspond with the numbering utilized within this arborist's report and the accompanying tree survey matrix. The numbered tree's locations are also shown on an accompanying tree location map which utilizes a Topographic Map for this purpose.
- The Tree Survey Matrix serves to document the dimensions, health and structural conditions of individual trees. The matrix also denotes whether individual trees are suitable for preservation or should be removed at this time, based upon their condition ratings and/or undesirable species characteristics. The matrix also provides limited comments pertaining to trees of concern.
- The arborist's report provides background information and a discussion regarding the nature of the proposed improvements. The report provides observations and conclusions regarding the subject trees and their suitability for preservation. The report further provides preliminary recommendations for tree preservation and protection during both the design and the construction phases of the proposed development. This report also provides a preliminary inspection schedule for tree protection during the construction period.

LIMITATIONS:

The inspection of the surveyed trees was made from the ground. No tree canopies were accessed to examine their above ground structures, nor were any of these trees inspected below soil grade to examine their root systems. The inspections of trees were limited to visual examinations and did not entail any advanced testing of their interior structures.

This is a preliminary Tree Protection Report based on a site inspection and discussions pertaining to the nature of the proposed improvements. I was provided with a Topographic Survey Map and a Site Plan showing the footprints of proposed structures and the surrounding infrastructure within the project area (Prepared by LANDESIGN GROUP - July 2018). I have not had the opportunity to review any detailed Civil, Landscape or Architectural Plans at this early stage of the project.

DISCUSSION:

Fifty-two trees were surveyed within the project site. The new assisted living building will be situated in the northern area of the development property, closer to Soquel Drive. The facility will be serviced by a driveway that enters off Soquel Drive. A new landscape will be installed on the east side of the new building and it will be designed around the established native trees growing within this area. The other proposed improvements for the southern section of the project site will comprise of a large parking area, a garage and a community garden and recreation areas.

The predominant tree species on the project site comprise of Native Willows, Coast Live Oaks and Coast Redwoods. These trees must be preserved and protected as long as they have good health and structural conditions and will be well setback from the proposed building and infrastructure footprints.

Thirty-nine Coast Live Oaks were surveyed in preparation for this report, the great majority of which appear to have grown in the wild from acorns. These oaks vary in height, between 10 and 55-feet tall. The great majority of these oaks have good overall health and structural conditions and as such, are recommended for preservation and protection from damage during this development project.

Five Coast Redwood Trees are identified within the project site. All of these trees are worthy of preservation, based upon their condition ratings. It is my understanding that one of the redwoods will likely need to be removed due to grading and building encroachments within its Critical Root Zone (Tree #46). Coast Redwoods are being generally tolerant of construction impacts as long as enough of their Critical Root Zone Areas are properly protected.

The preliminary site plan shows that the native willows, oaks and redwoods growing within the riparian areas are well setback from proposed construction work and disturbances. There should be minimal impacts on the health of these riparian trees, as long as sufficient care is taken to protect their Critical Root Zone Areas from damage during design and construction.

OBSERVATIONS AND PRELIMINARY RECOMMENDATIONS CONCERNING EXISTING TREE CONDITIONS:

Tree #1 - 14-inch DBH Coast Live Oak *(Quercus agrifolia)*:

The trunk of this tree transects the western property boundary.

This oak is worthy of preservation based upon its condition ratings.

Tree's #2 - 5 & 6-inch DBH Holly *(Ilex spp.)*:

Tree #3 - 4/5/6-inch DBH African Yellow Pine *(Afrocarpus gracilor)*:

Both of these trees must be removed because they are located within the proposed building footprint.

Tree #4 - 9-inch DBH Coast Live Oak:

The trunk of this tree is located on the adjacent property to the west. The canopy extends into the development property.

The small oak is worthy of preservation based upon its condition ratings, however its location may be problematic concerning the proximity of the proposed driveway as shown on the site plan.

Tree #5 - 10 & 11-inch DBH Brazilian Pepper Tree *(Schinus terebinthifolius)*:

This tree is located near the southwest corner of the existing administration and facilities building.

The Brazilian Pepper Tree should be removed due to its location, being within very close proximity to the proposed driveway footprint as shown on the site plan. It is also important to note that root growth pattern of this species is often destructive to nearby curbs and driveway surfaces.

Tree #6 - 24-inch DBH Fruitless Mulberry *(Morus alba "Fruitless")*:

This tree is located near the southwest corner of the existing administration and facilities building.

The Fruitless Mulberry must be removed because of the extensive internal decay within the lower trunk. The tree is vulnerable to falling at this time.

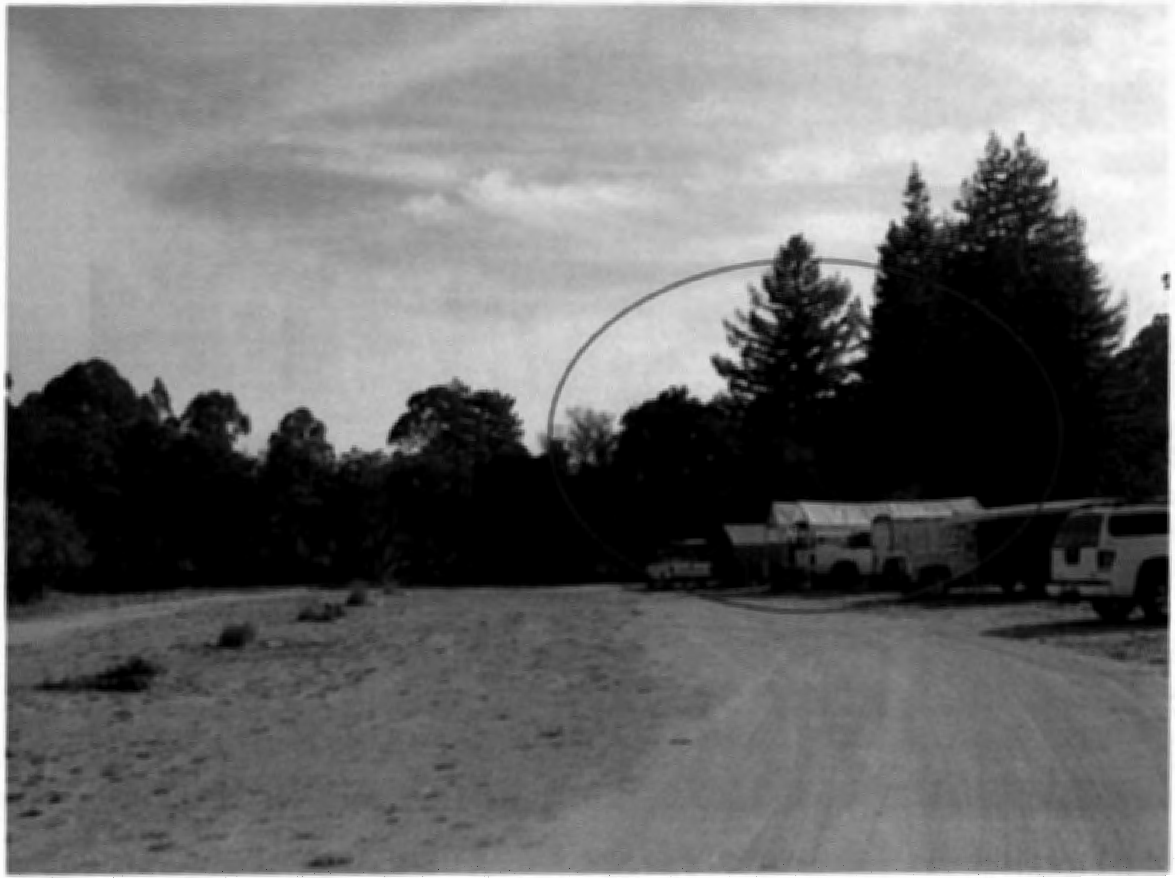
The fruiting body of Artist's Conk fungus *(Ganoderma applanatum)*

Tree's #8 & #9 - Two Coast Redwoods *(Sequoia sempervirens)*:

Tree's #10 through #14 - Five Coast Live Oaks:

These Coast Redwoods and Coast Live Oaks are located on the bank at the southwest corner of the project site. The trunk of Tree #9 (40-inch DBH Coast Redwood) transects the property boundary line.

All of these trees are worthy of preservation based upon their condition ratings and they are well setback from proposed improvements and related disturbances.

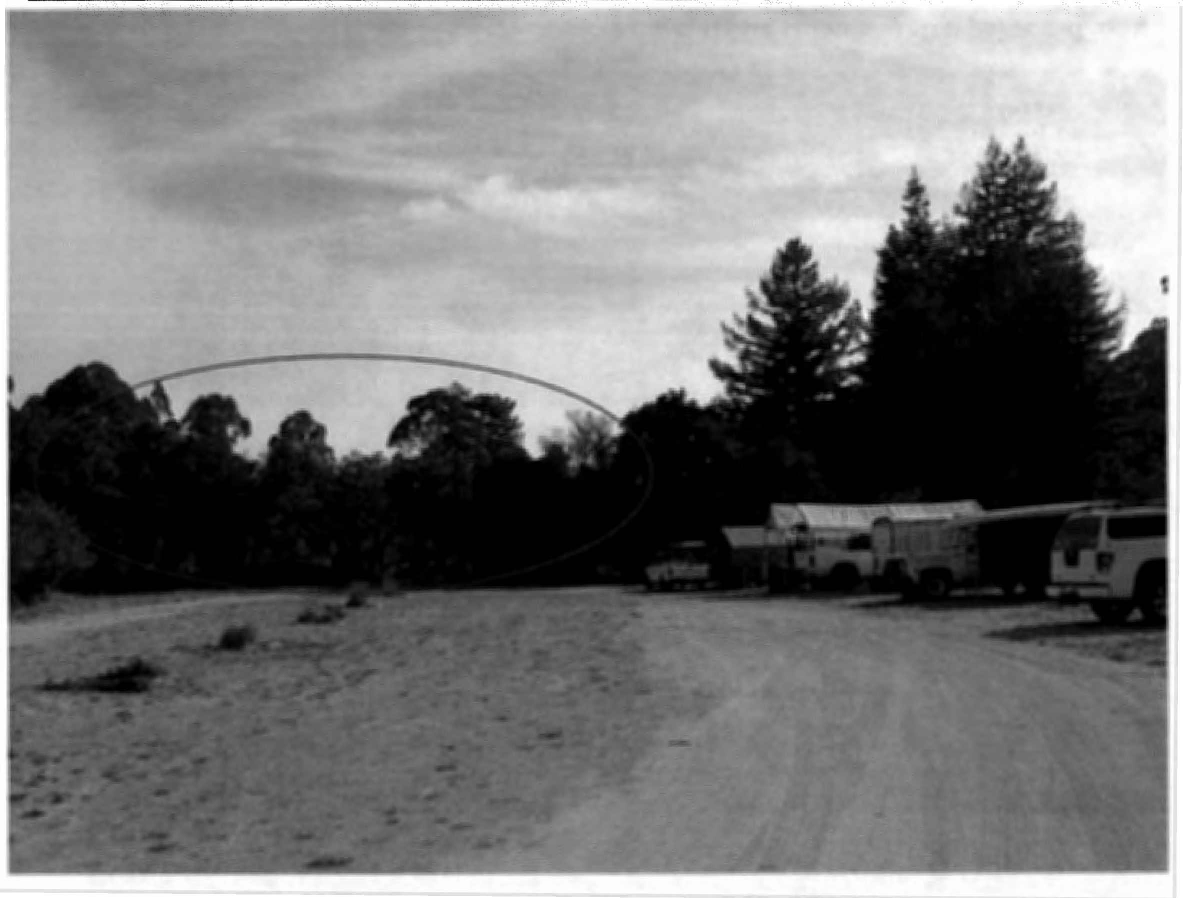


Tree #15 - 7, 9 & 8-inch DBH Coast Live Oak:

Located on the bank at the south end of the project area.

This tree is dead and should be removed before it falls down.

Tree's #16 through #19 - Four Coast Live Oaks located on the bank at the south end of the project area:



All of these trees are worthy of preservation based upon their condition ratings.

I noted that Tree #19 (15-inch DBH Coast Live Oak), appears to be symptomatic of an infection caused by Sudden Oak Death Syndrome *(Phytophthora ramorum)*. I noted distinctive bleeding spots on the trunk. The tree will likely die but it does not have to be removed immediately. It is my understanding the risk of disease transmission from infected to healthy oaks should not be a concern, regarding this pathogen.

I recommend that the most valuable oaks on the property are monitored and treated annually to reduce the spread of this disease. There is an effective prophylactic treatment available for this purpose. This work should be undertaken by a knowledgeable Licensed Pest Applicator who specializes in treating tree diseases.

Tree's #20 - Numerous Native Willows *(Salix spp.)*:

These willows are growing on the western bank of the intermittent stream, on the east side of the project area.

I noted on the site plan, that a bio filtration pond is proposed to be dug near the canopies of some of these trees. This work will have no significant impact on the health of these trees.

All of the native willows are worthy of preservation based upon their condition ratings.

Tree's #21 & #22 - Two Coast Live Oaks - (19 & 18-inch DBH, respectively):

Both of these trees are located on the bank above the intermittent creek and their trunks and major limbs are being smothered by English Ivy growth. Tree #22 leans heavily to the west and could be vulnerable to falling in storm conditions.

Both of these oaks are worthy of preservation, based upon their condition ratings.

I recommend that they are pruned to remove the ivy growth and to improve their structures. These actions will serve to expose any structural defects that may be hidden at this time and will also reduce the risk of limb failures and whole tree failures. I recommend that the canopy weight of the leaning tree is reduced at this time.

Tree #23 - 8-inch DBH Native Willow:

This tree is located at the top of the bank above the intermittent stream. The tree leans heavily to the west and is worthy of preservation despite its poor structural condition.

I recommend that it is pruned to improve its structure and reduce the risk of it falling.

Tree #24 -23-inch DBH Coast Live Oak:

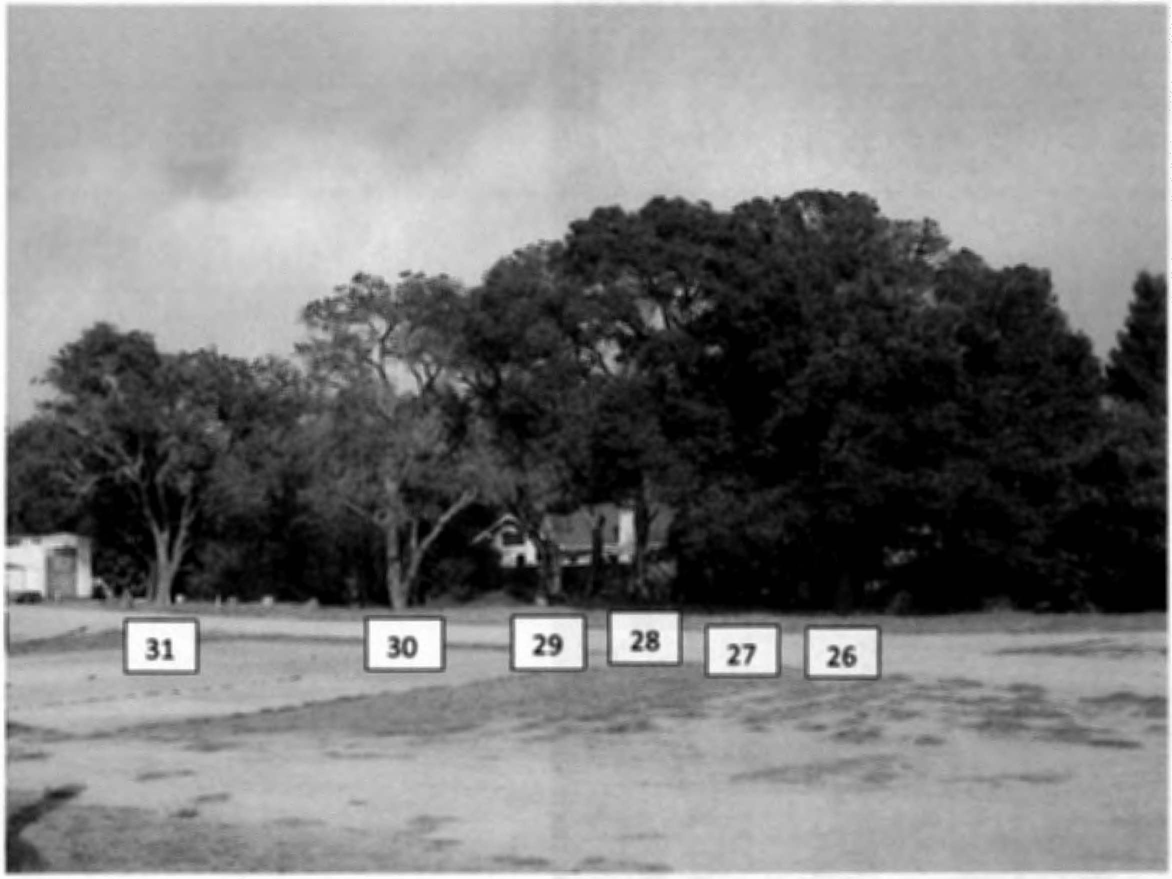
This oak is located on the bank above the intermittent creek and is well setback from any potential construction disturbances.

The tree is worthy of preservation due to its good condition rating.

Tree #25 - 10-inch DBH Wild Plum *(Prunus spp.)*:

This self-seeded plum should be removed because of its poor condition rating and because of the invasive nature of this species.

Tree #26 through #28 - Three large Coast Live Oaks (19 - 22 & 23 - 25-inch DBH, respectively):



Tree #26 is located on the flat area beyond the top of the slope. The two other oaks are growing on the bank above the intermittent stream.

All of these trees are worthy of preservation and protection, based upon their condition ratings.

Tree #29 - 17 & 17-inch DBH Coast Live Oak:

This tree is located on the bank above the intermittent stream.

The oak is dying at this time, as evidenced by its poor foliage condition and the large areas of dead bark observed on its trunk. This dieback pattern may have resulted from an infection caused by Sudden Oak Death Syndrome or by another pathogen that exhibits similar symptoms. There are no effective means available to prevent the further decline and death of the oak at this time.

I recommend that this tree is removed at this time in order to remove a potential hazard. The tree will decay rapidly after it dies and it will become vulnerable to falling within a short period of time.

Tree #30 - 15 & 20-inch DBH Coast Live Oak:

Tree #31 - 17 & 21-inch DBH Coast Live Oak:

Tree #30 is located on the flat area beyond the top of the bank above the intermittent stream.

Tree #31 is growing on a steep section of the bank above the intermittent stream.

Both trees are worthy of preservation and protection based upon their condition ratings and they are also well setback from proposed improvements and related disturbances.

Tree #32 - 7-inch DBH Native Willow:

This tree has a very poor structure and is vulnerable to failure.

I recommend that it is severely pruned to reduce the risk of failure (or that it is cut back to the stump which will then re-sprout).

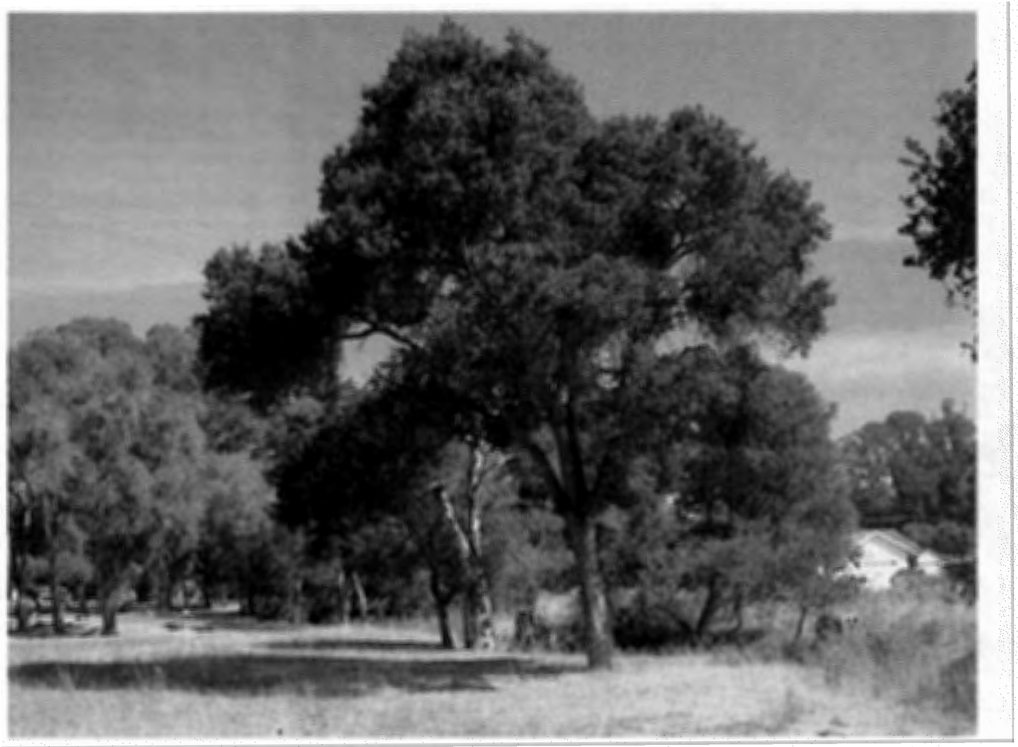
Tree #33 - 12 & 14-inch DBH Coast Live Oak:

This oak is located between the Rochelle Drive and the northern section of the intermittent stream closer to Soquel Drive.

The tree has a poor structural condition due to the development of a weak codominant structure, having two secondary trunks, that are poorly attached to the main trunk below.

I recommend that this tree is pruned and that support cables are installed to reduce the risk of trunk failures.

Tree #34 - 19-inch DBH Coast Live Oak:



This oak is growing on the flat area to the west of the intermittent creek, to the east of the proposed Assisted Living Building site.

This oak is worthy of preservation and protection during construction.

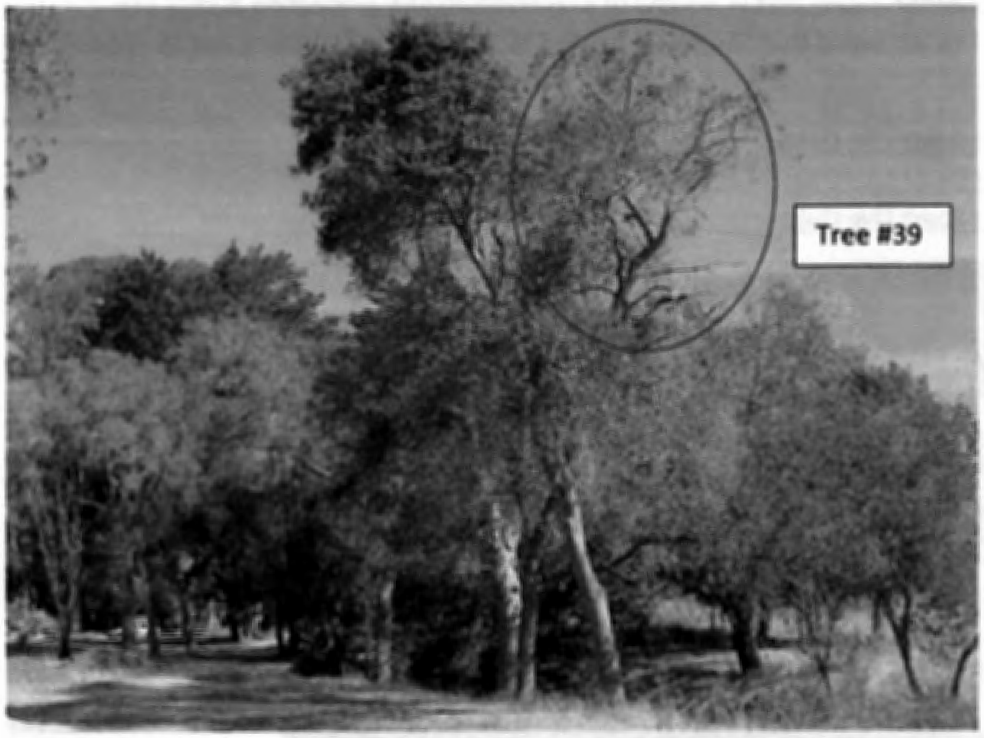
I recommend that it is pruned to improve its structure and that support cables are installed to reduce the risk of scaffold limb failures.

Tree #35 - 23-inch DBH Coast Live Oak:

This dead oak is located at the top of the intermittent stream bank.

I recommend that it is removed at this time to abate a potential hazard.

Tree #36 - 9-inch DBH Coast Live Oak:
Tree #37 - 10-inch DBH Coast Live Oak:
Tree #38 - 12-inch DBH Coast Live Oak:



Located above the intermittent stream, east of the proposed Assisted Living Building site.

These trees have good condition ratings and are worthy of preservation and protection during the development period. I recommend that they are pruned to improve their structures and reduce the risk of limb failures.

Tree #39 - 13-inch DBH Coast Live Oak:

Located on the bank above the intermittent stream, to the east of the proposed building site.

This oak is in declining health as evidenced by its poor canopy and foliage conditions. I observed a large area of missing bark on the trunk at about 15-feet above grade and noted an advanced dieback pattern in the upper canopy (see the photograph above).

I recommend that this tree is removed at this time because it is dying. There are no effective treatments available to reverse this decline.

Tree #40 - 24-inch DBH Coast Live Oak:

Located on the bank above the intermittent stream, east of the proposed Assisted Living Building site.

This oak has a good condition rating and is worthy of preservation and protection during the development period. I recommend that the oak is pruned to improve its structure and to reduce the risk of limb failures.

Tree #41 - 25-inch DBH Coast Live Oak:
Tree #42 - 18-inch DBH Coast Live Oak:
~~Tree #43 - 19-inch DBH Coast Live Oak~~:

These three oaks are growing on the flat grade in between the intermittent creek and the proposed Assisted Living Building footprint. The trees are located within close proximity to proposed landscape and infrastructure improvements, as shown on the site plan.

All three trees have good overall condition ratings and are worthy of preservation and protection during the development period.

The trunks of Tree's #41 and #42 have been infested by Western Sycamore Borer *(Synanthedon resplendens)*. The larvae of this insect feeds on the outer corky bark of Coast Live Oaks and sometimes causes significant damage to the inner bark and vascular cambium tissue underneath.

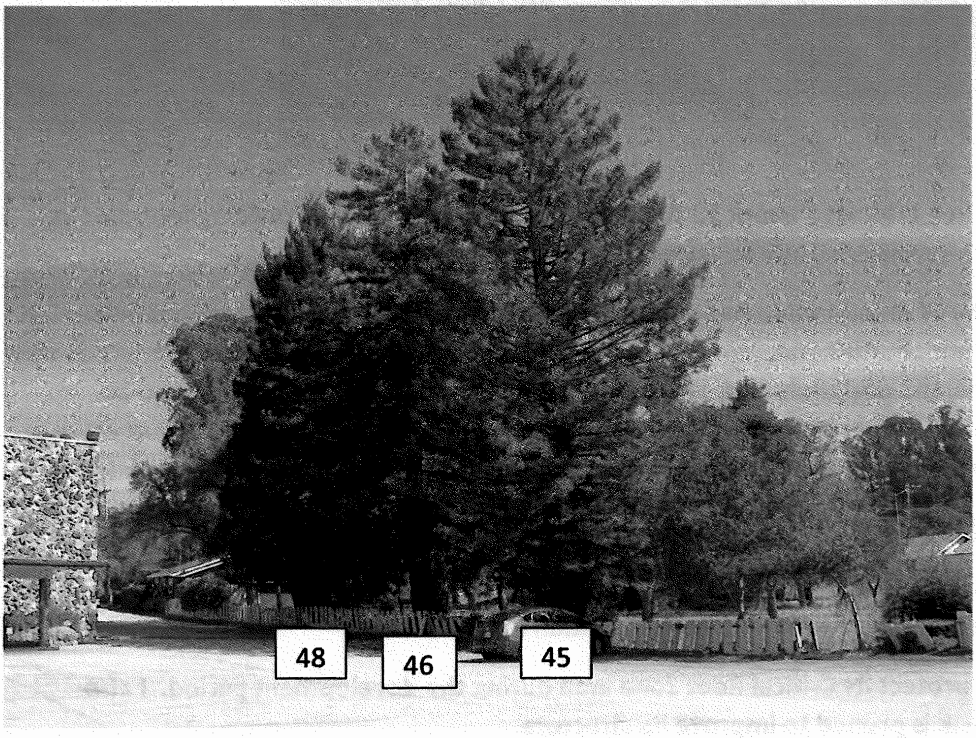
I also noted that Tree #43 is infested by California Oak Worm *(Phryganidia californica)*. The other oaks within this area were also infested to a lesser extent. The larvae of this insect often defoliates oaks. This is usually not of great concern as long as the affected trees are in good health. Successive infestations resulting in canopy defoliation can be problematic concerning tree health, particularly regarding those trees that already under stress or in decline for other reasons.

I recommend that all of the significant oaks in the landscape are monitored and treated for insect pests and diseases by a Licensed Pest Applicator who specializes in Integrated Pest and Disease Management (IPM). I also recommend that these trees are pruned to improve their structural conditions and safety.

Tree #44 - 6 & 5-inch DBH Coast Live Oak:

This small oak is worthy of preservation based upon its condition rating but it may have to be removed due to its location within the area of proposed landscape improvements.

Tree #45 - 44-inch DBH Coast Redwood:



This large tree is located about 20-feet to the east of the proposed building footprint as shown on the site plan.

The tree is worthy of preservation during the development period and care must be taken to protect its Critical Root Zone during the development period (The Critical Root Zone is defined by the tree's canopy drip line perimeter, or by the trunk diameter multiplied by a factor of eight).

Tree #46 - 42-inch DBH Coast Redwood:

The trunk of this large tree is located about 20-feet to the east of the proposed building footprint as shown on the site plan.

This large tree is worthy of preservation based upon its condition rating. It is my understanding that the tree's location is problematic concerning the proposed grading and construction work within this area. For these reasons, the designers and owners are requesting that this single redwood be removed. I will support the removal and replacement of this on large tree in the event that there are no other practical options available concerning its preservation.

Tree #47 - 17-inch DBH Coast Live Oak:

The trunk of this oak is located about 20-feet east of the proposed building footprint and it is worthy of preservation and protection, based upon its good condition rating.

Care must be taken to protect its Critical Root Zone area during the development period. I also recommend that this oak is pruned to improve its structure.

Tree #48 - 35-inch DBH Coast Redwood:

The trunk of this large redwood is setback about 20-feet east of the proposed building footprint and it is worthy of preservation and protection, based upon its good condition rating.

Care must be taken to protect its Critical Root Zone area during the development period.

Tree #49 - 18-inch DBH Coast Live Oak:

The trunk of this oak is located about 20-feet east of the proposed building footprint and it is worthy of preservation and protection, based upon its good condition rating. I noted that the canopy of this oak is infested by California Oak Worm.

I recommend that these oaks are monitored and treated for insects and diseases by a Licensed Pest Applicator who specializes in Integrated Pest and Disease Management (IPM). I also recommend that it is pruned to improve its structure and safety at this time.

Care must be taken to protect its Critical Root Zone area during the development period.

Tree #50 - 9-inch DBH Scotts pine *(Pinus sylvestris)*:

This pine has a poor structural condition due to the development of two tops which are weakly attached to the trunk. These tops are vulnerable to failing in storm conditions.

I recommend that this pine must be removed in order to abate a potential hazard that cannot be effectively reduced by other means.

Tree #51 - 24-inch DBH Coast Live Oak:

The trunk of this oak is located about 20-feet east of the proposed building footprint and it is worthy of preservation and protection, based upon its good condition rating. I noted that this oak had been defoliated by California oak Worm.

I recommend that these oaks are monitored and treated for pests and diseases by a Licensed Pest Applicator who specializes in Integrated Pest and Disease Management (IPM).

Care must be taken to protect its Critical Root Zone area during the development period.

Tree #52 - 15-inch DBH Coast Live Oak:

The trunk of this oak is setback about 40-feet from the proposed building footprint and it is worthy of preservation and protection based upon its condition rating.

The trunk of this oak is located about 20-feet east of the proposed building footprint and it is worthy of preservation and protection based upon its good condition rating.

Care must be taken to protect its Critical Root Zone area during the development period.

PRELIMINARY RECOMMENDATIONS FOR TREE PROTECTION DURING DESIGN AND CONSTRUCTION:

TREE PROTECTION DURING DESIGN DEVELOPMENT:

The project arborist must work with the design team in order to provide plan review comments and recommendations concerning the preservation and protection of desirable trees during the design development phases of this project. These recommendations pertain the protection of the Critical Root Zones of trees situated within close proximity to proposed grading, work, construction activities and new underground utilities and drains (and the new driveway and parking infrastructure).

1- Tree Protection Zone (TPZ) fence locations must be shown on the Final Site Demolition and Construction Plans.

2- I recommend that the individual tree numbers are identified within this report are shown on the Completed Civil Plans, so as to provide an easy reference in the field during the demolition and construction periods of this project.

3- I recommend that the following notes are added on the final Demolition, Grading, Drainage, Utility and Construction Plan Sheets:

- Tree Protection Zone Fencing must be installed and approved of by the project arborist, before site demolition and construction work proceeds. These fences must not be dismantled or moved at any time during the construction period, without first obtaining the consent of the project arborist.

Tree Protection Zone Fences must comprise of steel chain-link construction, attached to steel posts driven into the ground. Laminated Tree Protection Notices must be attached to TPZ fences at distances of every 10-feet (see the attached TPZ notice template). TPZ fences must not be dismantled or moved at any time during the construction period, without first obtaining the consent of the project arborist.

- The project arborist must attend a pre-construction meeting with the General Contractor, the demolition contractor and the grading contractor and must also be notified concerning scheduled site meetings throughout the construction period.

- All construction activities must be excluded from fenced Tree Protection Zones unless such encroachments are unavoidable, in which case the project arborist must provide supervision regarding root protection and preservation. Vehicles and equipment must be excluded from Tree Protection Zones. No materials, chemicals or waste products may be stored or disposed of within these protected areas.

- The project arborist must be notified in the event that significant roots over 2-inches diameter are encountered during any underground work.

TREE PRUNING AND MAINTENANCE RECOMMENDATIONS:

1- I recommend that the trees designated for preservation should be pruned in order to improve their health and structural conditions and to reduce the risk of limb failures. This work should be completed before the construction phase begins. Such work will entail the removal of dead, broken, diseased and crossing branches and the reduction of weight in the ends of heavy and over extended limbs. The installation of support cables is also recommended when required to strengthen trees with weak codominant growth patterns.

The Project Arborist must meet with the approved Tree Service Provider to discuss the scope of recommended pruning work before it proceeds and must also inspect the work in progress in order to ensure that it is being performed correctly. Such work must be undertaken by a State Licensed Tree Service Provider and comply with ANSI A-300 Best Management Practices and ISA Standards for tree pruning and maintenance work. This work must be performed under the supervision of an ISA Certified Arborist.

2- I recommend that a Licensed Pest Applicator is contracted to monitor the health of the native oaks, some of which appear to have been infected by Sudden Oak Death Syndrome and have been infested by insects. The approved company must specialize in tree health and should provide an ongoing Integrated Pest Management Program.

CONSTRUCTION PERIOD TREE PROTECTION RECOMMENDATIONS:

1- Tree Protection Zone Fencing must be installed and approved of by the project arborist, before site demolition and construction work proceeds. These TPZ Fences must comprise of steel chain-link construction, attached to steel posts driven into the ground. Laminated Tree Protection Notices must be attached to TPZ fences at distances of every 10-feet.

TPZ fences must not be dismantled or moved at any time during the construction period, without first obtaining the consent of the project arborist.

All construction activities must be excluded from fenced Tree Protection Zones, unless such encroachments are unavoidable, in which case the project arborist must provide supervision regarding root protection and preservation. Vehicles and equipment must be excluded from Tree Protection Zones. No materials, chemicals or waste products may be stored or disposed of within these protected areas.

2- The project arborist must attend a pre-construction meeting with the General Contractor and the grading contractor and must also be notified concerning scheduled site meetings throughout the construction period.

3- The project arborist must be notified in the event that significant roots over 2-inches diameter are encountered during any underground work.

PRELIMINARY INSPECTION SCHEDULE:

Document all site inspections in an e-mail format and share this correspondence with the Project Team and the Oakmont Senior Housing Group.

1- The project arborist must meet with the General Contractor at a pre-construction meeting before any site work proceeds in order to discuss tree protection requirements.

2- The project arborist must inspect Tree Protection Zone Fences once they have been installed and before any site work proceeds.

3- The project arborist must provide supervision and oversight in the event that any grading, excavation or trenching work will encroach within the Tree Protection Zones defined by TPZ fences. The project arborist must provide direction and supervision concerning required root preservation and root pruning measures.

4- The project arborist must provide supervision and oversight concerning all construction disturbances that encroach within the Critical Root Zones areas of Protected Trees (as defined by their canopy drip line perimeters or their trunk diameter measurements).

5 - Inspect the site whenever roots 2-inches or larger in diameter are encountered outside fenced TPZ areas during any grading, trenching and construction activities.

6- Provide guidance and supervision pertaining to required tree pruning work. Meet with the approved Tree Service Provider to discuss the required scope of work and provide inspections and oversight as needed.

Please contact me if you have any questions pertaining to this report.

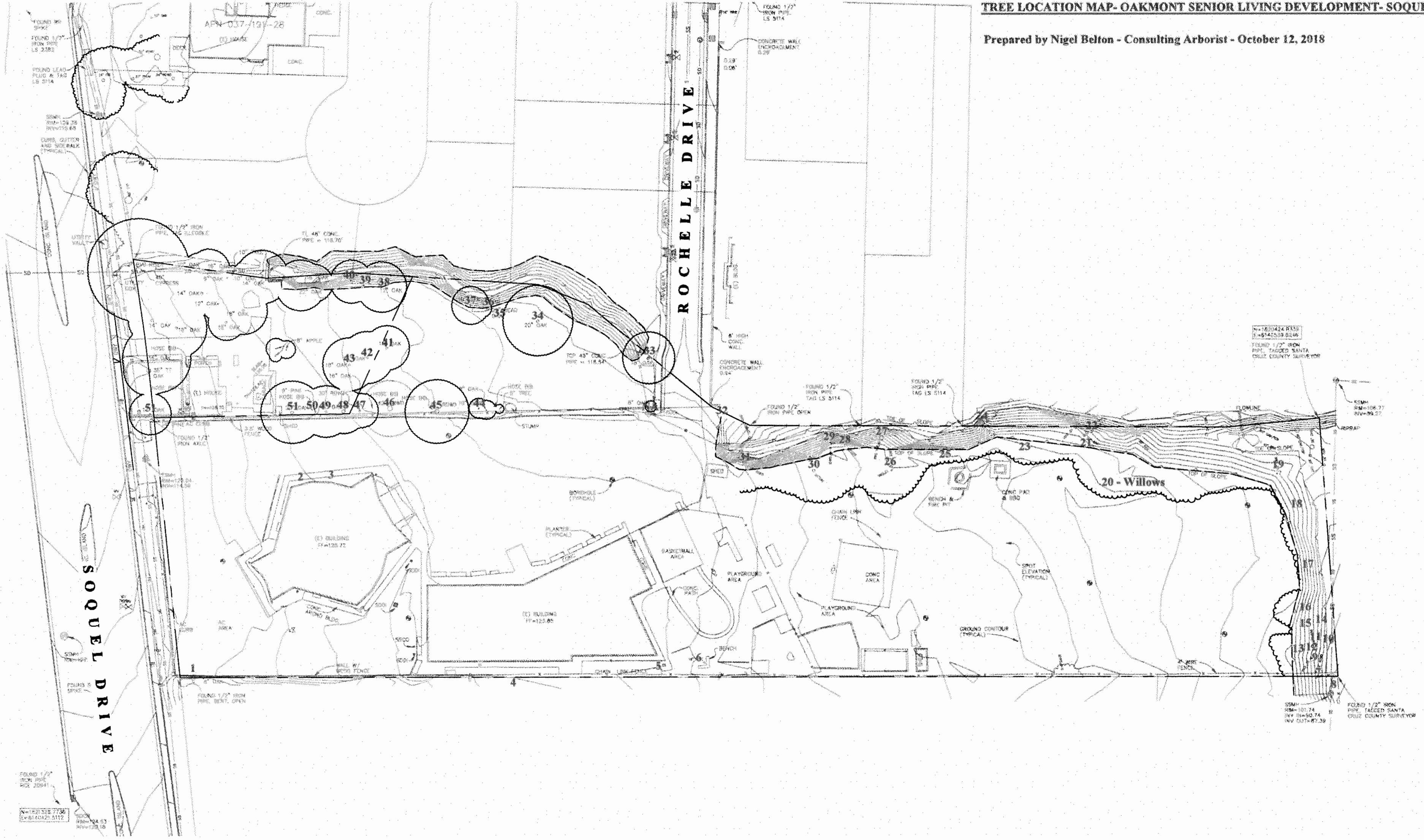
Respectfully submitted

Nigel Belton

Attachments:
- Assumptions and Limiting Conditions
- Tree Survey Matrix
- Tree Location Map
- Sample Tree Protection Zone Notice
- Site Plan
- List of Approved Tree Service Providers

TREE LOCATION MAP- OAKMONT SENIOR LIVING DEVELOPMENT- SOQUEL - CA:

Prepared by Nigel Belton - Consulting Arborist - October 12, 2018



OAKMONT OF SOQUEL

EXISTING SURVEY

JULY 2018

SOQUEL, CALIFORNIA

OAKMONT SENIOR LIVING

NORTH

30' 15' 0' 30' 60'

SCALE: 1"=30'

SHEET:
1

LANDESIGN GROUP
3344 GRAVENSTEIN HWY. N. SEBASTOPOL, CA
(707) 829-2580

TREE SURVEY MATRIX - OAKMONT SENIOR LIVING DEVELOPMENT PROJECT - SOQUEL DRIVE, SANTA CRUZ:

#	*SHEET 1 OF 5.* SPECIES:	TRUNK DIAMETER AT 54-INCHES ABOVE NATURAL GRADE:	ESTIMATED HEIGHT:	ESTIMATED SPREAD:	HEALTH: (1 = Best Rating out of 5)	STRUCTURE: (1 = Best Rating out of 5)	SUITABLE FOR PRESERVATION: (Based on condition ratings)	RECOMMENDED FOR REMOVAL: (POOR CONDITION RATINGS)	COMMENTS:
1	Coast Live Oak *(Quercus agrifolia)*	14	20	25	2	2	X	-	- Located at the northwest corner of the project site. - The trunk transects the property boundary line.
2	Holly *(Ilex spp.)*	5/6	20	15	2	3	X	-	Beside the sanctuary.
3	African Yellow Pine *(Afrocarpus gracilor)*	4/5/6	25	20	2	4	-	X	Beside the sanctuary.
4	Coast Live Oak	9	15	15	2	2	X	-	Located on the adjacent property beyond the west boundary.
5	Brazilian Pepper *(Schinus terebinthifolius)*	10/11	20	20	2	3	X	-	Located beside the west boundary.
6	Fruitless Mulberry *(Morus alba (Fruitless)*	24	25	25	1	4	-	X	Noted a very large heartwood decay fungus conk on the base of the trunk. Rotten in the center of the trunk and vulnerable to falling.
7	Coast Live Oak	13	45	25	2	2	X	-	Located in the southwest corner of the project site.
8	Coast Redwood *(Sequoia sempervirens)*	19	60	35	2	2	X	-	- Located in the southwest corner of the project site. - Trunk transects property boundary line.
9	Coast Redwood	40	70	40	2	4	X	-	Located in the southwest corner of the project site.
10	Coast Live Oak	15	40	25	2	4	X	-	Located in the southwest corner of the project site.
11	Coast Live Oak	6	25	10	3	3	X	-	Located in the southwest corner of the project site.

Site visit by Nigel Belton, ISA Certified Arborist WE-0410A - September 26, 2018

TREE SURVEY MATRIX - OAKMONT SENIOR LIVING DEVELOPMENT PROJECT - SOQUEL DRIVE, SANTA CRUZ:

#	***SHEET 2 OF 5.*** **SPECIES:**	**TRUNK DIAMETER AT 54-INCHES ABOVE NATURAL GRADE:**	**ESTIMATED HEIGHT:**	**ESTIMATED SPREAD:**	**HEALTH: (1 = Best Rating out of 5)**	**STRUCTURE: (1 = Best Rating out of 5)**	**SUITABLE FOR PRESERVATION: (Based on condition ratings)**	**RECOMMENDED FOR REMOVAL: (POOR CONDITION RATINGS)**	**COMMENTS:**
12	Coast Live Oak	18	35	25	2	3	X	-	Located in the southwest corner of the project site.
13	Coast Live Oak	7/10	25	25	2	3	X	-	Located in the southwest corner of the project site.
14	Coast Live Oak	12	30	20	2	2	X	-	Located in the southwest corner of the project site.
15	Coast Live Oak	7/9/8	25	15	5	4	-	X	Located in the southwest corner of the project site. Dead tree.
16	Coast Live Oak	11/9	20	25	2	3	X	-	Located at the south end of the project site.
17	Coast Live Oak	10	25	20	2	3	X	-	Located at the south end of the project site.
18	Coast Live Oak	12	20	15	2	3	X	-	Located at the south end of the project site.
19	Coast Live Oak	15	35	25	2	3	X	-	- Located at the southeast corner of the project site. - Noted symptoms consistent with an infection by Sudden Oak Death Syndrome.
20	Group of Native Willows *(Salix spp.)*	< 10	15-25	-	1	3	X	-	A large group of Willows on the bank above the intermittent creek.
21	Coast Live Oak	19	35	25	3	3	X	-	- Located above/near the intermittent creek. - Trunk and major limbs smothered by English Ivy.
22	Coast Live Oak	18	45	25	2	4	X	-	- Located above/near the intermittent creek. - Trunk and major limbs smothered by English Ivy. - Exhibits a strong lean to the west.
23	Native Willow	8	25	35	2	4	X	-	- Located above/near the intermittent creek. - Exhibits a strong lean to the west.
24	Coast Live Oak	23	50	60	2	3	X	-	Located above/near the intermittent creek.

Site visit by Nigel Belton, ISA Certified Arborist WE-0410A - September 26, 2018

TREE SURVEY MATRIX - OAKMONT SENIOR LIVING DEVELOPMENT PROJECT - SOQUEL DRIVE, SANTA CRUZ:

#	***SHEET 3 OF 5.*** **SPECIES:**	**TRUNK DIAMETER AT 54-INCHES ABOVE NATURAL GRADE:**	**ESTIMATED HEIGHT:**	**ESTIMATED SPREAD:**	**HEALTH: (1 = Best Rating out of 5)**	**STRUCTURE: (1 = Best Rating out of 5)**	**SUITABLE FOR PRESERVATION: (Based on condition ratings)**	**RECOMMENDED FOR REMOVAL: (POOR CONDITION RATINGS)**	**COMMENTS:**
25	Wild Plum *(Prunus spp.)*	10	20	20	2	4	-	X	- Located above/near the intermittent creek. - Invasive species.
26	Coast Live Oak	19	45	45	2	2	X	-	Located above/near the intermittent creek.
27	Coast Live Oak	22/33	55	60	2	3	X	-	Located above/near the intermittent creek.
28	Coast Live Oak	25	50	45	2	3	X	-	Located above/near the intermittent creek.
29	Coast Live Oak	17/17	45	35	4	3	-	X	- Located above/near the intermittent creek. - Noted symptoms consistent with an infection by Sudden Oak Death Syndrome on the trunk and dead bark tissue. The tree appears to be dying at this time. - Once it is dead, it will quickly become hazardous due to the onset of internal decay.
30	Coast Live Oak	15/20	40	35	3	2	X	-	- Located above/near the intermittent creek. - Thin canopy.
31	Coast Live Oak	17/21	45	45	3	3	X	-	Located above/near the intermittent creek.
32	Native Willow	7	20	20	1	4	X	-	Located above/near the intermittent creek.
33	Coast Live Oak	12/14	25	25	2	4	X	-	- Located above/near the intermittent creek. - A weak codominant structure at 3-feet above grade. Recommended for the installation of support cables and structural pruning work.
34	Coast Live Oak	19	45	50	2	3	X	-	- Located above/near the intermittent creek. - Recommend the installation of support cables and structural pruning.

Site visit by Nigel Belton, ISA Certified Arborist WE-0410A - September 26, 2018

TREE SURVEY MATRIX - OAKMONT SENIOR LIVING DEVELOPMENT PROJECT - SOQUEL DRIVE, SANTA CRUZ:

#	*SHEET 4 OF 5.* SPECIES:	TRUNK DIAMETER AT 54-INCHES ABOVE NATURAL GRADE:	ESTIMATED HEIGHT:	ESTIMATED SPREAD:	HEALTH: (1 = Best Rating out of 5)	STRUCTURE: (1 = Best Rating out of 5)	SUITABLE FOR PRESERVATION: (Based on condition ratings)	RECOMMENDED FOR REMOVAL: (POOR CONDITION RATINGS)	COMMENTS:
35	Coast Live Oak	23	30	15	5	5	-	X	- Located above/near the intermittent creek. - Dead tree.
36	Coast Live Oak	9	25	20	3	2	X	-	Located above/near the intermittent creek.
37	Coast Live Oak	10	15	15	2	2	X	-	Located above/near the intermittent creek.
38	Coast Live Oak	12	45	15	2	2	X	-	- Located above/near the intermittent creek. - Noted an infestation by California Oak Worm.
39	Coast Live Oak	13	40	20	4	3	-	X	- Located above/near the intermittent creek. - Noted an area of missing bark on the trunk at 15-feet above grade and a dieback pattern in the canopy.
40	Coast Live Oak	24	40	30	3	2	X	-	Located above/near the intermittent creek.
41	Coast Live Oak	25	40	30	3	3	X	-	Noted an infestation by California Oak Worm and Western Sycamore Borer.
42	Coast Live Oak	18	40	30	3	2	X	-	Noted an infestation by California Oak Worm and Western Sycamore Borer.
43	Coast Live Oak	19	35	30	3	2	X	-	Noted an infestation by California Oak Worm.
44	Coast Live Oak	6/5	15	15	2	3	X	-	Poor area of attachment between the codominant trunks.
45	Coast Redwood	44	80	50	2	2	X	-	Dominant tree.
46	Coast Redwood	42	85	55	2	2	X	-	Dominant tree.
47	Coast Live Oak	17	45	20	2	2	X	-	-
48	Coast Redwood	35	90	40	2	2	X	-	Dominant tree.

Site visit by Nigel Belton, ISA Certified Arborist WE-0410A - September 26, 2018

TREE SURVEY MATRIX - OAKMONT SENIOR LIVING DEVELOPMENT PROJECT - SOQUEL DRIVE, SANTA CRUZ:

#	***SHEET 5 OF 5.*** **SPECIES:**	**TRUNK DIAMETER AT 54-INCHES ABOVE NATURAL GRADE:**	**ESTIMATED HEIGHT:**	**ESTIMATED SPREAD:**	**HEALTH: (1 = Best Rating out of 5)**	**STRUCTURE: (1 = Best Rating out of 5)**	**SUITABLE FOR PRESERVATION: (Based on condition ratings)**	**RECOMMENDED FOR REMOVAL: (POOR CONDITION RATINGS)**	**COMMENTS:**
49	Coast Live Oak	18	40	25	3	2	X	-	Noted an infestation by California Oak Worm.
50	Scotts Pine *(Pinus sylvestris)*	9	50	15	3	4	-	X	Noted a weak codominant top which is vulnerable to failure.
51	Coast Live Oak	24	45	45	3	2	X	-	Noted an infestation by California Oak Worm.
52	Coast Live Oak	15	20	30	3	2	X	-	-

Site visit by Nigel Belton, ISA Certified Arborist WE-0410A - September 26, 2018

TREE PRESERVATION AREA – KEEP OUT

TREE PROTECTION ZONE FENCING MUST REMAIN IN PLACE DURING THE ENTIRE CONSTRUCTION PERIOD

FENCING MUST NOT BE MOVED OR DISMANTLED WITHOUT THE NOTIFICATION OF THE PROJECT MANAGER AND THE WRITTEN CONSENT OF THE PROJECT ARBORIST

Attachment 3

Geotechnical Investigation

December 14, 2018

THE COUNTY OF SANTA CRUZ

1850

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GEOTECHNICAL INVESTIGATION

5630 Soquel Drive
Soquel, Santa Cruz County, California

Submitted to:

Bill Mabry
9240 Old Redwood Highway, Suite 200
Windsor, California 95492

Prepared by:

CMAG ENGINEERING, INC.
Project No. 18-141-SC
December 14, 2018

CMAG ENGINEERING, INC.
P.O. BOX 640 APTOS, CALIFORNIA 95001
PHONE: 831.475.1411
WWW.CMAGENGINEERING.COM

December 14, 2018
Project No. 18-141-SC

Bill Mabry
9240 Old Redwood Highway, Suite 200
Windsor, California 95492

SUBJECT: **GEOTECHNICAL INVESTIGATION**
Proposed Assisted Living Facility
5630 Soquel Drive, Soquel, Santa Cruz County, California
APN 037-191-14

Dear Mr. Mabry:

In accordance with your authorization, we have completed a geotechnical investigation for the subject project. This report summarizes the findings, conclusions, and recommendations from our field exploration, laboratory testing, and engineering analysis. It is a pleasure being associated with you on this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office.

Sincerely,

CMAG ENGINEERING, INC.

Reviewed by:

SHANNON S. CHOME
No. 68398
CIVIL

ADRIAN L. GARNER
GE2814
6/30/20

Garner

Shannon Chome', PE
Senior Engineer
C 68398
Expires 9/30/19

Adrian L.Garner, PE, GE
Principal Engineer
C 66087, GE 2814
Expires 6/30/20

Distribution: Addressee (4 Hard Copies; Electronic Copy)

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed assisted living facility located at 5630 Soquel Drive in Soquel, Santa Cruz County, California.

The purpose of our investigation was to provide information regarding the surface and subsurface soil and bedrock conditions, and based on our findings, provide geotechnical recommendations for the design and construction of the proposed project. Conclusions and recommendations related to site grading, drainage, foundations, slab-on-grade floors and retaining walls are presented herein.

1.1 Terms of Reference

CMAG Engineering, Inc.'s (CMAG) scope of work for this phase of the project included site reconnaissance, subsurface exploration, soil and bedrock sampling, laboratory testing, engineering analyses, and preparation of this report.

The work was undertaken in accordance with CMAG's *Proposal for Geotechnical Services* dated October 2, 2018.

The recommendations contained in this report are subject to the limitations presented in Section 8.0 of this report.

1.2 Site Location

The project site is located on the south side of Soquel Drive just west of its intersection with Monterey Avenue, in Soquel, Santa Cruz County, California. The site location is shown on the Site Location Map, Figure A-1, in Appendix A.

1.3 Surface Conditions

The property is currently occupied by the Inner Light Center, which consists of a church and an accessory building situated on the northern half of the lot adjacent to Soquel Drive. The area around the church and accessory building is mostly paved and used for parking. The south side of the parcel is relatively clear of development.

The parcel is approximately 3.4 acres and predominantly flat to gently sloping. A portion of the eastern edge of the parcel is bounded by Nobel Gulch, the banks of which are steeply sloping and vary in relief from 4 to 10 feet in height adjacent to the property. The southern edge of the property also descends moderately to steeply to the south.

2.0 PROJECT DESCRIPTION

It is our understanding the project will consist of the demolition of the existing church and accessory building and the construction of a new, 80,000 square foot, 3-story assisted living facility on the northern half of the parcel adjacent to Soquel Drive. A new parking garage is proposed on the southern half of the property. Anticipated construction consists of wood frame walls and roof, with slab-on-grade and raised wood floors. Based on the referenced preliminary plans, portions of the Assisted Living Facility will be constructed approximately 2 to 4 feet below the existing grades requiring perimeter retaining walls.

The proposed improvements also include a driveway along the west side of the assisted living facility which connects to Rochelle Lane to the east, and open parking adjacent to the new garage as well as on the southern end of the property. The parking area on the southern end of the property may consist of a permeable surface. Utility, stormwater retention/detention facilities, and landscape improvements are also anticipated.

3.0 FIELD EXPLORATION AND LABORATORY TESTING PROGRAMS

Our field exploration program included drilling, logging, and interval sampling of 13 borings on October 31, 2018 and November 1, 2018. Borings B-1 through B-13 were advanced to depths ranging from 6.5± feet to 40± feet below the existing grades. Details of the field exploration program, including the Boring Logs, Figures A-4 through A-16, are presented in Appendix A.

Representative samples obtained during the field investigation were taken to the laboratory for testing to determine physical and engineering properties. Details of the laboratory testing program are presented in Appendix B. Test results are presented on the Boring Logs and in Appendix B.

4.0 SUBSURFACE CONDITIONS AND EARTH MATERIALS

4.1 General

The geologic map of Santa Cruz County (Brabb, 1989) depicts the subject property as underlain by Lowest Emergent Coastal Terrace Deposits (Qcl; Pleistocene) described as consisting of well sorted sand with relatively continuous layers of gravel. Purisima Formation (Tp; Pliocene and Upper Miocene), described as consisting of yellowish-gray siltstone with interbeds of fine grained sandstone, is depicted to the north of the site.

Thirteen borings were advanced at the site in the area of the proposed development. The subsurface profile encountered during our field exploration generally consisted of Lowest Emergent Coastal Terrace Deposits overlying

Purisima Formation bedrock within the depths explored. A substantial wedge of artificial fill was also encountered across the southern half of the parcel. Complete subsurface profiles are presented on the Boring Logs in Appendix A. The boring locations are shown on the Site Map and Boring Location Plan, Figure A-2.

The earth materials were classified based on our field observation and laboratory testing. The classification was in accordance with the Unified Soil Classification System (Figure A-3).

A representative cross section has been constructed based on the results of our field investigation and the referenced Preliminary Utility Plan prepared by Ifland Engineers (August 20, 2018). Cross Section A-A', Figures A-17 and A-17.1, is presented in Appendix A.

4.2 Artificial Fill - af

A wedge of artificial fill was encountered across the southern half of the parcel. The fill generally increases in thickness towards the south and ranges in depth from approximately 2± feet to 7.5± feet below the existing grades. The artificial fill was comprised of silty sand, clayey sand to sandy lean clay with varying amounts of gravel, and some concrete and asphalt debris. The silty sand and clayey sand was generally loose to medium dense, dry to moist, and non plastic to slightly plastic. The sandy lean clay was stiff to very stiff, moist to wet, and plastic. Based on the results of our field investigation and laboratory testing, the artificial fill has a low expansion potential and is moderately to highly compressible.

4.3 Lowest Emergent Coastal Terrace Deposits - Qcl

Lowest Emergent Coastal Terrace Deposits were encountered from the surface across the northern half of the parcel and underlying the fill across the southern half to between 16.5± feet and 20± feet below the existing grades. The terrace deposits, within the upper 8± feet, generally consisted of clayey sand and sandy lean clay with varying amounts of gravel which was loose/stiff to medium dense/very stiff, dry to moist, and slightly plastic to plastic. The lower terrace deposits, which overlay the bedrock, generally consisted of silty sand and poorly to well graded sand with silt and varying amounts of gravel which was medium dense to dense, moist to wet, and non plastic. Based on the results of our field investigation and laboratory testing, the near-surface terrace deposits have a low to medium expansion potential and are moderately compressible.

4.4 Purisima Formation Bedrock - Tp

Purisima Formation bedrock was encountered underlying the Lowest Emergent Coastal Terrace Deposits to the extent of our borings. The bedrock generally consisted of medium dense to dense, moist, weakly cemented siltstone and sandstone within the depths explored.

4.5 Groundwater

Groundwater was encountered in Borings B-1, B-4, B-6, B-7, B-8, and B-9 at depths between 15.5± and 17± feet below the existing grades. In general, it appears that the groundwater was perched approximately 1 foot above the bedrock contact across the site at the time of our field exploration.

It should be noted that groundwater conditions, perched or regional, may vary with location and may fluctuate with variations in rainfall, runoff, irrigation, and other changes to the conditions existing at the time our field investigation was performed.

5.0 GEOTECHNICAL HAZARDS

5.1 General

In our opinion, the geotechnical hazards that could potentially affect the proposed project are:

- Seismic shaking

5.2 Seismic Shaking

The seismic hazard due to seismic shaking in California is high in many areas, indicative of the number of large earthquakes that have occurred historically. Intense seismic shaking may occur at the site during the design lifetime of the proposed structures from an earthquake along one of the local fault systems. Generally, the intensity of shaking will increase the closer the site is to the epicenter of an earthquake, however, seismic shaking is a complex phenomenon and may be modified by local topography and soil conditions. The transmission of earthquake vibrations from the ground into the structures may cause structural damage.

The County of Santa Cruz has adopted the seismic provisions set forth in the 2016 California Building Code (2016 CBC) to address seismic shaking. The seismic provisions in the 2016 CBC are minimum load requirements for the seismic design for the proposed structures. The provisions set forth in the 2016 CBC will not prevent structural and nonstructural damage from direct fault ground surface rupture, coseismic ground cracking, liquefaction and lateral spreading, seismically induced differential compaction, or seismically induced landsliding.

Table 1 has been constructed based on the 2016 CBC requirements for the seismic design of the proposed structures. The Site Class has been determined based on our field investigation and laboratory testing.

Table 1. Seismic Design Parameters - 2016 CBC

S_S	S_1	Site Class	F_a	F_v	S_{MS}	S_{M1}	S_{DS}	S_{D1}	PGA_M
1.500g	0.600g	D	1.0	1.5	1.500g	0.900g	1.000g	0.600g	0.552g

5.3 Collateral Seismic Hazards

In addition to seismic shaking, other seismic hazards that may have an adverse affect to the site and/or the structures are: fault ground surface rupture, coseismic ground cracking, seismically induced liquefaction and lateral spreading, seismically induced differential compaction, and seismically induced landsliding. It is our opinion that the potential for collateral seismic hazards to affect the site, and to damage the proposed structures is low.

6.0 DISCUSSIONS AND CONCLUSIONS

The subsurface profile across the site generally consists of terrace deposits overlying siltstone and sandstone bedrock. A wedge of artificial fill overlies the terrace deposits across the southern half of the parcel.

Based on our field and laboratory investigations, the native, near-surface terrace deposits across the northern half of the property are considered moderately compressible. The artificial fill soils encountered on the southern half of the parcel are considered moderately to highly compressible. The near-surface soils, both native and fill, possess a low to medium expansion potential.

Based on the referenced preliminary plans, a minimum setback of 30 feet will be maintained, from the top of the moderate to steep slopes along the east and south sides of the parcel, to all development including the proposed structures and driveway and parking areas.

The parcel is relatively flat and site drainage is an important aspect of the project. Based our field investigation and our experience in the area, groundwater may perch at or near the ground surface during the raining season. Consequently, ponding water may episodically develop within closed depressions and beneath structures with crawlspace areas which are lower the surrounding exterior grades.

7.0 RECOMMENDATIONS

7.1 General

Based on the results of our field investigation, laboratory testing, and engineering analysis, it is our opinion, from the geotechnical standpoint, the subject site will be suitable for the proposed development provided the recommendations presented herein are implemented during grading and construction.

We recommend that the proposed assisted living facility and the parking garage be founded on conventional shallow foundation systems. To help alleviate the potential for differential settlement due to compressible near-surface soils, site preparation consisting of overexcavation and recompaction will be required beneath conventional shallow foundations, slabs-on-grade, and non-permeable driveway and parking areas. Refer to Subsection 7.2.2 for earthwork recommendations and Subsection 7.3 for shallow foundation recommendations.

Where permeable driveway and parking areas are proposed, we recommend placement of geosynthetic reinforcement fabric beneath driveway sections to help alleviate the potential for settlement and deterioration. See Subsection 7.2.2 for details.

Groundwater may perch at or near the ground surface during the raining season. It is imperative that site drainage be designed to collect and direct surface water away from structures and driveway and parking areas to approved drainage facilities per Subsection 7.2.7.

7.2 Site Grading

7.2.1 Site Clearing

Prior to grading, the areas to be developed for structures, pavements and other improvements, should be stripped of any vegetation and cleared of any surface or subsurface obstructions, including any existing foundations, utility lines, basements, septic tanks, pavements, stockpiled fills, and miscellaneous debris.

Surface vegetation and organically contaminated topsoil should be removed from areas to be graded. The required depth of stripping will vary with the time of year the work is done and should be observed by the Geotechnical Engineer. It is generally anticipated that the required depth of stripping will be 6 to 8 inches.

Holes resulting from the removal of buried obstructions that extend below finished site grades should be backfilled with compacted engineered fill compacted to the requirements of Subsection 7.2.2.

7.2.2 Preparation of On-Site Soils

The results of the field investigation and laboratory testing indicate that the near-surface soils on the subject site are moderately to highly compressible. In order to ensure uniform compression characteristics and to obviate any potential for differential settlement, site preparation, consisting of overexcavation and recompaction will be required beneath conventional shallow foundations, slabs-on-grade, and non-permeable driveway and parking areas. The depths of overexcavation and recompaction recommended herein are subject to review during grading.

For conventional shallow foundations, the soil should be overexcavated a minimum of 2 feet below the bottom of footings, 2 feet below the existing grades, or a depth sufficient to remove all artificial fill, whichever is greater. The exposed surface should then be scarified, moisture conditioned, and compacted. The material which was removed should then be replaced as engineered fill compacted to a minimum of 90 percent relative compaction to finish grades. This zone of reworking shall extend a minimum of 5 feet laterally beyond the foundation footprint.

For concrete slabs-on-grade, the soil should be overexcavated a minimum of 1.5 feet below the bottom of the crushed rock, 2 feet below the existing grades, or a depth sufficient to remove all artificial fill, whichever is greater. The exposed surface should then be scarified, moisture conditioned, and compacted. The material which was removed should then be replaced as engineered fill compacted to a minimum of 90 percent relative compaction to finish subgrade. This zone of reworking shall extend a minimum of 5 feet laterally beyond the concrete slabs-on-grade.

In non-permeable driveway and parking areas (including concrete, asphalt, and non-permeable pavers), the soil should be overexcavated to a minimum of 1.5 feet below the bottom of the aggregate base course, 1.5 feet below the existing grades, or a depth sufficient to remove all artificial fill, whichever is greater. The exposed surface should then be scarified, moisture conditioned, and compacted. The material which was removed should then be replaced as engineered fill compacted to a minimum of 90 percent relative compaction. The upper 6 inches of subgrade and all aggregate base and subbase in driveway and parking areas shall be compacted to a minimum of 95 percent relative compaction. This zone of reworking shall extend a minimum of 2 feet laterally beyond the driveway and parking areas.

In non-permeable driveway and parking areas, where deeper fills are encountered at the southern end of the property, in lieu of removal of all of the artificial fill, the soil may be overexcavated to a minimum of 2 feet below the bottom of the aggregate base course and the exposed surface scarified, moisture conditioned, and compacted. A layer of Mirafi 600X geosynthetic fabric, or approved equivalent, should then be placed at the base of the excavation and the material which was removed, replaced as engineered fill compacted to a minimum of 90 percent relative compaction. The upper 6 inches of subgrade and all aggregate base and subbase shall be compacted to a minimum of 95 percent relative compaction. This zone of reworking shall extend a minimum of 2 feet laterally beyond the driveway and parking areas.

It is our understanding that <u>permeable pavers</u> may be proposed along the southern edge of the driveway/parking areas. This system is most effective in areas where shallow groundwater is not present and/or the underlying base course and subgrade has the ability to drain. However, if project requirements dictate the need for permeable pavers, the base course and subgrade should be designed and constructed per the recommendations provided by the Interlocking Concrete Pavement Institute (ICPI). The ICPI provides design guidelines for permeable interlocking concrete pavement systems. We recommend that the paver section be designed assuming no exfiltration, or infiltration testing should be performed in order to obtain infiltration rates for the subgrade soils. We can perform these services upon request for an additional fee. The subgrade should be sloped at a minimum of 2 percent to a subdrain to intercept the groundwater. Mirafi RS380i, or approved equivalent, should be placed between the subgrade and the rock section to provide additional subgrade stabilization. Additional geotechnical design recommendations for the proposed pavers can be provided upon request.

Engineered fill should be compacted to a minimum of 90 percent relative compaction. All fill should be compacted with heavy vibratory equipment. Fill should be compacted by mechanical means in uniform horizontal loose lifts not exceeding 8 inches in thickness. The relative compaction and required moisture content shall be based on the maximum dry density and optimum moisture content obtained in accordance with ASTM D1557. **The Geotechnical Engineer should observe the overexcavations, and placement of engineered fill.**

The on-site soils may be used as engineered fill, with the exception of any expansive clayey soils. <u>Note:</u> If this work is done during or soon after the rainy season, or in the spring, the soil may require significant drying prior to use as engineered fill. The soil should be verified by a representative of CMAG in the field during grading operations. All soils, both existing on-site and imported, to be used as fill, should contain less than 3 percent organics and be free of debris and gravel over 2.5 inches in maximum dimension.

Imported fill material should be approved by a representative of CMAG prior to importing. Soils having a significant expansion potential should not be used as imported fill. **The Geotechnical Engineer should be notified not less than 5 working days in advance of placing any fill or base course material proposed for import**. Each proposed source of import material should be sampled, tested, and approved by the Geotechnical Engineer prior to delivery of <u>any</u> soils imported for use on the site.

Any surface or subsurface obstruction, or questionable material encountered during grading, should be brought immediately to the attention of the Geotechnical Engineer for proper processing as required.

7.2.3 Cut and Fill Slopes

Cut and Fill slopes are not anticipated for the project at this time. Recommendations for cut and fill slopes can be supplied upon request if project requirements change.

7.2.4 Utility Trenches

Bedding material should consist of sand with SE not less than 30 which may then be jetted.

The on-site soils may be utilized for trench backfill, with the exception of any expansive clayey soils. Imported fill should be free of organic material and gravel over 2.5 inches in diameter. Backfill of all exterior and interior trenches should be placed in thin lifts and mechanically compacted to achieve a relative compaction of not less than 95 percent in paved areas and 90 percent in other areas per ASTM D1557. Care should be taken not to damage utility lines.

Utility trenches that are parallel to the sides of a building should be placed so that they do not extend below a line sloping down and away at an inclination of 2:1 H:V (horizontal to vertical) from the bottom outside edge of any footings.

A 3 foot concrete plug should be placed in each trench where it passes under the exterior footings. Anti-seep collars (trench dams) should also be placed in utility trenches on steep slopes to prevent migration of water and sand.

Trenches should be capped with 1.5± feet of impermeable material. Import material should be approved by the Geotechnical Engineer prior to its use.

Trenches must be shored as required by the local regulatory agency, the State Of California Division of Industrial Safety Construction Safety Orders, and Federal OSHA requirements.

7.2.5 Vibration During Compaction

Residential structures are within close proximity to the proposed development. The contractor should take all precautionary measures to minimize vibration on the site during grading operations. This may require that the engineered fill be placed in thin lifts using a static roller or hand operated equipment. It is the contractor's responsibility to ensure that the process in which the engineered fill is placed does not adversely affect the neighboring parcels.

7.2.6 Excavating Conditions

We anticipate that excavation of the on-site soils may be accomplished with standard earthmoving and trenching equipment.

Based on our experience in the area, shallow perched groundwater may occur at the site during the rainy season and spring. Construction of the project during the rainy season or in the spring will require careful techniques to prevent disturbing the soil during construction. Grading equipment on the building pad and/or foot traffic within the footing excavations may cause pumping and disturbance to the foundation soils and should be avoided. If the earthwork commences during the rainy season or during the spring, additional recommendations will be supplied, as necessary.

7.2.7 Surface Drainage

Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. A minimum gradient of 2± percent should be maintained and drainage should be directed toward approved swales or drainage facilities. Concentrations of surface water runoff should be handled by providing the necessary structures, paved ditches, catch basins, etc.

All roof eaves should be guttered with the outlets from the downspouts provided with adequate capacity to carry the storm water away from the structure to reduce the possibility of soil saturation and erosion.

Drainage patterns approved at the time of construction should be maintained throughout the life of the structures. The building and surface drainage facilities must not be altered nor any grading, filling, or excavation conducted in the area without prior review by the Geotechnical Engineer.

Irrigation activities at the site should be controlled and reasonable. Planter areas should not be sited adjacent to walls without implementing approved measures to contain irrigation water and prevent it from seeping into walls and under foundations and slabs-on-grade.

The finished ground surface should be planted with erosion resistant landscaping and ground cover and continually maintained to minimize surface erosion.

7.3 Foundations

7.3.1 Conventional Shallow Foundations

Conventional shallow foundations shall be founded on compacted engineered fill per Subsection 7.2.2.

Minimum recommended footing dimensions are presented in Table 2. Footing widths should be based on the allowable bearing value. Embedment depths should not be allowed to be affected adversely, such as through erosion, softening, digging, etc. Should local building codes require deeper embedment of the footings, or wider footings, the codes must apply.

Table 2. Recommended Footing Dimensions

Number of Floors Supported By Footing	Minimum Width (in)	Minimum Embedment Depth (in)
1	12	18
2	15	18
3	18	24

Footings constructed to the given criteria may be design for the allowable bearing capacity presented in Table 3. The allowable bearing capacity may be increased by one-third for short duration loads, such as those imposed by wind and seismic forces.

Table 3. Allowable Bearing Capacity

Footing Depth (in)	Allowable Bearing Capacity (psf)
18	2,500
24	3,000

The recommended allowable bearing values are calculated based on the on-site soils being used as engineered fill. If imported fill is to be used beneath shallow foundations, it should be approved by a representative of CMAG prior to importing, or the allowable bearing capacity values revised based on the actual import material used.

A passive pressure of 280 psf/ft (equivalent fluid pressure) may be assumed for design purposes. Neglect passive pressure in the upper 12 inches of soil. Passive pressures may be increased by one-third for seismic loading. A friction coefficient of 0.35, between engineered fill and rough concrete may be assumed for design purposes. Where both friction and the passive resistance are utilized for sliding resistance, either of the values indicated should be reduced by one-third.

Footing excavations should be observed by the Geotechnical Engineer before steel reinforcement is placed and concrete is poured.

7.3.2 Concrete Slabs-on-Grade

We recommend that concrete slab-on-grade floors be founded on compacted engineered fill per Subsection 7.2.2. The subgrade should be proof-rolled just prior to construction to provide a firm, relatively unyielding surface, especially if the surface has been loosened by the passage of construction traffic.

The slab-on-grade should be underlain by a minimum 4 inch thick capillary break of clean crushed rock. It is recommended that neither Class II baserock nor sand be employed as the capillary break material. Where moisture sensitive floor coverings are anticipated or vapor transmission may be a problem, a vapor retarder should be placed between the granular layer and the floor slab in order to reduce moisture condensation under the floor coverings. The vapor retarder should be specified by the slab designer. It should be noted that conventional slab-on-grade construction is not waterproof. Under-slab construction consisting of a capillary break and vapor retarder will not prevent moisture transmission through the slab-on-grade. CMAG does not practice in the field of moisture vapor transmission evaluation or mitigation. Where moisture sensitive floor coverings are to be installed, a waterproofing expert should be consulted for their recommended moisture and vapor protection measures.

7.3.3 Settlements

Total and differential settlements beneath the conventional shallow foundation system are expected to be within tolerable limits. Vertical movements are not expected to exceed 1 inch. Differential movements are expected to be within the normal range (½ inch) for the anticipated loads and spacings. These preliminary estimates should be reviewed by the Geotechnical Engineer when foundation plans for the proposed structures become available.

7.4 Retaining Structures

7.4.1 General

Perimeter retaining walls for the proposed structures as well as detached site retaining walls should be founded on spread footings per Subsection 7.3.1. All retaining wall footings shall be founded on compacted engineered fill in accordance with Subsection 7.2.2.

7.4.2 Lateral Earth Pressures

The lateral earth pressures presented in Table 2 are recommended for the design of retaining structures with a backdrain and non-expansive backfill. Refer to Subsection 7.4.3 for details.

Table 4. Lateral Earth Pressures

Soil Profile (H:V)	Equivalent Fluid Pressure (psf/ft)	
	Active Pressure	At-Rest Pressure
Level	38	58
4:1	44	72
3:1	48	76
2:1	58	84

Pressure due to any surcharge loads from adjacent footings, traffic, etc., should be analyzed separately. Refer to the Surcharge Pressure Diagram, Figure 1, for details. Pressures due to these loading conditions can be supplied upon receipt of the appropriate plans and loads.

7.4.3 Backfill

Backfill should be placed under engineering control. Backfill should be compacted per Subsection 7.2.2, however, precautions should be taken to ensure that heavy compaction equipment is not used immediately adjacent to walls, so as to prevent undue pressures against, and movement of, the walls.

It is recommended that granular, or relatively low expansivity, backfill be utilized, for a width equal to approximately 1/3 times the wall height, and not less than 2 feet, subject to review during construction. The permeable material used for the backdrain is suitable for use as backfill.

The granular backfill should be capped with at least 12 inches of relatively impermeable material.

The use of water-stops/impermeable barriers and appropriate waterproofing should be considered for any basement construction, and for building walls which retain earth.

7.4.4 Backfill Drainage

Backdrains should be provided directly behind retaining walls. Backdrains should consist of 4 inch diameter SDR 35 PVC perforated pipe or equivalent, embedded in Caltrans Class 2 permeable drain rock.

The drain should be a minimum of 18 inches in width and should extend to within 12 inches from the surface. The upper 12 inches should be capped with soil if the drain is not located directly beneath concrete or pavement. Mirafi 180N or approved equivalent should be placed between the surface cap and the drain rock. The pipe should be 4± inches above the trench bottom; a gradient of 2± percent being provided to the pipe and trench bottom; discharging into suitably protected outlets. See Typical Backdrain Detail, Figure 2, for recommendations.

Perforations in backdrains are recommended as follows: ½ inch diameter, in 2 rows at the ends of a 120 degree arc, at 5 inch centers in each row, staggered between rows, placed downward.

Backdrains should be observed by the Geotechnical Engineer after placement of bedding and pipe and prior to the placement of clean crushed gravel.

An unobstructed outlet should be provided at the lower end of each segment of backdrain. The outlet should consist of an unperforated pipe of the same diameter, connected to the perforated pipe and extended to a protected outlet at an approved location below the project area on a continuous gradient of at least 1 percent.

7.5 Plan Review

The recommendations presented in this report are based on preliminary design information for the proposed project and on the findings of our geotechnical investigation. When completed, the Grading Plans, Foundation Plans and design loads should be reviewed by CMAG prior to submitting the plans and contract bidding. Additional field exploration and laboratory testing may be required upon review of the final project design plans.

7.6 Observation and Testing

Field observation and testing must be provided by a representative of CMAG to enable them to form an opinion regarding the adequacy of the site preparation, the adequacy of fill materials, and the extent to which the earthwork is performed in accordance with the geotechnical conditions present, the requirements of the regulating agencies, the project specifications, and the recommendations presented in this report. Any earthwork performed in connection with the subject project without the full knowledge of, and not under the direct observation of CMAG will render the recommendations of this report invalid.

CMAG should be notified **at least 5 working days** prior to any site clearing or other earthwork operations on the subject project in order to observe the stripping and disposal of unsuitable materials and to ensure coordination with the grading contractor. During this period, a preconstruction meeting should be held on the site to discuss project specifications, observation and testing requirements and responsibilities, and scheduling.

8.0 LIMITATIONS

The recommendations contained in this report are based on our field explorations, laboratory testing, and our understanding of the proposed construction. The subsurface data used in the preparation of this report was obtained from the borings drilled during our field investigation. Variation in soil, geologic, and groundwater conditions can vary significantly between sample locations. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by the Project Geotechnical Engineer and the Geologist, and revised recommendations be provided as required. In addition, if the scope of the proposed construction changes from the described in this report, our firm should also be notified.

Our investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report.

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 brought to the attention of the Architect and Engineer for the project and incorporated into the plans, and that it is ensured that the Contractor and Subcontractors implement such recommendations in the field. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

This firm does not practice or consult in the field of safety engineering. We do not direct the Contractor's operations, and we are not responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the Contractor. The Contractor should notify the Owner if he considers any of the recommended actions presented herein to be unsafe.

The findings of this report are considered valid as of the present date. However, changes in the conditions of a site can occur with the passage of time, whether they be due to natural events or to human activities on this or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The scope of our services mutually agreed upon did not include any environmental assessment or study for the presence of hazardous to toxic materials in the soil, surface water, or air, on or below or around the site. CMAG is not a mold prevention consultant; none of our services performed in connection with the proposed project are for the purpose of mold prevention. Proper implementation of the recommendations conveyed in our reports will not itself be sufficient to prevent mold from growing in or on the structures involved.

REFERENCES

American Society of Civil Engineers (2010). *Minimum Design Loads for Buildings and Other Structures*. ASCE Standard 7-10.

ASTM International (2014). *Annual Book of ASTM Standards, Section Four, Construction*. Volume 4.08, Soil and Rock (I): D 420 - D 5876.

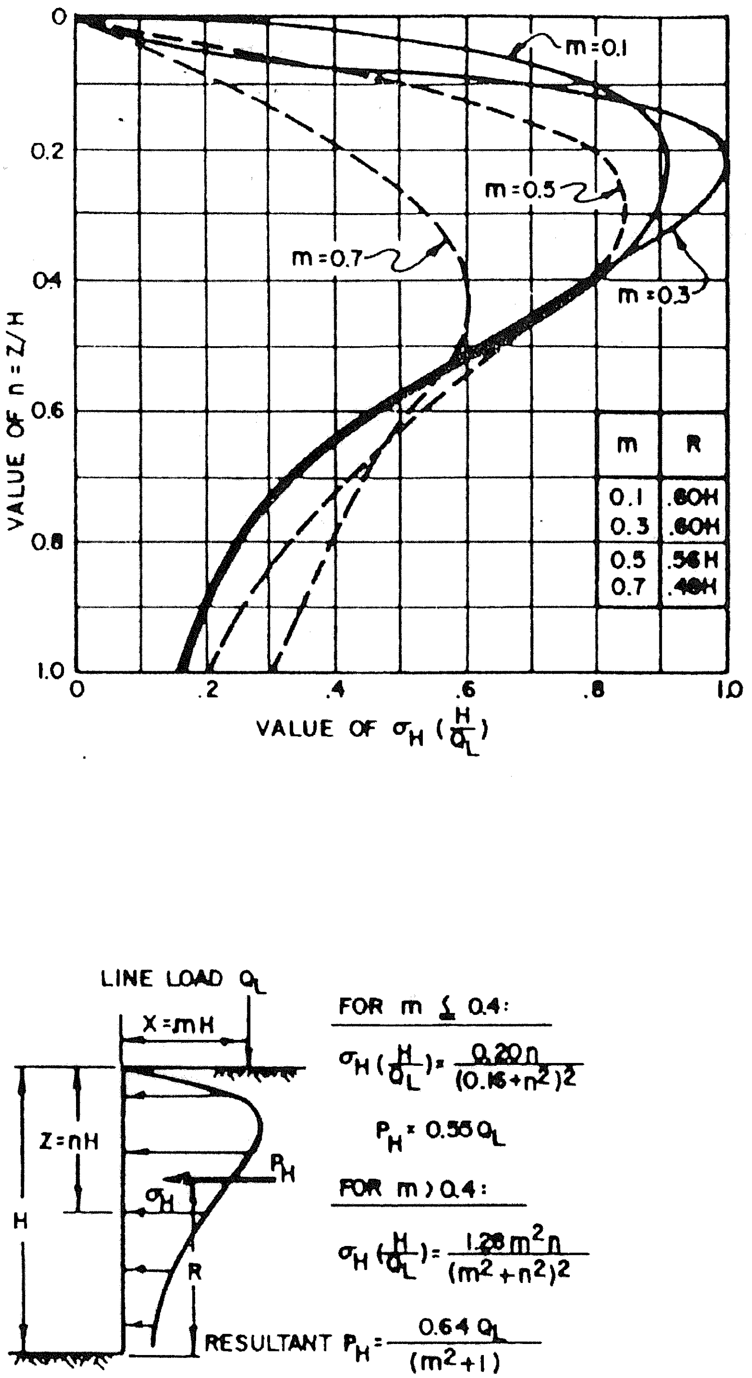
Brabb, E.E. (1989). *Geologic Map of Santa Cruz County, California*. U.S. Geological Survey Miscellaneous Investigation Series, Map I-1905, scale 1:62500.

CMAG Engineering, Inc. (October 2, 2018). *Proposal for Geotechnical Services, Geotechnical Investigation, Proposed Assisted Living Facility, 5630 Soquel Drive, Soquel, Santa Cruz County, California, APN 037-191-14* . Proposal No. P18-81.

Ifland Engineers. (August 20, 2018). *Preliminary Utility Plan, Oakmont Senior Living, 5630 Soquel Drive, Soquel, California, 95073*. Job No. 18031. Sheets C1.0 and C1.1. Original Scale: 1"=20'.

International Code Council (2016). *California Building Code.* Volume 2.

Landesign Group. (July 2018). *Preliminary Grading, Oakmont Senior Living. Soquel, California*. Sheet 1. Original Scale: 1"=30'.



m	R
0.1	.60H
0.3	.60H
0.5	.56H
0.7	.48H

FOR m ≤ 0.4:

$$\sigma_H\left(\frac{H}{Q_L}\right) = \frac{0.20\,n}{(0.16+n^2)^2}$$

$$P_H = 0.55\,Q_L$$

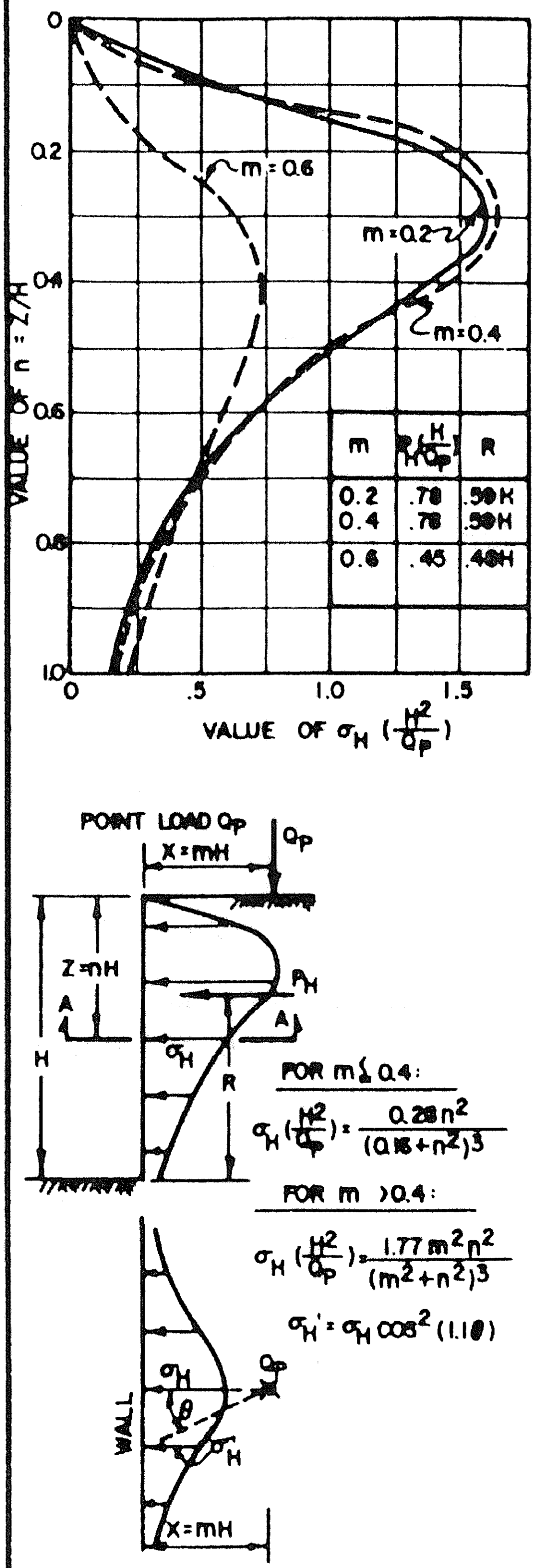
FOR m > 0.4:

$$\sigma_H\left(\frac{H}{Q_L}\right) = \frac{1.28\,m^2 n}{(m^2+n^2)^2}$$

$$\text{RESULTANT } P_H = \frac{0.64\,Q_L}{(m^2+1)}$$

PRESSURES FROM LINE LOAD Q_L

(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)



m	$P_H\left(\frac{H}{Q_P}\right)$	R
0.2	.78	.59H
0.4	.78	.59H
0.6	.45	.48H

FOR m ≤ 0.4:

$$\sigma_H\left(\frac{H^2}{Q_P}\right) = \frac{0.28\,n^2}{(0.16+n^2)^3}$$

FOR m > 0.4:

$$\sigma_H\left(\frac{H^2}{Q_P}\right) = \frac{1.77\,m^2 n^2}{(m^2+n^2)^3}$$

$$\sigma_H' = \sigma_H \cos^2(1.1\theta)$$

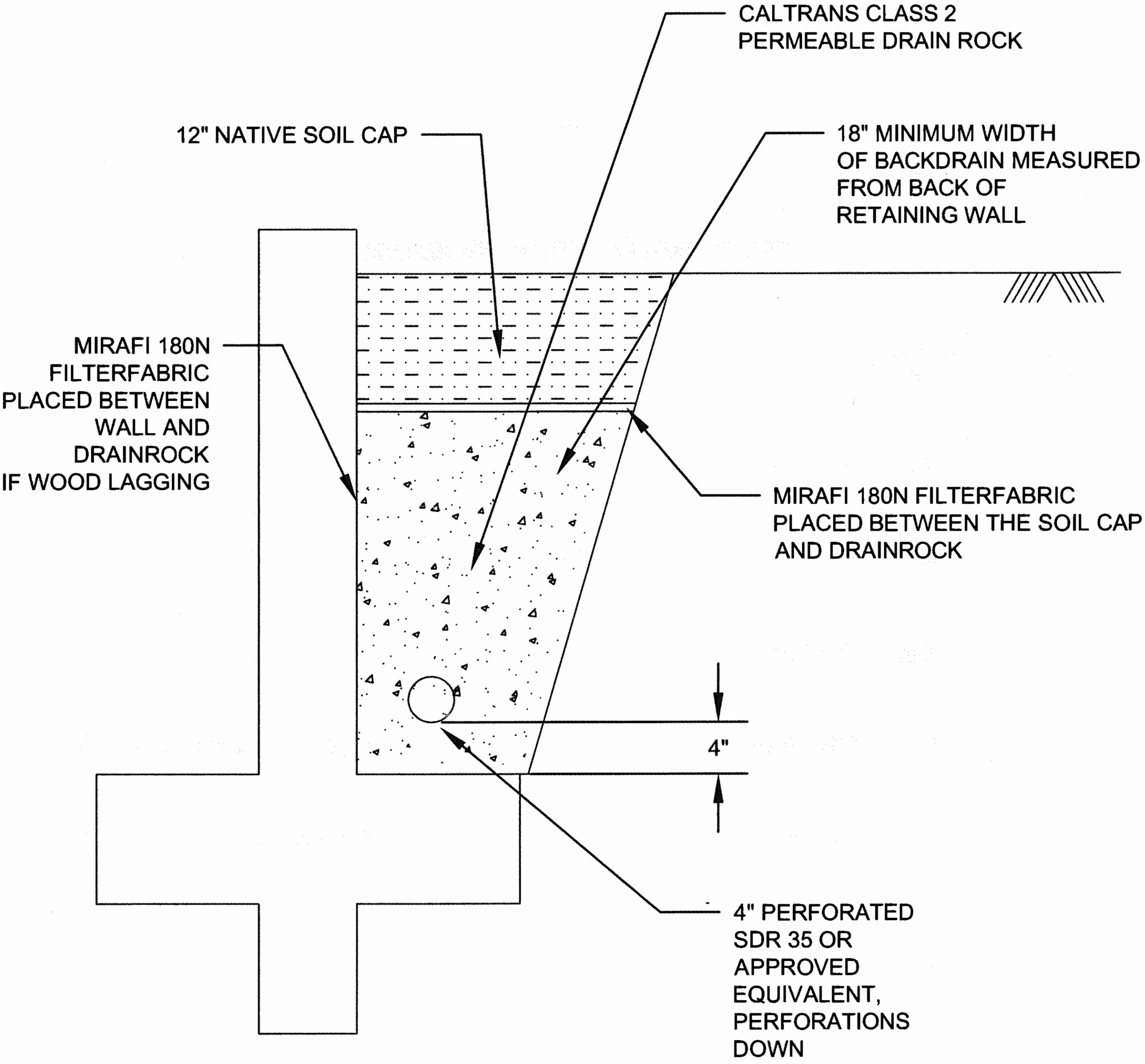
SECTION A-A

PRESSURES FROM POINT LOAD Q_P

(BOUSSINESQ EQUATION

MODIFIED BY EXPERIMENT)

CMAG ENGINEERING	SURCHARGE PRESSURE DIAGRAM	FIGURE 1



NOTES:

1. DRAWING IS NOT TO SCALE
2. 2± PERCENT TO PIPE AND TRENCH BOTTOM
3. PERFORATED SDR 35 PVC PIPE, OR APPROVED EQUIVALENT, CONNECTED TO CLOSED CONDUITS THAT DISCHARGE TO AN APPROVED LOCATION
4. INSTALL CLEAN OUTS AT APPROVED LOCATIONS

CMAG ENGINEERING	TYPICAL BACKDRAIN DETAIL	FIGURE 2

APPENDIX A

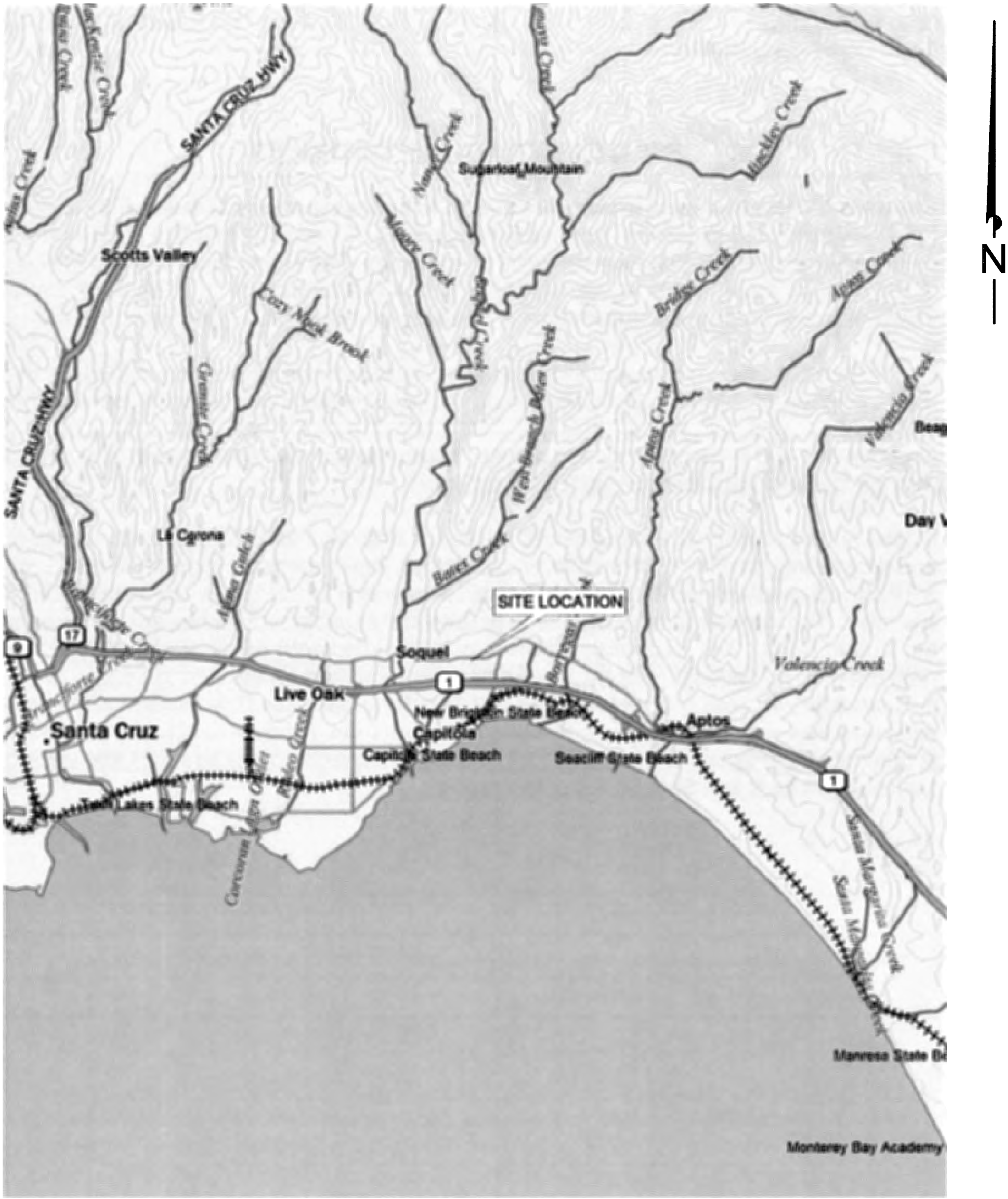
FIELD EXPLORATION PROGRAM

FIELD EXPLORATION PROCEDURES

Subsurface conditions were explored by drilling 13 borings to depths between 6.5± and 40± feet below the existing grades. Borings B-1 through B-13 were drilled with a truck mounted drill rig equipped with 6 inch diameter solid stem augers. The Key to The Logs and the Logs of the Borings are included in Appendix A, Figures A-3 through A-16. The approximate locations of the borings are shown on the Site Map and Boring Location Plan, Figure A-2.

The earth materials encountered in the borings were continuously logged in the field by a representative of CMAG. Bulk and relatively undisturbed samples were obtained for identification and laboratory testing. The samples were classified based on field observations and the laboratory test results. Classification was performed in accordance with the Unified Soil Classification System (Figure A-3).

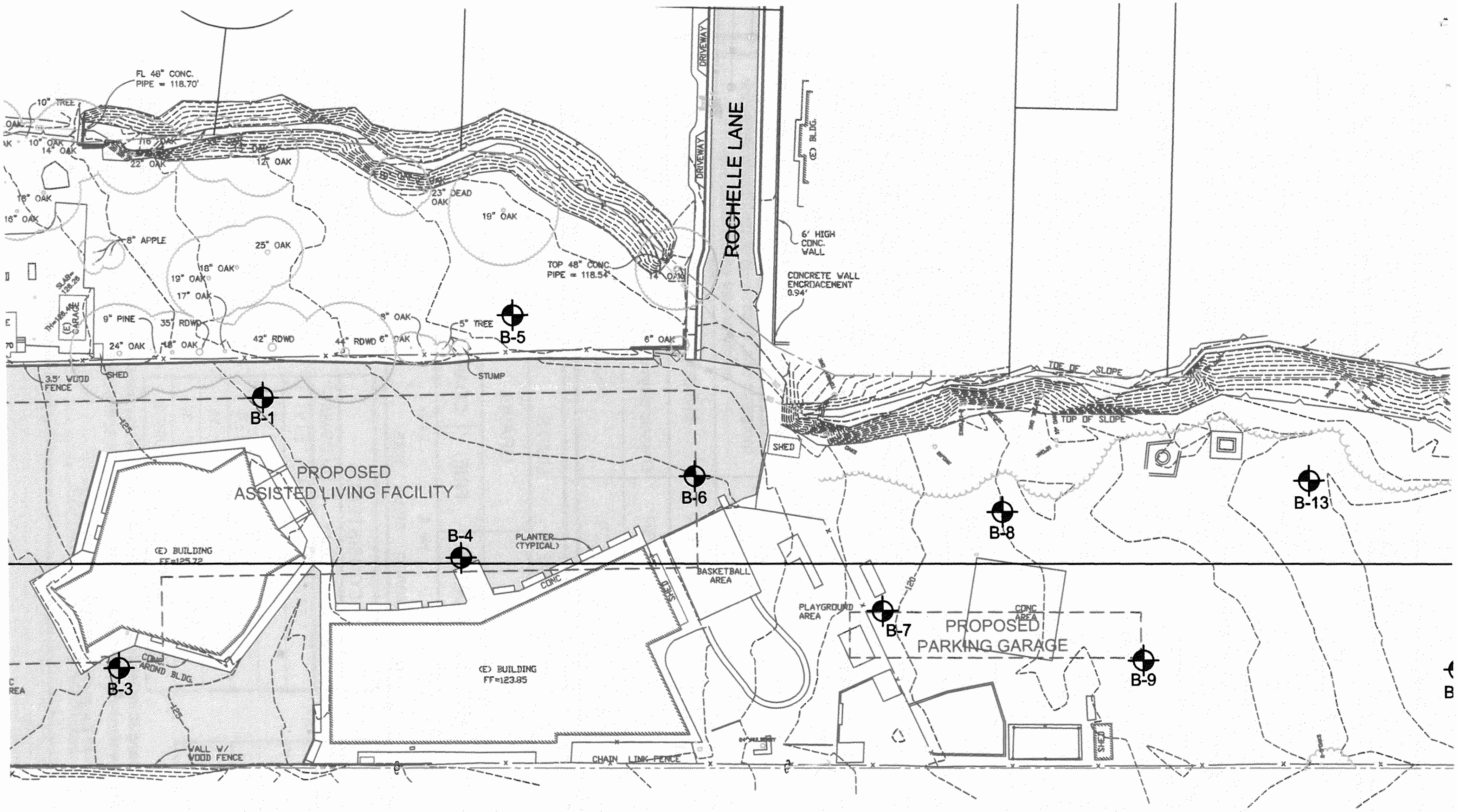
Representative samples were obtained by means of a drive sampler, the hammer weight and drop being 140 lb and 30 inches, respectively. These samples were recovered using a 3 inch outside diameter Modified California Sampler or a 2 inch outside diameter Terzaghi Sampler. The number of blows required to drive the samplers 12 inches are indicated on the Boring Logs. The penetration test data for the Terzaghi driven samples has been presented as N_{60} values. The N_{60} values are also indicated on the Boring Logs.
A representative cross section was developed for the subject site. The location of the cross section is shown on the Site Map and Boring Location Plan, Figure A-2. Cross Section A-A' is presented on Figures A-17 and A-17.1. For an explanation of the symbols and units on the cross section, see Section 4.0 of the report.



BASEMAP: DeLorme Topo USA®

SCALE: 1:100,000

CMAG ENGINEERING	**SITE LOCATION MAP**	FIGURE
	5630 Soquel Drive	A-1



EXPLANATION OF SYM

B-1 APPROXIMATE LOCA

A ⊢—⊣ A' LOCATION OF CROS

BASEMAP: Ifland Engineers. (August 20, 2018) *Oakmont Senior Living, 5630 Soquel Drive, Soquel, California*. Job No. 18031, Sheets C1.0, C1.1, Original Scale 1" = 20'

KEY TO LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of the material is larger than the No. 200 sieve	GRAVELS More than half of the coarse fraction is larger than the No. 4 sieve	CLEAN GRAVELS (Less than 5% fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS More than half of the coarse fraction is smaller than the No. 4 sieve	CLEAN SANDS (Less than 5% fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		SAND WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS More than half of the material is smaller than the No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	Inorganic silts and very fine sands, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomacaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

GRAIN SIZE LIMITS

SILT AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

No. 200 No. 40 No. 10 No. 4 3/4 in. 3 in. 12 in.

US STANDARD SIEVE SIZE

RELATIVE DENSITY

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

CONSISTENCY

SILT AND CLAY	BLOWS/FT*
VERY SOFT	0 - 2
SOFT	2 - 4
FIRM	4 - 8
STIFF	8 - 16
VERY STIFF	16 - 32
HARD	OVER 32

MOISTURE CONDITION

DRY

MOIST

WET

BEDROCK

(GROUP SYMBOL)

Brackets Denote Bedrock

* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch I.D.) split spoon (ASTM D-1586).

CMAG ENGINEERING

FIGURE
A-3

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Boring: B-1
Project: 5630 Soquel Drive
Santa Cruz County, California
Date Drilled: October 31, 2018
Logged By: SSC
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			2" AC / 4" Baserock					
1	SM		**Qcl:** Dark Brown Silty SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained.					
2	CL-SC	◫	Dark Brown Sandy Lean CLAY to Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained.	22	15		8.6	F.C.=50.5%
3 4	SC	⧅	Dark Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subrounded.	14		108.1	11.7	Direct Shear Φ' = 30° c' = 100 psf Particle Size F.C.=45.9%
5	SC	◫	Material Consistent - Trace Gravel - up to 3/4", Subrounded.	12	8		15.3	
6								
7			Gravels and Cobbles.					
8 9	SM	⧅	Yellowish Brown and Dark Yellowish Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Some Gravel - up to 1", Subrounded.	45		113.2	16.3	
10								
11								
12								
13								
14 15	SP-SM/ SM	◫	Interbedded: Light Olive Brown Poorly Graded SAND with Silt. Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Yellowish Brown Silty SAND. Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 1", Subrounded.	39	33		10.3	
16								
17			▽ Groundwater Encountered at 17± feet.					
18			**Tp:**					
19								
20								
21	(ML)	◫	Dark Bluish Gray SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	46	42		28.0	F.C.=62.1%
22								
23								
24								

CMAG ENGINEERING

FIGURE
A-4

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-1 (continued)
Date Drilled: October 31, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample ⧄ 2" Ring Sample ⧅ 2.5" Ring Sample
S 3" Shelby Tube ☒ Bulk Sample ▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
25								
26								
27								
28	(ML)	◫	Dark Bluish Gray SILSTONE. Very Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	54	52		29.4	
29								
30								
31								
32								
33								
34			Increase in Auger Resistance.					
35	(ML)	◫	Dark Bluish Gray SILTSTONE. Very Dense, Moist. Moderately Cemented. (Sandy Silt). Sand - Fine Grained.	100+			30.2	
36								
37								
38			Extremely Slow Auger Advancement.					
39								
40	(ML)	◫	Material Consistent.	100+			28.0	
41			Boring Terminated at 40± ft. Groundwater Encountered at 17± ft. Boring Backfilled with Cuttings.					
42								
43								
44								
45								
46								
47								
48								

CMAG ENGINEERING

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-2
Date Drilled: October 31, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1	SC-CL		4" AC / 3" Baserock **Qcl:** Yellowish Brown Clayey SAND to Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.					E.I. = 57 F.C.=47.4%
2	SC	⧅	Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 3/4", Subangular.	50		115.0	10.5	Particle Size F.C.=24.7%
3								
4	SC	◫	Light Brown and Dark Yellowish Brown Clayey SAND. Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 3/4", Subrounded.	43	30		11.6	
5								
6	SC	◫	Light Brown and Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained.	25	18		15.7	
7								
8								
9								
10								
11	SM	⧅	Light Brown Silty SAND. Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 3/4", Subrounded.	48		114.8	10.9	
12								
13								
14								
15								
16	SM	◫	Yellowish Brown and Dark Brown Silty SAND. Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Trace Gravels - up to 1", Subrounded.	40	35		7.8	
17								
18								
19								
20								
21	(SM)	◫	**Tp:** Dark Bluish Gray SANDSTONE. Very Dense, Moist. Weakly Cemented. (Silty Sand). Sand - Fine Grained.	71	65		28.9	F.C.=45.4%
22			Boring Terminated at 21.5± ft. Groundwater Not Encountered. Boring Backfilled with Cuttings.					
23								
24								

CMAG ENGINEERING

FIGURE
A-5

LOG OF EXPLORATORY BORING

Project No:	18-141-SC	Boring:	B-3
Project:	5630 Soquel Drive	Date Drilled:	October 31, 2018
	Santa Cruz County, California	Logged By:	SSC
Drill Rig:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer		

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			2" AC / 4" Baserock **Qcl:**					
1 2	SC	⧅	Light Brown and Yellowish Brown Clayey SAND. Very Loose, Moist to Wet, Slightly Plastic. Sand - Fine to Coarse Grained.	7		110.6	17.7	Sulfate Particle Size F.C.=39.1%
3 4	SC-CL	◫	Light Brown and Yellowish Brown Clayey SAND to Sandy Lean CLAY. Stiff, Moist to Wet, Plastic. Sand - Fine to Medium Grained.	15	10		20.7	
5 6	SC	⧅	Light Brown and Yellowish Brown Clayey SAND. Medium Dense, Moist to Wet, Slightly Plastic. Sand - Fine to Medium Grained.	28		113.6	19.0	
7 8	SC/CL	◫	Interbedded: Light Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - FG to MG. Light Brown Lean CLAY with Sand. Firm, Moist, Plastic. Sand - FG.	11	8		31.2	F.C.=87.8%
9 10								
11	SM	◫	Light Brown and Yellowish Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Some Gravel - up to 2", Subrounded.	30	24		7.6	F.C.=13.7%
12 13 14								
15 16	SP-SM	◫	Light Gray and Yellowish Brown Poorly Graded SAND with Silt and Gravel. Very Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Gravel - up to 3", Subrounded.	85	74		8.9	
17 18 19 20 21 22 23 24			Boring Terminated at 16.5± ft. Groundwater Not Encountered. Boring Backfilled with Cuttings.					

CMAG ENGINEERING

FIGURE
A-6

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-4
Date Drilled: October 31, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1	CL		2" AC / 3" Baserock **Qcl:** Light Brown Sandy Lean CLAY. Firm, Moist, Plastic. Sand - Fine to Medium Grained.					
2 3	SC	◫	Dark Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subrounded.	8	6		13.4	Particle Size F.C.=43.3%
4 5 6	SC	⧅	Light Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 2", Subrounded.	20		119.2	12.8	
7 8	SC	◫	Dark Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 2", Subrounded.	21	16		16.5	
9 10 11								
12 13	SM	⧅	Light Brown and Dark Yellowish Brown Silty SAND with Gravel. Dense, Moist to Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 3", Subrounded.	100+		122.1	12.1	
14 15 16			▽ Groundwater Encountered at 16.5± feet.					
17 18	(ML)	◫	**Tp:** Light Olive Brown and Dark Bluish Gray SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	52	47		29.2	
19 20 21								
22 23	(ML)	◫	Dark Bluish Gray SILTSTONE. Very Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	58	54		26.3	F.C.=60.7%
24			Boring Terminated at 23.5± ft. Groundwater Encountered at 16.5± ft. Boring Backfilled with Cuttings.					

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-5
Date Drilled: October 31, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1	SM		**Qcl:** Brown Silty SAND. Loose, Dry, Non Plastic. Sand - Fine to Medium Grained.					
2	SC-CL	◫	Yellowish Brown Clayey SAND to Sandy Lean CLAY. Medium Dense, Dry to Moist, Slightly Plastic. Sand - Fine to Medium Grained.	34	24		7.4	F.C.=50.5%
3	SC	⧅	Light Gray Clayey SAND. Loose, Dry to Moist, Slightly Plastic. Sand - Fine to Medium Grained.					
4	CL		Dark Yellowish Brown Sandy Lean CLAY. Hard, Moist, Plastic. Sand - Fine to Medium Grained.	23		113.5	13.4	q_u = 9,530psf
5 6 7 8 9	SC-CL	◫	Brown and Dark Yellowish Brown Clayey SAND to Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	36	26		12.5	
10 11 12 13	SW-SM	◫	Yellowish Brown and Dark Yellowish Brown Well Graded SAND with Silt and Gravel. Medium Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded.	37	29		9.9	Particle Size F.C.=11.1%
14 15 16	SP-SM/ SM	◫	Interbedded: Light Brown Poorly Graded SAND with Silt. Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Dark Yellowish Brown Silty SAND with Gravel. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded.	41	36		12.2	
17 18 19 20 21 22 23 24			Boring Terminated at 16.5± ft. Groundwater Not Encountered. Boring Backfilled with Cuttings.					

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FIGURE
A-8

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Boring: B-6
Project: 5630 Soquel Drive
Santa Cruz County, California
Date Drilled: November 1, 2018
Logged By: SSC
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af: 2" AC / 5" Baserock					
1 2	CH/SC	◫	Bluish Gray Fat CLAY with Sand, Stiff, Moist, Plastic. Sand - Fine Grained. and Dark Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained. (Mixture)	17	12		15.0	E.I. = 13 F.C.=47.0%
3 4	CH/SC	⧅	Bluish Gray Fat CLAY with Sand, Stiff, Moist, Plastic. Sand - Fine Grained. and Dark Grayish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained. (Mixture)	19		118.0	13.2	Particle Size F.C.=44.0% q_u = 3,770psf
			Qcl:					
5 6	SM	◫	Very Dark Brown Silty SAND. Very Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.	5	4		15.0	
7 8 9	SC	◫	Olive Gray Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained.	14	10		18.5	
10 11 12 13 14	SC-CL	⧅	Olive Gray, Bluish Gray, and Yellowish Brown Clayey SAND to Sandy Lean CLAY with Gravel. Medium Dense, Moist, Slightly Plastic to Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded.	49		120.5	14.3	
15 16 17 18	SM	◫	Gray, Light Brown, and Yellowish Brown Silty SAND with Gravel. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded. ▽ Groundwater Encountered at 17± feet.	39	34		13.8	
			Tp:					
19 20 21 22 23 24	(SM)	◫	Dark Bluish Gray SANDSTONE. Dense, Moist. Weakly Cemented. (Silty Sand). Sand - Fine Grained.	39	36	90.3	30.7	F.C.=38.7%

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-6 (continued)
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
25								
26	(SM)	◫	Dark Bluish Gray SANDSTONE. Dense, Moist. Weakly Cemented. (Silty Sand). Sand - Fine Grained.	34	32	91.0	35.1	
27			Boring Terminated at 26.5± ft. Groundwater Encountered at 17± ft. Boring Backfilled with Cuttings.					
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								

CMAG ENGINEERING

FIGURE
A-9.1

LOG OF EXPLORATORY BORING

Project No:	18-141-SC	Boring:	B-7
Project:	5630 Soquel Drive	Date Drilled:	November 1, 2018
	Santa Cruz County, California	Logged By:	SSC
Drill Rig:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer		

Terzaghi Split Spoon Sample | 2" Ring Sample | 2.5" Ring Sample
S 3" Shelby Tube | Bulk Sample | ▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af: Baserock/Soil Mixture:					
1 2	SM		Light Brown Silty SAND with Gravel. Loose, Dry, Non Plastic. Sand - Fine to Coarse Grained. Gravel up to 3/4", Angular.	21		105.8	7.3	Particle Size F.C.= 30.8%
3	SM		Material Consistent.					
4	SM		**Qcl:** Dark Brown Silty SAND. Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.	8	6		10.0	
5 6	SC-CL		Gray and Dark Yellowish Brown Clayey SAND to Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	20		112.0	18.0	F.C.= 51.8%
7 8	SC		Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Some Gravel up to 1/2", Subrounded.	18	13		15.5	
9 10 11 12	SC/CL		Interbedded: Yellowish Brown Clayey SAND with Gravel. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Gravel - up to 1", Subrounded. Gray and Yellowish Brown Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	19	15		13.0	
13 14			Gravel and Cobble.					
15 16	SP-SM		Gray Poorly Graded SAND with Silt and Gravel. Very Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Gravel - up to 2", Subrounded. ▽ Groundwater Encountered at 16± feet.	100+			15.4	
17 18			**Tp:** Dark Bluish Gray SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.					
19 20 21	(ML)		Dark Bluish Gray SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	44	41		30.4	
22 23 24			Boring Terminated at 21.5± ft. Groundwater Encountered at 16± ft. Boring Backfilled with Cuttings.					

CMAG ENGINEERING

FIGURE
A-10

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-8
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1	SM		**af:** Light Brown Silty SAND with Gravel. Loose, Dry, Non Plastic. Sand - Fine to Medium Coarse Grained. Gravel up to 3/4", Angular.					
2	SC	◫	**Qcl:** Light Brown and Yellowish Brown Clayey SAND. Medium Dense, Dry to Moist, Slightly Plastic. Sand - Fine to Medium Grained.					
3				20	14		9.6	
4								
5								
6		◫						
7	SC-CL		Light Brown and Yellowish Brown Clayey SAND to Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1", Subrounded.	33	24		11.9	
8								
9								
10								
11		◫						
12	SC		Light Brown and Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 2", Subrounded.	35	28		11.4	
13			Gravel and Cobble.					
14								
15			▽ Groundwater Encountered at 15.5± feet.					
16	SP-SM	◫	Brown Poorly Graded SAND with Silt. Very Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subrounded.					
17	(SM)		**Tp:** Light Olive Brown SANDSTONE. Very Dense, Moist, Weakly Cemented. (Silty Sand). Sand - Fine Grained.	87	77		29.1	
18			Boring Terminated at 17.5± ft. Groundwater Encountered at 15.5± ft. Boring Backfilled with Cuttings.					
19								
20								
21								
22								
23								
24								

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-9
Date Drilled: November 1, 2018
Logged By: SSC

|| Terzaghi Split Spoon Sample
╱ 2" Ring Sample
╲ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af: 5" Baserock					
1–2	SM/SC	||	Light Brown and Brown Silty SAND and Clayey SAND. Loose, Moist, Non Plastic to Slightly Plastic. Sand - Fine to Medium Grained. Some Gravel - up to 3/4", Angular. Chunk of Asphalt in Sample.	12	8		9.0	Sulfate Particle Size F.C.= 33.8%
3	SM	╲	**Qcl:** Dark Brown Silty SAND. Very Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.					
4	SC	╲	Light Brown and Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subrounded.	11		119.2	13.2	
5		||	Material Consistent - Medium Dense.	15	11		14.9	
8	CL	||	Grayish Brown and Dark Yellowish Brown Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	13	10		22.2	
13	SM	╲	Brown and Yellowish Brown Silty SAND with Gravel. Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded.	80		123.3	7.0	
14–15	SP-SM	||	Yellowish Brown Poorly Graded SAND with Silt. Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Some Gravel - up to 1", Subrounded.	40	34		12.5	
16			▽ Groundwater Encountered at 16 ± feet.					
17–18			**Tp:** Light Olive Brown SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.					
21	(ML)	||	Light Olive Brown SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	44	41		30.8	
22–23			Boring Terminated at 21.5± ft. Groundwater Encountered at 16± ft. Boring Backfilled with Cuttings.					

CMAG ENGINEERING

FIGURE
A-12

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-10
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af: Concrete Debris.					
1 2	SM-SC	◫	Very Dark Brown and Grayish Brown Silty SAND to Clayey SAND. Medium Dense, Slightly Plastic. Sand - Fine to Coarse Grained. Trace Gravel - up to 1/2", Subangular.	29	20		6.8	
3 4	SM-SC	◫	Very Dark Grayish Brown Silty SAND to Clayey SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Trace Siltstone and Granitic Gravel - up to 2", Subangular.	23	16		8.1	
5								
6 7	SC-CL	◫	Dark Brown and Dark Yellowish Brown Clayey SAND to Sandy Lean CLAY. Very Stiff, Slightly Plastic to Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subangular.	13	10		17.9	
8			**Qcl:**					
9 10	SM	◫	Dark Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Medium Grained.	18	14		14.5	
11 12 13 14 15 16 17 18 19 20 21 22 23 24			Boring Terminated at 10± ft. No Groundwater Encountered. Boring Backfilled with Cuttings.					

CMAG ENGINEERING

FIGURE
A-13

LOG OF EXPLORATORY BORING

Project No:	18-141-SC	Boring:	B-11
Project:	5630 Soquel Drive Santa Cruz County, California	Date Drilled:	November 1, 2018
		Logged By:	SSC
Drill Rig:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer		

◫ Terzaghi Split Spoon Sample	⧄ 2" Ring Sample	⧅ 2.5" Ring Sample
S 3" Shelby Tube	☒ Bulk Sample	∇ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af:					
1 2	SM-SC	◫	Dark Brown and Brown Silty SAND to Clayey SAND. Medium Dense, Dry to Moist, Slightly Plastic. Sand - Fine to Medium Grained. Trace Granitic Gravel - up to 3/4", Angular.	23	16		5.5	
3 4	SM-SC	◫	Brown and Dark Yellowish Brown Silty SAND to Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Trace Granitic Gravel - up to 3/4", Angular.	15	10		9.6	
5 6	CL	◫	Dark Yellowish Brown Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine to Medium Grained.					
7	SM	◫	**Qcl:** Dark Grayish Brown Silty SAND. Loose, Moist to Wet, Non Plastic. Sand - Fine to Medium Grained.	8	6		13.8	
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24			Boring Terminated at 7.5± ft. No Groundwater Encountered. Boring Backfilled with Cuttings.					

CMAG ENGINEERING

FIGURE
A-14

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Boring: B-12
Project: 5630 Soquel Drive
Santa Cruz County, California
Date Drilled: November 1, 2018
Logged By: SSC
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			Terzaghi Split Spoon Sample 2" Ring Sample 2.5" Ring Sample S 3" Shelby Tube ⊠ Bulk Sample ▽ Groundwater Elevation					
			af:					
1 2	SM-SC		Dark Brown and Light Yellowish Brown Silty SAND to Clayey SAND. Medium Dense, Dry to Moist, Non Plastic to Slightly Plastic. Sand - Fine to Coarse Grained. Trace Granitic Gravel - up to 1", Angular.	30	21		5.7	Particle Size F.C.=35.9%
3 4	SC		Dark Brown and Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained.	25	17		9.7	
5			**Qcl:** Dark Grayish Brown Silty SAND. Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.					
6	SM		Brown Silty SAND. Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.					
7	SC		Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Trace Gravel - up to 1/2", Subrounded.	8	6		12.9	
8 9			Boring Terminated at 7.5± ft. No Groundwater Encountered. Boring Backfilled with Cuttings.					
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24								

CMAG ENGINEERING

FIGURE
A-15

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-13
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af:					
1 2 3	SC	◫	Dark Brown and Dark Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Trace Gravel - up to 3/4", Subangular.	32	22		8.3	
4	SM	◫	**Qcl:** Dark Brown Silty SAND. Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.	13	9		6.6	
5 6	SC	◫	Light Yellowish Brown Clayey SAND with Gravel. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Gravel - up to 1/2", Subrounded.	24	17		10.6	
7 8			Boring Terminated at 6.5± ft. Groundwater Not Encountered. Boring Backfilled with Cuttings.					
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24								

CMAG ENGINEERING

FIGURE
A-16

v

UNITS

af: Artificial Fill

af Silty SAND, Clayey SAND, Sandy Lean CLAY

Qcl: Lowest Emergent Coastal Terrace Deposits

Qcl Silty SAND, Clayey SAND, Sandy Lean CLAY, Poorly Graded SAND with Gravel

Tp: Purisima Formation Bedrock

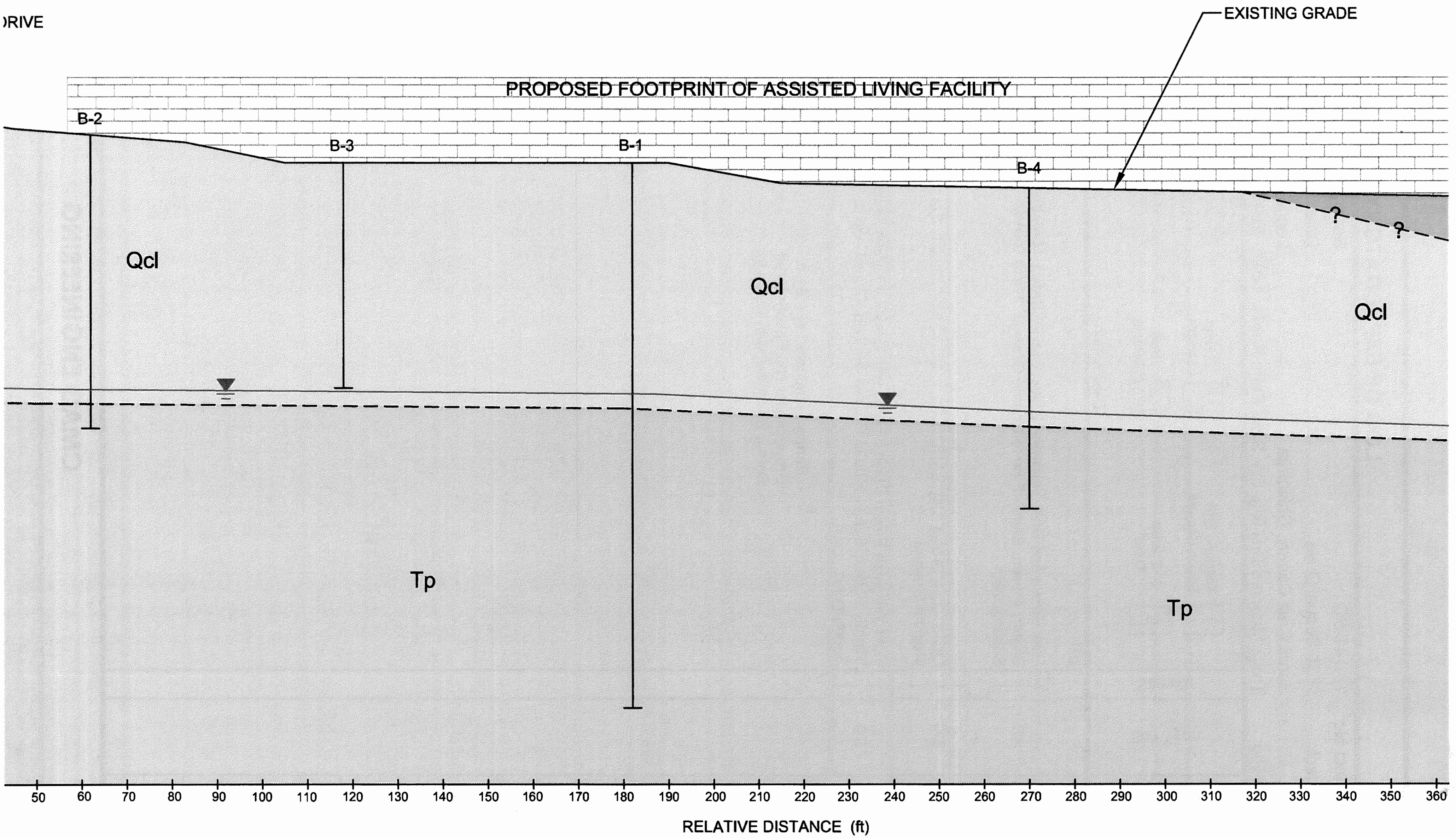
Tp SILTSTONE, SANDSTONE

GEOLOGIC CONTACT, DAS
QUERIED WHERE UNCERT

APPROXIMATE GROUNDW
(OBSERVED 10-31-18 and

B-2 APPROXIMATE LOCATION

RIVE



EXPLANATION

UNITS

af: Artificial Fill

af	Silty SAND, Clayey SAND, Sandy Lean CLAY

Qcl: Lowest Emergent Coastal Terrace Deposits

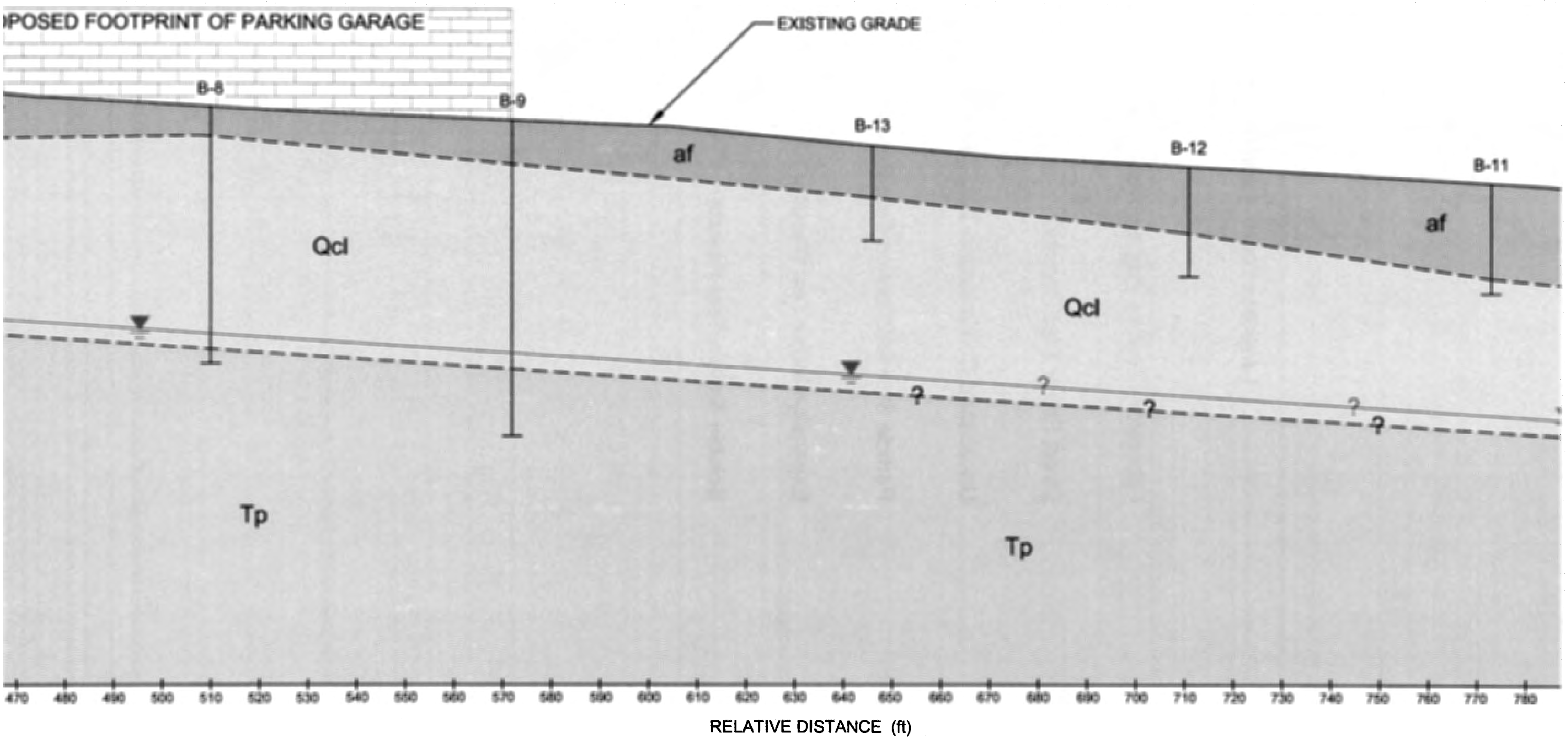
Qcl	Silty SAND, Clayey SAND, Sandy Lean CLAY, Poorly Graded SAND with Gravel

Tp: Purisima Formation Bedrock

Tp	SILTSTONE, SANDSTONE

SYMBOLS

—— -- ?	GEOLOGIC CONTACT, DASH QUERIED WHERE UNCERTAI
▼	APPROXIMATE GROUNDWAT (OBSERVED 10-31-18 and 11-1
B-2	APPROXIMATE LOCATION OF



APPENDIX B

LABORATORY TESTING PROGRAM

LABORATORY TESTING PROCEDURES

Classification

Soils were classified according to the Unified Soil Classification System in accordance with ASTM D 2487 and D 2488. See Figure A-3. Moisture content and dry density determinations were made for representative, relatively undisturbed samples in accordance with ASTM D 2216. Results of the moisture-density determinations, together with classifications, are shown on the Boring Logs in Appendix A.

Direct Shear

A consolidated drained direct shear test was performed in accordance with ASTM D 3080 on a representative, relatively undisturbed sample of the on-site soils. To simulate possible adverse field conditions the sample was saturated prior to shearing. A saturating device was used which permitted the sample to absorb moisture while preventing volume change. The direct shear test results are presented on the Boring Logs and Figure B-1.

Unconfined Compression

Unconfined compression tests were performed on representative samples of the on-site soils in accordance with ASTM D 2166. The test results are presented on the Boring Logs and Figures B-2 and B-3.

Particle Size Distribution

Particle size distribution tests were performed on representative samples of the on-site soils and bedrock in accordance with ASTM D 422. The test results are presented on the Boring Logs and Figures B-4 through B-16.

Expansion

Expansion index tests were performed on representative remolded samples of the on-site soils in accordance with the ASTM D 4829. The test results are presented on the Boring Logs and in Table B-1.

Table B-1. Expansion Index Test Results

Boring	Depth (ft)	Soil Type	Expansion Index	Expansion Potential
B-2	1.5	SC-CL	57	Medium
B-6	1.5	CH/SC	13	Very Low

Soluble Sulfates

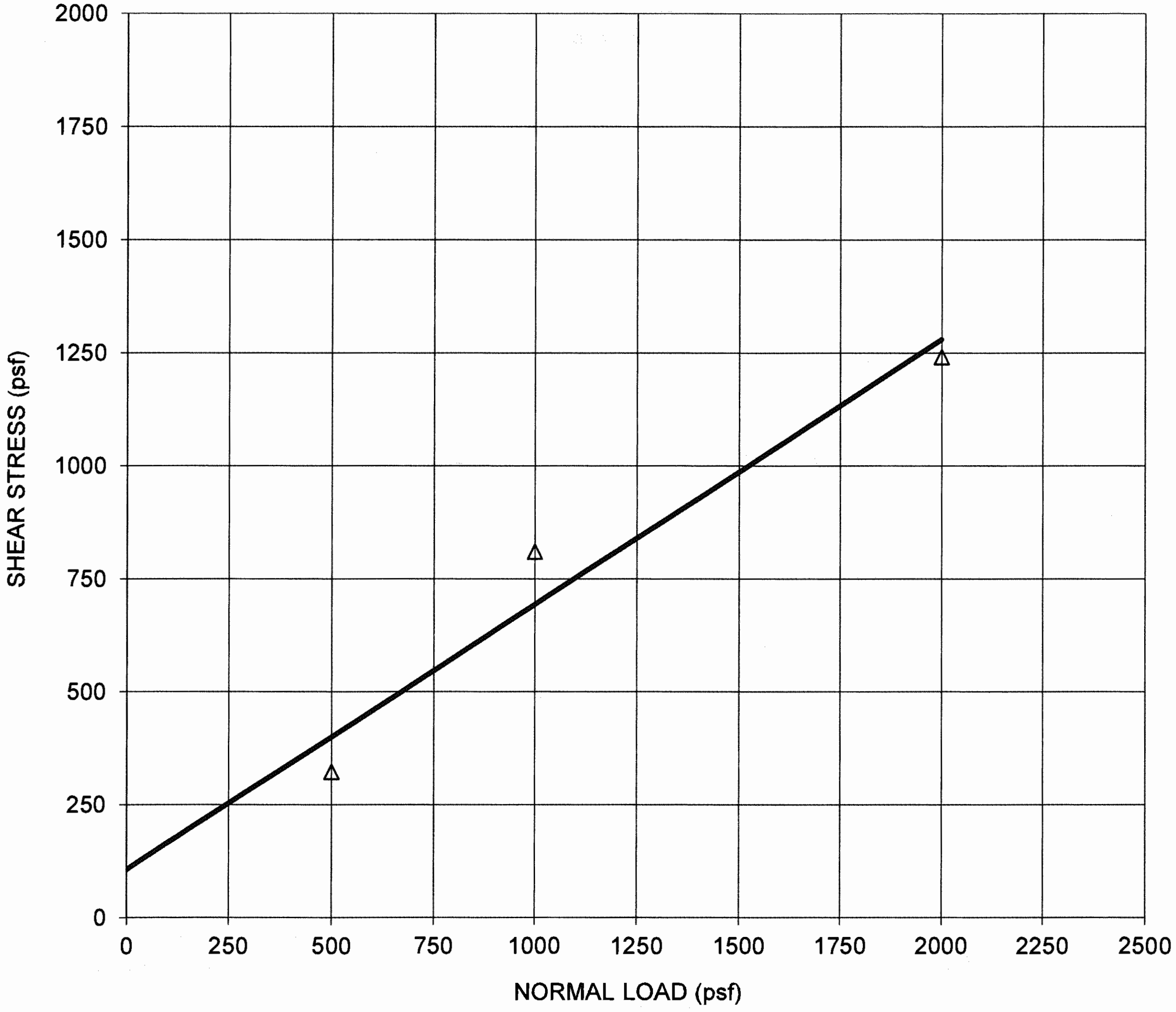
The soluble sulfate content was determined for samples considered representative of the on-site soils in accordance with Caltrans 417. The test results are presented in Table B-2.

Table B-2. Soluble Sulfate Test Results

Boring	Depth (ft)	Soil Type	Sulfates (ppm)	Sulfate Exposure Class
B-3	1	SC	28	Negligible
B-9	1	SM/SC	36	Negligible

BORING:	B-1		COHESION (psf)	FRICTION ANGLE
DEPTH (ft):	3.5			
SOIL TYPE (USCS):	SC	━━━━ PEAK	100	30
		▬ ▬ ▬ ▬ ULTIMATE		

MOISTURE: **SATURATED**	TEST TYPE: **CONSOLIDATED - DRAINED**



CMAG ENGINEERING

DIRECT SHEAR TEST RESULTS

5630 Soquel Drive

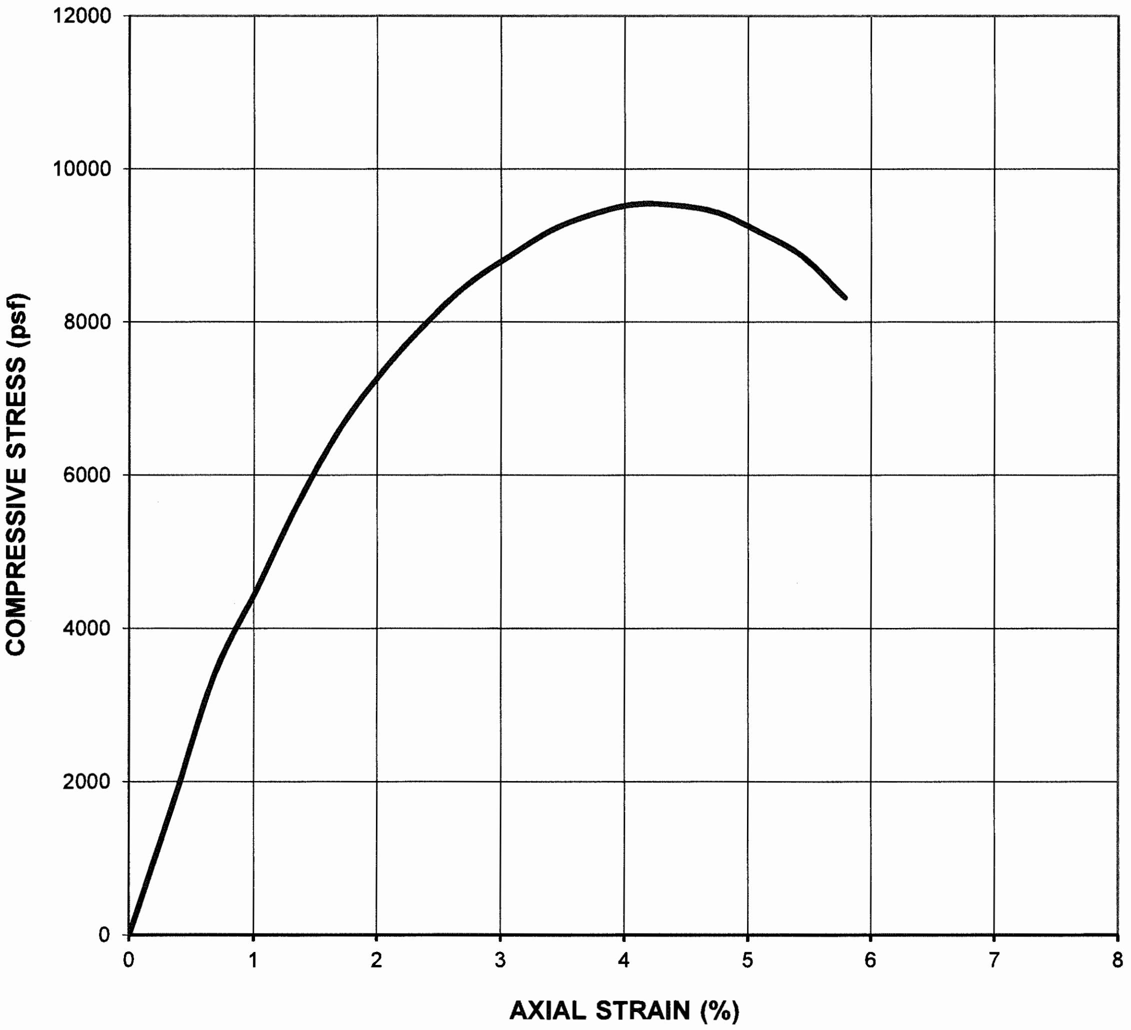
FIGURE

B-1

BORING:	B-5	**UNDISTURBED**	UCS
DEPTH (ft):	4		
SOIL TYPE (USCS):	CL		q_u = 9,530 psf

MOISTURE: **INSITU - SATURATED**

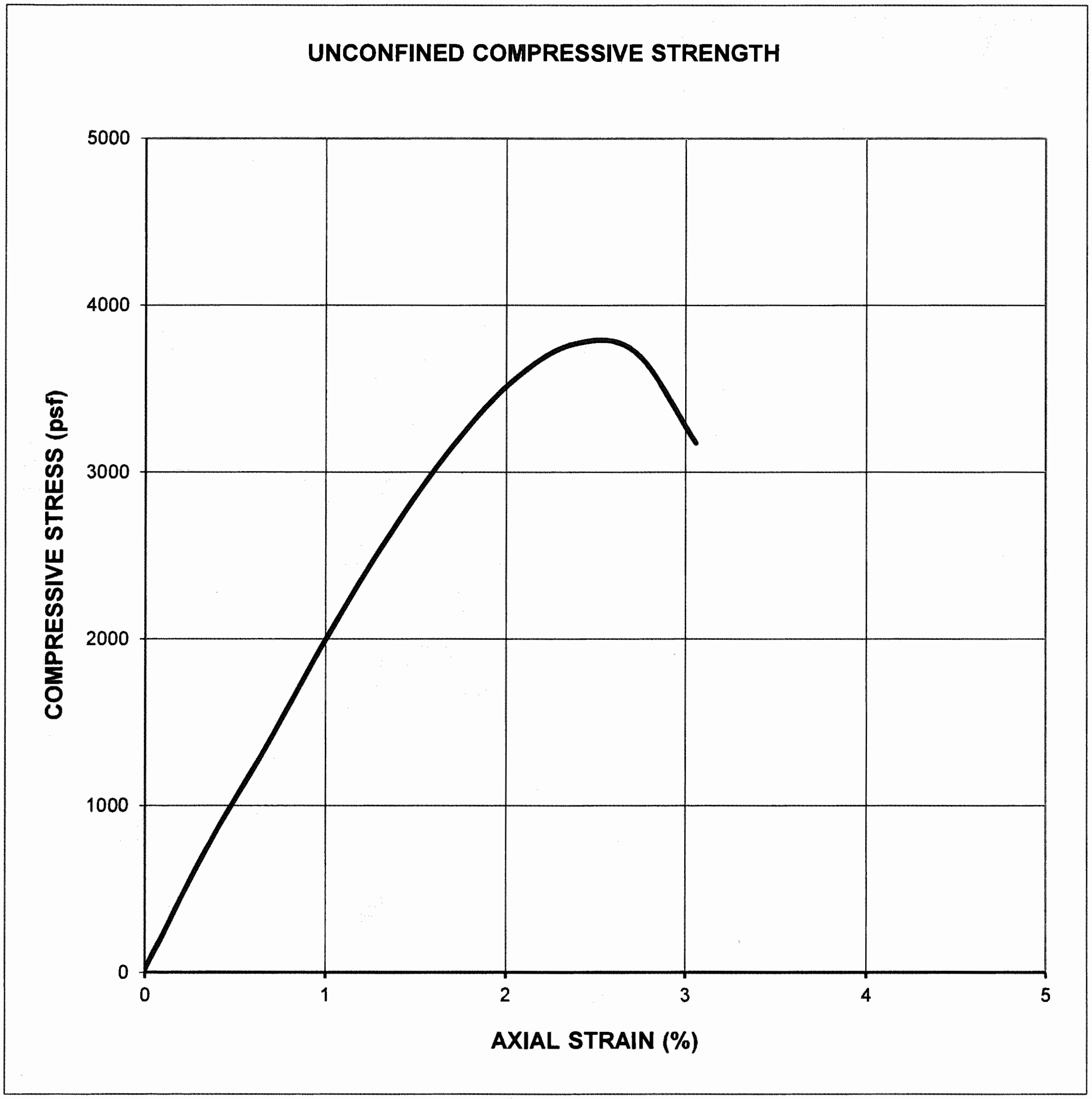
UNCONFINED COMPRESSIVE STRENGTH



CMAG ENGINEERING	**UNCONFINED COMPRESSIVE STRENGTH RESULTS**	FIGURE
	5630 Soquel Drive	B-2

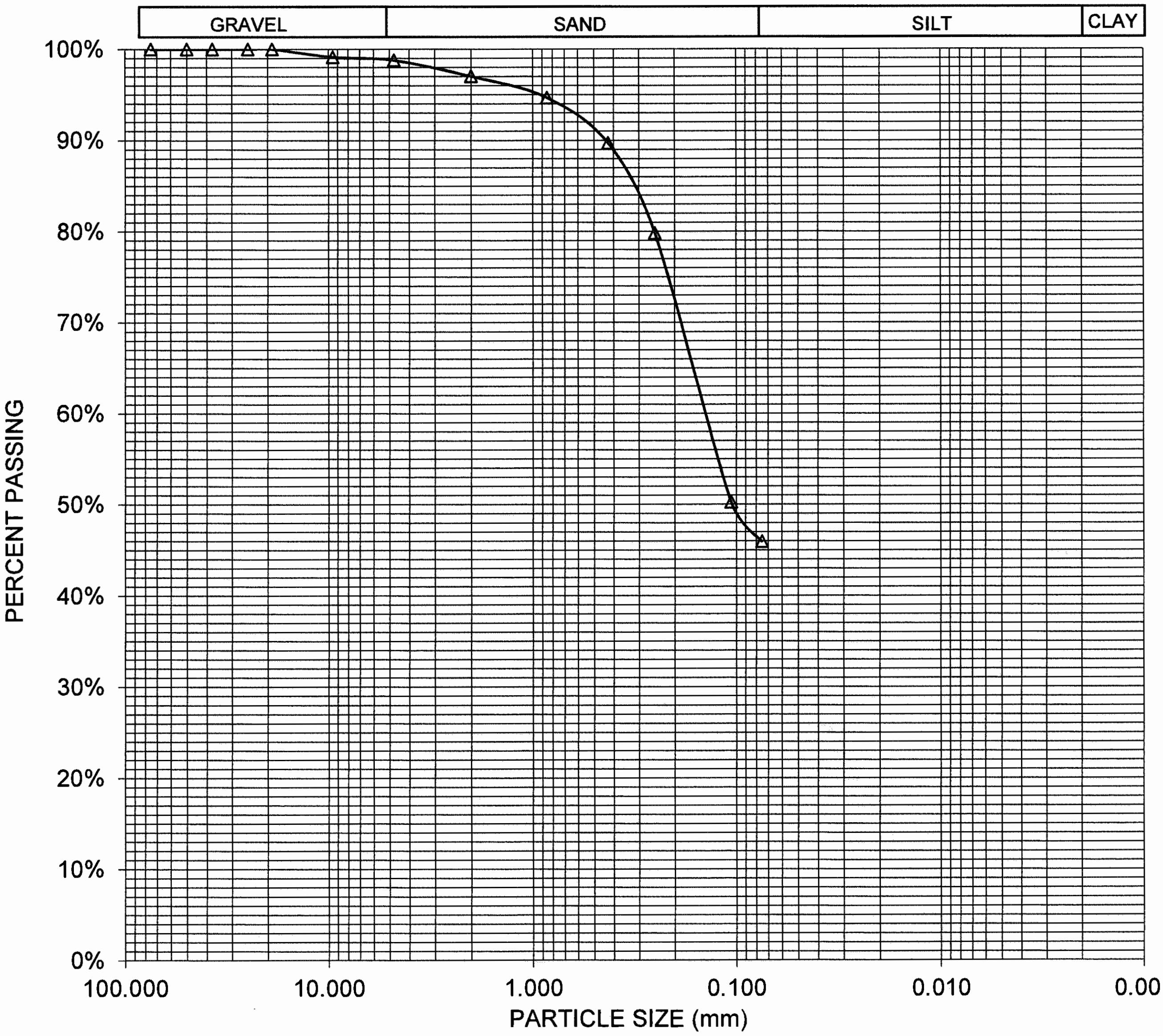
BORING:	B-6	UNDISTURBED	UCS
DEPTH (ft):	3.5		
SOIL TYPE (USCS):	CH/SC		q_u = 3,770 psf

MOISTURE: **INSITU - SATURATED**



CMAG ENGINEERING	**UNCONFINED COMPRESSIVE STRENGTH RESULTS**	FIGURE
	5630 Soquel Drive	B-3

BORING:	B-1	PERCENT	PERCENT
DEPTH (ft):	2.5	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	SC	98.8%	45.9%



CMAG ENGINEERING

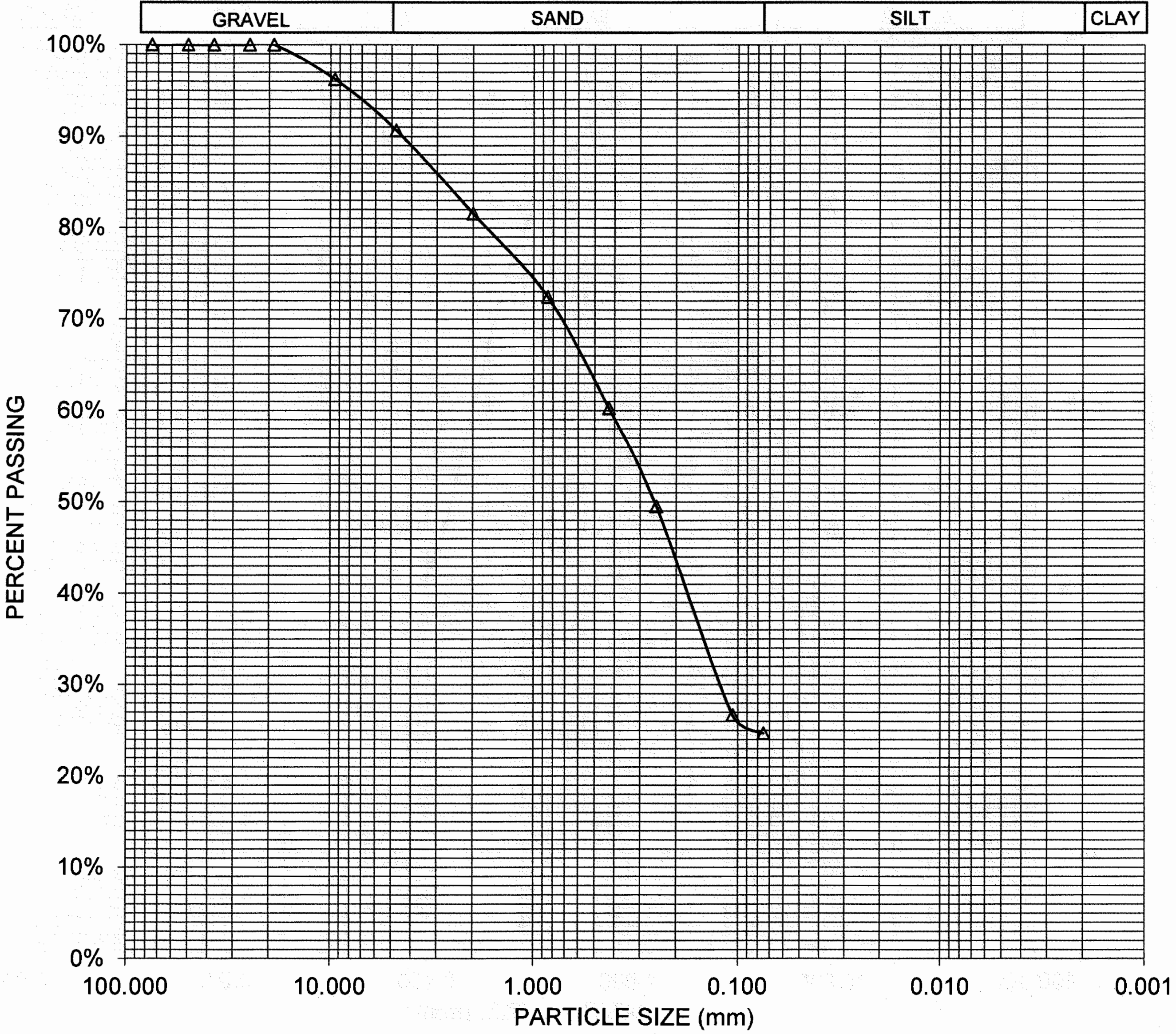
PARTICLE SIZE DISTRIBUTION

5630 Soquel Drive

FIGURE

B-4

		PERCENT PASSING No. 4	PERCENT PASSING No. 200
BORING:	B-2		
DEPTH (ft):	2.0		
SOIL TYPE (USCS):	SC	90.7%	24.7%



CMAG ENGINEERING

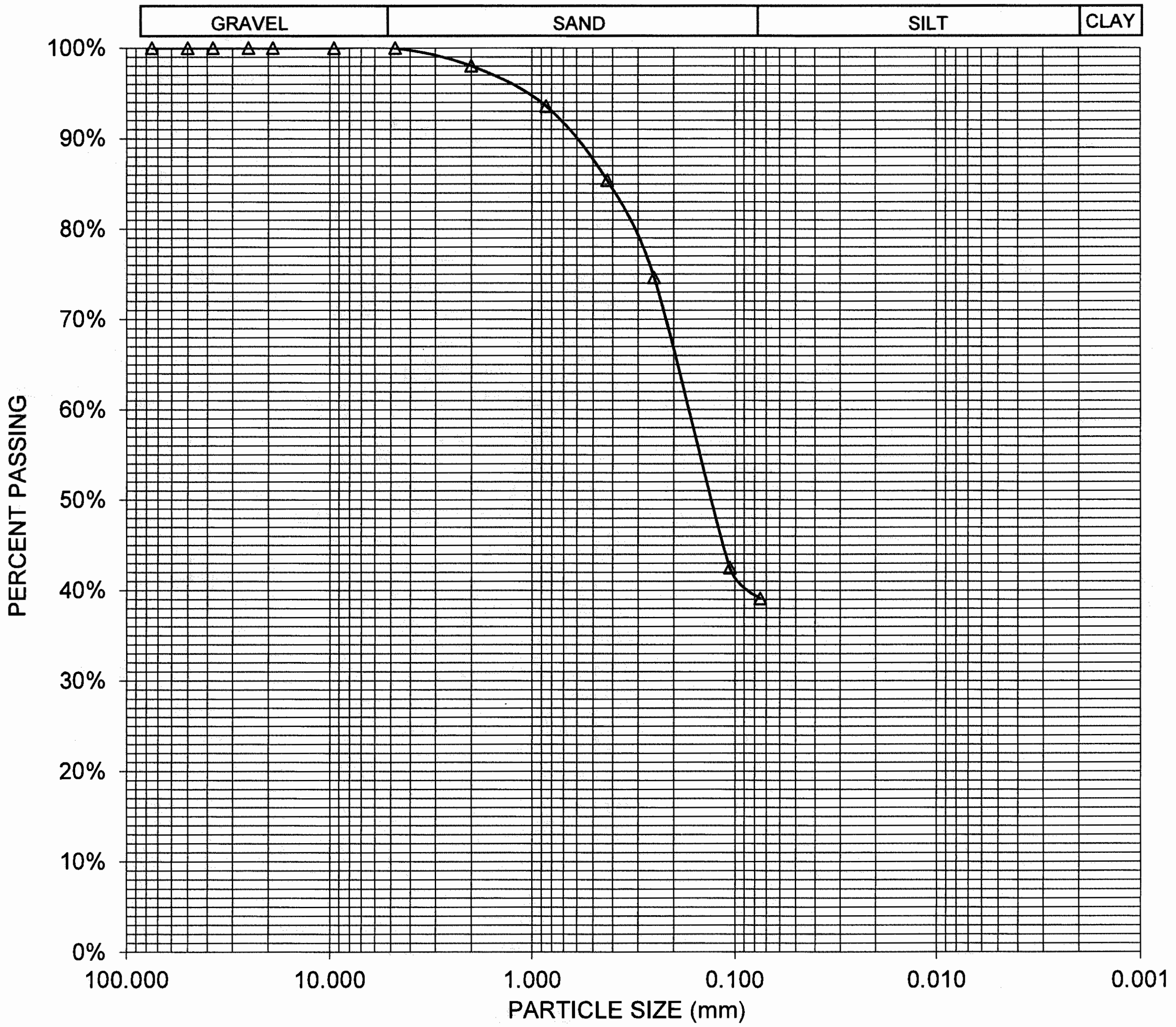
PARTICLE SIZE DISTRIBUTION

5630 Soquel Drive

FIGURE

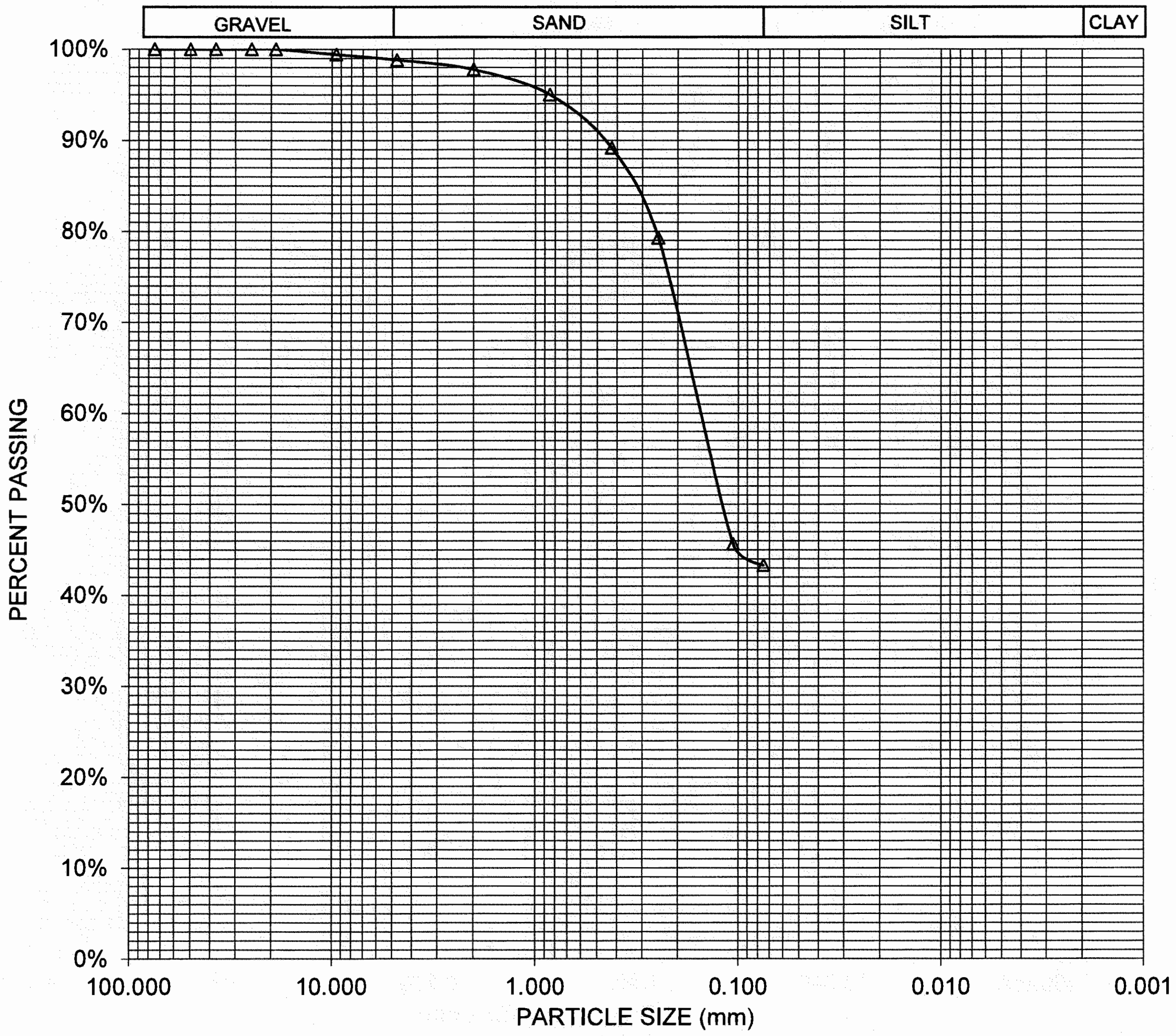
B-5

BORING:	B-3	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	1		
SOIL TYPE (USCS):	SC	100.0%	39.1%



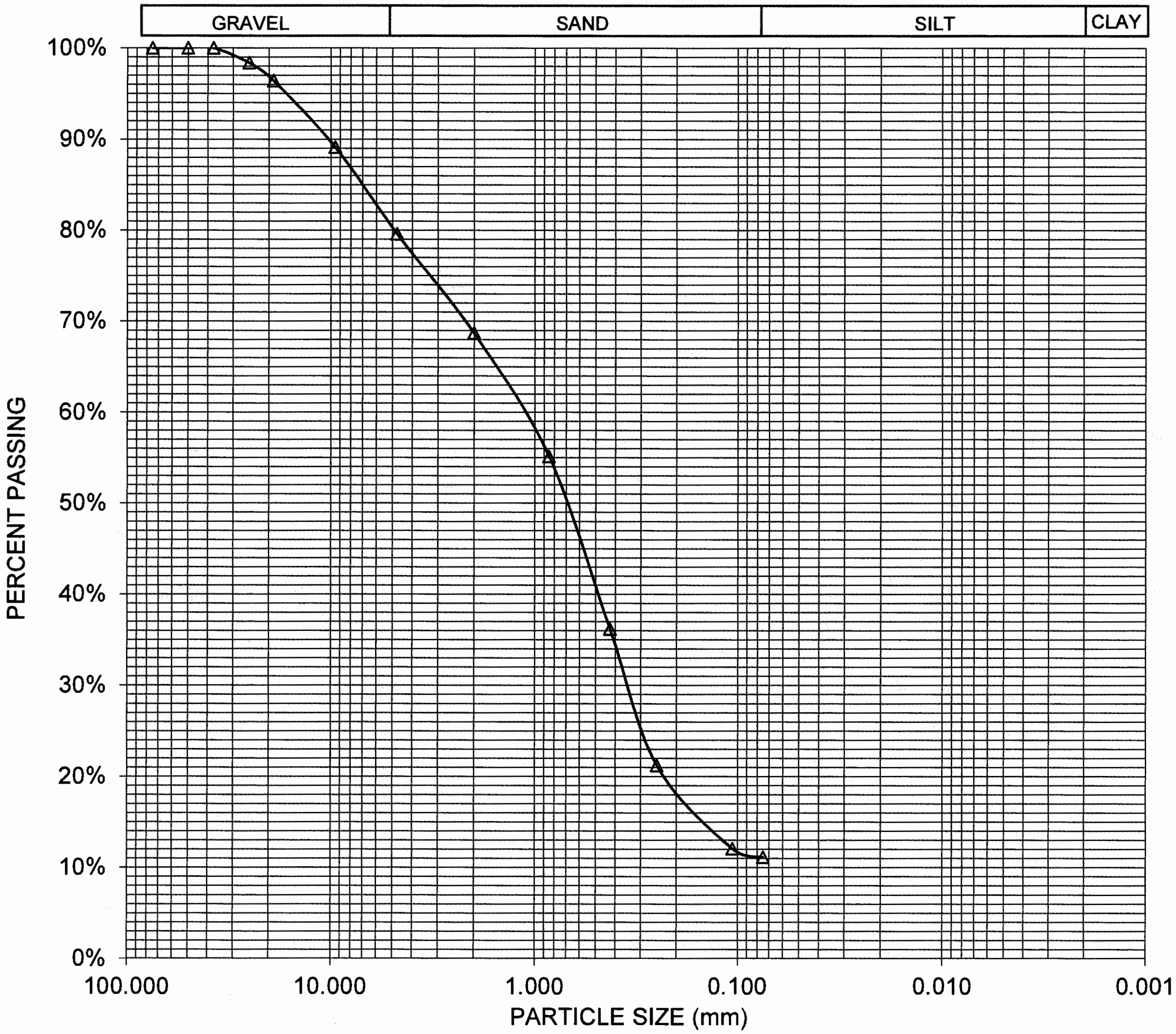
CMAG ENGINEERING	PARTICLE SIZE DISTRIBUTION 5630 Soquel Drive	FIGURE B-6

BORING:	B-4	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	1.5		
SOIL TYPE (USCS):	SC	98.8%	43.3%



CMAG ENGINEERING	PARTICLE SIZE DISTRIBUTION	FIGURE
	5630 Soquel Drive	B-7

BORING:	B-5	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	10		
SOIL TYPE (USCS):	SW-SM	79.6%	11.1%



CMAG ENGINEERING

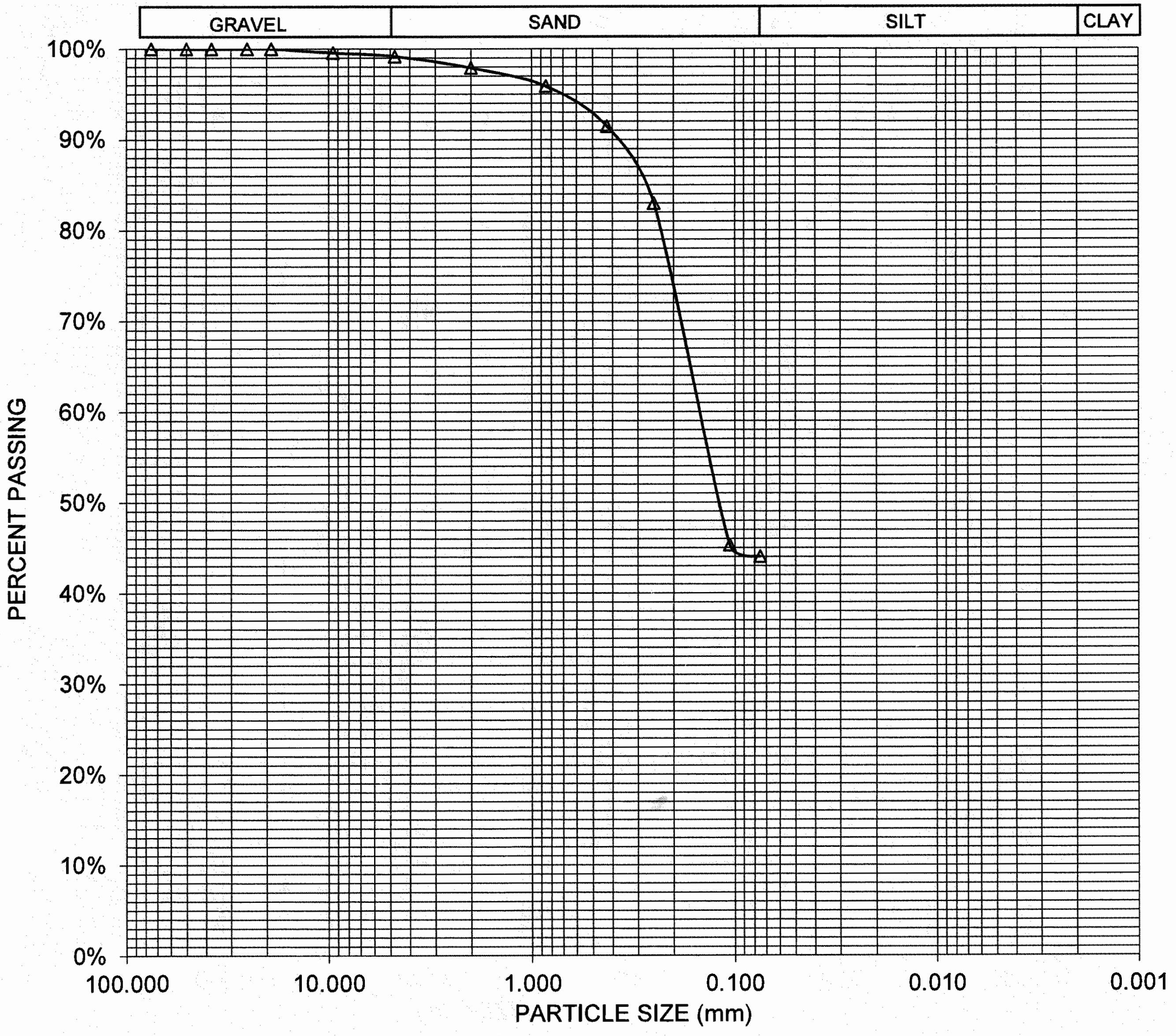
PARTICLE SIZE DISTRIBUTION

5630 Soquel Drive

FIGURE

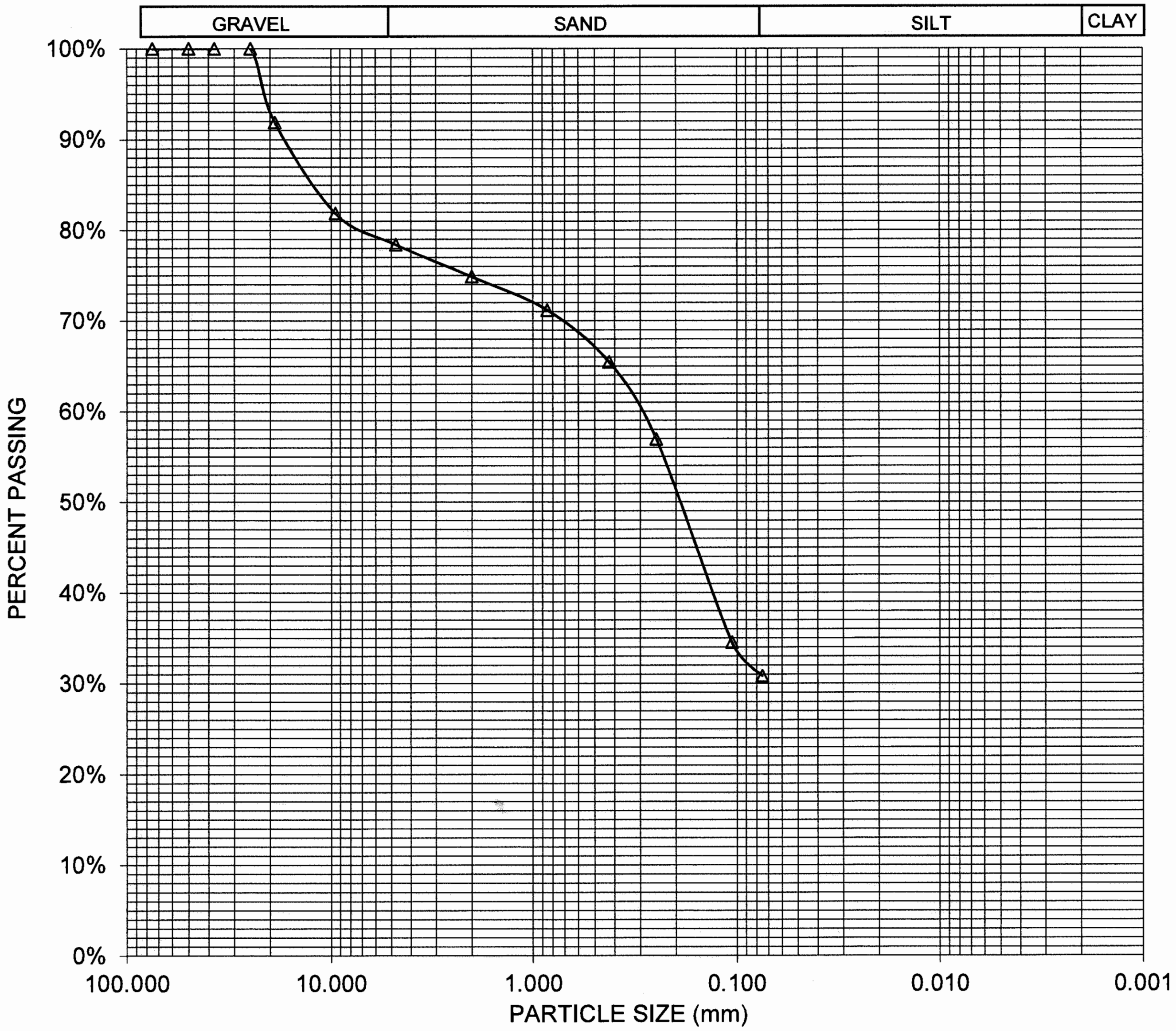
B-8

		PERCENT PASSING No. 4	PERCENT PASSING No. 200
BORING:	B-6		
DEPTH (ft):	2.5		
SOIL TYPE (USCS):	SC	99.2%	44.0%



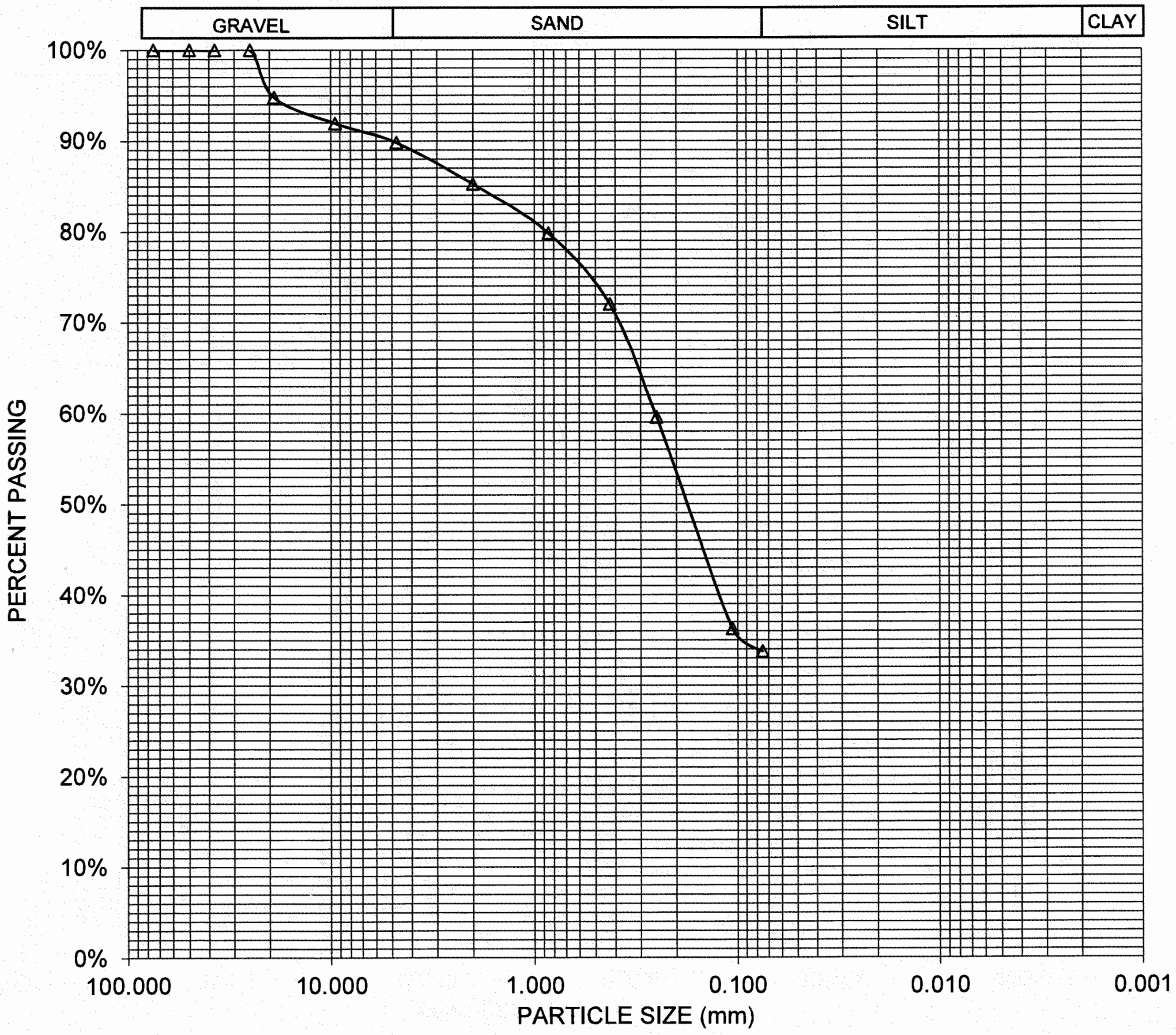
CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	5630 Soquel Drive	B-9

BORING:	B-7	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	1		
SOIL TYPE (USCS):	SM	78.4%	30.8%



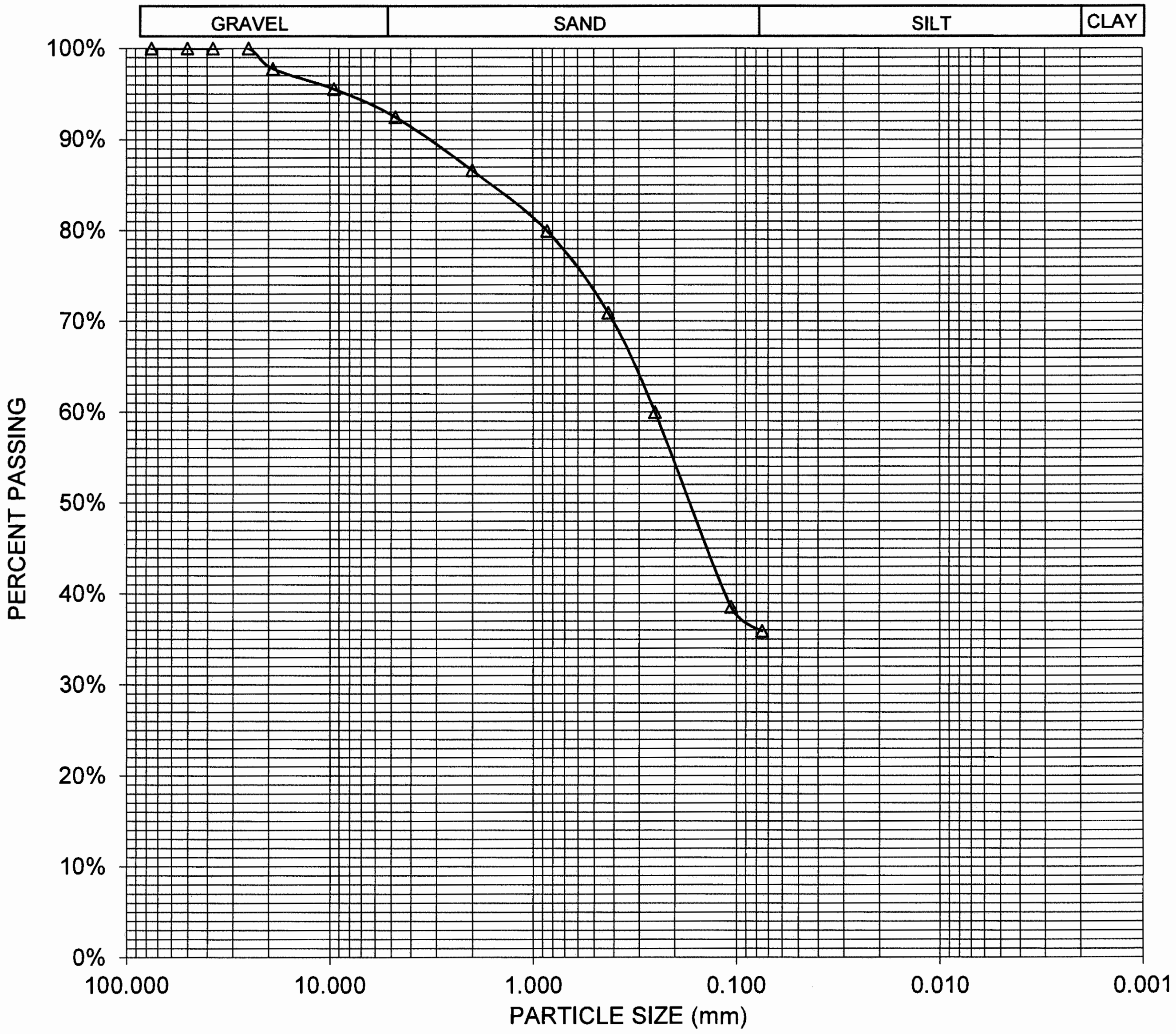
CMAG ENGINEERING	PARTICLE SIZE DISTRIBUTION	FIGURE
	5630 Soquel Drive	B-10

BORING:	B-9	PERCENT	PERCENT
DEPTH (ft):	1	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	SM/SC	89.8%	33.8%



CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	5630 Soquel Drive	B-11

BORING:	B-12	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	1		
SOIL TYPE (USCS):	SM-SC	92.5%	35.9%



CMAG ENGINEERING

PARTICLE SIZE DISTRIBUTION

5630 Soquel Drive

FIGURE

B-12

Attachment 4

Geotechnical Report Review Letter

March 13, 2019

THE COUNTY OF SANTA CRUZ
1850

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COUNTY OF SANTA CRUZ

PLANNING DEPARTMENT
701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060
(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123
KATHLEEN MOLLOY, PLANNING DIRECTOR

13 March 2019

Oakmont Senior Living
Attn: Hanna Daugherty
9240 Old Redwood Highway, Ste. 200
Windsor, CA 95492

Subject: Review of the Geotechnical Investigation for Proposed Assisted Living Facility at 5630 Soquel Drive/APN 037-191-14 dated 14 December 2018 by CMAG Engineering, Inc - Project No. 18-141-SC

Project Site: 5630 Soquel Drive
APN 037-191-14
Application No. REV191017

Dear Applicant:

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

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

2. Final plans shall reference the report by title, author, and date. Final plans should include a statement that the project shall conform to the report's recommendations.

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

   Any updates to report recommendations necessary to address conflicts between the report and plans must be provided via a separate addendum to the subject 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 *must remain involved with the project* during construction. Please review the Notice to Permits Holders (attached).

Our acceptance of the report 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: www.sccoplanning.com/html/devrev/plnappeal_bldg.htm

If we can be of any further assistance, please contact the undersigned at (831) 454-3168 or rick.parks@santacruzcounty.us

Sincerely,

Rick Parks, GE 2603
Civil Engineer – Environmental Planning

Cc: CMAG Engineering, Inc. Attn: Adrian Garner, GE
Environmental Planning, Attn: Robert Loveland
Owner, Inner Light Ministries

Attachments: Notice to Permit Holders

NOTICE TO PERMIT HOLDERS WHEN A SOILS REPORT HAS BEEN PREPARED, REVIEWED AND ACCEPTED FOR THE PROJECT

After issuance of the building permit, the County requires your soils engineer to be involved during construction. Several letters or reports are required to be submitted to the County at various times during construction. They are as follows:

1. **When a project has engineered fills and / or grading**, a letter from your soils engineer must be submitted to the Environmental Planning section of the Planning Department prior to foundations being excavated. This letter must state that the grading has been completed in conformance with the recommendations of the soils report. Compaction reports or a summary thereof must be submitted.

2. **Prior to placing concrete for foundations**, a letter from the soils engineer must be submitted to the building inspector and to Environmental Planning stating that the soils engineer has observed the foundation excavation and that it meets the recommendations of the soils report.

3. **At the completion of construction,** a *Soils (Geotechnical) Engineer Final Inspection Form* from your soils engineer is required to be submitted to Environmental Planning that includes copies of all observations and the tests the soils engineer has made during construction and is stamped and signed, certifying that the project was constructed in conformance with the recommendations of the soils report.

If the *Final Inspection Form* identifies any portions of the project that were not observed by the soils engineer, you may be required to perform destructive testing in order for your permit to obtain a final inspection. The soils engineer 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 5

Water demand Offset Program

May 15, 2018

THE COUNTY OF SANTA CRUZ
1850

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Approved Water Demand Offset Program

May 15, 2018

MEMO TO THE BOARD OF DIRECTORS

Subject: Agenda Item No. 6.7

Title: Water Demand Offset Program New Applicant Offset-Generating Project Proposal for 5360 Soquel Drive

Attachment(s):

1. Water Demand Offset Program New Applicant Offset-Generating Project Proposal Application by Oakmont Senior Living and Inner Light Ministries Church for 5360 Soquel Drive

Background

All new developments and expanded commercial development projects (applicants) in the District must participate in the Water Demand Offset (WDO) Program. Currently, each must offset two times the amount of water they are expected to use. In order to fulfill their offset requirement, the applicant must:

- Offset half of their total requirement by purchasing offset credits from future conservation projects/programs; and
- Offset half of their total requirement through replacement of older toilets in the District with ultra-high efficiency models, either by paying into the enhanced toilet rebate program or direct install of new fixtures, <u>or</u> by generating offsets through a self-performed offset-generating project accepted by the District Board of Directors (Board).

If an applicant proposes an offset generating project and it is approved by the Board, it is the applicant's responsibility to execute the project. Upon completion, their offset credit will first be applied to the half of their total offset requirement to be met by toilet replacements. If greater than half of the total offset requirement is met through the approved offset-generating project, the applicant may apply the remaining offsets to the half of the offset requirement that is met through payment into long-term offset generating projects. This component of the WDO program was approved by the Board at the meeting on May 16, 2017 (Item 6.3: http://www.soquelcreekwater.org/sites/default/files/documents/board-meeting/meeting-minutes/05-16-17%20Minutes_secured_0.pdf).

Proposal

Inner Light Ministries, partnering with Oakmont Senior Living, is proposing an 85-unit senior assisted living facility at 5360 Soquel Drive at the site of the current Inner Light Ministries Church. They are currently 35th on the wait list with an offset requirement of 9.26 acre-feet.

To meet their offset requirement, they are proposing a water-saving project to install new toilets, faucets, and showerheads at Seascape Resort's hotel and "condotel" rooms. "Condotels" are condominiums which function as a hotel when not occupied by a private owner. The following table summarizes the proposed retrofits. The table also shows the District's current water use efficiency requirements (WUER) in place for new or remodeled development and which align with the California Green Building code.

	Existing Fixture	**Proposed Fixture**	**Water Use Efficiency Requirement (WUER)**
Toilets (GPF) - 497 fixtures	1.6	1.0	1.28
Bathroom Faucets (GPM) - 491 fixtures	2.2	1.2	1.5
Kitchen Faucets (GPM) - 232 Fixtures	1.75	1.5	1.8
Showerheads (GPM) - 440 fixtures	2.5	1.75	2.0

GPF = gallons per flush; GPM = gallons per minute

All proposed retrofits go below the District's current standard for water use efficiency for this type of commercial use. We do not generally advocate going below 1.0 gallons per flush for commercial applications, per the guidance of the Environmental Protection Agency's Water Sense program (https://www.epa.gov/watersense/commercial-toilets).

The application for their offset-generating project is included as **Attachment 1**. The applicant estimates that the retrofits would save 18.16 acre-feet per year. The sources used for the calculations have been checked and deemed to be reliable. However, staff reviewed the calculations and suggests the following changes be made to the calculations to account for the fact that faucets and showerheads have a lifespan shorter than 20 years (i.e. they do not meet the WDO program permanence criteria of producing water savings for a 20-year period). The changes made to account for permanence are highlighted in the table below.

	Applicant Calculation of Water Saved Daily (gal)	**District Calculation of Water Saved Daily (gal) accounting for permanence**	**Justification**
Toilets	5,064	5,064	No change
Bathroom Faucets	16,674	8,337	Lifespan of fixture 10 years
Kitchen Faucets	414	207	Lifespan of fixture 10 years
Showerheads	10,273	2,568	Lifespan of fixture 5 years
Total Gallons/day (with 50% occupancy)	16,212	8,088	
Total Gallons/year (with 50% occupancy)	5,917,380	2,952,120	
	Applicant Calculation Total Savings (acre-feet)	**District Calculation Total Savings (acre-feet) accounting for permanence**	
Acre-feet/year (with 50% occupancy)	18.16	9.06	

After Staff modified the revisions to account for permanence, the savings are estimated to be 9.06 acre-feet per year over 20 years.

Discussion

The Board has established 3 criteria to rate applicant proposed offset-generating projects for the Water Demand Offset program. Those criteria are:

- Additionality (whether or not the savings would have occurred otherwise through District programs, changes in the building code or expected customer behavior)
- Measurability (savings can be quantified)
- Permanence (the savings can be counted on every year for 20 years)

The applicant has explained how they believe that that their proposal meets these criteria in pages 4 and 5 of their application shown in Attachment 1. Staff has suggested some revisions of the applicant's calculations to address concerns about the permanence of the fixtures in the calculations above.

There may be some question as to whether these replacements would have occurred otherwise through another District program or code changes and therefore meet the requirement for additionality. To address this concern, the applicant obtained a letter from Seascape Resort General Manager, Tim McGregor, which says that the resort would not be doing equivalent replacements if not for this proposed project. Staff feels it is unlikely that the retrofits would have been completed to this standard otherwise because the retrofits are more conserving than the requirements for new fixtures in the Green Building Code, WUERs, or the District's rebate. Though the District has a commercial rebate program which would provide $175 per toilet retrofit (for replacing a toilet that uses 1.6 GPF or more with a toilet that uses 1.28 GPF or less) and $50 per showerhead retrofit (for installing a replacement showerhead with a flow rate of 1.5 GPM or less), recent rebate uptake has been very poor. In the past two fiscal years there have only been 2 commercial toilet rebates and no commercial showerhead rebates. We do not offer a rebate on faucets.

POSSIBLE BOARD ACTION(S)

1. By MOTION, approve, approve with changes, or deny the proposal from Inner Light Ministries/Oakmont to retrofit toilets, showerheads, and faucets at Seascape Resort for offset credit; or
2. Take no action.

By Alyssa Abbey
Alyssa Abbey
Staff Analyst

By Shelley Flock
Shelley Flock
Conservation and Customer Service Field Manager

Attachment 6

Preliminary Stormwater Control Plan

January 2019

THE COUNTY OF SANTA CRUZ
1850

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Preliminary
Stormwater Control Plan

For

Oakmont Senior Living

5630 Soquel Drive
Santa Cruz, California
APN: 037-191-14 & 037-191-15

By: Greg Stein
Reviewed By: Richard Tso, RCE #60628

January, 2019

Job # 18031

IFLAND ENGINEERS
Civil Engineering ■ Structural Design ■ Land Development

**5300 Soquel Avenue Suite 101Santa
Cruz, CA 95062
(831) 426-5313 FAX (831) 426-1763
www.iflandengineers.com**

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Existing Conditions

The project site consists of two parcels. The main parcel (APN 037-191-14) approximately 3.4 acres in size, and the adjacent parcel to the East (APN 037-191-15) approximately 0.7 acres in size, both are located south of Soquel Drive, Soquel, California. Rochelle Lane extends from the easterly boundary to Monterey Avenue through an adjacent residential subdivision located east of Noble Gulch, which separates the project site from the subdivision. A site location map has been included as Figure 1 of this report. The site is bounded by residential zoned parcels along the sides and rear.

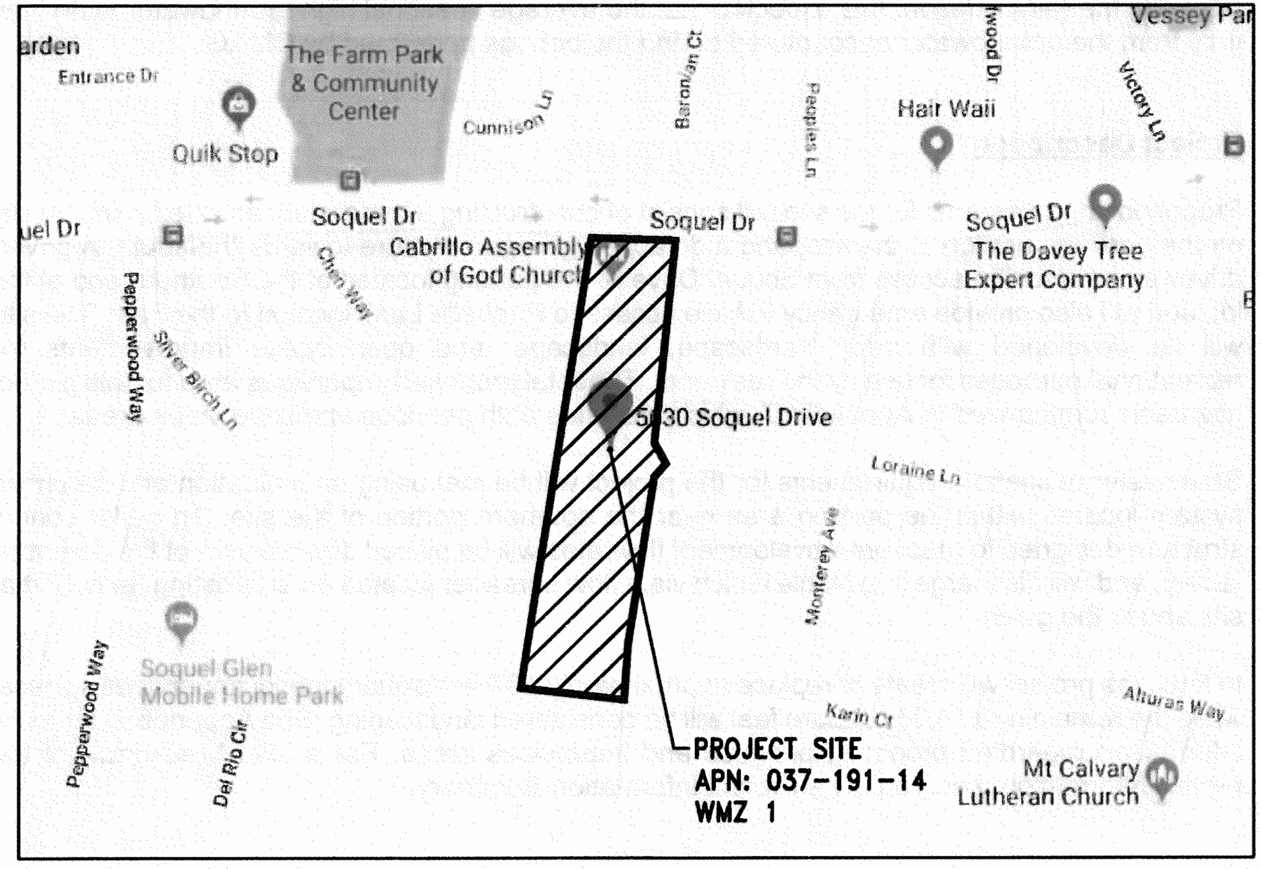

Figure 1 – Site Location Map
Not to scale – Source: Google Maps (Map data ©2018 Google)

There is an existing church and accessory building located on site. The Northern portion of the site between Soquel Drive and Rochelle Lane contains asphalt paving for the parking area, and the Southern portion of the lot is mainly hard-packed dirt and gravel, also used for parking. See Appendix C – Existing Pervious & Impervious Areas for a breakdown of existing surfaces on the project site.

In general, the site slopes from North to South. The Easterly property line is bounded by Noble Gulch which is considered a Riparian Corridor. An existing 48-inch concrete culvert passes below Rochelle Lane to connect the Northern and Southern portion of Noble Gulch.

Elevations onsite vary from approximately 129 at the North East corner, to 113 at the South West Corner, with slopes generally between 2% to 5%. The outer edges of the Easterly and Southerly property lines slope down to Noble Gulch along the East and a low-lying drainage area towards the South at approximately 3:1 slope. At present, the site is approximately 44% impervious.

The NRCS classifies soil in the site area as mostly Watsonville Loam at the surface and Sandy Clay below 18 inches. The NRCS estimates saturated conductivity (Ksat) of the limiting layer of soil at 0.43 inches/hour, see Appendix B. A Geotechnical Investigation provided by CMAG Engineering, Inc., dated December 14, 2018, has been included as Appendix A to this report. Based on their report, the site consists of terrace deposits overlying siltstone and sandstone bedrock.

The groundwater table was encountered in 6 of the 13 borings performed by CMAG, at depths varying from 15.5 to 17 feet. There is potential for perched groundwater to develop during and following the rainy season. It is expected that the average seasonal high groundwater table may vary from the groundwater encountered during the borings performed by CMAG.

Project Description

Proposed improvements for the site will consist of constructing a three-story assisted living facility on the northern portion of the site, and a detached garage structure towards the south. A paved driveway will provide access from Soquel Drive to the parking located at the Southern end of the lot, and will also provide emergency vehicle access to Rochelle Lane located to the East. The site will be developed with other hardscape, landscape, and open space improvements for recreational purposes for use by the residents. The total proposed impervious area for this project has been summarized in Appendix D, which identifies both pervious and impervious areas.

Stormwater mitigation requirements for the project will be met using an infiltration and detention system located within the parking area near the southern portion of the site. An outlet control structure designed to meet pre-development flowrates will be placed downstream of the detention facility, and will discharge into Noble Gulch via a flow spreader located on an existing "bench" that sits above the gulch.

In total, the project will create or replace approximately ±87,941 square feet of impervious surface, while the remaining ±74,164 square feet will be considered landscaping. See Appendix D for more information regarding proposed pervious and impervious areas. For a brief breakdown of the project information, see Table 1 – Project Information Summary.

Stormwater Management Requirements

The new Oakmont Senior Living project falls within the jurisdiction of the County of Santa Cruz. The County Public Works Design Criteria, dated February 2018, provides requirements for stormwater mitigation for all new development within the unincorporated areas of Santa Cruz County. These requirements are based upon the requirements put forth by the Central Coast Regional Water Quality Control Board in Resolution R3-2013-0032 for Watershed Management Zones 1, 4 &10. As shown in Figure 2, based upon the Soquel WMZ Map, the site falls within Watershed Management Zone 1.

Project Name:	Oakmont Senior Living
Project Reference Number:	TBD
Address:	5630 Soquel Drive, Soquel CA 95073
APN:	037-191--14 & 037-191-15
Project Type:	Assisted Living Facility
Detached Single Family Home:	No
Development Type:	New Development
Total Project Area (Ac):	3.72
Existing Impervious Area (SF):	71,467
Total Proposed Impervious Area (SF):	87,941
Net Impervious Area (SF):	16,474

Table 1 – Project Information Summary

Since the project is creating more than 5,000 square feet of new or replaced impervious area, it is categorized as a Large Project by the County. Large Projects must incorporate Low Impact Development (LID) and Best Management Practices (BMP) to reduce and treat pollution from the 85th percentile storm. Large projects are also required to retain runoff from the 2 – year, 2 – hour storm onsite and maintain predevelopment discharge rates up to the 10 – year, 15 – minute design storm through the use of detention and metered release. For complete stormwater runoff mitigation requirements, refer to the County Design Criteria.

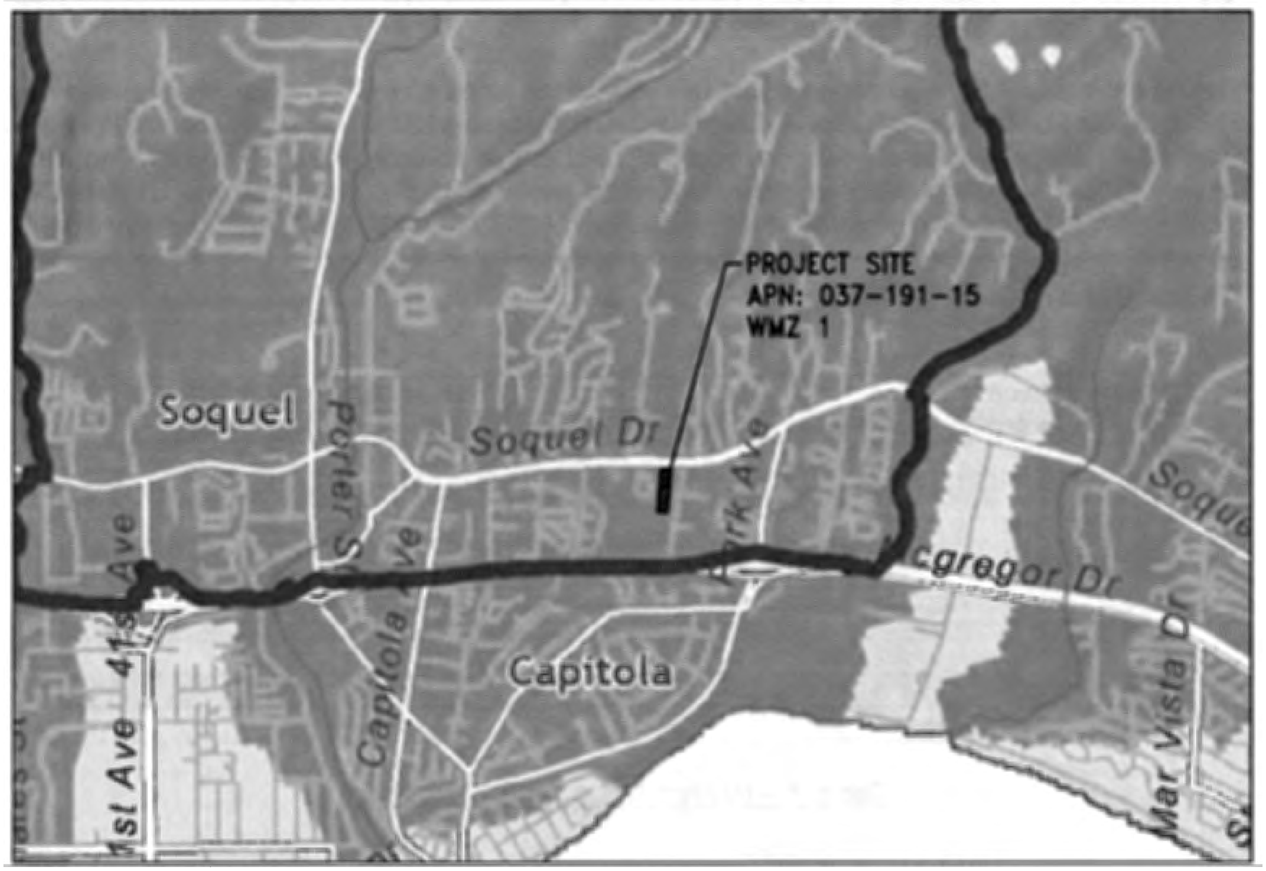

Figure 2 – Watershed Management Zone Map
Not to scale – Source: Stillwater Sciences, 2012

Stormwater Management Strategy

As the proposed development in this report will create approximately 16,474 square-feet of impervious area, well above the 5,000 square feet threshold for Large Projects, it will be required to comply with the requirements for large projects summarized above. The following section is an outline of the strategies that will be used to meet the runoff mitigation requirements, with detailed information and sizing calculations to follow.

To minimize runoff and pollution from the development, a number of LID measures will be implemented on the project. The project will be constructed to limit the disturbance to natural drainage features. There will be some disturbance to Noble Gulch, due to the construction of the required stormwater outfall pipe, but it will be constructed to minimize disturbance to the maximum extent practicable, with oversite from the required regulatory bodies. Soil Compaction will be limited to areas below hardscape, building and parking garage areas. Finally, the project will reduce the amount of offsite runoff by capturing stormwater and providing a controlled release offsite.

The project will also use a number of source control measures to address & reduce potential pollution sources created as a part of this project. The source control measures used are found in Table 2 of this report.

ccidental Spills or Leaks	Y	- Owner/operator shall prepare a spill prevention plan to be located onsite - Employees shall be trained on spill prevention and cleanup - Spill cleanup materials shall be located onsite
nterior Floor Drains	Y	- All interior floor drains will be connected to sanitary sewer system
arking/Storage Area Maintenance	Y	- Covered parking garage areas shall drain to sanitary sewer - Parking area shall be maintained per project O&M Manual and CASQA BMP Fact Sheets SC-43 Parking Area Maintenance & SC-74 Drainage System Maintenance
ndoor and Structural Pest Control	Y	- Owner/operator shall incorporate integrated pest management practices into maintenance plan
andscape/Outdoor Pesticide Use	Y	- Owner/operator shall incorporate integrated pest management practices into maintenance plan - Owner/operator shall minimize pesticide use onsite - Pesticides shall be applied with a handheld sprayer to minimize quantity used and spray drift - Pesticides shall not be applied prior to rain - Landscape areas shall be maintained per project O&M Manual and CASQA BMP Fact Sheets SC-41 Building Grounds & Maintenance & SC-73 Landscape Maintenance
ools, Spas, Ponds, Decorative Fountains nd Other Water Features	Y	- Owner/operator shall incorporate pollution prevention procedures into maintenance plan - Water features shall be maintained per project O&M Manual and CASQA BMP Fact Sheet SC-72 Fountain & Pool maintenance
estaurants, Grocery Stores, and Other ood Service Operations	Y	- Kitchen shall drain to grease interceptor and discharge into the sanitary sewer system - Grease interceptor shall be maintained per project O&M Manual and CASQA BMP Fact Sheets SC-34
efuse Areas	Y	- Refuse area will be covered and drained to sanitary sewer
ndustrial Processes	N	- No industrial processes will occur onsite
utdoor Storage of Equipment or Materials	N	- No outdoor storage of equipment or materials will occur onsite
ehicle and Equipment Cleaning	N	- No vehicle or equipment cleaning will occur onsite
ehicle and Equipment Repair and aintenance	N	- No vehicle or equipment maintenance will occur onsite
uel Dispensing Areas	N	- No vehicle or equipment fueling will occur onsite
oading Docks	N	- No loading dock onsite
ire Sprinkler Test Water	Y	- Fire sprinkler test water shall not be released to the storm drain system - A fire sprinkler test drain will be installed and connected to the sanitary sewer system
rain or Wash Water from Boiler Drain ines, Condensate Drain Lines, Rooftop quipment, Drainage Sumps and Other ources	Y	- Condensate lines will discharge to the sanitary sewer or landscape areas
nauthorized Non-stormwater Discharges	Y	- Storm drains will be painted "NO DUMPING - DRAINS TO BAY. NO TIRE - DESECHO CORRE AL MAR"
uilding and Ground Maintenance	Y	- Building and landscape shall be maintained per project O&M Manual and CASQA BMP Fact Sheets SC-41 Building Grounds & Maintenance, SC-43 Parking Area Maintenance, SC-73 Landscape Maintenance & SC-74 Drainage System Maintenance

Table 2 – Source Control Measures (CSCDC Part 3, Section C.2)

Proposed Drainage Management Areas

Based upon site improvements and grading, the site will be divided into three separate Drainage Management Areas (DMA's). See Appendix E – Stormwater Management Plan for more detailed information about each DMA.

- DMA 1 encompasses all of the proposed roof area of the assisted living facility, detached garage structure, and a portion of the hardscape area located towards the north of the site.
    - DMA 1 – 84,531 SF, approximately 78% impervious.
- DMA 2 makes up the southern portion of the parking area and landscape islands.
    - DMA 2 – 18,281 SF, approximately 91% impervious.
- DMA 3 consists of the remainder of the lot located to the East and South. The majority of this DMA consists of existing landscaped area. A small portion of proposed hardscape will surface drain across the landscape before entering into Noble Gulch.
    - DMA 3 – 59,293 SF, approximately 9% impervious.

Runoff Retention Sizing (CSCDC Part 3, Section I)

The Santa Cruz County Public Works Design Criteria gives a requirement to provide retention-based treatment measures sized to retain the difference in runoff from the 2 – year, 2 – hour storm in the pre-development condition against a number of post-development 2 – year storms. Sizing of retention-based treatment measures is done per CSCDC Part 3, Section I, which gives procedures for sizing retention measures for both the slope infiltration method and the storage percolation method, with the latter being more commonly used on relatively flat sites. The storage percolation method was used for this project.

According to the NRCS soils survey, the site has an infiltration rate of 0.43 in/hr (see Appendix B). Specific on-site infiltration testing by the geotechnical engineer is set to take place at a later date. The results of this testing will then be used to make the necessary adjustments to the system.

The retention system sizing was determined using the Santa Cruz County Figure SWM-24 Calculator which can be seen in Appendix D – Retention Calculations. There are two retention pits for this project, one for DMA 1, and one for DMA 2. The details of the two retention pits can be seen on the Preliminary Stormwater Control Plan and Detail sheets in Appendix C.

The retention pit for DMA 1 has an overall footprint of 71.5'x74.5', and is 2.33' deep. It has a drawdown time of about 33 hours. Once this portion of the system reaches capacity, it will overflow into the adjacent detention facility, and ultimately be routed through the outlet control structure located at the southern portion of the lot.

The retention pit for DMA 2 has been sized to fit within the footprint of the proposed detention chambers. Each detention vault has an outside footprint of 8'x16', giving the total footprint of 2,432 square-feet. For application in Figure SWM-24, the square-root of the total footprint (49.31 feet) was used for the length and width values seen on the spreadsheet in Appendix D. This system has a drawdown time of 18 hours. Once this portion of the system reaches capacity, it will begin to fill the detention chambers that sit directly above, and will then flow through the outlet control structure and off site.

Runoff Detention Vault Sizing (CSCDC Part 3, Section H)

Stormwater control measures will be required to offset the peak discharge from the site for the 10–year design storm. The method of detaining runoff from the site will be to store the required detention volume within Oldcastle Stormcapture vaults located beneath the southerly portion of the driveway and provide metered runoff through an orifice located within the outlet control structure (OCS). The orifice will be on a weir plate downstream of the inlet pipe into the OCS. The weir will allow runoff from larger storm events to spill over and bypass the orifice. Details will be provided for the OCS during the construction document phase, and will be added to the final stormwater report.

The required detention volume was determined using the Santa Cruz County Figure SWM-17 Calculator which can be seen in Appendix E – Detention Calculations. This calculator is used to determine runoff detention using the Modified Rational Method for the 10 – year design storm. It determines the volume of storage required to detain the maximum difference in runoff volume for the pre-construction 10 – year, 15 – minute storm and post-construction 10 – year storm across a variety of times of concentration. Based upon the proposed site plan, the required 10 – year detention volume is 3,922 cubic feet of water, with a discharge rate of 0.849 cubic feet per second. Given the storage capacity per Stormcapture unit of 210 cubic feet, a minimum of 3,922 cubic feet / 210 cubic feet = 18.7 Stormcapture units will be necessary. Rounding up gives the final number of 19 units to be installed. It should be noted that the open-bottom storm capture units will be used due to the fact that the retention system sits directly below the chambers. While this number of units could be reduced by using a deeper system, it was determined that a shallower system with a larger footprint would better serve the project.

To ensure that post-construction discharge rates do not exceed pre-construction rates, the orifice located on the weir plate was sized using the following equations:

$$A = \frac{Q}{C_d \times \sqrt{2gh}}$$

where

$$A = Orifice\ Area$$
$$Q = Pre - construction\ Flow\ Rate$$
$$C_d = Coefficient\ of\ Discharge\ (0.61)$$
$$g = Acceleration\ of\ Gravity$$
$$h = Hydrostatic\ Head$$

and

$$d = 2\sqrt{\frac{A}{\pi}}$$

where

$$d = Maximum\ Orifice\ Diameter$$

Using these equations, the 10 – year orifice diameter is 4.74 inches. Therefore, the orifice will be conservatively rounded to 4-5/8 inches diameter for ease of fabrication of the outlet control structure.

Downstream Analysis

All offsite runoff from this project will eventually drain into Noble Gulch, which is apart of the Soquel Creek Drainage Basin, according to the County of Santa Cruz Stormwater Master Plan and Management Program Volume 1, Zone 5 Master Drainage Plan. The Zone 5 Master Plan identifies the existing 48-inch pipe that runs below Rochelle Lane with an ID number of 063052-063054. The relevant map and conveyance facility table from that report have been included as Appendix F of this report for reference. The information provided for this pipe has been summarized in the following table 3.

	L (ft)	S (ft/ft)	MANNINGS N	D (in.)	100-YEAR DESIGN DISCHARGE (cfs)	PIPE CAPACITY (cfs)
FROM ZONE 5 REPORT	94	0.0053	0.013	48	113	105
SITE MEASURED	91	0.0143	0.013	48	-	185

Table 3– Summary of Existing Pipe Flow

The Zone 5 report shows that the existing 48-inch pipe is inadequate to convey the 100-year design discharge of 113 CFS. The reported pipe capacity of 105 CFS is based on the pipe flowing full, but maximum flow capacity is achieved when the pipe is flowing at approximately 94% full, giving a maximum capacity of 112.5 CFS. Analysis of the site measured data shows that the slope of the pipe is actually steeper than the original report, and the length is slightly less. Based on the site measured values of 91 feet long and a slope of 1.43%, the maximum pipe capacity is 185 CFS, which is more than adequate to convey the 100-year design discharge of 113 CFS. Hydraflow Express calculations for both of the conditions described above can be seen in Appendix F.

Since our overflow from the detention system discharges at a point further south than the existing 48-inch culvert, the analysis was extended slightly further downstream. The Zone 5 report states that the section capacity for the natural channel with ID number 063054-063060 is 245 CFS, and the existing 100-year discharge value is 113 CFS. Based on a Rational Method analysis of the proposed conditions onsite, the maximum runoff from the site for the 100-year, 10-minute storm is 7.5 CFS. Details of this calculation can be found in Appendix F. Therefore, the total downstream flow from the site, including the existing 100-year design discharge as reported by the Zone 5 Master Plan is 120.5 CFS, well below the channel capacity of 245 CFS.

Operations and Maintenance Requirements

Prior to completion and issuance of the certificate of occupancy for this project, an Operation and Maintenance Agreement with the County of Santa Cruz shall be prepared. This agreement shall be recorded against the property with the County Recorder's Office, and it will be binding on all subsequent owners of the property. This Maintenance Agreement shall remain in place for the life of the project.

The maintenance agreement will set forth a schedule of maintenance tasks, to be performed by the Oakmont Assisted Living building maintenance staff, which are required for safe and efficient function of the onsite stormwater treatment & detention facilities. It will also specify procedures for yearly inspections and record keeping of inspections, maintenance and repairs performed. Refer to the County of Santa Cruz Design Criteria for more information regarding the Operation and Maintenance Agreement requirements.

APPENDIX A

(GEOTECHNICAL INVESTIGATION)

GEOTECHNICAL INVESTIGATION

5630 Soquel Drive
Soquel, Santa Cruz County, California

Submitted to:

Bill Mabry
9240 Old Redwood Highway, Suite 200
Windsor, California 95492

Prepared by:

CMAG ENGINEERING, INC.

Project No. 18-141-SC
December 14, 2018

CMAG ENGINEERING, INC.
P.O. BOX 640 APTOS, CALIFORNIA 95001
PHONE: 831.475.1411
WWW.CMAGENGINEERING.COM

December 14, 2018
Project No. 18-141-SC

Bill Mabry
9240 Old Redwood Highway, Suite 200
Windsor, California 95492

SUBJECT: **GEOTECHNICAL INVESTIGATION**
Proposed Assisted Living Facility
5630 Soquel Drive, Soquel, Santa Cruz County, California
APN 037-191-14

Dear Mr. Mabry:

In accordance with your authorization, we have completed a geotechnical investigation for the subject project. This report summarizes the findings, conclusions, and recommendations from our field exploration, laboratory testing, and engineering analysis. It is a pleasure being associated with you on this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office.

Sincerely,

CMAG ENGINEERING, INC.

Reviewed by:

SHANNON S. CHOME
No. 68398
CIVIL

ADRIAN L. GARNER
GE2814
6/30/20

Shannon Chome', PE
Senior Engineer
C 68398
Expires 9/30/19

Adrian L.Garner, PE, GE
Principal Engineer
C 66087, GE 2814
Expires 6/30/20

Distribution: Addressee (4 Hard Copies; Electronic Copy)

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1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed assisted living facility located at 5630 Soquel Drive in Soquel, Santa Cruz County, California.

The purpose of our investigation was to provide information regarding the surface and subsurface soil and bedrock conditions, and based on our findings, provide geotechnical recommendations for the design and construction of the proposed project. Conclusions and recommendations related to site grading, drainage, foundations, slab-on-grade floors and retaining walls are presented herein.

1.1 Terms of Reference

CMAG Engineering, Inc.'s (CMAG) scope of work for this phase of the project included site reconnaissance, subsurface exploration, soil and bedrock sampling, laboratory testing, engineering analyses, and preparation of this report.

The work was undertaken in accordance with CMAG's *Proposal for Geotechnical Services* dated October 2, 2018.

The recommendations contained in this report are subject to the limitations presented in Section 8.0 of this report.

1.2 Site Location

The project site is located on the south side of Soquel Drive just west of its intersection with Monterey Avenue, in Soquel, Santa Cruz County, California. The site location is shown on the Site Location Map, Figure A-1, in Appendix A.

1.3 Surface Conditions

The property is currently occupied by the Inner Light Center, which consists of a church and an accessory building situated on the northern half of the lot adjacent to Soquel Drive. The area around the church and accessory building is mostly paved and used for parking. The south side of the parcel is relatively clear of development.

The parcel is approximately 3.4 acres and predominantly flat to gently sloping. A portion of the eastern edge of the parcel is bounded by Nobel Gulch, the banks of which are steeply sloping and vary in relief from 4 to 10 feet in height adjacent to the property. The southern edge of the property also descends moderately to steeply to the south.

2.0 PROJECT DESCRIPTION

It is our understanding the project will consist of the demolition of the existing church and accessory building and the construction of a new, 80,000 square foot, 3-story assisted living facility on the northern half of the parcel adjacent to Soquel Drive. A new parking garage is proposed on the southern half of the property. Anticipated construction consists of wood frame walls and roof, with slab-on-grade and raised wood floors. Based on the referenced preliminary plans, portions of the Assisted Living Facility will be constructed approximately 2 to 4 feet below the existing grades requiring perimeter retaining walls.

The proposed improvements also include a driveway along the west side of the assisted living facility which connects to Rochelle Lane to the east, and open parking adjacent to the new garage as well as on the southern end of the property. The parking area on the southern end of the property may consist of a permeable surface. Utility, stormwater retention/detention facilities, and landscape improvements are also anticipated.

3.0 FIELD EXPLORATION AND LABORATORY TESTING PROGRAMS

Our field exploration program included drilling, logging, and interval sampling of 13 borings on October 31, 2018 and November 1, 2018. Borings B-1 through B-13 were advanced to depths ranging from 6.5± feet to 40± feet below the existing grades. Details of the field exploration program, including the Boring Logs, Figures A-4 through A-16, are presented in Appendix A.

Representative samples obtained during the field investigation were taken to the laboratory for testing to determine physical and engineering properties. Details of the laboratory testing program are presented in Appendix B. Test results are presented on the Boring Logs and in Appendix B.

4.0 SUBSURFACE CONDITIONS AND EARTH MATERIALS

4.1 General

The geologic map of Santa Cruz County (Brabb, 1989) depicts the subject property as underlain by Lowest Emergent Coastal Terrace Deposits (Qcl; Pleistocene) described as consisting of well sorted sand with relatively continuous layers of gravel. Purisima Formation (Tp; Pliocene and Upper Miocene), described as consisting of yellowish-gray siltstone with interbeds of fine grained sandstone, is depicted to the north of the site.

Thirteen borings were advanced at the site in the area of the proposed development. The subsurface profile encountered during our field exploration generally consisted of Lowest Emergent Coastal Terrace Deposits overlying

Purisima Formation bedrock within the depths explored. A substantial wedge of artificial fill was also encountered across the southern half of the parcel. Complete subsurface profiles are presented on the Boring Logs in Appendix A. The boring locations are shown on the Site Map and Boring Location Plan, Figure A-2.

The earth materials were classified based on our field observation and laboratory testing. The classification was in accordance with the Unified Soil Classification System (Figure A-3).

A representative cross section has been constructed based on the results of our field investigation and the referenced Preliminary Utility Plan prepared by Ifland Engineers (August 20, 2018). Cross Section A-A', Figures A-17 and A-17.1, is presented in Appendix A.

4.2 Artificial Fill - af

A wedge of artificial fill was encountered across the southern half of the parcel. The fill generally increases in thickness towards the south and ranges in depth from approximately 2± feet to 7.5± feet below the existing grades. The artificial fill was comprised of silty sand, clayey sand to sandy lean clay with varying amounts of gravel, and some concrete and asphalt debris. The silty sand and clayey sand was generally loose to medium dense, dry to moist, and non plastic to slightly plastic. The sandy lean clay was stiff to very stiff, moist to wet, and plastic. Based on the results of our field investigation and laboratory testing, the artificial fill has a low expansion potential and is moderately to highly compressible.

4.3 Lowest Emergent Coastal Terrace Deposits - Qcl

Lowest Emergent Coastal Terrace Deposits were encountered from the surface across the northern half of the parcel and underlying the fill across the southern half to between 16.5± feet and 20± feet below the existing grades. The terrace deposits, within the upper 8± feet, generally consisted of clayey sand and sandy lean clay with varying amounts of gravel which was loose/stiff to medium dense/very stiff, dry to moist, and slightly plastic to plastic. The lower terrace deposits, which overlay the bedrock, generally consisted of silty sand and poorly to well graded sand with silt and varying amounts of gravel which was medium dense to dense, moist to wet, and non plastic. Based on the results of our field investigation and laboratory testing, the near-surface terrace deposits have a low to medium expansion potential and are moderately compressible.

4.4 Purisima Formation Bedrock - Tp

Purisima Formation bedrock was encountered underlying the Lowest Emergent Coastal Terrace Deposits to the extent of our borings. The bedrock generally consisted of medium dense to dense, moist, weakly cemented siltstone and sandstone within the depths explored.

4.5 Groundwater

Groundwater was encountered in Borings B-1, B-4, B-6, B-7, B-8, and B-9 at depths between 15.5± and 17± feet below the existing grades. In general, it appears that the groundwater was perched approximately 1 foot above the bedrock contact across the site at the time of our field exploration.

It should be noted that groundwater conditions, perched or regional, may vary with location and may fluctuate with variations in rainfall, runoff, irrigation, and other changes to the conditions existing at the time our field investigation was performed.

5.0 GEOTECHNICAL HAZARDS

5.1 General

In our opinion, the geotechnical hazards that could potentially affect the proposed project are:

- Seismic shaking

5.2 Seismic Shaking

The seismic hazard due to seismic shaking in California is high in many areas, indicative of the number of large earthquakes that have occurred historically. Intense seismic shaking may occur at the site during the design lifetime of the proposed structures from an earthquake along one of the local fault systems. Generally, the intensity of shaking will increase the closer the site is to the epicenter of an earthquake, however, seismic shaking is a complex phenomenon and may be modified by local topography and soil conditions. The transmission of earthquake vibrations from the ground into the structures may cause structural damage.

The County of Santa Cruz has adopted the seismic provisions set forth in the 2016 California Building Code (2016 CBC) to address seismic shaking. The seismic provisions in the 2016 CBC are minimum load requirements for the seismic design for the proposed structures. The provisions set forth in the 2016 CBC will not prevent structural and nonstructural damage from direct fault ground surface rupture, coseismic ground cracking, liquefaction and lateral spreading, seismically induced differential compaction, or seismically induced landsliding.

Table 1 has been constructed based on the 2016 CBC requirements for the seismic design of the proposed structures. The Site Class has been determined based on our field investigation and laboratory testing.

Table 1. Seismic Design Parameters - 2016 CBC

S_S	S_1	Site Class	F_a	F_v	S_{MS}	S_{M1}	S_{DS}	S_{D1}	PGA_M
1.500g	0.600g	D	1.0	1.5	1.500g	0.900g	1.000g	0.600g	0.552g

5.3 Collateral Seismic Hazards

In addition to seismic shaking, other seismic hazards that may have an adverse affect to the site and/or the structures are: fault ground surface rupture, coseismic ground cracking, seismically induced liquefaction and lateral spreading, seismically induced differential compaction, and seismically induced landsliding. It is our opinion that the potential for collateral seismic hazards to affect the site, and to damage the proposed structures is low.

6.0 DISCUSSIONS AND CONCLUSIONS

The subsurface profile across the site generally consists of terrace deposits overlying siltstone and sandstone bedrock. A wedge of artificial fill overlies the terrace deposits across the southern half of the parcel.

Based on our field and laboratory investigations, the native, near-surface terrace deposits across the northern half of the property are considered moderately compressible. The artificial fill soils encountered on the southern half of the parcel are considered moderately to highly compressible. The near-surface soils, both native and fill, possess a low to medium expansion potential.

Based on the referenced preliminary plans, a minimum setback of 30 feet will be maintained, from the top of the moderate to steep slopes along the east and south sides of the parcel, to all development including the proposed structures and driveway and parking areas.

The parcel is relatively flat and site drainage is an important aspect of the project. Based our field investigation and our experience in the area, groundwater may perch at or near the ground surface during the raining season. Consequently, ponding water may episodically develop within closed depressions and beneath structures with crawlspace areas which are lower the surrounding exterior grades.

7.0 RECOMMENDATIONS

7.1 General

Based on the results of our field investigation, laboratory testing, and engineering analysis, it is our opinion, from the geotechnical standpoint, the subject site will be suitable for the proposed development provided the recommendations presented herein are implemented during grading and construction.

We recommend that the proposed assisted living facility and the parking garage be founded on conventional shallow foundation systems. To help alleviate the potential for differential settlement due to compressible near-surface soils, site preparation consisting of overexcavation and recompaction will be required beneath conventional shallow foundations, slabs-on-grade, and non-permeable driveway and parking areas. Refer to Subsection 7.2.2 for earthwork recommendations and Subsection 7.3 for shallow foundation recommendations.

Where permeable driveway and parking areas are proposed, we recommend placement of geosynthetic reinforcement fabric beneath driveway sections to help alleviate the potential for settlement and deterioration. See Subsection 7.2.2 for details.

Groundwater may perch at or near the ground surface during the raining season. It is imperative that site drainage be designed to collect and direct surface water away from structures and driveway and parking areas to approved drainage facilities per Subsection 7.2.7.

7.2 Site Grading

7.2.1 Site Clearing

Prior to grading, the areas to be developed for structures, pavements and other improvements, should be stripped of any vegetation and cleared of any surface or subsurface obstructions, including any existing foundations, utility lines, basements, septic tanks, pavements, stockpiled fills, and miscellaneous debris.

Surface vegetation and organically contaminated topsoil should be removed from areas to be graded. The required depth of stripping will vary with the time of year the work is done and should be observed by the Geotechnical Engineer. It is generally anticipated that the required depth of stripping will be 6 to 8 inches.

Holes resulting from the removal of buried obstructions that extend below finished site grades should be backfilled with compacted engineered fill compacted to the requirements of Subsection 7.2.2.

7.2.2 Preparation of On-Site Soils

The results of the field investigation and laboratory testing indicate that the near-surface soils on the subject site are moderately to highly compressible. In order to ensure uniform compression characteristics and to obviate any potential for differential settlement, site preparation, consisting of overexcavation and recompaction will be required beneath conventional shallow foundations, slabs-on-grade, and non-permeable driveway and parking areas. The depths of overexcavation and recompaction recommended herein are subject to review during grading.

For conventional shallow foundations, the soil should be overexcavated a minimum of 2 feet below the bottom of footings, 2 feet below the existing grades, or a depth sufficient to remove all artificial fill, whichever is greater. The exposed surface should then be scarified, moisture conditioned, and compacted. The material which was removed should then be replaced as engineered fill compacted to a minimum of 90 percent relative compaction to finish grades. This zone of reworking shall extend a minimum of 5 feet laterally beyond the foundation footprint.

For concrete slabs-on-grade, the soil should be overexcavated a minimum of 1.5 feet below the bottom of the crushed rock, 2 feet below the existing grades, or a depth sufficient to remove all artificial fill, whichever is greater. The exposed surface should then be scarified, moisture conditioned, and compacted. The material which was removed should then be replaced as engineered fill compacted to a minimum of 90 percent relative compaction to finish subgrade. This zone of reworking shall extend a minimum of 5 feet laterally beyond the concrete slabs-on-grade.

In non-permeable driveway and parking areas (including concrete, asphalt, and non-permeable pavers), the soil should be overexcavated to a minimum of 1.5 feet below the bottom of the aggregate base course, 1.5 feet below the existing grades, or a depth sufficient to remove all artificial fill, whichever is greater. The exposed surface should then be scarified, moisture conditioned, and compacted. The material which was removed should then be replaced as engineered fill compacted to a minimum of 90 percent relative compaction. The upper 6 inches of subgrade and all aggregate base and subbase in driveway and parking areas shall be compacted to a minimum of 95 percent relative compaction. This zone of reworking shall extend a minimum of 2 feet laterally beyond the driveway and parking areas.

In non-permeable driveway and parking areas, where deeper fills are encountered at the southern end of the property, in lieu of removal of all of the artificial fill, the soil may be overexcavated to a minimum of 2 feet below the bottom of the aggregate base course and the exposed surface scarified, moisture conditioned, and compacted. A layer of Mirafi 600X geosynthetic fabric, or approved equivalent, should then be placed at the base of the excavation and the material which was removed, replaced as engineered fill compacted to a minimum of 90 percent relative compaction. The upper 6 inches of subgrade and all aggregate base and subbase shall be compacted to a minimum of 95 percent relative compaction. This zone of reworking shall extend a minimum of 2 feet laterally beyond the driveway and parking areas.

It is our understanding that permeable pavers may be proposed along the southern edge of the driveway/parking areas. This system is most effective in areas where shallow groundwater is not present and/or the underlying base course and subgrade has the ability to drain. However, if project requirements dictate the need for permeable pavers, the base course and subgrade should be designed and constructed per the recommendations provided by the Interlocking Concrete Pavement Institute (ICPI). The ICPI provides design guidelines for permeable interlocking concrete pavement systems. We recommend that the paver section be designed assuming no exfiltration, or infiltration testing should be performed in order to obtain infiltration rates for the subgrade soils. We can perform these services upon request for an additional fee. The subgrade should be sloped at a minimum of 2 percent to a subdrain to intercept the groundwater. Mirafi RS380i, or approved equivalent, should be placed between the subgrade and the rock section to provide additional subgrade stabilization. Additional geotechnical design recommendations for the proposed pavers can be provided upon request.

Engineered fill should be compacted to a minimum of 90 percent relative compaction. All fill should be compacted with heavy vibratory equipment. Fill should be compacted by mechanical means in uniform horizontal loose lifts not exceeding 8 inches in thickness. The relative compaction and required moisture content shall be based on the maximum dry density and optimum moisture content obtained in accordance with ASTM D1557. **The Geotechnical Engineer should observe the overexcavations, and placement of engineered fill.**

The on-site soils may be used as engineered fill, with the exception of any expansive clayey soils. Note: If this work is done during or soon after the rainy season, or in the spring, the soil may require significant drying prior to use as engineered fill. The soil should be verified by a representative of CMAG in the field during grading operations. All soils, both existing on-site and imported, to be used as fill, should contain less than 3 percent organics and be free of debris and gravel over 2.5 inches in maximum dimension.

Imported fill material should be approved by a representative of CMAG prior to importing. Soils having a significant expansion potential should not be used as imported fill. **The Geotechnical Engineer should be notified not less than 5 working days in advance of placing any fill or base course material proposed for import**. Each proposed source of import material should be sampled, tested, and approved by the Geotechnical Engineer prior to delivery of any soils imported for use on the site.

Any surface or subsurface obstruction, or questionable material encountered during grading, should be brought immediately to the attention of the Geotechnical Engineer for proper processing as required.

7.2.3 Cut and Fill Slopes

Cut and Fill slopes are not anticipated for the project at this time. Recommendations for cut and fill slopes can be supplied upon request if project requirements change.

7.2.4 Utility Trenches

Bedding material should consist of sand with SE not less than 30 which may then be jetted.

The on-site soils may be utilized for trench backfill, with the exception of any expansive clayey soils. Imported fill should be free of organic material and gravel over 2.5 inches in diameter. Backfill of all exterior and interior trenches should be placed in thin lifts and mechanically compacted to achieve a relative compaction of not less than 95 percent in paved areas and 90 percent in other areas per ASTM D1557. Care should be taken not to damage utility lines.

Utility trenches that are parallel to the sides of a building should be placed so that they do not extend below a line sloping down and away at an inclination of 2:1 H:V (horizontal to vertical) from the bottom outside edge of any footings.

A 3 foot concrete plug should be placed in each trench where it passes under the exterior footings. Anti-seep collars (trench dams) should also be placed in utility trenches on steep slopes to prevent migration of water and sand.

Trenches should be capped with 1.5± feet of impermeable material. Import material should be approved by the Geotechnical Engineer prior to its use.

Trenches must be shored as required by the local regulatory agency, the State Of California Division of Industrial Safety Construction Safety Orders, and Federal OSHA requirements.

7.2.5 Vibration During Compaction

Residential structures are within close proximity to the proposed development. The contractor should take all precautionary measures to minimize vibration on the site during grading operations. This may require that the engineered fill be placed in thin lifts using a static roller or hand operated equipment. It is the contractor's responsibility to ensure that the process in which the engineered fill is placed does not adversely affect the neighboring parcels.

7.2.6 Excavating Conditions

We anticipate that excavation of the on-site soils may be accomplished with standard earthmoving and trenching equipment.

Based on our experience in the area, shallow perched groundwater may occur at the site during the rainy season and spring. Construction of the project during the rainy season or in the spring will require careful techniques to prevent disturbing the soil during construction. Grading equipment on the building pad and/or foot traffic within the footing excavations may cause pumping and disturbance to the foundation soils and should be avoided. If the earthwork commences during the rainy season or during the spring, additional recommendations will be supplied, as necessary.

7.2.7 Surface Drainage

Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. A minimum gradient of 2± percent should be maintained and drainage should be directed toward approved swales or drainage facilities. Concentrations of surface water runoff should be handled by providing the necessary structures, paved ditches, catch basins, etc.

All roof eaves should be guttered with the outlets from the downspouts provided with adequate capacity to carry the storm water away from the structure to reduce the possibility of soil saturation and erosion.

Drainage patterns approved at the time of construction should be maintained throughout the life of the structures. The building and surface drainage facilities must not be altered nor any grading, filling, or excavation conducted in the area without prior review by the Geotechnical Engineer.

Irrigation activities at the site should be controlled and reasonable. Planter areas should not be sited adjacent to walls without implementing approved measures to contain irrigation water and prevent it from seeping into walls and under foundations and slabs-on-grade.

The finished ground surface should be planted with erosion resistant landscaping and ground cover and continually maintained to minimize surface erosion.

7.3 Foundations

7.3.1 Conventional Shallow Foundations

Conventional shallow foundations shall be founded on compacted engineered fill per Subsection 7.2.2.

Minimum recommended footing dimensions are presented in Table 2. Footing widths should be based on the allowable bearing value. Embedment depths should not be allowed to be affected adversely, such as through erosion, softening, digging, etc. Should local building codes require deeper embedment of the footings, or wider footings, the codes must apply.

Table 2. Recommended Footing Dimensions

Number of Floors Supported By Footing	Minimum Width (in)	Minimum Embedment Depth (in)
1	12	18
2	15	18
3	18	24

Footings constructed to the given criteria may be design for the allowable bearing capacity presented in Table 3. The allowable bearing capacity may be increased by one-third for short duration loads, such as those imposed by wind and seismic forces.

Table 3. Allowable Bearing Capacity

Footing Depth (in)	Allowable Bearing Capacity (psf)
18	2,500
24	3,000

The recommended allowable bearing values are calculated based on the on-site soils being used as engineered fill. If imported fill is to be used beneath shallow foundations, it should be approved by a representative of CMAG prior to importing, or the allowable bearing capacity values revised based on the actual import material used.

A passive pressure of 280 psf/ft (equivalent fluid pressure) may be assumed for design purposes. Neglect passive pressure in the upper 12 inches of soil. Passive pressures may be increased by one-third for seismic loading. A friction coefficient of 0.35, between engineered fill and rough concrete may be assumed for design purposes. Where both friction and the passive resistance are utilized for sliding resistance, either of the values indicated should be reduced by one-third.

Footing excavations should be observed by the Geotechnical Engineer before steel reinforcement is placed and concrete is poured.

7.3.2 Concrete Slabs-on-Grade

We recommend that concrete slab-on-grade floors be founded on compacted engineered fill per Subsection 7.2.2. The subgrade should be proof-rolled just prior to construction to provide a firm, relatively unyielding surface, especially if the surface has been loosened by the passage of construction traffic.

The slab-on-grade should be underlain by a minimum 4 inch thick capillary break of clean crushed rock. It is recommended that neither Class II baserock nor sand be employed as the capillary break material. Where moisture sensitive floor coverings are anticipated or vapor transmission may be a problem, a vapor retarder should be placed between the granular layer and the floor slab in order to reduce moisture condensation under the floor coverings. The vapor retarder should be specified by the slab designer. It should be noted that conventional slab-on-grade construction is not waterproof. Under-slab construction consisting of a capillary break and vapor retarder will not prevent moisture transmission through the slab-on-grade. CMAG does not practice in the field of moisture vapor transmission evaluation or mitigation. Where moisture sensitive floor coverings are to be installed, a waterproofing expert should be consulted for their recommended moisture and vapor protection measures.

7.3.3 Settlements

Total and differential settlements beneath the conventional shallow foundation system are expected to be within tolerable limits. Vertical movements are not expected to exceed 1 inch. Differential movements are expected to be within the normal range (½ inch) for the anticipated loads and spacings. These preliminary estimates should be reviewed by the Geotechnical Engineer when foundation plans for the proposed structures become available.

7.4 Retaining Structures

7.4.1 General

Perimeter retaining walls for the proposed structures as well as detached site retaining walls should be founded on spread footings per Subsection 7.3.1. All retaining wall footings shall be founded on compacted engineered fill in accordance with Subsection 7.2.2.

7.4.2 Lateral Earth Pressures

The lateral earth pressures presented in Table 2 are recommended for the design of retaining structures with a backdrain and non-expansive backfill. Refer to Subsection 7.4.3 for details.

Table 4. Lateral Earth Pressures

Soil Profile (H:V)	Equivalent Fluid Pressure (psf/ft)	
	Active Pressure	At-Rest Pressure
Level	38	58
4:1	44	72
3:1	48	76
2:1	58	84

Pressure due to any surcharge loads from adjacent footings, traffic, etc., should be analyzed separately. Refer to the Surcharge Pressure Diagram, Figure 1, for details. Pressures due to these loading conditions can be supplied upon receipt of the appropriate plans and loads.

7.4.3 Backfill

Backfill should be placed under engineering control. Backfill should be compacted per Subsection 7.2.2, however, precautions should be taken to ensure that heavy compaction equipment is not used immediately adjacent to walls, so as to prevent undue pressures against, and movement of, the walls.

It is recommended that granular, or relatively low expansivity, backfill be utilized, for a width equal to approximately 1/3 times the wall height, and not less than 2 feet, subject to review during construction. The permeable material used for the backdrain is suitable for use as backfill.

The granular backfill should be capped with at least 12 inches of relatively impermeable material.

The use of water-stops/impermeable barriers and appropriate waterproofing should be considered for any basement construction, and for building walls which retain earth.

7.4.4 Backfill Drainage

Backdrains should be provided directly behind retaining walls. Backdrains should consist of 4 inch diameter SDR 35 PVC perforated pipe or equivalent, embedded in Caltrans Class 2 permeable drain rock.

The drain should be a minimum of 18 inches in width and should extend to within 12 inches from the surface. The upper 12 inches should be capped with soil if the drain is not located directly beneath concrete or pavement. Mirafi 180N or approved equivalent should be placed between the surface cap and the drain rock. The pipe should be 4± inches above the trench bottom; a gradient of 2± percent being provided to the pipe and trench bottom; discharging into suitably protected outlets. See Typical Backdrain Detail, Figure 2, for recommendations.

Perforations in backdrains are recommended as follows: ½ inch diameter, in 2 rows at the ends of a 120 degree arc, at 5 inch centers in each row, staggered between rows, placed downward.

Backdrains should be observed by the Geotechnical Engineer after placement of bedding and pipe and prior to the placement of clean crushed gravel.

An unobstructed outlet should be provided at the lower end of each segment of backdrain. The outlet should consist of an unperforated pipe of the same diameter, connected to the perforated pipe and extended to a protected outlet at an approved location below the project area on a continuous gradient of at least 1 percent.

7.5 Plan Review

The recommendations presented in this report are based on preliminary design information for the proposed project and on the findings of our geotechnical investigation. When completed, the Grading Plans, Foundation Plans and design loads should be reviewed by CMAG prior to submitting the plans and contract bidding. Additional field exploration and laboratory testing may be required upon review of the final project design plans.

7.6 Observation and Testing

Field observation and testing must be provided by a representative of CMAG to enable them to form an opinion regarding the adequacy of the site preparation, the adequacy of fill materials, and the extent to which the earthwork is performed in accordance with the geotechnical conditions present, the requirements of the regulating agencies, the project specifications, and the recommendations presented in this report. Any earthwork performed in connection with the subject project without the full knowledge of, and not under the direct observation of CMAG will render the recommendations of this report invalid.

CMAG should be notified **at least 5 working days** prior to any site clearing or other earthwork operations on the subject project in order to observe the stripping and disposal of unsuitable materials and to ensure coordination with the grading contractor. During this period, a preconstruction meeting should be held on the site to discuss project specifications, observation and testing requirements and responsibilities, and scheduling.

8.0 LIMITATIONS

The recommendations contained in this report are based on our field explorations, laboratory testing, and our understanding of the proposed construction. The subsurface data used in the preparation of this report was obtained from the borings drilled during our field investigation. Variation in soil, geologic, and groundwater conditions can vary significantly between sample locations. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by the Project Geotechnical Engineer and the Geologist, and revised recommendations be provided as required. In addition, if the scope of the proposed construction changes from the described in this report, our firm should also be notified.

Our investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report.

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 brought to the attention of the Architect and Engineer for the project and incorporated into the plans, and that it is ensured that the Contractor and Subcontractors implement such recommendations in the field. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

This firm does not practice or consult in the field of safety engineering. We do not direct the Contractor's operations, and we are not responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the Contractor. The Contractor should notify the Owner if he considers any of the recommended actions presented herein to be unsafe.

The findings of this report are considered valid as of the present date. However, changes in the conditions of a site can occur with the passage of time, whether they be due to natural events or to human activities on this or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The scope of our services mutually agreed upon did not include any environmental assessment or study for the presence of hazardous to toxic materials in the soil, surface water, or air, on or below or around the site. CMAG is not a mold prevention consultant; none of our services performed in connection with the proposed project are for the purpose of mold prevention. Proper implementation of the recommendations conveyed in our reports will not itself be sufficient to prevent mold from growing in or on the structures involved.

REFERENCES

American Society of Civil Engineers (2010). *Minimum Design Loads for Buildings and Other Structures.* ASCE Standard 7-10.

ASTM International (2014). *Annual Book of ASTM Standards, Section Four, Construction.* Volume 4.08, Soil and Rock (I): D 420 - D 5876.

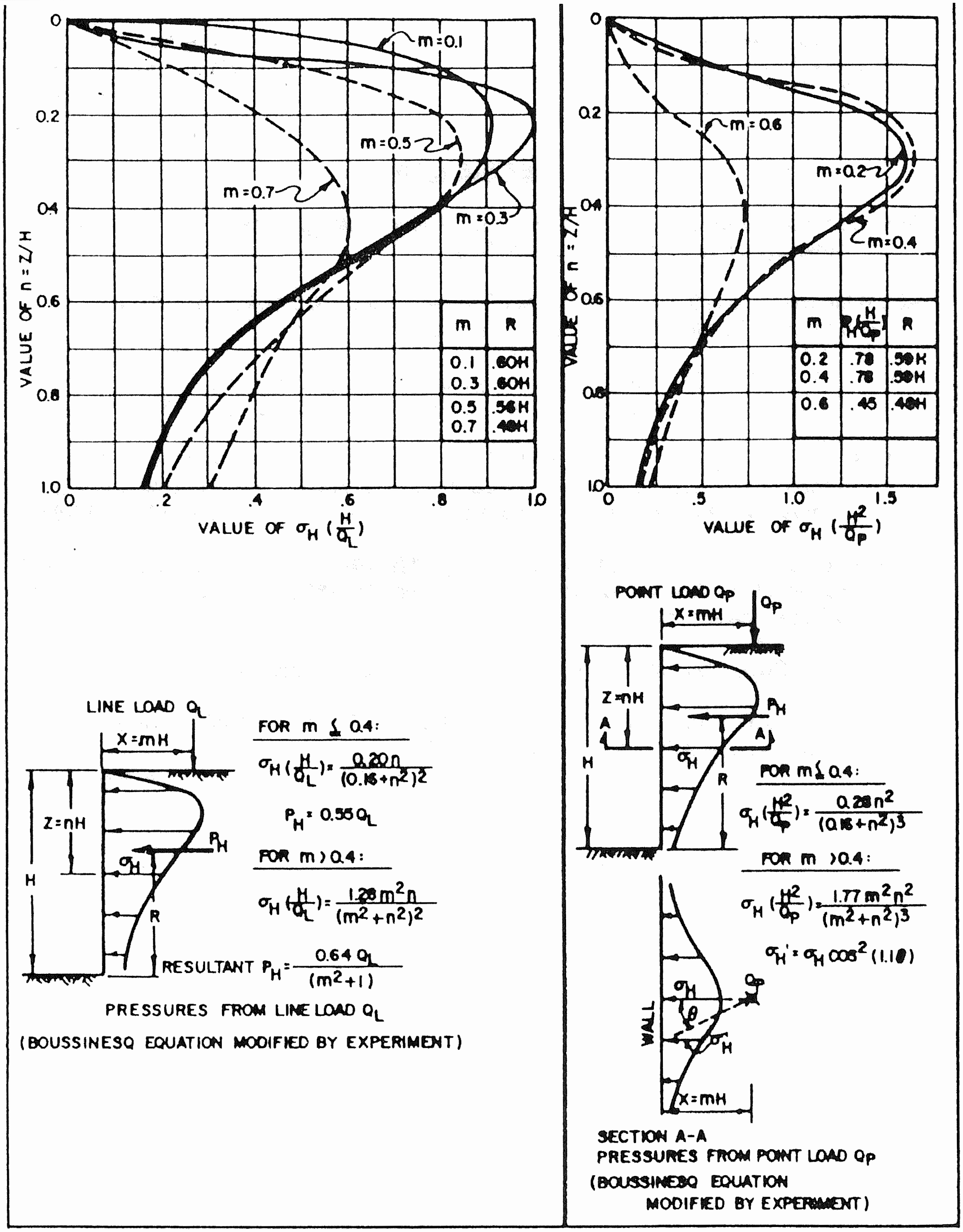
Brabb, E.E. (1989). *Geologic Map of Santa Cruz County, California.* U.S. Geological Survey Miscellaneous Investigation Series, Map I-1905, scale 1:62500.

CMAG Engineering, Inc. (October 2, 2018). *Proposal for Geotechnical Services, Geotechnical Investigation, Proposed Assisted Living Facility, 5630 Soquel Drive, Soquel, Santa Cruz County, California, APN 037-191-14* . Proposal No. P18-81.

Ifland Engineers. (August 20, 2018). *Preliminary Utility Plan, Oakmont Senior Living, 5630 Soquel Drive, Soquel, California, 95073.* Job No. 18031. Sheets C1.0 and C1.1. Original Scale: 1"=20'.

International Code Council (2016). *California Building Code.* Volume 2.

Landesign Group. (July 2018). *Preliminary Grading, Oakmont Senior Living. Soquel, California.* Sheet 1. Original Scale: 1"=30'.



m	R
0.1	.60H
0.3	.60H
0.5	.56H
0.7	.48H

m	$P_H(\frac{H}{Q_p})$	R
0.2	.78	.59H
0.4	.78	.59H
0.6	.45	.48H

FOR m ≤ 0.4:

$$\sigma_H (\frac{H}{Q_L}) = \frac{0.20n}{(0.16+n^2)^2}$$

$$P_H = 0.55 Q_L$$

FOR m > 0.4:

$$\sigma_H (\frac{H}{Q_L}) = \frac{1.28 m^2 n}{(m^2+n^2)^2}$$

$$\text{RESULTANT } P_H = \frac{0.64 Q_L}{(m^2+1)}$$

PRESSURES FROM LINE LOAD Q_L

(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)

FOR m ≤ 0.4:

$$\sigma_H (\frac{H^2}{Q_p}) = \frac{0.28 n^2}{(0.16+n^2)^3}$$

FOR m > 0.4:

$$\sigma_H (\frac{H^2}{Q_p}) = \frac{1.77 m^2 n^2}{(m^2+n^2)^3}$$

$$\sigma_H' = \sigma_H \cos^2 (1.1\theta)$$

SECTION A-A

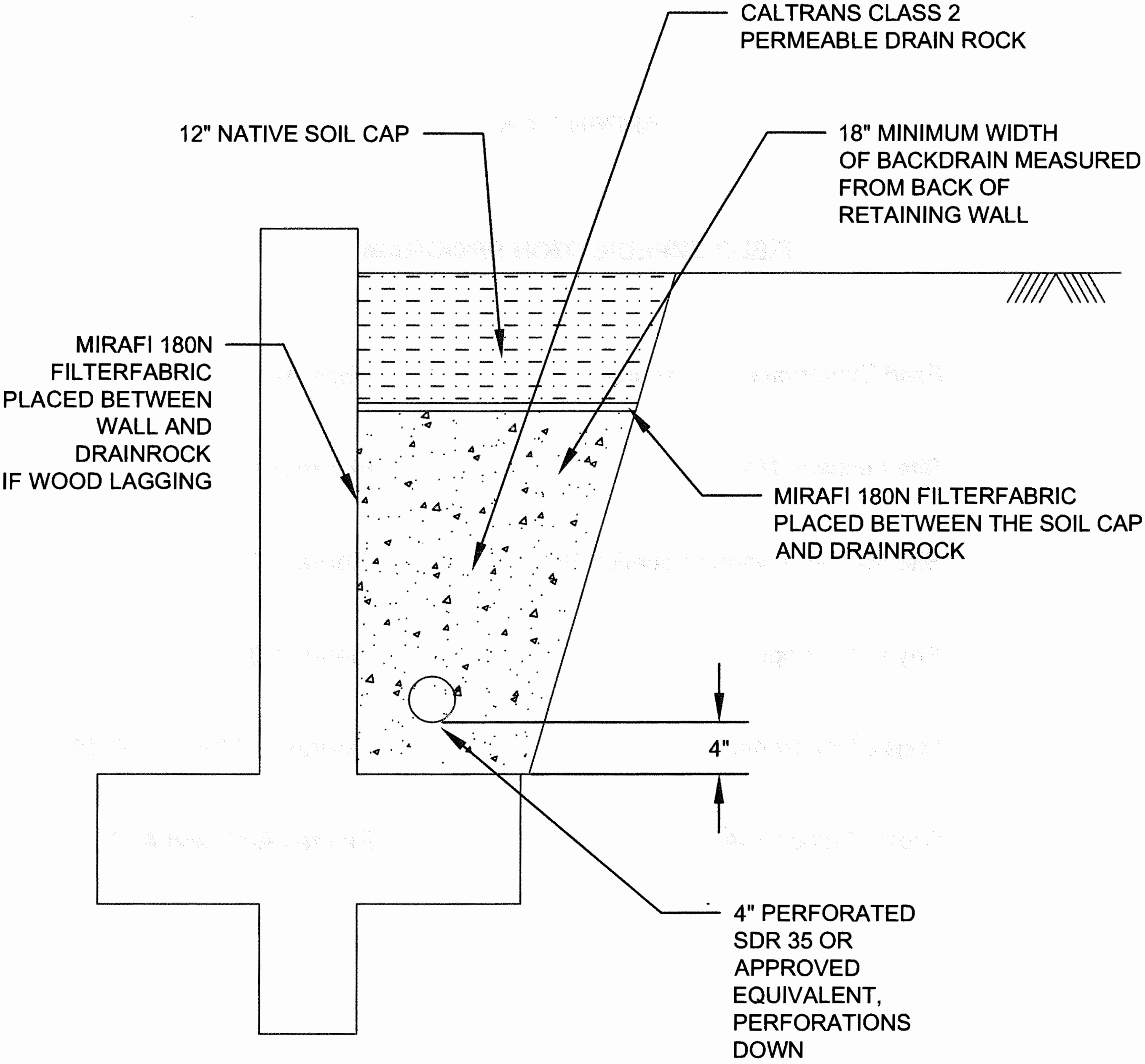
PRESSURES FROM POINT LOAD Q_P

(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)

CMAG ENGINEERING

SURCHARGE PRESSURE DIAGRAM

FIGURE 1



NOTES:

1. DRAWING IS NOT TO SCALE
2. 2± PERCENT TO PIPE AND TRENCH BOTTOM
3. PERFORATED SDR 35 PVC PIPE, OR APPROVED EQUIVALENT, CONNECTED TO CLOSED CONDUITS THAT DISCHARGE TO AN APPROVED LOCATION
4. INSTALL CLEAN OUTS AT APPROVED LOCATIONS

CMAG ENGINEERING	TYPICAL BACKDRAIN DETAIL	FIGURE 2

APPENDIX A

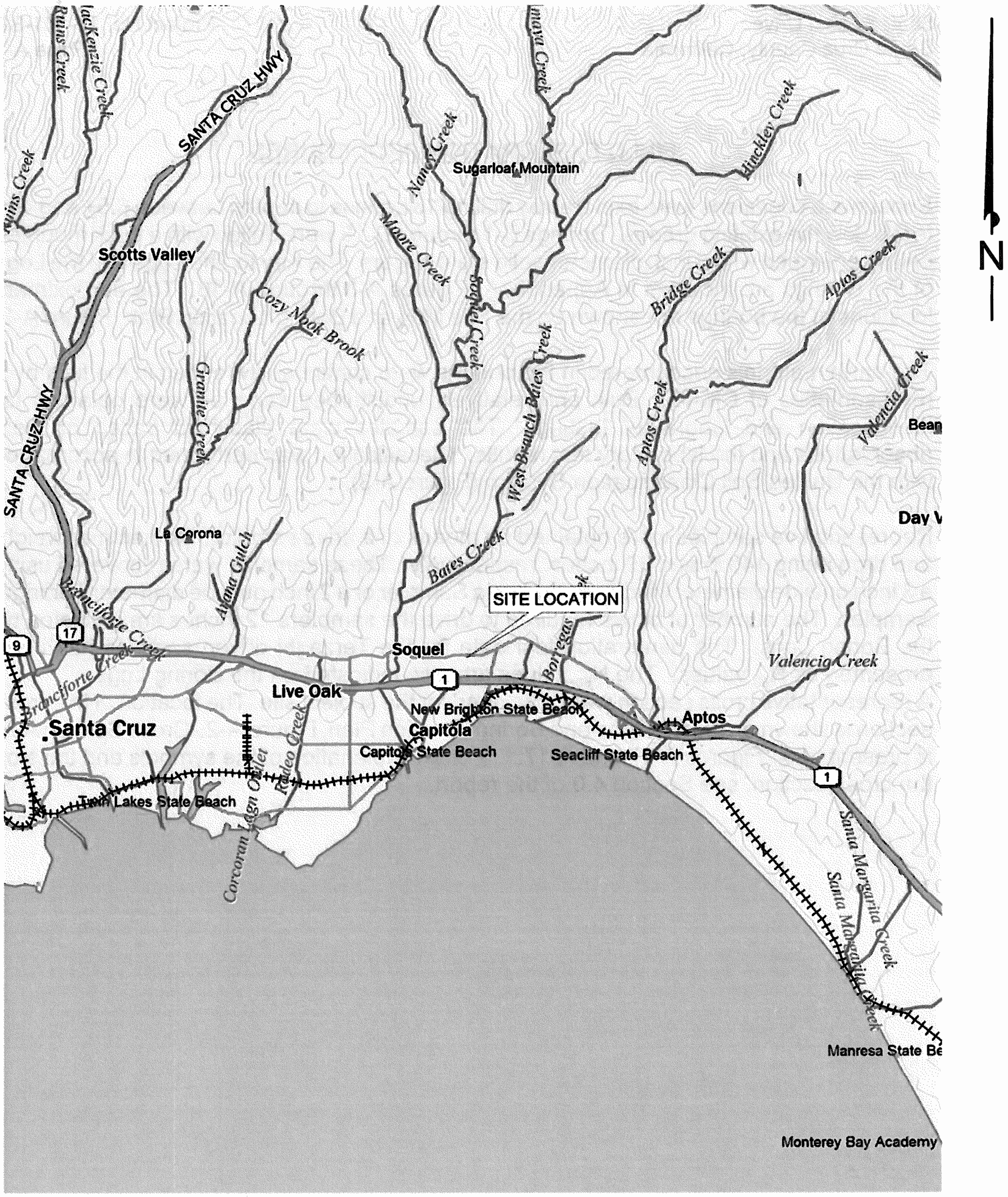
FIELD EXPLORATION PROGRAM

FIELD EXPLORATION PROCEDURES

Subsurface conditions were explored by drilling 13 borings to depths between 6.5± and 40± feet below the existing grades. Borings B-1 through B-13 were drilled with a truck mounted drill rig equipped with 6 inch diameter solid stem augers. The Key to The Logs and the Logs of the Borings are included in Appendix A, Figures A-3 through A-16. The approximate locations of the borings are shown on the Site Map and Boring Location Plan, Figure A-2.

The earth materials encountered in the borings were continuously logged in the field by a representative of CMAG. Bulk and relatively undisturbed samples were obtained for identification and laboratory testing. The samples were classified based on field observations and the laboratory test results. Classification was performed in accordance with the Unified Soil Classification System (Figure A-3).

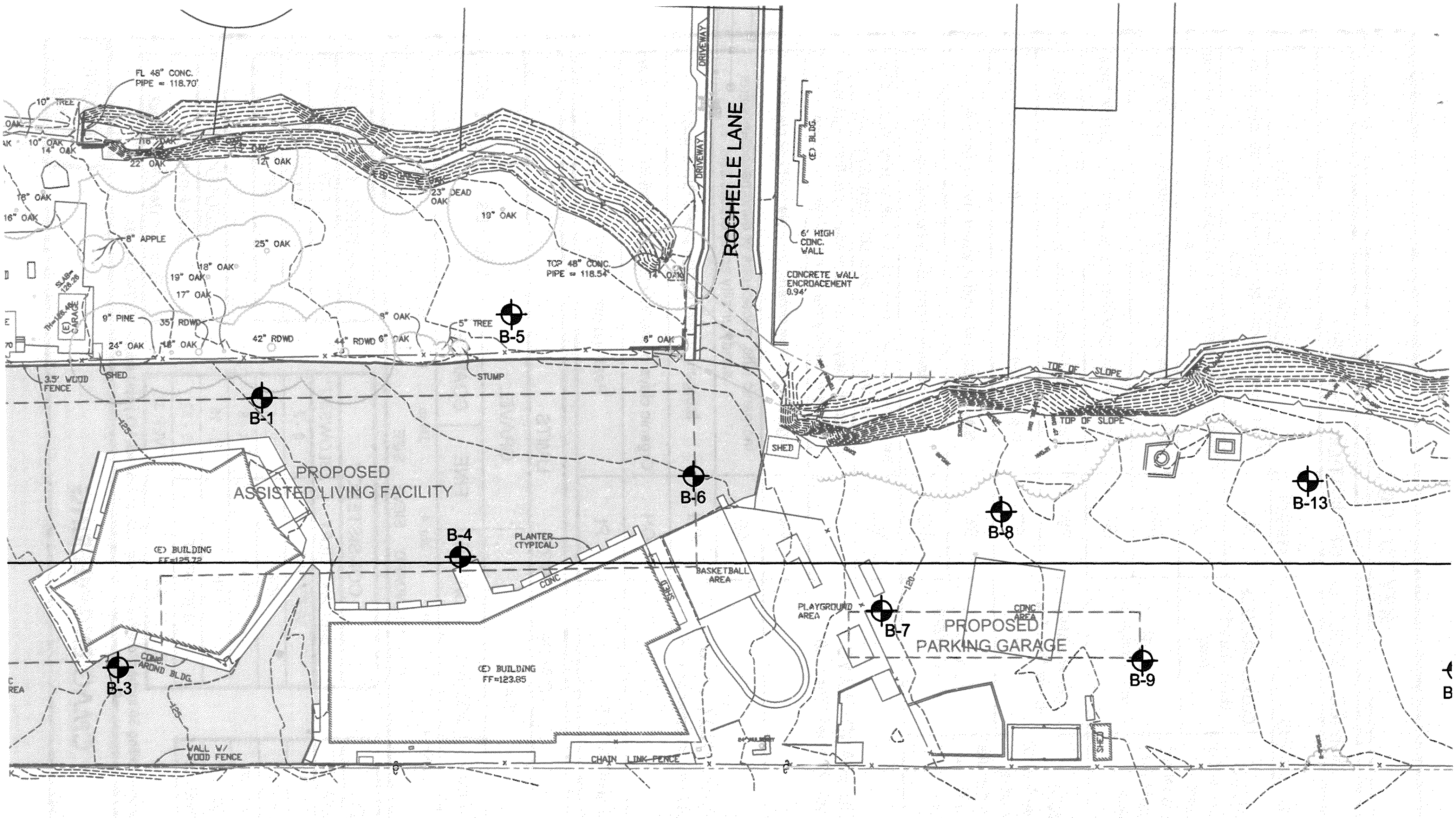
Representative samples were obtained by means of a drive sampler, the hammer weight and drop being 140 lb and 30 inches, respectively. These samples were recovered using a 3 inch outside diameter Modified California Sampler or a 2 inch outside diameter Terzaghi Sampler. The number of blows required to drive the samplers 12 inches are indicated on the Boring Logs. The penetration test data for the Terzaghi driven samples has been presented as N_{60} values. The N_{60} values are also indicated on the Boring Logs.
A representative cross section was developed for the subject site. The location of the cross section is shown on the Site Map and Boring Location Plan, Figure A-2. Cross Section A-A' is presented on Figures A-17 and A-17.1. For an explanation of the symbols and units on the cross section, see Section 4.0 of the report.



SCALE: 1:100,000

BASEMAP: DeLorme Topo USA®

CMAG ENGINEERING	**SITE LOCATION MAP**	FIGURE
	5630 Soquel Drive	A-1



EXPLANATION OF SYM

B-1 APPROXIMATE LOCA

A ⊢——⊣ A' LOCATION OF CROS

BASEMAP: Ifland Engineers. (August 20, 2018) *Oakmont Senior Living, 5630 Soquel Drive,*

KEY TO LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of the material is larger than the No. 200 sieve	GRAVELS More than half of the coarse fraction is larger than the No. 4 sieve	CLEAN GRAVELS (Less than 5% fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS More than half of the coarse fraction is smaller than the No. 4 sieve	CLEAN SANDS (Less than 5% fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		SAND WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS More than half of the material is smaller than the No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	Inorganic silts and very fine sands, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomacaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

GRAIN SIZE LIMITS

SILT AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

No. 200 No. 40 No. 10 No. 4 3/4 in. 3 in. 12 in.

US STANDARD SIEVE SIZE

RELATIVE DENSITY	
SAND AND GRAVEL	BLOWS/FT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CONSISTENCY	
SILT AND CLAY	BLOWS/FT*
VERY SOFT	0 - 2
SOFT	2 - 4
FIRM	4 - 8
STIFF	8 - 16
VERY STIFF	16 - 32
HARD	OVER 32

MOISTURE CONDITION
DRY
MOIST
WET

BEDROCK
(GROUP SYMBOL) Brackets Denote Bedrock

* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch I.D.) split spoon (ASTM D-1586).

CMAG ENGINEERING

FIGURE
A-3

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Boring: B-1
Project: 5630 Soquel Drive
Santa Cruz County, California
Date Drilled: October 31, 2018
Logged By: SSC
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			2" AC / 4" Baserock					
1	SM		**Qcl:** Dark Brown Silty SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained.					
2	CL-SC	◫	Dark Brown Sandy Lean CLAY to Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained.	22	15		8.6	F.C.=50.5% Direct Shear Φ' = 30°
3	SC	⧅	Dark Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subrounded.	14		108.1	11.7	c' = 100 psf Particle Size F.C.=45.9%
4								
5	SC	◫	Material Consistent - Trace Gravel - up to 3/4", Subrounded.	12	8		15.3	
6								
7			Gravels and Cobbles.					
8								
9	SM	⧅	Yellowish Brown and Dark Yellowish Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Some Gravel - up to 1", Subrounded.	45		113.2	16.3	
10								
11								
12								
13								
14			Interbedded:					
15	SP-SM/ SM	◫	Light Olive Brown Poorly Graded SAND with Silt. Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Yellowish Brown Silty SAND. Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 1", Subrounded.	39	33		10.3	
16								
17			▽ Groundwater Encountered at 17± feet.					
18			**Tp:**					
19								
20								
21	(ML)	◫	Dark Bluish Gray SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	46	42		28.0	F.C.=62.1%
22								
23								
24								

CMAG ENGINEERING

FIGURE
A-4

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-1 (continued)
Date Drilled: October 31, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
25								
26								
27								
28	(ML)	◫	Dark Bluish Gray SILSTONE. Very Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	54	52		29.4	
29								
30								
31								
32								
33								
34			Increase in Auger Resistance.					
35	(ML)	◫	Dark Bluish Gray SILTSTONE. Very Dense, Moist. Moderately Cemented. (Sandy Silt). Sand - Fine Grained.	100+			30.2	
36								
37								
38			Extremely Slow Auger Advancement.					
39								
40	(ML)	◫	Material Consistent.	100+			28.0	
41			Boring Terminated at 40± ft. Groundwater Encountered at 17± ft. Boring Backfilled with Cuttings.					
42								
43								
44								
45								
46								
47								
48								

CMAG ENGINEERING

FIGURE
A-4.1

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-2
Date Drilled: October 31, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1	SC-CL		4" AC / 3" Baserock **Qcl:** Yellowish Brown Clayey SAND to Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.					E.I. = 57 F.C.=47.4%
2 3	SC	⧅	Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 3/4", Subangular.	50		115.0	10.5	Particle Size F.C.=24.7%
4 5	SC	◫	Light Brown and Dark Yellowish Brown Clayey SAND. Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 3/4", Subrounded.	43	30		11.6	
6 7 8 9	SC	◫	Light Brown and Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained.	25	18		15.7	
10 11 12 13 14	SM	⧅	Light Brown Silty SAND. Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 3/4", Subrounded.	48		114.8	10.9	
15 16 17 18 19	SM	◫	Yellowish Brown and Dark Brown Silty SAND. Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Trace Gravels - up to 1", Subrounded.	40	35		7.8	
20 21	(SM)	◫	**Tp:** Dark Bluish Gray SANDSTONE. Very Dense, Moist. Weakly Cemented. (Silty Sand). Sand - Fine Grained.	71	65		28.9	F.C.=45.4%
22 23 24			Boring Terminated at 21.5± ft. Groundwater Not Encountered. Boring Backfilled with Cuttings.					

CMAG ENGINEERING

FIGURE
A-5

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-3
Date Drilled: October 31, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			2" AC / 4" Baserock					
1 2	SC	⧅	**Qcl:** Light Brown and Yellowish Brown Clayey SAND. Very Loose, Moist to Wet, Slightly Plastic. Sand - Fine to Coarse Grained.	7		110.6	17.7	Sulfate Particle Size F.C.=39.1%
3 4	SC-CL	◫	Light Brown and Yellowish Brown Clayey SAND to Sandy Lean CLAY. Stiff, Moist to Wet, Plastic. Sand - Fine to Medium Grained.	15	10		20.7	
5 6	SC	⧅	Light Brown and Yellowish Brown Clayey SAND. Medium Dense, Moist to Wet, Slightly Plastic. Sand - Fine to Medium Grained.	28		113.6	19.0	
7 8	SC/CL	◫	Interbedded: Light Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - FG to MG. Light Brown Lean CLAY with Sand. Firm, Moist, Plastic. Sand - FG.	11	8		31.2	F.C.=87.8%
9 10								
11	SM	◫	Light Brown and Yellowish Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Some Gravel - up to 2", Subrounded.	30	24		7.6	F.C.=13.7%
12 13 14								
15 16	SP-SM	◫	Light Gray and Yellowish Brown Poorly Graded SAND with Silt and Gravel. Very Dense, Moist, Non Plastic. Sand - Fine to Medium Grained. Gravel - up to 3", Subrounded.	85	74		8.9	
17 18 19 20 21 22 23 24			Boring Terminated at 16.5± ft. Groundwater Not Encountered. Boring Backfilled with Cuttings.					

LOG OF EXPLORATORY BORING

Project No:	18-141-SC	Boring:	B-4
Project:	5630 Soquel Drive Santa Cruz County, California	Date Drilled:	October 31, 2018
		Logged By:	SSC
Drill Rig:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer		

◫ Terzaghi Split Spoon Sample   ⧄ 2" Ring Sample   ⧅ 2.5" Ring Sample
S 3" Shelby Tube   ⊠ Bulk Sample   ▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1	CL		2" AC / 3" Baserock **Qcl:** Light Brown Sandy Lean CLAY. Firm, Moist, Plastic. Sand - Fine to Medium Grained.					
2	SC	◫	Dark Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subrounded.	8	6		13.4	Particle Size F.C.=43.3%
3								
4								
5	SC	⧅	Light Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 2", Subrounded.	20		119.2	12.8	
6								
7								
8	SC	◫	Dark Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 2", Subrounded.	21	16		16.5	
9								
10								
11								
12								
13	SM	⧅	Light Brown and Dark Yellowish Brown Silty SAND with Gravel. Dense, Moist to Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 3", Subrounded.	100+		122.1	12.1	
14								
15								
16			▽ Groundwater Encountered at 16.5± feet.					
17								
18	(ML)	◫	**Tp:** Light Olive Brown and Dark Bluish Gray SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	52	47		29.2	
19								
20								
21								
22								
23	(ML)	◫	Dark Bluish Gray SILTSTONE. Very Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	58	54		26.3	F.C.=60.7%
24			Boring Terminated at 23.5± ft. Groundwater Encountered at 16.5± ft. Boring Backfilled with Cuttings.					

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FIGURE
A-7

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-5
Date Drilled: October 31, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1	SM		**Qcl:** Brown Silty SAND. Loose, Dry, Non Plastic. Sand - Fine to Medium Grained.					
2	SC-CL	◫	Yellowish Brown Clayey SAND to Sandy Lean CLAY. Medium Dense, Dry to Moist, Slightly Plastic. Sand - Fine to Medium Grained.	34	24		7.4	F.C.=50.5%
3	SC	⧅	Light Gray Clayey SAND. Loose, Dry to Moist, Slightly Plastic. Sand - Fine to Medium Grained.					
4	CL	⧅	Dark Yellowish Brown Sandy Lean CLAY. Hard, Moist, Plastic. Sand - Fine to Medium Grained.	23		113.5	13.4	q_u = 9,530psf
5	SC-CL	◫	Brown and Dark Yellowish Brown Clayey SAND to Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	36	26		12.5	
6								
7								
8								
9								
10								
11	SW-SM	◫	Yellowish Brown and Dark Yellowish Brown Well Graded SAND with Silt and Gravel. Medium Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded.	37	29		9.9	Particle Size F.C.=11.1%
12								
13								
14			Interbedded:					
15	SP-SM/ SM	◫	Light Brown Poorly Graded SAND with Silt. Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Dark Yellowish Brown Silty SAND with Gravel. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded.	41	36		12.2	
16								
17			Boring Terminated at 16.5± ft. Groundwater Not Encountered. Boring Backfilled with Cuttings.					
18								
19								
20								
21								
22								
23								
24								

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FIGURE
A-8

LOG OF EXPLORATORY BORING

Project No:	18-141-SC	Boring:	B-6
Project:	5630 Soquel Drive	Date Drilled:	November 1, 2018
	Santa Cruz County, California	Logged By:	SSC
Drill Rig:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer		

∥ Terzaghi Split Spoon Sample
╱ 2" Ring Sample
╲ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af: 2" AC / 5" Baserock					
1 2	CH/SC	∥	Bluish Gray Fat CLAY with Sand, Stiff, Moist, Plastic. Sand - Fine Grained. and Dark Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained. (Mixture)	17	12		15.0	E.I. = 13 F.C.=47.0%
3 4	CH/SC	╲	Bluish Gray Fat CLAY with Sand, Stiff, Moist, Plastic. Sand - Fine Grained. and Dark Grayish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained. (Mixture)	19		118.0	13.2	Particle Size F.C.=44.0% q_u = 3,770psf
			Qcl:					
5	SM	∥	Very Dark Brown Silty SAND. Very Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.	5	4		15.0	
6								
7	SC	∥	Olive Gray Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained.	14	10		18.5	
8								
9								
10 11	SC-CL	╲	Olive Gray, Bluish Gray, and Yellowish Brown Clayey SAND to Sandy Lean CLAY with Gravel. Medium Dense, Moist, Slightly Plastic to Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded.	49		120.5	14.3	
12								
13								
14								
15 16 17	SM	∥	Gray, Light Brown, and Yellowish Brown Silty SAND with Gravel. Dense, Wet, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded. ▽ Groundwater Encountered at 17± feet.	39	34		13.8	
18			**Tp:**					
19								
20								
21	(SM)	∥	Dark Bluish Gray SANDSTONE. Dense, Moist. Weakly Cemented. (Silty Sand). Sand - Fine Grained.	39	36	90.3	30.7	F.C.=38.7%
22								
23								
24								

CMAG ENGINEERING

FIGURE
A-9

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-6 (continued)
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
25								
26	(SM)	◫	Dark Bluish Gray SANDSTONE. Dense, Moist. Weakly Cemented. (Silty Sand). Sand - Fine Grained.	34	32	91.0	35.1	
27			Boring Terminated at 26.5± ft. Groundwater Encountered at 17± ft. Boring Backfilled with Cuttings.					
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								

CMAG ENGINEERING

FIGURE
A-9.1

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-7
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample	⧄ 2" Ring Sample
⧅ 2.5" Ring Sample	S 3" Shelby Tube
⊠ Bulk Sample	▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af: Baserock/Soil Mixture:					
1 2	SM	⧅	Light Brown Silty SAND with Gravel. Loose, Dry, Non Plastic. Sand - Fine to Coarse Grained. Gravel up to 3/4", Angular.	21		105.8	7.3	Particle Size F.C.= 30.8%
3	SM	◫	Material Consistent.					
4	SM	◫	**Qcl:** Dark Brown Silty SAND. Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.	8	6		10.0	
5								
6	SC-CL	⧅	Gray and Dark Yellowish Brown Clayey SAND to Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	20		112.0	18.0	F.C.= 51.8%
7 8	SC	◫	Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Some Gravel up to 1/2", Subrounded.	18	13		15.5	
9								
10 11 12	SC/CL	◫	Interbedded: Yellowish Brown Clayey SAND with Gravel. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Gravel - up to 1", Subrounded. Gray and Yellowish Brown Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	19	15		13.0	
13 14			Gravel and Cobble.					
15 16	SP-SM	◫	Gray Poorly Graded SAND with Silt and Gravel. Very Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Gravel - up to 2", Subrounded. ▽ Groundwater Encountered at 16± feet.	100+			15.4	
17 18 19			**Tp:** Dark Bluish Gray SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.					
20 21	(ML)	◫	Dark Bluish Gray SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	44	41		30.4	
22 23 24			Boring Terminated at 21.5± ft. Groundwater Encountered at 16± ft. Boring Backfilled with Cuttings.					

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FIGURE
A-10

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-8
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
⊠ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1	SM		**af:** Light Brown Silty SAND with Gravel. Loose, Dry, Non Plastic. Sand - Fine to Medium Coarse Grained. Gravel up to 3/4", Angular.					
2	SC	◫	**Qcl:** Light Brown and Yellowish Brown Clayey SAND. Medium Dense, Dry to Moist, Slightly Plastic. Sand - Fine to Medium Grained.	20	14		9.6	
3								
4								
5								
6		◫	Light Brown and Yellowish Brown Clayey SAND to Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1", Subrounded.					
7	SC-CL			33	24		11.9	
8								
9								
10								
11		◫	Light Brown and Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Some Gravel - up to 2", Subrounded.					
12	SC			35	28		11.4	
13			Gravel and Cobble.					
14								
15			▽ Groundwater Encountered at 15.5± feet.					
16	SP-SM	◫	Brown Poorly Graded SAND with Silt. Very Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subrounded.					
17	(SM)		**Tp:** Light Olive Brown SANDSTONE. Very Dense, Moist, Weakly Cemented. (Silty Sand). Sand - Fine Grained.	87	77		29.1	
18			Boring Terminated at 17.5± ft. Groundwater Encountered at 15.5± ft. Boring Backfilled with Cuttings.					
19								
20								
21								
22								
23								
24								

CMAG ENGINEERING

FIGURE
A-11

LOG OF EXPLORATORY BORING

Project No:	18-141-SC	Boring:	B-9
Project:	5630 Soquel Drive Santa Cruz County, California	Date Drilled:	November 1, 2018
		Logged By:	SSC
Drill Rig:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer		

- ▯ Terzaghi Split Spoon Sample
- ⧄ 2" Ring Sample
- ⧅ 2.5" Ring Sample
- S 3" Shelby Tube
- ☒ Bulk Sample
- ▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af: 5" Baserock					
1–2	SM/SC	▯	Light Brown and Brown Silty SAND and Clayey SAND. Loose, Moist, Non Plastic to Slightly Plastic. Sand - Fine to Medium Grained. Some Gravel - up to 3/4", Angular. Chunk of Asphalt in Sample.	12	8		9.0	Sulfate Particle Size F.C.= 33.8%
3	SM	⧅	**Qcl:** Dark Brown Silty SAND. Very Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.					
4	SC		Light Brown and Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subrounded.	11		119.2	13.2	
5		▯	Material Consistent - Medium Dense.	15	11		14.9	
8	CL	▯	Grayish Brown and Dark Yellowish Brown Sandy Lean CLAY. Stiff, Moist, Plastic. Sand - Fine to Medium Grained.	13	10		22.2	
13	SM	⧅	Brown and Yellowish Brown Silty SAND with Gravel. Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Gravel - up to 2", Subrounded.	80		123.3	7.0	
14–15	SP-SM	▯	Yellowish Brown Poorly Graded SAND with Silt. Dense, Wet, Non Plastic. Sand - Fine to Medium Grained. Some Gravel - up to 1", Subrounded.	40	34		12.5	
16			▽ Groundwater Encountered at 16 ± feet.					
17–18			**Tp:** Light Olive Brown SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.					
21	(ML)	▯	Light Olive Brown SILTSTONE. Dense, Moist. Weakly Cemented. (Sandy Silt). Sand - Fine Grained.	44	41		30.8	
22–24			Boring Terminated at 21.5± ft. Groundwater Encountered at 16± ft. Boring Backfilled with Cuttings.					

CMAG ENGINEERING

FIGURE
A-12

LOG OF EXPLORATORY BORING

Project No:	18-141-SC	Boring:	B-10
Project:	5630 Soquel Drive Santa Cruz County, California	Date Drilled:	November 1, 2018
		Logged By:	SSC
Drill Rig:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer		

Terzaghi Split Spoon Sample — 2" Ring Sample — 2.5" Ring Sample

S 3" Shelby Tube — Bulk Sample — Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af:					
1			Concrete Debris.					
2	SM-SC		Very Dark Brown and Grayish Brown Silty SAND to Clayey SAND. Medium Dense, Slightly Plastic. Sand - Fine to Coarse Grained. Trace Gravel - up to 1/2", Subangular.	29	20		6.8	
3								
4	SM-SC		Very Dark Grayish Brown Silty SAND to Clayey SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Coarse Grained. Trace Siltstone and Granitic Gravel - up to 2", Subangular.	23	16		8.1	
5								
6								
7	SC-CL		Dark Brown and Dark Yellowish Brown Clayey SAND to Sandy Lean CLAY. Very Stiff, Slightly Plastic to Plastic. Sand - Fine to Medium Grained. Trace Gravel - up to 1/2", Subangular.	13	10		17.9	
8			**Qcl:**					
9	SM		Dark Brown Silty SAND. Medium Dense, Moist, Non Plastic. Sand - Fine to Medium Grained.	18	14		14.5	
10								
11			Boring Terminated at 10± ft. No Groundwater Encountered. Boring Backfilled with Cuttings.					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								

CMAG ENGINEERING

FIGURE
A-13

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-11
Date Drilled: November 1, 2018
Logged By: SSC

- ◫ Terzaghi Split Spoon Sample
- ⧄ 2" Ring Sample
- ⧅ 2.5" Ring Sample
- S 3" Shelby Tube
- ⊠ Bulk Sample
- ⊽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af:					
1 2	SM-SC	◫	Dark Brown and Brown Silty SAND to Clayey SAND. Medium Dense, Dry to Moist, Slightly Plastic. Sand - Fine to Medium Grained. Trace Granitic Gravel - up to 3/4", Angular.	23	16		5.5	
3 4	SM-SC	◫	Brown and Dark Yellowish Brown Silty SAND to Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Trace Granitic Gravel - up to 3/4", Angular.	15	10		9.6	
5 6	CL	◫	Dark Yellowish Brown Sandy Lean CLAY. Very Stiff, Moist, Plastic. Sand - Fine to Medium Grained.					
7	SM		**Qcl:** Dark Grayish Brown Silty SAND. Loose, Moist to Wet, Non Plastic. Sand - Fine to Medium Grained.	8	6		13.8	
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24			Boring Terminated at 7.5± ft. No Groundwater Encountered. Boring Backfilled with Cuttings.					

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

Boring: B-12
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
⧄ 2" Ring Sample
⧅ 2.5" Ring Sample
S 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
			af:					
1 2	SM-SC	◫	Dark Brown and Light Yellowish Brown Silty SAND to Clayey SAND. Medium Dense, Dry to Moist, Non Plastic to Slightly Plastic. Sand - Fine to Coarse Grained. Trace Granitic Gravel - up to 1", Angular.	30	21		5.7	Particle Size F.C.=35.9%
3 4	SC	◫	Dark Brown and Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained.	25	17		9.7	
			Qcl:					
5			Dark Grayish Brown Silty SAND. Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.					
6	SM	◫	Brown Silty SAND. Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.					
7	SC	◫	Yellowish Brown Clayey SAND. Loose, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Trace Gravel - up to 1/2", Subrounded.	8	6		12.9	
8 9			Boring Terminated at 7.5± ft. No Groundwater Encountered. Boring Backfilled with Cuttings.					
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24								

CMAG ENGINEERING

FIGURE
A-15

LOG OF EXPLORATORY BORING

Project No: 18-141-SC
Project: 5630 Soquel Drive
Santa Cruz County, California
Drill Rig: Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer

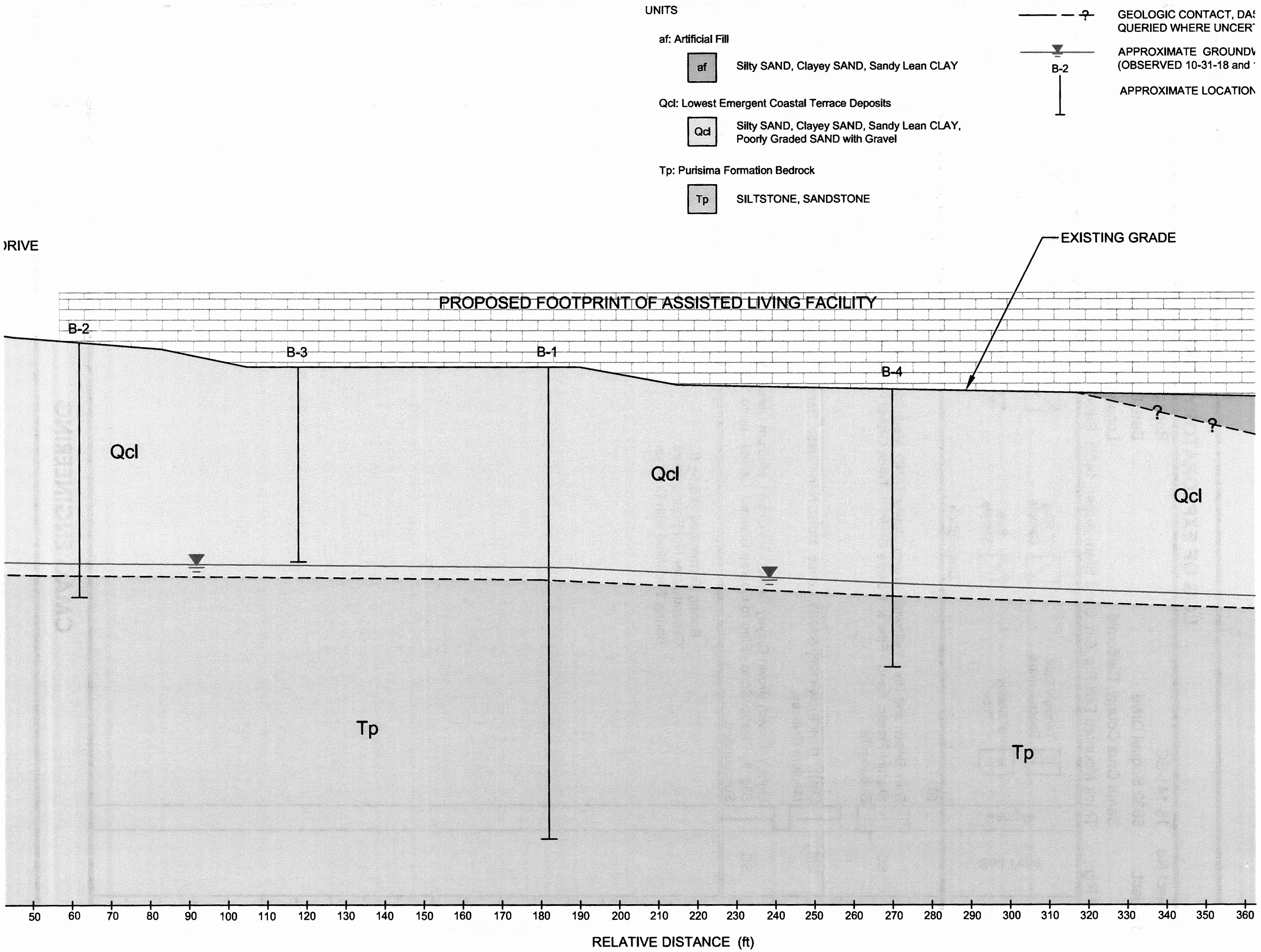
Boring: B-13
Date Drilled: November 1, 2018
Logged By: SSC

◫ Terzaghi Split Spoon Sample
▨ 2" Ring Sample
▧ 2.5" Ring Sample
s 3" Shelby Tube
☒ Bulk Sample
▽ Groundwater Elevation

Depth (ft.)	Soil Type	Sample	Description	Blows / Foot	N_{60}	Dry Density (pcf)	Moisture Cont. (%)	Other Tests
1 2 3	SC	◫	**af:** Dark Brown and Dark Yellowish Brown Clayey SAND. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Trace Gravel - up to 3/4", Subangular.	32	22		8.3	
4	SM	◫	**Qcl:** Dark Brown Silty SAND. Loose, Moist, Non Plastic. Sand - Fine to Medium Grained.	13	9		6.6	
5 6	SC	◫	Light Yellowish Brown Clayey SAND with Gravel. Medium Dense, Moist, Slightly Plastic. Sand - Fine to Coarse Grained. Gravel - up to 1/2", Subrounded.	24	17		10.6	
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24			Boring Terminated at 6.5± ft. Groundwater Not Encountered. Boring Backfilled with Cuttings.					

CMAG ENGINEERING

FIGURE
A-16


UNITS
af: Artificial Fill
af
Silty SAND, Clayey SAND, Sandy Lean CLAY
Qcl: Lowest Emergent Coastal Terrace Deposits
Qcl
Silty SAND, Clayey SAND, Sandy Lean CLAY, Poorly Graded SAND with Gravel
Tp: Purisima Formation Bedrock
Tp
SILTSTONE, SANDSTONE
?
GEOLOGIC CONTACT, DAS
QUERIED WHERE UNCERT
APPROXIMATE GROUNDW
(OBSERVED 10-31-18 and
B-2
APPROXIMATE LOCATION
RIVE
EXISTING GRADE
PROPOSED FOOTPRINT OF ASSISTED LIVING FACILITY
B-2
B-3
B-1
B-4
?
?
Qcl
Qcl
Qcl
Tp
Tp
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
RELATIVE DISTANCE (ft)

EXPLANATION

UNITS

af: Artificial Fill

af	Silty SAND, Clayey SAND, Sandy Lean CLAY

Qcl: Lowest Emergent Coastal Terrace Deposits

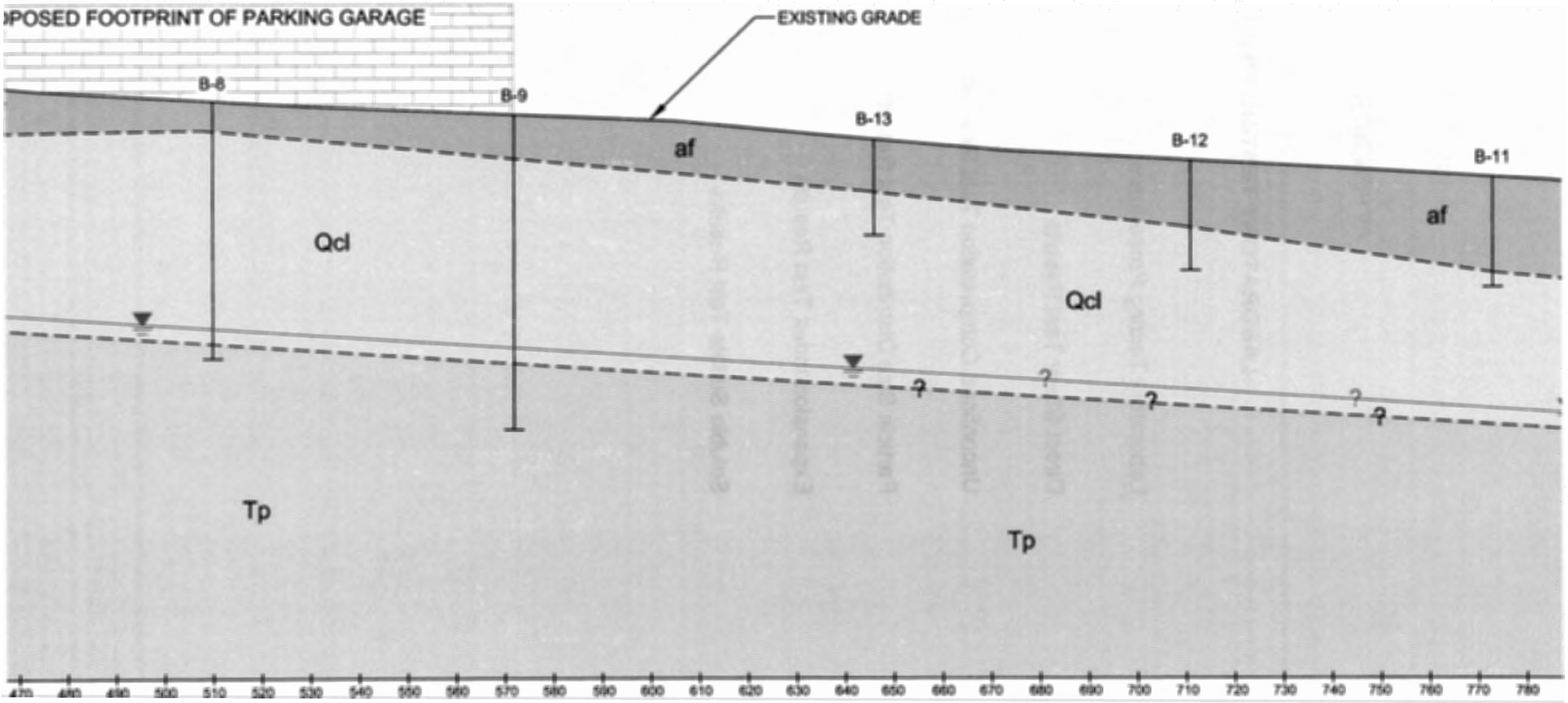
Qcl	Silty SAND, Clayey SAND, Sandy Lean CLAY, Poorly Graded SAND with Gravel

Tp: Purisima Formation Bedrock

Tp	SILTSTONE, SANDSTONE

SYMBOLS

—— — ?	GEOLOGIC CONTACT, DASHE QUERIED WHERE UNCERTAII
▼	APPROXIMATE GROUNDWAT (OBSERVED 10-31-18 and 11-1
B-2	APPROXIMATE LOCATION OF



RELATIVE DISTANCE (ft)

APPENDIX B

LABORATORY TESTING PROGRAM

LABORATORY TESTING PROCEDURES

Classification

Soils were classified according to the Unified Soil Classification System in accordance with ASTM D 2487 and D 2488. See Figure A-3. Moisture content and dry density determinations were made for representative, relatively undisturbed samples in accordance with ASTM D 2216. Results of the moisture-density determinations, together with classifications, are shown on the Boring Logs in Appendix A.

Direct Shear

A consolidated drained direct shear test was performed in accordance with ASTM D 3080 on a representative, relatively undisturbed sample of the on-site soils. To simulate possible adverse field conditions the sample was saturated prior to shearing. A saturating device was used which permitted the sample to absorb moisture while preventing volume change. The direct shear test results are presented on the Boring Logs and Figure B-1.

Unconfined Compression

Unconfined compression tests were performed on representative samples of the on-site soils in accordance with ASTM D 2166. The test results are presented on the Boring Logs and Figures B-2 and B-3.

Particle Size Distribution

Particle size distribution tests were performed on representative samples of the on-site soils and bedrock in accordance with ASTM D 422. The test results are presented on the Boring Logs and Figures B-4 through B-16.

Expansion

Expansion index tests were performed on representative remolded samples of the on-site soils in accordance with the ASTM D 4829. The test results are presented on the Boring Logs and in Table B-1.

Table B-1. Expansion Index Test Results

Boring	Depth (ft)	Soil Type	Expansion Index	Expansion Potential
B-2	1.5	SC-CL	57	Medium
B-6	1.5	CH/SC	13	Very Low

Soluble Sulfates

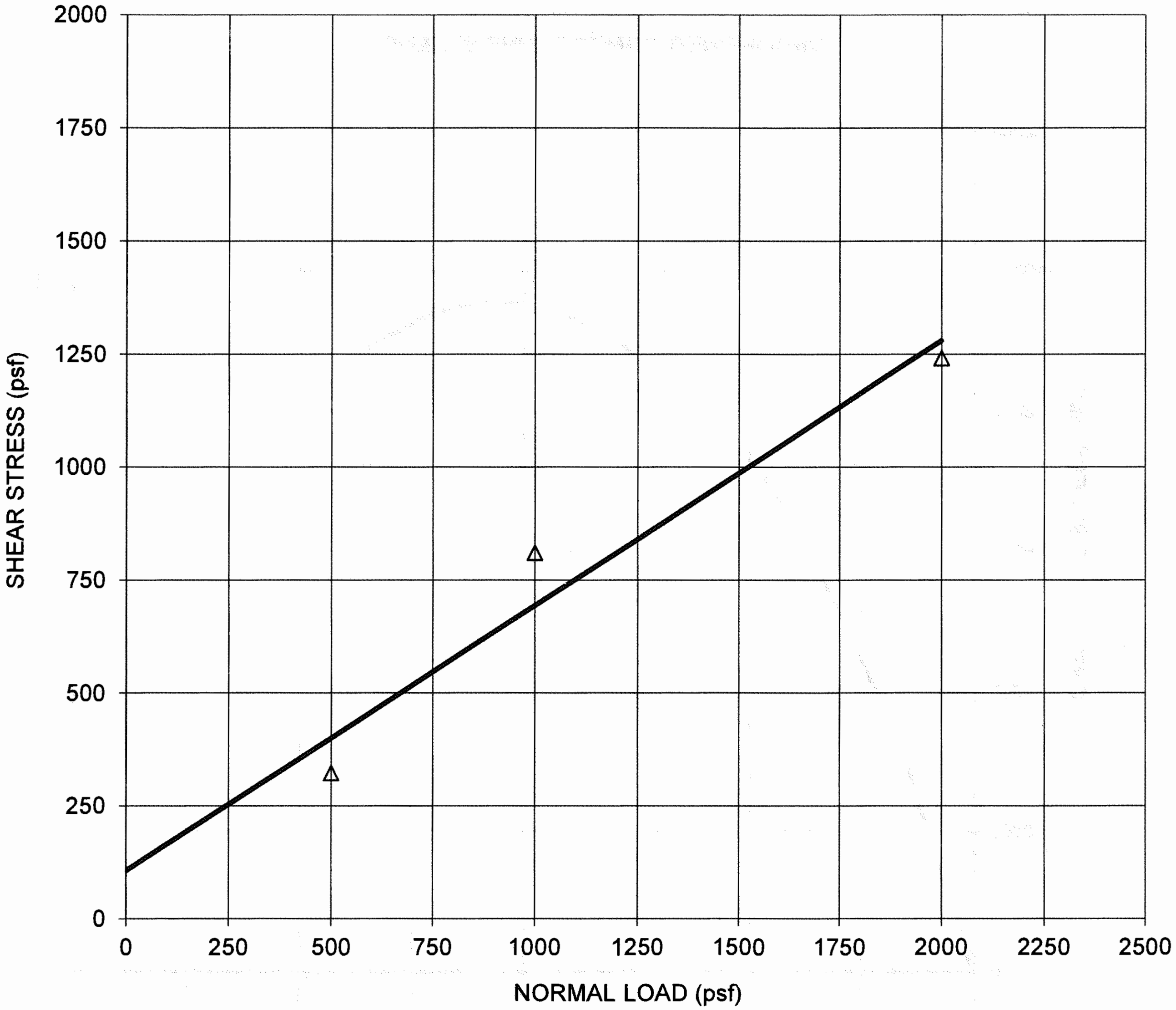
The soluble sulfate content was determined for samples considered representative of the on-site soils in accordance with Caltrans 417. The test results are presented in Table B-2.

Table B-2. Soluble Sulfate Test Results

Boring	Depth (ft)	Soil Type	Sulfates (ppm)	Sulfate Exposure Class
B-3	1	SC	28	Negligible
B-9	1	SM/SC	36	Negligible

BORING:	B-1		COHESION (psf)	FRICTION ANGLE
DEPTH (ft):	3.5			
SOIL TYPE (USCS):	SC	——— PEAK	100	30
		– – – ULTIMATE		

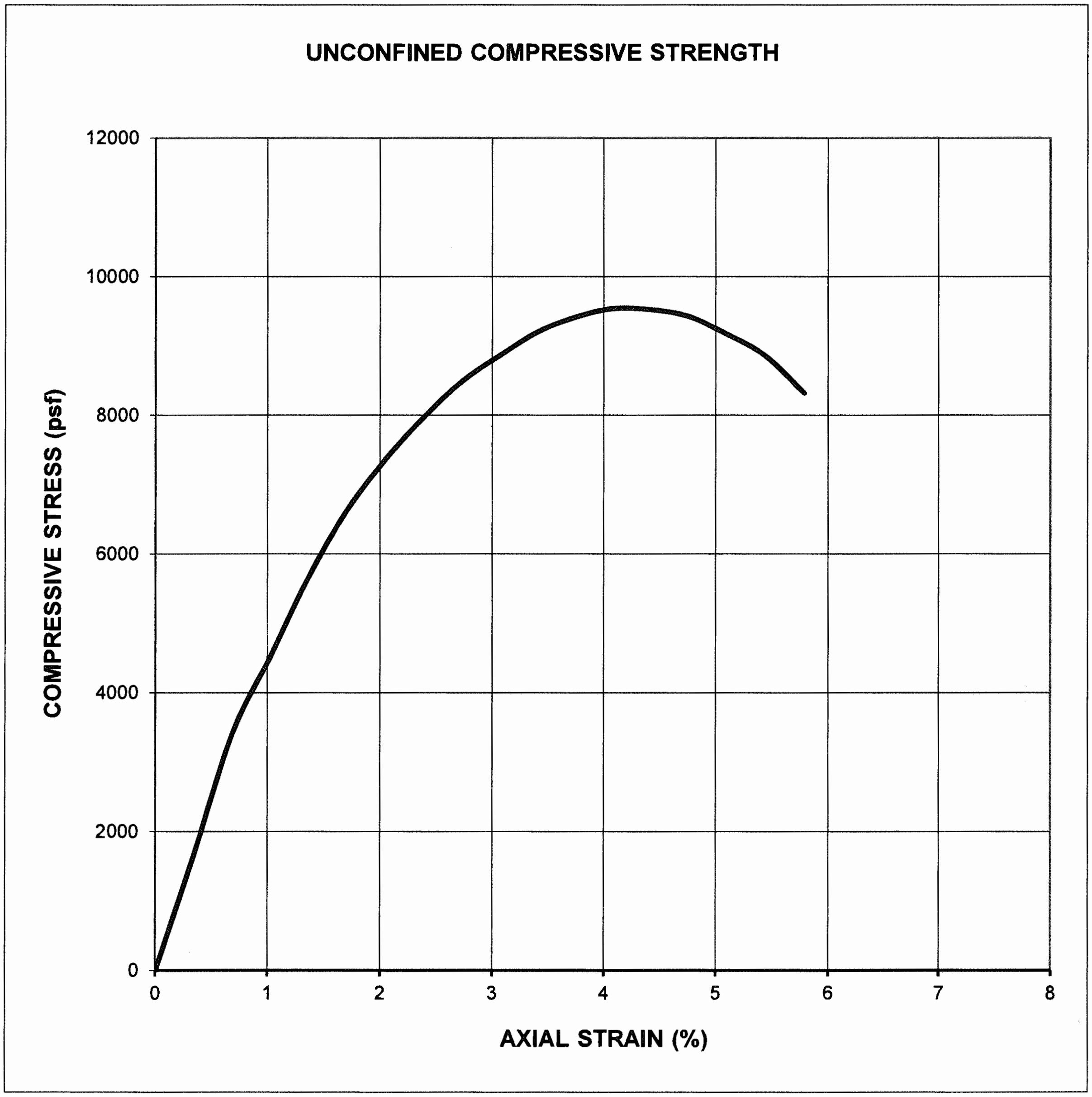
MOISTURE: **SATURATED**	TEST TYPE: **CONSOLIDATED - DRAINED**



CMAG ENGINEERING	**DIRECT SHEAR TEST RESULTS**	FIGURE
	5630 Soquel Drive	B-1

BORING:	B-5	**UNDISTURBED**	UCS
DEPTH (ft):	4		
SOIL TYPE (USCS):	CL		q_u = 9,530 psf

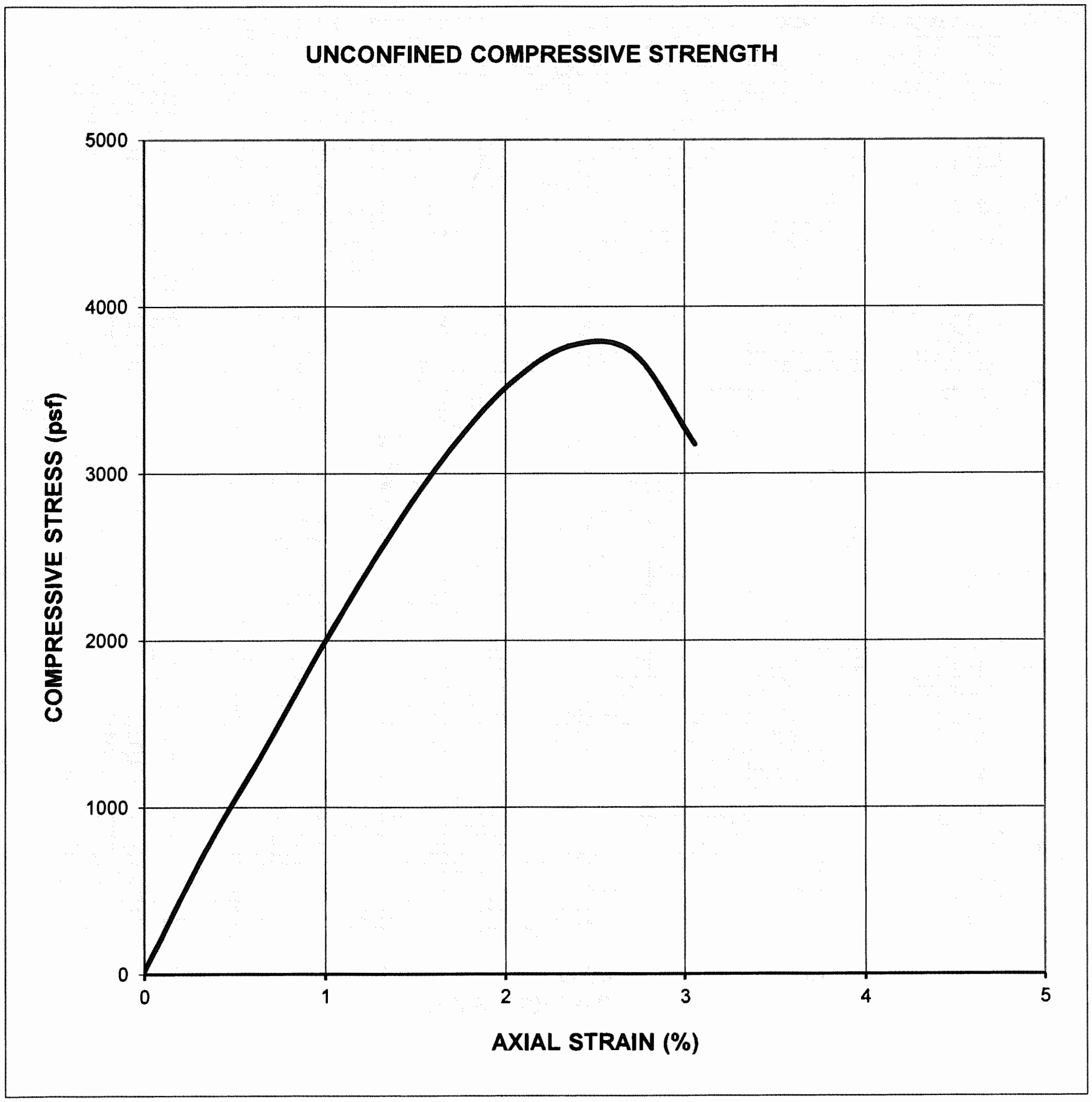
MOISTURE: **INSITU - SATURATED**



CMAG ENGINEERING	**UNCONFINED COMPRESSIVE STRENGTH RESULTS**	FIGURE
	5630 Soquel Drive	B-2

BORING:	B-6	**UNDISTURBED**	UCS
DEPTH (ft):	3.5		
SOIL TYPE (USCS):	CH/SC		q_u = 3,770 psf

MOISTURE: **INSITU - SATURATED**



CMAG ENGINEERING

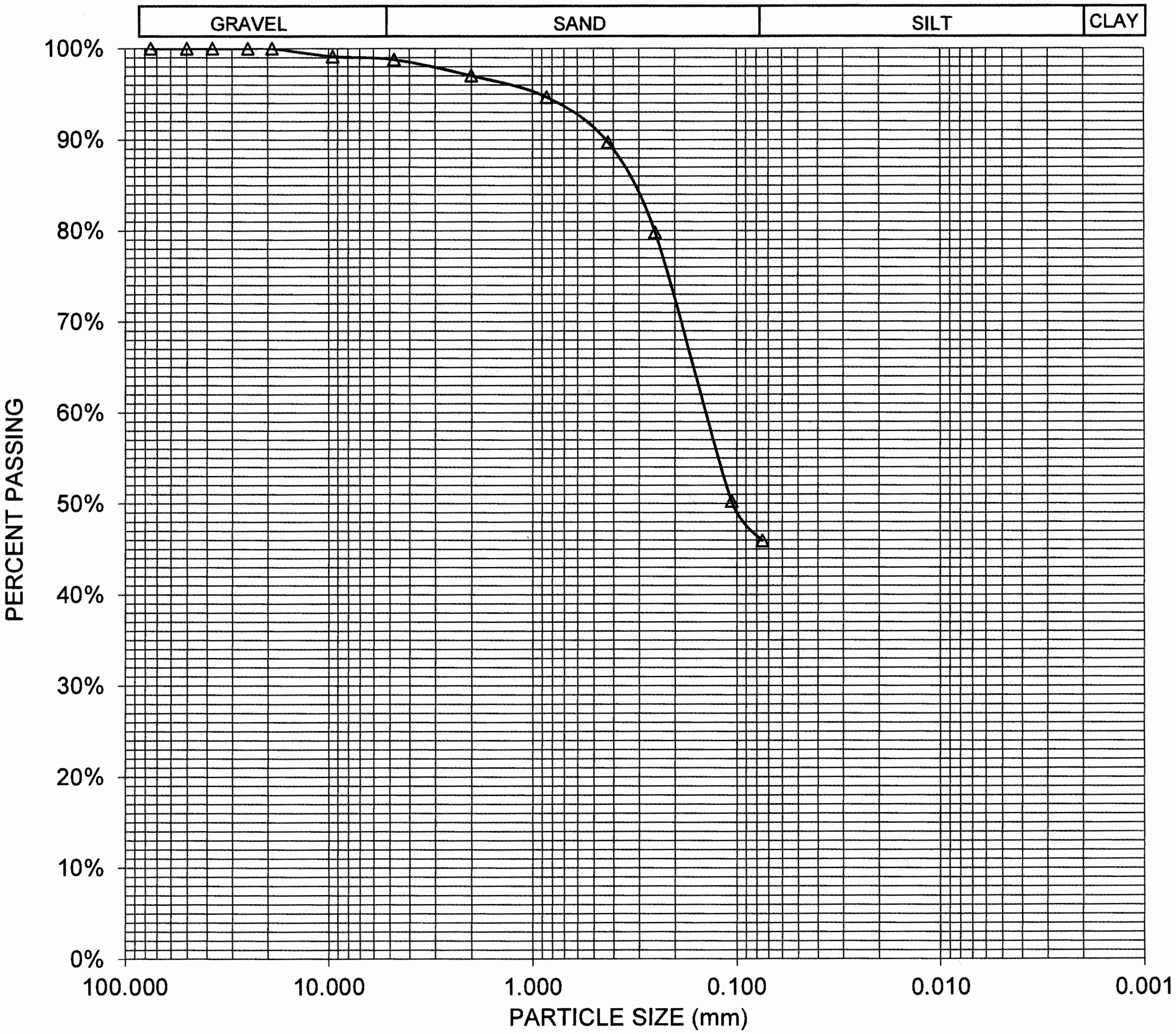
UNCONFINED COMPRESSIVE STRENGTH RESULTS

5630 Soquel Drive

FIGURE

B-3

		PERCENT PASSING No. 4	PERCENT PASSING No. 200
BORING:	B-1		
DEPTH (ft):	2.5		
SOIL TYPE (USCS):	SC	98.8%	45.9%



CMAG ENGINEERING

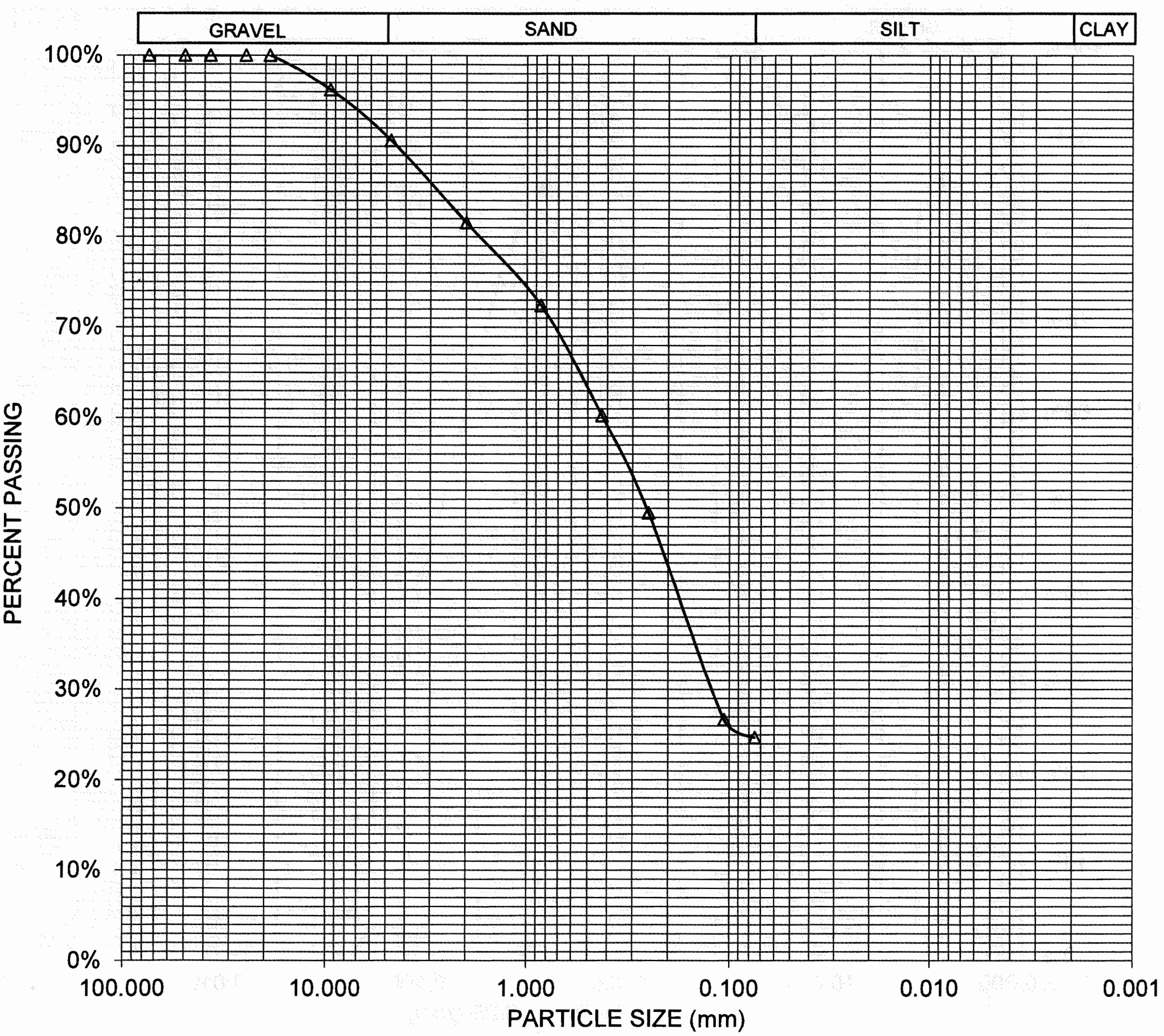
PARTICLE SIZE DISTRIBUTION

5630 Soquel Drive

FIGURE

B-4

BORING:	B-2	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	2.0		
SOIL TYPE (USCS):	SC	90.7%	24.7%



CMAG ENGINEERING

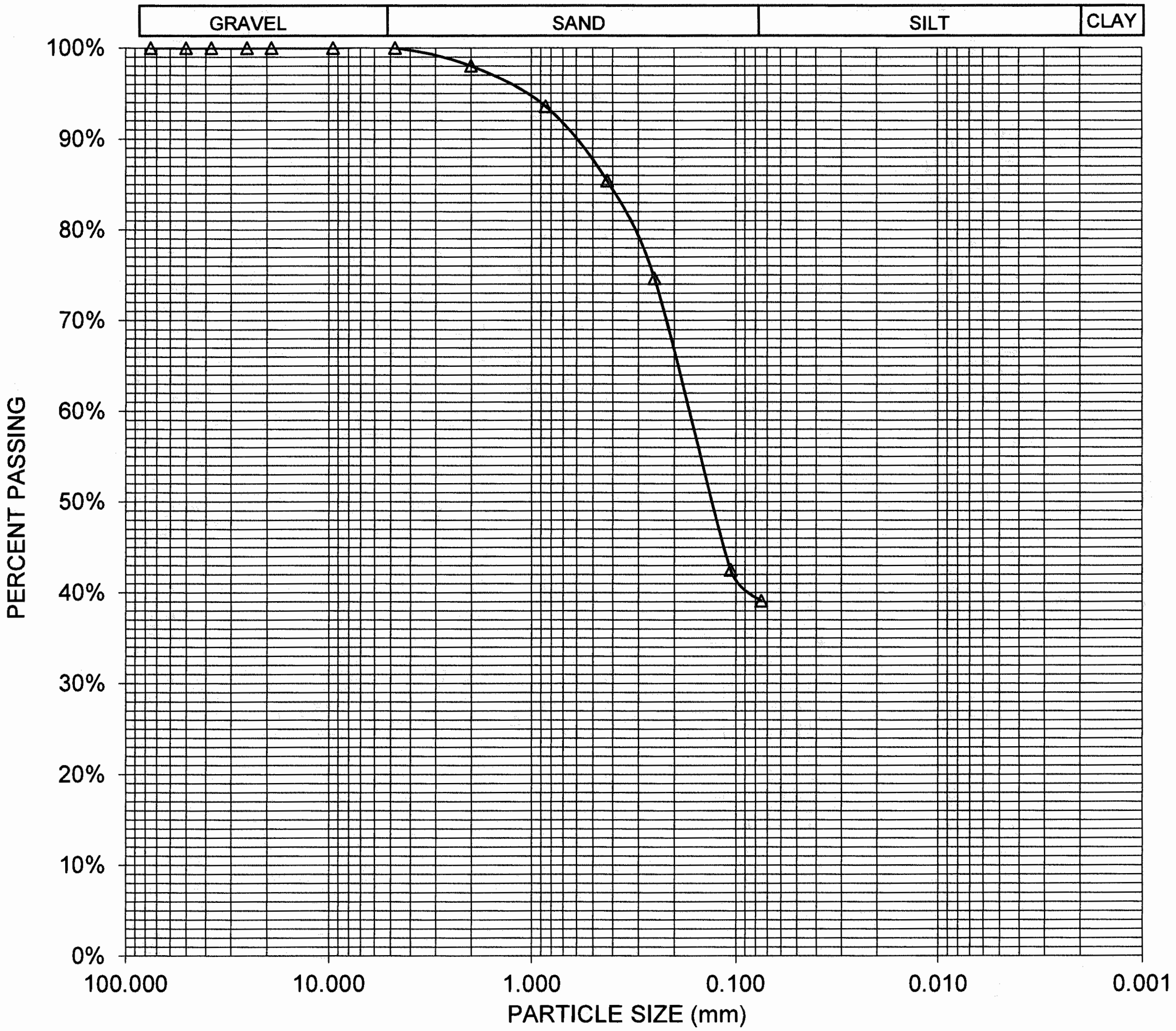
PARTICLE SIZE DISTRIBUTION

5630 Soquel Drive

FIGURE

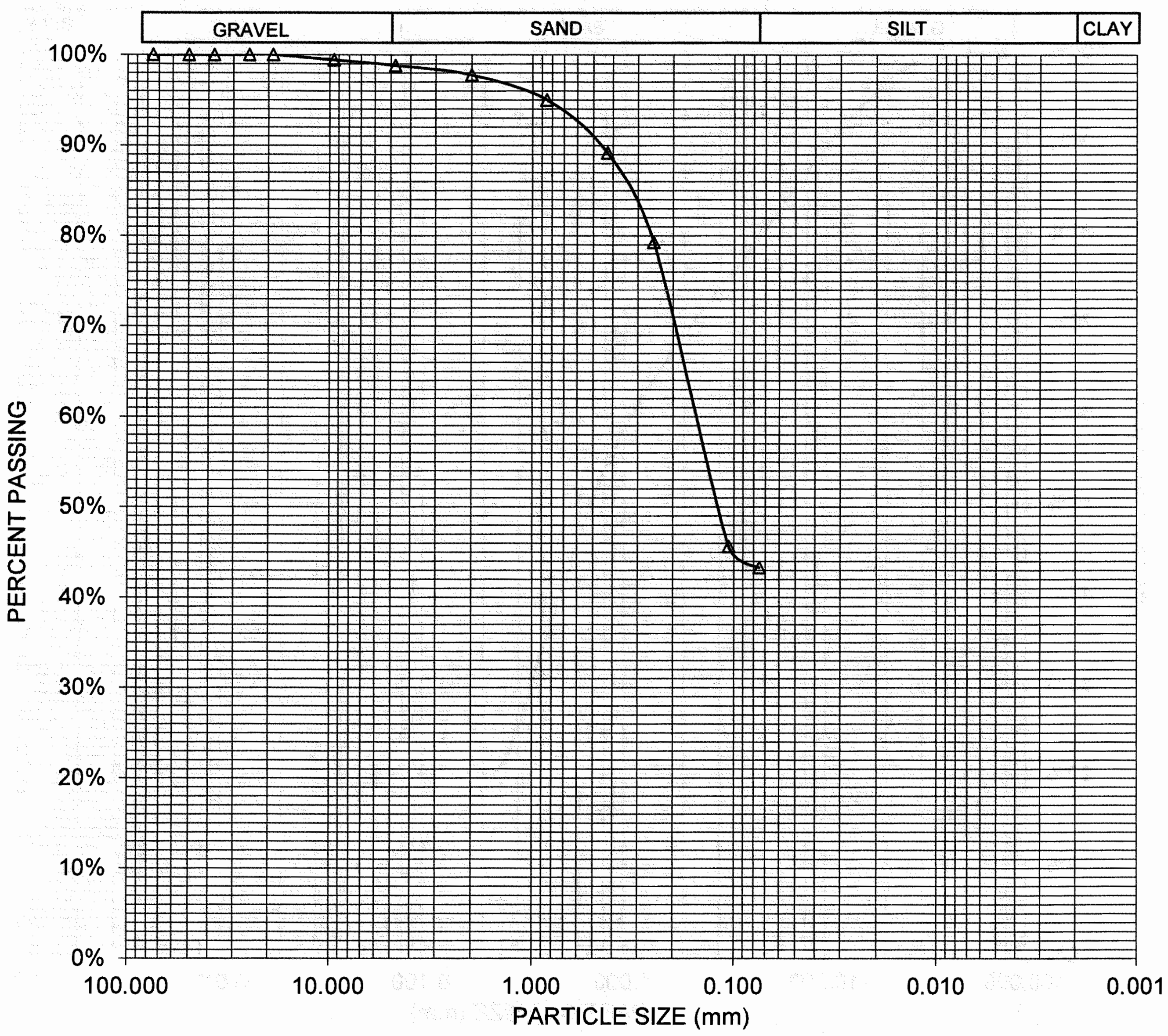
B-5

		PERCENT PASSING No. 4	PERCENT PASSING No. 200
BORING:	B-3		
DEPTH (ft):	1		
SOIL TYPE (USCS):	SC	100.0%	39.1%



CMAG ENGINEERING	PARTICLE SIZE DISTRIBUTION	FIGURE
	5630 Soquel Drive	B-6

BORING:	B-4	PERCENT	PERCENT
DEPTH (ft):	1.5	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	SC	98.8%	43.3%



CMAG ENGINEERING

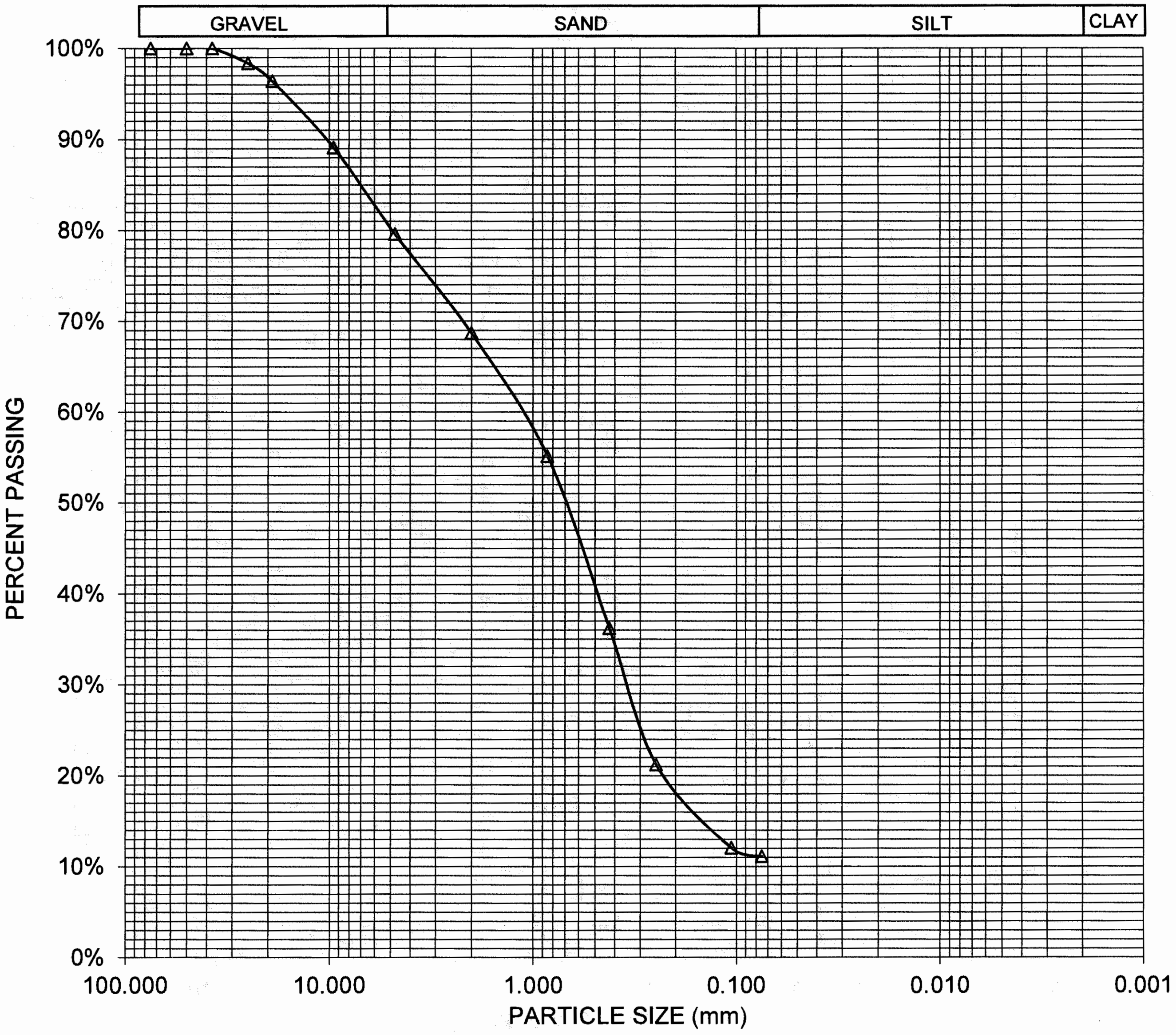
PARTICLE SIZE DISTRIBUTION

5630 Soquel Drive

FIGURE

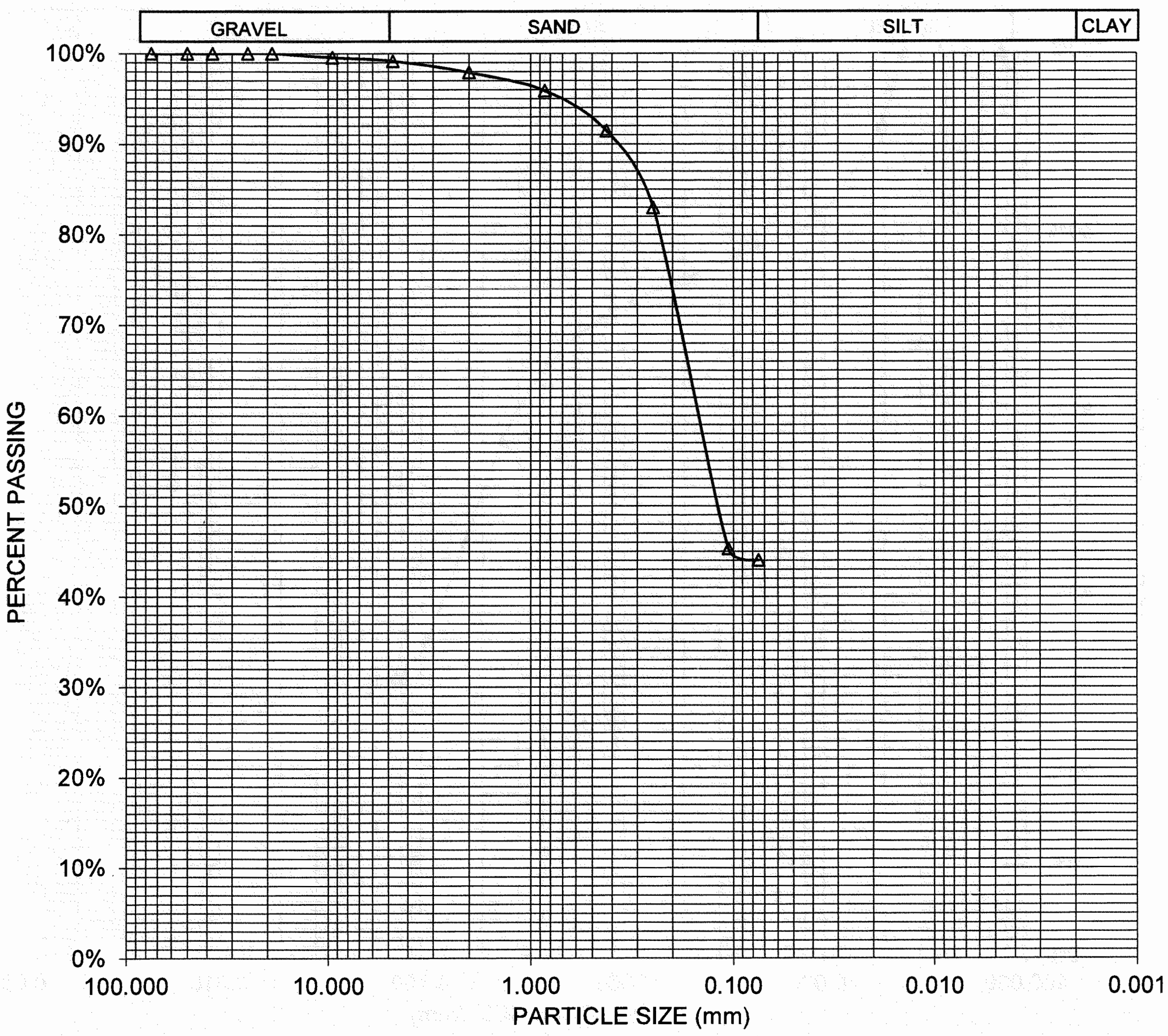
B-7

BORING:	B-5	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	10		
SOIL TYPE (USCS):	SW-SM	79.6%	11.1%



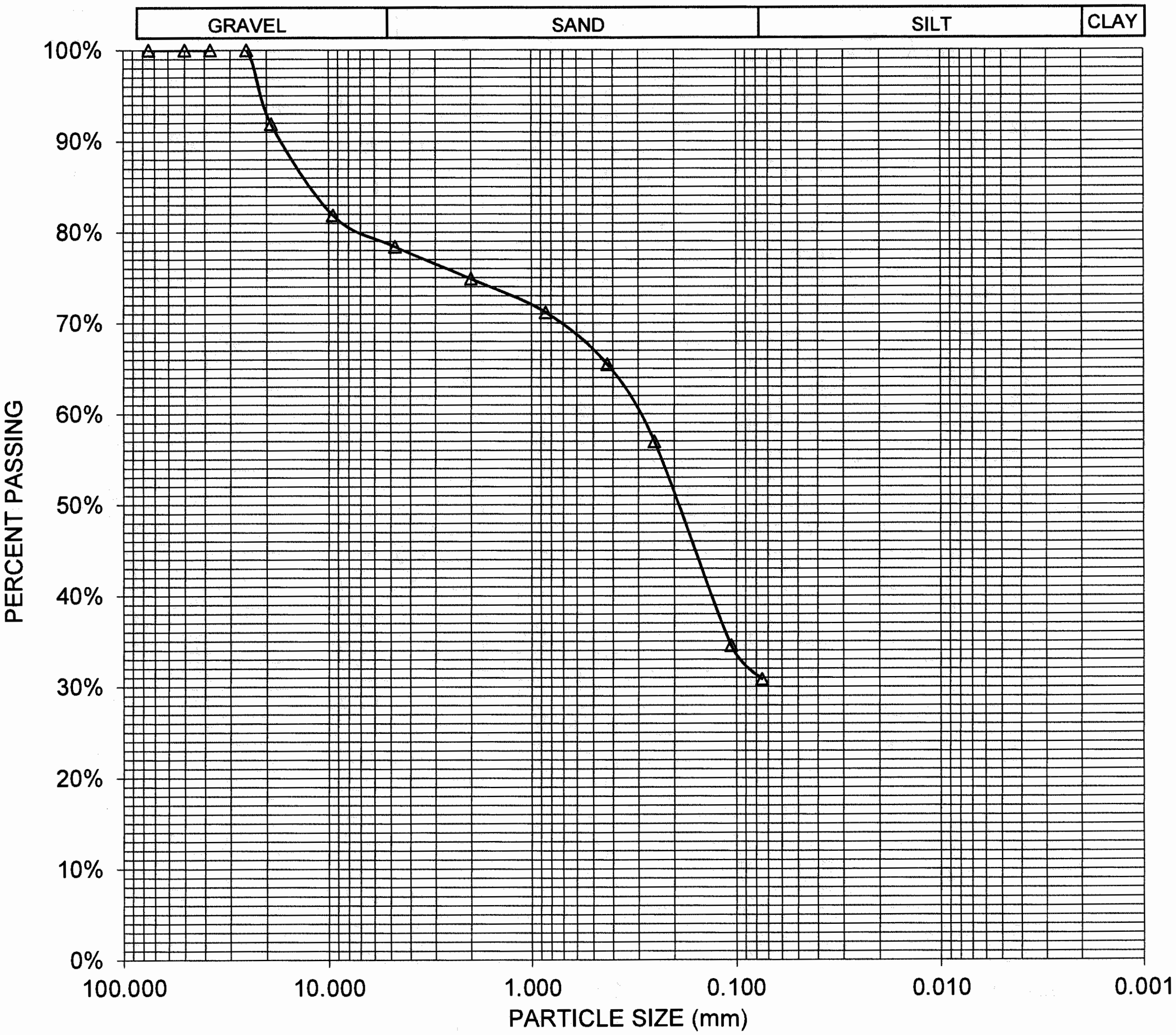
CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	5630 Soquel Drive	B-8

		PERCENT PASSING No. 4	PERCENT PASSING No. 200
BORING:	B-6		
DEPTH (ft):	2.5		
SOIL TYPE (USCS):	SC	99.2%	44.0%



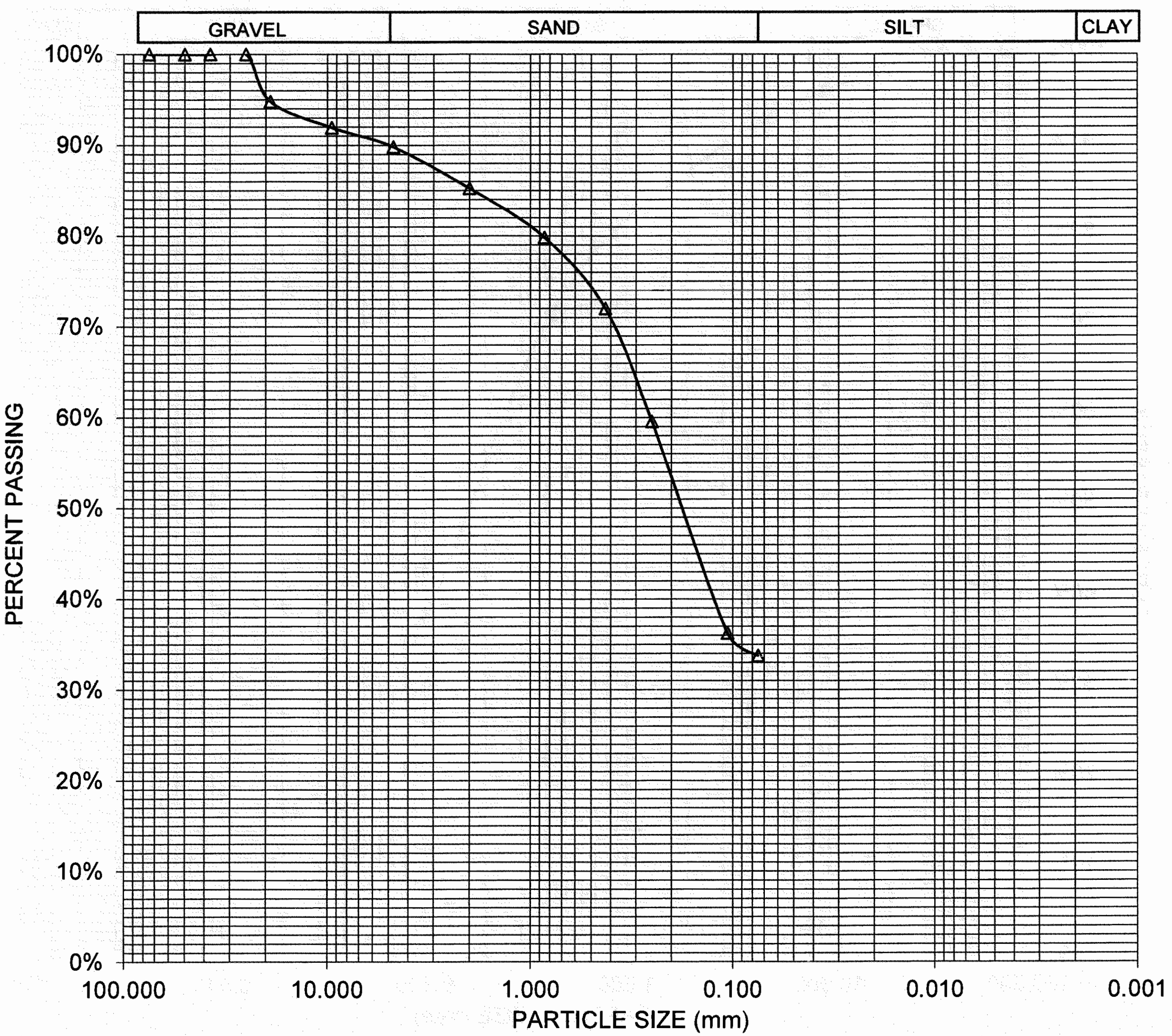
CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	5630 Soquel Drive	B-9

BORING:	B-7	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	1		
SOIL TYPE (USCS):	SM	78.4%	30.8%



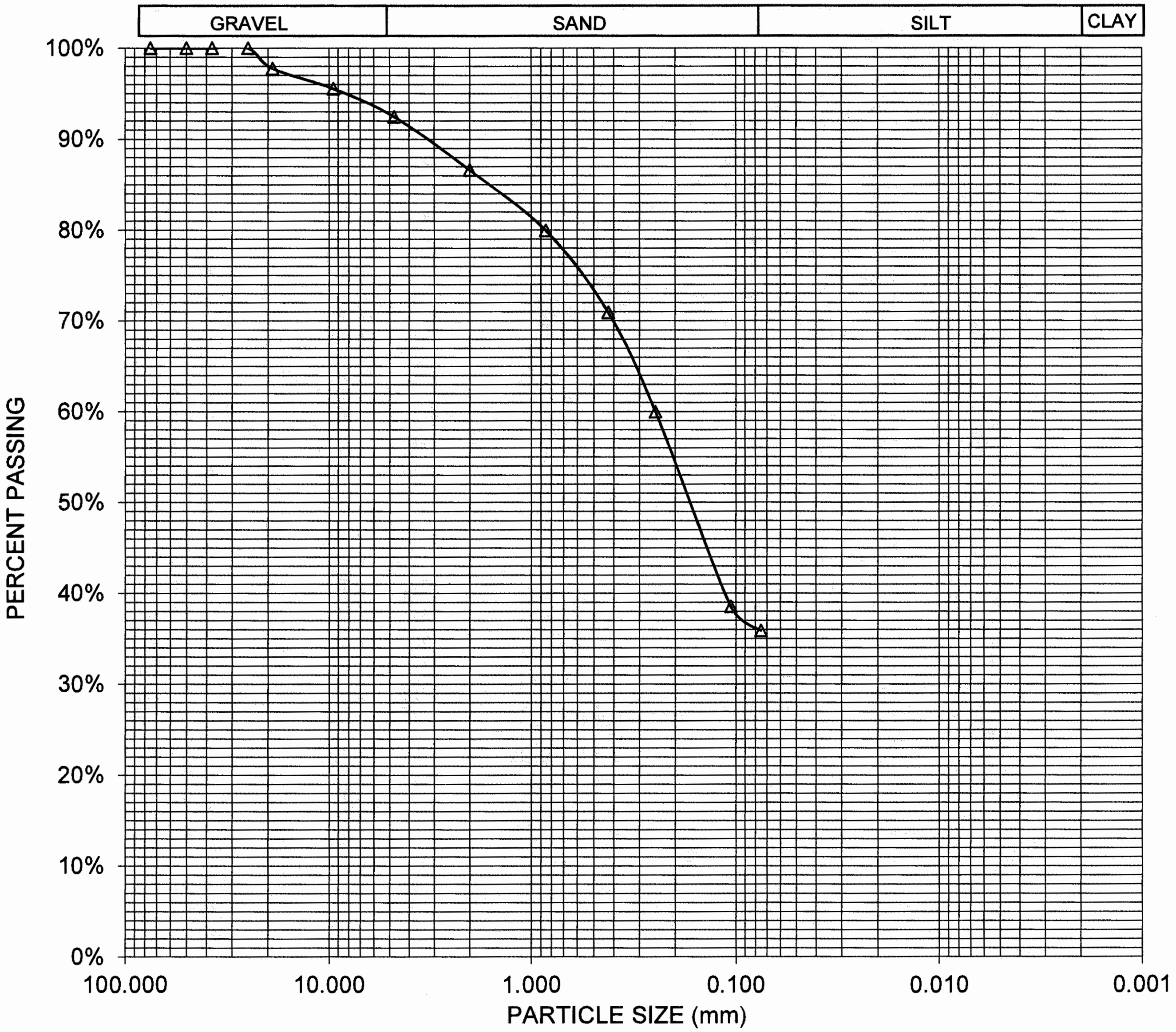
CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	5630 Soquel Drive	B-10

BORING:	B-9	PERCENT	PERCENT
DEPTH (ft):	1	PASSING No. 4	PASSING No. 200
SOIL TYPE (USCS):	SM/SC	89.8%	33.8%



CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	5630 Soquel Drive	B-11

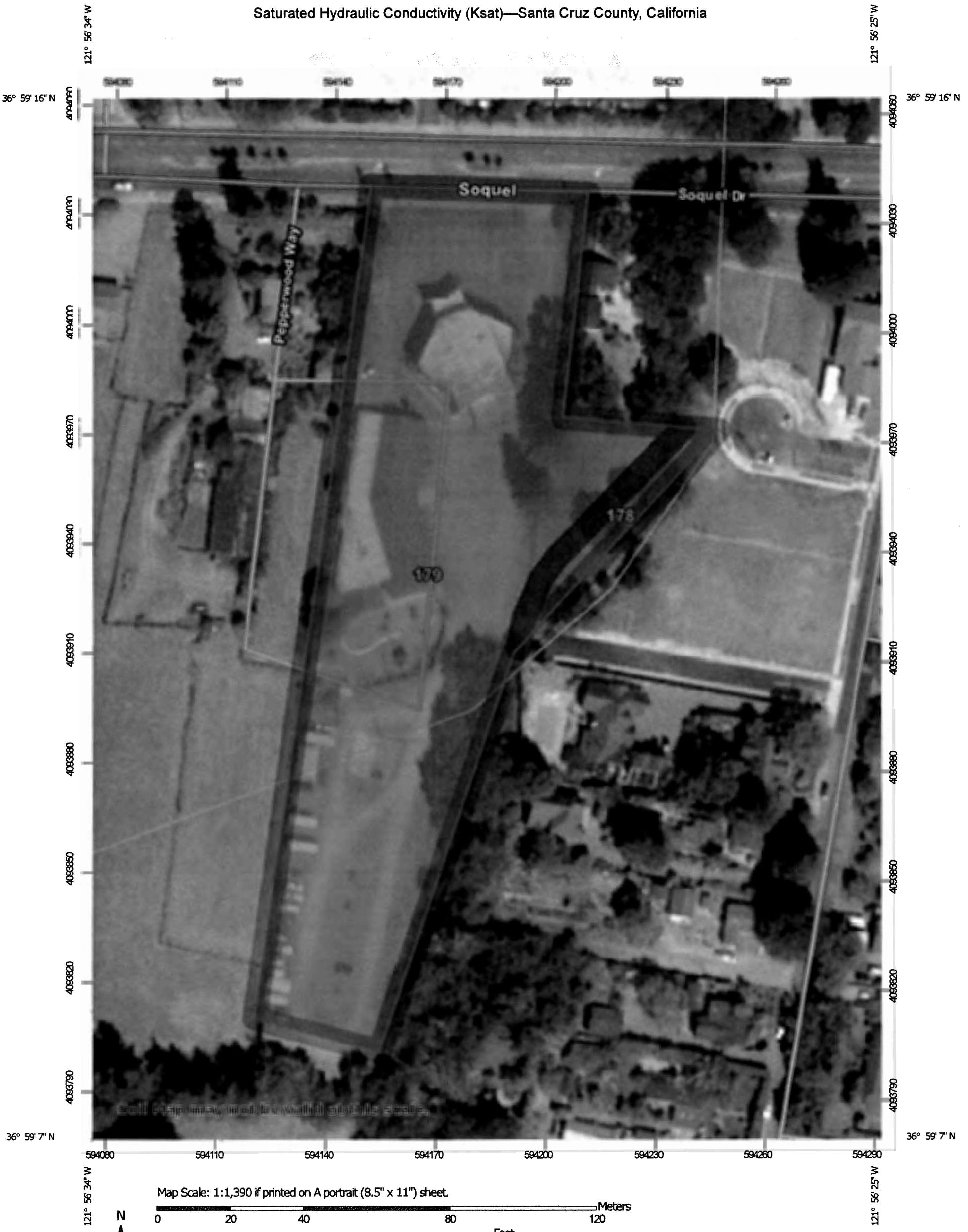
BORING:	B-12	PERCENT PASSING No. 4	PERCENT PASSING No. 200
DEPTH (ft):	1		
SOIL TYPE (USCS):	SM-SC	92.5%	35.9%



CMAG ENGINEERING	**PARTICLE SIZE DISTRIBUTION**	FIGURE
	5630 Soquel Drive	B-12

APPENDIX B
(NRCS SOILS SURVEY)

Saturated Hydraulic Conductivity (Ksat)—Santa Cruz County, California



Map Scale: 1:1,390 if printed on A portrait (8.5" x 11") sheet.

N

0 20 40 80 120 Meters

0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

☐ Area of Interest (AOI)

Soils

Soil Rating Polygons

■ = 3.0057

☐ Not rated or not available

Soil Rating Lines

〰 = 3.0057

⋯ Not rated or not available

Soil Rating Points

▣ = 3.0057

▢ Not rated or not available

Water Features

〰 Streams and Canals

Transportation

┼┼┼ Rails

〰 Interstate Highways

〰 US Routes

〰 Major Roads

〰 Local Roads

Background

▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Cruz County, California
Survey Area Data: Version 12, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
178	Watsonville loam, thick surface, 0 to 2 percent slopes	3.0057 0.43in/hr	0.1	4.2%
179	Watsonville loam, thick surface, 2 to 15 percent slopes	3.0057	3.3	95.8%
Totals for Area of Interest			**3.4**	**100.0%**

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Rating Options

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

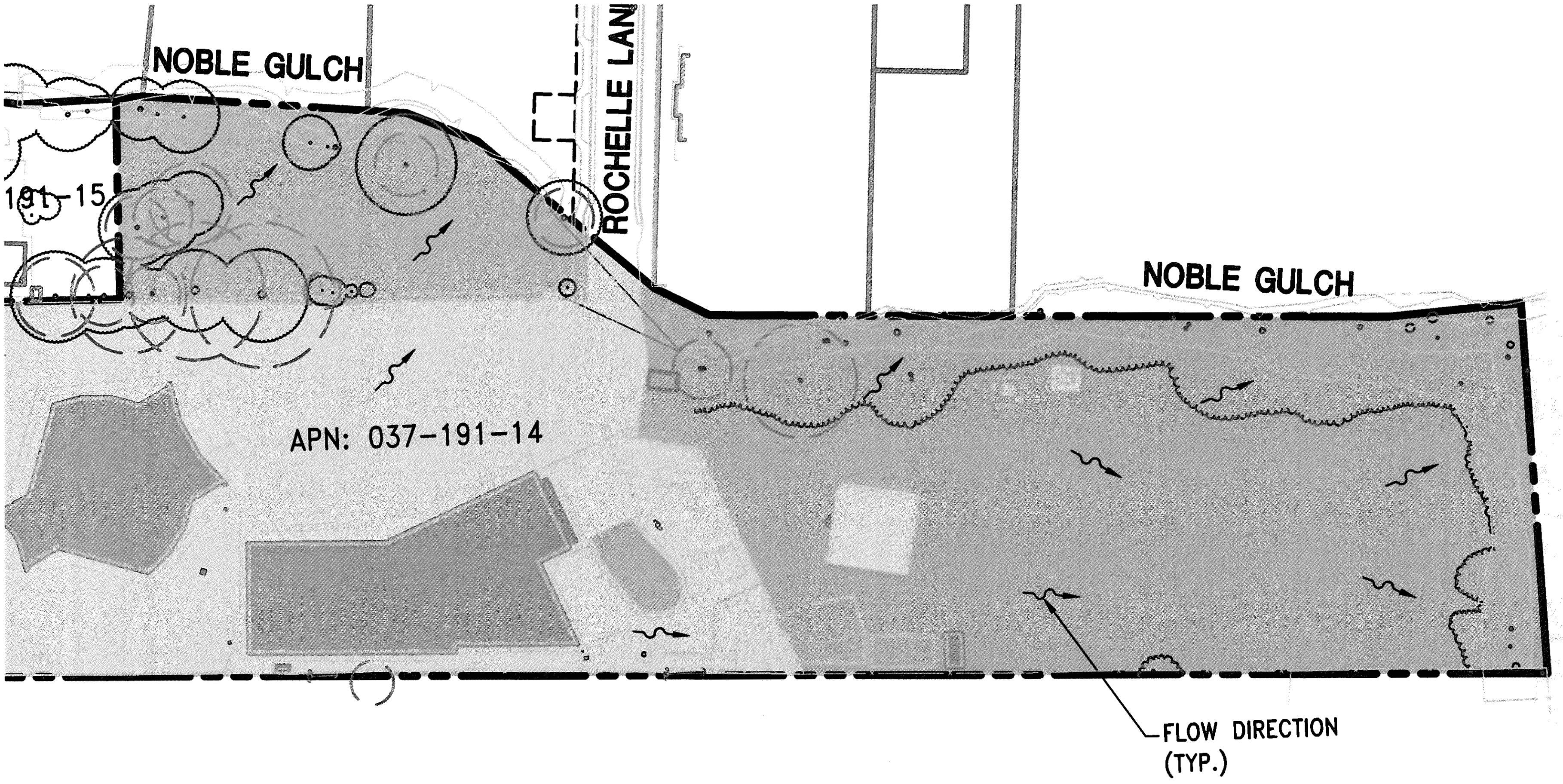
Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): All Layers (Weighted Average)

APPENDIX C
(EXISTING PERVIOUS & IMPERVIOUS)



HATCH

▨

▨

▨

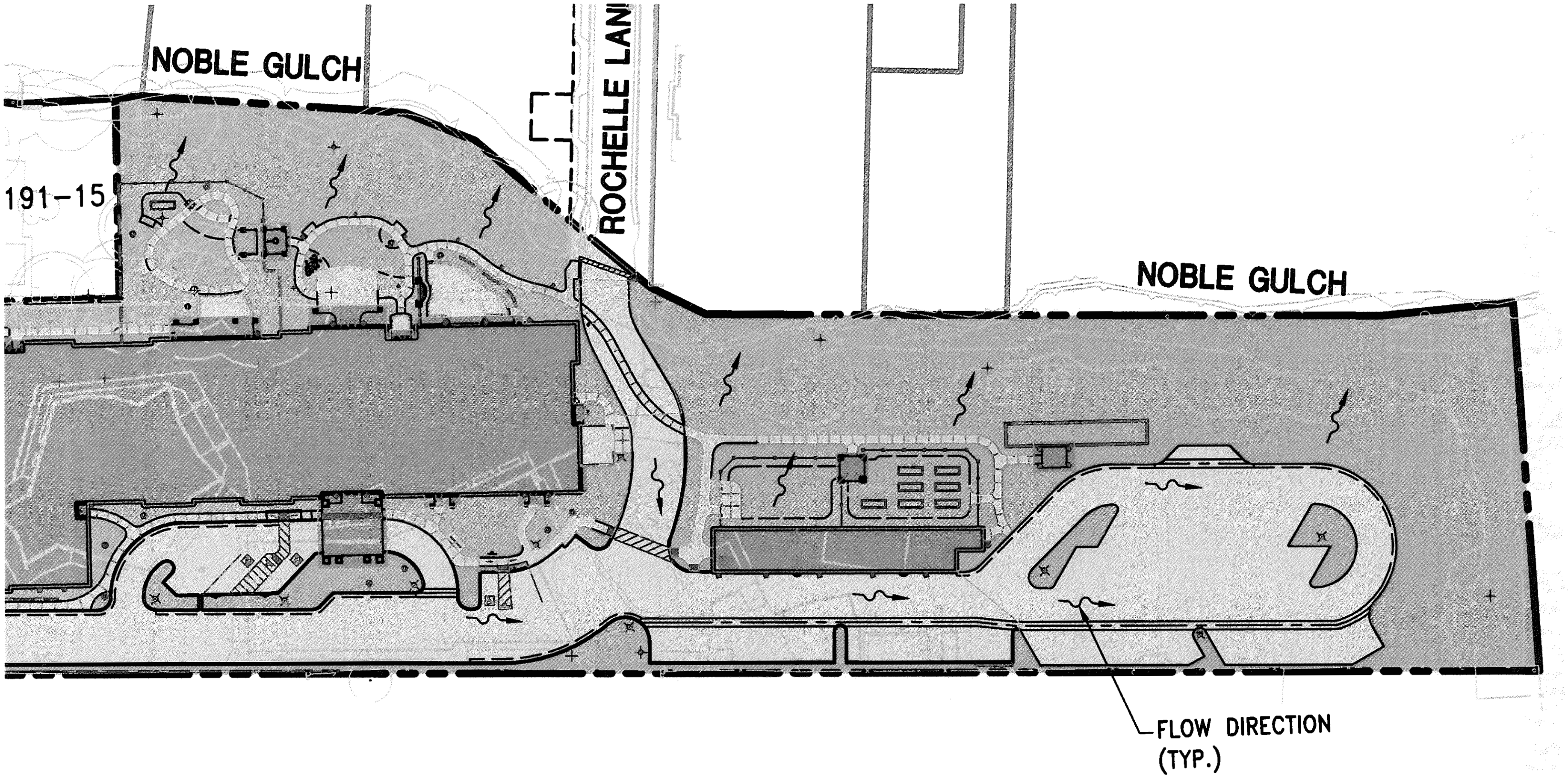
▨

EXISTING AREA

ROOF AREA
HARDSCAPE AREA
AC PAVING
TOTAL IMPERVIOUS AREA
LANDSCAPE AREA
TOTAL AREA

APPENDIX D

(PROPOSED PERVIOUS & IMPERVIOUS)

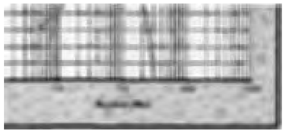


HATCH

PROPOSED ARE
ROOF AREA
HARDSCAPE AREA
AC PAVING
TOTAL IMPERVIOUS AREA
LANDSCAPE AREA
TOTAL AREA

APPENDIX E

(STORMWATER CONTROL PLAN & DETAILS)



itations on Use:

ed rational method, and therefore the standard calculations are applicable to
s up to 20 acres or less
etention volume determinations shall be based on all net new impervious are
d off-site, resulting from the proposed project. Pervious areas shall not be
e detention volume sizing; an exception may be made for incidental pervious
than 10% of the total area
ked detention chambers shall specify on the plans, aggregate that is washed
d uniformly graded (of single size), ensuring void space not less than 35%
wing boundaries of both regulated impervious areas and actual drainage
d to the hydraulic control structure of the detention facility is to be provided,
tinguishing between the two areas, and noting the square footage.
efines a class V injection well as any bored, drilled, or driven shaft, or dug
deeper than its widest surface dimension, or an improved sinkhole, or a
fluid distribution system. Such storm water drainage wells are "authorized
e more information on these rules, contact the EPA. A web site link is
om the County DPW Stormwater Management web page.
e County of Santa Cruz Design Criteria, for complete method criteria

Impervious Area 65844 ft²
Saturated Soil Permeability 0.43 in/hr

Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.16	0.063	0.226	0.048	2118	-0.015	-1336
1200	0.18	0.068	0.244	0.064	3166	0.003	192
960	0.20	0.074	0.268	0.088	4066	0.027	1546
720	0.22	0.084	0.303	0.123	4684	0.062	2661
480	0.26	0.100	0.359	0.180	4903	0.118	3408
360	0.30	0.113	0.406	0.226	4774	0.165	3563
240	0.35	0.134	0.482	0.302	4377	0.241	3472
180	0.40	0.151	0.545	0.365	4018	0.304	3279
120	0.47	0.180	0.647	0.467	3460	0.406	2922
90	0.53	0.203	0.731	0.551	3103	0.490	2644
60	0.63	0.241	0.868	0.688	2606	0.627	2256
45	0.71	0.272	0.980	0.801	2268	0.739	1996
30	0.85	0.323	1.164	0.984	1884	0.923	1662
20	1.01	0.384	1.382	1.203	1541	1.141	1370
15	1.14	0.434	1.562	1.382	1332	1.321	1169
10	1.35	0.515	1.855	1.675	1079	1.614	868
5	1.81	0.691	2.488	2.309	747	2.247	674

STRUCTURE DIMENSIONS FOR RETENTION

4903 ft³ storage volume calculated
40 % void space assumed
12258 ft³ excavated volume needed

Structure	Length	Width*	Depth**
Ratios	71.50	74.50	2.33
Dimen. (ft)	71.20	74.19	2.32

5958 ft² internal surface area
4170 ft² effective surface area
32.6 hrs estimated structure drainage time

* For pipe, use the square root of the sectional area
* If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

3563 ft³ storage volume calculated
100 % void space assumed
3563 ft³ excavated volume needed

Structure	Length	Width*	Depth*
Ratios	1.00	1.00	1.00
Dimen. (ft)	15.27	15.27	15.27

Impervious Area 18826 ft²
Saturated Soil Permeability 0.43 in/hr

Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.16	0.016	0.057	0.012	198	-0.004	-337
1200	0.18	0.017	0.062	0.016	548	0.001	49
960	0.20	0.019	0.068	0.022	846	0.007	390
720	0.22	0.021	0.076	0.031	1075	0.016	672
480	0.26	0.025	0.091	0.045	1196	0.030	861
360	0.30	0.028	0.103	0.057	1192	0.042	900
240	0.35	0.034	0.122	0.076	1116	0.061	877
180	0.40	0.038	0.138	0.092	1035	0.077	828
120	0.47	0.045	0.163	0.118	905	0.102	738
90	0.53	0.051	0.185	0.139	812	0.124	668
60	0.63	0.061	0.219	0.174	665	0.158	570
45	0.71	0.069	0.248	0.202	603	0.187	504
30	0.85	0.082	0.294	0.249	499	0.233	420
20	1.01	0.097	0.349	0.304	410	0.288	346
15	1.14	0.110	0.394	0.349	355	0.333	300
10	1.35	0.130	0.468	0.423	288	0.407	244
5	1.81	0.175	0.628	0.583	200	0.567	170

STRUCTURE DIMENSIONS FOR RETENTION

1196 ft³ storage volume calculated
40 % void space assumed
2989 ft³ excavated volume needed

Structure	Length	Width*	Depth**
Ratios	49.31	49.31	1.25
Dimen. (ft)	49.04	49.04	1.24

2648 ft² internal surface area
1854 ft² effective surface area
18.0 hrs estimated structure drainage time

* For pipe, use the square root of the sectional area
* If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

900 ft³ storage volume calculated
100 % void space assumed
900 ft³ excavated volume needed

Structure	Length	Width*	Depth*
Ratios	1.00	1.00	1.00
Dimen. (ft)	9.65	9.65	9.65

PREDEVELOPMENT DISCHA
DISCHARGE COEFFICIENT
HEADWATER DEPTH (FT)
TAILWATER DEPTH (FT)

ORIFICE AREA (IN²)
ORIFICE DIAMETER (IN)
FINAL ORIFICE DIAMETER
VELOCITY (FT/S)

* ROUNDS DOWN TO NEA

DETE

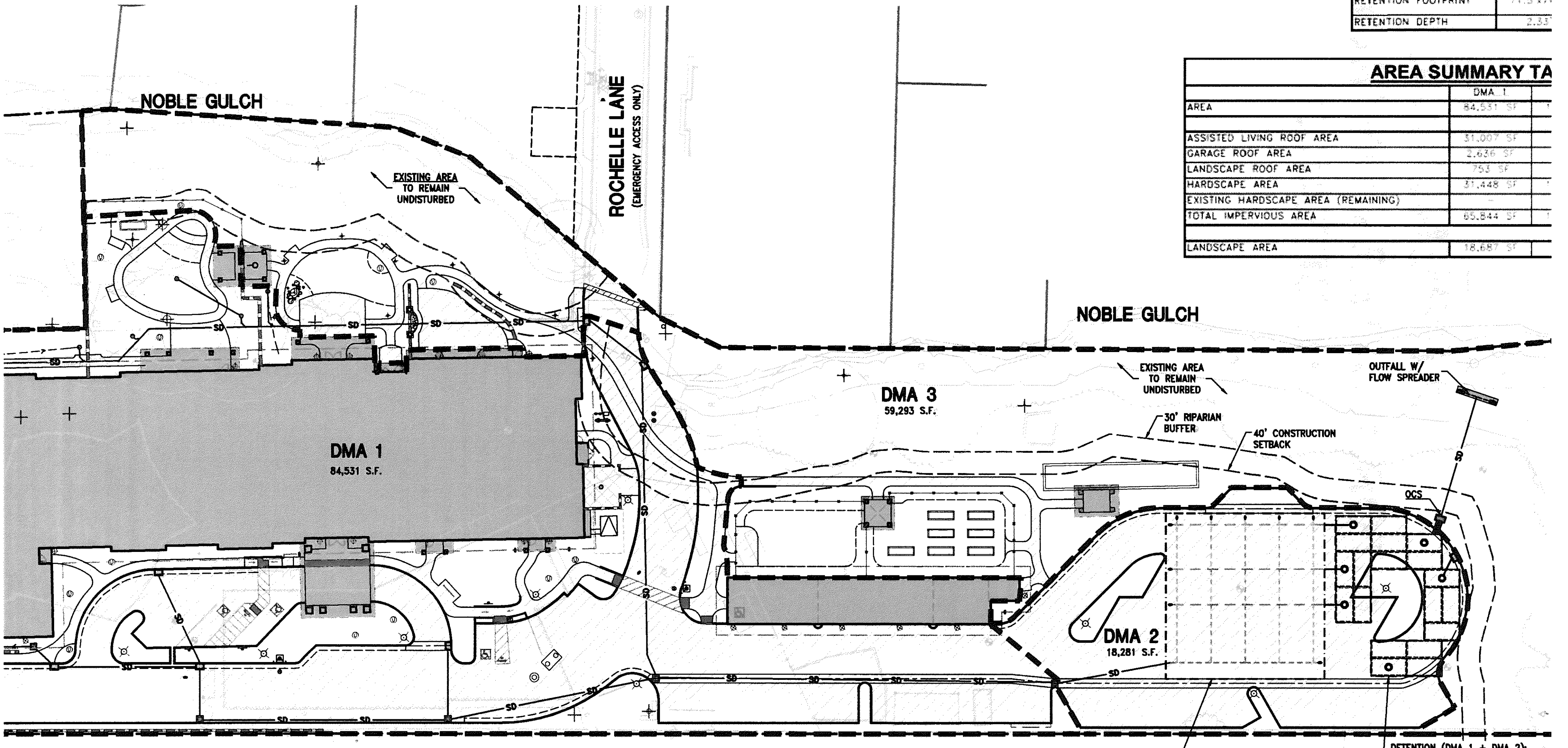
IMPERVIOUS AREA
REQUIRED DETENTIC
VOLUME/MODULE
MODULES REQUIREC

RETENTIO

	DMA
IMPERVIOUS AREA	65,844
RETENTION FOOTPRINT	71.5'x7
RETENTION DEPTH	2.33'

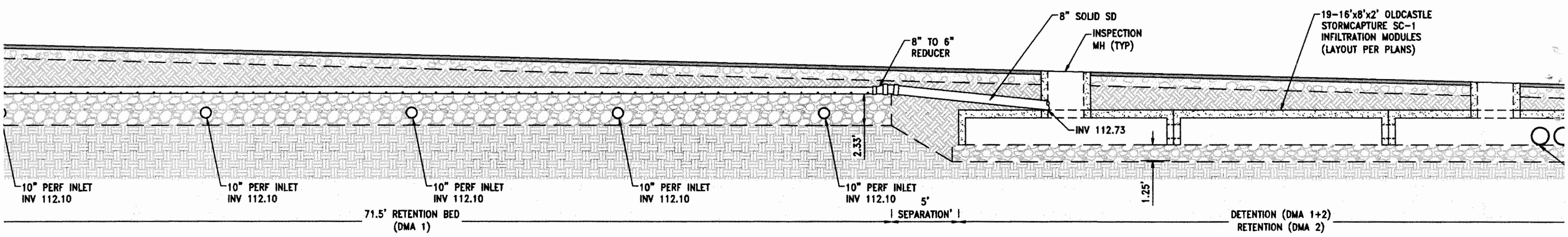
AREA SUMMARY TA

	DMA 1
AREA	84,531 SF
ASSISTED LIVING ROOF AREA	31,007 SF
GARAGE ROOF AREA	2,636 SF
LANDSCAPE ROOF AREA	753 SF
HARDSCAPE AREA	31,448 SF
EXISTING HARDSCAPE AREA (REMAINING)	-
TOTAL IMPERVIOUS AREA	65,844 SF
LANDSCAPE AREA	18,687 SF



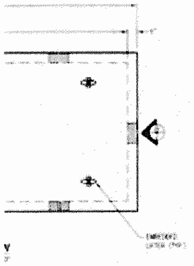
RETENTION (DMA 1)
71.5'x74.5'x2.33'
CRUSHED STONE

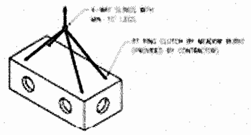
DETENTION (DMA 1 + DMA 2):
OLDCASTLE STORMCAPTURE SC-1 IN
19 - 16'x8'x2' MODULES
DETENTION CAPACITY 3,990 CF
RETENTION (DMA 2):
1.25' CRUSHED STONE RETENTION



SECTION A

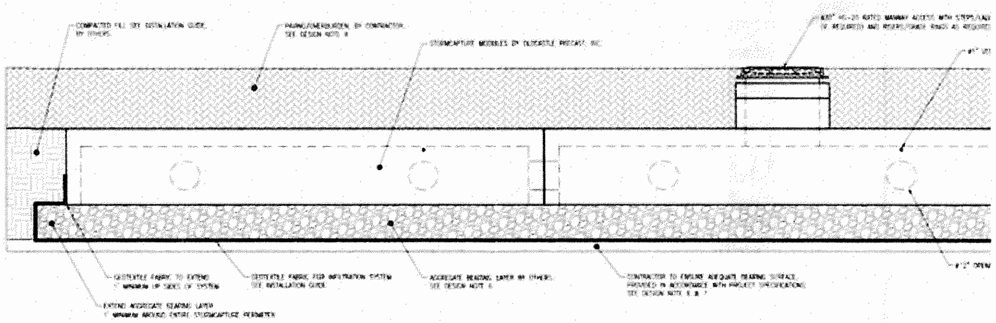
1"=5'



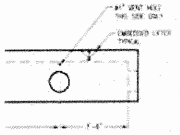


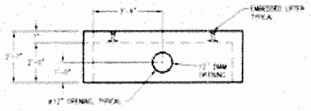
MODULE LIFTING DETAIL

N.T.S.



TYPICAL ELEVATION





VIEW B

- PRELIMINARY -
NOT FOR CONSTRUCTION

Oldcastle Precast

DESIGN NOTES:
1. DESIGN LOADINGS:
   - A. AASHTO HS-20-44 W/ IMPACT
   - B. DEPTH OF COVER = 6" - 5'-0" (120 PCF ASSUMED)
   - C. ASSUMED WATER TABLE = BELOW BOTTOM OF PRECAST
   - D. DRY LATERAL EARTH PRESSURE (EFP) = 45 PCF
   - E. LATERAL LIVE LOAD SURCHARGE = 80 PSF (APPLIED TO 8' BELOW GRADE)
   - F. NO LATERAL SURCHARGE FROM ADJACENT BUILDINGS, WALL PIERS, OR FOUNDATIONS
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH SHALL BE 6,000 PSI
3. STEEL REINFORCEMENT: REBAR, ASTM A-615 OR A-706 GRADE 60

APPENDIX F
(RETENTION CALCULATIONS)

PROJECT: Oakmont Assisted Living - APN: 037-19-114 & -115 (DMA 1) **Calc by:** GS **Date:** 1/23/2019

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES **Notes & Limitations on Use:** SS Ver:1.0

Site Location P60 Isopleth:	1.50	Fig. SWM-2
Rational Coefficients Cpre:	0.25	
Cpost:	0.90	
Impervious Area:	65844	ft^2
Saturated Soil Permeability:	0.43	in/hr

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.

Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.

Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.

Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.

Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.16	0.063	0.226	0.046	2118	-0.015	-1336
1200	0.18	0.068	0.244	0.064	3186	0.003	192
960	0.20	0.074	0.268	0.088	4066	0.027	1546
720	0.22	0.084	0.303	0.123	4684	0.062	2661
480	0.26	0.100	0.359	0.180	4903	0.118	3408
360	0.30	0.113	0.406	0.226	4774	0.165	3563
240	0.35	0.134	0.482	0.302	4377	0.241	3472
180	0.40	0.151	0.545	0.365	4018	0.304	3279
120	0.47	0.180	0.647	0.467	3480	0.406	2922
90	0.53	0.203	0.731	0.551	3103	0.490	2644
60	0.63	0.241	0.868	0.688	2606	0.627	2256
45	0.71	0.272	0.980	0.801	2286	0.739	1996
30	0.85	0.323	1.164	0.984	1884	0.923	1662
20	1.01	0.384	1.382	1.203	1541	1.141	1370
15	1.14	0.434	1.562	1.382	1332	1.321	1189
10	1.35	0.515	1.855	1.675	1079	1.614	968
5	1.81	0.691	2.488	2.309	747	2.247	674

STRUCTURE DIMENSIONS FOR RETENTION

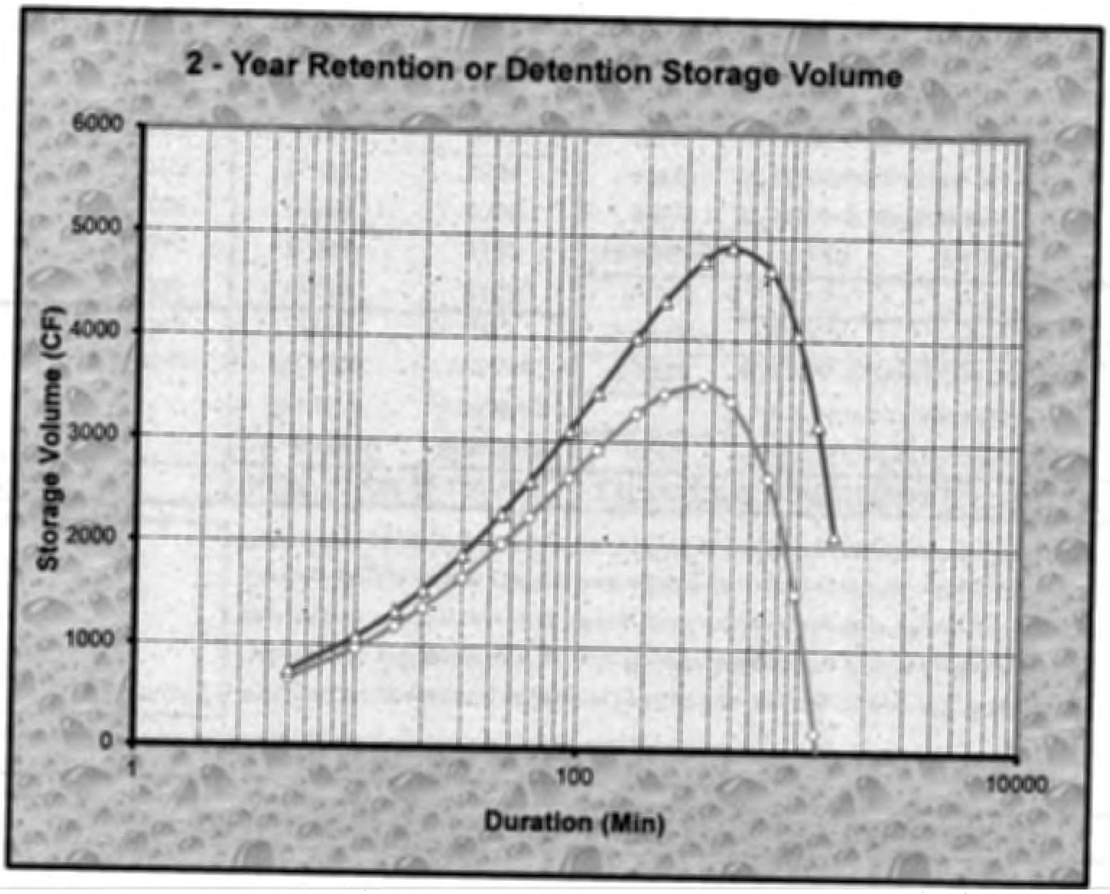
4903	ft^3 storage volume calculated		
40	% void space assumed		
12258	ft^3 excavated volume needed		
Structure	Length	Width*	Depth* #
Ratios	71.50	74.50	2.33
Dimen. (ft)	**71.20**	**74.19**	**2.32**
5958	ft^2 internal surface area		
4170	ft^2 effective surface area		
32.8	hrs estimated structure drainage time		

* For pipe, use the square root of the sectional area.

\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

3563	ft^3 storage volume calculated		
100	% void space assumed		
3563	ft^3 excavated volume needed		
Structure	Length	Width*	Depth*
Ratios	1.00	1.00	1.00
Dimen. (ft)	**15.27**	**15.27**	**15.27**


2 - Year Retention or Detention Storage Volume
Storage Volume (CF)
6000
5000
4000
3000
2000
1000
0
1
100
10000
Duration (Min)

PROJECT: Oakmont Assisted Living - APN: 037-19-114 & -115 (DMA 2) **Calc by:** GS **Date:** 1/23/2019

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES **Notes & Limitations on Use:** SS Ver:1.0

Site Location P60 Isopleth:	1.50	Fig. SWM-2
Rational Coefficients Cpre:	0.25	
Cpost:	0.90	
Impervious Area:	16626	ft^2
Saturated Soil Permeability:	0.43	in/hr

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.

Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.

Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.

Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.

Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.16	0.016	0.057	0.012	198	-0.004	-337
1200	0.18	0.017	0.062	0.016	548	0.001	49
960	0.20	0.019	0.068	0.022	846	0.007	390
720	0.22	0.021	0.076	0.031	1075	0.016	672
480	0.26	0.025	0.091	0.045	1196	0.030	861
360	0.30	0.028	0.103	0.057	1192	0.042	900
240	0.35	0.034	0.122	0.076	1116	0.061	877
180	0.40	0.038	0.138	0.092	1035	0.077	828
120	0.47	0.045	0.163	0.118	905	0.102	738
90	0.53	0.051	0.185	0.139	812	0.124	668
60	0.63	0.061	0.219	0.174	686	0.158	570
45	0.71	0.069	0.248	0.202	603	0.187	504
30	0.85	0.082	0.294	0.249	499	0.233	420
20	1.01	0.097	0.349	0.304	410	0.288	346
15	1.14	0.110	0.394	0.349	355	0.333	300
10	1.35	0.130	0.468	0.423	288	0.407	244
5	1.81	0.175	0.628	0.583	200	0.567	170

STRUCTURE DIMENSIONS FOR RETENTION

1196 ft^3 storage volume calculated

40 % void space assumed

2989 ft^3 excavated volume needed

Structure	Length	Width*	Depth* #
Ratios	49.31	49.31	1.25
Dimen. (ft)	**49.04**	**49.04**	**1.24**

2648 ft^2 internal surface area

1854 ft^2 effective surface area

18.0 hrs estimated structure drainage time

* For pipe, use the square root of the sectional area.

\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

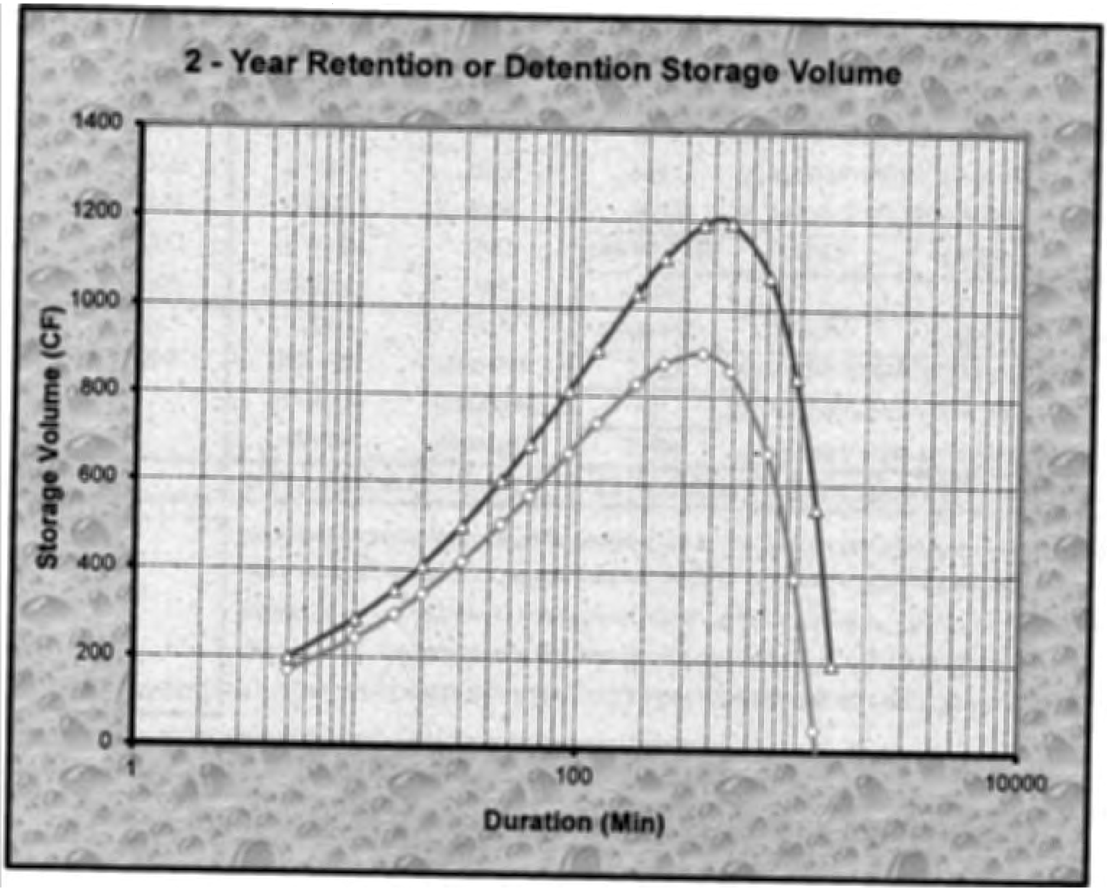
STRUCTURE DIMENSIONS FOR DETENTION

900 ft^3 storage volume calculated

100 % void space assumed

900 ft^3 excavated volume needed

Structure	Length	Width*	Depth*
Ratios	1.00	1.00	1.00
Dimen. (ft)	**9.65**	**9.65**	**9.65**



2 - Year Retention or Detention Storage Volume

APPENDIX G

(DETENTION CALCULATIONS)

PROJECT: OAKMONT ASSISTED LIVING - APN: 037-119-114 (DMA 1+2) **Calc by:** GS **Date:** 1/22/2019

RUNOFF DETENTION BY THE MODIFIED RATIONAL METHOD

Data Entry: PRESS TAB & ENTER DESIGN VALUES SS Ver: 1.0

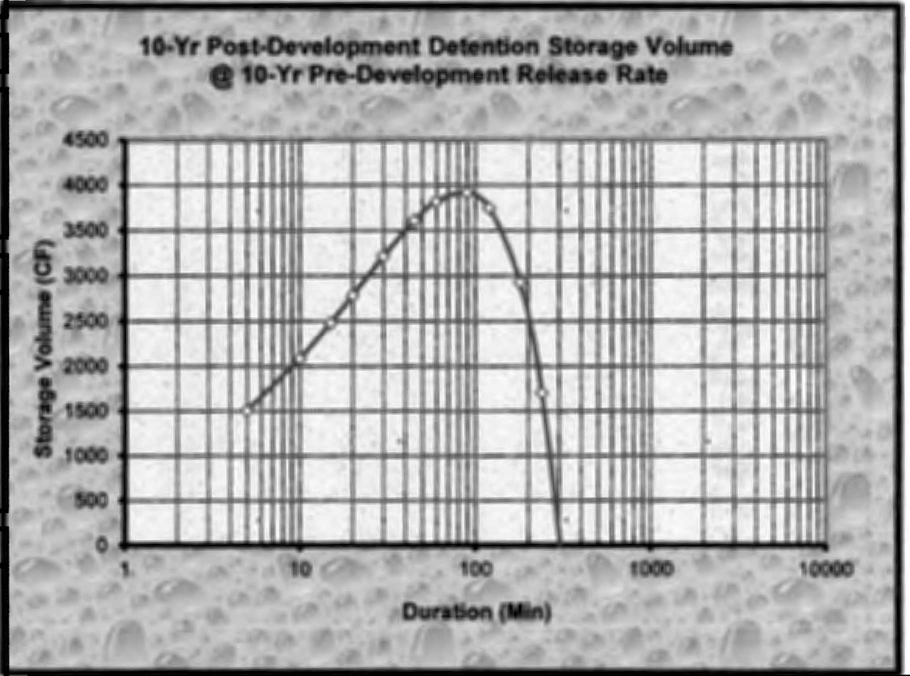
Site Location P60 Isopleth: 1.50 Fig. SWM-2 in County Design Criteria
Rational Coefficients Cpre: 0.25 See note # 2
Cpost: 0.90 See note # 2
Impervious Area: 82470 ft^2 See note # 2 and # 4

STRUCTURE DIMENSIONS FOR DETENTION

3922 ft^3 storage volume calculated
100 % void space assumed
3922 ft^3 excavated volume needed

Structure	Length	Width*	Depth*
Ratios	1.00	1.00	1.00
Dimen. (ft)	**15.77**	**15.77**	**15.77**

*For pipe, use the square root of the sectional area



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	0.26	0.123	0.441	-0.408	-44015
1200	0.28	0.132	0.477	-0.372	-33486
960	0.31	0.146	0.524	-0.325	-23382
720	0.34	0.165	0.592	-0.257	-13865
480	0.41	0.195	0.703	-0.146	-5244
360	0.46	0.221	0.795	-0.054	-1470
240	0.55	0.262	0.944	0.095	1702
180	0.62	0.296	1.066	0.217	2929
120	0.74	0.352	1.266	0.417	3752
90	0.83	0.397	1.430	0.581	3922
60	0.99	0.472	1.698	0.849	3822
45	1.12	0.533	1.919	1.070	3610
30	1.33	0.633	2.278	1.429	3216
20	1.57	0.752	2.706	1.857	2785
15	1.78	**0.849**	3.057	2.207	2483
10	2.11	1.008	3.630	2.781	2086
5	2.83	1.353	4.870	4.020	1508

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 are 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.

DETENTION SUMMARY

	DMA 1 + 2
IMPERVIOUS AREA (DMA 1+2)	82,470 CF
REQUIRED DETENTION (SWM-17)	3,922 CF
VOLUME/MODULE	210 CF
MODULES REQUIRED	19

10-YEAR ORIFICE SIZING (DMA 1+2)

PREDEVELOPMENT DISCHARGE RATE (FT^3/S)	0.849
DISCHARGE COEFFICIENT	0.61
HEADWATER DEPTH (FT)	2.00
TAILWATER DEPTH (FT)	0
ORIFICE AREA (IN^2)	17.66
ORIFICE DIAMETER (IN)	**4.74**
FINAL ORIFICE DIAMETER (IN)*	4 5/8
VELOCITY (FT/S)	6.92

* ROUNDS DOWN TO NEAREST 1/8

APPENDIX H

(DOWNSTREAM ANALYSIS)

S

100


PORTER GULCH RD
PORTER GULCH RD
JOHANNA RD
TOLAK RD
TOLAK RD
CALLE SERRA
MERRILL RD
McGLENN DR
ARLINGTON DR
BASELINE DR
WILLOWBROOK LN
CABRILLO COLLEGE DR
PARK AV
VICTORY LN
BAY HEIGHTS
MONTEREY AV
CUNNISON LN
FAIRWAY DR
FAIRWAY DR
LAURENTIAN DR
GLEN HAVEN RD
SYCAMORE ST
PRESCOTT RD
GLEN HAVEN RD
HIHN'S RAILROAD GRADE
CHERRYVALE AVE
HIHN M/R
ORCHARD ST
EDRINGTON WY
ROSEDALE AV
SOQUEL DR
CARY DR
CAPITOLA AV
BELLEVUE ST
CENTER ST
VIA GATOS
MAIN ST
MAIN ST
BRIDGE ST
SOQUEL SAN JOSE RD

County of Santa Cruz
Stormwater Facilities Management System
Conveyance Facilities
06 - Soquel Creek Basin

	LOCATION				EXISTING SECTION								DESIGN DISCHARGE (cfs)						Section Capacity
ID	Comments	Type	USIE	DSIE	USGE	DSGE	Length	Slope	Man N	No	Size*	Base*	2	5	10	25	50	100	
062514-062520	CMP	Pipe			70	60	87	.1149	.024	1	72.0		40	65	83	105	118	138	778
062520-060240	Ditch	Natural Channel					150		.035	1			53	92	121	159	183	212	
062600-062504		Pipe	111.39	105.43	116		371	.0161	.013	1	36.0		8	13	16	20	23	27	85
062604-062506		Pipe	105.43	103.50	112		269	.0072	.013	1	24.0		8	13	16	20	23	27	19
062606-062508	Ditch	Natural Channel					234		.035				8	13	16	20	23	27	
062608-062510		Pipe	93.00	85.36			155	.0493	.013	1	36.0		8	13	16	20	23	27	148
062700-062702		Pipe	87.50	82.50			924	.0054	.013	1	18.0		3	6	8	10	12	14	8
062702-062704		Pipe	82.50	62.70		69	414	.0478	.013	1	21.0		3	6	8	10	12	14	35
062704-062520		Pipe	62.70	53.16	69		440	.0217	.013	1	24.0		3	6	8	10	12	14	33
062800-062810		Roadway		57.00	110	61	888	.0552	.020	1			1	2	4	9	12	16	
062810-062816		Pipe	57.00	29.90			558	.0486	.013	1	12.0		1	2	4	9	12	16	8
062816-062818		Pipe	29.90	23.45			207	.0312	.013	1	18.0		1	2	4	9	12	16	19
062818-062820		Pipe	23.45	23.20			351	.0007	.013	1	27.0		1	2	4	9	12	16	8
062820-060250		Pipe	23.20	13.20			645	.0155	.013	1	27.0		5	12	19	31	41	52	39
062828-060250	Ditch	Natural Channel					137		.035				5	12	19	31	41	52	
063000-063010	O/S Zone 5	Natural Channel					1705		.035		9.8	19.4	5	11	15	23	28	35	
063010-063030	O/S Zone 5	Natural Channel					1356		.035		9.8	19.4	9	20	30	44	55	67	
063030-063040		Natural Channel			146	130	954	.0168	.035		23.3	27.3	12	26	39	58	73	90	115
063040-063050		Pipe	122.00	117.70	130		184	.0234	.013	1	48.0		13	28	42	63	79	98	220
063050-063052		Natural Channel			126	120	257	.0233	.035		24.1	15.5	15	32	47	72	91	113	210
063052-063054		Pipe			120	120	94	.0053	.013	1	48.0		15	32	47	72	91	113	105
063054-063060		Natural Channel			120	92	863	.0319	.035		24.1	15.5	15	32	47	72	91	113	245
063060-063062		Natural Channel			92	90	389	.0051	.035		86.5	42.2	46	102	155	238	305	385	423
063062-063070		Pipe	80.25	77.42			302	.0094	.013	1	54.0		46	102	155	238	305	385	191
063070-063072		Natural Channel			80	74	565	.0106	.035		95.3	48.6	76	174	265	406	518	646	653

*NOTE: Size = diameter in inches for pipes, depth in feet for boxes and improved channels, and area in square feet for natural channels.
Base = Base width in feet for boxes and improved channels, and wetted perimeter in feet for natural channels.

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Wednesday, Jan 23 2019

EXISTING CULVERT (MEASURED)

Circular

Diameter (ft) = 4.00

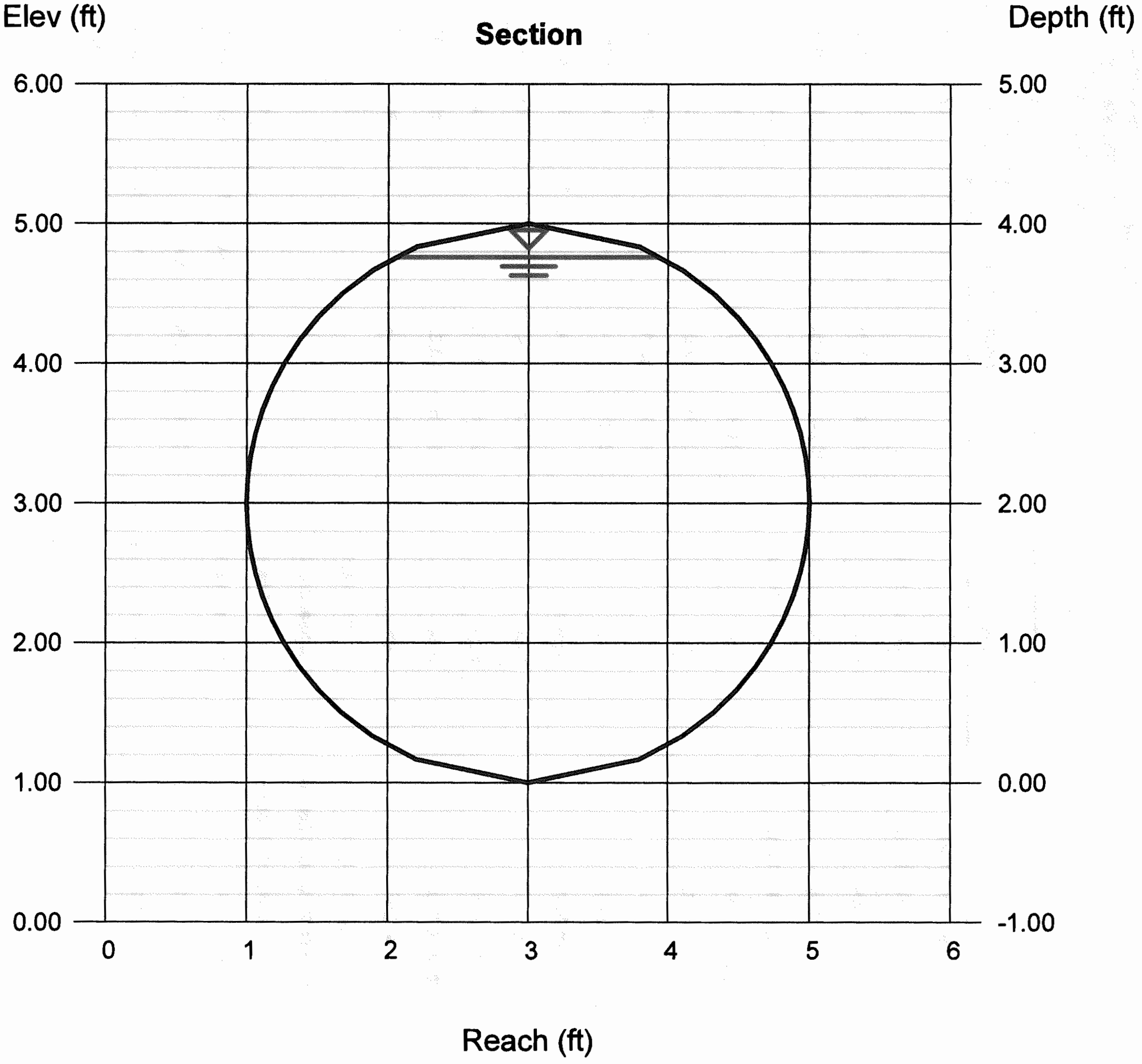
Invert Elev (ft) = 1.00
Slope (%) = 1.43
N-Value = 0.013

Calculations

Compute by: Q vs Depth
No. Increments = 50

Highlighted

Depth (ft) = 3.76
Q (cfs) = 184.78
Area (sqft) = 12.26
Velocity (ft/s) = 15.07
Wetted Perim (ft) = 10.60
Crit Depth, Yc (ft) = 3.80
Top Width (ft) = 1.89
EGL (ft) = 7.29



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Jan 23 2019

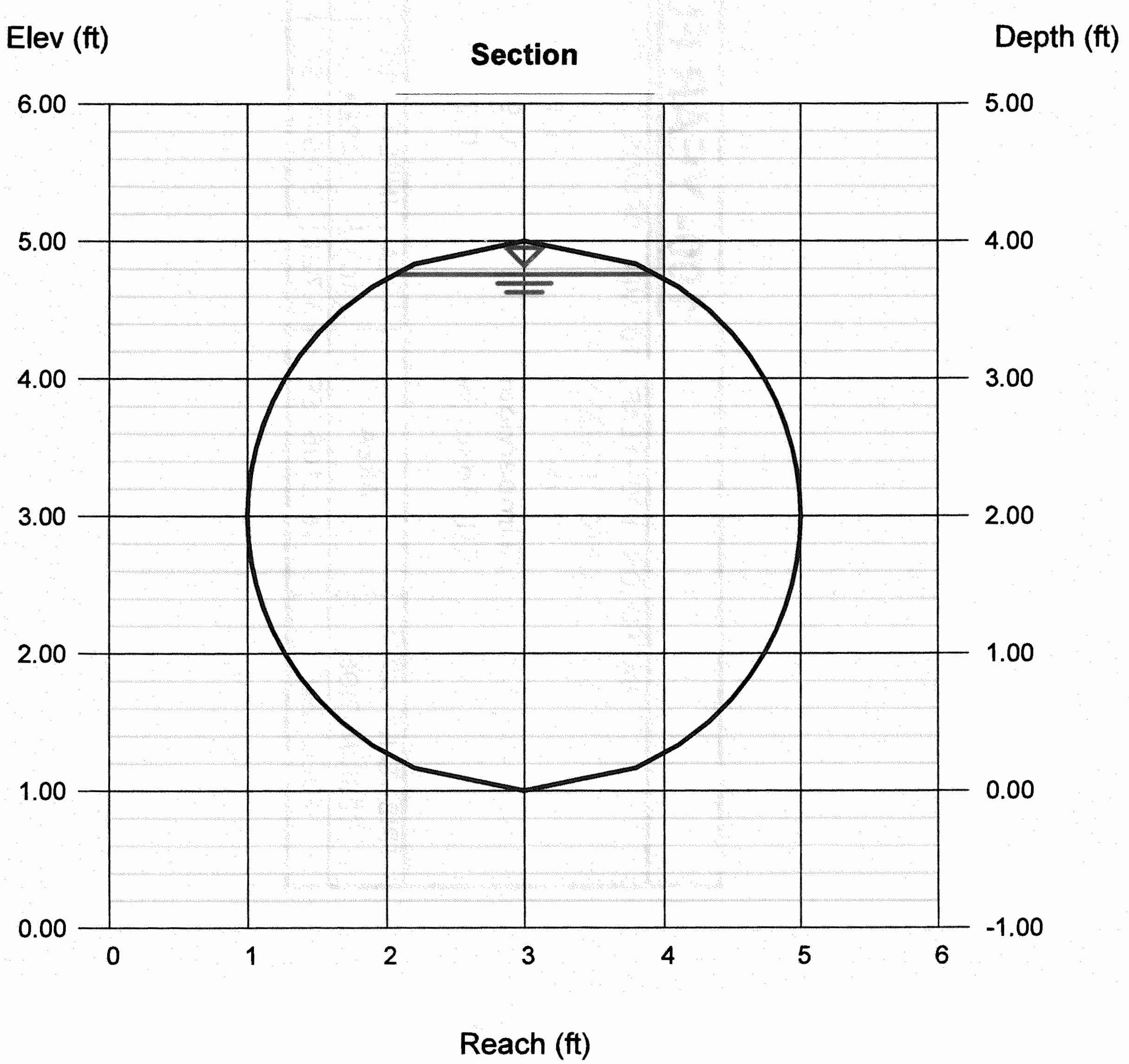
EX. CULVERT (ZONE 5 REPORT VALUES)

Circular
Diameter (ft) = 4.00

Invert Elev (ft) = 1.00
Slope (%) = 0.53
N-Value = 0.013

Calculations
Compute by: Q vs Depth
No. Increments = 50

Highlighted
Depth (ft) = 3.76
Q (cfs) = 112.49
Area (sqft) = 12.26
Velocity (ft/s) = 9.17
Wetted Perim (ft) = 10.60
Crit Depth, Yc (ft) = 3.21
Top Width (ft) = 1.89
EGL (ft) = 5.07



100- YEAR FLOW

BASED ON 100-YEAR, 10 MIN. DESIGN STORM I (IN/HR)= 3.17

Q=(Ca)(Cw)(i)(A) P60=1.5

Ca= 1.1

C(impervious) 0.9

C(landscape) 0.2

TRIBUTARY AREA DESIGNATION	AREA	AREA (AC)	IMPERVIOUS AREA	PERVIOUS AREA	WEIGHTED Cw	Cw x Ca	Q, FLOW (CFS)
FULL SITE	162,105 SF	3.721	87,941 SF	74,164 SF	0.58	0.64	**7.5 CFS**

Attachment 7

Stormwater Infiltration Study

February 19, 2019

THE COUNTY OF SANTA CRUZ
1850

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CMAG ENGINEERING, INC.
P.O. BOX 640, APTOS, CALIFORNIA 95001
PHONE: 831.475.1411
WWW.CMAGENGINEERING.COM

February 19, 2019
Project No. 18-141-SC

Bill Mabry
9240 Old Redwood Highway, Suite 200
Windsor, California 95492

SUBJECT: **STORMWATER INFILTRATION STUDY**
Proposed Assisted Living Facility
5630 Soquel Avenue, Soquel, Santa Cruz County, California
APN 037-191-14

Dear Mr. Mabry:

1.0 INTRODUCTION

As requested, our firm has performed infiltration testing at the subject site in order to aid in quantifying the infiltration rates of the near-surface soils in the area of the proposed stormwater control measures (SCMs) for the subject project. The testing was performed in general accordance with the referenced infiltration testing guidelines prepared by Earth Systems Pacific (2013). The subject infiltration testing was performed upon completion of the referenced Geotechnical Investigation report for the subject site which depicts the subsurface soil/bedrock conditions as well the groundwater elevation at the time of our field investigation.

Based on the referenced plans prepared by Ifland Engineers (2019), the proposed SCMs for the project, consist of relatively shallow (1 to 6 feet embedment below grade) retention/detention facilities. The retention facilities consist of approximately 5,300 square feet of crushed stone underlying a permeable driveway/parking surface. The crushed stone layer is approximately 2 feet thick. The retention system overflows into the detention system at the southernmost end of the driveway/parking area consisting of a series of concrete Oldcastle Stormcapture Modules.

Based on our geotechnical investigation, these facilities will be embedded entirely into artificial fill and will not extend into the underlying native terrace deposits. Our infiltration testing was performed to quantify the infiltration rates of the soils that the proposed SCMs will be embedded into, in order to aid in sizing of the facilities.

A total of 4 infiltration test sites were constructed in the area of the proposed SCMs. The depths of the testing ranged from approximately 6.5 to 8 feet below the existing grades which corresponds to approximately 2 feet below the invert elevation of the proposed SCMs.

2.0 TEST PREPARATION

Four, 6-inch diameter, boreholes were drilled to various depths at the site on February 5, 2019. The drilling method consisted of hydraulically operated continuous flight augers. The sidewalls of the boreholes were scraped and three inch perforated pipe was installed. The annulus between the pipe and borehole sidewall was filled with fine gravel. All test locations were saturated twenty-four hours prior to commencement of the infiltration testing. The approximate test locations are shown on Figure 1.

3.0 TESTING PROCEDURE

The testing was performed in general accordance with the referenced infiltration testing guidelines prepared by Earth Systems Pacific (2013) for "shallow infiltration-based stormwater control measures." This testing method utilizes a 30-minute period in which a constant head is maintained at the proposed elevation of the base of the SCMs. The volume of water that entered the test pipe during the 30-minute period is measured and recorded. Immediately following the 30-minute period of constant head, a falling head infiltration test is performed. Depending on the rate of fall, measurements are recorded at intervals ranging from 1 minute to 30 minutes, over a period of 2 hours, or less if 2 refills occur.

Our firm performed infiltration testing at 4 locations (I-1 through I-4) on February 6, 2019. The falling head infiltration testing was initiated at a water level approximately 8 to 12 inches below the existing grades and extended to the bottom of the pipe, or to the last water level reading at the end of testing as designated by the guidelines.

4.0 TEST RESULTS

The Porchet Method (Inverse Borehole Method) was used to determine the infiltration rate (I_t) in units of inches/hour, for each test location. The infiltration rate (I_t) is then divided by a factor of safety of 2 in order to determine the measured infiltration rate (KM). The I_t and KM for each test location is presented below:

Infiltration Test	I_t (in/hr)	KM (in/hr)
I-1	0.05	0.03
I-2	0.07	0.04
I-3	15.8	7.9
I-4	14.6	7.3

5.0 DISCUSSION

The infiltration rates for I-1 and I-2, located on the northern portion of the proposed SCMs were relatively slow. The calculated rates for KM ranged from 0.03 to 0.04 inches per hour.

The infiltration rates for I-3 and I-4, located on the southern portion of the proposed SCMs were relatively high. The calculated rates for KM ranged from 7.3 to 7.9 inches per hour.

There are many probable reasons for the varying infiltration rates determined during our testing, not the least of which include dissimilar soil types placed as fill within the project area, variations in the relative density and permeablity of the fill soils, and potentially saturated soils within nearby undisclosed utility trenches.

6.0 RECOMMENDATIONS

We recommend the project designer use the test results presented above for the design of the proposed SCMs, however, the design should be conservatively based on engineering judgement and experience in the vicinity.

It is a pleasure being associated with you on this project. If you have any questions or if we may be of further assistance please do not hesitate to contact our office.

Sincerely,

CMAG ENGINEERING, INC.

SHANNON S. CHOME
No. 68398
CIVIL

Shannon Chome', PE
Senior Engineer
C 68398
Expires 9/30/19

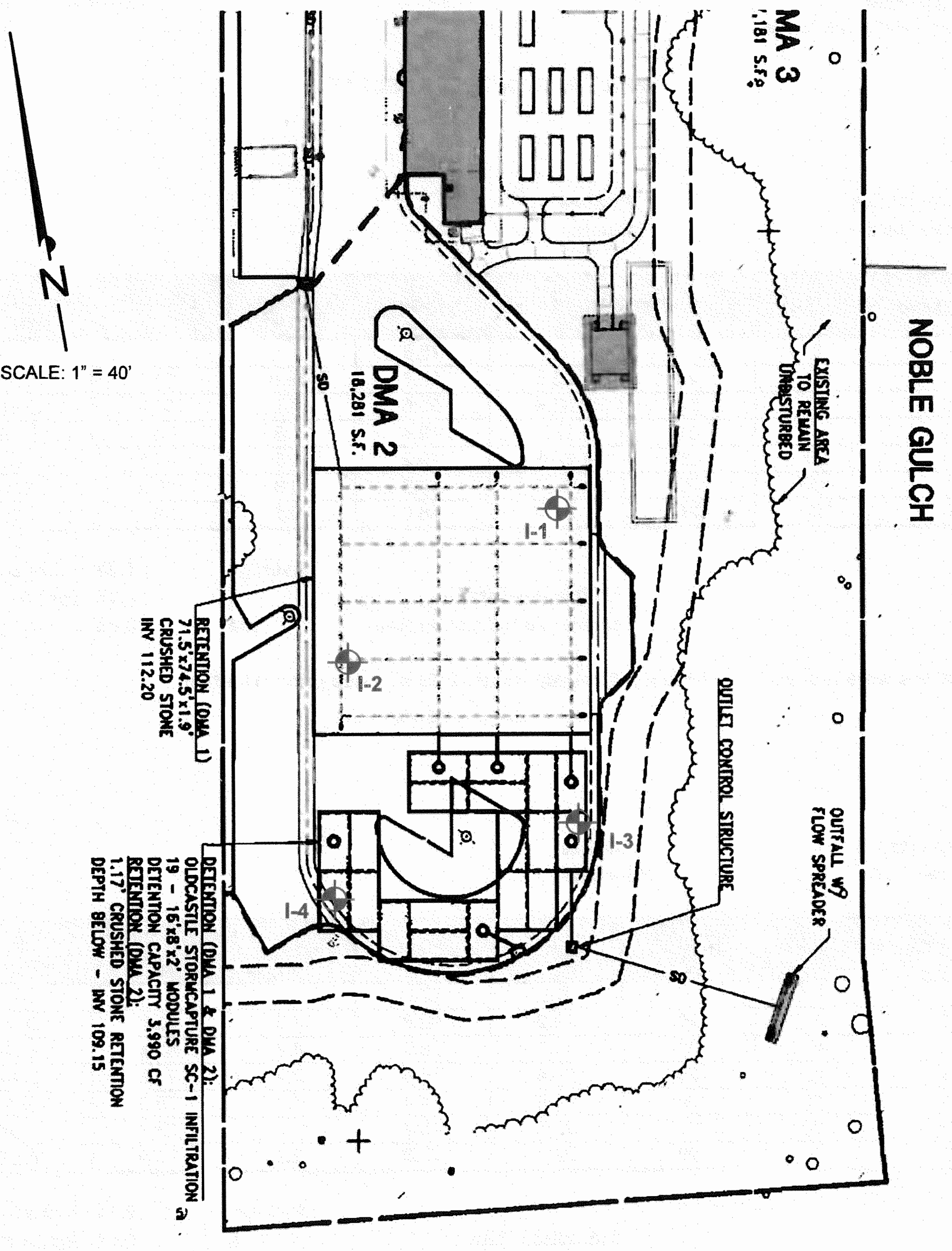
Attachments:	Figure 1 - Infiltration Test Site Location Plan Infiltration Test Results
Distribution:	Addressee (Electronic Copy) Greg Stein - Ifland Engineers (Electronic Copy)

REFERENCES

CMAG Engineering, Inc. (December 14, 2018). *Geotechnical Investigation, Proposed Assisted Living Facility, 5630 Soquel Avenue, Soquel, Santa Cruz County, California, APN 037-191-14.* Project No. 18-141-SC.

Earth Systems Pacific. (December 2013). *Native Soil Assessment for Small Infiltration-Based Stormwater Control Measures*. Prepared for the Central Coast Low Impact Development Initiative by Dennis Shallenberger, PE, GE, and Robert Down, PE of Earth Systems Pacific.

Ifland Engineers. (January 29, 2019). *Preliminary Stormwater Control Plan, Oakmont Senior Living, 5630 Soquel, California. Job No. 18031.* Sheets C3.0 and C3.1.



SCALE: 1" = 40'

EXPLANATION OF SYMBOLS

⊕ I-1 APPROXIMATE LOCATION OF INFILTRATION TEST SITE

BASEMAP: Ifland Engineers. (January 18, 2019). Preliminary Stormwater Control Plan, Oakmont Senior Living, 5630 Soquel Drive, Soquel, California. Job No. 18031. Original Scale 1" = 30'. Sheet C3.0.

CMAG ENGINEERING	**INFILTRATION TEST SITE LOCATION PLAN**	FIGURE
	5630 Soquel Drive	1

INFILTRATION TEST RESULTS

I-1

2/6/2019

Bore Hole Radius	3 inches
Bore Hole Depth	84 inches

Reading	Time (min)	Δt (min)	Depth (in)	H_o (in)	ΔH (in)	H_{avg} (in)	I_t (in/hour)
	0		8.4	75.6			
1	20	20	25.2	58.8	16.8	67.2	1.10
2	40	20	32.4	51.6	7.2	55.2	0.57
3	60	20	34.2	49.8	1.8	50.7	0.16
4	80	20	34.8	49.2	0.6	49.5	0.05
5	100	20	35.4	48.6	0.6	48.9	0.05
6	120	20	36.0	48.0	0.6	48.3	0.05

	Average	**0.33**	**inches/hour**
Infiltration Rate	**I_t**	**0.05**	**inches/hour**
Measured Infiltration Rate	**KM**	**0.03**	**inches/hour**

***3.1 gallons were required to maintain a Constant Head for 30 minutes prior to testing.**

I-2

2/6/2019

Bore Hole Radius	3 inches
Bore Hole Depth	96 inches

Reading	Time (min)	Δt (min)	Depth (in)	H_o (in)	ΔH (in)	H_{avg} (in)	I_t (in/hour)
	0		8.4	87.6			
1	20	20	13.2	82.8	4.8	85.2	0.25
2	40	20	18.0	78.0	4.8	80.4	0.26
3	60	20	20.4	75.6	2.4	76.8	0.14
4	80	20	21.6	74.4	1.2	75.0	0.07
5	100	20	22.8	73.2	1.2	73.8	0.07
6	120	20	24.0	72.0	1.2	72.6	0.07

	Average	**0.14**	**inches/hour**
Infiltration Rate	**I_t**	**0.07**	**inches/hour**
Measured Infiltration Rate	**KM**	**0.04**	**inches/hour**

***0.75 gallons were required to maintain a Constant Head for 30 minutes prior to testing.**

I-3

2/6/2019

Bore Hole Radius	3 inches
Bore Hole Depth	78 inches

Reading	Time (min)	Δt (min)	Depth (in)	H_o (in)	ΔH (in)	H_{avg} (in)	I_t (in/hour)
	0.0		12.0	66.0			
1	1.0	1.0	37.2	40.8	25.2	53.4	41.3
2	2.0	1.0	52.8	25.2	15.6	33.0	40.7
3	3.0	1.0	64.8	13.2	12.0	19.2	52.2
4	4.0	1.0	70.2	7.8	5.4	10.5	40.5
5	5.0	1.0	72.0	6.0	1.8	6.9	19.3
6*	0.0		12.0	66.0			
7	1.0	1.0	34.8	43.2	22.8	54.6	36.6
8	2.0	1.0	51.6	26.4	16.8	34.8	41.7
9	3.0	1.0	62.4	15.6	10.8	21.0	43.2
10	4.0	1.0	68.4	9.6	6.0	12.6	38.3
11	5.0	1.0	71.0	7.0	2.6	8.3	24.3
12*	0.0		12.0	66.0			
13	1.0	1.0	36.0	42.0	24.0	54.0	38.9
14	2.0	1.0	50.4	27.6	14.4	34.8	35.7
15	3.0	1.0	61.2	16.8	10.8	22.2	41.0
16	4.0	1.0	67.8	10.2	6.6	13.5	39.6
17	5.0	1.0	70.6	7.4	2.8	8.8	24.1
18	6.0	1.0	72.0	6.0	1.4	6.7	15.8

* Refilled Bore Hole

	Average	**35.8**	**inches/hour**
Infiltration Rate	**I_t**	**15.8**	**inches/hour**
Measured Infiltration Rate	**KM**	**7.9**	**inches/hour**

***A flow rate of 1.9 gpm was required to maintain a Constant Head for 30 minutes prior to testing.**

I-4

2/6/2019

Bore Hole Radius	3 inches
Bore Hole Depth	96 inches

Reading	Time (min)	Δt (min)	Depth (in)	H_o (in)	ΔH (in)	H_{avg} (in)	I_t (in/hour)
	0.0		12.0	84.0			
1	1.0	1.0	48.0	48.0	36.0	66.0	48.0
2	2.0	1.0	73.2	22.8	25.2	35.4	61.5
3	3.0	1.0	85.2	10.8	12.0	16.8	59.0
4	4.0	1.0	88.8	7.2	3.6	9.0	30.9
5	5.0	1.0	90.0	6.0	1.2	6.6	13.3
6*	0.0		12.0	84.0			
7	1.0	1.0	44.4	51.6	32.4	67.8	42.1
8	2.0	1.0	63.6	32.4	19.2	42.0	39.7
9	3.0	1.0	78.0	18.0	14.4	25.2	48.5
10	4.0	1.0	85.8	10.2	7.8	14.1	45.0
11	5.0	1.0	88.8	7.2	3.0	8.7	26.5
12*	0.0		12.0	84.0			
13	1.0	1.0	44.4	51.6	32.4	67.8	42.1
14	2.0	1.0	64.8	31.2	20.4	41.4	42.8
15	3.0	1.0	78.0	18.0	13.2	24.6	45.5
16	4.0	1.0	85.8	10.2	7.8	14.1	45.0
17	5.0	1.0	88.7	7.3	2.9	8.8	25.3
18	6.0	1.0	90.0	6.0	1.3	6.7	14.6

* Refilled Bore Hole

	Average	**39.4**	**inches/hour**
Infiltration Rate	**I_t**	**14.6**	**inches/hour**
Measured Infiltration Rate	**KM**	**7.3**	**inches/hour**

***A flow rate of 2.1 gpm was required to maintain a Constant Head for 30 minutes prior to testing.**

Attachment 8

Hydrologic Modeling Summary

April 19, 2019

THE COUNTY OF SANTA CRUZ

1850

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Balance Hydrologics

800 Bancroft Way • Suite 101 • Berkeley, CA 94710 • (510) 704-1000
224 Walnut Avenue • Suite E • Santa Cruz, CA 95060 • (831) 457-9900
PO Box 1077 • Truckee, CA 96160 • (530) 550-9776
www.balancehydro.com • email: office@balancehydro.com

April 19, 2019

Mr. Greg Stein
Ifland Engineers, Inc.
5300 Soquel Avenue, Suite 101
Santa Cruz, California 95062

RE: Summary of Hydraulic Modeling along Noble Gulch near 5630 Soquel Drive, Soquel, California.

Dear Mr. Greg Stein,

As requested, a hydraulic analysis of the reach of Noble Gulch near 5630 Soquel Drive has been completed. The intent of the analysis is to estimate the 100-year water surface elevations near the site of the proposed Oakmont Senior Living facility.

Modeling Approach and Assumptions

The Federal Emergency Management Agency (FEMA) has delineated the 100-year water surface elevation for Noble Gulch from its confluence at Soquel Creek upstream to the Highway 1 crossing. The section of Noble Gulch that flows adjacent to the project site is about 1,500 feet upstream of Highway 1 and is not currently covered by FEMA floodplain mapping. Therefore, a hydraulic model was prepared to analyze the 100-year water surface elevation for the section of Noble Gulch adjacent to the project site. The Army Corps of Engineers' HEC-RAS modeling platform was used to generate estimates of the 100-year water surface elevations along the analyzed reach. As with any hydraulic analysis, a number of assumptions were used. Several of the most important are summarized below:

Cross-section geometry. The topographic mapping of the creek section was provided by Ifland Engineers. The topographic data covered the project site and most of the analyzed creek section. Some sections of the creek's left bank (looking downstream) required additional topographic data and was supplemented using the combined LIDAR data from the 2013 California ARRA and 2010 California Coastal Conservancy databases. All elevation information presented on the workmap and used in the model is referenced to the National Geodetic Vertical Datum of 1929[1].

---

[1] The reported elevation values are referenced in NGVD 29 for consistency with the existing topography data. To convert elevations to NAVD 88 at the project site, a correction value of 2.756 feet should be added to the NGVD 29 elevations. (NAVD 88 = NVGD 29 + 2.756').

Manning's roughness coefficients. The Manning's roughness coefficients (or 'n' values) were estimated based on current satellite imagery as well as Google Street Views in areas along the creek. For all cross sections, a uniform 'n' value of 0.04 and 0.035 was assigned to the overbank and channel areas, respectively.

Channel crossing. The existing crossing includes a 48-inch diameter reinforced concrete pipe (RCP) with upstream and downstream inverts at about 114.1 feet and 112.8 feet, respectively. The culvert extends about 91 feet underneath the westerly end of Rochelle Lane that connects the project site to Monterey Avenue. The existing condition of the culvert, including any obstructions and vegetation cover were unknown and not accounted for in the model. The existing roadway slopes gradually upward from Monterey Avenue until reaching the entrance to the project site, where it makes a sharp grade break of about three feet upwards and almost directly above the upstream culvert crossing. At the upstream culvert crossing, the road crest elevation is approximately 119.2 feet.

Starting water surface elevation. The downstream boundary condition was defined using a normal depth calculation assuming a slope of 0.025 based on an average downstream channel gradient. This boundary condition is approximately 340 feet downstream from the existing channel crossing, and as a result, does not substantially impact the modeled results along this area of concern.

Flood discharge estimate. The 100-year discharge rate for the section of Noble Gulch was determined from the County of Santa Cruz Zone 5 Master Plan and the potential runoff from the proposed conditions onsite as calculated by Ifland Engineers. For the analyzed section of Noble Gulch, the Zone 5 Master Plan estimates a 100-year discharge rate of 113 cubic feet per second (cfs), and the calculated 100-year runoff by Ifland Engineers is estimated at 7.5 cfs bringing the total modeled 100-year flow in the creek to 120.5 cfs[2].

Modeling Results

The output of the HEC-RAS modeling is included as Appendix A with a tabular summary of the calculated 100-year water surface elevations included as Table 1. Water surface elevations were shown to be contained within the channel along the modeled section. The modeling indicates that a small amount of overtopping can be expected at the culvert crossing on the left bank of the roadway at elevations under 119.4 feet, but this would not impact the proposed development site. Uncertainties associated with the left bank topography (looking downstream) and culvert crossing can be further analyzed for improved accuracy of water surface elevations along the analyzed reach. The modeled 100-year water surface elevations along the property were estimated to range from approximately 103.5 to 120.2 feet (NGVD 29).

---

[2] The current drainage plan for the project shows the runoff being discharged at the southern boundary of the site. In order to produce a conservative estimate for the water surface elevation, and to account for any potential changes in the land plan, the entire section of Noble Gulch was modeled with 120.5 cfs.

Closing

We appreciate the opportunity to provide this hydraulic analysis for Noble Gulch near 5630 Soquel Drive. Do not hesitate to contact us if you have any questions or comments related to the items discussed here.

Sincerely,

BALANCE HYDROLOGICS, Inc.

Joshua Alexander

Josh Alexander, E.I.T.
Engineer/Hydrologist

Ed D. Ballman

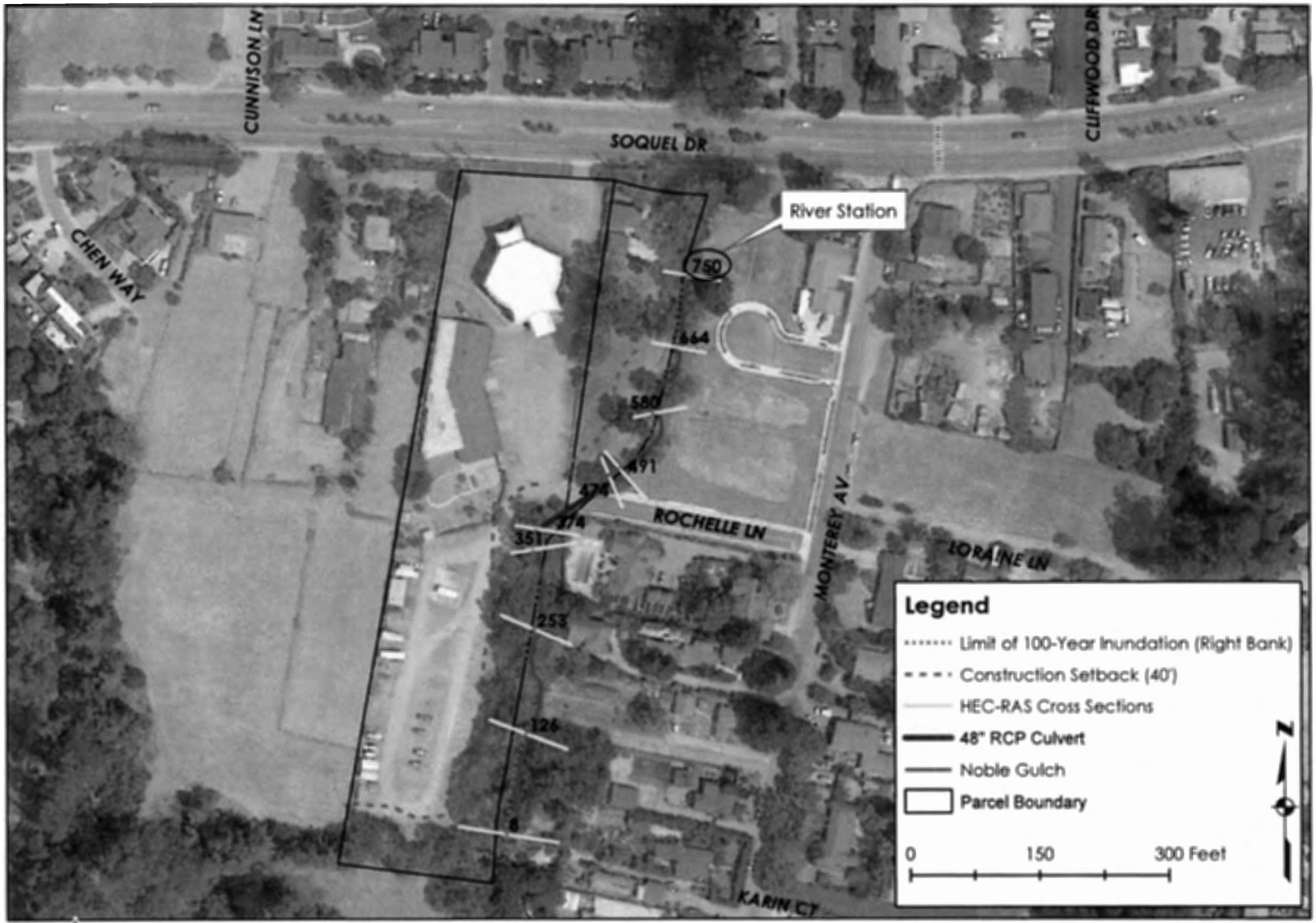
Edward D. Ballman, P.E., CFM
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
EDWARD D. BALLMAN
No. C 64095
Exp. 09/30/2020
STATE OF CALIFORNIA

Enclosures:
- Table 1. Summary of HEC-RAS Output
- Figure 1. HEC-RAS Workmap
- Appendix A. HEC-RAS Output Report

Table 1. Summary of HEC-RAS Output, Noble Gulch at 5360 Soquel Drive

River Station	Total Flow *(cfs)*	Min. Channel Elev *(feet, NGVD 29)*	Water Surface Elev ***(feet, NGVD 29)***	Energy Grade Elev *(feet, NGVD 29)*	Channel Velocity *(ft/sec)*	Flow Area *(square feet)*	Top Width *(feet)*
8	120.5	100.8	**103.5**	104.1	5.8	20.8	11.5
126	120.5	104.3	**106.5**	107.1	5.8	20.7	11.8
253	120.5	107.8	**110.4**	111.1	7.0	17.3	9.8
351	120.5	109.5	**112.6**	112.9	4.0	30.2	14.3
374	120.5	112.8	**115.6**	116.4	7.3	16.9	11.8
430	Culvert						
474	120.5	114.1	**119.4**	119.5	2.1	69.8	39.5
491	120.5	115.0	**119.4**	119.5	2.4	57.7	46.5
580	120.5	115.9	**119.5**	119.7	3.5	34.3	15.7
664	120.5	116.3	**119.7**	120.0	4.6	26.2	13.8
750	120.5	117.1	**120.2**	120.5	4.7	25.4	12.1



Balance Hydrologics, Inc.

Figure 1. HEC-RAS Workmap,
5630 Soquel Drive, Soquel, California

Source: Google Earth, 2018

Appendix A

```
                   HEC-RAS HEC-RAS 5.0.7 March 2019
                      U.S. Army Corps of Engineers
                     Hydrologic Engineering Center
                           609 Second Street
                           Davis, California

X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Noble Gulch Hydraulic Model
Project File : NobleGulchHydraul.prj
Run Date and Time: 4/18/2019 11:44:15 AM

Project in English units

Project Description:
This 1D hydraulic model is used to evaluate a section of Noble Gulch under the 100-year storm flow of 120.5 cfs. The location of the site is 5630 Soquel Drive, Soquel, CA 95073.

Flow data for the section of Noble Gulch was
estimated from the County of Santa Cruz Zone 5 Master Plan (113 cfs) and runoff from the site as computed by Ifland Engineers (7.5 cfs). A total design discharge of 120.5 cfs was used.

Topo data was provided by Ifland Engineers
and covered most of the creek section and the right bank areas (looking downstream). The left bank areas were derived from a combination of LIDAR data from the 2013 ARRA and 2010

PLAN DATA

Plan Title: Steady_Q100
Plan File : p:\2019\219047 Oakmont Noble Gulch Floodplain Assessment\219047 Modeling\HEC-RAS\2019-04-10 HEC-RAS Model\NobleGulchHydraul.p01

```
           Geometry Title: Noble Gulch Geo
           Geometry File : p:\2019\219047 Oakmont Noble Gulch Floodplain
Assessment\219047 Modeling\HEC-RAS\2019-04-10 HEC-RAS Model\NobleGulchHydraul.g01

           Flow Title    : Noble Gulch Flow
           Flow File     : p:\2019\219047 Oakmont Noble Gulch Floodplain
Assessment\219047 Modeling\HEC-RAS\2019-04-10 HEC-RAS Model\NobleGulchHydraul.f01

Plan Description:
Baseline plan


Plan Summary Information:
Number of:  Cross Sections =   10    Multiple Openings  =    0
            Culverts       =    1    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Mixed Flow



FLOW DATA

Flow Title: Noble Gulch Flow
Flow File : p:\2019\219047 Oakmont Noble Gulch Floodplain Assessment\219047
Modeling\HEC-RAS\2019-04-10 HEC-RAS Model\NobleGulchHydraul.f01

Flow Data (cfs)

  River           Reach           RS                   Q100
  Noble Gulch     Noble Gulch     750                 120.5


Boundary Conditions


  River           Reach           Profile                       Upstream
     Downstream
```

```
  Noble Gulch     Noble Gulch     Q100                        Normal S = 0.01
  Normal S = 0.025



GEOMETRY DATA

Geometry Title: Noble Gulch Geo
Geometry File : p:\2019\219047 Oakmont Noble Gulch Floodplain Assessment\219047
Modeling\HEC-RAS\2019-04-10 HEC-RAS Model\NobleGulchHydraul.g01

CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch        RS: 750

INPUT
Description:
Station Elevation Data    num=      52
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  125.79       1  125.87     6.1   126.1     8.3  126.17    10.1  126.19
    11.2  126.24    15.2  126.28    16.2  126.32    19.3  126.26    19.6  126.21
    20.1  126.08    20.3  126.04    20.5  125.94    21.3  125.27    22.2  124.36
    22.3  124.29    23.3  124.11    24.4  123.45    24.6 123.255    26.4   121.5
    28.3  119.65    29.2  118.79    29.4  118.48    29.8  118.29      30  118.18
    30.4  117.98    31.5  117.69    31.8  117.62    33.5  117.09    34.5   117.3
    36.5  117.89    38.6   118.3    38.7  118.41    39.6  119.48    40.6  123.05
    40.8   123.4    41.3   124.2    41.6  124.65    41.7 124.657    42.6  124.72
    43.6  124.76    44.6  124.78    47.7  124.89    49.7  124.93    50.7  124.96
    51.7  124.97      53     125    56.7  125.03    57.9  125.06    59.9  125.07
    63.9  125.22    65.5  125.24

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04    26.4    .035    40.6     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          26.4    40.6             82.2    85.8    87.3             .1       .3

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)            120.54    Element                   Left OB    Channel
 Right OB
  Vel Head (ft)               0.35    Wt. n-Val.                            0.035
```

```
  W.S. Elev (ft)          120.19   Reach Len. (ft)            82.20      85.80
   87.30
  Crit W.S. (ft)          119.46   Flow Area (sq ft)                     25.40

  E.G. Slope (ft/ft)    0.005780   Area (sq ft)                          25.40

  Q Total (cfs)           120.50   Flow (cfs)                           120.50

  Top Width (ft)           12.05   Top Width (ft)                        12.05

  Vel Total (ft/s)          4.74   Avg. Vel. (ft/s)                       4.74

  Max Chl Dpth (ft)         3.10   Hydr. Depth (ft)                       2.11

  Conv. Total (cfs)       1585.0   Conv. (cfs)                          1585.0

  Length Wtd. (ft)         85.80   Wetted Per. (ft)                      14.26

  Min Ch El (ft)          117.09   Shear (lb/sq ft)                       0.64

  Alpha                     1.00   Stream Power (lb/ft s)                 3.05

  Frctn Loss (ft)           0.50   Cum Volume (acre-ft)        0.01       0.41
    0.00
  C & E Loss (ft)           0.01   Cum SA (acres)              0.07       0.21
    0.01


CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch        RS: 664

INPUT
Description:
Station Elevation Data    num=      36
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0   123.35     1.5   123.28     4.2   123.18    10.3   123.19    12.3   123.12
    14.4   123.18    14.6   123.11    15.6    122.5    16.3   122.16    17.4   121.61
    18.5   121.11    19.5   120.63    20.1   120.33    20.5   120.13    21.5   119.65
    22.5   119.15    23.5   118.67    24.6   118.17    25.6   117.69    26.6   117.18
    27.6   116.71    28.6   116.41    29.7   116.34    30.7   116.62    34.8   119.47
    36.9120.9505    38.8   122.29    39.8   122.38    41.9    122.5    42.9   122.54
      47   122.78    47.9   122.81    53.1   123.13    56.1   123.15    57.7   123.12
    61.8   123.15

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04    19.5    .035    36.9     .04

Bank Sta: Left    Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          19.5    36.9              79.6    84.1    87.4              .1        .3

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)             120.03    Element                   Left OB    Channel
 Right OB
  Vel Head (ft)                0.33    Wt. n-Val.                            0.035

  W.S. Elev (ft)             119.70    Reach Len. (ft)            79.60      84.10
   87.40
  Crit W.S. (ft)                       Flow Area (sq ft)                     26.20

  E.G. Slope (ft/ft)       0.005823    Area (sq ft)                          26.20

  Q Total (cfs)              120.50    Flow (cfs)                           120.50

  Top Width (ft)              13.75    Top Width (ft)                        13.75

  Vel Total (ft/s)             4.60    Avg. Vel. (ft/s)                       4.60

  Max Chl Dpth (ft)            3.36    Hydr. Depth (ft)                       1.91

  Conv. Total (cfs)          1579.1    Conv. (cfs)                          1579.1

  Length Wtd. (ft)            84.10    Wetted Per. (ft)                      15.48

  Min Ch El (ft)             116.34    Shear (lb/sq ft)                       0.62

  Alpha                        1.00    Stream Power (lb/ft s)                 2.83

  Frctn Loss (ft)              0.33    Cum Volume (acre-ft)        0.01       0.36
    0.00
  C & E Loss (ft)              0.04    Cum SA (acres)              0.07       0.18
    0.01


Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Noble Gulch
```

```
REACH: Noble Gulch          RS: 580

INPUT
Description:
Station Elevation Data      num=       38
     Sta     Elev       Sta    Elev      Sta     Elev       Sta     Elev       Sta     Elev
       0   121.89       1.1  121.92      2.2   122.04         3   122.08       6.2   121.82
     7.3    121.7       9.2  121.68     10.2   121.69      13.3   121.69      14.3   121.71
    15.3   121.71      16.3  121.75     18.4   121.69      19.4   121.47      21.4   120.34
    22.5119.7215       27.5  116.91     28.5   116.35      29.6   115.85      32.6   115.94
    33.1   116.13      33.6  116.37     34.6   116.99      36.7   118.26      37.7   118.87
    39.6120.0791       39.9  120.27     40.7   120.75      41.7   120.95      45.6   121.15
    46.8   121.19      47.7  121.24     49.9   121.33      52.9    121.5        54   121.52
      55   121.52        56  121.53     60.6   121.53

Manning's n Values          num=        3
     Sta    n Val       Sta   n Val      Sta    n Val
       0      .04      21.4    .035     39.6      .04

Bank Sta: Left    Right     Lengths: Left Channel    Right      Coeff Contr.    Expan.
          21.4     39.6              95.2     88.9      83               .1        .3

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)               119.66    Element                     Left OB     Channel
 Right OB
  Vel Head (ft)                  0.19    Wt. n-Val.                               0.035

  W.S. Elev (ft)               119.47    Reach Len. (ft)               95.20      88.90
   83.00
  Crit W.S. (ft)                         Flow Area (sq ft)                        34.30

  E.G. Slope (ft/ft)         0.002811    Area (sq ft)                             34.30

  Q Total (cfs)                120.50    Flow (cfs)                              120.50

  Top Width (ft)                15.70    Top Width (ft)                           15.70

  Vel Total (ft/s)               3.51    Avg. Vel. (ft/s)                          3.51

  Max Chl Dpth (ft)              3.62    Hydr. Depth (ft)                          2.18

  Conv. Total (cfs)            2272.6    Conv. (cfs)                             2272.6

  Length Wtd. (ft)              88.94    Wetted Per. (ft)                         17.59

  Min Ch El (ft)               115.85    Shear (lb/sq ft)                          0.34

  Alpha                          1.00    Stream Power (lb/ft s)                    1.20
```

```
  Frctn Loss (ft)             0.12    Cum Volume (acre-ft)        0.01       0.30
    0.00
  C & E Loss (ft)             0.03    Cum SA (acres)              0.07       0.16
    0.01


Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch        RS: 491

INPUT
Description:
Station Elevation Data    num=      40
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0 118.954     1.35 118.839    3.356   118.88      5.7 119.025    6.898    119.1
   8.902 119.182   10.413 119.186   14.944 119.292   19.805 119.313   22.496 119.375
  23.193 119.368   24.609 119.388   25.318 119.371   26.026 119.229   26.476 119.052
   27.81 118.369     28.3   118.13   34.482 115.114    34.58 115.089    36.09 114.956
  36.653 114.959   37.151 115.038   37.362 115.116    38.07 115.435   43.643 118.043
   47.28   119.83   47.825 120.091   47.989 120.145   48.174 120.173   49.159 120.239
  50.493 120.298   53.162 120.478   54.496 120.537   55.831 120.627   57.165 120.686
  61.168 120.956   63.836 121.074    67.81 121.156   69.174 121.213   71.048 121.255

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0     .04    27.81    .035   43.643     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
         27.81  43.643             17.4    17.4    17.4             .1       .3

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)            119.51    Element                   Left OB    Channel
 Right OB
  Vel Head (ft)               0.09    Wt. n-Val.                 0.040      0.035
   0.040
  W.S. Elev (ft)            119.42    Reach Len. (ft)            17.40      17.40
   17.40
  Crit W.S. (ft)                      Flow Area (sq ft)           7.26      48.50
    1.94
  E.G. Slope (ft/ft)      0.000800    Area (sq ft)                7.26      48.50
```

```
    1.94
  Q Total (cfs)             120.50    Flow (cfs)                  3.06     115.96
    1.48
  Top Width (ft)             46.45    Top Width (ft)             27.81      15.83
    2.81
  Vel Total (ft/s)            2.09    Avg. Vel. (ft/s)            0.42       2.39
    0.76
  Max Chl Dpth (ft)           4.47    Hydr. Depth (ft)            0.26       3.06
    0.69
  Conv. Total (cfs)         4261.1    Conv. (cfs)                108.3     4100.4
    52.4
  Length Wtd. (ft)           17.40    Wetted Per. (ft)           28.51      17.26
    3.13
  Min Ch El (ft)            114.96    Shear (lb/sq ft)            0.01       0.14
    0.03
  Alpha                       1.26    Stream Power (lb/ft s)      0.01       0.34
    0.02
  Frctn Loss (ft)             0.01    Cum Volume (acre-ft)        0.00       0.22
    0.00
  C & E Loss (ft)             0.01    Cum SA (acres)              0.04       0.12
    0.00


Warning: The cross-section end points had to be extended vertically for the
computed water surface.

CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch          RS: 474

INPUT
Description:
Station Elevation Data    num=      46
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 118.753     3.8 118.643   4.431 118.625   5.181 118.885   5.512 118.984
   6.182 119.021   6.594 119.079   8.757 119.094   9.838 119.125   10.92 118.611
  11.544 118.632  13.076 118.625  15.246 118.688  16.327 118.688  17.409 118.719
   18.49 118.719  19.572  118.75   19.97 118.635  20.653 118.364  20.935  118.23
  21.502 118.001  21.735 117.849  22.816 117.281    23.8 116.814  23.898 116.753
    25.7 115.874  26.061 115.698  27.142 115.139    28.5   114.2    29.5   114.1
    30.5   114.2  31.438 115.087  33.758 116.351  34.524 116.747  36.689 117.939
  40.121 119.776  41.202 120.269  41.417 120.303  42.183 120.374  44.481 120.501
  45.528 120.574   46.61 120.618  52.141 120.967  55.068 121.119  56.343  121.14
  60.511  121.31

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
       0     .04   21.735    .035   36.689     .04

Bank Sta: Left    Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        21.735  36.689              97.7    100.2   106.9              .3       .5

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)              119.49    Element                    Left OB    Channel
 Right OB
  Vel Head (ft)                 0.06    Wt. n-Val.                   0.040      0.035
   0.040
  W.S. Elev (ft)              119.43    Reach Len. (ft)              97.70     100.20
  106.90
  Crit W.S. (ft)              116.93    Flow Area (sq ft)            14.95      52.73
    2.08
  E.G. Slope (ft/ft)        0.000528    Area (sq ft)                 14.95      52.73
    2.08
  Q Total (cfs)               120.50    Flow (cfs)                    9.64     109.52
    1.34
  Top Width (ft)               39.47    Top Width (ft)               21.74      14.95
    2.78
  Vel Total (ft/s)              1.73    Avg. Vel. (ft/s)              0.64       2.08
    0.65
  Max Chl Dpth (ft)             5.33    Hydr. Depth (ft)              0.69       3.53
    0.75
  Conv. Total (cfs)           5243.6    Conv. (cfs)                  419.5     4765.9
    58.3
  Length Wtd. (ft)            100.20    Wetted Per. (ft)             22.78      16.98
    3.16
  Min Ch El (ft)              114.10    Shear (lb/sq ft)              0.02       0.10
    0.02
  Alpha                         1.33    Stream Power (lb/ft s)        0.01       0.21
    0.01
  Frctn Loss (ft)                       Cum Volume (acre-ft)          0.00       0.20

  C & E Loss (ft)                       Cum SA (acres)                0.03       0.12
    0.00



CULVERT


RIVER: Noble Gulch
REACH: Noble Gulch        RS: 430

INPUT
Description:
Distance from Upstream XS =      24
```

```
Deck/Roadway Width        =      30
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       4
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  119.04   112.8      26  119.17   112.8   66.47  122.01   112.8
      82  122.34   112.8

Upstream Bridge Cross Section Data
Station Elevation Data    num=      46
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 118.753     3.8 118.643   4.431 118.625   5.181 118.885   5.512 118.984
   6.182 119.021   6.594 119.079   8.757 119.094   9.838 119.125   10.92 118.611
  11.544 118.632  13.076 118.625  15.246 118.688  16.327 118.688  17.409 118.719
   18.49 118.719  19.572  118.75   19.97 118.635  20.653 118.364  20.935  118.23
  21.502 118.001  21.735 117.849  22.816 117.281    23.8 116.814  23.898 116.753
    25.7 115.874  26.061 115.698  27.142 115.139    28.5   114.2    29.5   114.1
    30.5   114.2  31.438 115.087  33.758 116.351  34.524 116.747  36.689 117.939
  40.121 119.776  41.202 120.269  41.417 120.303  42.183 120.374  44.481 120.501
  45.528 120.574   46.61 120.618  52.141 120.967  55.068 121.119  56.343  121.14
  60.511  121.31

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04  21.735    .035  36.689     .04

Bank Sta: Left   Right    Coeff Contr.    Expan.
        21.735  36.689             .3       .5

Downstream  Deck/Roadway Coordinates
    num=       4
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  119.04   112.8      26  119.17   112.8   66.47  122.01   112.8
      82  122.34   112.8

Downstream Bridge Cross Section Data
Station Elevation Data    num=      53
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 119.061   2.083 119.011   3.095 119.017   5.119     119   7.144 119.013
   9.168 118.965  11.192 118.876  12.204 118.857  13.217   118.9  14.229 119.005
  15.241 119.071  16.253 119.094  17.265 119.084  18.277 119.057  19.289     119
  21.314 118.813  22.326 118.471   24.35 117.389   24.55 117.338  25.362  117.21
  29.411 116.663  31.553 116.403   38.52 115.464  39.532 115.355  40.545 115.094
    40.6 115.055  41.557 114.379  42.569  113.62    44.1   112.9    45.1   112.8
    46.1   112.9  46.617 113.127   47.63 113.947  49.654 115.857  49.934 116.037
  50.469 116.561  50.666 116.705    50.7 116.711   50.81 116.731  51.678 116.961
   52.56 117.897   52.69 117.984  53.702  119.72  54.068 119.902  54.311 120.044
  54.715 120.231  55.727 120.452  56.739 120.739  56.937 120.778  57.751 120.873
  65.848 121.162  67.872 121.265  73.959 121.482
```

```
Manning's n Values        num=       3
     Sta    n Val     Sta   n Val     Sta    n Val
       0      .06    40.6    .055    50.7      .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
          40.6    50.7              .3       .5

Upstream Embankment side slope               =       0 horiz. to 1.0 vertical
Downstream Embankment side slope             =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins          =
Energy head used in spillway design          =
Spillway height used in design               =
Weir crest shape                             = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       4
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                  4      90     .013     .013        0                    .5
       1
Upstream   Elevation =  114.1
           Centerline Station =  29.5
Downstream Elevation =  112.8
           Centerline Station =  45.1

CULVERT OUTPUT  Profile #Q100  Culv Group:  Culvert #1

  Q Culv Group (cfs)        103.41    Culv Full Len (ft)
  # Barrels                      1    Culv Vel US (ft/s)          9.96
  Q Barrel (cfs)            103.41    Culv Vel DS (ft/s)         13.07
  E.G. US. (ft)             119.49    Culv Inv El Up (ft)       114.10
  W.S. US. (ft)             119.43    Culv Inv El Dn (ft)       112.80
  E.G. DS (ft)              116.41    Culv Frctn Ls (ft)          0.86
  W.S. DS (ft)              115.59    Culv Exit Loss (ft)         1.45
  Delta EG (ft)               3.08    Culv Entr Loss (ft)         0.77
  Delta WS (ft)               3.84    Q Weir (cfs)               17.09
  E.G. IC (ft)              119.45    Weir Sta Lft (ft)           0.00
  E.G. OC (ft)              119.49    Weir Sta Rgt (ft)          30.61
  Culvert Control           Outlet    Weir Submerg                0.00
  Culv WS Inlet (ft)        117.18    Weir Max Depth (ft)         0.45
  Culv WS Outlet (ft)       115.21    Weir Avg Depth (ft)         0.35
  Culv Nml Depth (ft)         2.23    Weir Flow Area (sq ft)     10.81
  Culv Crt Depth (ft)         3.08    Min El Weir Flow (ft)     119.05
```

```
Warning: The flow through the culvert is supercritical.  However, since there is
flow over the road (weir flow), the program
         cannot determine if the downstream cross section should be subcritical or
supercritical.  The program used the
         downstream subcritical answer, even though it may not be valid.
Note:    The flow in the culvert is entirely supercritical.

CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch        RS: 374

INPUT
Description:
Station Elevation Data    num=      53
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0 119.061   2.083 119.011   3.095 119.017   5.119     119   7.144 119.013
   9.168 118.965  11.192 118.876  12.204 118.857  13.217   118.9  14.229 119.005
  15.241 119.071  16.253 119.094  17.265 119.084  18.277 119.057  19.289     119
  21.314 118.813  22.326 118.471   24.35 117.389   24.55 117.338  25.362  117.21
  29.411 116.663  31.553 116.403   38.52 115.464  39.532 115.355  40.545 115.094
    40.6 115.055  41.557 114.379  42.569  113.62    44.1   112.9    45.1   112.8
    46.1   112.9  46.617 113.127   47.63 113.947  49.654 115.857  49.934 116.037
  50.469 116.561  50.666 116.705    50.7 116.711   50.81 116.731  51.678 116.961
   52.56 117.897   52.69 117.984  53.702  119.72  54.068 119.902  54.311 120.044
  54.715 120.231  55.727 120.452  56.739 120.739  56.937 120.778  57.751 120.873
  65.848 121.162  67.872 121.265  73.959 121.482

Manning's n Values        num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    40.6    .055    50.7     .06

Bank Sta: Left    Right    Lengths: Left Channel    Right     Coeff Contr.    Expan.
          40.6     50.7               23       23      23              .3        .5

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)              116.41     Element                    Left OB    Channel
 Right OB
  Vel Head (ft)                 0.83     Wt. n-Val.                   0.060      0.055

  W.S. Elev (ft)              115.59     Reach Len. (ft)              23.00      23.00
   23.00
  Crit W.S. (ft)              115.59     Flow Area (sq ft)             0.63      16.29

  E.G. Slope (ft/ft)        0.040404     Area (sq ft)                  0.63      16.29
```

```
  Q Total (cfs)                120.50   Flow (cfs)                 1.09     119.41

  Top Width (ft)                11.75   Top Width (ft)             2.98       8.77

  Vel Total (ft/s)               7.12   Avg. Vel. (ft/s)           1.74       7.33

  Max Chl Dpth (ft)              2.79   Hydr. Depth (ft)           0.21       1.86

  Conv. Total (cfs)             599.5   Conv. (cfs)                 5.4      594.1

  Length Wtd. (ft)              23.00   Wetted Per. (ft)           3.04      10.39

  Min Ch El (ft)               112.80   Shear (lb/sq ft)           0.52       3.95

  Alpha                          1.05   Stream Power (lb/ft s)     0.90      28.98

  Frctn Loss (ft)                2.03   Cum Volume (acre-ft)       0.00       0.15

  C & E Loss (ft)                0.63   Cum SA (acres)             0.00       0.09


Warning: The energy equation could not be balanced within the specified number of
iterations.  The program used critical
         depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was
set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates that there
is not a valid subcritical answer.  The
         program defaulted to critical depth.

CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch         RS: 351

INPUT
Description:
Station Elevation Data     num=      52
```

```
         Sta      Elev       Sta      Elev       Sta      Elev       Sta      Elev       Sta      Elev
           0    118.95     1.155   118.921      2.24   118.816      4.19   118.667     5.201   118.633
       6.213   118.704     7.225   118.803     8.384   118.922     9.248   119.031       9.3   119.031
       10.14   119.029    14.306   118.938    15.317   118.816    18.352   118.344    19.363   118.156
      22.427   116.802     23.41   116.414    24.421   116.085    25.433   115.599    27.456   114.579
      28.326   114.278    29.479   113.967    30.491   113.758     36.56   112.859    37.572   112.578
      40.606   110.612    41.618   109.977    42.629   109.718    43.641    109.62    44.652     109.5
      45.664   109.625    47.003   109.899    48.618   110.204      49.7   110.373     49.71   110.375
      50.514   111.139    50.722   111.357    56.791   118.466    57.535   119.294    57.803   119.572
      58.814   120.313    60.838    120.32    61.849   120.346    62.801   120.343    64.557   120.381
      65.895    120.39    67.918   120.443    68.945   120.439    70.953   120.491    72.976   120.513
      74.999   120.566    75.882   120.561

Manning's n Values          num=        3
     Sta     n Val       Sta     n Val       Sta     n Val
       0       .06    37.572      .055    56.791       .06

Bank Sta: Left    Right     Lengths: Left Channel    Right        Coeff Contr.    Expan.
          37.572   56.791            101.1     97.4    93.9                .1        .3

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)              113.75    Element                        Left OB     Channel
 Right OB
  Vel Head (ft)                 2.91    Wt. n-Val.                                   0.055

  W.S. Elev (ft)              110.84    Reach Len. (ft)                101.10        97.40
   93.90
  Crit W.S. (ft)              111.63    Flow Area (sq ft)                             8.80

  E.G. Slope (ft/ft)        0.325352    Area (sq ft)                                  8.80

  Q Total (cfs)               120.50    Flow (cfs)                                  120.50

  Top Width (ft)                9.95    Top Width (ft)                                9.95

  Vel Total (ft/s)             13.70    Avg. Vel. (ft/s)                             13.70

  Max Chl Dpth (ft)             1.34    Hydr. Depth (ft)                              0.88

  Conv. Total (cfs)            211.3    Conv. (cfs)                                  211.3

  Length Wtd. (ft)             97.40    Wetted Per. (ft)                             10.50

  Min Ch El (ft)              109.50    Shear (lb/sq ft)                             17.02

  Alpha                         1.00    Stream Power (lb/ft s)                      233.04

  Frctn Loss (ft)               1.66    Cum Volume (acre-ft)                          0.14
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  C & E Loss (ft)             0.05    Cum SA (acres)                         0.09



Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch        RS: 253

INPUT
Description:
Station Elevation Data    num=      54
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  115.41     8.3  115.39    10.5  115.35    12.7  115.28    13.8   115.3
    14.8  115.25    15.9  115.24    17.2  115.19    20.3  115.19    21.4  115.17
    23.3  115.22    24.9  115.22      30  115.36    31.1  114.87    32.8113.7985
    34.4  112.79    34.8  112.48    35.6  111.83    38.7  108.49    39.4  108.13
    39.8  107.95    40.9  107.78    41.7  107.86    44.1  108.25    44.7  108.68
    45.2  109.11    46.3  110.13    47.4  110.79    50.8  112.44    51.7  112.86
      53113.4982    53.9  113.94    56.1  115.03    57.2   116.2    58.3  117.71
    58.5  117.76      60  117.92    60.4  117.96    60.7  117.96    62.3  117.96
    64.1  117.94    66.9  117.94      68  117.91    69.2  117.91    70.2  117.93
    71.4   118.1    72.4   118.2    73.7  118.23    79.1   118.5      80  118.53
    81.1  118.59    82.1  118.62    84.4  118.75    88.1  118.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    35.6    .055    47.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          35.6    47.4            126.4   127.4   129.6             .1       .3

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)            111.14    Element                    Left OB     Channel
 Right OB
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  Vel Head (ft)              0.76   Wt. n-Val.                          0.055

  W.S. Elev (ft)           110.39   Reach Len. (ft)          126.40    127.40
  129.60
  Crit W.S. (ft)           110.27   Flow Area (sq ft)                   17.27

  E.G. Slope (ft/ft)     0.039032   Area (sq ft)                        17.27

  Q Total (cfs)            120.50   Flow (cfs)                         120.50

  Top Width (ft)             9.78   Top Width (ft)                       9.78

  Vel Total (ft/s)           6.98   Avg. Vel. (ft/s)                     6.98

  Max Chl Dpth (ft)          2.61   Hydr. Depth (ft)                     1.76

  Conv. Total (cfs)         609.9   Conv. (cfs)                         609.9

  Length Wtd. (ft)         127.40   Wetted Per. (ft)                    11.55

  Min Ch El (ft)           107.78   Shear (lb/sq ft)                     3.64

  Alpha                      1.00   Stream Power (lb/ft s)              25.41

  Frctn Loss (ft)            4.01   Cum Volume (acre-ft)                 0.11

  C & E Loss (ft)            0.07   Cum SA (acres)                       0.06


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.
Note:    Hydraulic jump has occurred between this cross section and the previous
upstream section.

CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch        RS: 126

INPUT
Description:
Station Elevation Data    num=      65
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0   112.07     3.9   112.23     6.7   112.27     7.5   112.31     8.1   112.32
     8.6    112.3    13.5   111.83    15.2   111.54    17.8   111.05    18.8   110.87
    19.1   110.83    20.7   110.68    22.2   110.55    24.2   110.44    25.2   110.52
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    26.3   110.7    27.4  110.84    29.5  111.15    30.7  111.39    31.5  111.51
    32.7  111.54    33.8  111.54    34.6   111.2    34.9  111.08    35.9  109.83
      37  108.55    38.4 106.905    40.2  104.79    40.6  104.68    40.8  104.58
    41.3  104.49    43.4  104.39    44.5  104.37    46.6  104.28    47.7  104.42
    48.6   104.8    48.8   104.9    49.4  105.39    50.1  106.12    51.7  107.74
    52.5  108.53    56.3  112.27    56.6  112.49    57.3  112.92    58.4  113.26
    59.4113.4236    59.5  113.44    60.5  113.65    65.9  114.55    66.9  114.76
    70.2   115.3    74.4  115.73    75.5  115.87    76.6  116.07    77.6  116.23
    78.7  116.43    79.8   116.6    80.8   116.8    81.9  116.84    82.7   116.8
    84.1  116.69    89.4  116.34    90.4  116.28    92.6   116.2    95.7  116.04

Manning's n Values         num=        3
     Sta    n Val      Sta    n Val     Sta    n Val
       0      .06       37     .055    52.5      .06

Bank Sta: Left    Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            37     52.5             116.3    118.2   119.3             .1       .3

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)            107.06    Element                    Left OB     Channel
 Right OB
  Vel Head (ft)               0.52    Wt. n-Val.                               0.055

  W.S. Elev (ft)            106.53    Reach Len. (ft)            116.30      118.20
  119.30
  Crit W.S. (ft)                      Flow Area (sq ft)                        20.74

  E.G. Slope (ft/ft)      0.025866    Area (sq ft)                             20.74

  Q Total (cfs)             120.50    Flow (cfs)                              120.50

  Top Width (ft)             11.79    Top Width (ft)                           11.79

  Vel Total (ft/s)            5.81    Avg. Vel. (ft/s)                          5.81

  Max Chl Dpth (ft)           2.25    Hydr. Depth (ft)                          1.76

  Conv. Total (cfs)          749.2    Conv. (cfs)                              749.2

  Length Wtd. (ft)          118.20    Wetted Per. (ft)                         13.42

  Min Ch El (ft)            104.28    Shear (lb/sq ft)                          2.50

  Alpha                       1.00    Stream Power (lb/ft s)                   14.50

  Frctn Loss (ft)             3.01    Cum Volume (acre-ft)                      0.06

  C & E Loss (ft)             0.00    Cum SA (acres)                            0.03
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Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Noble Gulch
REACH: Noble Gulch        RS: 8

INPUT
Description:
Station Elevation Data    num=      74
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0   109.02      1.9   108.81      3.1   108.74      8.2   108.38        9   108.34
     9.9   108.25       12   108.09     13.7   108.05     15.1   108.03     18.1   107.93
    22.1   107.81     23.2   107.81     24.2   107.83     26.2   107.83     27.2    107.8
    30.3   107.63     32.3   107.55     33.5   107.54     37.3   107.64     40.3   107.37
    42.4   107.25     43.4   106.66     44.1  106.114     44.4   105.88     45.5    105.2
    45.7   105.08     46.5   104.79     47.5   104.44     48.5   103.84     49.5   103.06
    51.5   101.41     51.8   101.23     52.5   100.83     53.6   100.94     54.4      101
    55.6    101.1     56.6   101.17     57.6   101.38     58.6   102.12     60.6   103.69
    61.7   104.41     65.5106.4873     67.7   107.69       68   107.76     68.4   107.84
    68.7   107.94     69.8   108.03     70.1   108.03     71.8   107.98     72.8   107.91
    74.8   107.86     75.8   107.86     76.8   107.83     77.9   107.84     78.9   107.81
    79.9   107.84     84.1   109.05       86   109.55       90   110.71       92   111.24
    92.8    111.5     95.1   112.13     96.3   112.47     97.2   112.73     99.1   113.23
   101.2   113.41    102.2   113.51    103.2   113.58    104.2   113.69    105.2   113.76
   107.2   113.95    111.2   113.97    113.3   114.01    115.7   114.03

Manning's n Values        num=       3
     Sta    n Val      Sta    n Val      Sta    n Val
       0      .06     47.5     .055     61.7      .06

Bank Sta: Left    Right    Coeff Contr.    Expan.
          47.5     61.7              .1        .3

CROSS SECTION OUTPUT  Profile #Q100


  E.G. Elev (ft)            104.05    Element                    Left OB    Channel
 Right OB
  Vel Head (ft)               0.52    Wt. n-Val.                              0.055

  W.S. Elev (ft)            103.53    Reach Len. (ft)
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Crit W.S. (ft)            103.16    Flow Area (sq ft)                  20.80
E.G. Slope (ft/ft)      0.025046    Area (sq ft)                       20.80
Q Total (cfs)             120.50    Flow (cfs)                        120.50
Top Width (ft)             11.50    Top Width (ft)                     11.50
Vel Total (ft/s)            5.79    Avg. Vel. (ft/s)                    5.79
Max Chl Dpth (ft)           2.70    Hydr. Depth (ft)                    1.81
Conv. Total (cfs)          761.4    Conv. (cfs)                        761.4
Length Wtd. (ft)                    Wetted Per. (ft)                   13.18
Min Ch El (ft)            100.83    Shear (lb/sq ft)                    2.47
Alpha                       1.00    Stream Power (lb/ft s)             14.29
Frctn Loss (ft)                     Cum Volume (acre-ft)
C & E Loss (ft)                     Cum SA (acres)
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SUMMARY OF MANNING'S N VALUES

River:Noble Gulch

Reach	River Sta.	n1	n2	n3
Noble Gulch	750	.04	.035	.04
Noble Gulch	664	.04	.035	.04
Noble Gulch	580	.04	.035	.04
Noble Gulch	491	.04	.035	.04
Noble Gulch	474	.04	.035	.04
Noble Gulch	430	Culvert		
Noble Gulch	374	.06	.055	.06
Noble Gulch	351	.06	.055	.06
Noble Gulch	253	.06	.055	.06
Noble Gulch	126	.06	.055	.06
Noble Gulch	8	.06	.055	.06

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SUMMARY OF REACH LENGTHS

River: Noble Gulch

      Reach              River Sta.       Left     Channel     Right

 Noble Gulch              750                 82.2       85.8      87.3
 Noble Gulch              664                 79.6       84.1      87.4
 Noble Gulch              580                 95.2       88.9        83
 Noble Gulch              491                 17.4       17.4      17.4
 Noble Gulch              474                 97.7      100.2     106.9
 Noble Gulch              430            Culvert
 Noble Gulch              374                   23         23        23
 Noble Gulch              351                101.1       97.4      93.9
 Noble Gulch              253                126.4      127.4     129.6
 Noble Gulch              126                116.3      118.2     119.3
 Noble Gulch              8
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SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Noble Gulch


      Reach              River Sta.      Contr.    Expan.

 Noble Gulch              750                .1        .3
 Noble Gulch              664                .1        .3
 Noble Gulch              580                .1        .3
 Noble Gulch              491                .1        .3
 Noble Gulch              474                .3        .5
 Noble Gulch              430        Culvert
 Noble Gulch              374                .3        .5
 Noble Gulch              351                .1        .3
 Noble Gulch              253                .1        .3
 Noble Gulch              126                .1        .3
 Noble Gulch              8                  .1        .3
```