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 PREVISICH, PLANNING DIRECTOR
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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) 454-3201

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 Romero at (831) 454-3137 (TDD number (831) 454-2123 or (831) 763-8123) to make arrangements.

PROJECT: JOHNSON GRADING

APP #: 141037

APN(S): 108-161-32, 34, 37, 38, 40, 46, 47

PROJECT DESCRIPTION: The proposed project is a proposal to construct a 2,270 foot long driveway and single family dwelling. The associated scope of work includes approximately 2,100 cubic yards of excavation and 1,500 cubic yards of fill and the removal and replacement of an existing ephemeral stream crossing. The project requires Preliminary Grading Approval.

PROJECT LOCATION: Project is located on a private drive on the east side of Freedom Boulevard 200 feet past Pleasant Valley Court in the Corralitos area.

EXISTING ZONE DISTRICT: R-A (Residential Agriculture)
APPLICANT: Dee Murray
OWNER: Ralph and Yeelan Johnson
PROJECT PLANNER: Carolyn Burke, (831) 454-5121
EMAIL: Carolyn.Burke@santacruzcounty.us
ACTION: Negative Declaration with Mitigations
REVIEW PERIOD: August 21, 2014 through September 19, 2014

This project will be considered administratively by the Project Planner at the conclusion of the review period.

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MITIGATED NEGATIVE DECLARATION

Project: Johnson Grading **APN(S): 108-161-32, 34, 37, 38, 40, 46, 47**

Project Description: Proposal to construct a 2,270 foot long driveway and single family dwelling. The associated scope of work includes approximately 2,100 cubic yards of excavation and 1,500 cubic yards of fill and the removal and replacement of an existing ephemeral stream crossing. The project requires Preliminary Grading Approval.

Project Location: The project is located on the east side of a Freedom Boulevard on a private drive 200 feet past Pleasant Valley Court.

Owner: Ralph and Yeelan Johnson

Applicant: Dee Murray

Staff Planner: Carolyn Burke, (831) 454-5121

Email: Carolyn.Burke@santacruzcounty.us

This project will be considered administratively by the Project Planner at the conclusion of the review period.

California Environmental Quality Act Mitigated 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, that revisions in the project plans or proposals made by or agreed to by the project applicant would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur; 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 as revised 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: September 19, 2014

Note: This Document is considered Draft until it is Adopted by the Appropriate County of Santa Cruz Decision-Making Body

Date: 8/20/14

TODD SEXAUER, Environmental Coordinator
(831) 454-3511

County of Santa Cruz

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CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) ENVIRONMENTAL REVIEW INITIAL STUDY

Date: July 7, 2014 **Application Number:** 141037

Staff Planner: Carolyn Burke

I. OVERVIEW AND ENVIRONMENTAL DETERMINATION

APPLICANT: Dee Murray **APN(s)**: 108-161-32, 34, 37, 38, 40, 46, 47

OWNER: Ralph and Yeelan Johnson **SUPERVISORAL DISTRICT**: 2

PROJECT LOCATION: Take Highway 1 south to Freedom Boulevard. Continue on Freedom Boulevard to a private drive on the east side of the road, 200 feet past Pleasant Valley Court.

SUMMARY PROJECT DESCRIPTION: Proposal to construct a 2,270-foot-long driveway and single family dwelling. The associated scope of work includes approximately 2,100 cubic yards of excavation and 1,500 cubic yards of fill and the removal and replacement of an existing ephemeral stream crossing. The project requires Preliminary Grading Approval.

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.

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

DISCRETIONARY APPROVAL(S) BEING CONSIDERED:

- ☐ General Plan Amendment
- ☐ Land Division
- ☐ Rezoning
- ☐ Development Permit
- ☐ Coastal Development Permit
- ☒ Preliminary Grading Approval
- ☒ Riparian Exception
- ☐ Other:

NON-LOCAL APPROVALS

Other agencies that must issue permits or authorizations: Possible agency permits required include 1602 Streambed Alteration Agreement, 404 Nationwide Permit (NWP 14) and 401 Water Quality Certification

DETERMINATION: (To be completed by the lead agency)
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.

Todd Sexauer
Environmental Coordinator

8/20/14
Date

II. BACKGROUND INFORMATION

EXISTING SITE CONDITIONS

Parcel Size: 16.916 acres (combined)
Existing Land Use: cattle grazing (undeveloped)
Vegetation: non-native annual grassland field/pasture and riparian
Slope in area affected by project: ☒ 0 - 30% ☐ 31 – 100%
Nearby Watercourse: ephemeral stream on parcel; tributary to Corralitos Lagoon
Distance To: 3,500 feet to Corralitos Lagoon

ENVIRONMENTAL RESOURCES AND CONSTRAINTS

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

SERVICES

Fire Protection: Pajaro
School District: Pajaro Valley
Sewage Disposal: Septic
Drainage District: Zone 7
Project Access: Freedom Boulevard
Water Supply: Domestic Well

PLANNING POLICIES

Zone District: RA – Residential Agriculture
General Plan: R-R – Rural Residential
Special Designation: None

Urban Services Line:	☐ Inside	☒ Outside
Coastal Zone:	☐ Inside	☒ Outside

ENVIRONMENTAL SETTING AND SURROUNDING LAND USES:

The affected property consists of 6 parcels with a total acreage of 16.9 acres. The property has a R-A (Residential Agriculture) zoning designation. Adjacent parcels to the east and north are zoned A (Agriculture) and C-A (Commercial Agriculture) respectively. The nearest C-A zoned property line is more than 200 feet from the proposed residence and associated improvements.

Vegetation on the property consists of non-native annual grassland and for many years has been used to graze cattle. The property generally slopes westward from a north-south trending ridge at the eastern most edge of the parcels, with the exception of a small knoll at the northwest corner of the property (APNs 108-161-46, 47). Site grades are relatively gentle, varying between 6:1 and 3:1 (H:V); isolated slopes to the west and

east of the building site on APN 108-161-32 are steeper, varying from 2.5:1 to 3.5:1 (H:V). Soils in the vicinity are sandy loams formed on eolian Aromas Sand deposits and alluvial terrace deposits with lenses of expansive clay.

Several drainage features exist on the property. A small drainage exists approximately 50 feet from the westerly property line of parcel 108-161-46 and consists of a small depression hydrated by a spring and roadway runoff from a driveway to the northwest. This drainage has been somewhat degraded by a long history of grazing on the property. A portion of the drainage runoff flows through developed properties along Pleasant Valley Court to the southwest, to Freedom Boulevard, then south to Corralitos Lagoon and Corralitos Creek. Separately, a much larger drainage crosses under the access road to the property on parcel 108-161-40. This ephemeral drainage begins approximately 2.5 miles above the access road crossing, and in the vicinity of the crossing supports a variety of riparian vegetation, including willow and blackberry. A separate colluvial drainage swale is located along the western edge of parcels 108-161-37, 38. This swale is ephemeral, and does not support any wetland or riparian vegetation.

PROJECT BACKGROUND:

A lot legality determination was conducted for the subject parcels in 2013, in which the parcels were deemed legal.

DETAILED PROJECT DESCRIPTION:

The proposed project consists of the construction of a 2,250-foot-long driveway through the lower parcels to access an upslope homesite on the eastern ridge on parcel 108-161-32. Construction of the driveway and residence requires 2,100 cubic yards of excavation and 1,500 cubic yards of fill, and would disturb approximately 1.5 acres. The first 600 feet of driveway would be aligned with an existing access road that traverses parcel 108-161-40 and crosses a small, ephemeral drainage. In order to accommodate emergency vehicle loading, the project includes an upgrade to the existing drainage crossing consisting of the installation of a corrugated pipe arch culvert. The culvert design allows for silt to accumulate in the bottom of the culvert, simulating an "open bottom" design. Preliminary improvement plans are included as Attachment 2.

Roadway drainage from the lower portion of the driveway would sheet flow directly into a percolation trench built adjacent to the roadway asphalt section. Runoff from the upper reaches of the driveway would be collected with traditional asphalt berms and directed to two dispersion trenches that outlet on the gentle sideslopes of an ephemeral drainage on parcels 108-161-37 and 38. This drainage is conveyed beneath the proposed driveway via a 12-inch High Density Polyethylene (HDPE) culvert.

The proposed residence is designed to step down the north-south trending ridgeline on parcel 108-161-32, incorporating a garage and basement beneath second-story living

space. The driveway terminates at the residence with a required fire department turnaround.

III. ENVIRONMENTAL REVIEW CHECKLIST

A. GEOLOGY AND SOILS

Would the project:

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
1.	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
	A. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
	B. Strong seismic ground shaking?	☐	☐	☒	☐
	C. Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
	D. Landslides?	☐	☐	☒	☐

Discussion (A through D): The project site is located outside of the limits of the State Alquist-Priolo Special Studies Zone (County of Santa Cruz GIS Mapping, California Division of Mines and Geology, 2001). However, the project site is located approximately 4.4 miles southwest of the San Andreas fault zone, and approximately 0.9 mile southwest of the Zayante-Vergeles fault zone. 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.

A geologic investigation for the project was prepared by Nolan Associates, dated November 20, 2013 (Attachment 4), and a geotechnical investigation was prepared by Rock Solid Engineering, Inc., dated November 7, 2013 (Attachment 5). These reports have been reviewed and accepted by the Environmental Planning Section of the Planning Department (Attachment 6). The reports conclude that fault rupture would not be a potential threat to the proposed development. The driveway, home and leach field locations have all been reviewed and approved by the geotechnical engineer and geologist as being in conformance with the recommendations of their technical reports

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

(Attachment 11).

2. 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 residence and driveway will be constructed in conformance with the recommendations of the soils and geology reports and will not be located on soils that are unstable or would become unstable.

3. Develop land with a slope exceeding 30%?	☐	☐	☐	☒

Discussion: There are slopes that exceed 30% on the property. However, no improvements are proposed on slopes in excess of 30%.

4. 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 due to the relatively shallow depth of proposed cuts and fills required for the driveway. Prior to approval of a grading or building permit, the project would have an approved Stormwater Pollution Control Plan as required by County Code 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.

5. Be located on expansive soil, as defined in Section 1802.3.2 of the California Building Code (2007), creating substantial risks to life or property?	☐	☐	☒	☐

Discussion: There are indications of expansive soils in the area. The project would be designed to conform to the recommendations of the accepted geotechnical and geologic reports and would not result in substantial risks to life or property due to expansive soils.

6. Place sewage disposal systems in areas dependent upon soils incapable of adequately supporting the use of septic tanks, leach fields, or alternative waste water disposal systems where	☐	☐	☐	☒

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

sewers are not available?

***Discussion*:**

The proposed project would use an onsite sewage disposal system, and County Environmental Health Services has determined that site conditions are appropriate to support such a system. No impact is anticipated.

7.	Result in coastal cliff erosion?	☐	☐	☐	☒

***Discussion*:** The proposed project is not located in the vicinity of a coastal cliff or bluff; and therefore, would not contribute to coastal cliff erosion.

B. HYDROLOGY, WATER SUPPLY, AND WATER QUALITY
Would the project:

1.	Place development within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒

***Discussion*:** According to the Federal Emergency Management Agency (FEMA) National Flood Insurance Rate Map, dated May 16, 2012, no portion of the project site lies within a 100-year flood hazard area.

2.	Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒

***Discussion*:** According to the Federal Emergency Management Agency (FEMA) National Flood Insurance Rate Map, dated May 16, 2012, no portion of the project site lies within a 100-year flood hazard area.

3.	Be inundated by a seiche, tsunami, or mudflow?	☐	☐	☐	☒

***Discussion*:** Due to the location of the project approximately 4 miles inland from the coast, the likelihood of inundation by a seiche or tsunami is negligent. Neither the geotechnical nor the geologic report identified any potential for mudflows on the property. No impact is anticipated.

4.	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby	☐	☐	☒	☐

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

wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Discussion: The project would rely on a private well for water supply. The project proponents have applied for and been issued a well permit by the Santa Cruz County Environmental Health Department, indicating that groundwater supply is adequate in this area. Although a portion of the driveway is located in a mapped groundwater recharge area, most driveway runoff would be percolated back into the ground via dissipation trenches and a percolation ditch adjacent to the roadway. The proposed residence is not within the mapped groundwater recharge area (Attachment 1).

5. Substantially degrade a public or private water supply? (Including the contribution of urban contaminants, nutrient enrichments, or other agricultural chemicals or seawater intrusion).	☐	☐	☒	☐

Discussion: The project would not discharge runoff either directly or indirectly into a public or private water supply. However, runoff from this project may contain small amounts of chemicals and other household contaminants. No commercial or industrial activities are proposed that would contribute contaminants. Potential siltation from the proposed project would be addressed through implementation of Best Management Practices (BMPs) outlined in the Stormwater Pollution Control Plan submitted per the requirements of County Code 7.79.100, which would specify detailed erosion and sedimentation control measures.

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6. Degrade septic system functioning?	☐	☐	☐	☒

Discussion: There is no indication that existing septic systems in the vicinity would be affected by the project.

7. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding, on- or off-site?	☐	☐	☒	☐

Discussion: The proposed project is not located near any major watercourses, and would not alter the existing overall drainage pattern of the site. A stream crossing would be installed within a minor ephemeral drainage on the property, but would replace an existing crossing and would not alter the course of the drainage. Drainage

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

from the roadway would be collected and dispersed to percolate into site soils, thereby minimizing any increase in runoff. Department of Public Works Drainage Section staff has reviewed and approved the proposed drainage plan.

8.	Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems, or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐

Discussion: Department of Public Works Drainage staff has reviewed the project and have determined that existing storm water facilities are adequate to handle the increase in drainage associated with the project. Refer to response B-5 for discussion of urban contaminants and/or other polluting runoff.

9.	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐

Discussion: The project is not located near any FEMA mapped flood plains. The existing drainage traversed by the driveway is ephemeral, with a shallow channel and no evidence of scour patterns indicative of high stream flows. No levees or dams exist in the vicinity of the proposed project. The risk of loss, injury or death due to flooding is anticipated to be less than significant.

10.	Otherwise substantially degrade water quality?	☐	☐	☒	☐

Discussion: Runoff from this project may contain small amounts of chemicals and other household contaminants. No commercial or industrial activities are proposed that would contribute contaminants. Potential siltation from the proposed project would be addressed through implementation of Best Management Practices (BMPs) outlined in the Stormwater Pollution Control Plan submitted per the requirements of County Code 7.79.100, which would specify detailed erosion and sedimentation control measures.

C. 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,	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
or by the California Department of Fish and Game, or U.S. Fish and Wildlife Service?				

Discussion: A Biotic Assessment was prepared for this project by EcoSystems West, dated September 3, 2013 (Attachment 7). This assessment determined that no threatened, sensitive, or special status plant species exist on the site and therefore none would be impacted by the proposed development. A Biotic Report was prepared for this project by Biosearch Associates, dated May 24, 2013 (Attachment 9) which evaluated the project site for potential habitat for the Santa Cruz Long-Toed Salamander (SCLTS) and California Red-Legged Frog (CRLF). This report has been reviewed and accepted by the Planning Department Environmental Coordinator (Attachment 10). The report found that the property is within 1.2 miles of two known Santa Cruz Long-Toed Salamander (SCLTS) breeding ponds, and within 1 mile of one known California Red-Legged Frog (CRLF) breeding pond. Multiple other potential breeding ponds for both species exist within one mile of the property, but due to the lack of long-term standing water no breeding ponds for either species exist on site. While these species do not breed on site, the grasslands may provide upland habitat for use during their migration between breeding and non-breeding habitats. The small spring-fed drainage in the northwest corner of parcel 108-161-46 at best provides marginal over-summering habitat for SCLTS and foraging and sheltering habitat for CRLF, however this area would not be impacted by proposed development.

While the Biotic Report concluded that no significant impact would occur to the CRLF and SCLTS, conditions of the biotic approval have been imposed to further reduce potential impacts. The biotic report acceptance letter authored by Matthew Johnston, Environmental Coordinator (Attachment 10) lists restrictions on disturbance timeframes, use of retaining walls, and swimming pool construction. The conditions of approval for this development permit will also require that the drainage on parcel 108-161-46 be fenced to prevent cattle and other livestock from grazing and allow revegetation of the area, and if parcel 108-161-46 is developed in the future a full restoration plan will be implemented that would include removal of non-native plant species and revegetation with native wetland, upland and riparian plant species.

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 Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐

Discussion: The proposed project includes the replacement of an existing concrete crossing over a small, ephemeral drainage with a new concrete arch culvert with a

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

natural channel bottom. Replacement of this crossing requires a Riparian Exception issued by the County of Santa Cruz. The Riparian Exception will incorporate the following conditions of approval of this permit: construction of the crossing must take place between April 15 and October 15 to avoid the rainy season, erosion and sediment measures will be in place at all times during construction, a spill prevention and response plan including all appropriate products will be available at the project site during the course of construction activities, and following construction the disturbed area will be revegetated and enhanced with native plant species replaced at a 3:1 ratio. These mitigations will prevent the proposed work from having an adverse impact on the riparian habitat.

A possible wetland does exist at the northwest corner of parcel 108-161-46, but no development is planned in this area. The grassland on site is composed of non-native grass species and is not considered sensitive habitat.

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

Discussion: A Biotic Assessment was prepared for this project by EcoSystems West, dated September 3, 2013 (Attachment 7). A Biotic Report was prepared for this project by Biosearch Associates, dated May 24, 2013 (Attachment 9). This report has been reviewed and accepted by the Planning Department Environmental Coordinator (Attachment 10). The report found that the property is within 1.2 miles of two known Santa Cruz Long-Toed Salamander (SCLTS) breeding ponds, and within 1 mile of one known California Red-Legged Frog (CRLF) breeding pond. Multiple other potential breeding ponds for both species exist within one mile of the property, but due to the lack of long-term standing water no breeding ponds for either species exist on site. While these species do not breed on site, the grasslands may provide upland habitat for use during their migration between breeding and non-breeding habitats. The small spring-fed drainage in the northwest corner of parcel 108-161-46 provides marginal over-summering habitat for SCLTS and foraging and sheltering habitat for CRLF. This area would not be impacted by proposed development. Both the Biotic Assessment and Biotic Report concluded that no significant impact would occur to CRLF and SCLTS.

While the Biotic Report concluded that no significant impact would occur to the CRLF and SCLTS, conditions of the biotic approval have been imposed to further reduce potential impacts. The biotic report acceptance letter authored by Matthew Johnston, Environmental Coordinator (Attachment 10) lists restrictions restrictions on disturbance

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

timeframes, use of retaining walls, and swimming pool construction to minimize the potential for the proposed development to impede the movement of these species. These conditions will be incorporated into the conditions of approval for the Preliminary Grading approval.

4.	Produce nighttime lighting that would substantially illuminate wildlife habitats?	☐	☐	☒	☐

Discussion: The only light sources included in the proposed development are associated with the residence, which is located along a ridge at the eastern limits of the property. This ridgeline is located approximately 750 feet upslope of the nearest wetland or riparian habitat, and therefore would not substantially illuminate these wildlife habitats.

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

Discussion: A small spring-fed possible wetland was identified in the northwest corner of parcel 108-161-46. This area would not be impacted by the proposed development.

6.	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 proposed project includes the replacement of an existing concrete stream crossing over a ephemeral drainage with a concrete arch culvert with a natural channel bottom. Replacement of this crossing requires a Riparian Exception issued by the County of Santa Cruz to conform to the requirements of Santa Cruz County Code Chapter 16.30 "Riparian Corridor and Wetlands Protection". The findings for the Riparian Exception can be made as follows:

1. *That there are special circumstances or conditions affecting the property.* Due to the position of the existing drainage parallel to Freedom Boulevard and the fact that the drainage extends the full width of the parcel used to access the proposed development, the only possible path to the proposed development requires crossing

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

the drainage.

2. *That the exception is necessary for the proper design and function of some permitted or existing activity on the property.* The existing crossing does not meet loading and width requirements for emergency vehicle access. In order to gain access to the proposed residence, this crossing must be demolished and upgraded to meet current codes.

3. *That the granting of the exception will not be detrimental to the public welfare or injurious to other property downstream or in the area in which the project is located.* The proposed open-bottom arch culvert will have a similar profile to the existing stream crossing, thus it is not anticipated that installation of the stream crossing will significantly alter stream flow patterns adjacent to or downstream of the bridge.

4. *That the granting of the exception, in the Coastal Zone, will not reduce or adversely impact the riparian corridor, and there is no feasible less environmentally damaging alternative.* This project is not within the Coastal Zone.

5. *That the granting of the exception is in accordance with the purpose of this chapter, and with the objectives of the General Plan and elements thereof, and the Local Coastal Program Land Use Plan.* The proposed stream crossing replacement is necessary to ensure adequate access to the proposed residence by emergency service vehicles, in accordance with section 7.16 of the General Plan regarding fire protection in rural areas. The conditions of this permit will conform to all applicable policies of the General Plan subsections 5.1 (Biological Resources) and 5.2 (Riparian Corridors and Wetlands).

Mitigations for the protection of the migration of SCLTS and CRLF have been outlined in the biotic approval issued by the County of Santa Cruz (Attachment 10) in conformance with the Sensitive Habitat Protection ordinance, Chapter 16.32 of the County Code. All the aforementioned requirements have been included in the Conditions of Approval for the development; the development otherwise does not conflict with any local policies or ordinances protecting biological resources.

7.	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 proposed 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.

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

D. AGRICULTURE AND FOREST RESOURCES

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

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

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

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

Discussion: The project site is zoned R-A (Residential Agriculture), 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.

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 adjacent to land designated as Timber Resource,

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

therefore the proposed project poses no direct impact to the resource.

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. No impact is anticipated.

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

Discussion: The project site and surrounding area within radius of one-quarter 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 2.5 miles of the proposed project site. Therefore, no impacts are anticipated.

E. 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 R-A (Residential Agriculture), 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

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

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.

F. VISUAL RESOURCES AND AESTHETICS

Would the project:

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

Discussion: The project would not directly impact any public scenic resources, as designated in the County's General Plan (1994), or obstruct any public views of these visual resources.

2.	Substantially damage scenic resources, within a designated scenic corridor or public view shed area including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒

Discussion: The project site is not located along a County designated scenic road, public viewshed area, scenic corridor, within a designated scenic resource area, or within a state scenic highway. Therefore, no impact is anticipated.

3.	Substantially degrade the existing visual character or quality of the site and its surroundings, including substantial change in topography or ground surface relief features, and/or development on a ridgeline?	☐	☐	☒	☐

Discussion: The existing visual setting is grasslands with scattered oak trees. The proposed project is designed and landscaped so as to fit into this setting and would not include substantial changes in topography, with minimal cuts and fills required for driveway construction.

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 create an incremental increase in night lighting. However, this increase would be small, and would be similar in character to the lighting associated with the surrounding existing uses.

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

G. CULTURAL RESOURCES

Would the project:

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

Discussion: The affected parcels are unimproved, with no existing structures or other federal, state or local historical resources on the property. No impacts to such are anticipated.

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

Discussion: No archeological resources have been identified in the project area. Pursuant to County Code Section 16.40.040, if at any time in the preparation for or process of excavating or otherwise disturbing the ground, any human remains of any age, 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 County Code Chapter 16.40.040.

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

Discussion: Pursuant to Section 16.40.040 of the Santa Cruz County Code, 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 archeological report shall be prepared and representatives of the local Native California Indian group shall be contacted. Disturbance shall not resume until the significance of the archeological resource is determined and appropriate mitigations to preserve the resource on the site are established.

4.	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

Discussion: There are no known paleontological resources or unique geologic features on the project site.

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

H. HAZARDS AND HAZARDOUS MATERIALS

Would the project:

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

Discussion: The proposal would not result in the routine transportation, use or disposal of hazardous materials.

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: Hazardous materials are not known to exist on the subject property. Small amounts of hazardous chemicals may be used during construction (related to construction equipment, adhesives, etc.) but these would be used according to established codes and protocols and would not cause a reasonably foreseeable hazard to the public.

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 proposal would not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste. No schools exist within one-quarter mile of the project area.

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 4/4/14 list of hazardous sites in Santa Cruz County compiled pursuant to the specified code.

5.	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				

Discussion: The project site is not located within an airport land use plan area.

6.	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒

Discussion: The project site is not located within the vicinity of a private airstrip.

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

Discussion: The proposed development is not expected to interfere with an adopted emergency response or evacuation plan.

8.	Expose people to electro-magnetic fields associated with electrical transmission lines?	☐	☐	☐	☒

Discussion: The proposed development would not involve the construction of electrical transmission lines and no lines are known to exist on the subject property.

9.	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

Discussion: The project design incorporates all applicable fire safety code requirements and includes fire protection devices as required by the local fire agency.

I. TRANSPORTATION/TRAFFIC

Would the project:

1.	Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?				

Discussion: The project would create a small incremental increase in traffic on nearby roads and intersections, due to the occupancy of the proposed single family dwelling. However, given the small number of new trips created by the project, this increase is not significant.

2. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒

Discussion: The project location is not within an existing airport land use clear zone; and therefore, no change to air traffic patterns is expected.

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

Discussion: The project does not include design features that would result in dangerous design features or other transportation hazards.

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

Discussion: The project's road access meets County standards and has been approved by the local fire agency.

5. Cause an increase in parking demand which cannot be accommodated by existing parking facilities?	☐	☐	☐	☒

Discussion: The project meets the code requirements for the required number of parking spaces and therefore new parking demand would be accommodated on site.

6. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

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

Discussion: The proposed project would comply with current road requirements to prevent potential hazards to motorists, bicyclists, and/or pedestrians.

7.	Exceed, either individually (the project alone) or cumulatively (the project combined with other development), a level of service standard established by the County General Plan for designated intersections, roads or highways?	☐	☐	☐	☒

Discussion: See response I-1 above.

J. NOISE

Would the project result in:

1.	A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐

Discussion: The project would create an incremental increase in the existing noise environment. However, this increase would be small, and would be similar in character to noise generated by the surrounding existing uses.

2.	Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐

Discussion: Ground vibrations generated during construction or grading activities may temporarily increase the groundborne noise levels for adjoining areas. Construction would be temporary, however, and given the limited duration of this impact it is considered to be less than significant.

3.	Exposure of persons to or generation of noise levels in excess of standards established in the General Plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐

Discussion: Per County policy, average hourly noise levels shall not exceed the General Plan threshold of 50 Leq during the day and 45 Leq during the nighttime. Impulsive noise levels shall not exceed 65 db during the day or 60 db at night. The proposed project would not generate noise in excess of these levels or expose individuals to noise in excess of the established thresholds.

4.	A substantial temporary or periodic	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
increase in ambient noise levels in the project vicinity above levels existing without the project?				

Discussion: Noise generated during construction would increase the ambient noise levels for adjoining areas. Construction would be temporary, however, and given the limited duration of this impact it is considered to be less than significant.

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 expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion: The project location is not within an existing airport land use clear zone or within two miles of a public airport.

6.	For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion: There are no private airstrips within the vicinity of the project.

K. AIR QUALITY

Where available, the significance criteria established by the Monterey Bay Unified Air Pollution Control District (MBUAPCD) may be relied upon to make the following determinations. Would the project:

1.	Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐

Discussion: The North Central Coast Air Basin does not meet state standards for ozone and particulate matter (PM_{10}). Therefore, the regional pollutants of concern that would be emitted by the project are ozone precursors (Volatile Organic Compounds [VOCs] and nitrogen oxides [NO_x]), and PM_{10}.

Given the limited amount of new traffic that would be generated by the project there is no indication that new emissions of VOCs or NO_x would exceed MBUAPCD 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 dust. However, standard dust control best management practices, such

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

as periodic watering, would be implemented during construction to avoid impacts.

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

Discussion: The project would not conflict with or obstruct implementation of the regional air quality plan. See K-1 above.

3.	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 (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒

Discussion: The proposal would result in the construction of one residence, a use that is not expected to result in an cumulatively considerable net increase in air pollutants, pollutant concentrations or objectionable odors, therefore no impact is anticipated.

4.	Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒

Discussion: See response K-3 above.

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

Discussion: See response K-3 above.

L. 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 proposed project, like all development, would be responsible for an incremental increase in greenhouse gas emissions by usage of fossil fuels during the site grading and construction. Santa Cruz County has recently 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 AB 32 legislation. The strategy intends to reduce greenhouse gas 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. All project construction

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

equipment would be required to comply with the Regional Air Quality Control Board emissions requirements for construction equipment. As a result, impacts associated with the temporary increase in greenhouse gas 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 L-1 above. No impacts are anticipated.

M. PUBLIC SERVICES

Would the project:

1.	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 or other recreational activities?	☐	☐	☐	☒
	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

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

school and recreational facilities and public roads.

N. 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: See response M-1 above.

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 include recreational facilities, nor does it require the construction or expansion of recreational facilities.

O. UTILITIES AND SERVICE SYSTEMS

Would the project:

1.	Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

Discussion: Department of Public Works Drainage 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.

2.	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

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

The project would be served by an on-site sewage disposal system, which would be adequate to accommodate the relatively light demands of the project.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
3. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒

Discussion: The project's wastewater flows would not violate any wastewater treatment standards.

4. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒

Discussion: The Environmental Health Department has approved a well permit for the property that they have determined would produce sufficient water supplies to serve the proposed single family residence, and would not require expanded entitlements.

5. 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: Wastewater treatment would occur onsite, therefore a determination by a wastewater treatment provider is not required for this project.

6. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒

Discussion: Due to the small incremental increase in solid waste generation, the impact would not be significant.

7. Comply with federal, state, and local 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.

P. LAND USE AND PLANNING

Would the project:

1. Conflict with any applicable land use	☐	☒	☐	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				

Discussion: The proposed project includes the replacement of an existing concrete stream crossing over a small, ephemeral drainage with an arch culvert with a natural channel bottom. Replacement of this crossing requires a Riparian Exception issued by the County of Santa Cruz to conform to the requirements of Santa Cruz County Code Chapter 16.30 "Riparian Corridor and Wetlands Protection". Findings can be made for the Riparian Exception as outlined in Response C(6). Mitigations for the protection of the migration of SCLTS and CRLF have been outlined in the biotic approval issued by the County of Santa Cruz in conformance with the Sensitive Habitat Protection ordinance, Chapter 16.32 of the County Code. All the aforementioned requirements have been included in the Conditions of Approval for the development; the development otherwise does not conflict with any local policies or ordinances protecting biological resources.

2.	Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Discussion: The project does not conflict with any applicable habitat conservation plan or natural community conservation plan.

3.	Physically divide an established community?	☐	☐	☐	☒

Discussion: The project would not include any element that would physically divide an established community.

Q. POPULATION AND HOUSING

Would the project:

1.	Induce substantial 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 proposed 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

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

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.

The proposed 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.

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

Discussion: The proposed project would not displace any existing housing since the site is currently vacant.

3.	Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion: The proposed project would not displace a substantial number of people since the site is currently vacant.

R. MANDATORY FINDINGS OF SIGNIFICANCE

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
1. Does the project have the potential to 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, reduce the number or restrict the range of a rare or endangered plant or animal community, 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?	☐	☒	☐	☐

Discussion: The potential to 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, 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 of this Initial Study. Resources that have been evaluated as significant would be potentially impacted by the project, particularly upland habitat traversed by Santa Cruz Long-Toed Salamander (SCLTS). However, mitigation has been included that clearly reduces these effects to a level below significance. This mitigation includes restrictions on disturbance timeframes, use of retaining walls, and swimming pool construction to minimize the potential for the proposed development to impede the movement of these species. 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.

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
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 projects potential for incremental effects that are cumulatively considerable. As a result of this evaluation, there were determined to be less than significant cumulative effects related to transportation and traffic, as well as biotic resources (with mitigation). Therefore, the cumulative impacts would also be deemed less than significant.

	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
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 relating to Air Quality, Geology and Soils, Hazards and Hazardous Materials, Water Quality, Noise, Population and Housing, and Transportation and Traffic. As a result of this evaluation, there is no substantial evidence that there are adverse effects to human beings associated with this project. Therefore, this project has been determined not to meet this Mandatory Finding of Significance.

IV. REFERENCES USED IN THE COMPLETION OF THIS ENVIRONMENTAL REVIEW INITIAL STUDY

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 Geographic Information System
Maps indicating presence of resources, constraints, hazards, and distances from existing uses and the subject property.

Federal Emergency Management Agency (FEMA)
National Flood Insurance Rate Map, dated May 16, 2012

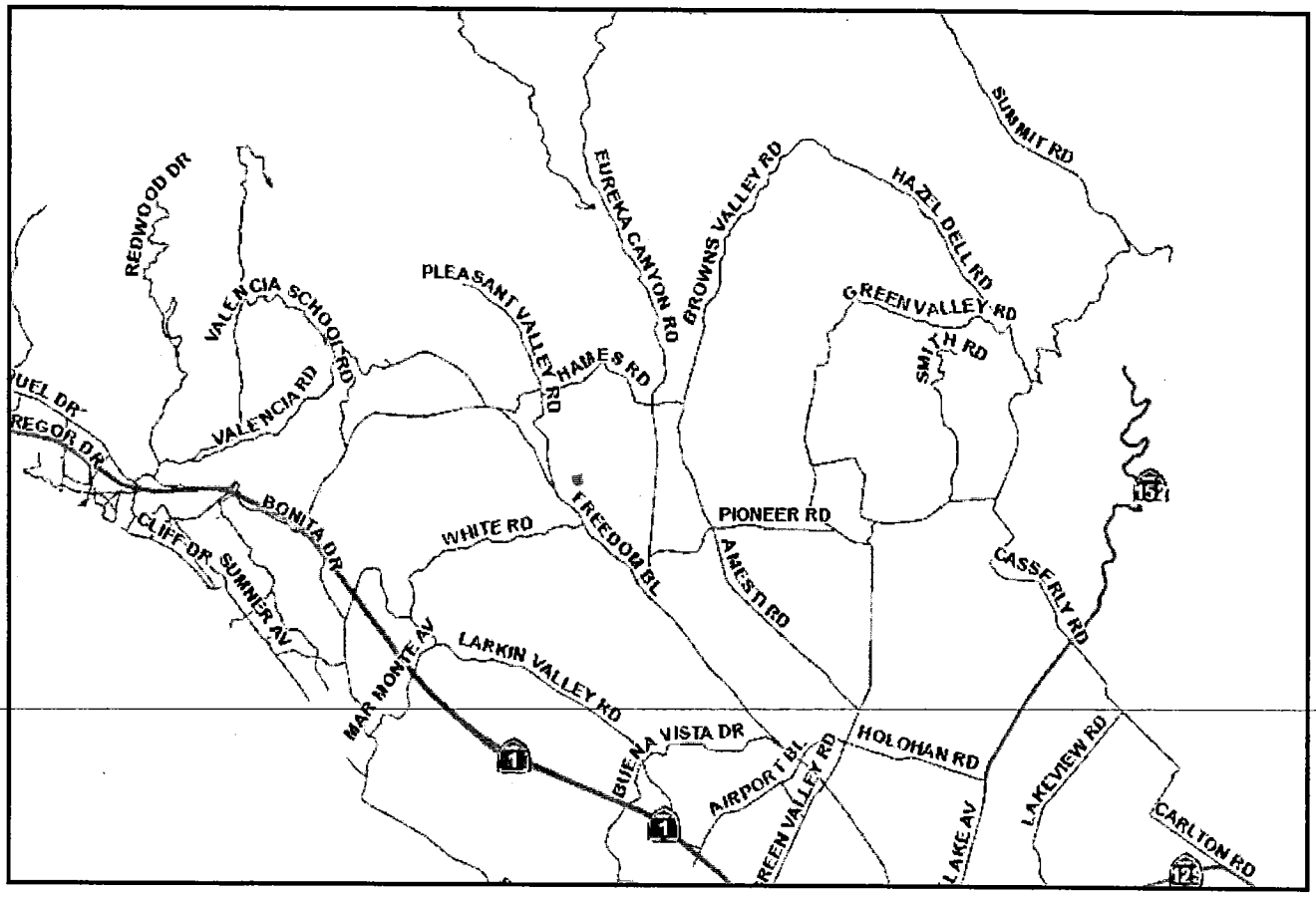
V. ATTACHMENTS

1. *Vicinity Map, Map of Zoning Districts; Map of General Plan Designations; Assessor's Parcel Map; Groundwater Recharge Map.*
2. *Preliminary Improvement Plans*, prepared by Roper Engineering, dated 2/25/14, revised 6/6/2014.
3. *Geologic Hazards Assessment*, prepared by Joe Hanna, County Geologist, dated 6/17/13.
4. *Geologic Investigation (Geologic Hazards, Conclusions, Recommendations)*, prepared by Nolan Associates, dated 11/20/13.
5. *Geotechnical Investigation (Conclusions and Recommendations)*, prepared by Rock Solid Engineering, Inc., dated November 7, 2013.
6. *Geologic and Geotechnical Report Review Letter*, prepared by Joe Hanna, County geologist, dated 4/2/14.
7. *Biotic Assessment*, prepared by Ecosystems West, dated 9/3/13.
8. *Biotic Assessment Review Letter*, prepared by Matt Johnston, dated 9/4/13.
9. *Biotic Report*, prepared by Biosearch Associates, dated May 24, 2013.
10. *Biotic Report Review Letter*, prepared by Matt Johnston, dated 8/2/13.
11. *Geotechnical and Geologic Plan Review Forms*, prepared by Rock Solid Engineering, Inc. and Nolan Associates, dated 6/10/14.

VI. DOCUMENTS CITED IN THE COMPLETION OF THIS ENVIRONMENTAL REVIEW INITIAL STUDY ON FILE WITH THE COUNTY OF SANTA CRUZ

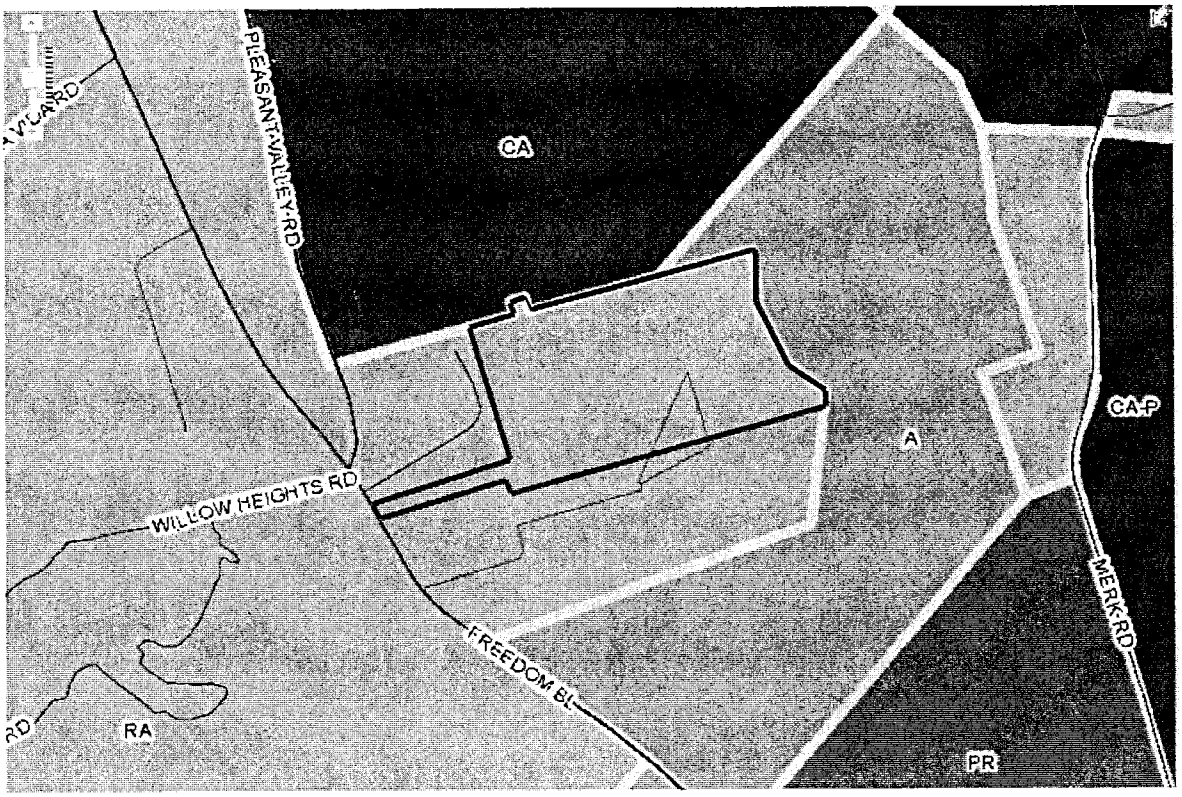
1. *Septic Lot Check*, prepared by Environmental Health Services, dated 3/6/2014
2. *Application for Well Installation*, Environmental Health Services, dated 3/20/14

VICINITY MAP
APPLICATION 141037: JOHNSON PERLIMINARY GRADING REVIEW
APN 108-161-32
FREEDOM BOULEVARD



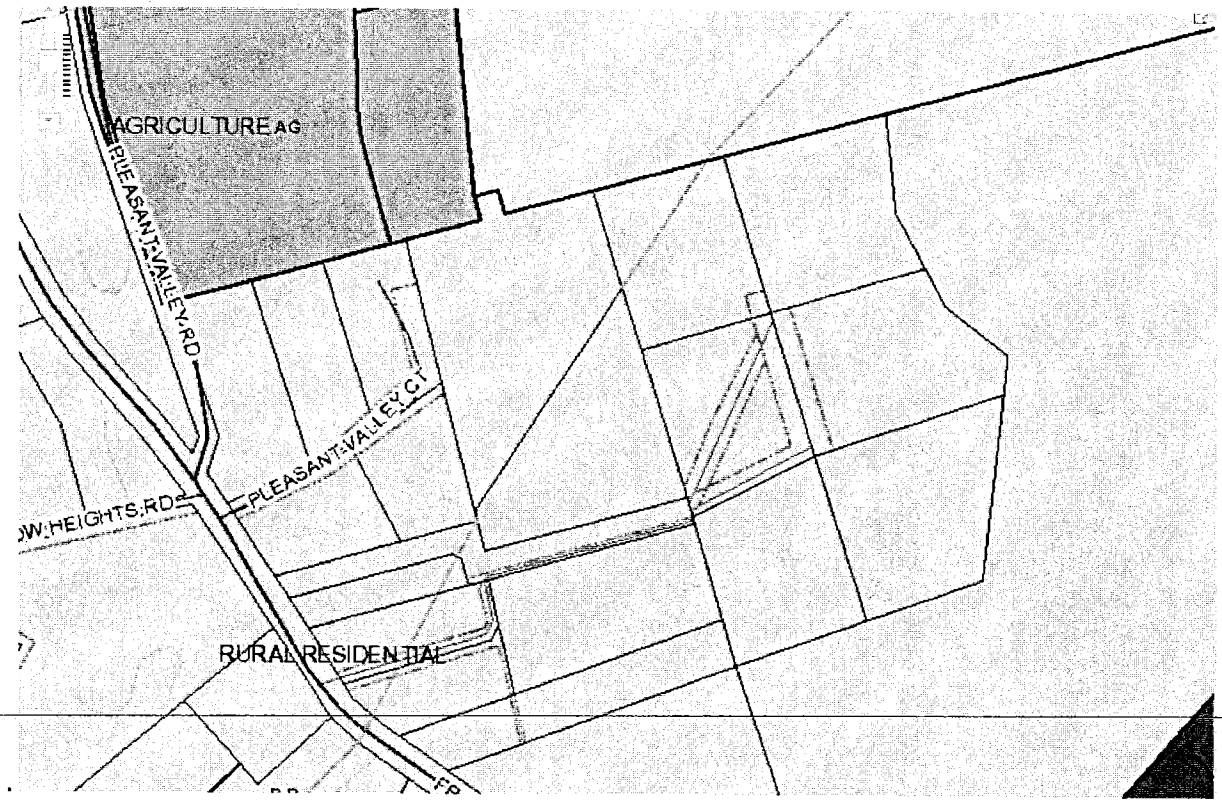
ATTACHMENT 1

MAP OF ZONING DISTRICTS
APPLICATION 141037: JOHNSON PERLIMINARY GRADING REVIEW
APN 108-161-32
FREEDOM BOULEVARD



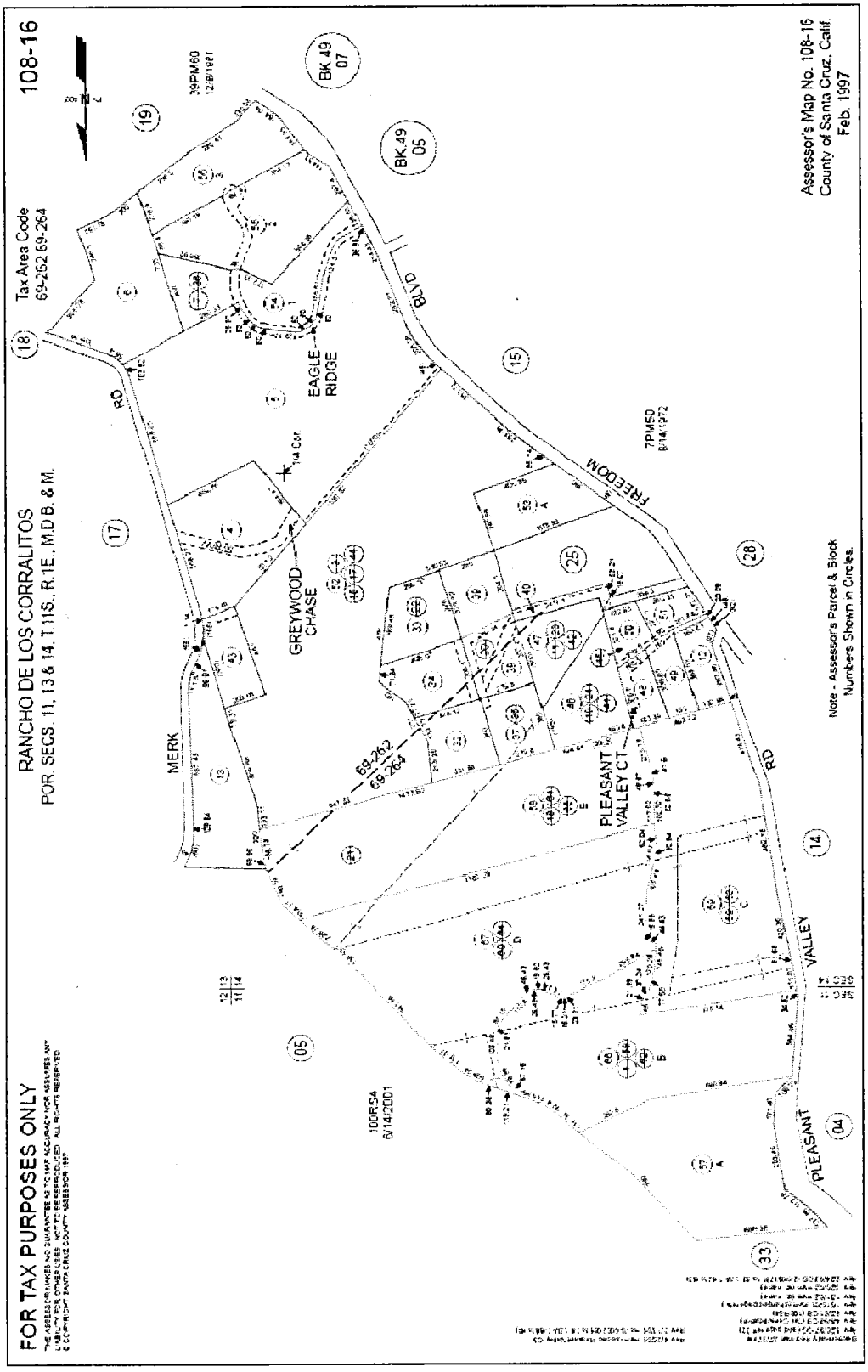
ATTACHMENT 1

MAP OF GENERAL PLAN DESIGNATIONS
APPLICATION 141037: JOHNSON PERLIMINARY GRADING REVIEW
APN 108-161-32
FREEDOM BOULEVARD



ATTACHMENT 1

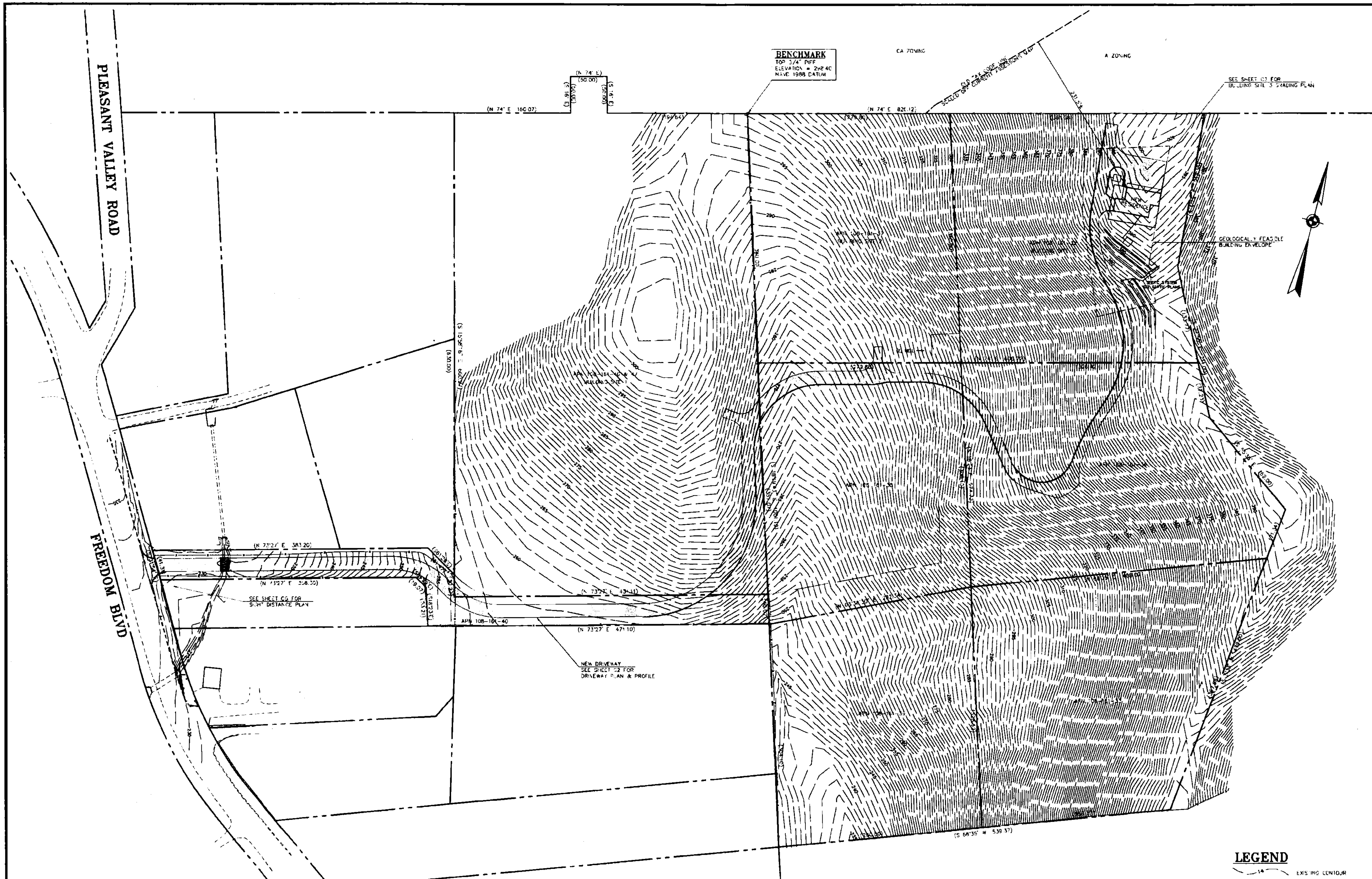
ASSESSOR'S PARCEL MAP
APPLICATION 141037: JOHNSON PERLIMINARY GRADING REVIEW
APN 108-161-32
FREEDOM BOULEVARD



ATTACHMENT 1

GROUNDWATER RECHARGE MAP
APPLICATION 141037: JOHNSON PERLIMINARY GRADING REVIEW
APN 108-161-32
FREEDOM BOULEVARD

ATTACHMENT 1



ROPER ENGINEERING
CIVIL ENGINEERING & LAND SURVEYING
64 PENNY LANE, SUITE A WATSONVILLE, CA 95076
(831) 724-5300 PHONE (831) 724-5509 FAX jeff@roperengineering.com

UNLESS SIGNED BY THE ENGINEER, THIS PLAN IS FOR REFERENCE ONLY. THE SIGNED PLAN IS THE ONLY PLAN TO BE USED FOR CONSTRUCTION.

PRELIMINARY

STIE DEVELOPMENT FOR YEELAN & RALPH JOHNSON

FREEDOM BLVD. APN 108-161-32-34,37-40,46-47

CIVIL SITE PLAN

SCALE	AS NOTED
DESIGNED BY:	JR
DRAWN BY:	JR
DATE:	FEB. 25, 2014
REVISED:	JUNE 6, 2014
JOB NO.:	13026
SHEET	C1
OF	7 SHEETS

ABBREVIATIONS

APN	ASSESSORS PARCEL NUMBER	JP	JOINT UTILITIES POLE
BVC	BEGIN VERTICAL CURVE	L	ARC LENGTH
CL	CENTERLINE	MIN	MINIMUM
Δ	DELTA, CENTRAL ANGLE	(N)	NEW
DS	DOWNSPOUT	PC	POINT OF CURVATURE
DET	DETAIL	PRC	POINT OF REVERSE CURVATURE
(E)	EXISTING	PT	POINT OF TANGENCY
EP	EDGE OF PAVEMENT	PVC	POLYVINYL CHLORIDE PIPE
EVC	END VERTICAL CURVE	R	RADIUS
FF	FINISHED FLOOR	STA	STATION
FL	FLOWLINE	TB	TOP OF BANK
HDPE	HIGH DENSITY POLYETHYLENE	TYP	TYPICAL
INV	INVERT	VC	VERTICAL CURVE

CIVIL SITE PLAN

SCALE: 1"=60'
0 30 60 120
FEET

SEE SHEET C7 FOR FIRE DEPARTMENT NOTES

EARTHWORK

STRIPPINGS : 800 ± CY
EXCAVATION : 1300 ± CY
FILL : 1500 ± CY
SHRINKAGE : 200 ± CY

LEGEND

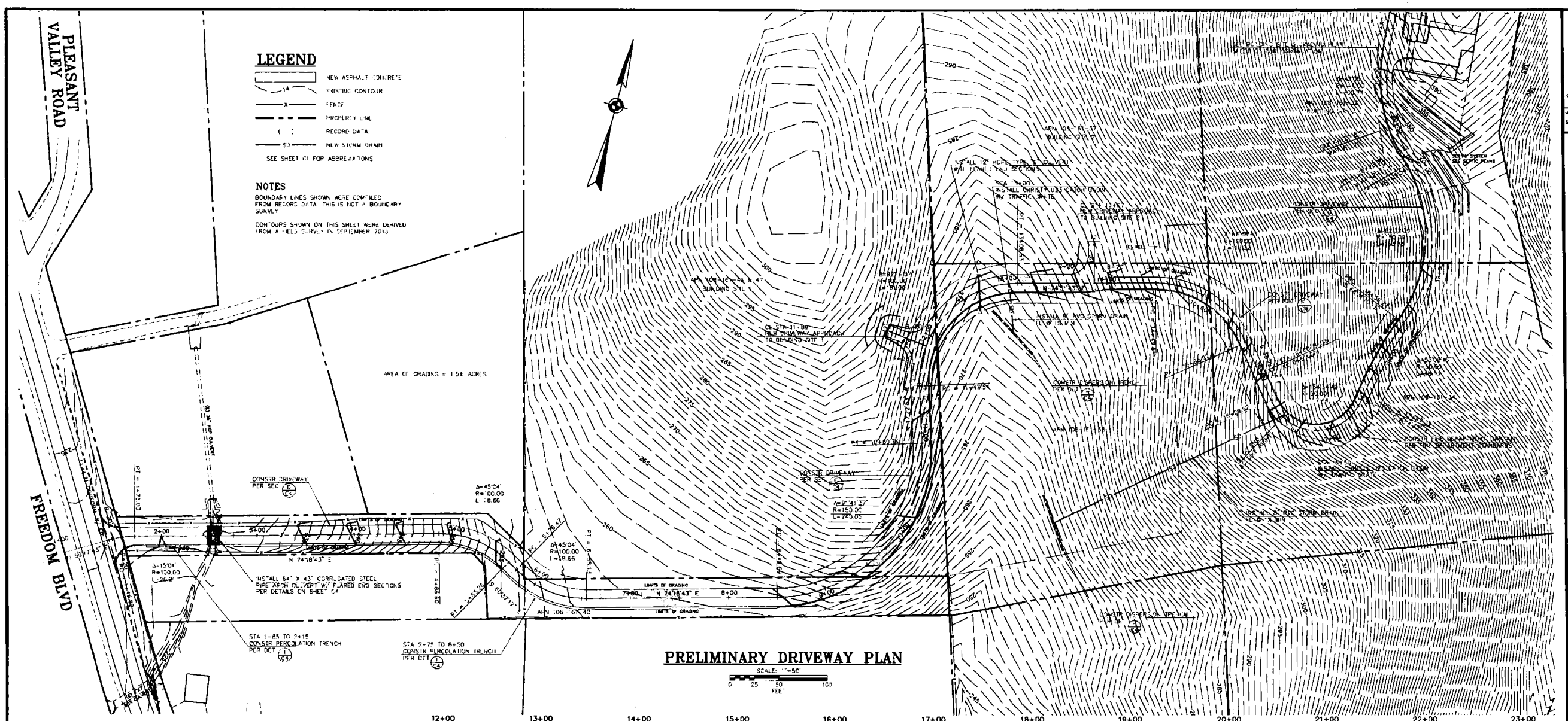
EXISTING CONTOUR
FENCE
PROPERTY LINE
( ) RECORD DATA

NOTES

BOUNDARY LINES SHOWN WERE COMPILED FROM RECORD DATA. THIS IS NOT A BOUNDARY SURVEY.

CONTOURS SHOWN ON THIS SHEET WERE DERIVED FROM A FIELD SURVEY IN SEPTEMBER 2013.

ATTACHMENT 2



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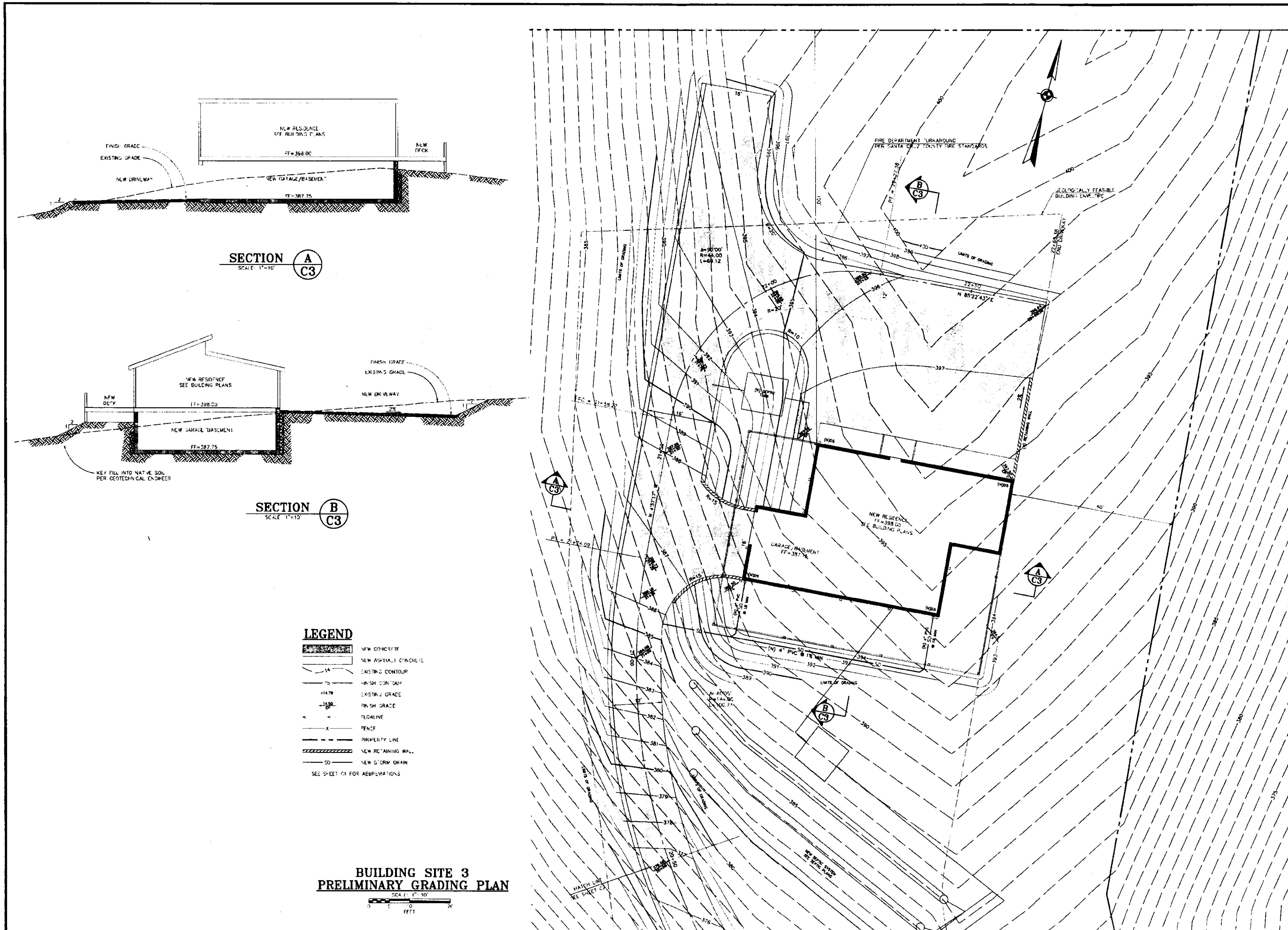
FREEDOM BLVD. APN 108-161-32-34,37-40,46-47

PRELIMINARY DRIVEWAY PLAN & PROFILE

SCALE:	AS NOTED
DESIGNED BY:	JR
DRAWN BY:	JR
DATE:	FEB. 25, 2014
REVISED:	JUNE 6, 2014
JOB NO.	13026
SHEET	C2
OF	7 SHEETS

ATTACHMENT 2



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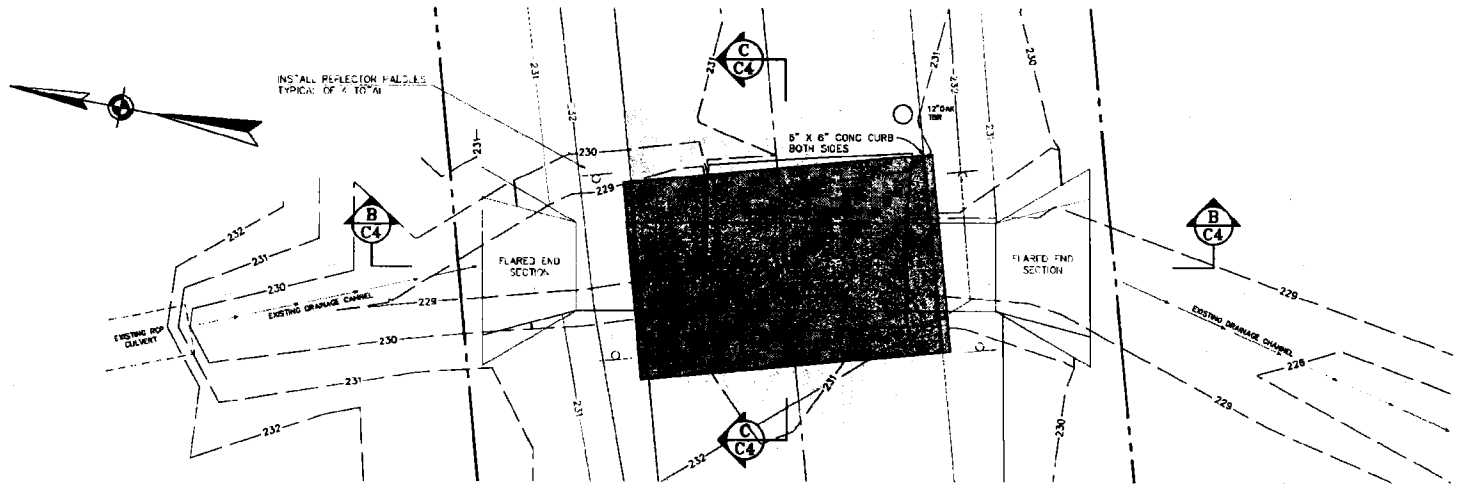
BUILDING SITE 3 PRELIMINARY GRADING PLAN

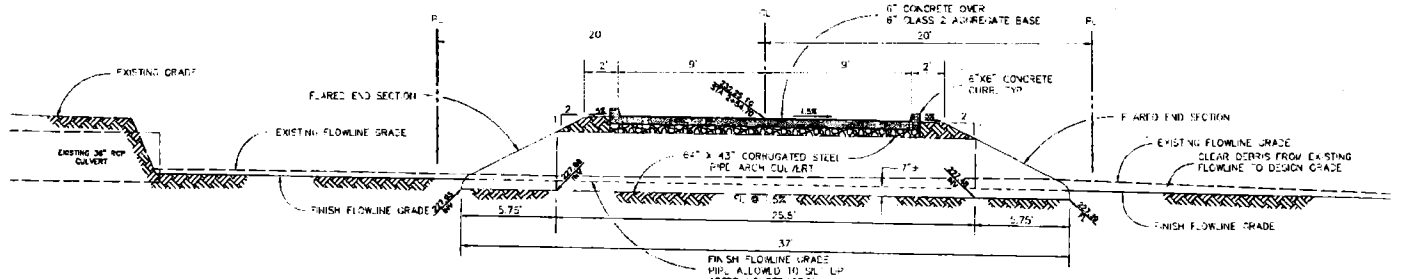
SCALE	AS NOTED
DESIGNED BY	JR
DRAWN BY	JR
DATE	FEB 25, 2014
REVISED	JUNE 6, 2014
JOB NO.	13026
SHEET	C3
OF	7 SHEETS

ATTACHMENT 2



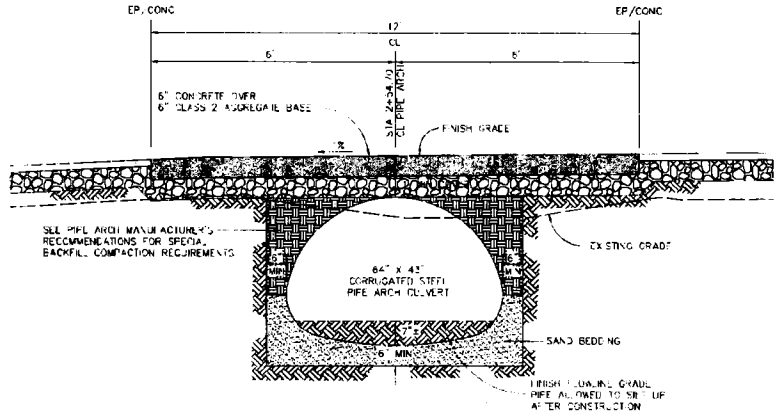
CULVERT CROSSING DETAIL A C4

SCALE: 1"=5'



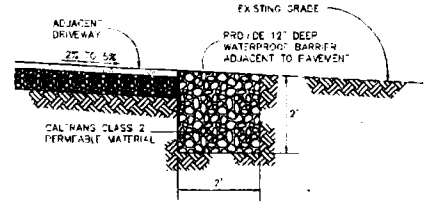
CULVERT CROSSING SECTION B C4

SCALE: 1"=5'



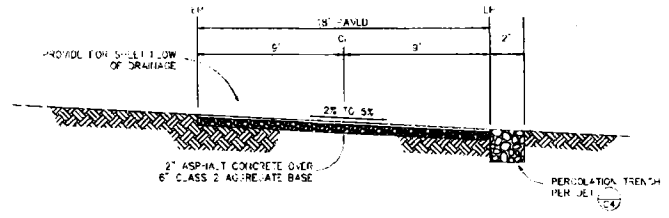
CULVERT CROSSING SECTION C C4

SCALE: 1"=2'



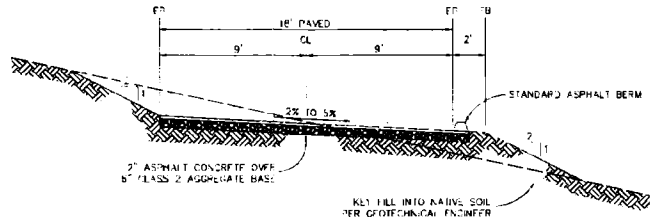
PERCOLATION TRENCH DETAIL I C4

SCALE: 1"=2'



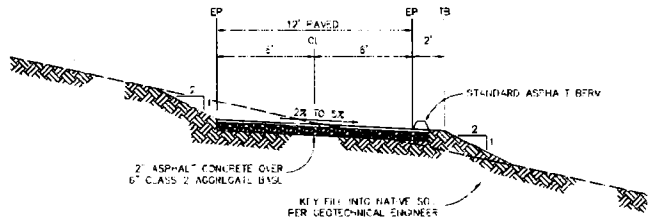
TYPICAL DRIVEWAY SECTION D C4

SCALE: 1"=5'
STA BEGIN TO 8+50



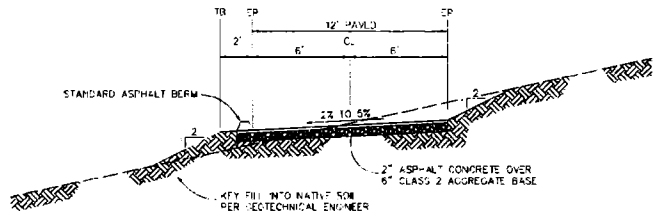
TYPICAL DRIVEWAY SECTION E C4

SCALE: 1"=5'
STA 8+50 TO 14+00



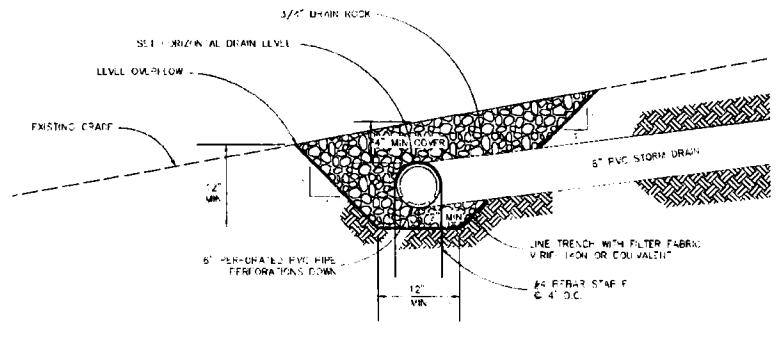
TYPICAL DRIVEWAY SECTION F C4

SCALE: 1"=5'
STA 14+00 TO 16+25



TYPICAL DRIVEWAY SECTION G C4

SCALE: 1"=5'
STA 16+25 TO END



DISPERSION TRENCH DETAIL H C4

SCALE: 1"=1'

PRELIMINARY

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STIE DEVELOPMENT FOR
YEELAN & RALPH JOHNSON
FREEDOM BLVD. APN 108-161-32-34,37-40,46-47

CULVERT CROSSING DETAILS

SCALE:	AS NOTED
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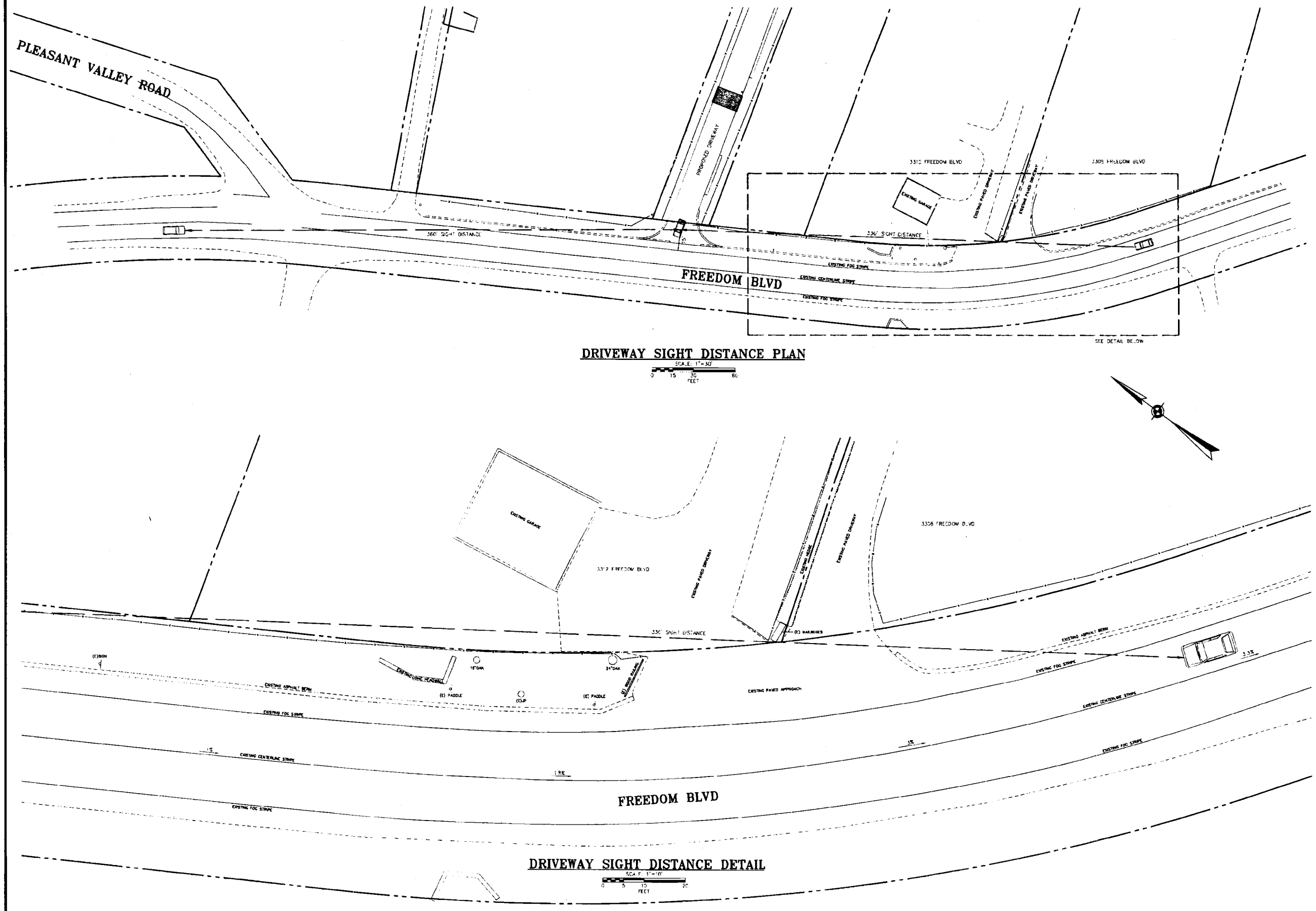
DRAWN BY:	JR
DATE:	FEB. 25, 2014
REVISED:	JUNE 6, 2014
JOB NO:	13026
SHEET	C4
OF	7 SHEETS

ATTACHMENT 2



DRIVEWAY SIGHT DISTANCE PLAN

SCALE: 1"=30'

0 15 30 60 FEET

DRIVEWAY SIGHT DISTANCE DETAIL

SCALE: 1"=10'

0 5 10 20 FEET

PRELIMINARY

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DRIVEWAY SIGHT DISTANCE PLAN

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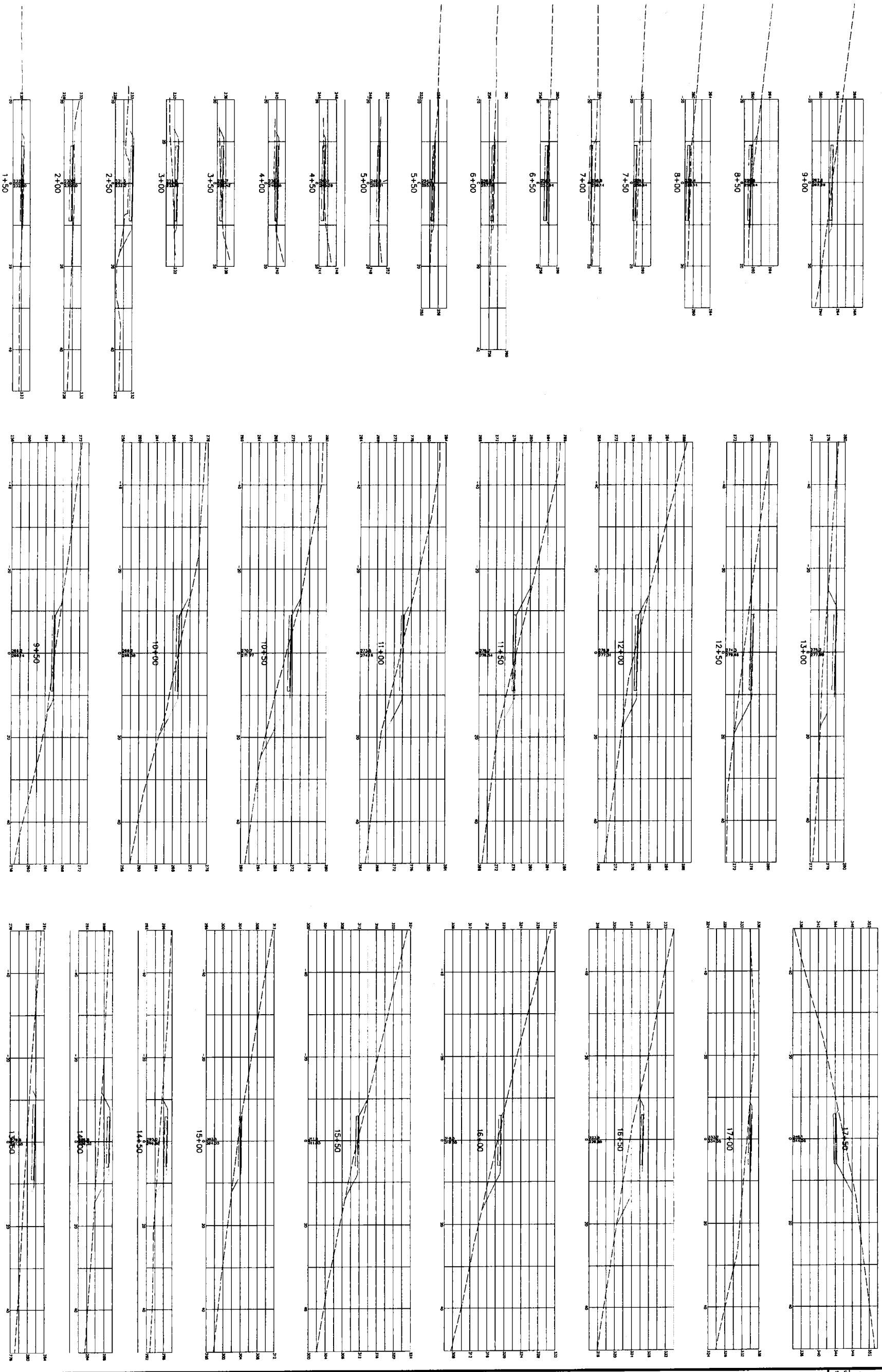

ATTACHMENT 2

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DRIVEWAY CROSS SECTIONS

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SHEET: C6
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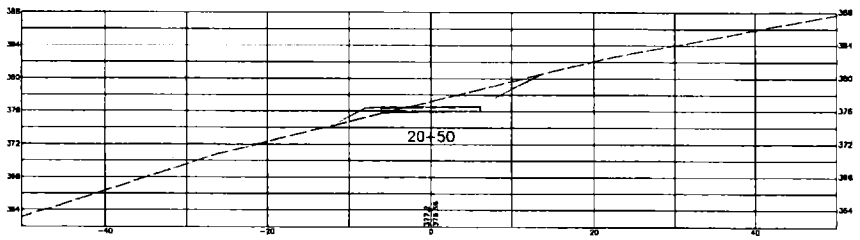
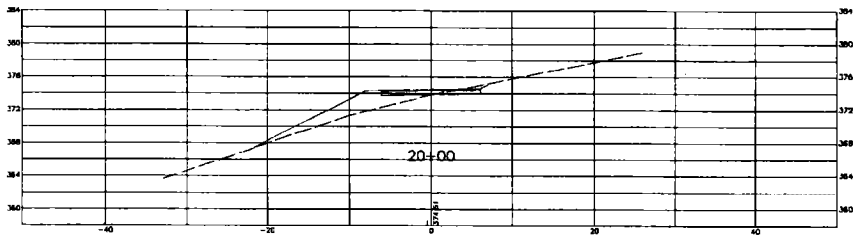
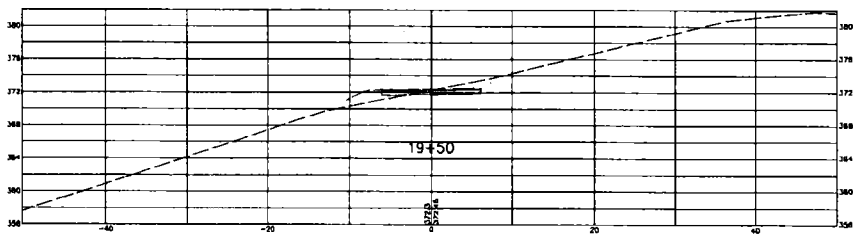
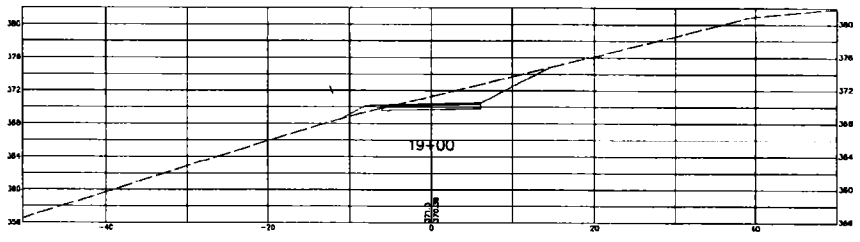
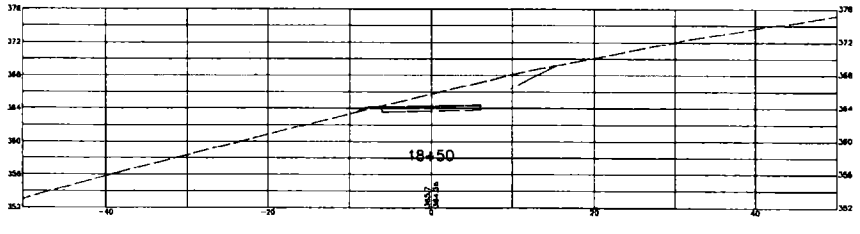
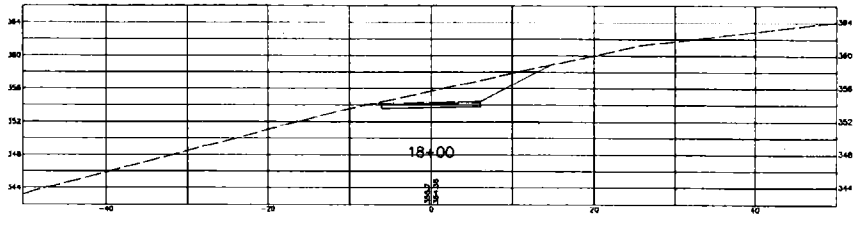






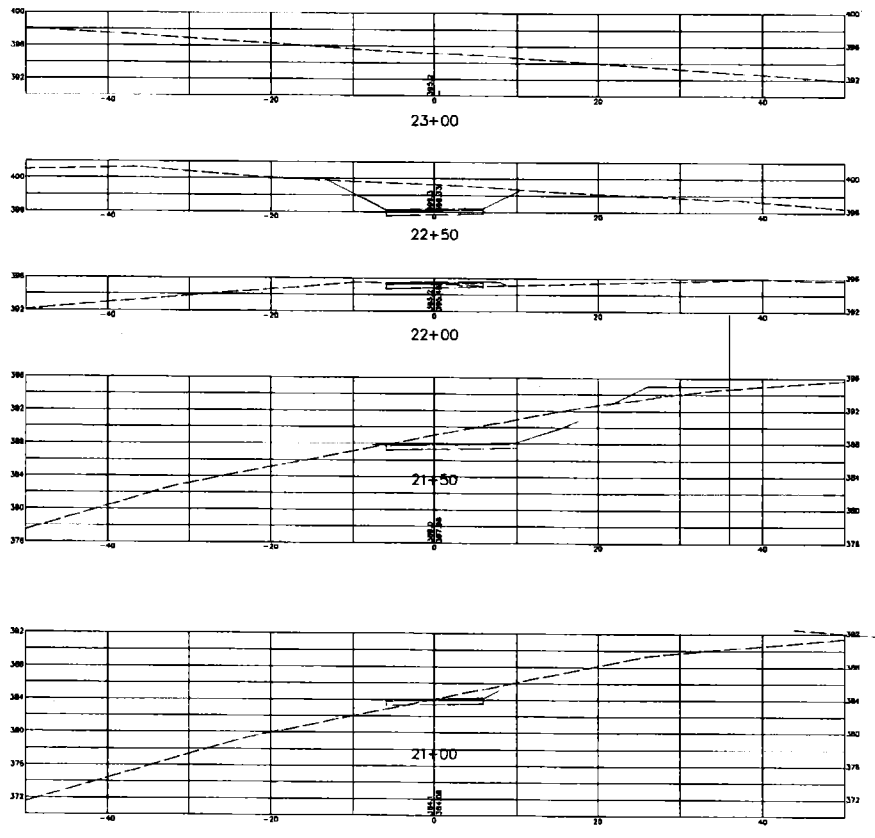


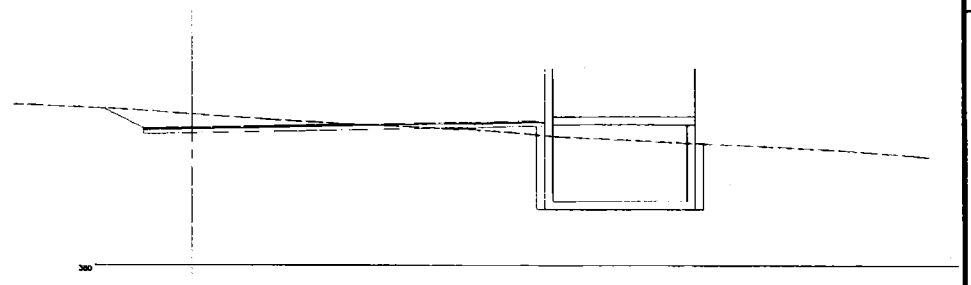


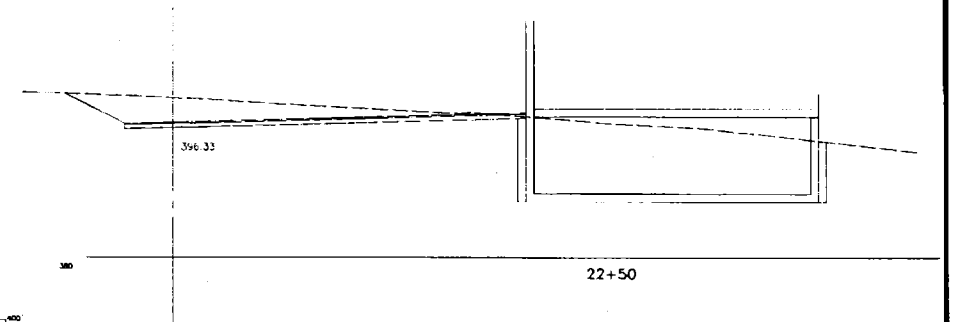


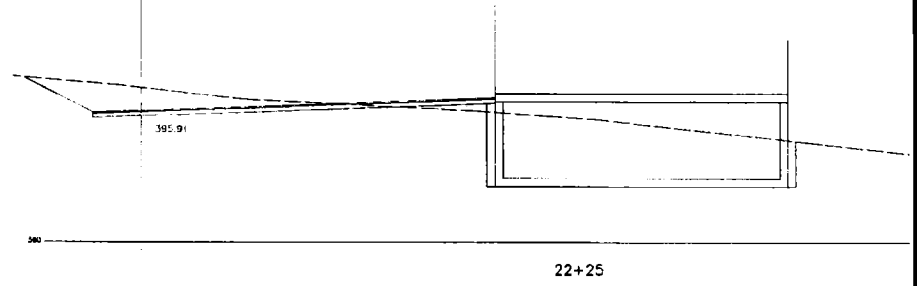
FIRE DEPARTMENT NOTES

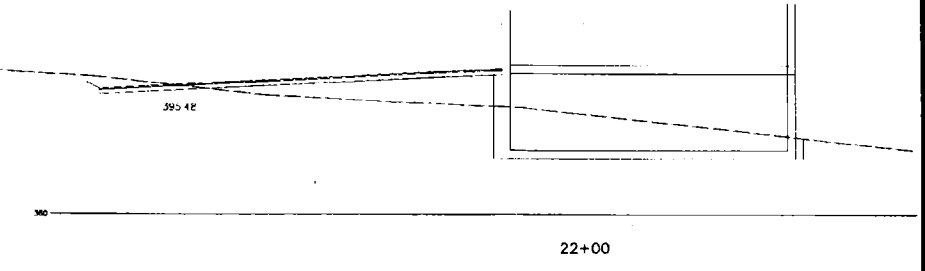
1. EACH APN (LOT) SHALL HAVE SEPARATE SUBMITTALS FOR BUILDING AND SPRINKLER SYSTEM PLANS
2. THESE PLANS ARE IN COMPLIANCE WITH CALIFORNIA BUILDING AND FIRE CODES (2013 EDITION), AND TAHOE VALLEY FIRE PROTECTION DISTRICT AMENDMENTS.
3. THE ACCESS ROAD SHALL BE 18 FEET MINIMUM UNOBSTRUCTED WIDTH AND MAXIMUM TWENTY PERCENT SLOPE. THE ACCESS ROAD FRONTING THE PROJECT PROPERTY CORNER TO PROPERTY CORNER SHALL CONFORM TO THE MINIMUM MCFD STANDARD.
4. THE ACCESS ROAD / DRIVEWAY SHALL BE AN "ALL WEATHER" SURFACE. "ALL WEATHER SURFACE" IS DEFINED AS A MINIMUM 6" OF COMPACTED AGGREGATE BASE ROCK, CLASS II OR EQUIVALENT, AND CERTIFIED IN WRITING BY A LICENSED ENGINEER TO 95% COMPACTION FOR GRADES UP TO AND INCLUDING 5%. FOR GRADES IN EXCESS OF 5% BUT NOT EXCEEDING 15%, OIL AND SCREEDS SHALL BE APPLIED TO A MINIMUM 6" OF COMPACTED AGGREGATE BASE ROCK, CLASS II OR EQUIVALENT, THEN FIELD IS BY A LICENSED ENGINEER TO 95% COMPACTION. FOR GRADES EXCEEDING 15%, 3" OF ASPHALTIC CONCRETE SHALL BE APPLIED OVER A MINIMUM 6" OF COMPACTED AGGREGATE BASE ROCK, CLASS II OR EQUIVALENT, CERTIFIED IN WRITING BY A LICENSED ENGINEER TO 95%.
5. THE MAXIMUM GRADE OF THE ACCESS ROAD SHALL NOT EXCEED 20% WITH GRADES GREATER THAN 15% NOT PERMITTED FOR DISTANCES OF MORE THAN 200 FEET AT A TIME.
6. THE ACCESS ROAD SHALL HAVE A VERTICAL CLEARANCE OF 13'-6" FOR ITS ENTIRE WIDTH AND LENGTH, INCLUDING TURNOUTS.
7. AN APPROVED TURN-A-ROUND SHALL BE PROVIDED FOR ACCESS ROADS AND DRIVEWAYS IN EXCESS OF 150 FEET IN LENGTH.
8. DRAINAGE DETAILS FOR THE ROAD OR DRIVEWAY SHALL CONFORM TO CURRENT ENGINEERING PRACTICES, INCLUDING EROSION CONTROL MEASURES.
9. ALL PRIVATE ACCESS ROADS, DRIVEWAYS, TURN-AROUND AND BRIDGES ARE THE RESPONSIBILITY OF THE OWNER(S) OF RECORD AND SHALL BE MAINTAINED TO ENSURE THE FIRE DEPARTMENT SAFE AND EXPEDIENT PASSAGE AT ALL TIMES.
10. THE DRIVEWAY SHALL BE THEREAFTER MAINTAINED TO THESE STANDARDS AT ALL TIMES.
11. A 100-FOOT CLEARANCE SHALL BE MAINTAINED AROUND AND ADJACENT TO THE BUILDING OR STRUCTURE TO PROVIDE ADDITIONAL FIRE PROTECTION OR FIRE BREAK BY REMOVING ALL BRUSH, FLAMMABLE VEGETATION, OR COMBUSTIBLE GROWTH. EXCEPTION: SINGLE SPECIMENS OF TREES, ORNAMENTAL SHRUBBERY OR SIMILAR PLANTS USED AS GROUND COVERS, PROVIDED THEY DO NOT FORM A MEANS OF RAPIDLY TRANSMITTING FIRE FROM NATIVE GROWTH TO ANY STRUCTURE."
12. THE JOB COPIES OF THE BUILDING AND FIRE SYSTEMS PLANS AND PERMITS MUST BE ON-SITE DURING INSPECTIONS."
13. AS A CONDITION OF SUBMITTAL OF THESE PLANS, THE SUBMITTER, DESIGNER AND INSTALLER CERTIFY THAT THESE PLANS AND DETAILS COMPLY WITH APPLICABLE SPECIFICATIONS, STANDARDS, CODES AND ORDINANCES. AND THAT THEY ARE SOLELY RESPONSIBLE FOR COMPLIANCE WITH APPLICABLE SPECIFICATIONS, STANDARDS, CODES AND ORDINANCES, AND FURTHER AGREE TO CORRECT ANY DEFICIENCIES NOTED BY THIS REVIEW, SUBSEQUENT REVIEW, INSPECTION OR OTHER SOURCE, AND, TO HOLD HARMLESS AND WITHOUT PREJUDICE, THE REVIEWER AND REVIEWER AGENCY.
14. FOR DRIVEWAYS OVER 500' IN LENGTH, APPROVED TURNOUTS ARE REQUIRED. THE DIMENSIONS FOR THE TURNOUTS CAN BE FOUND ON OUR WEBSITE, WWW.SANJACINTOVALLEY.COM. DRIVEWAYS THAT SERVE TWO OR FEWER HOMES MUST BE 12' IN WIDTH. DRIVEWAYS SERVING THREE OR MORE HOMES MUST BE 18' IN WIDTH.











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STIE DEVELOPMENT FOR
YEELAN & RALPH JOHNSON
FREEDOM BLVD. APN 108-161-32-34,37-40,46-47

DRIVEWAY CROSS SECTIONS

SCALE:	AS NOTED
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OF	7 SHEETS

ATTACHMENT 2

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 PREVISICH, PLANNING DIRECTOR

June 17, 2013

Cypress Environmental
P.O. Box 1844
Aptos, CA 95001

Subject: GEOLOGIC HAZARDS ASSESSMENT,
APN 108-161-33, 34, 37, 38, 39, 40, 46, and 47
LOCATION: Freedom Boulevard
PERMIT APPLICATION NUMBER: REV131054
OWNER: Yeeland and Ralph Johnson

Dear: Kim Tschantz:

I performed a site reconnaissance of the parcel referenced above on June 5, 2013. The parcel was evaluated for possible geologic hazards due to its location near and on a slope. This letter briefly discusses my site observations; outlines permit conditions; and indicates the requirements for further technical investigation (from a County perspective).

This assessment included a site reconnaissance, a review of maps and other pertinent documents on file with the Planning Department, and an evaluation of aerial photographs. The scope of this assessment is not intended to be as detailed as a full geologic or geotechnical report completed by a state registered consultant.

SEISMIC HAZARDS

The subject property is located immediately near the San Andreas Fault zone. Very strong ground shaking is likely to occur on the parcel during the anticipated lifetime of the proposed dwelling(s) and, therefore, proper structural and foundation design is imperative. In addition to the San Andreas other nearby fault systems capable of producing intense seismic shaking on this property include the San Gregorio, Zayante, Sargent, Hayward, Butano, and Calaveras faults, and Corralitos fault complexes. In addition to intense ground shaking hazard, development on this parcel could be subject to the effects of ridgetop shattering, ridge and/or lateral spreading, lurch cracking, liquefaction or subsidence and seismically induced landsliding during a large magnitude earthquake occurring along one of the above mentioned faults.

At least a portion of the development area is mapped as high liquefaction. The geotechnical engineer must evaluate this potential as part of their site investigation.

ATTACHMENT 3

SLOPE STABILITY HAZARDS

A "Preliminary Map of Landslide Deposits in Santa Cruz County" was prepared in 1975 as part of the County's General Plan. This interpretive map was prepared from aerial photographs and was designed only for "regional land use evaluations." The map indicates areas where questionable, probable, or definite past instability is suspected. While not a susceptibility map indicating potential site-specific stability problems, when utilized in conjunction with other published data and documents the map is a useful planning resource. A review of the landslide map and aerial photographs of the parcels shows relief suggestive of landsliding on the hillslopes.

The property is underlain by the Aromas Sands which can be problematic with regards to slope stability. And the hillside has large swales that appear to contain thick eroding and eroded material that may have the potential to produce landslides and soil creep. These areas of potential instability are marked as on the attached Aerial Photograph 1.

Proposed building sites 3 (b) and (c) are located at the very upslope terminus of this area of instability while site 3 (a) is set back some from these steeper slopes (Photos 2, 3, and 4). Development of all three areas will require an assessment of site stability by both an engineering geologist to identify the site constraints, and by a geotechnical engineer to determine engineer solutions to these constraints. Their evaluation must include possible seismic issues such as ridge top cracking particularly at the edges of the ridges. The consultants must review the alignment of the access roadway as crosses the slope below these potential future building locations.

Sites 1 and 2 must be evaluated by a geotechnical engineer for foundation and site development issues. For site 2 the geotechnical engineer needs to assess the stability of the slope above the home site, but if the setback between potential unstable slope and the building is great enough this assessment can be qualitative rather than quantitatively analyzed.

An engineered drainage plan must be developed by the project civil engineer for any project. The intent of the plan is to reduce the impact of post development hydrologic conditions on slope stability, ground water recharge, and stream flow. Specifically, the civil engineer must address the crossing that is located on the flag lot if the existing driveway alignment is used for an access roadway.

REPORT REQUIREMENTS

Based on my site visit and review of pertinent maps and other documents, further geologic evaluation in the form of a full geologic report is indicated for sites 3 (a), (b), and (c). A geotechnical (soils) investigation performed by a state registered geotechnical engineer is required for all sites prior to the Planning Department approval of your proposal. The

investigations must include, but not necessarily be limited to, a thorough evaluation of the following concerns:

1. Sites 3 (a), (b), and (c)
    a. Foundations Design;
    b. Access Roadway Development;
    c. Slope stability;
    d. Grading, and,
    e. Septic System dispersal field stability.
2. Sites 1 and 2
    a. Foundations Design;
    b. Access Roadway Development; and
    c. Grading.

PERMIT CONDITIONS

Permit conditions will be developed for your proposal after the technical report has been reviewed. At a minimum, however, you can expect to be required to follow all the recommendations contained in the report in addition to the following items:

I. Grading activities must be kept to a minimum. A grading permit is likely required as a part of the grading permit(s). The access roadway to the homes sites on the ridge will require extensive grading and special effort needs to be made to reduce the area of disturbance of this roadway.

II. An engineered drainage plan is required for this project. The plan must reduce the impact of post development hydrologic conditions on slope stability, ground water recharge, and stream flow.

III. The recommendation of the reports will become conditions of the permit.

IV. The irrigation of the slope should cease until the practice is reviewed by the geotechnical engineer.

Final building plans submitted to the Planning Department will be checked to verify that the project is consistent with the conditions outlined above prior to issuance of a building permit. If you have any questions concerning these conditions, the hazards assessment, or geologic issues in general, please contact me at 454-3175. It should be noted that other planning issues not related specifically to geology may alter or modify your development proposal and/or its specific location.

Sincerely,

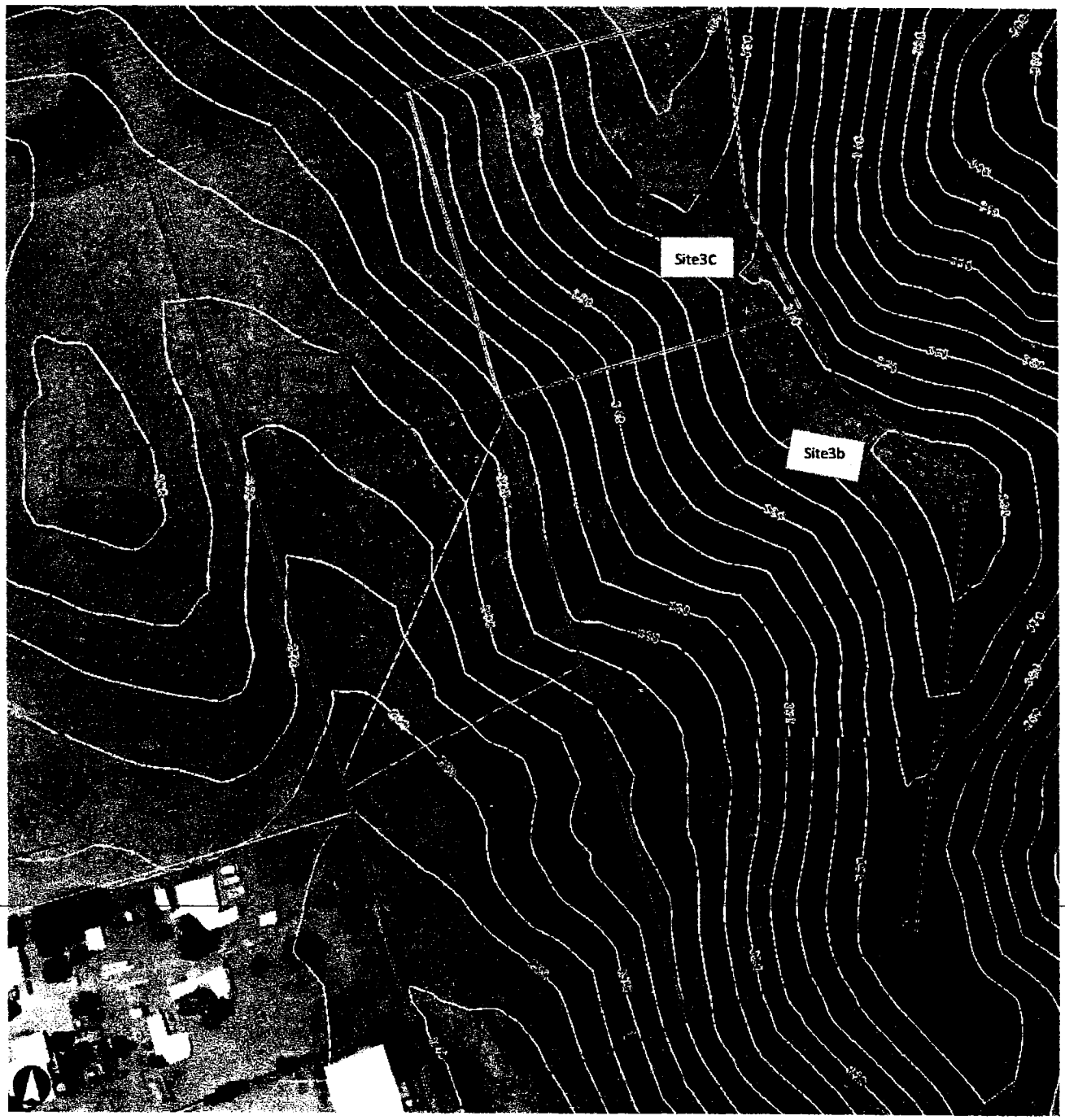
JOE HANNA
County Geologist
CEG #1313

FOR: Kent Edler PE
Senior Civil Engineer

Date

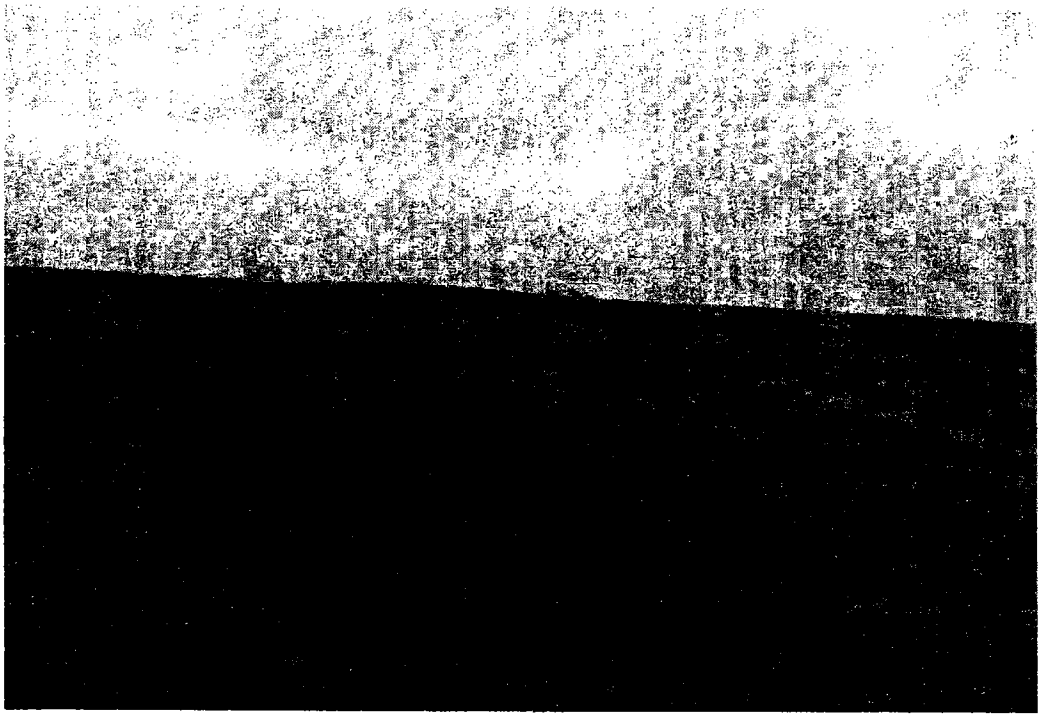
Enclosure(s)

cc: GHA File

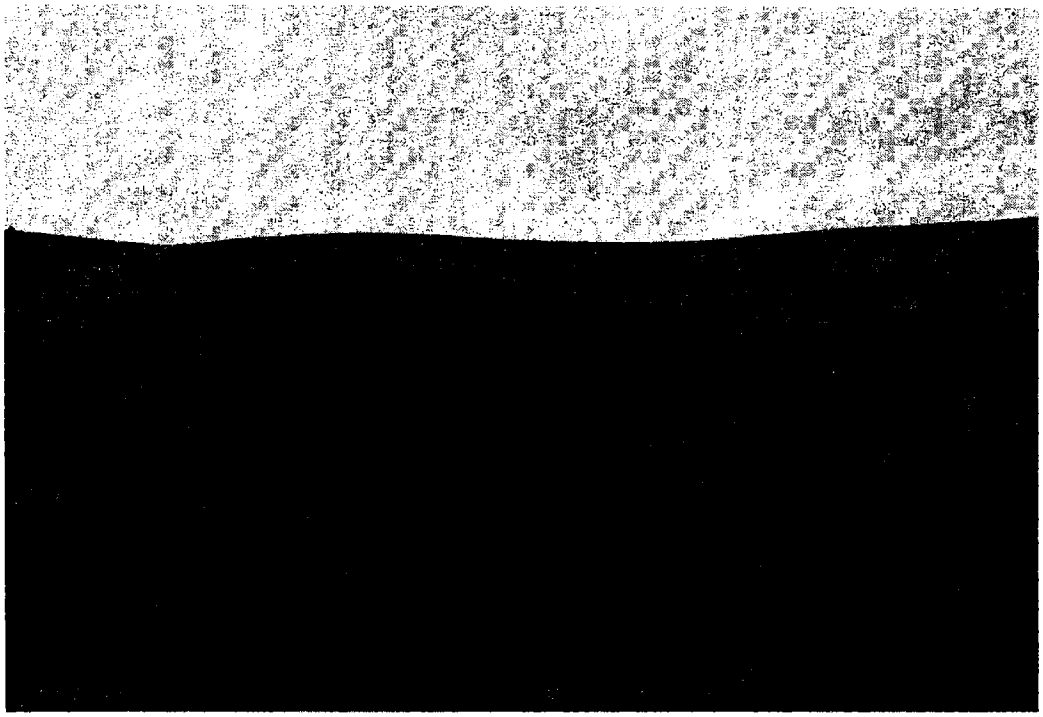


Site 3 requires application of ag buffer exception, if not approved the alternative sites are the lighter blue.

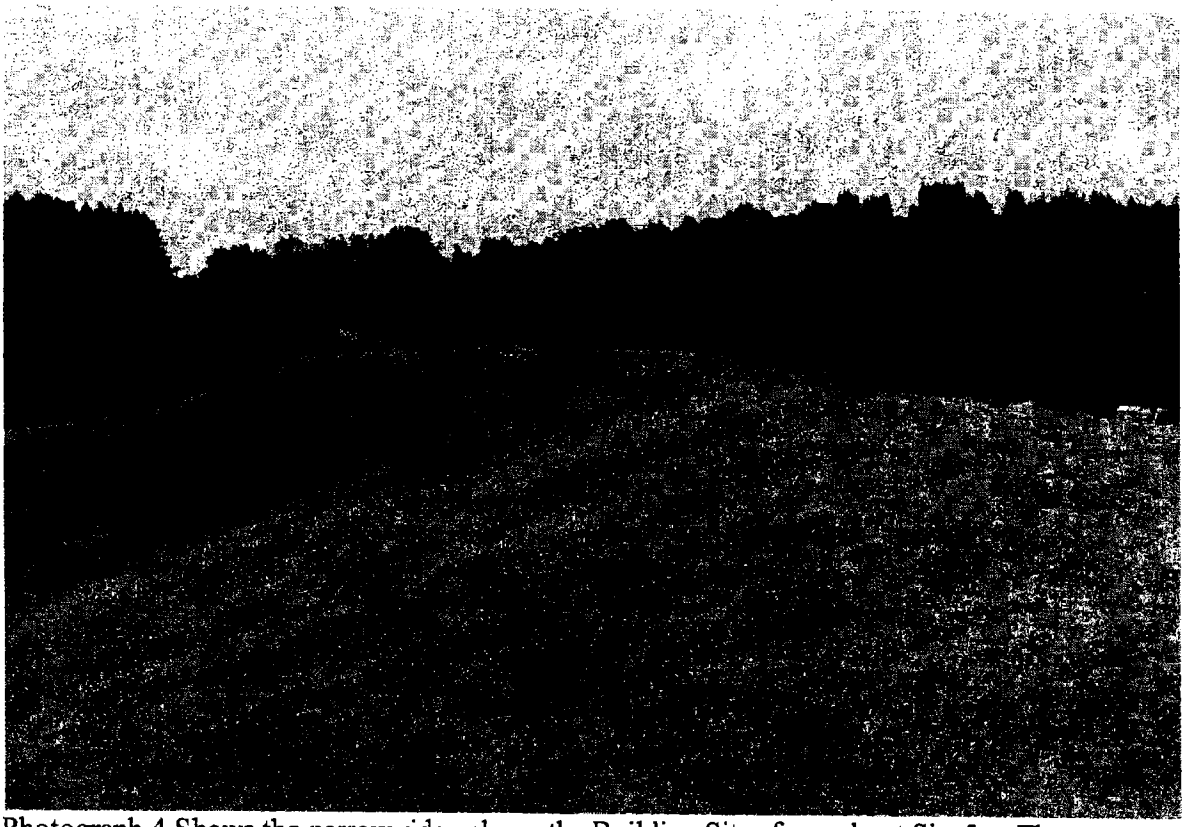
ATTACHMENT 3



Photograph 2 – Shows top of slope near the building site 3b



Photograph 3 Shows swales above Site 2



Photograph 4 Shows the narrow ridge above the Building Sites from about Site 3 a. The photograph shows the north side of the slope.

PRELIMINARY GEOLOGIC HAZARDS INVESTIGATION

Proposed Single Family Residences
Freedom Blvd.
Corralitos
Santa Cruz County, California
APNs: 108-161-32, 33, 34, 37, 38, 39, 40, 46, & 47

Prepared for:
Ralph and Yeelan Johnson

Prepared by:
Nolan Associates
P.O. Box 597
Santa Cruz, CA 95061

Job No. 13018
November 20, 2013

ATTACHMENT 4

NOLAN ASSOCIATES

November 20, 2013 Job No. 13018

Ralph and Yeelan Johnson
60 Old Orchard Road
Los Gatos, CA 95030

Subject: **Preliminary Geologic Hazards Investigation**

Project: Three Proposed Single Family Residence Sites
Property on Freedom Blvd.
Corralitos
Santa Cruz County, California
APNs: 108-161-32, 33, 34, 37, 38, 39, 40, 46, & 47

Dear Mr. and Ms. Johnson:

We have completed our preliminary geologic hazards investigation at the above-referenced project site. Our investigation addressed potential geologic hazards associated with permitting and developing single family residences at three prospective homesites on the subject parcels.

Geologic hazards considered for this investigation included strong seismic shaking, co-seismic ground cracking, seismically induced ground deformation, slope instability (landsliding), soil creep, and erosion. It is our opinion that all three potential homesites are subject to ordinary risk with respect to geologic hazards, provided that our recommendations are followed. Your project engineers and designers should carefully review our conclusions and recommendations and incorporate them into the project plans.

We have attempted to mitigate recognized risks at the proposed homesites to the level of "ordinary" risk. Ordinary risk is defined qualitatively as the level of risk that is typical for comparable existing residential structures in similar settings. More discussion of Ordinary risk is provided in Appendix C of this report. Ordinary risk is not meant to imply that the project cannot or will not be damaged during an earthquake, landslide event, or other natural calamity, but that damage in most cases will be repairable. Please review the discussion of ordinary risks in Appendix C. If you determine that an ordinary level of risk is not acceptable, we would be happy to develop mitigation recommendations to provide for a lower risk.

Our recommendations are intended principally to lower the risks posed to habitable structures by geologic hazards. This report in no way implies that the subject property will not be subject to earthquake shaking, landsliding, faulting or other acts of nature. Such events could damage the property and affect the property's value or its viability in ways other than damage to habitable

P.O. Box 597 Santa Cruz, California 95061 Tel. 831-423-7006 Fax 831-423-7008 Email: na@nolangeology.com

structures. We have not attempted to investigate or mitigate all such risks and we do not warrant the project against them. We would be happy to discuss such risks with you, at your request.

If you have any questions or comments regarding this report, please contact us at your earliest convenience.

Sincerely,
Nolan Associates

Jeffrey M. Nolan
Principal Geologist
C.E.G. #2247

TABLE OF CONTENTS

ATTACHMENT 4

NOTE: This report should not be considered complete without all listed figures and plates.

INTRODUCTION

This report presents the results of our preliminary geologic hazards investigation for a project site located on Freedom Blvd. near Corralitos, California, on Assessor's parcel numbers (APN) 108-161-32, 33, 34, 37, 38, 39, 40, 46, & 47. Figure 1, Topographic Index Map, depicts the location and topographic setting of the subject properties. Our report is intended to support an application for building permits to develop a three single family residences (SFR) at sites on the subject parcels.

PURPOSE AND SCOPE

The purpose of our investigation was to provide an assessment of geologic hazards at the subject properties relevant to development of the parcel for residential purposes. Where particular geologic hazards were found to present greater than acceptable risks to the project, we developed recommendations to reduce these risks. Our geologic hazards analysis was based on an assumed 50-year design life span for the project.

Services performed for this study included:

1. A review of select published and unpublished geologic maps and reports for the parcel.

2. Examination and interpretation of stereo pair vertical aerial photographs of the site and vicinity, ranging in age from 1935 to 1974, to assess the recent geologic history of the area.

3. Field reconnaissance and geologic mapping around the project site.

4. Observation and logging of four exploratory borings.

5. Observation and logging of on exploratory backhoe trench.

6. Preparation of a geologic base map and geologic cross sections for the project site, to be used for the geologic and geotechnical evaluations.

7. Analysis and interpretation of the geologic data and preparation of this report.

REGIONAL GEOLOGY AND SEISMICITY

The subject property is located within the central portion of the Coast Ranges Physiographic Province of California, a series of coastal mountain chains that parallel the pronounced northwest-southeast oriented structural grain of Central Californian geology. The property is located within the central Santa Cruz Mountains, which are mostly underlain by a large, elongate structural unit known as the Salinian Block.

The Salinian Block is floored with granitic and metamorphic rocks of Mesozoic age, and is separated from contrasting basement rock of the Franciscan Complex to the northeast and southwest by the San Andreas and Nacimiento-San Gregorio-Sur faults, respectively (Figure 2: Regional Geologic Map). The granitic basement is overlain by a sequence of dominantly marine sedimentary rocks of Paleocene to Pliocene age and non-marine sediments of late Pliocene to Pleistocene age.

Throughout the later portion of the Cenozoic Era, this part of California has been dominated by tectonic forces associated with horizontal or "transform" motion between the North American and Pacific lithospheric plates, producing long, northwest-trending faults such as the San Andreas and San Gregorio, with horizontal displacements measured in tens to hundreds of miles.

Accompanying the horizontal (strike-slip) movement of the plates have been episodes of compressive stress, reflected by repeated episodes of uplift, deformation, erosion and deposition of sedimentary rocks. Near the crest of the Santa Cruz Mountains, this tectonic deformation is evidenced by steeply dipping folds, overturned bedding, faulting, jointing, and fracturing in the sedimentary rocks older than the middle Miocene. Along the coast, the on-going tectonic activity is most evident in the formation of a series of uplifted marine terraces.

The Quaternary history of the Santa Cruz Mountains includes abundant evidence for landslide related processes as an important factor shaping the evolution of the modern landscape. Historical accounts and geologic studies of the San Andreas earthquake of 1906 and the Loma Prieta earthquake of 1989 indicate that there is a strong correlation between major earthquakes and resulting landslides, earth flows and ground cracking in this region. The occurrence of landsliding is also strongly controlled by the amount of seasonal rainfall the area receives.

California's broad system of strike-slip faulting has a long and complex history. The region as a whole is subject to on-going seismicity. The most severe historic earthquakes to affect the subject property are the 1906 San Francisco Earthquake and the 1989 Loma Prieta Earthquake, both with hypocenters on or near the San Andreas Fault, with Richter magnitudes of about 8.3 and 7.1, respectively. Other historic earthquakes of note include two magnitude 6.1 earthquakes in Monterey Bay in 1926 and a host of smaller or more distant events.

Figure 3, Regional Seismicity Map, shows Quaternary faults (Bryant, 2005) and historic earthquake epicenters (California Geologic Survey, 2000) in the site region. Locally, the San Andreas and Zayante-Vergeles fault systems are considered to be active. Because of their proximity, these faults present the greatest seismic hazard to the project. Other active faults within the region include the San Gregorio, the Monterey Bay-Tularcitos, Monte Vista-Shannon, and the Sargent.

SITE GEOLOGIC SETTING

This section describes geologic conditions at the project site. Plate 1, Geologic Site Map, and Plate 2, Geologic Cross Sections, depict relevant geologic information collected for the project site. Figure 4, Local Geologic Map, shows generalized geologic information for the site vicinity

(Brabb, 1989). Figure 5, Santa Cruz County Landslide Map, shows the results of a preliminary, planning-stage landslide hazard mapping program conducted for Santa Cruz County (Cooper-Clark and Associates, 1975). Because the maps shown on Figures 4 and 5 were compiled at a relatively small scale (1:24,000), property-scale geologic features may not be depicted accurately.

Physiographic Setting

The subject properties comprise an irregularly shaped group of parcels with a combined area of about 21½ acres, located within a south flowing, ephemeral stream drainage tributary to Corralitos Creek (Figure 1). The drainage is bounded by moderately sloping hillsides that rise to the crest of a long north to northwest trending ridges that flank the valley to the east and west.

The subject properties are situated on the west-facing (eastern) flank of the drainage, rising from the floor of the valley, at about elevation 240 feet, to the crest of the ridge bounding the valley to the east, at about 400 feet above mean sea level (msl). Slopes on the parcel range from near level to slightly over 30% gradient, with steeper slopes bounding the properties to the east.

The proposed building sites are situated in the northern portion of the property on parcels 32, 37, and 46 (Plate 1, Geologic Site Map). Building site one is situated on the ridge crest in the northeastern corner of the property. Building site two is located near the head of a small drainage valley encompassed by the property, and building site three occupies a small knoll in the north eastern section of the combined acreage.

The project site is vegetated by grasses and was formerly used as cattle pasture. We did not observe any standing or flowing surface water during our site reconnaissance (June to October 2013).

Earth Materials

The subject property is underlain by bedrock belonging to the fluvial facies of the Aromas Sand, of Quaternary age (Figure 4). Adjacent portions of the drainage valley floor are filled with colluvium, alluvium, and basin deposits, all of Quaternary age. We noted a thickened soil layer interpreted here as colluvium along the axis of the small, south flowing drainage that crosses through the center of the combined properties. The Santa Cruz County landslide map (Figure 5) also identified a probable landslide on the southwestern portion of the property.

These units are described in more detail, below.

Aromas Sand (Qaf)

The Aromas Sand is a relatively young geologic deposit made up of alternating sequences of stream and sand dune deposits. The portion of the Aromas Sand mapped on the subject property is classified as the fluvial portion of the unit, deposited by streams. The fluvial facies is described as a heterogeneous sequence of interbedded gravel, sand, silt and clay layers. Our exploratory borings on the site encountered fluvial sands with only a few, thin interbeds with

appreciable clay or silt content. Logs of exploratory borings B-1, B-2, B-4, B-4A, & B-10 are included in Appendix D. B-4A was drilled at the site of B-4 in order to collect drive samples from the upper 24 feet of the explored interval. Logs of the other exploratory borings on the site are included in the report by the project geotechnical engineer, Rock Solid Engineering.

Layering in the Aromas Sand is summarized on cross sections A-A' and B -B', Plate 2 and described on the boring logs.

Colluvium (Qtl)

Colluvium is a soil that develops on steep slopes by downslope (gravitational) creep and mixing of organic material, soil, and rock fragments produced by in-situ weathering of bedrock. It accumulates at the bottom of steep slopes and has partially filled older stream valleys on the subject property. A thin layer of colluvium, up to a few feet thick, mantles slopes on the property, but the unit was not mapped on Plate 1 except where it was inferred to be over 5 feet thick. In boring B-3, the colluvial layer is described as a dark brown silty sand.

The colluvium deposit forms a relatively flat, gently to moderately southward sloping geomorphic surface extending up the drainage that crosses north-south through the central portion of the subject properties.

Landslide Deposits (Qls)

Landsliding is common in the Santa Cruz Mountains, ranging from small, mobile debris flows a few cubic yards in volume to large, deep-seated rotational landslides with surface areas of tens or hundreds of acres. We noted equivocal surficial (geomorphic) evidence for a moderate-size landslide deposit in the southwest portion of the properties (Plate 1), about as mapped on the County landslide map (Figure 5). Any such landslide at the site would consist of disaggregated Aromas Sand, derived from underlying bedrock. We also mapped a small landslide on the slopes east of the subject parcel.

Landsliding will be discussed in more detail in a following section.

Local Geologic Structure and Faulting

The subject property is underlain by Aromas Sand bedrock. This unit has a southerly dip of about one degree, measured on the contact between the fluvial and eolian facies, near the top of the unit. This dip may represent the initial dip of the formation (Figure 4). Bedding exposed in our exploratory trench T-1 was approximately flat lying.

The active or potentially active fault closest to the subject property is the Zayante fault, situated about 0.9 miles northeast of the property (Figure 3). The most significant fault in the region, the San Andreas fault, is located 4.4 miles to the northeast (Figure 3). Other active faults occur in the region, including the San Gregorio, Shannon/Monte Vista, Calaveras, and Sargent faults and the Monterey Bay-Tularcitos fault zone.

Table 1: Distances and Directions to Local Faults			
Fault	**Distance from site (miles**	**Distance from site (km)**	**Direction from site**
Zayante-Vergeles	0.9	1.46	northeast
San Andreas	4.4	7.1	northeast
Monterey Bay-Tularcitos	15.3	24.6	southwest
Shannon/Monte Vista	16.1	25.9	north
Sargent	16.5	26.5	northeast
Calaveras	17.3	27.9	northeast
San Gregorio	20.5	32.9	southwest

We did not find evidence for active faulting traversing the project site in our aerial photograph review or during our site reconnaissance. Published geologic and fault maps (Bryant, 2005; Hall et al., 1974; McLaughlin et al., 2001; Brabb, 1989) do not depict faults crossing the site.

Table 1 contains a list of active faults nearest the subject property. The distances and directions shown on Table 1 were measured using the geologic map of Santa Cruz County (Brabb, 1989) for the Zayante and San Andreas faults, and the database of Quaternary-active faults (Bryant, 2005) for the remaining faults. See Figure 3 for locations of these faults and Appendix B for more detailed discussions of the Zayante-Vergeles, San Andreas, San Gregorio, and Monterey Bay-Tularcitos fault systems. These faults are considered active seismic sources (Petersen, et al., 2008) and may produce large earthquakes during the project lifetime.

Landsliding

Landsliding has occurred throughout the Santa Cruz Mountains during the recent geologic times. A portion of the Santa Cruz County landslide map is shown on Figure 5 (Cooper-Clark and Associates, 1975). This map is only a preliminary map of landslides prepared for planning purposes and does not generally contain the amount of detail necessary for assessing landslide hazards at the scale of an individual parcel. It was compiled from inspection of aerial photographs and therefore is highly interpretive in areas of heavy vegetation or tree cover. To help express the amount of uncertainty in the map's landslide interpretation, the landslides are classified as definite, probable, and uncertain.

The County landslide map shows a probable landslide deposit underlying the southeastern portion of the subject properties and a very large, definite landslide to the south of the subject properties (Figure 5). We performed geologic field mapping of the parcels, but did not perform a specific evaluation of the suspected landslide shown on the subject properties. Based on our field reconnaissance, we are of the opinion that surficial evidence for the landslide is equivocal.

The hillside above the suspected landslide has a relatively steep, bowl-shaped aspect that is suggestive of a landslide headscarp. However, the suspected landslide deposit forms a low ridge that is not centered on this suspected headscarp, but is located somewhat off to one side. There is a subtle, but distinct break in slope traceable from the top of the suspected landslide mass laterally around the topographic bowl. This observation suggests that there may have once been a larger landslide mass centered on the suspected headscarp, but that much of the central portion of the suspected mass was eroded away, leaving only a remnant of the landslide mass, principally along the southern side of the bowl. This interpretation is simply a hypothesis: the suspected landslide is located away from areas proposed for development and we did not attempt to investigate it. The degree of dissection of this suspected landslide mass indicates that, if it is a landslide deposit, it is an old feature. Plate 1 depicts this feature as an uncertain landslide.

In our opinion, evidence for the "definite" landslide located south of the subject parcel is also equivocal.

We did map one small landslide on the slope to the east of the property (Plate 1). It appears to have involved weathered bedrock in a shallow rotational type failure mode. Geomorphic expression of the landslide is muted, but distinct. This landslide is also located away from areas of proposed development.

There is a moderately steep sided arroyo crossing the northwestern property corner (Plate 1). Building site #1 verges on this arroyo, and could be impacted by any instability of the slope on the east side of the arroyo. The break in slope at the top of the arroyo side slope is sharp, and somewhat arcuate in plan form. This geometry is suggestive of a headscarp, but there is no sign of a landslide mass associated with this scarp (see cross sections C-C' and D-D', Plate 2). We are of the opinion that the sharp break in slope is a relict of agricultural activities on the parcel and is not related to landsliding.

The Aromas Sand includes layers of plastic clay or silty clay that can be 10 to 12 feet thick. Based on our experience with landsliding in the Aromas Sand, most, if not all, of the larger scale landsliding we have observed is facilitated by basal slip along one of the clay layers. The exploratory drilling program identified an approximately 5 foot thick clay layer at a depth of 25 to 30 feet in boring B-3 (located on Plate 1, see Rock Solid Engineering, 3013, for a copy of the boring log). This layer is located too deep to have an effect on slope stability in the vicinity of the boring, as indicated by the slope stability analysis (Rock Solid Engineering, 2013). However, the terrain decreases in elevation southward. Assuming that the layering in the Aromas Sand dips southward at about one degree, we would expect this layer to crop out at the ground surface close to the southern property line. The appearance of this clay layer at the toe of slope in this area may explain the occurrence of the landslides shown on the County landslide map, to the south of the proposed project (Figure 5). This layer is not expected to impact slope stability in the area of the proposed project.

This clay layer, assuming it is laterally continuous, should also crop out in the arroyo near the northwestern corner of the site (Plate 1). Our surface reconnaissance in the arroyo did not reveal any evidence for a clay layer in outcrop. Our septic investigation revealed a significant change

in stratigraphy between homesites #1 and #2, indicating that layering noted in boring B-3 probably does not extend westward to the arroyo.

GEOLOGIC HAZARDS

Potential geologic hazards relevant to the subject property include the effects of strong seismic shaking, coseismic ground cracking, seismically induced ground deformation, slope instability, soil creep, and erosion. These hazards are discussed in the following sections. Other geologic hazards, such as flooding, are not pertinent to the subject property.

Seismic Shaking Hazards

Seismic shaking at the subject site will be intense during the next major earthquake along one of the local fault systems. Modified Mercalli Intensities (see Appendix B, Table B1) of VIII to IX are expected at the site, based on the intensities reported by Lawson et al. (1908) for the 1906 earthquake and by Stover et al. (1990) for the 1989 Loma Prieta earthquake. It is important that our recommendations regarding seismic shaking be considered in the design of site improvements.

We have estimated expected deterministic seismic shaking intensities for the site. A deterministic assessment considers only the effects of the largest ground motion that can be expected at a given site, regardless of how likely it is to occur within the typical 50-year design life of a single family residence.

For comparison, we have included the results of a statewide probabilistic seismic hazards assessment, applied to the project site. A probabilistic seismic analysis differs from a deterministic analysis in that it evaluates the probability for shaking of a certain intensity to occur at a particular site within a given time frame (50 years for residential development).

The intensity of seismic ground shaking is typically characterized as the peak horizontal acceleration that a point on the ground experiences during the shaking. Acceleration is measured as a percentage of the acceleration of the Earth's gravity, g. Both the deterministic and probabilistic ground shaking estimates are for generic site conditions (firm soil/soft rock, shear wave velocities in the upper 30 meters of about 370m/s). Seismic shaking intensity can be affected by site specific conditions, such as bedrock type or topography. Consequently, the seismic shaking parameters listed below should be adjusted for site specific conditions, as necessary, before being used in design.

Deterministic Seismic Shaking Analysis

For the purpose of evaluating deterministic peak ground accelerations for the site, we have considered the San Andreas and Zayante faults as the potential earthquake sources. (Peterson et al., 2008). While other faults in this region are active, their potential contribution to deterministic seismic hazards at the site is overshadowed by these much closer and/or larger faults.

Table 2 shows estimated magnitude ($M_{W(MAX)}$) and rupture geometry for the maximum expected earthquake on the San Andreas and Zayante faults (Petersen et al., 2008; USGS, 2008). Estimated peak ground acceleration (PGA) values for the site were calculated using this information and the fault distances shown in Table 1. The accelerations are based on attenuation relationships derived from the analysis of historical earthquakes (Campbell and Bozorgnia (2008), Chiou and Youngs (2008), and Boore and Atkinson (2008)). These attenuation relationships describe how shaking intensity diminishes as distance from the earthquake increases.

The PGA values in Table 2 are for sites founded on firm soil/soft rock (site class C/D boundary). We caution that the listed values are approximations, based on theoretical curves fit to a limited data set: actual measured accelerations may be larger or smaller. The PGA + σ value (mean plus one standard deviation), also shown on Table 2, is a conservative design value that is intended to compensate for the uncertainty in the attenuation relationships.

The duration of strong seismic shaking shown in Table 2 is calculated from a magnitude-dependent formula proposed by Abrahamson and Silva (1996). Expected recurrence interval (RI) is the expected time between major earthquakes on the fault. Expected recurrence intervals often depend on the particular earthquake scenario chosen, so the recurrence intervals in Table 2 should be considered approximate and are meant only to indicate the relative level of activity of the listed faults.

Table 2: Deterministic Ground Motions

Fault	$M_{W(MAX)}$*	Rupture Geometry*	PGA (g)	PGA + ∂ (g)	Duration D_{05}-D_{95} (sec)	Recurrence Interval (years)
San Andreas (1906 type rupture)	7.9	Strike-slip	0.46	0.76	31	133-266**
Zayante	7.0	Strike-slip	0.59	0.99	14	8821***

*$M_{W(MAX)}$: Moment magnitude of maximum credible earthquake and rupture geometry: 2008 Seismic Hazards Maps - Fault Parameters: http://geohazards.usgs.gov/cfusion/hazfaults_search/hf_search_main.cfm
**Recurrence Interval after Bryant and Lundberg, 2002
***Recurrence Interval after Petersen et al., 1996
PGA and PGA+σ: Mean peak horizontal ground accelerations based on an evenly weighted average of attenuation relationships by Campbell and Bozorgnia (2008), Chiou and Youngs (2008), and Boore and Atkinson (2008).
Duration: Abrahamson and Silva, 1996

In summary, the Zayante fault, passing within 0.9 miles (1.46 km) of the site, is expected to generate the largest earthquake ground motion at the site. The characteristic earthquake on this fault ($M_{W(MAX)}$ = 7.0) corresponds to an on-site peak ground acceleration of about 0.59g, with an upper level design ground motion (mean plus one standard deviation) of 0.99g. Duration of

strong seismic shaking from this event will be about 14 seconds. The estimated recurrence interval on this fault, 8,821 years, means that there is a low statistical probability that the earthquake will happen during the lifetime of the project.

Because it is farther from the site, the maximum event on the San Andreas fault is expected to generate a smaller ground acceleration (Table 2). The recurrence interval for this earthquake is estimated to be 133 - 266 years; therefore, the statistical probability of this earthquake occurring within the project life-span is considered to be relatively high. Although the ground motion at the site due to the maximum earthquake on the San Andreas is predicted to be less than that of the Zayante fault, the maximum earthquake on the San Andreas will be a larger event, and it is expected to have a longer duration of 31 seconds.

Probabilistic Ground Motion Estimate

The U.S. Geological Survey, in conjunction with the California Geological Survey, has produced a probabilistic seismic hazards assessment for California (Petersen et al., 1996, Cao et al., 2003; Petersen et al., 2008; USGS, 2008). These studies consider the likelihood for large earthquakes to occur on each of the important active faults in California. Using that data and studies of how seismic shaking diminishes (attenuates) with distance, the researchers create maps showing the intensity of seismic shaking that has a certain probability of occurring at any given location.

Probabilistic peak ground motions interpolated from the 2008 National Seismic Hazard Mapping Program 0.05 degree data grid (Petersen et al., 2008; California Geological Survey, 2013) are listed in Table 3. These estimated ground motions assume a soil profile type of site class C/D (soft rock/stiff soil: shear wave velocity of about 370 m/sec in the upper 30m of site soils), per the 2010 California Building Code (CBSC, 2010). We caution that this value is not based on a site-specific probabilistic assessment, which is normally required for critical structures such as schools and hospitals.

Table 3: Probabilistic Ground Motions

Ground Motion Measure	**Acceleration in Firm Rock (g) (Site Class C/D boundary)**
Peak Ground Acceleration (g), 10% probability of being exceeded in 50 years)	0.56
Peak Ground Acceleration (g), 2% probability of being exceeded in 50 years)	0.97

The ground motion intensities shown in Table 3 are the seismic shaking intensities that have only a 10% chance or 2% chance of being exceeded in 50 years. The "10% in 50 year" ground motion cited in Table 3 has generally been considered appropriate for a residential structure in California.

The ground motions listed in tables 2 and 3 are not site specific values. These ground motions may be reduced or increased by site specific conditions. We recommend that the project structural engineer carefully consider both the deterministic and probabilistic acceleration values and the site characteristics in performing the seismic design.

Co-seismic Ground Cracking

Experience during the 1989 Loma Prieta earthquake (Ponti and Wells, 1991; Spittler and Harp, 1990; Technical Advisory Group, 1991; Nolan and Weber, 1998) showed that ground cracking can be a significant seismic hazard in the Santa Cruz Mountains. During the 1989 earthquake, numerous ground cracks opened up, principally along the crests of ridges. The ground cracks ranged from fractions of an inch to many feet wide and up to one-quarter mile long. Where the ground cracks crossed under buildings, the buildings were damaged.

Ridge top ground cracking has been documented at numerous locations throughout the world (Beck, 1968; Tabor, 1971; Radbruch-Hall et al., 1977; Bovis, 1982; Savage and Varnes, 1987; Thorsen, 1989; Varnes et al., 1989). Co-seismic ground cracking along ridge crests occurs as a result of strong seismic shaking during an earthquake. The resulting ground cracks may be due to incremental movement of landslides, ridge top spreading, or ground shattering. Ridge top spreading or shattering occurs generally as a series of cracks roughly following a ridge crest due to gravitational "relaxation" of the ridge flanks or vertical "heave" due to topographic amplification of shaking at the ridge crest.

Ground cracks were also noted along the sides of ridges following the 1989 earthquake. These ground cracks were commonly associated with re-activation of large, older landslides rather than ridge top ground cracking. Landslide related ground cracks typically have an arcuate shape, opening down slope, that outlines the head of the landslide block, but may also include cracks running directly downhill, along the lateral margins of the landslide, or transverse cracks forming within the landslide mass.

Nolan and Weber (1998) studied ground cracking in the Santa Cruz Mountains following the 1989 Loma Prieta earthquake. They found that large scale ground cracking (over several inches wide and involving vertical offsets of an inch or more) tended to recur in the same location from earthquake to earthquake. Such ground cracks were associated with surficial scarps or subsurface evidence of prior ground cracking. Both these types of evidence for past ground cracking can be observed in the field. Consequently, the likely location of large ground cracks can generally be predicted and avoided by careful site investigation. Small ground cracks (less than 3" wide with little or no vertical offset) were not found to be as predictable.

The proposed building site situated on the eastern ridge line (building site #3) is to be located along the crest of a ridge line with moderately steep side slopes. In order to evaluate the proposed building site for potential ground cracking hazard, we excavated a 5 foot deep backhoe trench across the ridge crest at building site #3 to look for evidence of past ground cracking. A log of this exposure, denoted Trench T-1 is depicted on Plate 3. The trench exposed weathered Aromas Sand consisting of layered fine to coarse grained sand, locally containing pebbles, with a few thin layers of silt rich sediment. The bedrock observed in the trench was consistent with descriptions of the fluvial facies or the Aromas Sand and it is consistent with our observations in borings B-1, B-2, B-3, B-4, and B-10.

We observed no evidence for previous ridge top ground cracking in the trench, and are therefore of the opinion that the risk posed by coseismic ground cracking at this site is low. We noted very minor fracturing in the sediments at each end of the trench where the slope begins to steepen. These fractures did not show any offset of soil horizons or significant dilation, and therefore do not suggest the need to design foundations for ground cracking.

Nevertheless, ridge top sites in the Santa Cruz Mountains can be exposed to amplified ground shaking due to their topographic setting. It is prudent to perform very careful seismic resistant design in structures and to provide stiff foundations at these sites.

Seismically Induced Ground Deformation

The subject site is situated on predominantly dense, granular soils. Blow counts from Borings B-1, B-3, B-4, B-6, and B-7 (Rock Solid Engineering, 2013) indicate that the sandy soil material is medium dense to very dense and the thin clayey or silty soils layers are very stiff to hard in the areas proposed for development. Ground water was encountered in boring B-3 at a depth of about 25', perched on top of a approximately 5 foot thick clay layer. The conditions observed in the exploratory borings indicate that there is little likelihood of seismically induced ground deformation at the proposed homesites. The project soils engineer should be consulted for any specific recommendations regarding soil performance during earthquakes.

Landslide Hazards

The geologic evaluation of landslide hazard is based on a qualitative assessment of geologic conditions around the proposed residence. Among the factors considered are the distribution, ages, and types of landsliding in the area surrounding the proposed development site; the steepness of slopes; and the occurrence of geologic conditions in the area that would favor landslide formation, such as weak bedrock or shallow soils on steep slopes. In this type of assessment, often the best indicator of landslide hazard is the past behavior of slopes in the area. Consequently, the type and location of past landsliding is heavily relied upon as an indicator of possible future occurrence of landsliding.

It should be pointed out, however, that there is always some potential for landsliding in areas of steep slopes or mountainous terrain, regardless of past conditions, and anyone building in such areas must be prepared to assume some risk due to landsliding. No amount of qualitative or

quantitative analysis can be expected to identify every factor that might cause landsliding to occur.

We noted evidence for one landslide on slopes bordering the subject parcels to the east (Plate 1). This landslide is located away from areas proposed for residential development, but it does indicate that landsliding on these slopes is possible. Suspected landslides have been mapped by others on slopes to the south of the areas proposed for development. We did not investigate these suspected landslide areas. The results of the exploratory drilling program for this project suggest that there may be stratigraphic reasons for landsliding in these areas that do not pertain to the areas proposed for development (see the discussion of landsliding under Site Geologic Setting).

The results of the slope stability analysis by Rock Solid Engineering (2013) indicate that the west and east facing slopes in the areas proposed for development of sites #2 and #3 are sufficiently stable under expected static and simulated earthquake conditions to permit development without requiring greater than ordinary slope setbacks.

Because we did observe some landsliding on slopes to the east of the development site, we have recommended a minimum slope setback of 30 feet from face of slope, to be measured horizontally from the base of the foundation. "Slope" in this context means slopes inclined at gradients in excess of 30%. We have not recommended setbacks from slopes 30% or less in gradient. Our recommended setback is similar in size to that mandated by State code. Should our recommended setback and the setback according to State code differ, the larger of the two setbacks should be followed. We have incorporated our recommended setback into the building envelope shown on Plate 1 for homesite #3. The setback associated with the depicted building envelope assumes a shallow foundation. Deepened foundations may result in moving the setback line closer to the break in slope.

We have also stipulated a setback from the steeper slopes associated with the arroyo northwest of homesite #1. This slope was not subject to a quantitative slope stability analysis; this setback is based on a qualitative evaluation by projecting a 2.5:1 (H:V) sloping line upward from the base of arroyo slope and placing the setback line at the point where the 2.5:1 line daylights at the top of slope (cross section C-C', Plate 2).

Provided that our setback recommendations for landslide hazard mitigation are fully implemented, we consider risks posed by landslide hazards at the proposed building sites to be "ordinary" (as defined in Appendix C).

Soil Creep

Moderately steep to steep slopes may be subject to soil creep hazards. Creep occurs where loose surficial materials, including loose colluvium, soil and deeply weathered rock, mantle harder bedrock on steep slopes. In soil creep, this loose surficial layer gradually creeps downslope, generally at rates of a fraction of an inch per year. This process can damage improperly designed foundations.

In our opinion, soils underlying gentle to moderate slopes included within the geologically feasible building envelopes have low potential to creep downslope where slopes are less than 20% gradient. Our trench T-1 did show some fracturing towards the ends of the trenches, where the slope increases, that might demonstrate some small amount of soil creep. Where foundations are made to bear on slopes over 20% gradient, the foundations should be deepened to resist any tendency for soil creep. The project geotechnical engineer should be consulted for recommendations regarding soil creep.

We consider the risks posed by soil creep to be ordinary provided our recommendations are implemented.

Erosion Hazard

We did not see evidence for active, accelerated erosion occurring in the area proposed for development at the time of our 2013 field mapping. However, the subject building sites are situated on relatively uncemented sediments of the Aromas Sand consisting primarily of sand with modest amounts of silt and clay. These sediments can be easily eroded by concentrated discharge from steeper slopes.

We consider the risk of accelerated erosion on the parcel to be ordinary provided that site development is served by properly designed and maintained drainage system.

Driveway Alignment

The proposed homesite #3 will be served by a new access road entering the western side of the property from Freedom Blvd. and traversing up the ridge flank. The driveway has been configured to cross slopes of less than 30% gradient. Provided that current grading and drainage standards are adhered to, we are of the opinion that the new access road can be developed without significant risk.

CONCLUSIONS

We have evaluated hazards at the site related to geologic processes such as strong seismic shaking, co-seismic ground cracking, seismically induced soil deformation, slope instability, soil creep, and erosion. Our recommendations include measures to reduce risks to the proposed single family residence sites to ordinary levels, as defined in Appendix C. Provided that our recommendations are correctly incorporated into project design and construction, we are of the opinion that the proposed development is geologically feasible and is subject to ordinary risk.

Our recommendations are intended principally to lower the risks posed to habitable structures by geologic hazards. This report in no way implies that the subject property will not be subject to earthquake shaking, landsliding, faulting or other acts of nature. Such events could damage the property and affect the property's value or its viability in ways other than damage to habitable structures. We have not attempted to investigate or mitigate all such risks and we do not warrant the project against them. We would be happy to discuss such risks with you, at your request.

RECOMMENDATIONS

1. We recommend that all structures intended for human habitation, and any structurally attached appurtenances, be placed within the areas designated as "Geologically Feasible Building Envelope" on Plate 1. These building envelopes incorporate setbacks from certain slopes, as discussed in the landslide hazard section, above. The designation of these building sites is based partially on the scope of the geologic investigation and is not meant to imply that these sites are the only geologically acceptable sites on the property. Specifically, setbacks from steep slopes shown on Plate 1 may be modified by incorporating deepened foundations into building design. We reserve the right to amend or relocate the building envelope where investigation shows such changes are consistent with sound geologic judgement. Building envelope configurations may also be modified based on site specific engineering design.

2. The project geotechnical engineer should provide site specific foundation recommendations for all proposed buildings.

3. The project geotechnical engineer should evaluate the final proposed driveway alignments with respect to geotechnical conditions, including the condition of any existing fill soils at the site.

4. We recommend that the project engineers consider the findings of our seismic shaking analysis in project design. Given the potential for strong seismic shaking to occur during the design life span of the proposed structures, all structures should be designed to the most current standards of the California Building Code, at a minimum. Building sites located on ridge crests can be subject to topographic amplification of seismic shaking and particular care should be directed towards seismic design at such sites.

5 We recommend that all drainage from roads or improved surfaces be captured by closed pipe or lined ditches and dispersed on site in such a way as to maintain the pre-development runoff patterns as much as possible. At no time should any concentrated discharge be allowed to spill directly onto the ground adjacent to structures or to fall directly onto slopes. The control of runoff is essential for erosion control and the prevention of water ponding against foundations and other improvements.

6. An engineered drainage and erosion control plan should be prepared for the project by a qualified engineer or erosion control specialist.

7. This report is issued with the understanding that it is the duty and responsibility of the owner, or of his representative or agent, to ensure that this report is provided to and brought to the attention the architect, engineer(s) and general contractor for the project, and that all recommendations made in the report are incorporated into the plans and specifications, and that the necessary steps are taken to see that the contractor and subcontractors carry out the report's recommendations in the field.

8. We request the privilege of reviewing final project plans for conformance with our recommendations. If we are not permitted such a review, we cannot be held responsible for misinterpretation or omission of our recommendations.

9. If any unexpected variations in soil conditions, or if any unanticipated geologic conditions are encountered during construction, or if the proposed project will differ from that discussed or illustrated in this report, Nolan Associates should be notified so that supplemental recommendations can be given. Our conclusions and recommendations shall not be considered valid unless the changes are reviewed and the conclusions in this report are modified or verified in writing by a representative of Nolan Associates

10. We recommend that home owners implement the simple safety procedures outlined by Peter Yanev in his book, *Peace of Mind in Earthquake Country*. This book contains a wealth of information regarding earthquakes, seismic design and precautions that the individual home owner can take to reduce the potential for loss of life, injury and property damage.

INVESTIGATIVE LIMITATIONS

1. The conclusions and recommendations noted in this report are based on probability and in no way imply the site will not possibly be subjected to ground failure or seismic shaking so intense that structures will be severely damaged or destroyed. The report does suggest that implementation of the recommendations contained within will reduce the risks posed by geologic hazards.

2. This report is issued with the understanding that it is the duty and responsibility of the owner or his representative or agent to ensure that the recommendations contained in this report are brought to the attention of the architect and engineer for the project, incorporated into the plans and specifications, and that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. If any unexpected variations in soil conditions or if any undesirable conditions are encountered during construction or if the proposed construction will differ from that planned at the present time, Nolan Associates should be notified so that supplemental recommendations can be given.

4. The findings of this report are valid as of the present date. However, changes in the conditions of the property and its environs can occur with the passage of time, whether they be due to natural processes of the works of man. In addition, changes in applicable or appropriate standards occur whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or partially, by changes outside our control. Therefore, the conclusions and recommendations contained in this report cannot be considered valid beyond a period of two years from the date of this report without review by a representative of this firm.

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

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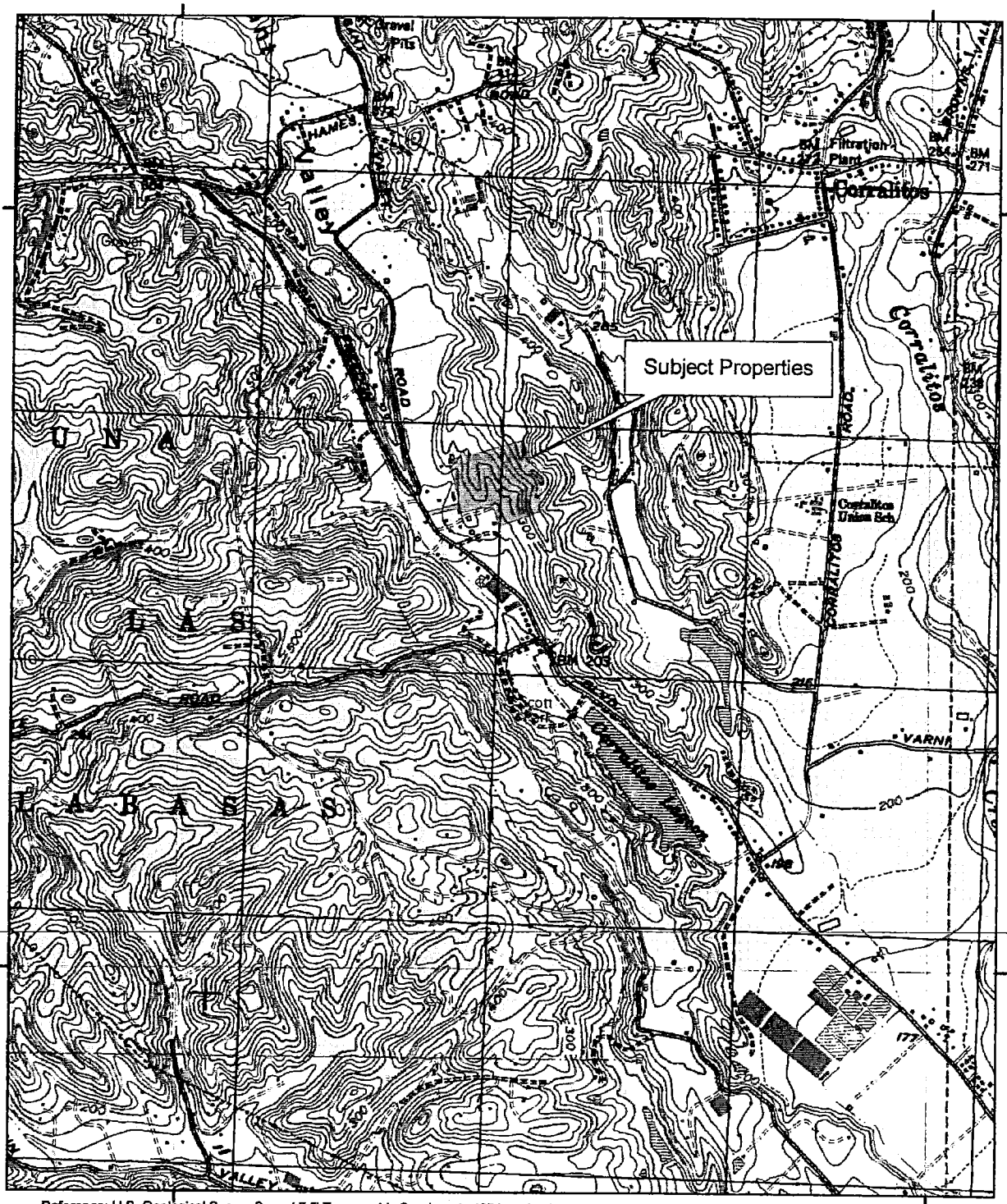
APPENDIX A:
Figures



Reference: U.S. Geological Survey Soquel 7.5' Topographic Quadrangle 1954; revised 1994;
U.S. Geological Survey Laurel 7.5' Topographic Quadrangle 1955; revised 1994

SCALE 1:24,000

0 625 1,250 2,500 3,750 Feet

N

• Engineering Geology
• Hydrogeology
• GIS Services

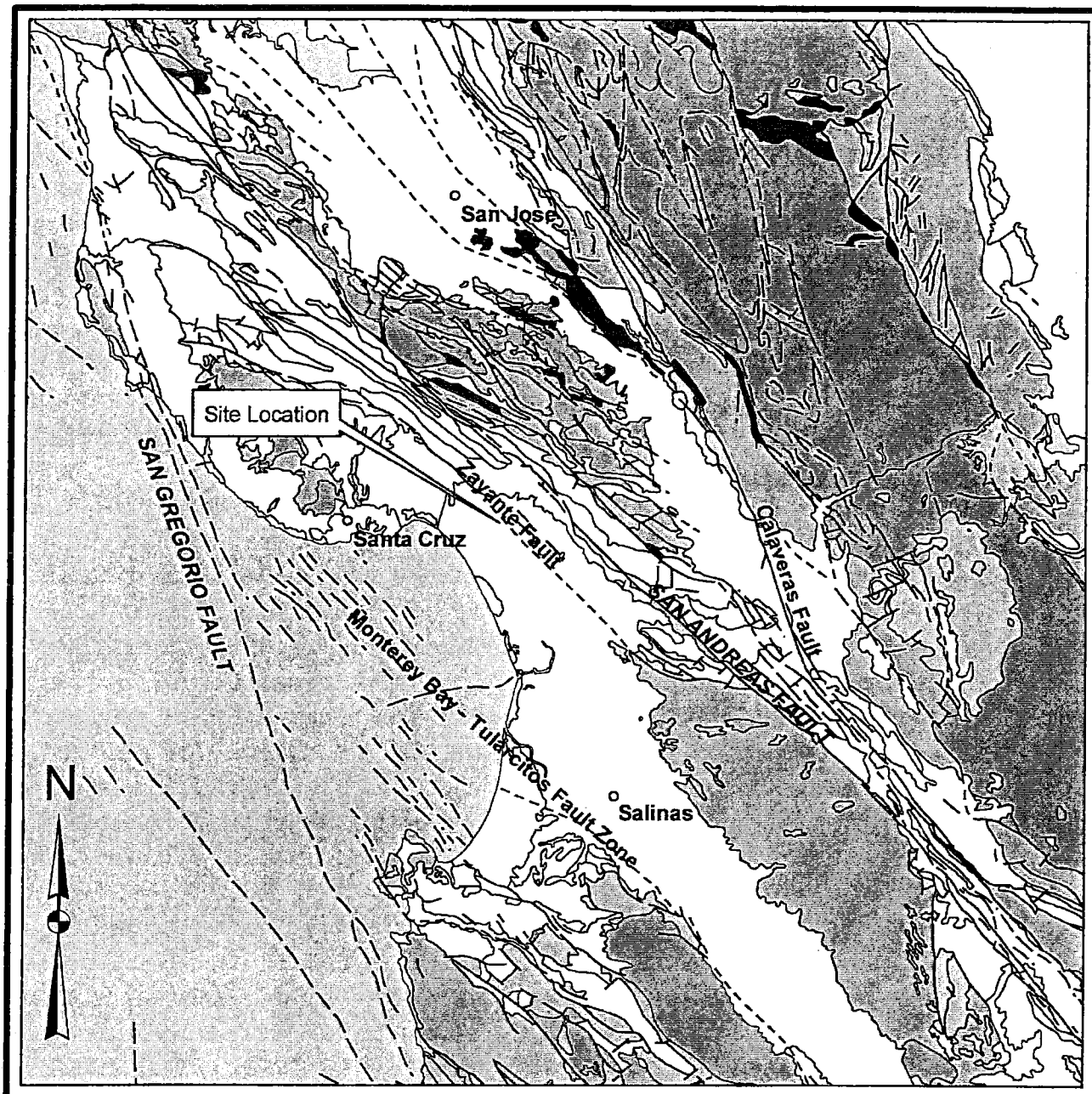
NOLAN ASSOCIATES

Topographic Index Map
Lands of Johnson
Freedom Blvd
Santa Cruz County, California

FIGURE # **1**

JOB # **13018**

ATTACHMENT 4



References: Jennings, 1977; Saucedo et al., 2000

Legend

Symbols

- geologic contact
- fault, certain
- fault, approximate
- fault, concealed or inferred

Geologic Units

- Quaternary Deposits
- Quaternary Volcanics
- Tertiary Sedimentary Rocks
- Tertiary Volcanic Rocks
- Pre-Tertiary Sedimentary Rocks
- Granitic Intrusive Rocks
- Pre-Tertiary Volcanic Rocks
- Pre-Tertiary Metamorphic Rocks
- Franciscan Complex
- Ultramafic Rocks
- Pre-Cambrian Metamorphic and Igneous Rocks

SCALE 1:750,000

10 0 10 20 Miles

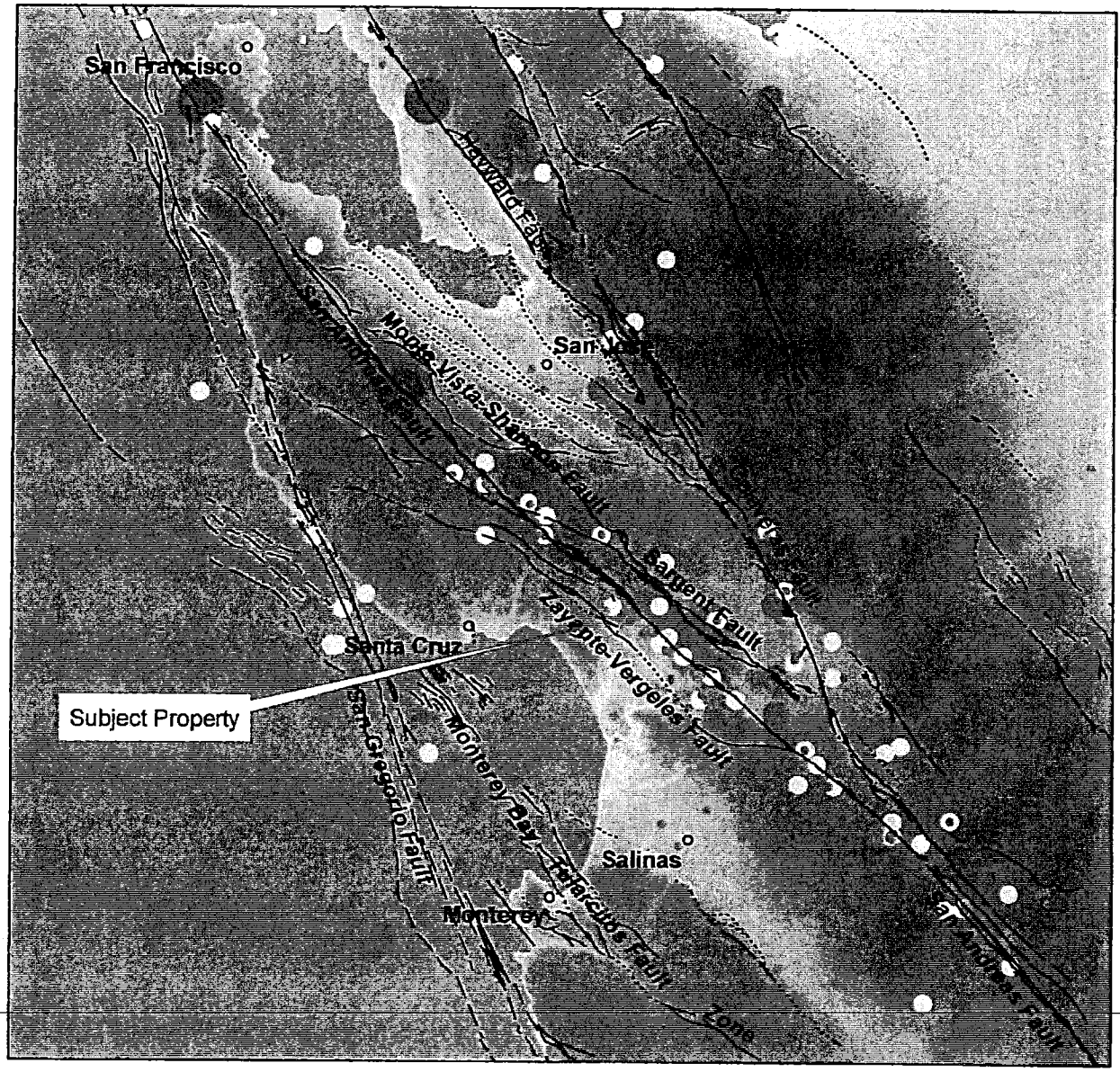
• Engineering Geology
• Hydrogeology
• GIS Services

NOLAN ASSOCIATES

Topographic Index Map
Lands of Johnson
Freedom Blvd
Santa Cruz County, California

FIGURE # **2**
JOB # **13018**

ATTACHMENT 4



Seismicity Information: CGS, 2000, Magnitude 4 and greater earthquakes
Fault Information: Bryant, 2005, Quaternary fault digital database

EXPLANATION

Quaternary (Active and Potentially Active) Faults

- certain
- approximate
- concealed

Earthquake Magnitude

- 4.0 to 4.99
- 5.0 to 5.99
- 6.0 to 6.99
- 7.0 +

N

SCALE 1:1,000,000

10 0 10 20 Miles

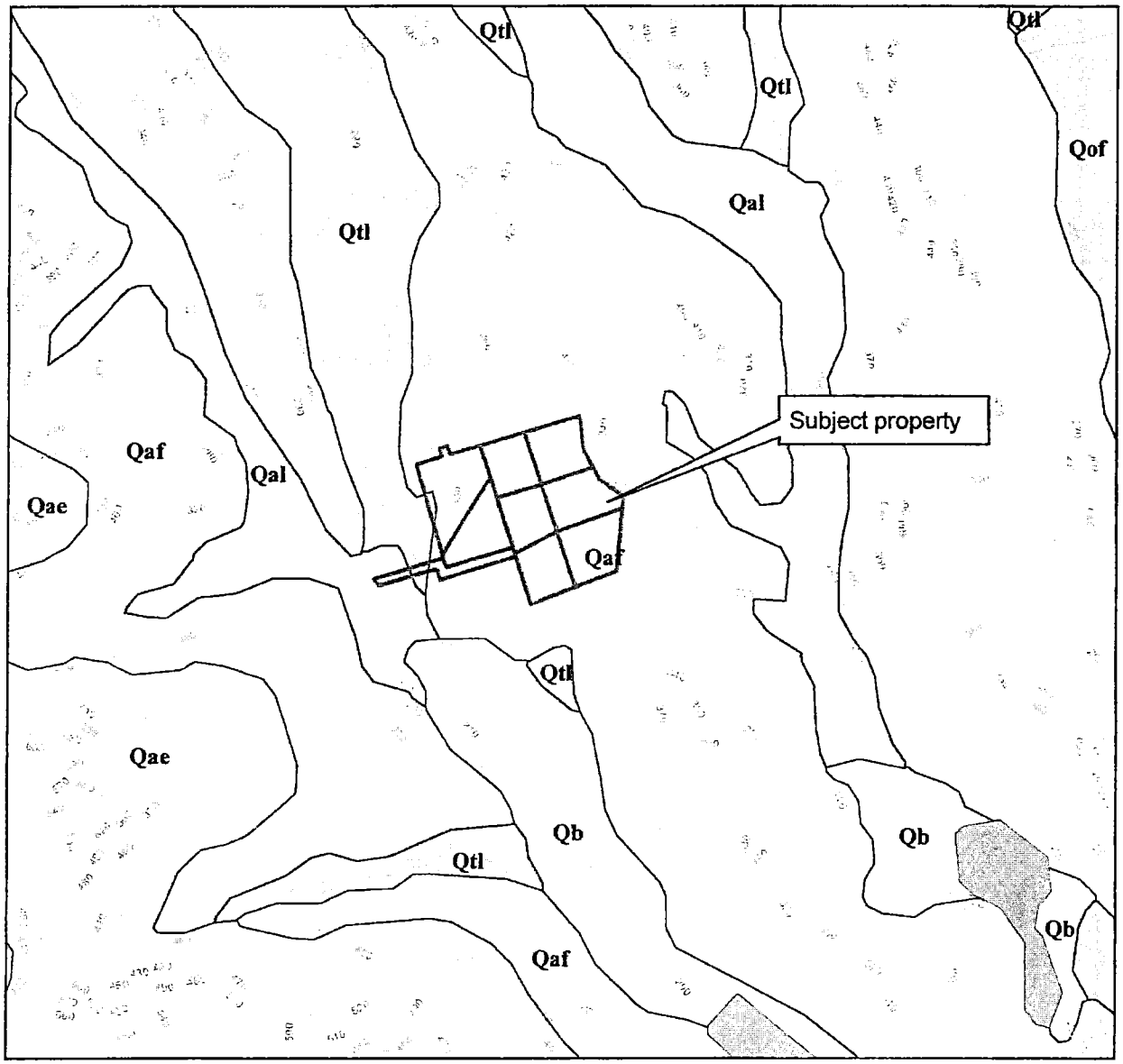
- Engineering Geology
- Hydrogeology
- GIS Services

NOLAN ASSOCIATES

Topographic Index Map
Lands of Johnson
Freedom Blvd
Santa Cruz County, California

FIGURE # **3**
JOB # **13018**

ATTACHMENT 4



Reference: E.E. Brabb, 1989, Geologic Map of Santa Cruz County, California: USGS Miscellaneous Investigations Series map I-1905, scale 1:62,500
Digital Compilation: S. Graham, C. Wentworth, D. Knifong, R. Graymer, and J. Blissenbach, 1997: USGS Open-File Report 97-489

EXPLANATION

- strike and dip of bedding
- strike and dip of bedding, approximate
- horizonatal bedding
- fault, certain
- fault, approx. located
- fault, concealed
- contact, certain
- contact, approximate
- contact, inferred

UNITS

- water
- Qtl: Colluvium
- Qal: Alluvial deposits
- Qb Basin deposits
- Qof: Older floodplain deposits
- Qt: Terrace deposits
- Qaf Aromas Formation fluvial facies
- Qae Aromas Formation aeolian facies

20 ft. topographic contours

N

SCALE 1:12,000

0 250 500 1,000 1,500 2,000 Feet

• Engineering Geology
• Hydrogeology
• GIS Services

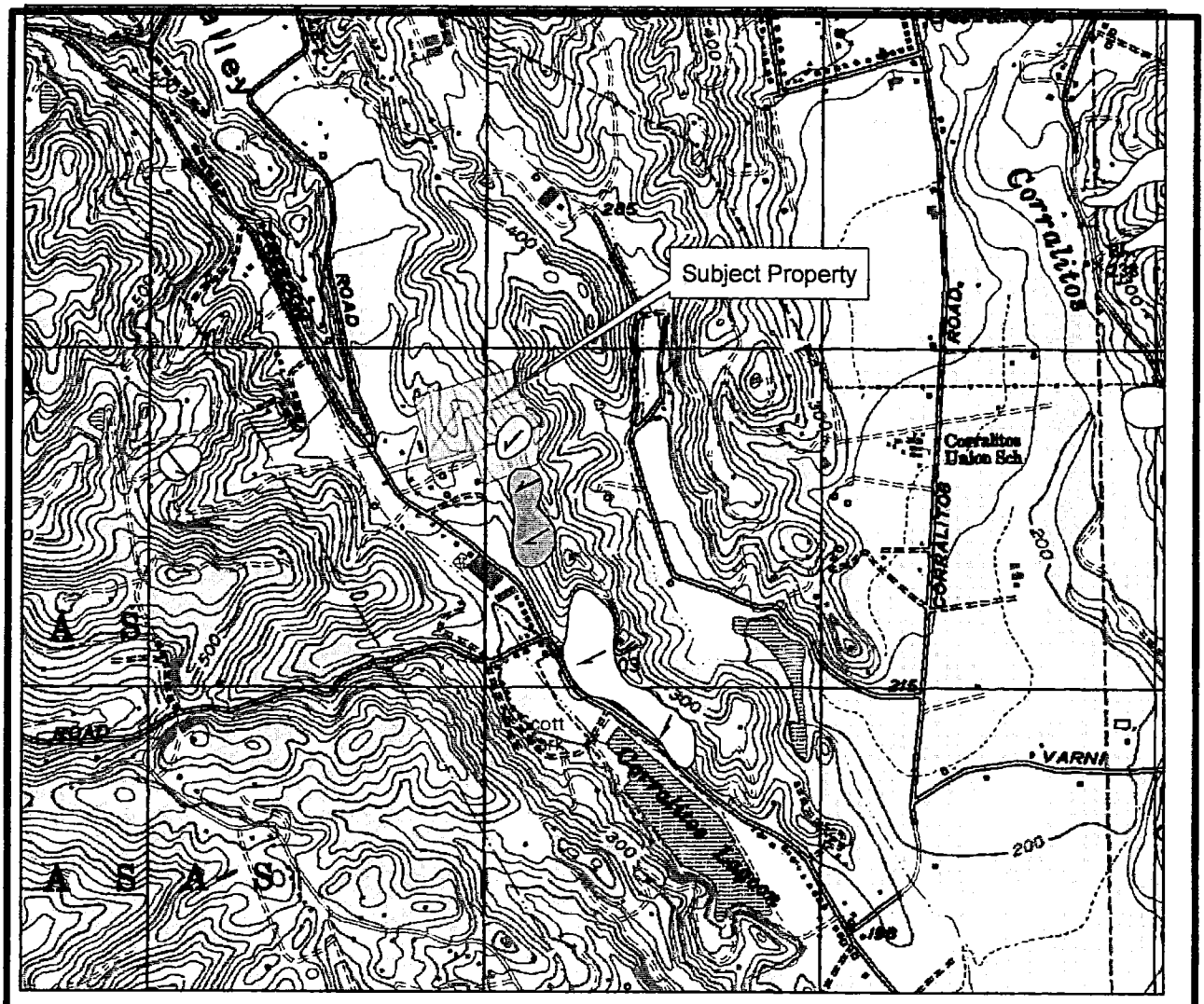
NOLAN ASSOCIATES

Local Geologic Map
Lands of Johnson
Freedom Blvd.
Santa Cruz County, Califorina

FIGURE # **4**

JOB # **13018**

ATTACHMENT 4



Reference: Roberts et al., 1998, Digital Compilation of "Preliminary Map of Landslide Deposits in Santa Cruz County, California, by Cooper-Clark and Associates, 1975"

Legend

——— contact, certain

┌┬┬┬┐ topographic escarpment

Landslides

Definite Landslide

Probable Landslide

Uncertain Landslide

Small Landslide, arrow points in direction of movement

Definite

Probable

Uncertain

N

SCALE 1:20,000

1,000 0 1,000 2,000 Feet

• Engineering Geology
• Hydrogeology
• GIS Services

NOLAN ASSOCIATES

Santa Cruz County Landslide Map
Lands of Johnson
Freedom Blvd.
Santa Cruz County, California

FIGURE # **5**

JOB # **13018**

ATTACHMENT 4

APPENDIX B:
Faults of Significance in the Site Region

San Andreas Fault

The San Andreas fault is active and represents the major seismic hazard in northern California (Jennings, 1994). The main trace of the San Andreas fault trends northwest-southeast and extends over 700 miles from the Gulf of California through the Coast Ranges to Point Arena, where the fault passes offshore and merges with the Mendocino triple junction.

Geologic evidence suggests that the San Andreas fault has experienced right-lateral, strike-slip movement throughout the latter portion of Cenozoic time, with cumulative offset of hundreds of miles. Surface rupture during historical earthquakes, fault creep, and historical seismicity confirm that the San Andreas fault and its branches, the Hayward, Calaveras, and San Gregorio faults, are all active today.

Historical earthquakes along the San Andreas fault and its branches have caused substantial seismic shaking in Santa Cruz County. The two largest historical earthquakes on the San Andreas to affect the area were the moment magnitude (M_w) 7.9 San Francisco earthquake of 18 April 1906 and the M_w 6.9 Loma Prieta earthquake of 17 October 1989. The San Francisco earthquake caused severe seismic shaking and structural damage to many buildings in the Santa Cruz Mountains. The Loma Prieta earthquake may have caused more intense seismic shaking than the 1906 event in localized areas of the Santa Cruz Mountains, even though its regional effects were not as extensive. There were also major earthquakes in northern California along or near the San Andreas fault in 1838, 1865, and possibly 1890 (Sykes and Nishenko, 1984; Working Group On Northern California Earthquake Potential (WGONCEP, 1996).

Geologists have recognized that the San Andreas fault system can be divided into segments with "characteristic" earthquakes of different magnitudes and recurrence intervals (Working Group on California Earthquake Potential (WGCEP), 1988 and 1990; WGONCEP, 1996). Two overlapping segments of the San Andreas fault system represent the greatest potential hazard to the subject property. The first segment is defined by the rupture that occurred from the Mendocino triple junction to San Juan Bautista along the San Andreas fault during the great M_w 7.9 San Francisco earthquake of 1906. The WGONCEP (1996) has hypothesized that this "1906 rupture" segment experiences earthquakes with comparable magnitudes about every 200 years.

The second segment is defined approximately by the rupture zone of the M_w 6.9 Loma Prieta earthquake. The WGONCEP (1996) has posited earthquakes of M_w 7.0 on this segment of the fault, with an independent segment recurrence interval of 138 years.

Modified Mercalli Intensities (see Table B1) of up to VIII (8) are considered possible at the site, based on the intensities reported by Lawson et al. (1908) for the 1906 earthquake and by Stover et al. (1990) for the 1989 Loma Prieta earthquake.

Zayante-Vergeles Fault

The Zayante fault lies west of the San Andreas fault and trends about 50 miles northwest from the Watsonville lowlands into the Santa Cruz Mountains. The postulated southern extension of the Zayante fault, known as the Vergeles fault, merges with the San Andreas fault south of San Juan Bautista.

The Zayante-Vergeles fault has a long, well-documented history of vertical movement (Clark and Reitman, 1973), probably accompanied by some right-lateral, strike-slip movement (Hall et al., 1974; Ross and Brabb, 1973). Stratigraphic and geomorphic evidence indicates that the Zayante-Vergeles fault has undergone late Pleistocene and Holocene movement and is potentially active (Coppersmith, 1979).

Some historical seismicity may be related to the Zayante-Vergeles fault (Griggs, 1973). The Zayante-Vergeles fault may have undergone sympathetic fault movement during the 1906 earthquake centered on the San Andreas fault, although this evidence is equivocal (Coppersmith, 1979). Gallardo et al. (1999) concluded that a magnitude 4.0 earthquake in 1998 in the Santa Cruz Mountains occurred on the Zayante fault.

In summary, the Zayante-Vergeles fault should be considered active for design purposes. Cao et al. (2003) concluded that the Zayante-Vergeles fault is capable of generating a magnitude 6.8 earthquake, with a recurrence interval of almost 9,000 years.

San Gregorio Fault

The San Gregorio fault skirts Santa Cruz County seaward of Monterey Bay and intersects the coast at Point Año Nuevo. North of Año Nuevo it passes offshore, intersecting the coast again at Half Moon Bay. North of Half Moon Bay, the San Gregorio fault lies offshore until it connects with the San Andreas fault near Bolinas. Southward from Monterey Bay, the San Gregorio fault intersects the coast at Point Sur and eventually connects with the Hosgri fault in south-central California (Dickinson et al., 2005).

The onshore segments of the San Gregorio fault at Point Año Nuevo and at Half Moon Bay show evidence of late Pleistocene and Holocene displacement (Weber and Cotton, 1981; Weber et al., 1995; Simpson et al., 1997). In addition to Stratigraphic evidence for Holocene activity, the historical seismicity in the region is partially attributed to the San Gregorio fault. Due to inaccuracies of epicenter locations, the magnitude 6+ earthquakes of 1926, tentatively assigned to the Monterey Bay fault zone, may have actually occurred on the San Gregorio fault (Greene, 1977). Recent stratigraphic studies of the fault document 97 miles of horizontal offset on the fault (Dickinson et al., 2005).

Petersen et al. (1996) divided the San Gregorio fault into the "San Gregorio" and "San Gregorio, Sur Region" segments. The segmentation boundary is located west of Monterey Bay, where the

fault appears to have a right step-over. Petersen et al. (1996) assigned the San Gregorio fault in the study area a recurrence interval of 400 years. Cao et al. (2003) consider the fault capable of a magnitude 7.2.

Monterey Bay-Tularcitos Fault Zone

The Monterey Bay-Tularcitos fault zone is 6 to 9 miles wide, about 25 miles long, and consists of many en échelon faults identified during shipboard seismic reflection surveys (Greene, 1977). The fault zone trends northwest-southeast and intersects the coast in the vicinity of Seaside and Ford Ord. At this point, several onshore fault traces have been tentatively correlated with offshore traces in the heart of the Monterey Bay-Tularcitos fault zone (Greene, 1977; Clark et al., 1974; Burkland and Associates, 1975). These onshore faults are, from southwest to northeast, the Tularcitos-Navy, Berwick Canyon, Chupines, Seaside, and Ord Terrace faults. Only the larger of these faults, the Tularcitos-Navy and Chupines, are shown on Figure 4. It must be emphasized that these correlations between onshore and offshore portions of the Monterey Bay-Tularcitos fault zone are only tentative; for example, no concrete geologic evidence for connecting the Navy and Tularcitos faults under the Carmel Valley alluvium has been observed, nor has a direct connection between these two faults and any offshore trace been found.

Outcrop evidence indicates a variety of strike-slip and dip-slip movement associated with onshore and offshore traces. Earthquake studies suggest the Monterey Bay-Tularcitos fault zone is predominantly right-lateral, strike-slip in character (Greene, 1977). Stratigraphically, both offshore and onshore fault traces in this zone have displaced Quaternary beds and, therefore, are considered potentially active. One offshore trace, which aligns with the trend of the Navy fault, has displaced Holocene beds and is therefore active by definition.

Seismically, the Monterey Bay-Tularcitos fault zone may be historically active. The largest historical earthquake *tentatively* located in the Monterey Bay-Tularcitos fault zone are two events, estimated at 6.2 on the Richter Scale, in October 1926 (Greene, 1977). Because of possible inaccuracies in locating the epicenter of these earthquakes, it is possible that they actually occurred on the nearby San Gregorio fault zone (Greene, 1977).

Another earthquake in April 1890 might be attributed to the Monterey Bay-Tularcitos fault zone (Burkland and Associates, 1975); this earthquake had an estimated Modified Mercalli Intensity of VII (Table B1) for Monterey County on a whole.

The WGONCEP (1996) has assigned an earthquake of M_w 7.1 with an effective recurrence interval of 2,600 years to the Monterey Bay-Tularcitos fault zone, based on Holocene offshore offsets. Petersen et al. (1996) have a similar earthquake magnitude, but for a recurrence interval of 2,841 years. Their earthquake is based on a composite slip rate of 0.5 millimeters per year (after Rosenberg and Clark, 1994)

Table B1: Modified Mercalli Intensity Scale

The modified Mercalli scale measures the intensity of ground shaking as determined from observations of an earthquake's effect on people, structures, and the Earth's surface. This scale assigns to an earthquake event a Roman numeral from I to XII as follows:

I	Not felt by people, except rarely under especially favorable circumstances.
II	Felt indoors only by persons at rest, especially on upper floors. Some hanging objects may swing.
III	Felt indoors by several. Hanging objects may swing slightly. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV	Felt indoors by many, outdoors by few. Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing automobiles rock. Windows, dishes, doors rattle. Wooden walls and frame may creak.
V	Felt indoors and outdoors by nearly everyone; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset; some dishes and glassware broken. Doors swing; shutters, pictures move. Pendulum clocks stop, start, change rate. Swaying of tall trees and poles sometimes noticed.
VI	Felt by all. Damage slight. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks and books fall off shelves; pictures off walls. Furniture moved or overturned. Weak plaster and masonry cracked.
VII	Difficult to stand. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in badly designed or poorly built buildings. Noticed by drivers of automobiles. Hanging objects quiver. Furniture broken. Weak chimneys broken. Damage to masonry; fall of plaster, loose bricks, stones, tiles, and unbraced parapets. Small slides and caving in along sand or gravel banks. Large bells ring.
VIII	People frightened. Damage slight in specially designed structures; considerable in ordinary substantial buildings, partial collapse; great in poorly built structures. Steering of automobiles affected. Damage or partial collapse to some masonry and stucco. Failure of some chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed pilings broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX	General panic. Damage considerable in specially designed structures; great in substantial buildings, with some collapse. General damage to foundations; frame structures, if not bolted, shifted off foundations and thrown out of plumb. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground; liquefaction.
X	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Landslides on river banks and steep slopes considerable. Water splashed onto banks of canals, rivers, lakes. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI	Few, if any masonry structures remain standing. Bridges destroyed. Broad fissures in ground; earth slumps and landslides widespread. Underground pipelines completely out of service. Rails bent greatly.
XII	Damage nearly total. Waves seen on ground surfaces. Large rock masses displaced. Lines of sight and level distorted. Objects thrown upward into the air.

APPENDIX C:
Scale of Acceptable Risks

SCALE OF ACCEPTABLE RISKS FROM SEISMIC GEOLOGIC HAZARDS

Level of Acceptable Risk	Kinds of Structure	Extra Project Cost Probably Required to Reduce Risk to an Acceptable Level
Extremely low[1]	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intake systems, plants manufacturing or storing explosives or toxic materials.	No set percentage (whatever is required for maximum attainable safety).
Slightly higher than under "Extremely low" level.[1]	Structures whose use is critically needed after a disaster: important utility centers; hospitals; fire, police and emergency communication facilities; fire station; and critical transportation elements such as bridges and overpasses; also dams.	5 to 25 percent of project cost.[2]
Lowest possible risk to occupants of the structure.[3]	Structures of high occupancy, or whose use after a disaster would be particularly convenient: schools, churches, theaters, large hotels, and other high rise buildings housing large numbers of people, other places normally attracting large concentrations of people, civic buildings such as fire stations, secondary utility structures, extremely large commercial enterprises, most roads, alternative or non-critical bridges and overpasses.	5 to 15 percent of project cost.[4]
An "ordinary" level of risk to occupants of the structure.[3,5]	The vast majority of structures: most commercial and industrial buildings, small hotels and apartment buildings, and single family residences.	1 to 2 percent of project cost, in most cases (2 to 10 percent of project cost in a minority of cases).[4]

[1] Failure of a single structure may affect substantial populations.

[2] These additional percentages are based on the assumptions that the base cost is the total cost of the building or other facility when ready for occupancy. In addition, it is assumed that the structure would have been designed and built in accordance with current California practice. Moreover, the estimated additional cost presumes that structures in this acceptable risk category are to embody sufficient safety to remain functional following an earthquake.

[3] Failure of a single structure would affect primarily only the occupants.

[4] These additional percentages are based on the assumption that the base cost is the total cost of the building or facility when ready for occupancy. In addition, it is assumed that the structures would have been designed and built in accordance with current California practice. Moreover the estimated additional cost presumes that structures in this acceptable-risk category are to be sufficiently safe to give reasonable assurance of preventing injury or loss of life during and following an earthquake, but otherwise not necessarily to remain functional.

[5] "Ordinary risk": Resist minor earthquakes without damage: resist moderate earthquakes without structural damage, but with some non-structural damage; resist major earthquakes of the intensity or severity of the strongest experienced in California, without collapse, but with some structural damage as well as non-structural damage. In most structures it is expected that structural damage, even in a major earthquake, could be limited to repairable damage. (Structural Engineers Association of California)

Source: Meeting the Earthquake, Joint Committee on Seismic Safety of the California Legislature, Jan. 1974, p.9.

SCALE OF ACCEPTABLE RISKS FROM NON-SEISMIC GEOLOGIC HAZARDS[6]

Risk Level	Structure Type	Risk Characteristics
Extremely low risks	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intake systems, plants manufacturing or storing explosives or toxic materials.	1. Failure affects substantial populations, risk nearly equals nearly zero.
Very low risks	Structures whose use is critically needed after a disaster: important utility centers; hospitals; fire, police and emergency communication facilities; fire station; and critical transportation elements such as bridges and overpasses; also dams.	1. Failure affects substantial populations. Risk slightly higher than 1 above.
Low risks	Structures of high occupancy, or whose use after a disaster would be particularly convenient: schools, churches, theaters, large hotels, and other high rise buildings housing large numbers of people, other places normally attracting large concentrations of people, civic buildings such as fire stations, secondary utility structures, extremely large commercial enterprises, most roads, alternative or non-critical bridges and overpasses.	1. Failure of a single structure would affect primarily only the occupants.
"Ordinary" risks	The vast majority of structures: most commercial and industrial buildings, small hotels and apartment buildings, and single family residences.	1. Failure only affects owners /occupants of a structure rather than a substantial population. 2. No significant potential for loss of life or serious physical injury. 3. Risk level is similar or comparable to other ordinary risks (including seismic risks) to citizens in a similar setting.
		4. No collapse of structures; structural damage limited to repairable damage in most cases. This degree of damage is unlikely as a result of storms with a repeat time of 50 years or less.
Moderate risks	Fences, driveways, non-habitable structures, detached retaining walls, sanitary landfills, recreation areas and open space.	1. Structure is not occupied or occupied infrequently. 2. Low probability of physical injury. 3. Moderate probability of collapse.

[6] Non-seismic geologic hazards include flooding, landslides, erosion, wave runup and sinkhole collapse

APPENDIX D:
Log of Borings B-1, B-2, B-4, B-4A, & B-10

NOLAN ASSOCIATES

Job #: `13018 Date: 7/31/13
Client: Johnson Logged by: JMN
Location: Freedom Blvd.
Driller: Central Coast Mobile B-52

BORING 1 SHEET 1 OF 2

EXPLANATION L 3-inch O.D. sampler M 2.5-inch O.D. sampler T 2-inch O.D. sampler
Blows are raw field counts for 6 inches of sampler penetration, or distance penetrated for 50 blows. Blow counts are not converted to SPT values.

depth (feet)	sample #	blows	geologic unit	SOIL DESCRIPTION
0				Silty fine grained sand, light yellowish brown, dry, loose
2	L	12 16 30		Clayey fine to medium grained sand, varigated light yellowish grey and strong brown to medium yellowish brown, plastic.
4	T	18 24 33		
6				Fine grained sand, brown to medium yellowish brown, slightly moist, dense, non-plastic, massive, slight binder
8				grades coarser grained, more moist downwards
10	L	22 28 28		medium to very coarse grained sand with few large granule size clasts, medium yellowish brown, moist very dense, friable, thin to medium bedding by grain size
12	T	18 13 15		clay layer– clay with silt and trace sand, pale brown to light yellowish brown, moist, wet, soft
14				fine to medium grained sand with silt and trace clay, with small rounded pebbles, medium yellowish brown dense, moist, friable
16	L	11 11 12		silt,. varigated light yellowish grey, with some brown to strong brown mottles, soft/friable, wet
18	T	9 12 14		sand silt sand, micaceous silt
20	L	28 35 27		medium to very coarse grained sand with few small rounded pebbles
22	T	15 14 19		fine grained sand layer 2" thick at 23'
24				fine to medium grained sand, trace clay, moist, dense, friable
26	L	18 24 39		
28	M	14 17 21		silt and very fine grained sand layer, medium yellowish brown, with strong brown mottling,
	T	14 18 20		gradual contact above, becomes sandier towards lower contact
30	L	26 40 43		clean medium grained sand, medium yellowish brown, moist, to wet, friable, soft
32	M	23 26 27		laminated sand and silt, 1/8" to 1/2" layers, strong brown mottled
34	T	22 24 25		4" thick sandy clay layer, light grey to light yellowish grey
36	L	23 24 20		medium to coarse grained sand, yellow to medium yellowish brown, soft, friable, moist
	M	13 22 26		grades coarser, with some rounded gravel downwards 1/4"silt layer 3" gravel layer
38	T	6 10 15		silty fine to coarse grained sand, dark brown, moist to wet, very plastic, organic rich

ATTACHMENT 4

NOLAN ASSOCIATES

Job #: 13018 Date: 7/31/13
Name: Johnson Logged by: JMN
Location: Freedom Blvd.
Driller: Central Coast Mobile B-52

BORING 1 SHEET 2 OF 2

EXPLANATION L 3-inch O.D. sampler M 2.5-inch O.D. sampler T 2-inch O.D. sampler
Blows are raw field counts for 6 inches of sampler penetration, or distance penetrated for 50 blows. Blow counts are not converted to SPT values.

depth (feet)	sample #	blows	geologic unit	SOIL DESCRIPTION
42	L	23 35 50/2"		micaceous medium to coarse grained sand, dark yellow to dark yellowish brown, friable, dense.
	M	27 17 xx		hammer hitting side of hole sampling from 41.5 to 43, pulled drill string and drilled to 43'
44	L	23 27 40		fine to coarse grained sand, clean, moist, friable, thin bedded by grain size, gradual contacts between beds
	M	19 24 21		coarse to very coarse grainedsand with clay
46	T	11 11 17		grades downward to very fine to fine grained sand and silt micaceous
48	T	12 16		
				Bottom of Hole 48.5'
50				
52				
54				
56				
58				
60				
62				
64				
66				
68				
70				
72				
74				
76				
78				

ATTACHMENT 4

NOLAN ASSOCIATES

Job #: 13018
Client: Johnson
Location: Freedom Blvd.
Driller: Central Coast Mobile B-52
Date: 7/31/13
Logged by: JMN

BORING 2
SHEET 1 OF 1

EXPLANATION L 3-inch O.D. sampler M 2.5-inch O.D. sampler T 2-inch O.D. sampler
Blows are raw field counts for 6 inches of sampler penetration, or distance penetrated for 50 blows. Blow counts are not converted to SPT values.

depth (feet)	sample #	blows	geologic unit	SOIL DESCRIPTION
0				Silty sand, yellowish brown, dry
2	L	12 16 30		Fine to coarse grained sand with clay, dark yellowish brown, slightly moist, plastic
4	M	18 24 33		
6	T			Medium grained sand, medium to dark yellowish brown, moist, friable, trace binder
8	L			uniform sand, some thin bedding by grain size variation
10	M			consistent ↓
12	T	22 28 28		medium grained sand, moist, friable
14	L	18 13 15		
16	M			consistent ↓
18	T	11 11 12		
20	L	9 12 14		
22	M	28 35 27		
24	T	15 14 19		medium grained sand, medium yellowish brown, moist to wet, friable, dense
26		18 24 39		consistent, trace silt
28		14 17 21		↓
30	T	14 18 20		
32		26 40 43		Bottom Hole 31.5'
34		23 26 27		
36		22 24 25		
38		23 24 20		
		13 22 26		
		6 10 15		

ATTACHMENT 4

NOLAN ASSOCIATES

Job #: 13018
Client: Johnson
Location: Freedom Blvd.
Driller: Britton Drilling CME 55

Date: 7/31 - 8/26/13
Logged by: JMN

BORING 4/4B
SHEET 1 OF 1

EXPLANATION L 3-inch O.D. sampler M 2.5-inch O.D. sampler T 2-inch O.D. sampler
Blows are raw field counts for 6 inches of sampler penetration, or distance penetrated for 50 blows. Blow counts are not converted to SPT values.
5 Dry coring interval, with recovery measurement, expressed as inches of core recovered over total core length

depth (feet)	sample #	blows/recovery	geologic unit	SOIL DESCRIPTION
0				silty sand, dark yellowish brown to brown, dry, hard, some organic matter
2	L	12 17 28		
4	M	18 28 24		fine to medium grained sand with trace silt and clay, dark yellowish brown, firm/moderately friable, few thin clay films on weakly formed ped faces
6	T	12 16 18		
8	L	13 19 22		medium to coarse grained sand, brown to strong brown, moist, friable, dense
10	M	26 25 31		
12	T	20 24 31		
14	L	3 6 10		
16	M	3 10 12		silty sand 1/4" silt layer
18	T	6 10 11		
20	L	10 16 21		sand
22	M	11 21 25		
24	T	12 16 19		Bottom Hole 23.5'
26				
28				
30				
32				
34				
36				
38				

NOTE

This log is a composite of boring B-4, which terminated at 11' due to mechanical problems with the drill rig, and boring B-4B. This log provided drive sample information for the interval in boring B-4A which was dry cored. B-4B was drilled about 1' higher in elevation than B-4, so depths from B-4B were corrected by subtracting 1' so they would correlate with the depths in B-4.

ATTACHMENT 4

NOLAN ASSOCIATES

Job #: 13018
Client: Johnson
Location: Freedom Blvd.
Driller: Britton Drilling CME 55
Date: 8/26/13
Logged by: JMN

BORING 4A SHEET 1 OF 1

EXPLANATION L 3-inch O.D. sampler M 2.5-inch O.D. sampler T 2-inch O.D. sampler
Blows are raw field counts for 6 inches of sampler penetration, or distance penetrated for 50 blows.
Blow counts are not converted to SPT values.
5 Dry coring interval, with recovery measurement, expressed as inches of core recovered over total core length

depth (feet)	sample #	blows/recovery	geologic unit	SOIL DESCRIPTION
2	1	48"/60"		silty fine to medium grained sand with trace clay, yellowish brown, dry
				silty fine to medium grained sand with clay, yelllowish brown, slightly moist, firm
4				fine to medium grained sand, trace clay, yellow to yellowish brown, dry, dense, horizontally stratified
				1" thick fine gravel layer
6	2	18"/60"		fine to medium grained sand, yellow to yellowish brown, dry, dense, horizontally stratified
8				1/16" to 1/8" thick silt layers
10				1/2" thick fine gravel layer
12	3	24"/60"		laminated to thin bedded sand
14				1/16" tp 1/8" thick silt laminae/layers
16	4	30"/60"		sand, consistent
18				
20				
22	5	36"/60"		medium grained sand, laminated to thin bedded by grain size, moist, soft/dense
24				Switched to drive sampling because of poor recovery in dry coring
26	L	26 25 31		medium to coarse grained sand, yellowish brown, moist, soft granule to small pebble size layer, rounded, with sand matrix, 26' to 26.5' coarse sand with rounded granule size clasts, 26.5' to 27.75'
	M	20 24 31		
28	T	17 26 28		fine to medium grained sand with some granule size clasts, yellowish brown
30	L	18 29 40		
32	M	19 22 30		sand
	T	15 19 25		
34				Bottom of Hole 34'
36				
38				

ATTACHMENT 4

NOLAN ASSOCIATES

Job #: `13018
Client: Johnson
Location: Freedom Blvd.
Driller: Britton Drilling CME 55
Date: 8/26/13
Logged by: JMN

BORING 10
SHEET 1 OF 1

EXPLANATION L 3-inch O.D. sampler M 2.5-inch O.D. sampler T 2-inch O.D. sampler
Blows are raw field counts for 6 inches of sampler penetration, or distance penetrated for 50 blows. Blow counts are not converted to SPT values.

depth (feet)	sample #	blows	geologic unit	SOIL DESCRIPTION
	L	9 7 8		Silty fine to medium grained sand, brown, dry, organic matter at surface
2	M	7 12 14		Fine to medium grained sand with trace clay, brown
4	T	9 9 11		Fine to medium grained sand, yellowish brown, massive, slightly moist
				thin, dark mineral rich layers at about 4.5' and 5.5'
6	L	7 18 22		Fine to coarse grained sand with some granule size clasts, thin to medium bedded, by grain size
	M	13 15 19		
8	T	10 12 13		3" thick fine gravel layer
10	L	10 14 25		small to medium size rounded pebbles
12	M	10 16 26		
	T	10 12 13		sand
14				mineralized parting surface, no gouge, no sigh of shearing, dipping about 40 degrees
	L	10 33 39		small to medium size rounded pebbles
16				fine to medium grained sand
	M	17 17 19		
18	T	9 13 15		consistent
20	L	9 16 20		fined to medium grained sand, yellowish brown, moist, soft/dense, massive
22	M	11 15 18		consistent
24	T	9 13 16		
	L	10 18 27		fine to medium grained sand, yellowish brown, moist, soft/dense, massive
26				1/8" thick silt interbed at about 26.5'
28	M	11 16 22		
	T	8 12 17		consistent
30	L	9 16 29		
	M	11 19 24		sand
32	T	10 15 19		fine to medium grained sand, yellowish brown, mostly massive, moist, soft/dense
34				Bottom of Hole 34.5'
36				
38				

ATTACHMENT 4

ROCK SOLID ENGINEERING, INC.
Soil Reports · Site Assessments · Manufactured Home Foundations · Expert Witness · Real Estate Inspections

GEOTECHNICAL INVESTIGATION-DESIGN PHASE

Three Proposed Single Family Residences
Freedom Boulevard
Aptos, California
A.P.N.'s: 108-161-32, 34, 37, 38, 40, 46, & 47

For:
Ralph and Yeelan Johnson
60 Old Orchard Road
Los Gatos, California 95030

Project No. 13025
November 7, 2013

ATTACHMENT 5

1100 Main Street, Suite A, Watsonville, CA 95076 · (831) 724-5868 ·Fax: (831) 763-1578 · Email:rocksolid@cruzio.com

ROCK SOLID ENGINEERING, INC.
Soil Reports · Site Assessments · Manufactured Home Foundations · Expert Witness · Real Estate Inspections

Project No. 13025
November 7, 2013

Ralph and Yeelan Johnson
60 Old Orchard Road
Los Gatos, California 95030

SUBJECT: **GEOTECHNICAL INVESTIGATION - DESIGN PHASE**
Geotechnical Investigation - Design Phase
Three Proposed Single Family Residences
Freedom Boulevard, Aptos, California
A.P.N.'s: 108-161-32, 34, 37, 38, 40, 46, & 47

Dear Mr. & Mrs. Johnson:

In accordance with your authorization, we have completed a geotechnical investigation for the three proposed single family residences off of Freedom Boulevard, in Aptos, California. This report summarizes the findings, conclusions, and recommendations from our field exploration, laboratory testing, and engineering analysis. The conclusions and recommendations included herein are based upon applicable standards at the time this report was prepared.

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,

ROCK SOLID ENGINEERING, INC.

REGISTERED PROFESSIONAL ENGINEER
YVETTE M. WILSON
No. 60245
Exp. 3/14
CIVIL
STATE OF CALIFORNIA

Signed: 11/15/13

Yvette M. Wilson, P.E.
Principal Engineer
R.C.E. 60245

Dusty Osburn
Staff Engineer

Distribution: (2) Addressee and via email
(4) Kim Tschantz and via email
Via email: Jeff Nolan and Jeff Roper

ATTACHMENT 5

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ATTACHMENT 5

1. INTRODUCTION

1.1 Purpose

The purpose of our investigation is to provide preliminary geotechnical design parameters and recommendations for development of the site. Conclusions and recommendations related to site grading, foundations, slabs-on-grade, pavements and retaining structures are presented herein.

1.2 Proposed Development

a. Based on our conversations with you, it is our understanding that the project consists of the construction of three new single family residences on individual lots. The proposed building locations are shown on **Figure A-1.**

b. Anticipated construction at Sites 1 and 2 consists of standard wood frame construction with raised wood or slab-on-grade floors. At Site 3, a modular home is proposed with a basement level. Exact wall, column, and foundation loads are unavailable, but are expected to be typical of such construction.

c. Final grading and foundation plans were unavailable at the time of this report. It is our understanding that the information obtained during our investigation will be used in the development of a finalized plan set.

d. Also anticipated, are the construction of an attendant driveway, drainage systems and associated landscaping improvements.

1.3 Scope of Services

The scope of services provided during the course of our investigation included:

a. Review of the referenced geotechnical, geologic, and seismological reports and maps pertinent to the development of the site (available in our files).

b. Field exploration consisting of 13 borings, drilled to depths between 4 and 48 feet below existing grade in the area of the proposed developments.

c. Logging and sampling of the borings by our Field Engineer, including the collection of soil samples for laboratory testing.

d. Laboratory testing of soil samples considered representative of subsurface conditions.

e. Geotechnical analyses of field and laboratory data.

f. Preparation of a report (6 copies) presenting our findings, conclusions and recommendations.

1.4 Authorization

This investigation, as outlined in our Proposal dated June 27, 2013, was performed in accordance with your written authorization on July 8, 2013.

2. FIELD EXPLORATION AND LABORATORY TESTING PROGRAM

Details of the field exploration and laboratory testing are presented in Appendix A.

3. SITE DESCRIPTION

3.1 Location

The subject project is located on Freedom Boulevard, in Aptos, Santa Cruz County, California. The site is accessed off of Freedom Boulevard at Parcel -40 approximately 180 feet south of Pleasant Valley Court. The location is shown on the Location Map, **Figure 1**.

3.2 Surface Conditions

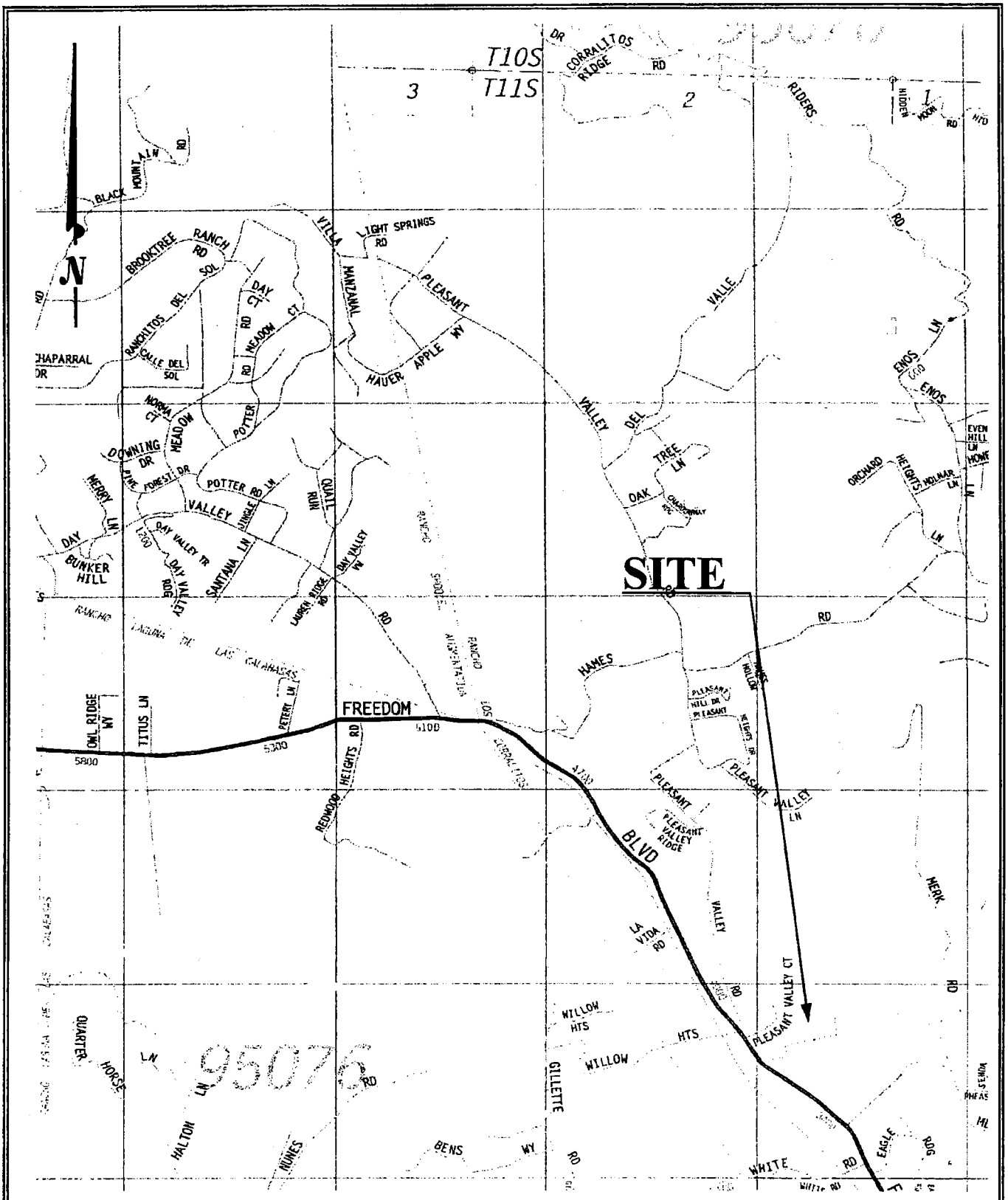
The area of proposed development spans over seven parcels. See **Figure A-1** for the currently proposed locations of the building sites and preliminary driveway alignment.

The parcel ending -40 will be used as the access to the remaining six parcels. This parcel is relatively level on the east side and slopes gently on the west side. Approaching the remaining parcels from the southeast a small knoll rises to the north. At the base of the knoll, to the east, is a low area which is a natural drainage swale. East of the swale is a hill, approximately 110 feet in height, which crests in a narrow ridge at the eastern most edge of the parcels.

The parcel ending in -46/47 will be the building site designated **Site 1**. Site 1 is located on the top the knoll. The knoll slopes steeply on the northwest side (average gradient of 2.5:1), and gently to the southwest and east (to the natural drainage swale) at an average gradient of approximately 6:1.

The parcels ending in -37/38 will be the building site designated **Site 2**. The low side, on the west, is the natural drainage swale. The building site then slopes moderately, uphill, to the east at average gradient of 3.5:1 (H:V).

The parcel ending in -32 will be the building site designated **Site 3**. Site 3 is situated on the narrow ridge at the top of the hill. The building envelope is located on the relatively level area of the ridge and extends slightly to the west, over a gently sloping area. The hillside slopes moderately to the west, at average gradient of 3.5:1 (H:V) and to the east at average gradient of 2.5:1 (H:V).



REFERENCE: The Thomas Guide, 2004.

ROCK SOLID ENGINEERING, INC.	LOCATION MAP	FIGURE
	Freedom Boulevard, Aptos	1

ATTACHMENT 5

3.3 Subsurface Conditions

a. The results of our field exploration indicate that the subsurface soils present on the site are relatively consistent, however, there are variations in color, moisture content, and density.

b. During the course of our field exploration, groundwater was only encountered in boring B3 at 25 feet below existing grade. A seasonal natural drainage area is located at the low lying area near the south property line of parcels -37 and -38.

c. The upper stratum generally consists of yellow brown silty sand. The silty sand was observed from the surface to between 1 and 5 feet below existing grade. This material is generally damp to moist, loose to dense, and non-to slightly plastic.

d. Underlying the silty sand stratum, yellow brown clayey sand with some silt and clay layers are present. The clayey sand was observed to the extent of our borings at approximately 48 feet below existing grade. This material is generally dry to wet, loose to very dense, and non- to medium plastic. Based on our laboratory test results, the clayey sand is slightly compressible under the anticipated loads and slightly collapsible upon wetting. The clay layer is discontinuous across the site and is considered to have a high potential for expansion.

e. Complete soil profiles are presented on the Logs of Exploratory Borings and the boring locations are shown on the Boring Location Plan in Appendix A.

4. GEOTECHNICAL HAZARDS

4.1 General

a. Potential geotechnical hazards to man made structures include ground shaking, surface rupture, landsliding, liquefaction, lateral spreading, and differential compaction. The potential for each of these to impact the site is discussed below.

b. Ground shaking caused by earthquakes is a complex phenomenon. Structural damage can result from the transmission of earthquake vibrations from the ground into the structure. The intensity of an earthquake at any given site depends on many variables including, the proximity of the site to the hypocenter, and the characteristics of the underlying soil and/or rock. The subject site is situated at the approximate latitude of 36°58' 41" and longitude -121°49' 15". The project location (latitude and longitude) were used in conjunction with the U.S. Geologic Survey website (Reference 9) to obtain the seismic design parameters presented in **Table 1**.

All proposed structures at the subject site shall be designed with the corresponding seismic design parameters in accordance with the 2010 California Residential Code (Reference 2).

Table 1
2010 CRC Seismic Design Criteria

SEISMIC DESIGN CRITERIA							
Site Class	Seismic Design Category	Spectral Response Accelerations					
		Ss	S1	SMs	SM1	SDs	SD1
D	E	1.977	0.840	1.977	1.260	1.318	0.840

c. Surface rupture usually occurs along lines of previous faulting. Based on our review of the Faults and Their Potential Hazards in Santa Cruz County map (Reference 7), no faults are shown to cross the property. Further discussion of faults is presented in the Preliminary Geologic Hazards Investigation prepared by Nolan and Associates Geology (Reference 6).

d. Landslides are generally mass movements of loose rock and soil, both dry and water saturated, and usually gravity driven. Based on our review of the Preliminary Map of Landslide Deposits if Santa Cruz County (Reference 4), no landslides are mapped on the subject parcel.

i. In accordance with the county comments on the proposed development of the site, we have performed a quantitative slope stability analysis of the slopes east and west of building Site 3 (APN 108-161-32). Details of our slope stability analysis are presented in Section 4.2, below.

ii. Proposed structures shall be setback from descending slopes in accordance with the Section R403.1.7.2 which requires a minimum setback of 1/3 of the slope height from the face of the footing. For structures with basements, the setback may be measured from the basement footing horizontally to the slope face.

e. Liquefaction, lateral spreading, and differential compaction tend to occur in loose, unconsolidated, noncohesive soils with shallow groundwater. Based on our review of Geology and Liquefaction Potential of Quaternary Deposits in Santa Cruz County, California (Reference 5) the site is mapped as Zone D, low potential for liquefaction. Our field observations confirm that the potential for these hazards to occur should be considered low, due to the presence of relatively dense, cohesive soils.

4.2 Slope Stability Analysis

4.2.1 General

a. The slope stability analysis was performed for the slopes west and east of Building Site 3 and were based on Cross Sections a-a' as shown on **Figure A-1.2.** The cross section was taken from the Preliminary Geologic Hazards Investigation by Nolan and Associates (Reference 6).

b. In order to model the slope conditions in an earthquake, the pseudo-static analyses assumed a seismic coefficient of 0.300 with a required minimum Factor of Safety of 1.0. The seismic coefficient was determined in accordance with Special Publication 117A (Reference 3). The Design Horizontal Acceleration was provide by Nolan and Associates. The following input was used:

Design Horizontal Acceleration	= 0.56g
f_{eq} (Factor for 5cm threshold)	= 0.52
Seismic Coefficient, $k_{eq} = f_{eq}$ x DHA	= 0.300 (rounded)

4.2.2 Results

i. Cross Section a-a' West

(a) The results of our analysis indicated that the minimum static factor of safety of the slope west of Site 3 is 2.9. This **exceeds** the minimum factor of safety of 1.5 considered to be the industry standard.

(b) From our analysis, the minimum pseudo-static factor of safety is approximately 1.4. This **exceeds** the minimum factor of safety of 1.0 considered to be the industry standard.

b. Cross Section a-a' East

(a) The results of our analysis indicated that the minimum static factor of safety of the proposed structure is 2.0. This **exceeds** the minimum factor of safety of 1.5 considered to be the industry standard.

(b) From our analysis, the minimum pseudo-static factor of safety is approximately 1.16. This **exceeds** the minimum factor of safety of 1.0 considered to be the industry standard.

c. Cross Section b-b'

(a) The results of our analysis indicates that the minimum static factor of safety is 1.7. This **exceeds** the minimum factor of safety of 1.5 considered to be the industry standard.

(b) From our analysis, the minimum pseudo-static factor of safety is approximately 1.3. This **exceeds** the minimum factor of safety of 1.0 considered to be the industry standard.

4.2.3 Discussion

a. Our quantitative slope stability analysis indicates that the slopes meet or exceed the current industry standards for the minimum required Factors of Safety.

b. Please be aware that quantitative slope stability analysis includes significant simplifying assumptions. Consequently, slope stability analyses and the generated Factors of Safety should be used as indicating trend lines. A slope with a Factor of Safety less than 1.0 will not necessarily fail, but the probability of slope movement will be greater than a slope with a higher Factor of Safety. Conversely, a slope with a Factor of Safety greater than 1.0 may fail, but the probability of stability is higher than a slope with a lower Factor of Safety.

c. Further discussion of slope stability analysis, methodology, and the results of the PCSTABL6 computer modeling program are presented in Appendix B.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 General

a. Based on the results of our investigation, it is our opinion that 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.

b. It is our opinion that the subject site will be suitable for the support of the proposed structures on a **foundation system composed of conventional, shallow, continuous and pad footings.** Recommendations for this foundation system are provided in section 5.3, Foundations.

c. A geologic trench was excavated near building Site 3. Should the trench cross the final building location, the trench must be backfilled per **section 5.2.6.**

d. Setbacks will be required from the steep slopes to the northwest of building Site 1 and east of building Site 3 to ensure the stability of the proposed structures. Recommendations for the setbacks can be found in Section 4, Geotechnical hazards.

e. **Highly expansive clay** was encountered on the site. Where this material is encountered in areas proposed for buildings, roadways and other improvements it shall be removed and replaced with the non-expansive materials encountered on the site. See **section 5.2.9.**

f. Laboratory consolidation test results indicate that the native, near-surface soils are moderately compressible under the anticipated loads and moderately collapsible upon wetting. **Site preparation**, consisting of over excavation and recompaction of the native subgrade will be required prior to placement of shallow foundations, slabs-on-grade, and pavements. See **section 5.2.6** for Preparation of On-Site Soil recommendations.

g. At the time we prepared this report, grading and foundation plans had not been finalized. We request an opportunity to review these plans during the design stages to determine if supplemental recommendations will be necessary.

h. The design recommendations of this report must be reviewed during the grading phase when subsurface conditions in the excavations become exposed.

---

i. **Field observation and testing must be provided by a representative of Rock Solid Engineering, Inc.**, to enable them to form an opinion regarding the adequacy of the site preparation, 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 Rock Solid Engineering, Inc., the Geotechnical Consultant, will render the recommendations of this report invalid.

j. **The Geotechnical Consultant should be notified at least five (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 conference should be held on the site to discuss project specifications, observation/testing requirements and responsibilities, and scheduling. This conference should include at least the Grading Contractor, the Architect, and the Geotechnical Consultant.

5.2 Grading

5.2.1 General

All grading and earthwork should be performed in accordance with the recommendations presented herein and the requirements of the regulating agencies.

5.2.2 Site Clearing

a. 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.

b. All pipelines encountered during grading should be relocated as necessary to be completely removed from construction areas or be capped and plugged according to applicable code requirements.

c. Any wells encountered shall be capped in accordance with **Santa Cruz County** Health Department requirements. The strength of the cap shall be at least equal to the adjacent soil and shall not be located within 5 feet of any structural element.

d. 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 must be observed by the Geotechnical Consultant. It is generally anticipated that the required depth of stripping will be 6 to 12 inches.

e. Holes resulting from the removal of buried obstructions that extend below finished site grades should be backfilled with compacted engineered fill in accordance with Section 5.2.5.

5.2.3 Excavating Conditions

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

b. Groundwater was encountered during the course of our field exploration, however, due to the water depth below existing grade and the shallow grading depths anticipated, is not expected to present a problem during construction.

5.2.4 Fill Material

a. With the exception of the medium to highly expansive clays encountered, the on-site soils **may** be used as compacted fill.

b. All soils, both on-site and imported, to be used as fill, should contain less than 3% organics and be free of debris and cobbles over 6 inches in maximum dimension.

c. Any imported soil to be used as engineered fill shall meet the following requirements:

(i) free of organics, debris and other deleterious materials
(ii) be granular (sandy) in nature and have sufficient fines to allow for excavation of the foundation trenches.
(iii) free of rock and cobbles in excess of 3 inches
(iv) have an expansion potential not greater than low (EI<20)
(v) have a soluble sulfate content less than 150 ppm

d. Imported fill material should be approved by the Geotechnical Consultant prior to importing. The Geotechnical Consultant 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 Consultant prior to delivery of any soils imported for use on the site.

5.2.5 Fill Placement and Compaction

a. Any fill or backfill required should be placed in accordance with the recommendations presented below.

b. With the exception of the upper 6 inches of subgrade in pavement and driveway areas, material to be compacted or reworked should be moisture-conditioned or dried to achieve near-optimum conditions, and compacted to achieve a minimum relative compaction of 90%. The upper 6 inches of subgrade in pavement and drive areas and all aggregate base and subbase shall be compacted to achieve a minimum relative compaction of 95%. The placement moisture content of imported material should be evaluated prior to grading.

c. The relative compaction and required moisture content shall be based on the maximum dry density and optimum moisture content obtained in accordance with ASTM D-1557.

d. The in-place dry density and moisture content of the compacted fill shall be tested in accordance with ASTM D-6780 or ASTM D-2922/ASTM D-3017.

e. The number and frequency of field tests required will be based on applicable county standards and at the discretion of the Geotechnical Consultant. As a minimum standard every 1 vertical foot of engineered fill placed within a building pad area, and every 2 vertical feet in all other areas shall be tested, unless specified otherwise by a Rock Solid Engineering, Inc. representative.

f. Fill should be compacted by mechanical means in uniform horizontal loose lifts not exceeding 8 inches in thickness.

g. All fill should be placed and all grading performed in accordance with applicable codes and the requirements of the regulating agency.

5.2.6 Preparation of On-Site Soils

a. Laboratory consolidation test results indicate that the native, near-surface soils are moderately compressible under the anticipated loads and moderately collapsible upon wetting. Site preparation, consisting of over excavation and recompaction of the native subgrade will be required prior to placement of shallow foundations, slabs-on-grade, and pavements.

b. The native subgrade beneath **shallow foundations, with the exception of basement foundations,** should be reworked to a depth sufficient to provide a zone of compacted fill extending at least 1.5 feet below the bottom of all footings.

c. The native subgrade beneath **basement foundations/thickened slab edges** will require no preparation, provide they are embedded per our recommendations in section 5.3, Foundations.

d. The native subgrade beneath **slabs-on-grade floors** should be reworked to a depth sufficient to provide a zone of compacted fill extending at least 12 inches below the bottom of the capillary break.

e. The native subgrade beneath **pavements** should be reworked to a depth sufficient to provide a zone of compacted fill extending at least 12 inches below the bottom of aggregate base coarse.

f. A geologic trench has been excavated near the building pad for Site 3. If the trench crosses the building pad, the trench must be overexcavated and the native soils recompacted under the supervision of Rock Solid Engineering.

g. **Highly expansive clay** was encountered on the site. Where this material is encountered in areas proposed for buildings, roadways and other improvements **it shall be removed and replaced** with the non-expansive native materials.

h. Should the proposed residences be founded on a cut/fill transition pad, it is important that all foundation elements be founded on a consistent bearing surface. Therefore the subgrade on the cut portion of the pad shall be overexcavated and recompacted to provide a minimum of 18 inches of compacted subgrade beneath all foundation elements. Please refer to **Figure 2** for Cut/Fill Transition Pad construction.

i. The zone of compacted fill must extend a minimum of 3 feet laterally beyond all shallow foundations.

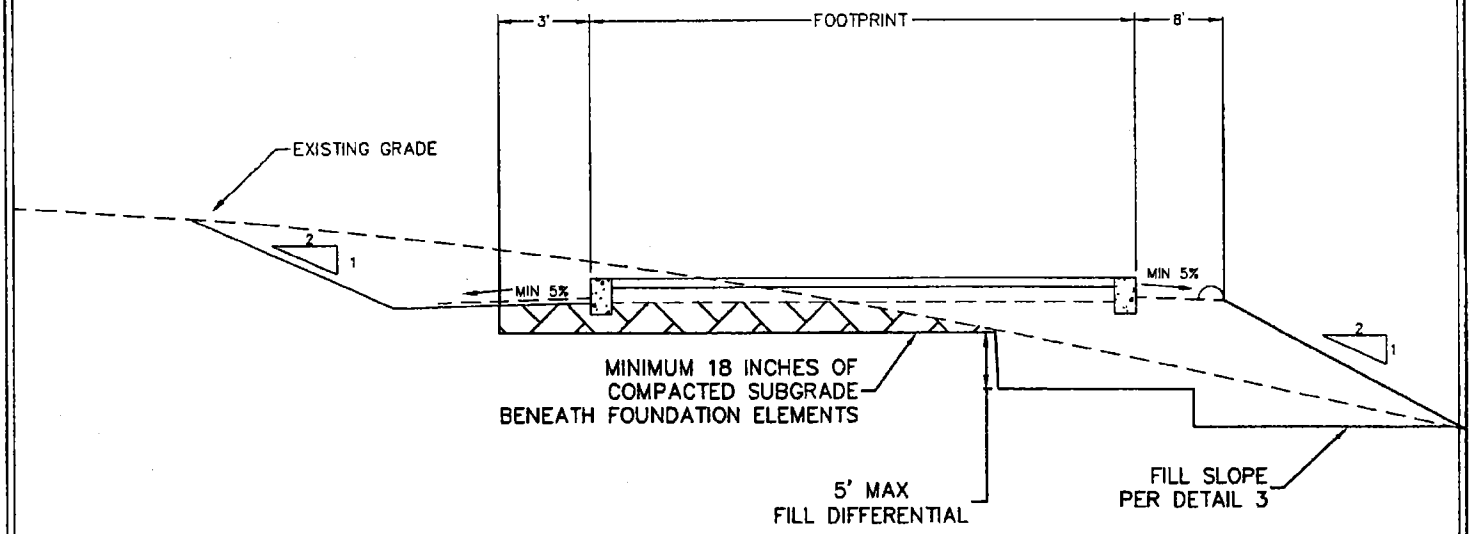
j. A representative of our firm shall observe the bottom of the excavation once the required depth of overexcavation has been achieved to verify suitability. Prior to replacing the excavated soil, the exposed surface should be scarified to a depth of 6 to 8 inches, moisture conditioned, and compacted.

k. The depths of reworking required are subject to review by the Geotechnical Consultant during grading when subsurface conditions become exposed.

5.2.7 Cut and Fill Slopes

a. All fill slopes should be constructed with engineered fill meeting the minimum density requirements of this report and have a gradient no steeper than 2:1 (horizontal to vertical). Fill slopes should not exceed 15 feet in vertical height unless specifically reviewed by the Geotechnical Consultant. Where the vertical height exceeds 15 feet, intermediate benches must be provided. These benches should be at least 6 feet wide and sloped to control surface drainage. A lined ditch should be used on each bench.

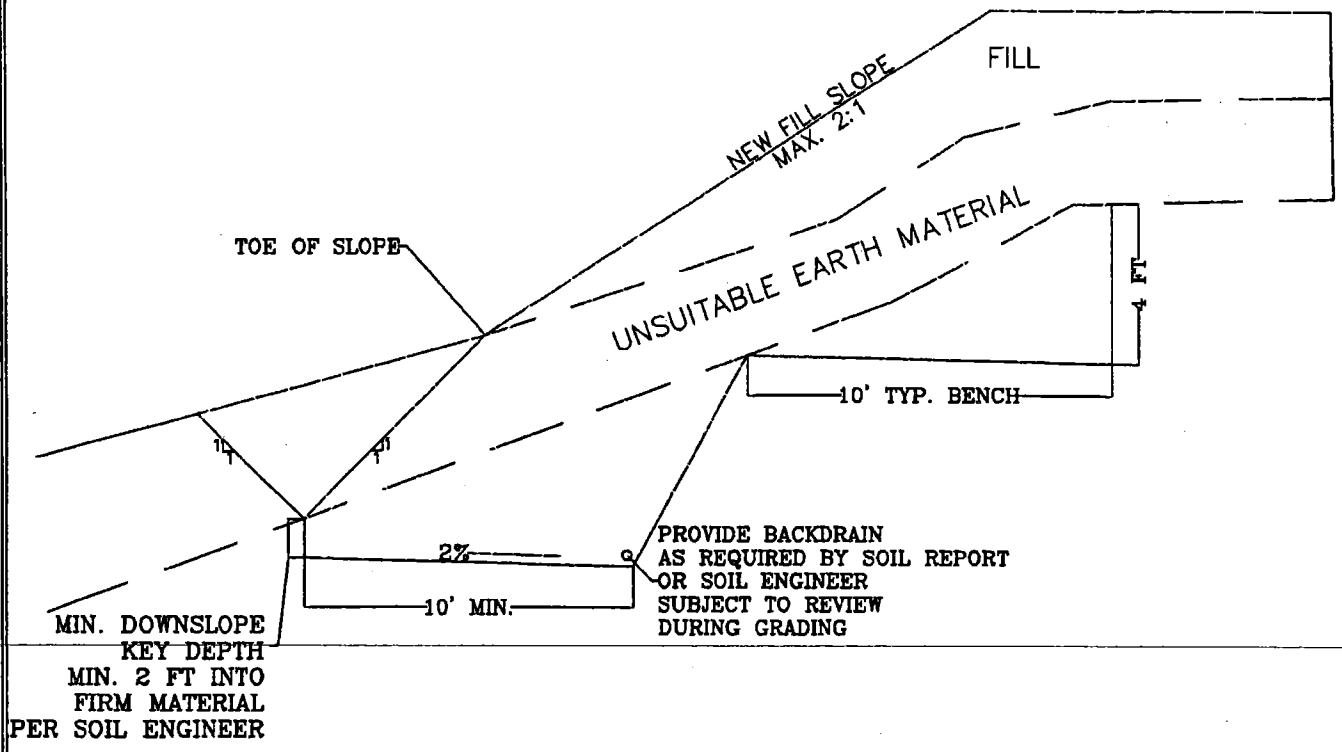
b. Fill slopes shall be benched and keyed into the native slopes by providing a base keyway whose minimum width is 10 feet and which is sloped negatively at least 2% back into the slope. The depth of keyways will vary, depending on the materials encountered, but at all locations shall be at least 2 feet into firm material. This keyway should be combined with intermediate benching as required. Refer to **Figure 3** for Typical Key and Bench Detail.



ATTACHMENT 5

ROCK SOLID ENGINEERING, INC.	CUT/FILL TRANSITION	FIGURE 2

FILL SLOPE
OVER NATIVE SOIL



NOTES:

ALL GRADING SHOULD BE IN ACCORDANCE WITH THE LOCAL JURISDICTION REQUIREMENTS AND THE 2010 CALIFORNIA BUILDING CODE.

ALL GRADING SHOULD BE INSPECTED BY THE SOIL ENGINEER. THE ENGINEER MUST APPROVE THE BASE KEYWAY, BENCHING AND COMPACTION.

WHEN NATURAL SLOPE IS LESS THAN 5:1, BENCHING IS NOT REQUIRED. HOWEVER, FILL IS NOT TO BE PLACED ON COMPESSIBLE OR UNSUITABLE MATERIAL.

ALL GRADING RECOMMENDATIONS ARE SUBJECT TO REVIEW BY THE SOILS ENGINEER DURING GRADING.

ATTACHMENT 5

ROCK SOLID ENGINEERING, INC.	TYPICAL KEY & BENCH DETAIL FILL SLOPE OVER NATIVE	FIGURE 3

c. Cut slopes shall not exceed a 2:1 (horizontal to vertical) gradient and a 15 foot vertical height unless specifically reviewed by the Geotechnical Consultant. Where the vertical height exceeds 15 feet, intermediate benches must be provided. These benches should be at least 6 feet wide and sloped to control surface drainage. A lined ditch should be used on each bench.

d. If a fill slope is to be placed above a cut slope, the toe of the fill slope should be set back at least 8 feet horizontally from the top of the cut slope. A lateral surface drain should be placed in the area between the cut and fill slopes.

e. The surfaces of all cut and fill slopes should be worked to reduce erosion. This work, as a minimum, should include track rolling of the fill slopes and effective planting of all slopes.

f. Periodic maintenance of slopes may be necessary, as minor sloughing and erosion may take place.

5.2.8 Groundwater Table

Groundwater **was** encountered during the course of our exploration, in boring B3 at 25 feet below the existing grade. The depth of the groundwater table is at least 5 feet below the lowest depth of the foundation of the proposed construction, therefore, it is not expected to interfere with the construction.

5.2.9 Expansive Soils

a. Building Pads

Our laboratory testing shows that the expansion index of the near surface soils encountered, in the areas of the proposed residences, range from 2 to 41, this indicates that the expansion potential of the near surface soils should be considered low.

The California Building Code (Section 1803.5.3) defines soils with an Expansion Index greater than 20 to be expansive. The foundation and grading recommendations presented herein are intended to be in accordance with CBC Section 1808.6.

b. Driveways

Our laboratory testing shows that the expansion index of the near surface clayey sands encountered, in the area of the proposed driveway adjacent to the culvert, is as high as 52, this indicates that the expansion potential of the near surface clays should be considered medium.

ATTACHMENT 5

The expansion index of the near surface **clays** encountered in the area of the proposed driveway on the slope to Site 3, is equal to 120. This indicates that the expansion potential of the near surface soils should be considered high. **Where these clay layers are encountered it should be removed and replaced with the non-expansive native materials.**

5.2.10 Sulfate Content

The results of our laboratory testing indicate that the soluble sulfate content of the on-site soils likely to come into contact with concrete is below the 150 ppm generally considered to constitute an adverse sulfate condition. **Type II cement** is therefore considered adequate for use in concrete in contact with the on-site soils.

5.2.11 Surface Drainage

a. Pad drainage should be designed to collect and direct surface water away from structures and slope faces to approved drainage facilities.

b. Pad drainage should be designed by the Civil Engineer. Generally, a minimum gradient of **5 percent for a distance of no less than 10 feet** measured perpendicularly from the wall face, should be maintained and drainage should be directed toward approved swales or drainage facilities. If 10 horizontal feet can not be satisfied due to lot lines or physical constraints, the drainage shall be designed in accordance with the requirements of Section R401.3 of the 2010 California Residential Code.

c. Swales and impervious surfaces shall be sloped a minimum of 2 percent towards an approved drainage inlet or discharge point or as specified by the Project Civil Engineer.

d. 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. The connection should be to a solid pipe or surface swale which discharges at an approved location away from the structure and the graded area. At **Site 3**, the discharge location should be carefully planned so that the runoff is directed toward shallower slopes and is properly dissipated to prevent concentrated flow from pipes. No runoff should be directed to the east side of the ridge.

e. 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 Consultant.

f. 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. Large trees should be planted a minimum distance of ½ their mature height away from the foundation.

5.2.12 Utility Trenches

a. Bedding material may consist of sand with SE not less than 20 which may then be jetted, unless local jurisdictional requirements govern.

b. Existing on-site soils (except for the clays) may be utilized for trench backfill, provided they are free of organic material and rocks over 6 inches in diameter.

c. If sand is used, a 3 foot concrete plug should be placed in each trench where it passes under the exterior footings.

d. 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% in paved areas and 90% in other areas per ASTM D-1557. Care should be taken not to damage utility lines.

e. 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) from the bottom outside edge of all footings.

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

g. 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.

5.3 Foundations

5.3.1 General

a. It is our opinion that the subject site will be suitable for the support of the proposed structure on a **foundation system composed of conventional, shallow, continuous and pad footings.**

b. At the time we prepared this report, grading and foundation plans had not been finalized. We request an opportunity to review these plans during the design stages to determine if supplemental recommendations will be necessary.

5.3.2 Conventional Shallow Foundations

a. Footing widths should be based on the allowable bearing values but not less than 12 inches for 1 story and 15 inches for 2 story structures.

b. **The minimum recommended depth of embedment is 18 inches for all footings.** Should local building codes require deeper embedment of the footings or wider footings the codes must apply.

c. Footing excavations must be checked by the Geotechnical Consultant before steel is placed and concrete is poured to insure bedding into proper material. Excavations should be thoroughly wetted down just prior to pouring concrete.

d. The **allowable bearing capacity** shall not exceed **2,000 psf.**

e. The allowable bearing capacity values above may be increased by one-third in the case of short duration loads, such as those induced by wind or seismic forces.

f. Footing should not be placed closer than 8 feet to the top of a fill slope, nor 6 feet from the base of a cut slope.

g. In the event that footings are founded in structural fill consisting of imported soil, the recommended allowable bearing capacity may need to be re-evaluated.

5.4 Settlements

Total and differential settlements beneath foundation elements 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 Consultant when foundation plans for the proposed structures become available.

5.5 Retaining Structures

5.5.1 General

Retaining walls may be founded on **conventional shallow footings.** Recommendations for this foundation system are provided in section 5.3, Foundations.

5.5.2 Lateral Earth Pressures

a. The lateral earth pressures presented in **Table 2** are recommended for the design of retaining structures with a gravel backdrain and backfill soils of expansivity not higher than medium. Should the slope behind the retaining walls be other than level or 2:1 (H:V), supplemental design criteria will be provided for the active earth or at-rest pressures for the particular slope angle.

Table 2
Lateral Earth Pressures

Type	Soil Profile	Soil Pressure (psf/ft)	
		Unrestrained Wall	Rigidly Supported Wall
Active Pressure	Level 2:1	35 55	- -
At-Rest Pressure	Level 2:1	- -	68 98
Passive Pressure* *Neglect upper 2'	Level 2:1	400 200	200 100

b. The friction factor between rough concrete and the native, near-surface **clayey sand** is **0.40**.

ATTACHMENT 5

c. Where both friction and the passive resistance are utilized for sliding resistance, either of the values indicated should be reduced by one-third.

d. When required by the code, lateral load due to earthquakes may be calculated as $15xH^2$ acting at 0.6H above the base of the wall.

e. These are ultimate values, no factor of safety has been applied.

f. Although not anticipated, pressure due to any surcharge loads from adjacent footings, traffic, etc., should be analyzed separately. Pressures due to these loading configurations can be supplied upon receipt of the appropriate plans and loads.

5.5.3 Backfill

a. Backfill should be placed under engineering control.

b. It is recommended that granular, or relatively low expansivity, backfill be utilized, for a width equal to approximately 1/3 x wall height, and not less than 2 feet, subject to review during construction.

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

d. Backfill should be compacted to achieve a minimum 90 percent relative compaction, the compaction standard being obtained in accordance with ASTM D-1557.

e. 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.

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

5.5.4 Backfill Drainage

a. Backdrains should consist of a minimum 4-inch diameter, perforated, SDR 35 pipe or equivalent, embedded in permeable material meeting the State of California Standard Specification Section 68-1.025, Class I or II, Type A, or equivalent. A layer of **Mirafi 140N Filter Fabric**, or equivalent, shall be placed over the permeable material and the remaining 12 inches shall be capped with compacted native soil.

b. The pipe should be approximately 4 inches above the trench bottom with a gradient of at least 1% being provided to the pipe and trench bottom, discharging to an approved location. See **Figure 4** for Retaining Wall Backdrain Configuration.

c. Perforations in backdrains are recommended as follows: 3/8-inch diameter, in 2 rows at the ends of a 120 degree arc, at 3-inch centers in each row, staggered between rows, placed downward.

d. Backdrains placed behind retaining walls should be approved by the Geotechnical Consultant prior to the placement of backfill.

e. 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 a lower elevation on a continuous gradient of at least 1%.

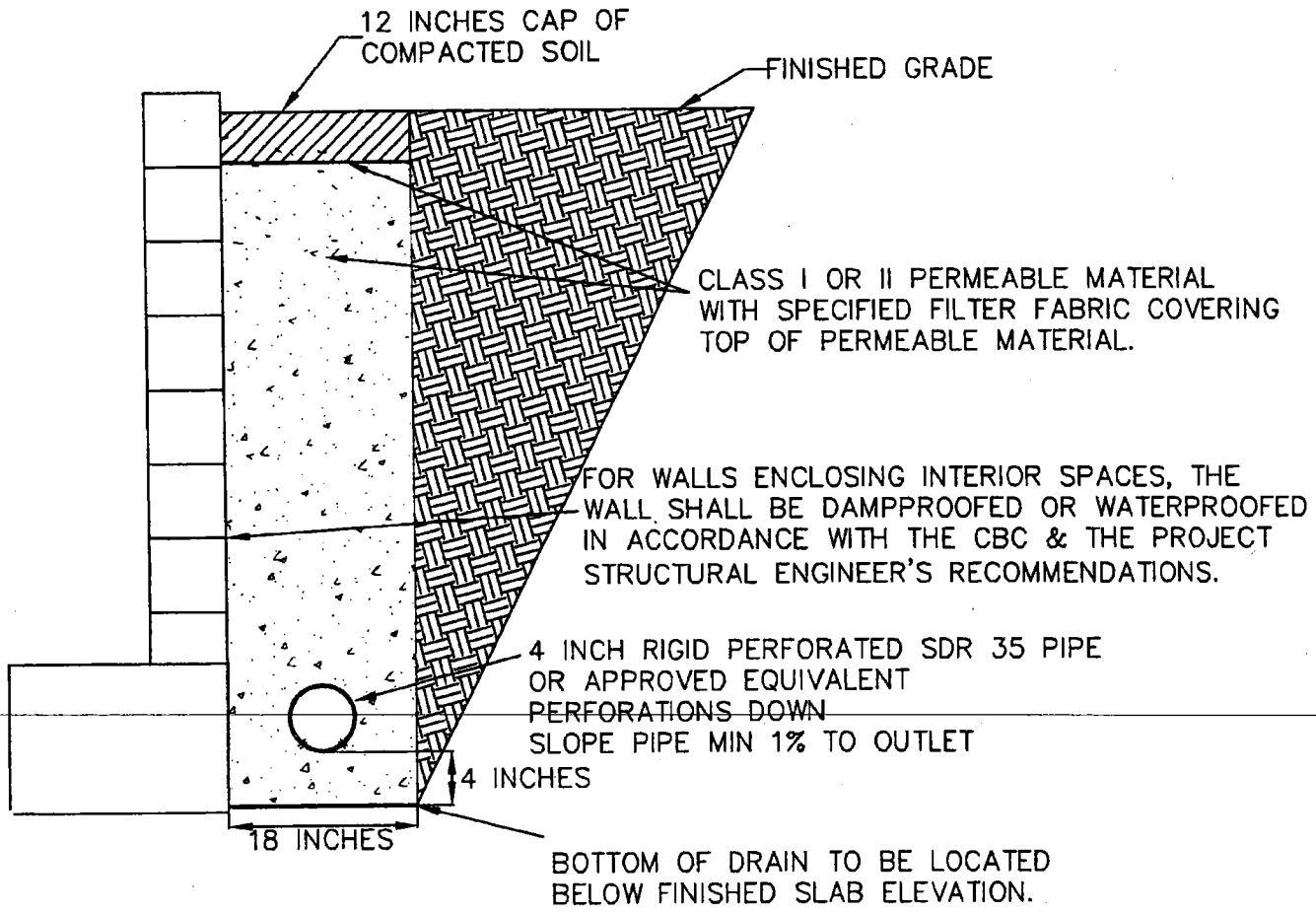
f. When terrace retaining walls are proposed, the upper retaining wall should have a backdrain which extends below the elevation of the top of the lower retaining wall backdrain. This will prevent spring effects and seepage between the terraced walls.

5.6 Slabs-on-Grade

a. Concrete floor slabs may be founded on compacted engineered fill per the recommendations in section 5.2.6. 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.

b. It is important that the subgrade soils be thoroughly saturated for 24 to 48 hours prior to the time the concrete is poured. **For compacted engineered fill with a low expansion potential, the subgrade should be presoaked 4 percentage points above optimum to a depth of 1.0 feet.**

c. The slab-on-grade section should incorporate a minimum 4 inch capillary break consisting of 3/4 inch, clean, crushed rock, or approved equivalent. Class II baserock is not recommended. Structural considerations may govern the thickness of the capillary break.



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ROCK SOLID ENGINEERING, INC.	RETAINING WALL BACKDRAIN CONFIGURATION	FIGURE 4

d. Where moisture sensitive floor coverings are anticipated or vapor transmission may be a problem, a 10 mil waterproof membrane should be placed between the floor slab and the capillary break in order to reduce moisture condensation under the floor coverings. Place a 2-inch layer of moist sand on top of the membrane. This will help protect the membrane and will assist in equalizing the curing rate of the concrete.

e. Slab thickness, reinforcement, and doweling should be determined by the Project Structural Engineer, based on the design live and dead loads, including vehicles.

5.7 Pavement Design

The design of the pavement section was beyond our scope of services. The following considerations are imperative for the selected pavement sections to perform effectively:

a. Use only quality materials of the type and minimum thickness specified. All baserock must meet Cal-Trans Standard Specifications for Class II Aggregate Base.

b. The **R-Value should be obtained at the conclusion of grading** and the design pavement sections reviewed at that time.

c. Compact the base and subgrade uniformly to a minimum relative dry density of 95%.

d. Asphalt concrete should be placed only during periods of fair weather when the ambient air temperature is within prescribed limits.

e. Provide sufficient gradient to prevent ponding of water.

f. Maintenance should be undertaken on a routine basis.

5.8 Exterior Concrete Flatwork

a. Concrete flatwork should be divided into as nearly square panels as possible. Frequent joints should be provided to give articulation to the panels. Landscaping and planters adjacent to concrete flatwork should be designed in such a manner as to direct drainage away from concrete areas to approved outlets.

b. It is assumed that concrete flatwork will be subjected only to pedestrian traffic.

6. LIMITATIONS

a. 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.

b. The samples taken and tested, and the observations made, are considered to be representative of the site; however, soil and geologic conditions can vary significantly between sample locations.

c. 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 Consultant and the Geologist, and revised recommendations be provided as required.

d. 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.

e. 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.

f. 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.

g. 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.

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3. California Geologic Survey, Special Puplication 117A, Guidelines for Evaluation and Mitigating Seismic Hazards in California, Dated September 11, 2008.

4. Cooper-Clark and Associates, 1975, Preliminary Map of Landslide Deposits in Santa Cruz County, California, Santa Cruz County Planning Dept., Scale: 1:62,500.

5. Dupré, W.R., 1975, Geology and Liquefaction Potential of Quaternary Deposits in Santa Cruz County, California, U.S. Geological Survey Miscellaneous Field Studies Map MF-648, Scale: 1:62,500.

6. Nolan Associates, Preliminary Geologic Hazards Investigation, Proposed Single Family Residences, Freedom Blvd, Corralitos, Santa Cruz County, California, APNs: 108-161-32, 33, 34, 37, 38, 39, 40, 46, & 47, Job No. 13018, Dated November 3, 2013.

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8. Seed et al.(2003), Recent Advances In Soil Liquefaction Engineering: A Unified And Consistent Framework, Dated: April 30, 2003.

9. U.S. Geologic Survey, Earthquake Ground Motion Parameter Java Application. Seismic Design Value for Buildings. Site Updated February 11, 2013, Utilized September 25, 2013. http://earthquake.usgs.gov/hazards/designmaps/javacalc.php

APPENDIX A

FIELD EXPLORATION AND LABORATORY TESTING PROGRAM

FIELD EXPLORATION PROCEDURES

A-1. Subsurface conditions were explored by drilling 14 borings. Borings B1through B3 were advanced with a truck mounted drill rig equipped with 6 inch solid stem augers. Borings B4 through B9 and B11 through B14 were advanced with a tractor mounted drill rig equipped with 6 inch solid stem augers. Boring B10 was advanced by the geologist, without the presence of a representative of Rock Solid Engineering, Inc., please see the Geologic Investigation, Reference 6, for the boring log. The approximate locations of the borings are shown on the Boring Location Plan, **Figure A-1**. The Key to Logs, **Figure A-2**, gives definitions of the terms used in the Logs of Exploratory Borings. The Logs of Exploratory Borings are presented in **Figures A-3** through **A-15**.

A-2. Drilling of the borings was observed by our Field Engineer who logged the soils and obtained bulk and relatively undisturbed samples for classification and laboratory testing. The soils were classified, based on field observations and laboratory testing, in accordance with Unified Soil Classification System.

A-3. Relatively undisturbed soil samples were obtained by means of a drive sampler. The hammer weight and drop being 140 pounds and 30 inches, respectively. The number of "Blows/Foot"required to drive samplers are indicated on the logs.

A-4. Exploratory borings were located in the field by measuring from know landmarks. The locations, as shown, are therefore within the accuracy of such a measurement.

A-5. Groundwater was encountered, in boring B3, at a depth of 25 feet below existing grade during the course of our field exploration.

LABORATORY TESTING PROCEDURES

A-6. Classification

Soils were classified in accordance with the Unified Soil Classification System. Moisture content and in-situ density determinations were made from relatively undisturbed soil samples. The results are presented in the Logs of Exploratory Borings and in the Summary of Laboratory Test Results, **Figure A-16**.

A-7. Direct Shear

Direct shear strength tests were performed on representative samples of the on-site soils in accordance with laboratory test standard ASTM D 3080-98. Samples were relatively undisturbed, or remolded as specified. To simulate possible adverse field conditions, the samples were saturated prior to testing unless otherwise noted. A saturating device was used which permitted the samples to absorb moisture while preventing volume change. The direct shear test results are presented in **Figures A-17 through A-21**.

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A-8. Consolidation

Consolidation tests were performed on representative, relatively undisturbed samples of the underlying soils to determine compressibility characteristics. The samples were saturated during the tests to simulate possible adverse field conditions. The test results are presented in **Figures A-22 through A-26**.

A-9. Expansion Index

Expansion tests were performed on representative, remolded samples of the on-site soils in accordance with laboratory test standard ASTM D 4829-95. The test results are presented in **Figure A-16**.

A-10. Amount of Materials in Soil Finer than the No. 200 Sieve

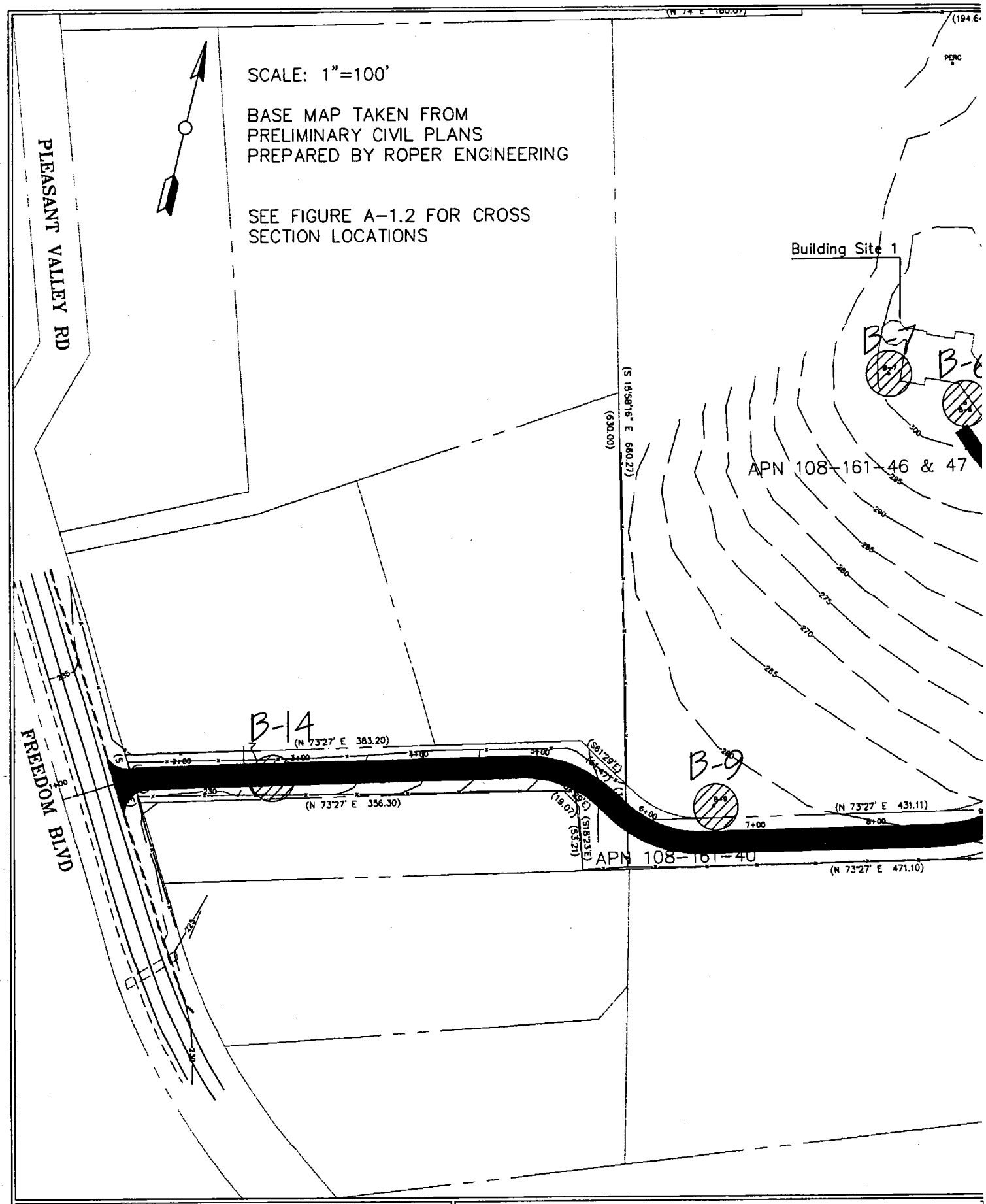
Determination of the amount of materials in the soil finer than the No. 200 sieve analyses were performed on samples considered representative of the on-site soils. The laboratory test was performed in accordance with ASTM: D 1140. The test results are presented in **Figure A-16.**

A-11 Plasticity Index

The plasticity index was determined for a sample considered representative of the on-site soils in accordance with ASTM D4318. The test results are presented on **Figure A-3.1**.

A-11. Soluble Sulfates

The soluble sulfate content was determined for samples considered representative of the on-soils likely to come in contact with concrete in accordance with test method California 417. The test results are presented in **Figure A-16**.



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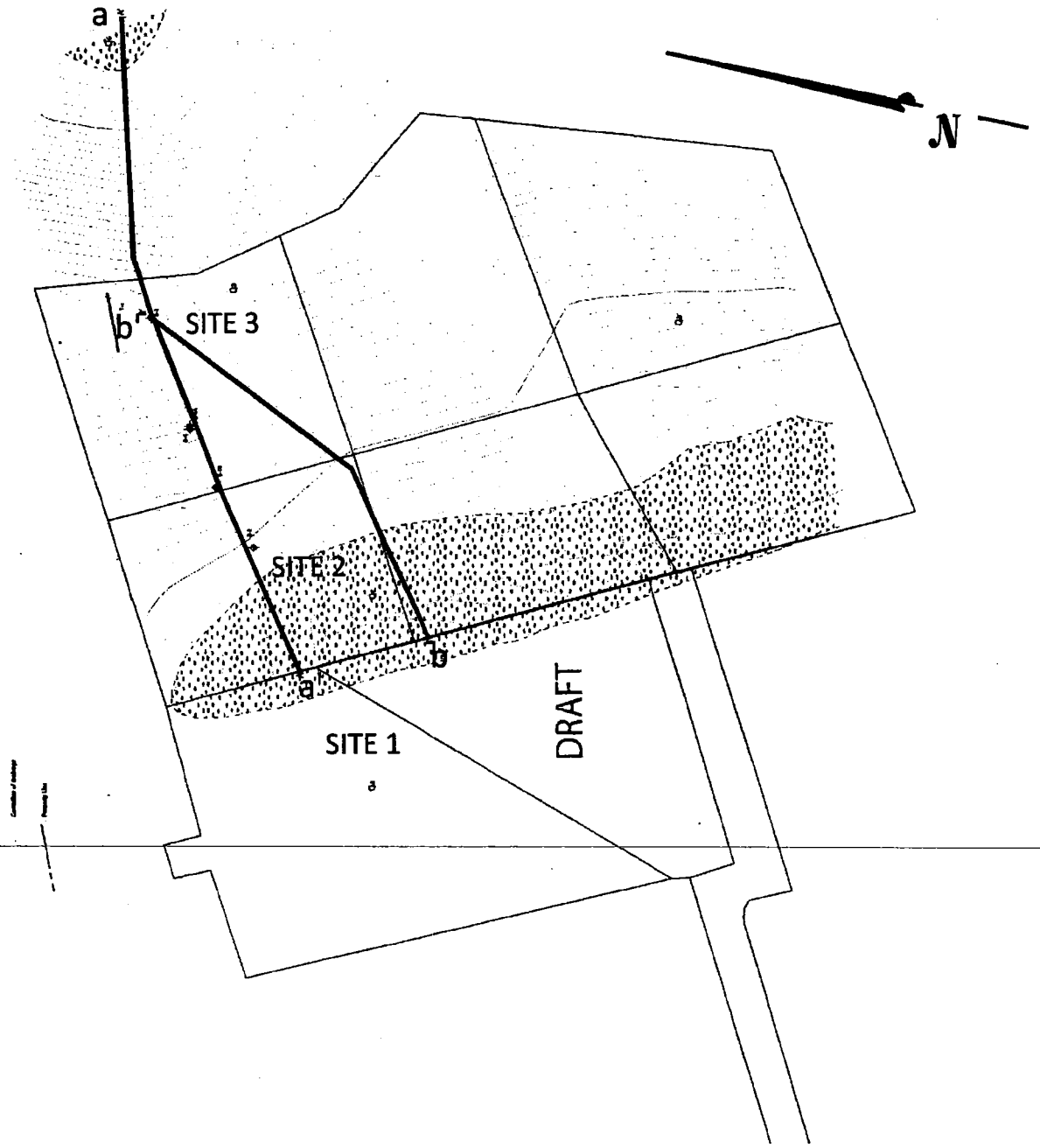
ATTACHMENT 5



Not to Scale

See Original Cross Site Plan By Nolan Associates

ROCK SOLID ENGINEERING, INC.	CROSS SECTION LOCATION PLAN	FIGURE
	Freedom Boulevard, Aptos	A-1.2

ATTACHMENT 5

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
DAMP
MOIST
WET

* 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).

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B1
Project:	Freedom Boulevard	Location:	Site 3 - Ridgetop
	Aptos, California	Elevation:	396'
Date:	July 31, 2013	Method of Drilling:	Truck Mounted Drill Rig, 6in. Solid Stem
Logged By:	YW		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SM			Tan SAND with Trace fines. Dry, Non-plastic.			16.7				
	CH			Tan CLAY with Sand. Moist, Hard, Medium Plastic.	46	104.5	21.0	126.5			
					60		20.8				E.I.=41
5	SP			Tan SAND. Dry, Dense, Non-plastic.			19.2				
				Material Consistent. Moist, Dense, Non-plastic.							
10				Coarser Grained.	56	115.4	10.4	127.4			Sulfate
	CL			Tan CLAY. Moist, Very Stiff, Plastic.	28		34.5				#200 Wash
	SC			Tan Clayey SAND. Moist, Medium Plastic.			21.6				#200 Wash
				Silt Layer @ 13.5 ft.							
15	MH			Tan SILT. Moist to Wet, Very Stiff, Plastic.	23	73.2	45.3	106.4	0	38	P.I.:24.3 L.L.:55.0
				Interbedded SILT/ Sandy Silt. Moist to Wet, Plastic. Plastic.	26		40.8				
20	SM			Tan SAND. Moist, Dense, Non-plastic. Coarser at Shoe.	72	115.8	8.8	126.0	120	43	
	SP			Silty SAND. Moist, Dense, Non-plastic.	33		18.2				
25											

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FIGURE A-3.1

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B1 Continued
Project:	Freedom Boulevard	Location:	Site 3 - Ridgetop
	Aptos, California	Elevation:	
Date:	July 31, 2013	Method of Drilling:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer
Logged By:	YW		

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SC		X	Brown SAND with Trace Clay. Moist, Dense, Non-plastic.	63	100.2	19.6	119.8			
	ML		X	Brown Sandy SILT. Moist, Medium Plastic.	38		28.6				
	SM		X	Brown SAND with Some Silt.							
			X	Brown SAND with Some Silt. Moist, Dense, Non-plastic.	38		16.3				
30			X	Brown SAND. Moist, Dense, Non-plastic.	83	84.2	10.1	92.8			
	ML		X	Tan Silt.	53		27.8				#200 Wash
	ML/ SM		X	Interbedded Layers of SILT an Sandy SILT.							
			X	Interbedded SILT and SAND.	49						
	SP			Light Tan SAND. Moist, Dense, Non-plastic.							
35			X	Brown SAND. Dry to Moist, Medium Dense, Non-plastic. Medium to Coarse Grained.	47	111.3	5.6	117.5			
				Material Consistent. Trace Cobbles.	48						
	SM		X	Dark Brown Silty SAND with Clay. Moist to Wet, Medium Dense, Plastic.	25		18.5				
40	SP		X	Brown SAND. Moist, Very Dense, Non-Plastic.	100+	97.2	24.4	121.0			
	SC		X	Brown Clayey SAND. Moist, Very Dense, Medium Plastic.	100+		17.5				#200 Wash
			X	Brown SAND. Moist, Dense, Non-plastic.	67						
45				Material Consistent. SILT Layer.	45		28.5				
			X	Brown SAND. Moist, Medium Dense, Non-plastic.	28						
				Material Consistent.	28						
50				Boring Terminated @ 48 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							

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FIGURE A-3.2

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B2
Project:	Freedom Boulevard	Location:	Site 2 - Base of Slope
	Aptos, California	Elevation:	305'
Date:	July 31, 2013	Method of Drilling:	Truck Mounted Drill Rig, 6in. Solid Stem
Logged By:	YW		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ°	Miscellaneous Laboratory Testing
	ML			Dark Brown SILT with Sand. Dry, Non-plastic.							
	SC			Light Brown Clayey SAND. Dry, Medium Dense, Slightly Plastic.	40	117.8	11.1	130.9	1190	30	E.I.=18 Consolidation
				Material Consistent. Moist.	29		13.6				
5	SP			Brown SAND. Dry to Moist, Medium Dense, Non-plastic.	25		13.1				
				Material Consistent. Moist.	47	117.4	15.4	135.4			
				Material Consistent.	37						
10				Material Consistent. Dense.	35		8.5				
				Material Consistent. Very Dense.	100+	118.0	11.1	131.2			
				Material Consistent. Medium Dense.	50						
15				Material Consistent. Dense.	39		10.0				
				Material Consistent. Very Dense.	100+						
				Material Consistent. Medium Dense.	55	110.2	9.8	121.0			
				Material Consistent. Dense.	45		10.4				
20				Material Consistent. Very Dense.	100+						
				Material Consistent. Dense.	78						
				Material Consistent. Very Dense.	58		8.9				
25											

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FIGURE A-4.1

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B2 Continued
Project:	Freedom Boulevard	Location:	Site 2 - Base of Slope
	Aptos, California	Elevation:	
Date:	July 31, 2013	Method of Drilling:	Truck Mounted Drill Rig, 6in. Solid Stem
Logged By:	YW		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
30	SP		X	Brown SAND. Dry to Moist, Dense, Non-plastic.	44		9.9				
				Boring Terminated @ 31.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
35											
40											
45											
50											

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B3
Project:	Freedom Boulevard	Location:	Site 2 - Building Pad
	Aptos, California	Elevation:	287'
Date:	July 31, 2013	Method of Drilling:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer
Logged By:	YW		

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ°	Miscellaneous Laboratory Testing
	SM			Dark Brown Silty SAND. Dry, Non-plastic.							
			X	Dark Brown Silty SAND. Dry, Dense, Non-plastic.	55	119.4	4.9	125.2			Sulfate
			X	Dark Brown Silty SAND. Dry, Dense, Non-plastic.	13		8.3				
5	SC		X	Brown Clayey SAND. Moist, Medium Dense, Slight Plastic. Some Pebbles in Sample.	32	117.2	13.1	132.6	1320	27	
			X	Material Consistent.	20		15.7				
10			X	Material Consistent. Wet. Sandier at Shoe.	28	112.7	20.2	135.4			
			X	Brown Clayey SAND. Wet, Medium Dense, Medium Plastic. Small Pebbles(1/4"-1/2").	24		20.5				
15	SP		X	Reddish Brown SAND. Fine Grained. Wet, Dense, Non-plastic.	35		17.8				
20			X	Brown SAND. Moist to Wet, Very Dense, Non-plastic.	100+	107.8	18.3	127.4			
			X	Material Consistent. Wet to Saturated. Very Dense, Non-plastic. Fine Grained.	65		18.9				
25				Perched Groundwater @ 25 feet.							

ROCK SOLID ENGINEERING, INC.

FIGURE A-5.1

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B3 Continued
Project:	Freedom Boulevard	Location:	Site 2 - Building Pad
	Aptos, California	Elevation:	
Date:	July 31, 2013	Method of Drilling:	Truck Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer
Logged By:	YW		

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
				Groundwater @ 25 feet.							
	CH		X	Tan CLAY. Wet, Very Stiff, Plastic.	32		41.9				
	CH		X	Black CLAY. Trace Organics. Wet, Plastic.			40.2				
30	SP		X	Tan SAND. Dry to Moist, Very Dense, Non-plastic.	100+		8.4				
				Boring Terminated @ 31.5 ft. Perched Groundwater @ 25 ft. After Drill @ 28 ft. 8 in. Boring Backfilled With Cuttings.							
35											
40											
45											
50											

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FIGURE A-5.2

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B4
Project:	Freedom Boulevard	Location:	3/4 Way Up Slope, Btwn Bldg. Site 2 & 3
	Aptos, California	Elevation:	359'-360'
Date:	July 31, 2013	Method of Drilling:	Tractor/Track Mounted Drill Rig, 6in. Solid/8
Logged By:	DO/YW		in. Hollow Stem Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SM			Brown to Dark Yellowish Brown Silty SAND. Dry, Slightly Plastic. Fine Grained.							
	SC			Brown to Dark Yellowish Brown Clayey SAND. Dry, Medium Dense, Slightly Plastic. Fine Grained.	45	114.4	7.6	123.1			#200 Wash
				Material Consistent. Slightly Less Clay at Bottom.	52		12.2				
5				Material Consistent. Dense. Clayey Layer in Center.	34		12.2				
	SC			Strong Brown SAND with Clay. Moist, Medium Dense, Non-Plastic. Coarser Grained. Some Small Gravels. Gravels Types Include Sandstone and Granitic, Various Colors, 1/4"	43	116.0	12.9	131.0			
	SC			9.5'~1" Layer of Silty Clayey SAND. Moist, Medium Plastic. Fine Grained Strong Brown SAND. Moist, Non-plastic.	36		16.7				
10				10'~1/2" Layer of Silt/Clay. Moist, Medium Plastic Fine Grained SAND with Trace Clay. Moist, Medium Dense, Non-plastic.	26		11.9				
				Hole Moved Over							
	SP			Orange Brown Sand. Moist.			9.6				
15				Material Consistent. Loose.	16						
				Material Consistent.	22						
				Material Consistent. Medium Dense.	21						
20				Material Consistent.	37						
				Material Consistent. Coarser Grained.	46						
				Material Consistent. Dense.	35						
25											

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FIGURE A-6.1

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B4 Continued
Project:	Freedom Boulevard	Location:	3/4 Way Up Slope, Btwn Bldg. Pad 3A & 2
	Aptos, California	Elevation:	
Date:	July 31, 2013	Method of Drilling:	Track Mounted Drill Rig, 8in. Hollow Stem
Logged By:	YW		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SP			Brown SAND. Moist, Dense, Non-plastic. Slightly Cemented. Some Gravel in Shoe. 1/8"-1/2".	56						
				Material Consistent. Dry, Very Dense.	55						
				Material Consistent. Very Dense.	54						
30				Orange Brown SAND. Dry, Dense, Non-Plastic.	69						
				Material Consistent.	52						
				Material Consistent.	44						
35				Boring Terminated @ 34.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
40											
45											
50											

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FIGURE A-6.2

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B5
Project:	Freedom Boulevard	Location:	Site 3 West Side of Building Envelope
	Aptos, California	Elevation:	394'
Date:	July 31, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem
Logged By:	DO		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SM		X	Brown Silty SAND. Dry, Slightly Plastic.			3.8				Sulfate
	SC		X	Brown Clayey Sand. Dry, Very Dense, Medium Plastic.	100+	119.9	9.7	131.6			Consolidation #200 Wash
			X	Material Consistent. Less Clay.	54		10.2				
			X	Red Brown Grained Sand with Gravels. Moist, Dense, Non-plastic.	33		14.1				
5				Yellow Brown Clay with SAND. Moist, Plastic.							
	SP		X	Reddish Brown SAND with Trace Gravel. Moist, Medium Dense, Non-plastic.	12		18.3				
10											
			X	Grey Brown with Reddish Staining SAND with Some Clay. Wet, Medium Dense, Non-plastic.	31	103.6	21.1	125.5			
			X	Reddish Brown SAND with Some Clay. Dry, Dense, Non-plastic.	34		14.2				
15				Boring Terminated @ 15 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
20											
25											

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FIGURE A-7

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B6
Project:	Freedom Boulevard	Location:	Site 1, SE Side of Building Envelope
	Aptos, California	Elevation:	301'
Date:	July 31, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer
Logged By:	DO		

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear ϕ °	Miscellaneous Laboratory Testing
	SM		X	Brown Silty SAND. Dry, Slightly Plastic.			3.4				Sulfate
	SC	X	X	Reddish Brown to Yellow Brown Clayey SAND. Dry, Medium Dense, Medium Plastic.	45	118.6	6.8	126.7			Consolidation
		X	X	Material Consistent. Dense.	34		12.2				#200 Wash
5				Reddish Brown SAND with Some Clay. Moist, Non-plastic.							
		X	X	Grey Brown Mottled with Yellow Brown Clayey SAND. Moist, Non-plastic.	27	81.6	21.3	98.9			
10	SP	X	X	Reddish Brown SAND with Trace Clay. Moist, Non-plastic.	23		11.4				
		X	X	Fine to Medium Grained SAND. Some gravels.	23		7.3				
15				Boring Terminated @ 13.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
20											
25											

ROCK SOLID ENGINEERING, INC.

FIGURE A-8

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B7
Project:	Freedom Boulevard	Location:	Site 1, NW Side of Building Envelope
	Aptos, California	Elevation:	301'
Date:	July 31, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem
Logged By:	DO		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SC			Brown to Reddish Yellow Brown Clayey SAND. Moist, Medium Dense, Medium Plastic.	21	116.4	9.1	127.0	550	39	E.I.=2 Consolidation
				Material Consistent. Grading to SAND with Clay.	12		20.3				#200 Wash
5				Yellow Brown SAND with Some Clay. Moist, Medium Dense, Non-plastic. Fine Grained.	45	112.2	18.1	132.5			
				Material Consistent. Red Brown Fine Grained.	25	104.9	11.8	117.2			Sulfate
10											
	SP			Yellow Brown Sand Trace Clay. Moist, Medium Dense, Non-plastic. Fine Grained.	40	108.1	14.3	123.6			
15											
				Material Consistent. Some Orange Lines Horizontally Through Sample.	25		10.6				
20											
	SC			Grey Brown and Yellow Brown Clayey SAND. Moist, Dense, Medium Plastic.	41		14.0				#200 Wash
				Boring Terminated @ 25.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
25	SC			Grey Brown and Yellow Brown Clayey SAND. Moist, Dense, Medium Plastic.	35		15.9				

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FIGURE A-9

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B8
Project:	Freedom Boulevard	Location:	Proposed Roadway NE Side of Site 1
	Aptos, California	Elevation:	285'
Date:	July 31, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem
Logged By:	DO		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SM		X	Dark Brown Silty SAND. Moist, Loose, Non-plastic.	14	94.7	6.9	101.2			#200 Wash
	SC		X	Material Consistent. Medium Dense. Clay Content Increases.	15		8.6				
5			X	Material Consistent. Red Staining.	21	114.2	10.3	126.1			
				Boring Terminated @ 6.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
10											
15											
20											
25											

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FIGURE A-10

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B9
Project:	Freedom Boulevard	Location:	Entry Driveway
	Aptos, California	Elevation:	258'
Date:	July 31, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem
Logged By:	DO		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ°	Miscellaneous Laboratory Testing
	SM			Brown Silty SAND. Moist, Loose, Non-plastic.	18	99.0	4.7	103.7			
				Brown Silty SAND. Dry, Medium Dense, Non-plastic.	21		5.2				
5				Yellow Brown Clayey SAND. Dry, Medium Dense, Slightly Plastic.	37	119.1	1.2	120.5			
				Boring Terminated @ 6.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
10											
15											
20											
25											

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FIGURE A-11

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B11
Project:	Freedom Boulevard	Location:	Prpsed Driveway Btwn St 18+00 and 19+00
	Aptos, California	Elevation:	360'
Date:	October 8, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem
Logged By:	DO		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ°	Miscellaneous Laboratory Testing
	SM			Yellow Brown Silty SAND. Dry, Non-Plastic.							
	CL	X	X	Grey Brown Sandy CLAY. Dry, Hard, Non-Plastic.	100+	93.8	24.0	116.3			#200 Wash
	SC		X	Yellow Brown with Orange Staining Clayey SAND. Moist, Very Dense, Non-Plastic.	100+		18.0				#200 Wash
5	SP	X	X	Red Brown SAND with Trace Fines. Moist, Dense, Non-Plastic.	58	113.1	10.8	125.3			
				Boring Terminated @ 5.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
10											
15											
20											
25											

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FIGURE A-12

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B12
Project:	Freedom Boulevard	Location:	Prpsed Driveway Btwn St 16+00 and 17+00
	Aptos, California	Elevation:	324'
Date:	October 8, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer
Logged By:	DO		

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SM			Yellow Brown Silty SAND. Dry, Non-Plastic.							
	CH			Brown CLAY. Moist, Very Stiff, Plastic.	30	96.9	19.1	115.4			E.I.=120 #200 Wash
	SC			Grey Brown Clayey SAND. Moist, Medium Dense, Non-Plastic. Oxide Staining. Clay Content Decreases.	23		10.1				
5				Material Consistent. Dense.	76	104.7	23.8	129.6			
				Boring Terminated @ 5.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
10											
15											
20											
25											

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FIGURE A-13

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B13
Project:	Freedom Boulevard	Location:	Site 2- Approximate end of Driveway
	Aptos, California	Elevation:	290'
Date:	October 8, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem Auger, 140lb. Safety Hammer
Logged By:	DO		

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SM			Reddish Brown Silty SAND. Dry, Non-Plastic.							
	SC			Red Brown Clayey SAND. Moist, Dense, Non-Plastic.	56	127.6	7.6	137.3			#200 Wash Consolidation
				Material Consistent. Medium Dense.	25		12.8				
5				Material Consistent. Medium Dense.	40	117.1	12.2	131.3			
				Boring Terminated @ 5.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
10											
15											
20											
25											

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FIGURE A-14

ATTACHMENT 5

LOG OF EXPLORATORY BORING

Project No.:	13025	Boring:	B14
Project:	Freedom Boulevard	Location:	Approx. 25' East of (E) Culvert
	Aptos, California	Elevation:	232'
Date:	October 8, 2013	Method of Drilling:	Tractor Mounted Drill Rig, 6in. Solid Stem
Logged By:	DO		Auger, 140lb. Safety Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
	SP			**FILL:** Brown SAND with Trace Clay and Gravels. Moist, Non-Plastic.							
	SC			**NATIVE:** Dark Brown SAND with Clay and Trace Gravel. Moist, Loose, Non-Plastic.	18	107.9	5.7	114.1			
				Dark Brown Clayey SAND. Moist, Medium Dense, Non-Plastic.	15		17.5				E.I.=52
5				Boring Terminated @ 4 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
10											
15											
20											
25											

ROCK SOLID ENGINEERING, INC.

FIGURE A-15

ATTACHMENT 5

SUMMARY OF LABORATORY TEST RESULTS

BORING	DEPTH	SOIL TYPE	IN-SITU			DIRECT SHEAR		GRAIN SIZE (%)				EXPANSION INDEX	SOLUBLE SULFATES (ppm)
			DRY DENSITY (pcf)	MOISTURE CONTENT (%)	WET DENSITY (pcf)	COHESION (psf) (PEAK)	FRICTION ANGLE (PEAK)	GRAVEL	SAND	SILT	CLAY		
B1	2T	SM		16.7									
B1	2B	CH	104.5	21.0	126.5								
B1	3-4	CH		20.8								41	
B1	3.5	SP		19.2									
B1	8.5	SP	115.4	10.4	127.4								13
B1	10T	CL		34.5						79			
B1	10B	SC		21.6						37			
B1	15.0	MH	73.2	45.3	106.4	0	38						
B1	16.5	MH		40.8									
B1	20.0	SM	115.8	8.8	126.0	120	43						
B1	21.5	SP		18.2									
B1	25.0	SC	100.2	19.6	119.8								
B1	26.5	ML		28.6									
B1	28.0	SM		16.3									
B1	30.0	SM	84.2	10.1	92.8								
B1	31.5	ML		27.8						69			
B1	35.0	SP	111.3	5.6	117.5								
B1	38.0	SM		18.5									
B1	40.0	SP	97.2	24.4	121.0								
B1	41.5	SC		17.5						49			
B1	45.0	SP		28.5									

ROCK SOLID ENGINEERING, INC.

FIGURE A-16.1

ATTACHMENT 5

SUMMARY OF LABORATORY TEST RESULTS

BORING	DEPTH	SOIL TYPE	IN-SITU			DIRECT SHEAR		GRAIN SIZE (%)				EXPANSION INDEX	SOLUBLE SULFATES (ppm)
			DRY DENSITY (pcf)	MOISTURE CONTENT (%)	WET DENSITY (pcf)	COHESION (psf) (PEAK)	FRICTION ANGLE (PEAK)	GRAVEL	SAND	SILT	CLAY		
B2	2.0	SC	117.8	11.1	130.9	1190	30					18	
B2	3.5	SC		13.6									
B2	5.0	SP		13.1									
B2	6.5	SP	117.4	15.4	135.4								
B2	9.5	SP		8.5									
B2	11.0	SP	118.0	11.1	131.2								
B2	14.0	SP		10.0									
B2	17.0	SP	110.2	9.8	121.0								
B2	18.5	SP		10.4									
B2	23.0	SP		8.9									
B2	30.0	SP		9.9									
B3	1.0	SM	119.4	4.9	125.2								20
B3	2.5	SM		8.3									
B3	5.0	SC	117.2	13.1	132.6	1320	27						
B3	6.5	SC		15.7									
B3	10.0	SC	112.7	20.2	135.4								
B3	11.5	SC		20.5									
B3	15.0	SP		17.8									
B3	20.0	SP	107.8	18.3	127.4								
B3	21.5	SP		18.9									
B3	25T	CH		41.9									

SUMMARY OF LABORATORY TEST RESULTS

BORING	DEPTH	SOIL TYPE	IN-SITU			DIRECT SHEAR		GRAIN SIZE (%)				EXPANSION INDEX	SOLUBLE SULFATES (ppm)
			DRY DENSITY (pcf)	MOISTURE CONTENT (%)	WET DENSITY (pcf)	COHESION (psf) (PEAK)	FRICTION ANGLE (PEAK)	GRAVEL	SAND	SILT	CLAY		
B3	25B	CH		40.2									
B3	30.0	SP		8.4									
B4	2.0	SM	114.4	7.6	123.1					34			
B4	3.5	SC		12.2									
B4	5.0	SC		12.2									
B4	6.5	SC	116.0	12.9	131.0								
B4	8.0	SC		16.7									
B4	9.5	SC		11.9									
B4	10-15	SP		9.6									
B5	0-1	SM		3.8									14
B5	1.0	SC	119.9	9.7	131.6					47			
B5	2.5	SC		10.2									
B5	4.0	SC		14.1									
B5	8.0	SP		18.3									
B5	12.0	SP	103.6	21.1	125.5								
B5	13.5	SP		14.2									
B6	0-1	SM		3.4									36
B6	1.5	SC	118.6	6.8	126.7								
B6	3.0	SC		12.2						37			
B6	8.0	SC	81.6	21.3	98.9								
B6	9.5	SP		11.4									

ROCK SOLID ENGINEERING, INC.

FIGURE A-16.3

ATTACHMENT 5

SUMMARY OF LABORATORY TEST RESULTS

BORING	DEPTH	SOIL TYPE	IN-SITU			DIRECT SHEAR		GRAIN SIZE (%)				EXPANSION INDEX	SOLUBLE SULFATES (ppm)
			DRY DENSITY (pcf)	MOISTURE CONTENT (%)	WET DENSITY (pcf)	COHESION (psf) (PEAK)	FRICTION ANGLE (PEAK)	GRAVEL	SAND	SILT	CLAY		
B6	12.0	SP		7.3									
B7	1.0	SC	116.4	9.1	127.0	550	39					2	
B7	2.5	SC		20.3						38			
B7	4.0	SC	112.2	18.1	132.5								
B7	8.0	SC	104.9	11.8	117.2								6
B7	12.0	SP	108.1	14.3	123.6								
B7	16.0	SP		10.6									
B7	20.0	SC		14.0						37			
B7	24.0	SC		15.9									
B8	0.5	SM	94.7	6.9	101.2					37			
B8	2.0	SC		8.6									
B8	5.0	SC	114.2	10.3	126.1								
B9	0.5	SM	99.0	4.7	103.7								
B9	2.0	SM		5.2									
B9	5.0	SM	119.1	1.2	120.5								
B11	1.0	CL	93.8	24.0	116.3					78			
B11	2.0	SC		18.0						42			
B11	4.0	SP	113.1	10.8	125.3								
B12	0.5	CH	96.9	19.1	115.4					72		120	
B12	2.0	SC		10.1									
B12	4.0	SC	104.7	23.8	129.6								

ROCK SOLID ENGINEERING, INC.

FIGURE A-16.4

ATTACHMENT 5

SUMMARY OF LABORATORY TEST RESULTS

BORING	DEPTH	SOIL TYPE	IN-SITU			DIRECT SHEAR		GRAIN SIZE (%)				EXPANSION INDEX	SOLUBLE SULFATES (ppm)
			DRY DENSITY (pcf)	MOISTURE CONTENT (%)	WET DENSITY (pcf)	COHESION (psf) (PEAK)	FRICTION ANGLE (PEAK)	GRAVEL	SAND	SILT	CLAY		
B13	1.0	SC	127.6	7.6	137.3					37			
B13	2.5	SC		12.8									
B13	4.0	SC	117.1	12.2	131.3								
B14	1.0	SP	107.9	5.7	114.1								
B14	2.5	SC		17.5								52	

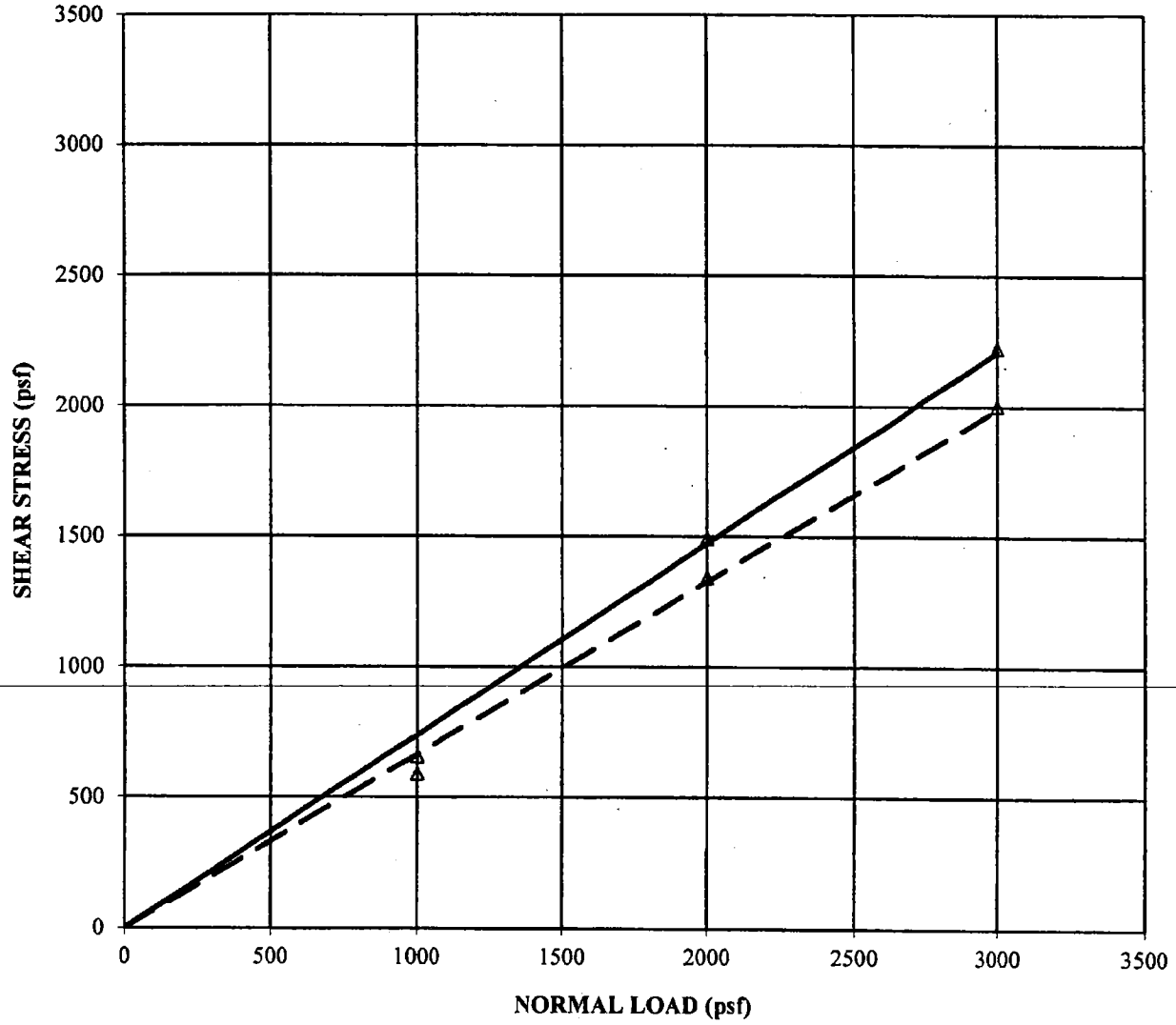
ROCK SOLID ENGINEERING, INC.

FIGURE A-16.5

ATTACHMENT 5

BORING:	B1		COHESION	FRICTION
DEPTH (ft):	15.0		(psf)	ANGLE
SOIL TYPE (USCS):	MH	PEAK	0	38
		RESIDUAL	0	35

TEST SAMPLE TYPE:	FIELD MOISTURE:	45.3%
IN-SITU (SATURATED)	SATURATED MOIST:	49.8%

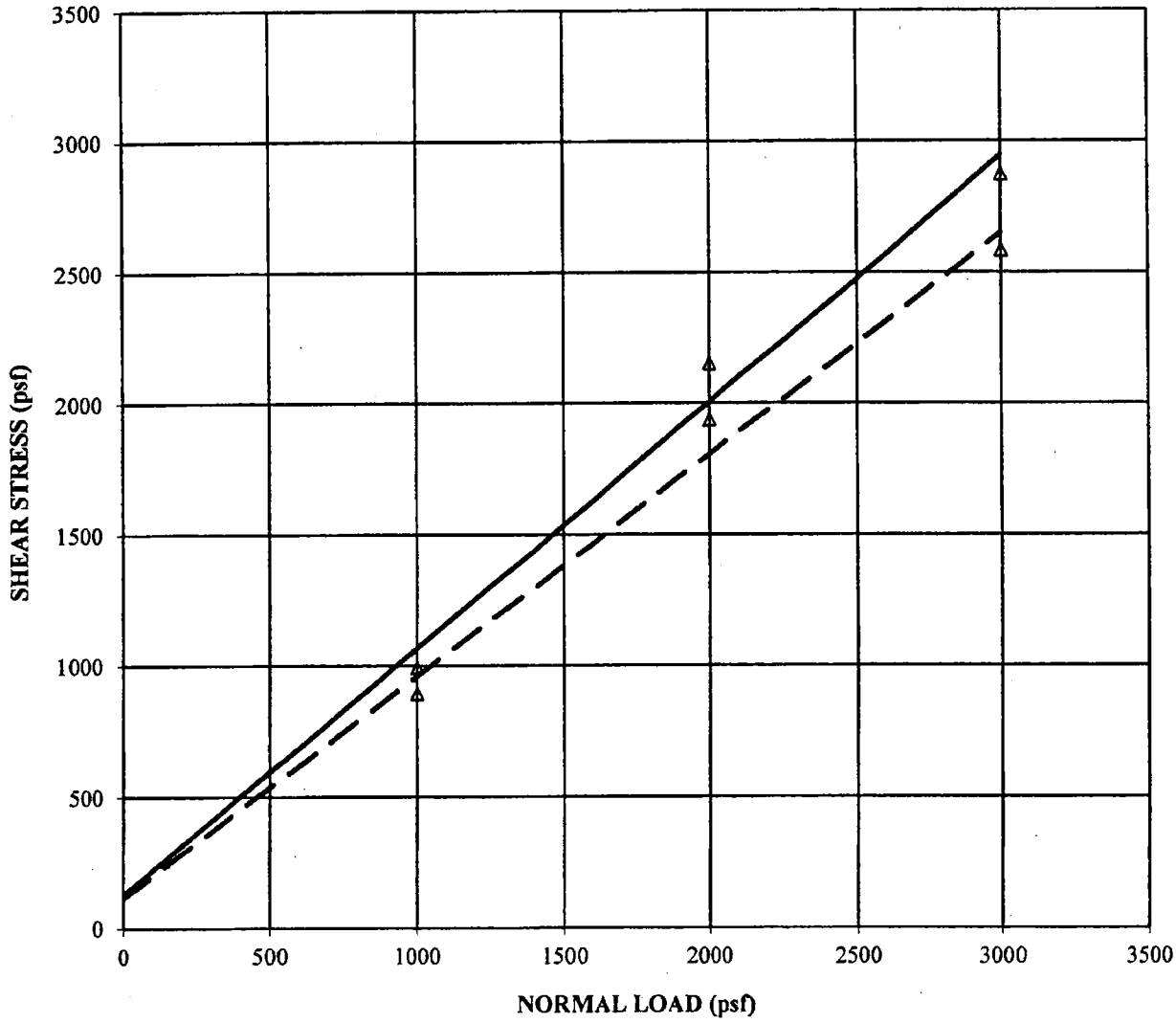


ROCK SOLID ENGINEERING, INC.	DIRECT SHEAR TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-17

ATTACHMENT 5

BORING:	B1		COHESION (psf)	FRICTION ANGLE
DEPTH (ft):	20.0			
SOIL TYPE (USCS):	SM	PEAK	120	43
		RESIDUAL	110	40

TEST SAMPLE TYPE:	FIELD MOISTURE:	8.8%
IN-SITU (SATURATED)	SATURATED MOIST:	23.1%

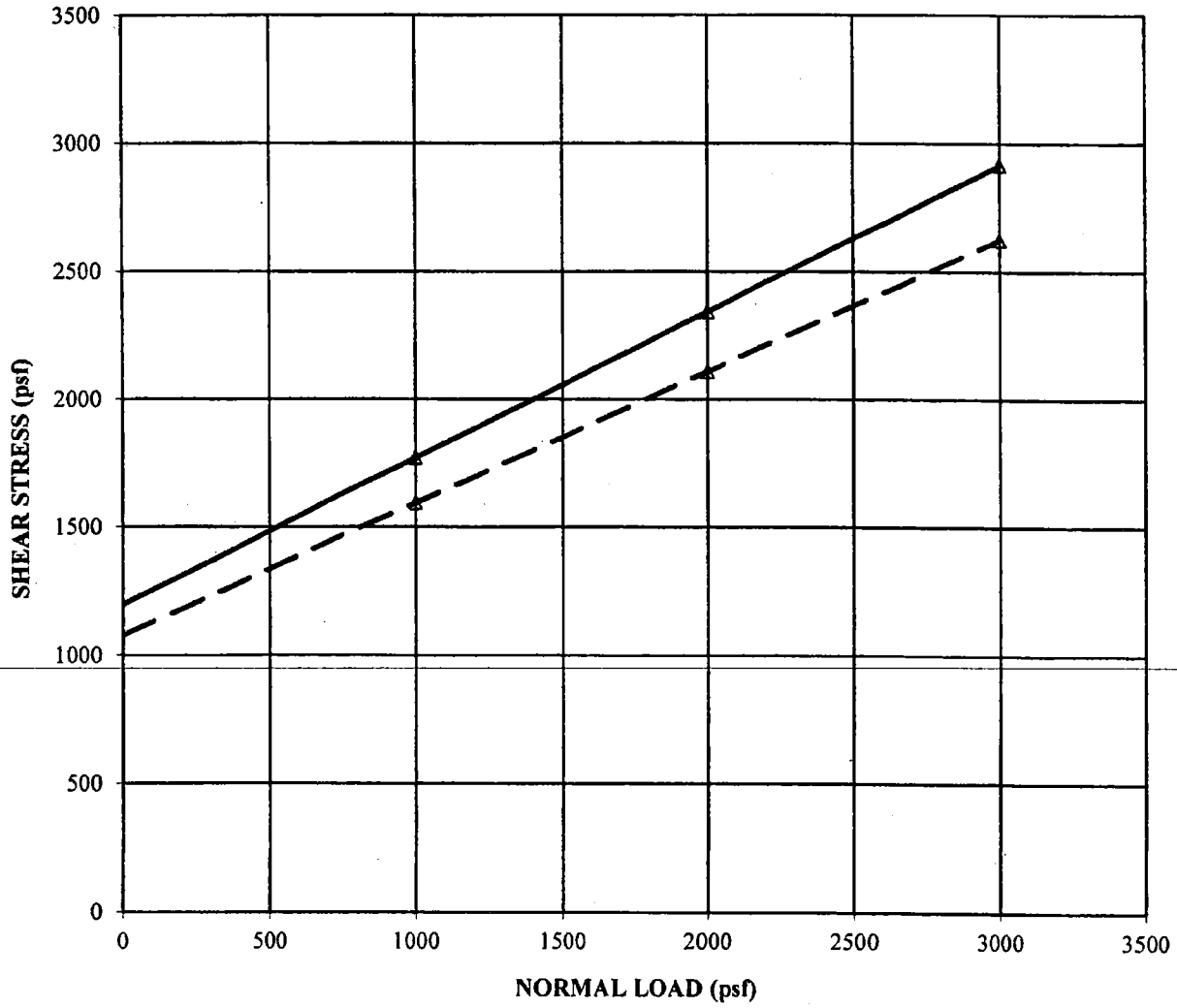


ROCK SOLID ENGINEERING, INC.	DIRECT SHEAR TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-18

ATTACHMENT 5

BORING:	B2		COHESION	FRICTION
DEPTH (ft):	2.0		(psf)	ANGLE
SOIL TYPE (USCS):	SC	PEAK	1190	30
		RESIDUAL	1070	27

TEST SAMPLE TYPE:	FIELD MOISTURE:	11.1%
IN-SITU (SATURATED)	SATURATED MOIST:	19.4%

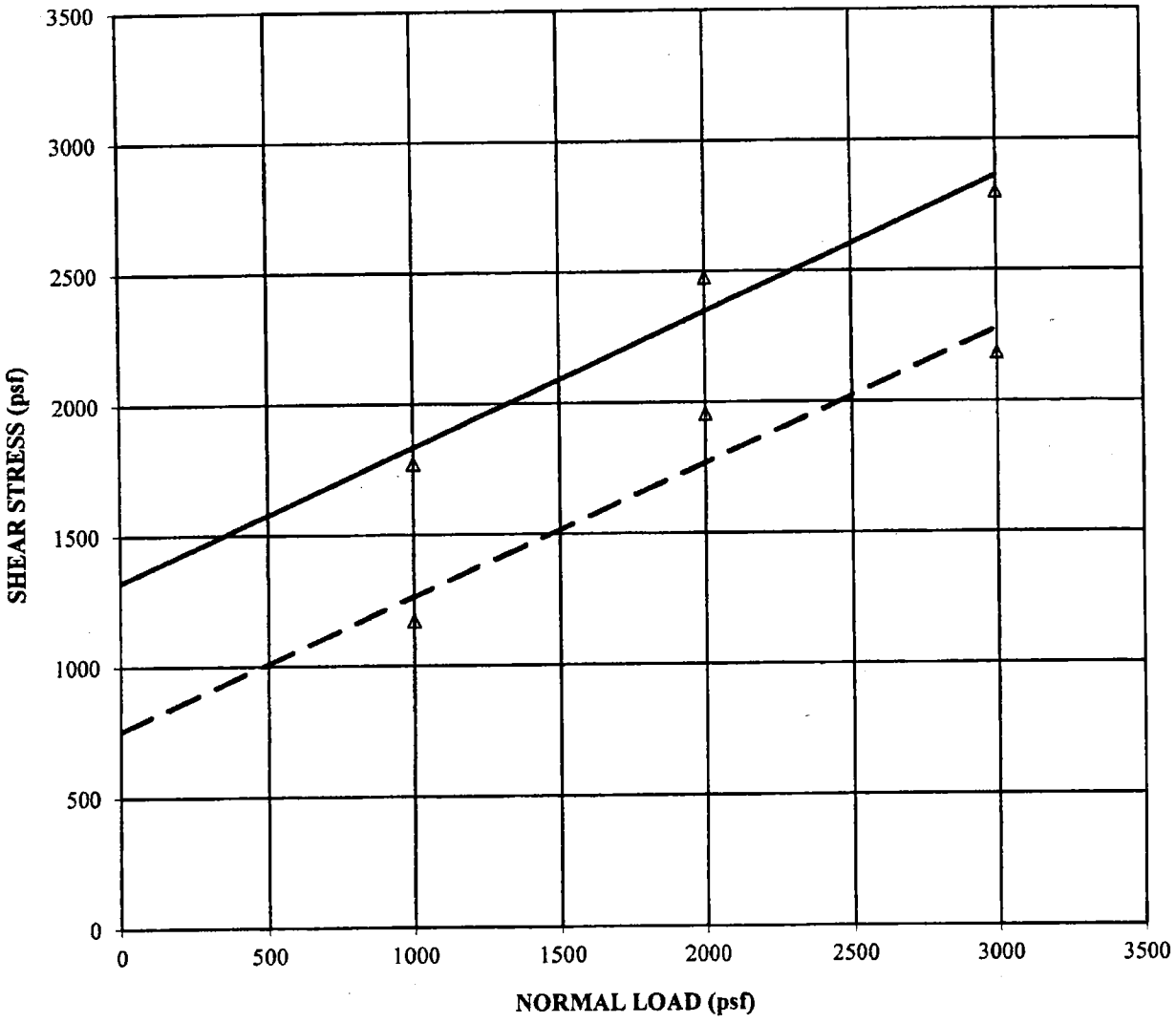


ROCK SOLID ENGINEERING, INC.	DIRECT SHEAR TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-19

ATTACHMENT 5

BORING:	B3		COHESION (psf)	FRICTION ANGLE
DEPTH (ft):	5.0			
SOIL TYPE (USCS):	SC	PEAK	1320	27
		RESIDUAL	750	27

TEST SAMPLE TYPE:	FIELD MOISTURE:	13.1%
IN-SITU (SATURATED)	SATURATED MOIST:	31.6%

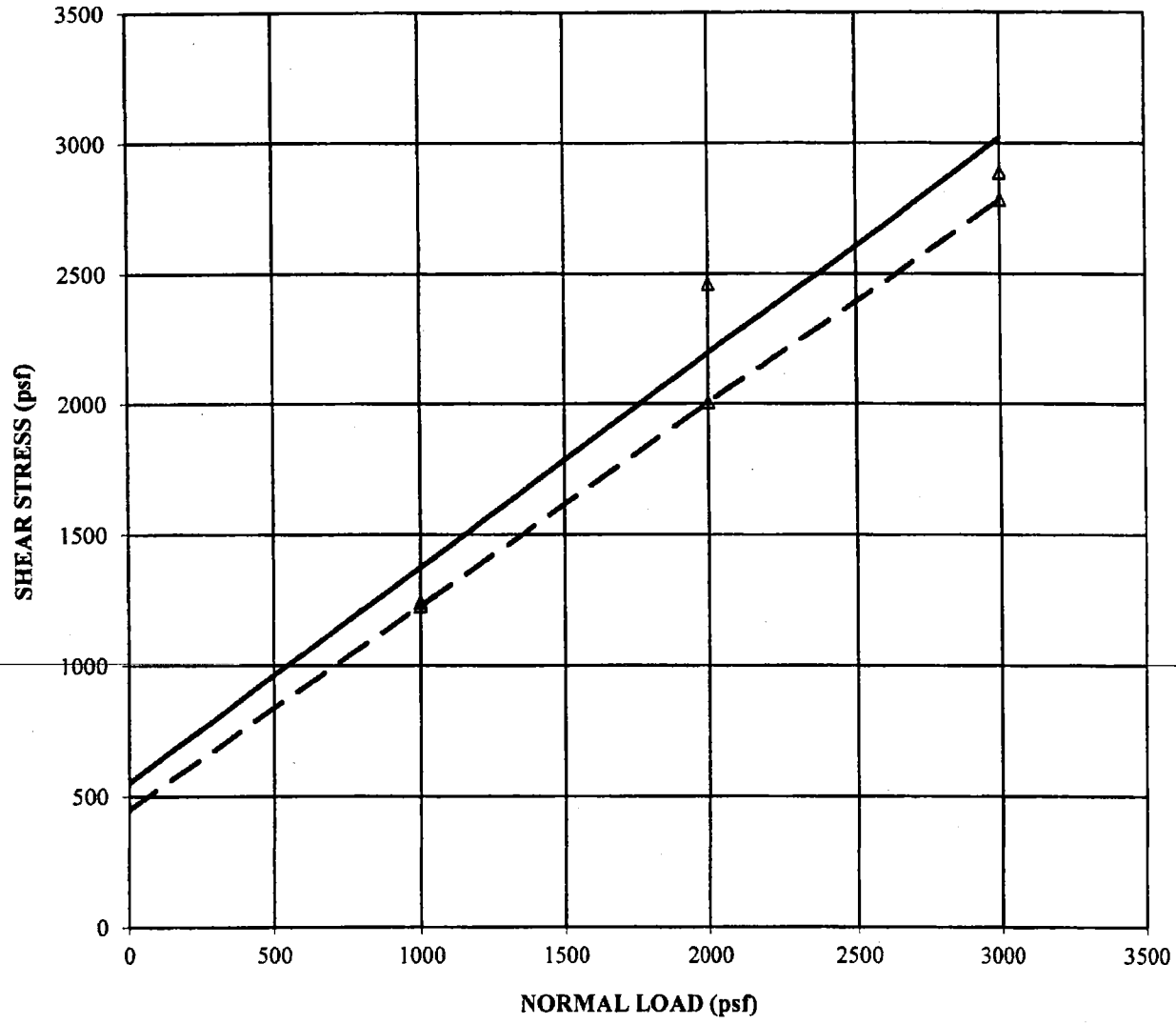


ROCK SOLID ENGINEERING, INC.	DIRECT SHEAR TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-20

ATTACHMENT 5

			COHESION	FRICTION
BORING:	B7		(psf)	ANGLE
DEPTH (ft):	1.0			
SOIL TYPE (USCS):	SC	PEAK	550	39
		RESIDUAL	440	38

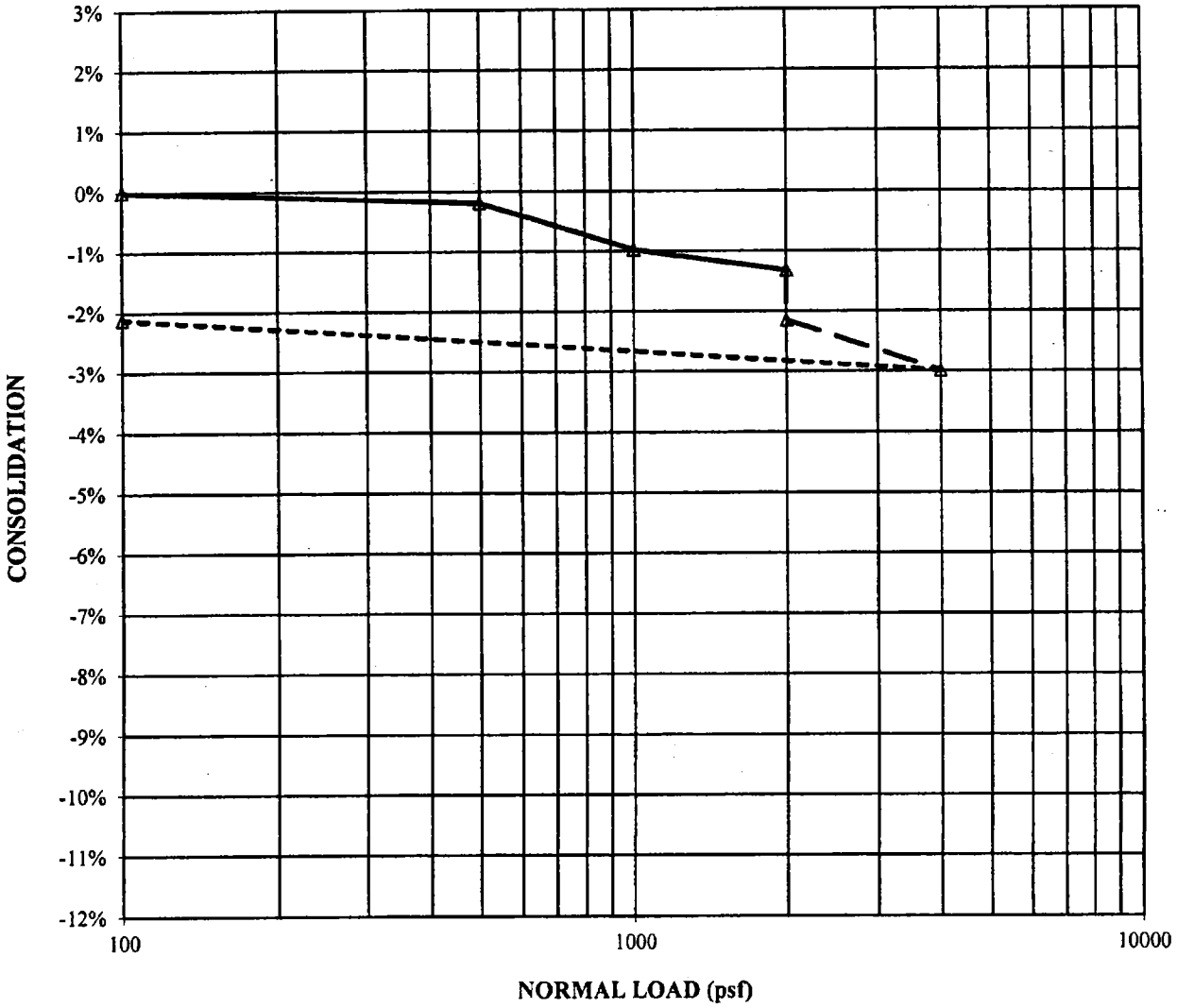
TEST SAMPLE TYPE:	FIELD MOISTURE:	9.1%
IN-SITU (SATURATED)	SATURATED MOIST:	22.7%



ROCK SOLID ENGINEERING, INC.	DIRECT SHEAR TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-21

ATTACHMENT 5

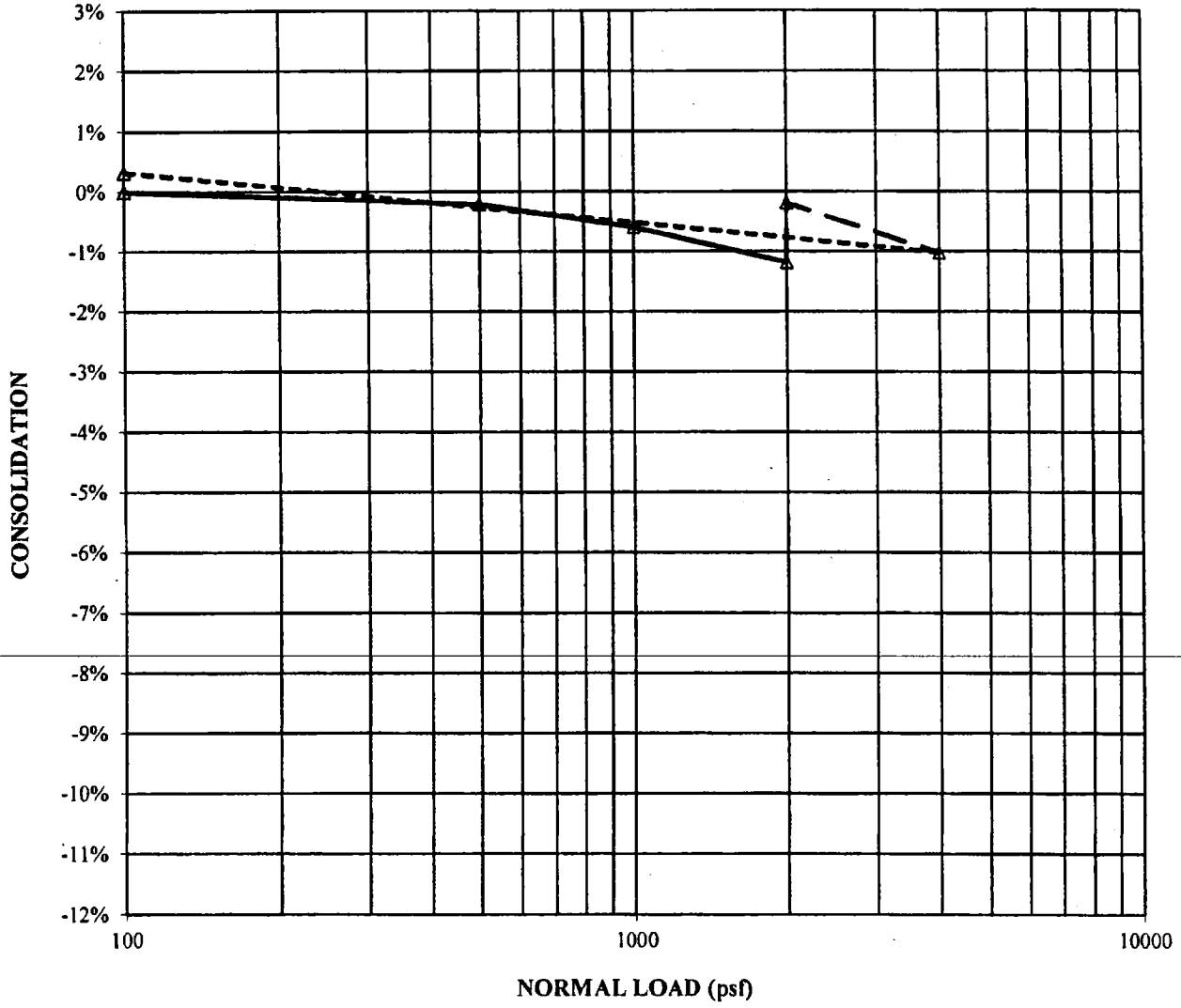
BORING:	B2	FIELD MOISTURE	
DEPTH (ft):	2.0	SATURATED	
SOIL TYPE (USCS):	SC	REBOUND	
SEATING WEIGHT:	220 psf	FIELD MOISTURE:	11.1%
		SATURATED MOIST:	15.7%



ROCK SOLID ENGINEERING, INC.	CONSOLIDATION TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-22

ATTACHMENT 5

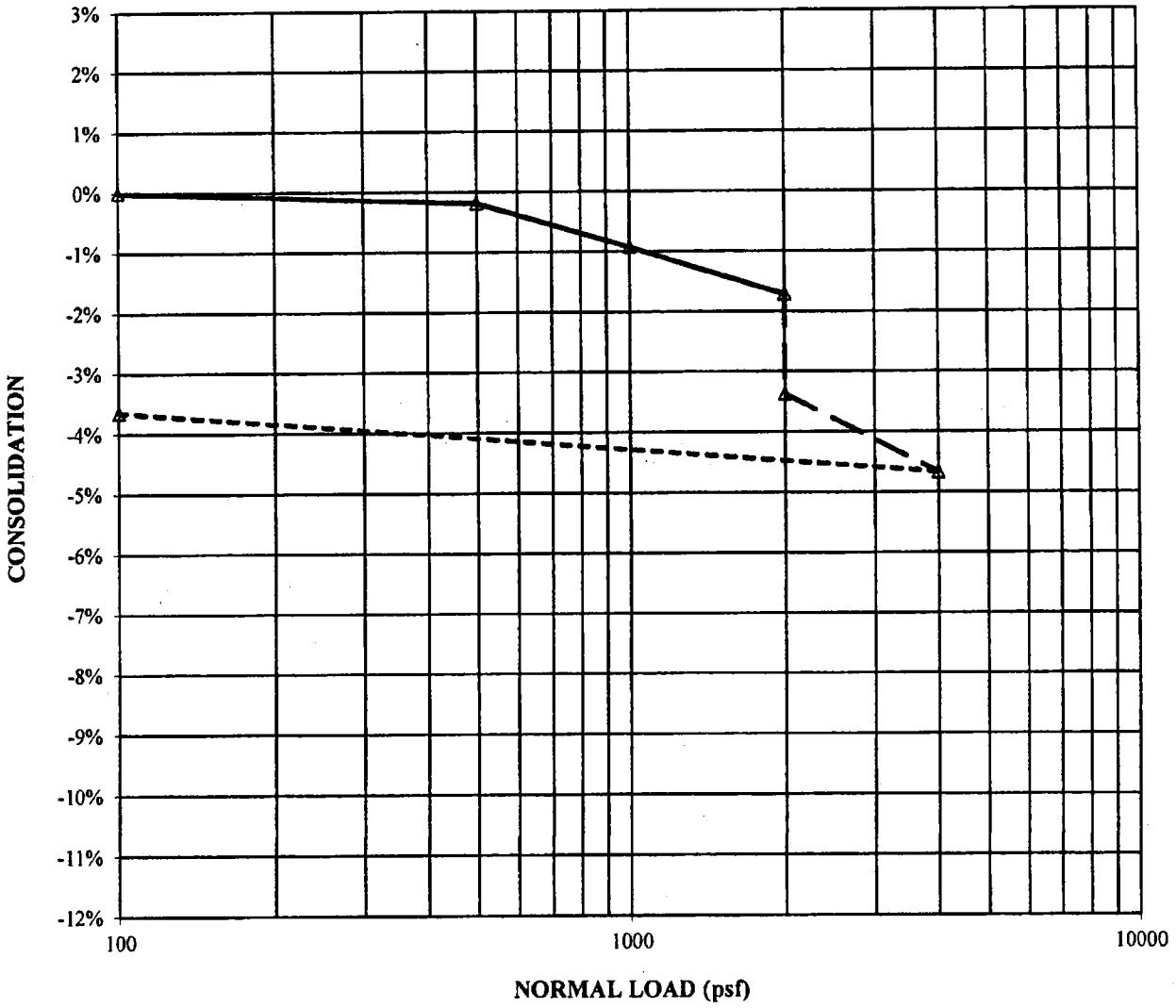
BORING:	B5	FIELD MOISTURE	
DEPTH (ft):	1.0	SATURATED	
SOIL TYPE (USCS):	SC	REBOUND	
SEATING WEIGHT:	220 psf	FIELD MOISTURE:	9.7%
		SATURATED MOIST:	20.2%



ROCK SOLID ENGINEERING, INC.	CONSOLIDATION TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-23

ATTACHMENT 5

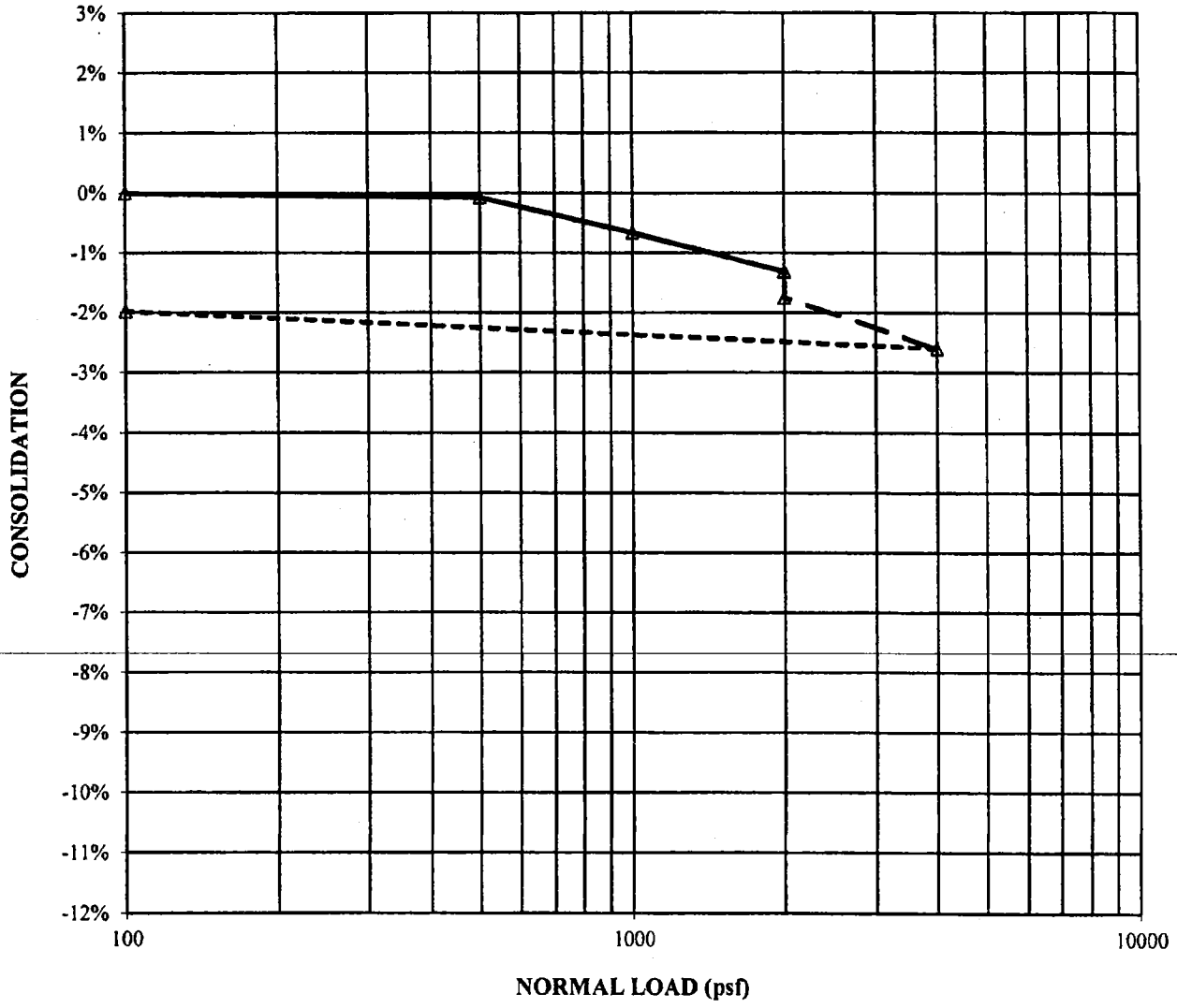
BORING:	B6	FIELD MOISTURE	
DEPTH (ft):	1.5	SATURATED	
SOIL TYPE (USCS):	SC	REBOUND	
SEATING WEIGHT:	220 psf	FIELD MOISTURE:	6.8%
		SATURATED MOIST:	18.3%



ROCK SOLID ENGINEERING, INC.	CONSOLIDATION TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-24

ATTACHMENT 5

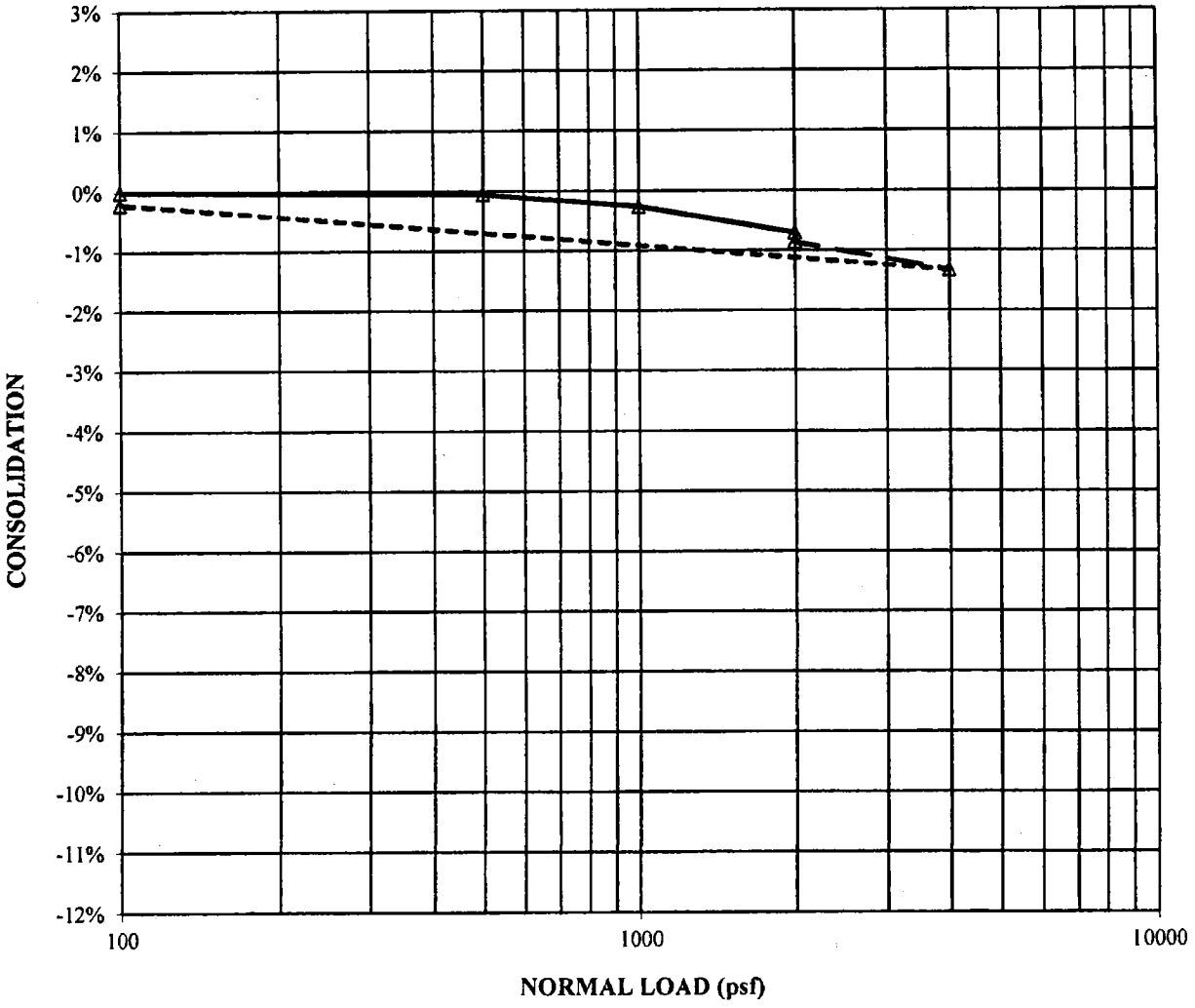
BORING:	B7	FIELD MOISTURE	
DEPTH (ft):	1.0	SATURATED	
SOIL TYPE (USCS):	SC	REBOUND	
SEATING WEIGHT:	250 psf	FIELD MOISTURE:	9.1%
		SATURATED MOIST:	17.9%



ROCK SOLID ENGINEERING, INC.	CONSOLIDATION TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-25

ATTACHMENT 5

BORING:	B13	FIELD MOISTURE	
DEPTH (ft):	1.0	SATURATED	
SOIL TYPE (USCS):	SC	REBOUND	
SEATING WEIGHT:	250 psf	FIELD MOISTURE:	7.6%
		SATURATED MOIST:	13.7%



ROCK SOLID ENGINEERING, INC.	CONSOLIDATION TEST RESULTS	FIGURE
	Freedom Boulevard, Aptos	A-26

ATTACHMENT 5

APPENDIX B

SLOPE STABILITY ANALYSIS

ATTACHMENT 5

METHODOLOGY

B-1. Slope stability calculations were performed on the slopes discussed under the slope stability section of this report, Section 4.2, and are considered representative of the conditions at the subject site.

B-2. The stability of the slope at the subject site was analyzed using the program PCSTABL6 which utilized a limiting equilibrium method for determining the Factor of Safety against sliding on an assumed failure surface. The cross sections analyzed, and the results of the analysis are presented below.

B-3. Material properties chosen for this analysis are conservatively based on laboratory test results. The material properties chosen are presented in **Table B-1**:

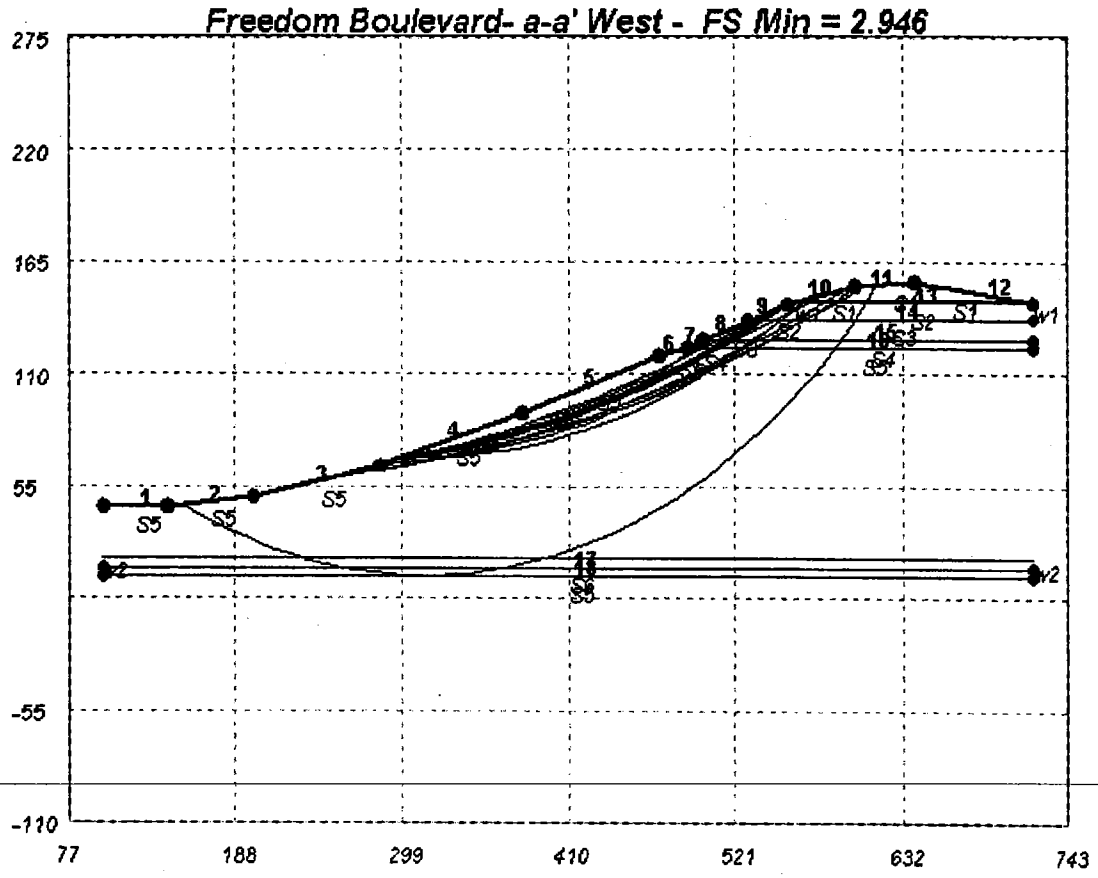
Table B-1
Soil Strength Properties

Cross Section	Soil No.	Soil Type (USCS)	Saturated Density (pcf)	Residual		Peak	
				C (psf)	ϕ (deg)	C (psf)	ϕ (deg)
a-a' & b-b'	1	SC	127	0	38	0	35
	2	MH	108	300	25	280	23
	3	SC	135	0	43	0	40
	4	MH	108	300	25	280	23
	5	SC	135	0	43	0	40
	6	CH	107	500	10	480	8

*Residual strength used for static analyses and peak strength used for pseudo-static analyses.

B-4. It must be cautioned that slope stability analysis is an inexact science and the mathematical models of the slopes and soils contain many simplifying assumptions, not the least of which are isotropy and homogeneity. Slope stability analyses and the generated factors of safety should be used as indicating trend lines. A slope with a safety factor less than one will not necessarily fail, but the probability of slope movement will be greater than a slope with a higher safety factor. Conversely, a slope with a safety factor greater than one may fail, but the probability of stability is higher than a slope with a lower safety factor.

CROSS SECTION a-a' West- **STATIC**

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** PCSTABL6 **
by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

PROBLEM DESCRIPTION   Freedom Boulevard- a-a' West

BOUNDARY COORDINATES

   12 Top   Boundaries
   18 Total Boundaries
```

ATTACHMENT 5

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	45.00	142.00	45.00	5
2	142.00	45.00	200.00	50.00	5
3	200.00	50.00	285.00	65.00	5
4	285.00	65.00	380.00	91.00	5
5	380.00	91.00	470.00	119.00	5
6	470.00	119.00	490.00	123.00	5
7	490.00	123.00	500.00	127.00	4
8	500.00	127.00	530.00	136.00	3
9	530.00	136.00	556.00	144.00	2
10	556.00	144.00	600.00	153.00	1
11	600.00	153.00	640.00	155.00	1
12	640.00	155.00	720.00	145.00	1
13	556.00	145.00	720.00	145.00	2
14	530.00	137.00	720.00	137.00	3
15	500.00	127.00	720.00	127.00	4
16	490.00	123.00	720.00	123.00	5
17	100.00	15.00	720.00	15.00	6
18	100.00	11.00	720.00	11.00	5

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	126.0	127.0	0.0	35.0	0.00	0.0	1
2	106.0	108.0	280.0	23.0	0.00	0.0	1
3	126.0	135.0	0.0	40.0	0.00	0.0	0
4	106.0	108.0	280.0	23.0	0.00	0.0	0
5	126.0	135.0	0.0	40.0	0.00	0.0	2
6	102.0	107.0	480.0	8.0	0.00	0.0	0

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	561.00	146.00
2	720.00	146.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	100.00	20.00
2	720.00	20.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 100.00 ft.
and X = 300.00 ft.

Each Surface Terminates Between X = 500.00 ft.
and X = 640.00 ft.

ATTACHMENT 5

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00 ft.

11.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -25.0
And 16.0 deg.

Following Are Displayed The Critical Of The Trial
Failure Surfaces Examined.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	300.00	69.11
2	310.93	70.34
3	321.84	71.74
4	332.73	73.30
5	343.59	75.02
6	354.43	76.91
7	365.24	78.96
8	376.01	81.18
9	386.75	83.55
10	397.46	86.09
11	408.12	88.79
12	418.74	91.65
13	429.32	94.66
14	439.85	97.84
15	450.33	101.17
16	460.77	104.67
17	471.14	108.32
18	481.46	112.12
19	491.73	116.08
20	501.93	120.19
21	512.07	124.46
22	522.14	128.88
23	532.15	133.45
24	542.08	138.17
25	550.42	142.28

Circle Center At X = 223.5 ; Y = 795.9 and Radius, 730.8

*** 2.946 ***

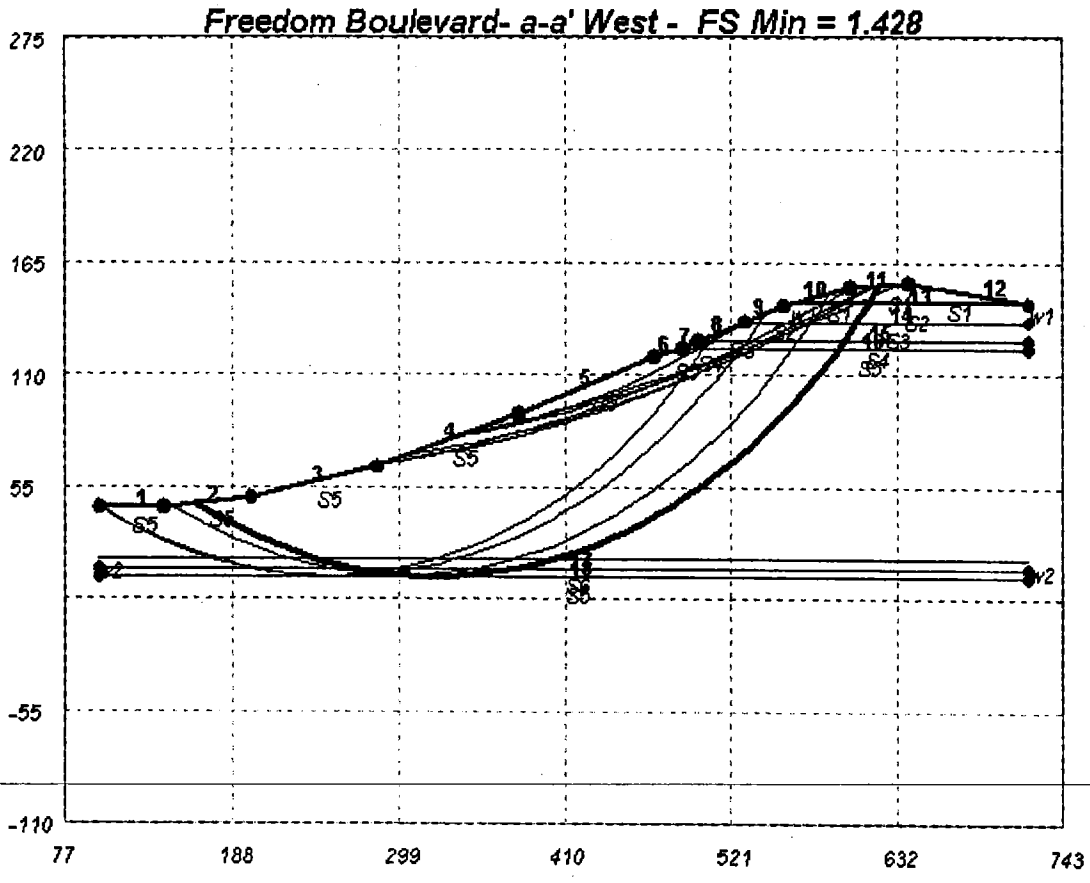
ATTACHMENT 5

Individual data on the 32 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.9	1210.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	10.9	3509.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	10.9	5565.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	10.9	7377.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	10.8	8946.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	10.8	10272.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	10.8	11356.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	4.0	4439.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	6.8	7867.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	10.7	13412.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	10.7	14311.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	10.6	14969.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	10.6	15386.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	10.5	15566.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	10.5	15511.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	10.4	15224.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	9.2	13116.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	1.1	1583.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	10.3	13060.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	8.5	9012.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	1.7	1641.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	8.3	7532.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	1.9	1664.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	6.7	5334.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	3.5	2557.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	5.8	4054.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	4.3	2730.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	7.9	4107.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	2.1	938.0	1355.2	0.0	0.0	0.0	0.0	0.0	0.0
30	7.5	2327.5	3997.3	0.0	0.0	0.0	0.0	0.0	0.0
31	2.5	466.2	1069.5	1429.9	0.0	0.0	0.0	0.0	0.0
32	8.3	697.3	2720.5	3349.0	0.0	0.0	0.0	0.0	0.0

ATTACHMENT 5

CROSS SECTION a-a' West- **PSEUDOSTATIC**

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** PCSTABL6 **
by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

PROBLEM DESCRIPTION   Freedom Boulevard- a-a' West

BOUNDARY COORDINATES

  12 Top   Boundaries
  18 Total Boundaries
```

ATTACHMENT 5

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	45.00	142.00	45.00	5
2	142.00	45.00	200.00	50.00	5
3	200.00	50.00	285.00	65.00	5
4	285.00	65.00	380.00	91.00	5
5	380.00	91.00	470.00	119.00	5
6	470.00	119.00	490.00	123.00	5
7	490.00	123.00	500.00	127.00	4
8	500.00	127.00	530.00	136.00	3
9	530.00	136.00	556.00	144.00	2
10	556.00	144.00	600.00	153.00	1
11	600.00	153.00	640.00	155.00	1
12	640.00	155.00	720.00	145.00	1
13	556.00	145.00	720.00	145.00	2
14	530.00	136.00	720.00	136.00	3
15	500.00	127.00	720.00	127.00	4
16	490.00	123.00	720.00	123.00	5
17	100.00	15.00	720.00	15.00	6
18	100.00	11.00	720.00	11.00	5

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	126.0	127.0	0.0	38.0	0.00	0.0	1
2	106.0	108.0	300.0	25.0	0.00	0.0	1
3	126.0	135.0	0.0	43.0	0.00	0.0	0
4	106.0	108.0	300.0	25.0	0.00	0.0	0
5	126.0	135.0	0.0	43.0	0.00	0.0	2
6	102.0	107.0	500.0	10.0	0.00	0.0	0

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	561.00	146.00
2	720.00	146.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	100.00	20.00
2	720.00	20.00

A Horizontal Earthquake Loading Coefficient
Of0.300 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 100.00 ft.
and X = 400.00 ft.

ATTACHMENT 5

Each Surface Terminates Between X = 500.00 ft.
and X = 640.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00 ft.

11.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -25.0
And 16.0 deg.

Following Is Displayed The Most Critical Of The Trial
Failure Surfaces Examined.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 47 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	163.16	46.82
2	173.19	42.30
3	183.34	38.07
4	193.61	34.14
5	204.00	30.51
6	214.48	27.18
7	225.06	24.16
8	235.72	21.45
9	246.45	19.05
10	257.25	16.96
11	268.11	15.19
12	279.01	13.73
13	289.95	12.59
14	300.92	11.77
15	311.91	11.27
16	322.91	11.10
17	333.91	11.24
18	344.90	11.70
19	355.87	12.48
20	366.82	13.58
21	377.73	14.99
22	388.59	16.73
23	399.40	18.78
24	410.14	21.14
25	420.81	23.81
26	431.40	26.80
27	441.89	30.09
28	452.29	33.68
29	462.58	37.58
30	472.75	41.77
31	482.79	46.26
32	492.70	51.03
33	502.46	56.10
34	512.08	61.44
35	521.53	67.07
36	530.82	72.96
37	539.93	79.13
38	548.86	85.55
39	557.59	92.23
40	566.13	99.17
41	574.47	106.35
42	582.59	113.77
43	590.49	121.42
44	598.16	129.30
45	605.61	137.40
46	612.81	145.71
47	619.57	153.98

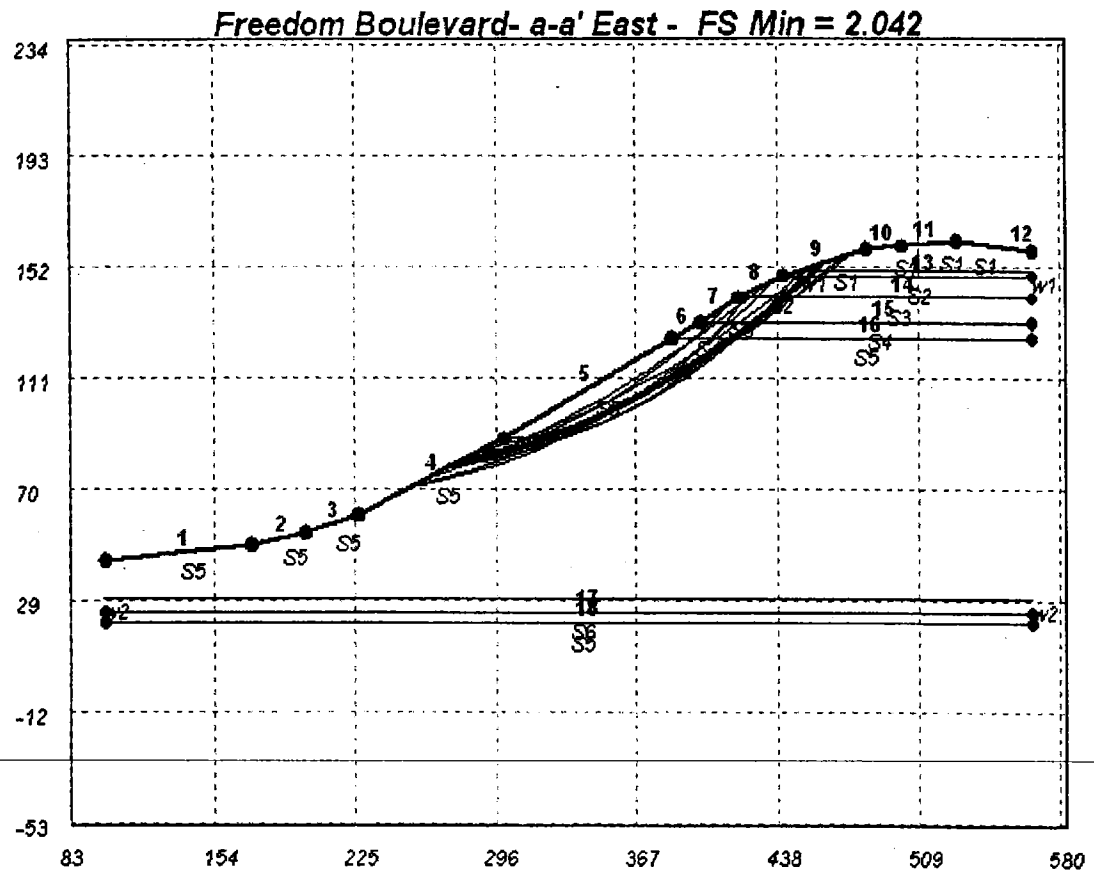
Circle Center At X = 323.6 ; Y = 389.1 and Radius, 378.0
*** 1.428 ***

ATTACHMENT 5

Individual data on the 65 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.0	3403.2	0.0	0.0	0.0	0.0	1021.0	0.0	0.0
2	10.2	10158.3	0.0	0.0	0.0	0.0	3047.5	0.0	0.0
3	10.3	16698.8	0.0	0.0	0.0	0.0	5009.7	0.0	0.0
4	6.4	13439.8	0.0	0.0	0.0	0.0	4031.9	0.0	0.0
5	4.0	9641.1	0.0	0.0	0.0	0.0	2892.3	0.0	0.0
6	10.5	30100.8	0.0	0.0	0.0	0.0	9030.2	0.0	0.0
7	10.6	37073.3	0.0	0.0	0.0	0.0	11122.0	0.0	0.0
8	10.7	43733.3	0.0	0.0	0.0	0.0	13120.0	0.0	0.0
9	6.5	29487.5	0.0	0.0	0.0	0.0	8846.3	0.0	0.0
10	4.3	20580.6	0.0	129.8	0.0	0.0	6174.2	0.0	0.0
11	10.8	56188.0	0.0	1370.6	0.0	0.0	16856.4	0.0	0.0
12	10.9	61922.4	0.0	2695.3	0.0	0.0	18576.7	0.0	0.0
13	1.4	8372.4	0.0	433.0	0.0	0.0	2511.7	0.0	0.0
14	9.5	58632.6	0.0	0.0	0.0	0.0	17589.8	0.0	0.0
15	6.0	38553.0	0.0	0.0	0.0	0.0	11565.9	0.0	0.0
16	5.0	32942.8	0.0	0.0	0.0	0.0	9882.8	0.0	0.0
17	11.0	76700.6	0.0	0.0	0.0	0.0	23010.2	0.0	0.0
18	11.0	81734.1	0.0	0.0	0.0	0.0	24520.2	0.0	0.0
19	11.0	86358.2	0.0	0.0	0.0	0.0	25907.5	0.0	0.0
20	11.0	90556.5	0.0	0.0	0.0	0.0	27167.0	0.0	0.0
21	11.0	94314.5	0.0	0.0	0.0	0.0	28294.4	0.0	0.0
22	11.0	97620.6	0.0	0.0	0.0	0.0	29286.2	0.0	0.0
23	10.9	100464.6	0.0	0.0	0.0	0.0	30139.4	0.0	0.0
24	10.9	102839.0	0.0	0.0	0.0	0.0	30851.7	0.0	0.0
25	0.0	456.7	0.0	0.0	0.0	0.0	137.0	0.0	0.0
26	2.2	21280.3	0.0	678.4	0.0	0.0	6384.1	0.0	0.0
27	8.6	82867.8	0.0	2148.7	0.0	0.0	24860.4	0.0	0.0
28	10.8	105893.2	0.0	1543.9	0.0	0.0	31768.0	0.0	0.0
29	5.6	55125.8	0.0	217.9	0.0	0.0	16537.7	0.0	0.0
30	5.2	51503.3	0.0	0.0	0.0	0.0	15451.0	0.0	0.0
31	10.7	106963.8	0.0	0.0	0.0	0.0	32089.1	0.0	0.0
32	10.6	106775.8	0.0	0.0	0.0	0.0	32032.7	0.0	0.0
33	10.5	106044.1	0.0	0.0	0.0	0.0	31813.2	0.0	0.0
34	10.4	104779.8	0.0	0.0	0.0	0.0	31433.9	0.0	0.0
35	10.3	102997.8	0.0	0.0	0.0	0.0	30899.3	0.0	0.0
36	7.4	73649.6	0.0	0.0	0.0	0.0	22094.9	0.0	0.0
37	2.7	27012.3	0.0	0.0	0.0	0.0	8103.7	0.0	0.0
38	10.0	96858.3	0.0	0.0	0.0	0.0	29057.5	0.0	0.0
39	7.2	67492.5	0.0	0.0	0.0	0.0	20247.7	0.0	0.0
40	2.7	24836.0	0.0	0.0	0.0	0.0	7450.8	0.0	0.0
41	7.3	66440.8	0.0	0.0	0.0	0.0	19932.2	0.0	0.0
42	2.5	22117.0	0.0	0.0	0.0	0.0	6635.1	0.0	0.0
43	9.6	84521.5	0.0	0.0	0.0	0.0	25356.5	0.0	0.0
44	9.5	79992.2	0.0	0.0	0.0	0.0	23997.7	0.0	0.0
45	8.5	68660.8	0.0	0.0	0.0	0.0	20598.2	0.0	0.0
46	0.8	6461.8	526.7	0.0	0.0	0.0	1938.5	0.0	0.0
47	9.1	69726.9	4965.0	0.0	0.0	0.0	20918.1	0.0	0.0
48	8.9	63919.5	3247.6	0.0	0.0	0.0	19175.8	0.0	0.0
49	7.1	47705.4	1445.5	0.0	0.0	0.0	14311.6	0.0	0.0
50	1.6	10157.7	186.4	0.0	0.0	0.0	3047.3	0.0	0.0
51	3.4	21092.5	287.7	0.0	0.0	0.0	6327.8	0.0	0.0
52	5.1	30096.8	147.9	0.0	0.0	0.0	9029.0	0.0	0.0
53	8.3	44366.4	0.0	0.0	0.0	0.0	13309.9	0.0	0.0
54	8.1	37488.1	0.0	0.0	0.0	0.0	11246.4	0.0	0.0
55	7.9	30604.3	0.0	0.0	0.0	0.0	9181.3	0.0	0.0
56	1.5	5249.7	0.0	0.0	0.0	0.0	1574.9	0.0	0.0
57	3.9	12359.3	0.0	0.0	0.0	0.0	3707.8	0.0	0.0
58	2.2	6485.1	0.0	0.0	0.0	0.0	1945.5	0.0	0.0
59	1.8	4912.6	0.0	0.0	0.0	0.0	1473.8	0.0	0.0
60	4.3	9898.5	0.0	0.0	0.0	0.0	2969.5	0.0	0.0
61	1.3	2491.1	0.0	1103.1	0.0	0.0	747.3	0.0	0.0
62	6.6	9719.6	0.0	3012.6	0.0	0.0	2915.9	0.0	0.0
63	0.6	643.4	0.0	37.9	0.0	0.0	193.0	0.0	0.0
64	0.2	231.0	0.0	3.3	0.0	0.0	69.3	0.0	0.0
65	6.5	3142.3	0.0	0.0	0.0	0.0	942.7	0.0	0.0

CROSS SECTION a-a' East- **STATIC**



** PCSTABL6 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

PROBLEM DESCRIPTION Freedom Boulevard- a-a' East

BOUNDARY COORDINATES

12 Top Boundaries
18 Total Boundaries

ATTACHMENT 5

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	44.00	173.00	50.00	5
2	173.00	50.00	200.00	54.00	5
3	200.00	54.00	227.00	61.00	5
4	227.00	61.00	300.00	89.00	5
5	300.00	89.00	385.00	126.00	5
6	385.00	126.00	400.00	132.00	4
7	400.00	132.00	418.00	141.00	3
8	418.00	141.00	441.00	149.00	2
9	441.00	149.00	482.00	159.00	1
10	482.00	159.00	500.00	160.00	1
11	500.00	160.00	528.00	162.00	1
12	528.00	162.00	566.00	158.00	1
13	441.00	149.00	566.00	149.00	2
14	418.00	141.00	566.00	141.00	3
15	400.00	132.00	566.00	132.00	4
16	385.00	126.00	566.00	126.00	5
17	100.00	25.00	566.00	25.00	6
18	100.00	21.00	566.00	21.00	5

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	126.0	127.0	0.0	35.0	0.00	0.0	1
2	1006.0	108.0	280.0	23.0	0.00	0.0	1
3	126.0	135.0	0.0	40.0	0.00	0.0	0
4	106.0	108.0	280.0	23.0	0.00	0.0	0
5	126.0	135.0	0.0	40.0	0.00	0.0	2
6	102.0	107.0	480.0	8.0	0.00	0.0	0

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	450.00	151.00
2	566.00	151.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	100.00	30.00
2	566.00	30.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 173.00 ft.
and X = 300.00 ft.

Each Surface Terminates Between X = 400.00 ft.
and X = 566.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00 ft.

11.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -25.0
And 23.0 deg.

Following Is Displayed The Most Critical Of The Trial
Failure Surfaces Examined.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	273.26	78.74
2	284.11	80.61
3	294.90	82.72
4	305.64	85.10
5	316.32	87.73
6	326.93	90.62
7	337.48	93.76
8	347.94	97.15
9	358.32	100.80
10	368.61	104.68
11	378.80	108.82
12	388.89	113.20
13	398.88	117.81
14	408.75	122.67
15	418.50	127.75
16	428.13	133.08
17	437.63	138.63
18	446.99	144.40
19	456.21	150.40
20	461.45	153.99

Circle Center At X = 201.1 ; Y = 532.2 and Radius, 459.1

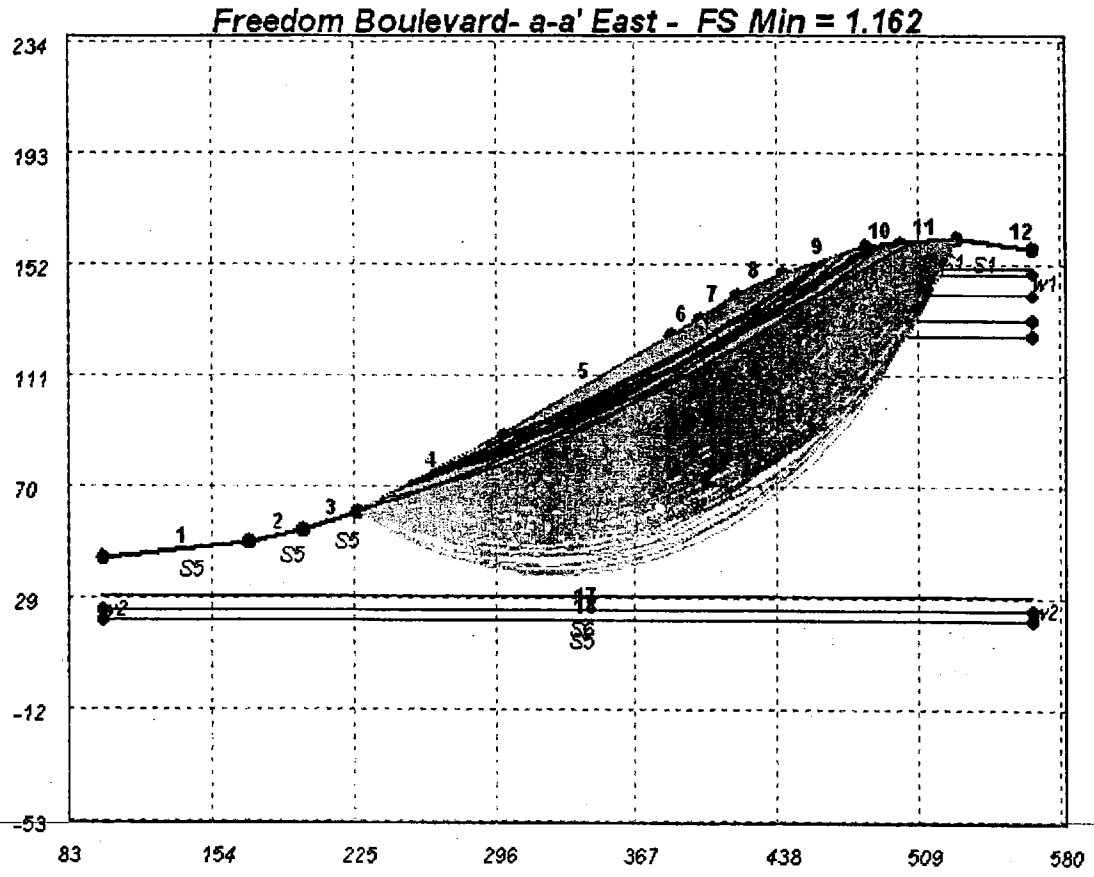
*** 2.042 ***

ATTACHMENT 5

Individual data on the 30 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.8	1569.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	10.8	4499.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	5.1	3042.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	5.6	4085.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	10.7	9906.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	10.6	12352.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	10.5	14380.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	10.5	15995.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	10.4	17200.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	10.3	18002.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	10.2	18408.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	6.2	11313.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	3.9	7019.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	10.0	16966.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	1.1	1803.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	8.8	14024.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	6.4	10212.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	2.9	4579.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.5	807.0	328.8	0.0	0.0	0.0	0.0	0.0	0.0
20	7.7	11691.4	4308.1	0.0	0.0	0.0	0.0	0.0	0.0
21	1.9	2745.0	876.4	0.0	0.0	0.0	0.0	0.0	0.0
22	9.5	11470.4	3027.5	0.0	0.0	0.0	0.0	0.0	0.0
23	3.4	3267.6	576.4	0.0	0.0	0.0	0.0	0.0	0.0
24	0.5	424.1	59.4	0.0	0.0	0.0	0.0	0.0	0.0
25	5.5	4302.6	428.9	3354.5	0.0	0.0	0.0	0.0	0.0
26	3.0	1876.2	33.3	1259.7	0.0	0.0	0.0	0.0	0.0
27	4.1	1963.8	0.0	1003.7	0.0	0.0	0.0	0.0	0.0
28	2.1	747.2	0.0	208.2	0.0	0.0	0.0	0.0	0.0
29	0.9	234.8	0.0	20.0	0.0	0.0	0.0	0.0	0.0
30	4.4	528.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CROSS SECTION a-a' East- **PSEUDOSTATIC**



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by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

PROBLEM DESCRIPTION Freedom Boulevard- a-a' East

BOUNDARY COORDINATES

12 Top Boundaries
18 Total Boundaries

ATTACHMENT 5

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	44.00	173.00	50.00	5
2	173.00	50.00	200.00	54.00	5
3	200.00	54.00	227.00	61.00	5
4	227.00	61.00	300.00	89.00	5
5	300.00	89.00	385.00	126.00	5
6	385.00	126.00	400.00	132.00	4
7	400.00	132.00	418.00	141.00	3
8	418.00	141.00	441.00	149.00	2
9	441.00	149.00	482.00	159.00	1
10	482.00	159.00	500.00	160.00	1
11	500.00	160.00	528.00	162.00	1
12	528.00	162.00	566.00	158.00	1
13	441.00	149.00	566.00	149.00	2
14	418.00	141.00	566.00	141.00	3
15	400.00	132.00	566.00	132.00	4
16	385.00	126.00	566.00	126.00	5
17	100.00	25.00	566.00	25.00	6
18	100.00	21.00	566.00	21.00	5

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	126.0	127.0	0.0	38.0	0.00	0.0	1
2	106.0	108.0	300.0	25.0	0.00	0.0	0
3	126.0	135.0	0.0	43.0	0.00	0.0	0
4	106.0	108.0	300.0	25.0	0.00	0.0	0
5	126.0	135.0	0.0	43.0	0.00	0.0	2
6	102.0	107.0	500.0	10.0	0.00	0.0	0

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	450.00	151.00
2	566.00	151.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	100.00	30.00
2	566.00	30.00

ATTACHMENT 5

A Horizontal Earthquake Loading Coefficient
Of0.300 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 227.00 ft.
and X = 350.00 ft.

Each Surface Terminates Between X = 420.00 ft.
and X = 528.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00 ft.

11.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -25.0
And 23.0 deg.

Following Is Displayed The Most Critical Of The Trial
Failure Surfaces Examined.

ATTACHMENT 5

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	252.90	70.93
2	263.54	73.71
3	274.15	76.60
4	284.74	79.59
5	295.30	82.68
6	305.82	85.88
7	316.31	89.18
8	326.77	92.58
9	337.20	96.09
10	347.59	99.70
11	357.94	103.42
12	368.26	107.23
13	378.54	111.15
14	388.78	115.17
15	398.98	119.29
16	409.14	123.51
17	419.25	127.83
18	429.32	132.25
19	439.35	136.77
20	449.34	141.39
21	459.27	146.10
22	469.17	150.92
23	479.01	155.83
24	485.60	159.20

Circle Center At X = -22.9 ; Y = 1148.9 and Radius, 1112.6

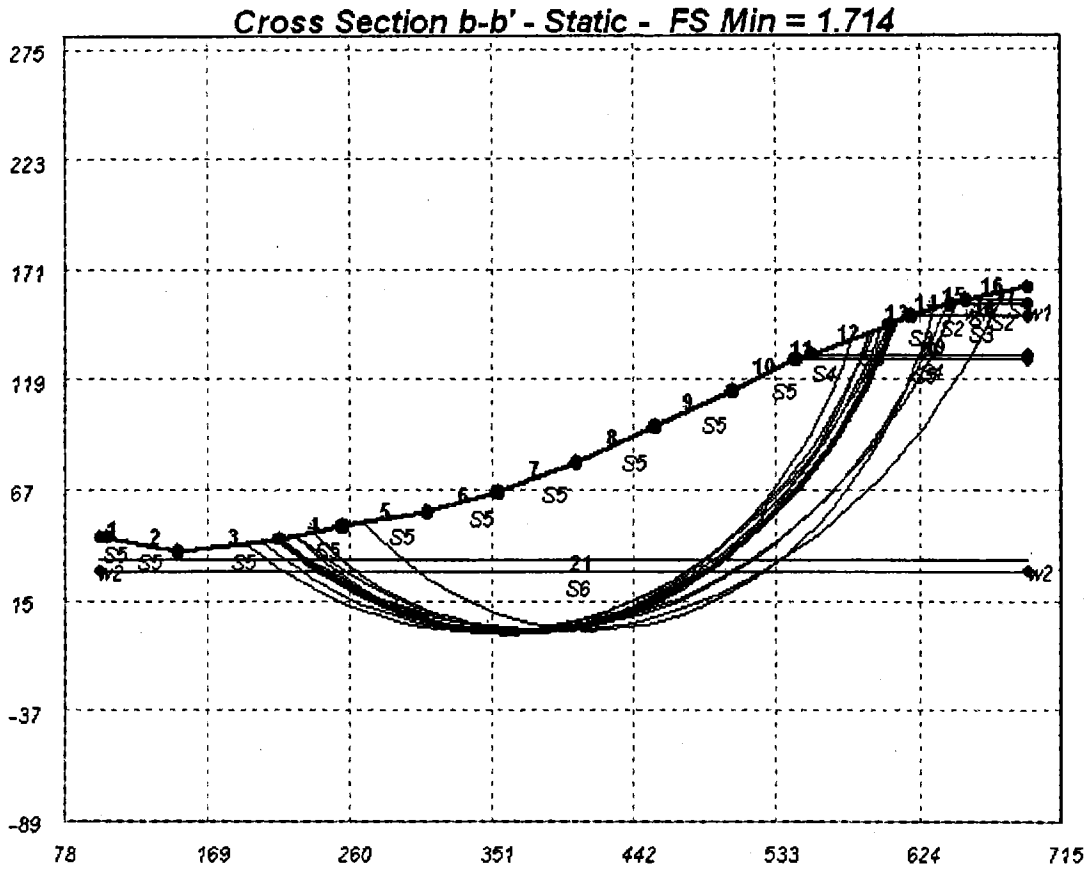
*** 1.162 ***

ATTACHMENT 5

Individual data on the 35 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.6	873.5	0.0	0.0	0.0	0.0	262.0	0.0	0.0
2	10.6	2536.1	0.0	0.0	0.0	0.0	760.8	0.0	0.0
3	10.6	4035.1	0.0	0.0	0.0	0.0	1210.5	0.0	0.0
4	10.6	5371.2	0.0	0.0	0.0	0.0	1611.4	0.0	0.0
5	4.7	2788.2	0.0	0.0	0.0	0.0	836.5	0.0	0.0
6	5.8	3867.4	0.0	0.0	0.0	0.0	1160.2	0.0	0.0
7	10.5	8314.8	0.0	0.0	0.0	0.0	2494.4	0.0	0.0
8	10.5	9879.1	0.0	0.0	0.0	0.0	2963.7	0.0	0.0
9	10.4	11277.2	0.0	0.0	0.0	0.0	3383.2	0.0	0.0
10	10.4	12510.2	0.0	0.0	0.0	0.0	3753.1	0.0	0.0
11	10.4	13579.1	0.0	0.0	0.0	0.0	4073.7	0.0	0.0
12	10.3	14485.0	0.0	0.0	0.0	0.0	4345.5	0.0	0.0
13	10.3	15229.3	0.0	0.0	0.0	0.0	4568.8	0.0	0.0
14	6.5	9912.5	0.0	0.0	0.0	0.0	2973.8	0.0	0.0
15	3.8	5812.1	0.0	0.0	0.0	0.0	1743.6	0.0	0.0
16	10.2	15111.7	0.0	0.0	0.0	0.0	4533.5	0.0	0.0
17	1.0	1465.1	0.0	0.0	0.0	0.0	439.5	0.0	0.0
18	9.1	13492.2	0.0	0.0	0.0	0.0	4047.6	0.0	0.0
19	5.8	9055.0	0.0	0.0	0.0	0.0	2716.5	0.0	0.0
20	3.0	4867.0	0.0	0.0	0.0	0.0	1460.1	0.0	0.0
21	1.3	2037.8	0.0	0.0	0.0	0.0	611.3	0.0	0.0
22	9.5	14984.4	0.0	0.0	0.0	0.0	4495.3	0.0	0.0
23	0.6	866.0	0.0	0.0	0.0	0.0	259.8	0.0	0.0
24	10.0	14243.9	0.0	0.0	0.0	0.0	4273.2	0.0	0.0
25	1.6	2144.9	0.0	0.0	0.0	0.0	643.5	0.0	0.0
26	7.5	8872.5	522.9	0.0	0.0	0.0	2661.8	0.0	0.0
27	0.8	896.8	3.7	0.0	0.0	0.0	269.0	0.0	0.0
28	0.7	701.7	0.0	0.0	0.0	0.0	210.5	0.0	0.0
29	9.3	8917.4	0.0	0.0	0.0	0.0	2675.2	0.0	0.0
30	6.0	4811.6	0.0	0.0	0.0	0.0	1443.5	0.0	0.0
31	3.9	2699.7	0.0	284.7	0.0	0.0	809.9	0.0	0.0
32	0.2	102.3	0.0	0.5	0.0	0.0	30.7	0.0	0.0
33	9.7	4481.3	0.0	0.0	0.0	0.0	1344.4	0.0	0.0
34	3.0	769.2	0.0	0.0	0.0	0.0	230.8	0.0	0.0
35	3.6	371.5	0.0	0.0	0.0	0.0	111.5	0.0	0.0

CROSS SECTION b-b'- STATIC



** PCSTABL6 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

PROBLEM DESCRIPTION Cross Section b-b' - Static

BOUNDARY COORDINATES

16 Top Boundaries
21 Total Boundaries

ATTACHMENT 5

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	45.00	105.00	45.00	5
2	105.00	45.00	150.00	38.00	5
3	150.00	38.00	215.00	44.00	5
4	215.00	44.00	255.00	50.00	5
5	255.00	50.00	309.00	57.00	5
6	309.00	57.00	355.00	66.00	5
7	355.00	66.00	405.00	80.00	5
8	405.00	80.00	455.00	97.00	5
9	455.00	97.00	505.00	114.00	5
10	505.00	114.00	545.00	129.00	5
11	545.00	129.00	555.00	131.00	4
12	555.00	131.00	605.00	145.00	3
13	605.00	145.00	618.00	149.00	3
14	618.00	149.00	645.00	155.00	2
15	645.00	155.00	655.00	157.00	1
16	655.00	157.00	695.00	163.00	1
17	645.00	155.00	695.00	155.00	2
18	618.00	149.00	695.00	149.00	3
19	555.00	131.00	695.00	131.00	4
20	545.00	129.00	695.00	129.00	5
21	100.00	29.00	695.00	29.00	6

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	126.0	127.0	0.0	35.0	0.00	0.0	0
2	106.0	108.0	280.0	23.0	0.00	0.0	0
3	126.0	135.0	0.0	40.0	0.00	0.0	0
4	106.0	108.0	280.0	23.0	0.00	0.0	0
5	126.0	135.0	0.0	40.0	0.00	0.0	2
6	102.0	107.0	480.0	8.0	0.00	0.0	0

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	655.00	157.00
2	695.00	157.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	100.00	34.00
2	695.00	34.00

ATTACHMENT 5

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 150.00 ft.
and X = 355.00 ft.

Each Surface Terminates Between X = 545.00 ft.
and X = 695.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00 ft.

12.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -40.0
And 17.0 deg.

Following Is Displayed The Most Critical Of The Trial
Failure Surfaces Examined.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

ATTACHMENT 5

Failure Surface Specified By 40 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	214.74	43.98
2	224.97	37.71
3	235.47	31.89
4	246.21	26.54
5	257.17	21.65
6	268.33	17.24
7	279.67	13.32
8	291.17	9.89
9	302.81	6.97
10	314.56	4.55
11	326.41	2.64
12	338.33	1.25
13	350.29	0.37
14	362.29	0.01
15	374.29	0.17
16	386.27	0.85
17	398.21	2.05
18	410.08	3.77
19	421.88	5.99
20	433.56	8.73
21	445.12	11.97
22	456.52	15.70
23	467.75	19.93
24	478.79	24.63
25	489.61	29.82
26	500.20	35.46
27	510.54	41.56
28	520.60	48.10
29	530.37	55.06
30	539.83	62.45
31	548.96	70.24
32	557.74	78.41
33	566.17	86.96
34	574.21	95.86
35	581.86	105.11
36	589.11	114.67
37	595.93	124.54
38	602.32	134.70
39	608.27	145.12
40	608.80	146.17

Circle Center At X = 364.5 ; Y = 277.2 and Radius, 277.2

*** 1.714 ***

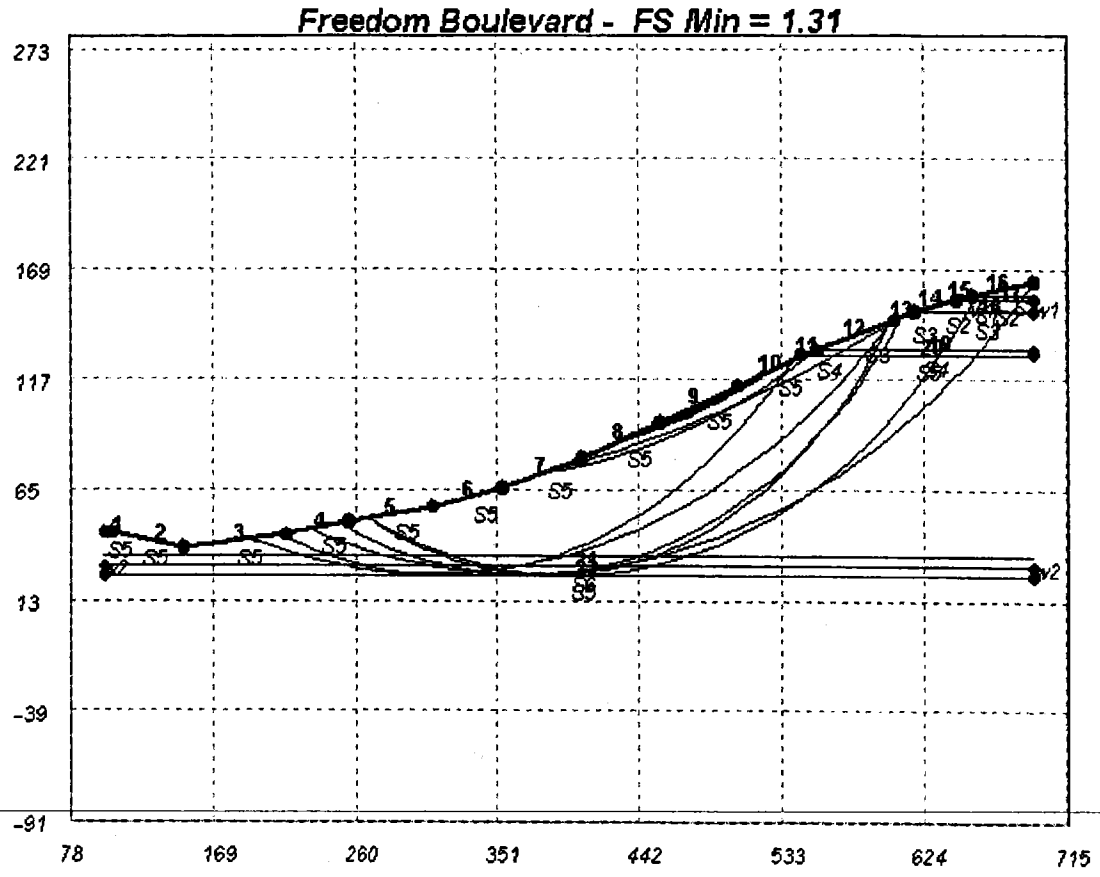
ATTACHMENT 5

Individual data on the 55 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.3	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	10.0	5007.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	6.7	8556.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	3.8	6663.7	0.0	285.6	0.0	0.0	0.0	0.0	0.0
5	5.8	12651.6	0.0	1437.1	0.0	0.0	0.0	0.0	0.0
6	4.9	12857.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	8.8	26903.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	2.2	7382.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	11.2	42323.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	11.3	49909.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	11.5	57064.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	11.6	63716.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	6.2	36141.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	5.6	33786.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	11.8	76385.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	11.9	82345.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	12.0	87594.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	4.7	35659.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	7.3	56710.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	12.0	97483.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	12.0	101888.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	11.9	105435.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	6.8	61469.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	5.1	46732.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	11.8	110859.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	11.7	112768.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	11.6	113752.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	9.9	98586.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	1.5	15231.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	11.2	112984.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	11.0	111275.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	9.1	91664.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	1.7	17041.0	0.0	541.2	0.0	0.0	0.0	0.0	0.0
34	7.9	77503.9	0.0	1161.6	0.0	0.0	0.0	0.0	0.0
35	2.7	26627.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	4.8	46128.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	5.5	52414.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	10.1	92723.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	9.8	86292.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	9.5	79291.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	5.2	41298.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	4.0	30318.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	6.0	43486.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	2.7	18642.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	8.4	53005.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	8.0	44119.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	7.7	35335.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	7.2	26773.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	6.8	18555.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	2.8	5570.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	1.3	2102.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	2.3	3248.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	2.7	2556.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	3.3	1334.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	0.5	29.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ATTACHMENT 5

CROSS SECTION b-b'- PSEUDOSTATIC

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** PCSTABL6 **
by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

PROBLEM DESCRIPTION   Freedom Boulevard

BOUNDARY COORDINATES

   16 Top   Boundaries
   22 Total Boundaries
```

ATTACHMENT 5

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	45.00	105.00	45.00	5
2	105.00	45.00	150.00	38.00	5
3	150.00	38.00	215.00	44.00	5
4	215.00	44.00	255.00	50.00	5
5	255.00	50.00	309.00	57.00	5
6	309.00	57.00	355.00	66.00	5
7	355.00	66.00	405.00	80.00	5
8	405.00	80.00	455.00	97.00	5
9	455.00	97.00	505.00	114.00	5
10	505.00	114.00	545.00	129.00	5
11	545.00	129.00	555.00	131.00	4
12	555.00	131.00	605.00	145.00	3
13	605.00	145.00	618.00	149.00	3
14	618.00	149.00	645.00	155.00	2
15	645.00	155.00	655.00	157.00	1
16	655.00	157.00	695.00	163.00	1
17	645.00	155.00	695.00	155.00	2
18	618.00	149.00	695.00	149.00	3
19	555.00	131.00	695.00	131.00	4
20	545.00	129.00	695.00	129.00	5
21	100.00	29.00	695.00	29.00	6
22	100.00	25.00	695.00	25.00	5

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	126.0	127.0	0.0	38.0	0.00	0.0	1
2	106.0	108.0	300.0	25.0	0.00	0.0	1
3	126.0	135.0	0.0	43.0	0.00	0.0	0
4	106.0	108.0	300.0	25.0	0.00	0.0	0
5	126.0	135.0	0.0	43.0	0.00	0.0	0
6	102.0	107.0	500.0	10.0	0.00	0.0	2

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	655.00	157.00
2	695.00	157.00

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	100.00	34.00
2	695.00	34.00

A Horizontal Earthquake Loading Coefficient
Of0.300 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 100.00 ft.
and X = 455.00 ft.

Each Surface Terminates Between X = 500.00 ft.
and X = 695.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00 ft.

12.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -25.0 And 16.0 deg.

Following Are Displayed The Most Critical Of The Trial Failure Surfaces Examined.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	436.32	90.65
2	447.99	93.42
3	459.57	96.56
4	471.06	100.04
5	482.43	103.88
6	493.67	108.06
7	504.79	112.59
8	515.76	117.45
9	521.29	120.11

Circle Center At X = 351.5 ; Y = 473.3 and Radius, 391.9

*** 1.310 ***

Individual data on the 10 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	11.7	876.8	0.0	0.0	0.0	0.0	263.0	0.0	0.0
2	7.0	1268.1	0.0	0.0	0.0	0.0	380.4	0.0	0.0
3	4.6	1059.6	0.0	0.0	0.0	0.0	317.9	0.0	0.0
4	11.5	3191.9	0.0	0.0	0.0	0.0	957.6	0.0	0.0
5	11.4	3481.2	0.0	0.0	0.0	0.0	1044.4	0.0	0.0
6	11.2	3210.6	0.0	0.0	0.0	0.0	963.2	0.0	0.0
7	11.1	2399.2	0.0	0.0	0.0	0.0	719.8	0.0	0.0
8	0.2	35.4	0.0	0.0	0.0	0.0	10.6	0.0	0.0
9	10.8	1289.3	0.0	0.0	0.0	0.0	386.8	0.0	0.0
10	5.5	203.6	0.0	0.0	0.0	0.0	61.1	0.0	0.0

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 PREVISICH, PLANNING DIRECTOR

April 2, 2014

Ralph and Teeland Johnson
60 Old Orchard Road
Los Gatos, CA 95030

Subject: Review of the Geotechncial Engineering Investigation/Report by Rock Solid Engineering; Dated November 13, 2013: Project: 13025, and, Review of the Preliminary Geologic Hazards Investigation / Report by Nolan Associates; Dated November 20, 2013, Job No. 13018

APN 108-161-32,34,38,40,46, and 47, Application #: REV141020

Dear Ralph and Teeland Johnson,

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

1. All construction shall comply with the recommendations of the report.

2. Final plans shall reference the report and include a statement that the project shall conform to the report's recommendations.

3. The engineering geologist must inspect all of the keyways, and provide a final letter that indicates that the grading complies with their report's recommendations.

4. Prior to building permit issuance a *plan review letter* shall be submitted to Environmental Planning. After plans are prepared that are acceptable to all reviewing agencies, please submit a geotechnical plan review letter that states the project plans conform to the recommendations of the geotechnical report. *Please note that the plan review letter must reference the final plan set by last revision date.* The author of the report shall write the *plan review letter.*

5. Please submit an electronic copy of the soils report in .pdf format via compact disk or email to: pln829@co.santa-cruz.ca.us. Please note that the report must be generated and/or sent directly from the soils engineer of record.

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.

ATTACHMENT 6
(over)

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

Please call the undersigned at (831) 454-3175, or by email at pln829@co.santa-cruz.ca.us if we can be of any further assistance.

Sincerely,

Joe Hanna CEG
County Geologist

Cc: Joseph Hanna, Environmental Planning
Rock Solid Engineering
owner (if different from applicant)

ATTACHMENT 6

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 *final letter* from your soils engineer is required to be submitted to Environmental Planning that summarizes the observations and the tests the soils engineer has made during construction. The final letter must also state the following: "Based upon our observations and tests, the project has been completed in conformance with our geotechnical recommendations."

   If the *final soils letter* identifies any items of work remaining to be completed or that any portions of the project were not observed by the soils engineer, you will be required to complete the remaining items of work and may be required to perform destructive testing in order for your permit to obtain a final inspection.

ATTACHMENT 6

(over)

ECOSYSTEMS WEST
CONSULTING GROUP

September 3, 2013

Mathew Johnston, Deputy Environmental Coordinator
Planning Department
County of Santa Cruz
701 Ocean Street
Santa Cruz, CA 95060

Re: Biotic Assessment to Develop Multiple Homesites on the Yeelan and Ralph Johnson Properties (Application No. REV131049)

This letter reports the findings of a biotic assessment on the Yeelan and Ralph Johnson properties (Assessor's Parcel No.s 10816132, 33, 34, 37, 38, 39, 40, 46, and 47), located northeast of Freedom Boulevard, approximately 200 feet south of Pleasant Valley Court in the Eureka Canyon Planning Area of Southern Santa Cruz County, California. The proposed development consists of 9 parcels averaging about 2.4 acres in size for a total combined acreage of 21.7 acres. The parcels with the exception of Parcel 40 occur on a west-facing grassland dominated slope that peaks on a north to south trending ridgeline. Parcel 40 is a linear parcel that would provide road/driveway access to the parcels from Freedom Boulevard. The applicants are seeking approval to construct multiple single family residences on the combined parcels.

The U.S. Soil Conservation Service Soil Survey of Santa Cruz County (1980) classifies the soils on the Johnson properties as: (105) Baywood loamy sand, 2-15% slopes; (129) Elder sandy loam, 0-2% slopes; (162) Pinto loam, 2-9% slopes; (174)Tierra-Watsonville complex, 15-30% slopes; and (177) Watsonville loam, 2 to 15 percent slopes. The majority of parcels are found on Baywood loamy sand which is an excessively drained soil derived on sand dunes and eolian deposits. Permeability of the Baywood loamy sand is rapid with slow to medium runoff potential and a slight to moderate erosion hazard potential. Elder sandy loam is found as only a small lens in the right-of-way access parcel on the edge of Freedom Boulevard. This soil type is formed on alluvial fans and plains The Pinto loam soil is confined to the ridge top on the eastern edge of the parcels and formed on coastal terraces and uplifted alluvial fans. Soil permeability is slow with a tendency to support a perched water table. The Tierra-Watsonville complex is found near the western edge of the development parcels and tends to parallel an ephemeral drainage that occurs primarily on the adjacent parcel to the north. The Tierra-Watsonville complex forms on alluvial and marine terraces. The soil complex is very deep and moderately well drained with slow permeability and rapid runoff and high erosion potential. The Watsonville loam is a very deep somewhat poorly drained soil formed in alluvium on coastal terraces. Permeability of

180 Seventh Avenue, Suite 201, Santa Cruz, CA 95062
Phone: 831-429-6730 * Fax: 831-429-8742

ATTACHMENT 7

Watsonville loam is very slow with slow to medium runoff potential and slight to moderate erosion hazard. The Watsonville loam soils occur primarily on the northern edge of the development properties with the greatest extent of this soil type on the adjacent parcel. It supports a ruderaly dominated annual grass and herb habitat.

Bill Davilla of EcoSystems West and Matt Johnston and Bob Loveland of Santa Cruz County Planning Department conducted a field survey on the Johnson properties in May 2013. The parcels are located on the east side of Freedom Boulevard and are contiguous to one another. The building sites would be accessed by a linear undeveloped corridor originating off Freedom Blvd. and running along the southern edge of the clustered parcels. The proposed driveway will follow an existing unpaved right-of-way that supports ruderal non-native grassland and herbs that had been mowed and lightly disked at the time of our site visit. Scattered native coast live oaks (*Quercus agrifolia*) and non-native horticultural and introduced trees occur along the northern edge of the right-of-way. The topography on the remaining parcels features a moderately rising west-facing slope supporting non-native annual grassland field/pasture on 90 percent of the other eight development parcels. The eastern boundary of the parcels terminates along an annual grassland vegetated fenced ridgeline separating the development parcels from an unnamed valley to the east. There is a disturbed ephemeral drainage along the northwest edge of the development parcels that drains into a small depression on the west side of Pleasant Valley Court. All eight development parcels have been intensively grazed in the recent past including the drainage area, resulting in a closely cropped vegetation structure. The northwestern boundary of the parcel features a narrow stand of arroyo willow (*Salix lasiolepis*), with an understory California hazelnut (*Corylus cornuta* ssp. *californicus*), Baltic rush (*Juncus balticus*) and Italian rye grass. Beyond the ephemeral drainage corridor the parcels open up into a large rectangular ruderal grassland/pasture dominated by non-native grasses and herbs. Annual grasses include Canary grass (*Phalaris canariensis*), slender wild-oat grass (*Avena barbata*), ripgut brome (*Bromus diandrus*), Italian rye grass (*Lolium multiflorum*) rat tail fescue (*Festuca myuros*), and soft chess (*Bromus hordeaceus*). Herb species include wild radish (*Raphanus sativus*), common plantain (*Plantago lanceolata*), bur clover (*Medicago polymorpha*), rose clover (*Trifolium hirtum*), bird's foot trefoil (*Lotus corniculatus*), Italian thistle (*Carduus pycnocephalus*), sheep sorrel (*Rumex acetosella*), common madia (*Madia elegans*), and horseweed (*Conyza canadensis*). Clumps of Himalaya berry (*Rubus procerus*) systematically occur around remnant sprinkler heads that were used for dry season irrigation in the distant past. Most of the heads look to be inoperable at the time of our survey but still were wetting the ground where the Himalaya berry was growing. A narrow stand of coast live oaks and other non-native trees occurs along the western edge of the proposed development parcels, adjacent to the existing homes to the west.

No sensitive plant or animal species indigenous in the vicinity of the site were observed on the parcel during the time of our survey. The high level of impact from grazing and rotation creates an unstable habitat for native species. The field is predominantly covered by ruderal, non-native plant species. The Santa Cruz tarplant (*Holocarpha macradenia*) is primarily found on Watsonville loam soils in the County; however, this plant would have been identifiable at the time of this survey. The nearest occurrence for this species is the Watsonville Airport. No significant special-status wildlife habitat was observed on the parcel. The closest known

breeding ponds are for the rare and endangered Santa Cruz long-toed salamander (SCLTS) occurs approximately 1 mile northwest of the Johnson parcel in the White Road Area and Calabasas Road. No breeding habitat occurs on the site although the intermittent drainage on the northwest end of the project area could provide potential upland, all be it marginal, habitat for the salamander. The nearest known red-legged frog breeding habitat is at Calabasas pond approximately two miles southwest of the proposed development. Like the salamander no breeding habitat exists on the parcel. As presently proposed the proposed development would occur entirely within the ruderal grassland habitat that is not utilized by either of the species. The grassland habitat does not provide aestivating habitat for these species because no ground squirrel burrows are present. No indications of nesting raptors were observed in the trees along the property line.

Based on this preliminary assessment, it is my professional opinion that the proposed development will not result in significant impact on those sensitive biotic resources known within the vicinity of the project, particularly, if the development is confined to the disturbed grassland habitat.

Should you require further information or clarification, please don't hesitate to contact me.

Sincerely,

Bill Davilla
Principal

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 PREVISICH, PLANNING DIRECTOR

September 4, 2013

Mr. Kim Tschantz
Cypress Environmental and Land Use Planning
P.O. Box 1844
Aptos, CA 95003

Subject: Johnson-Wei Property Biotic Assessment, Application REV131049

Dear Mr. Tschantz:

We have received the completed biotic assessment for this property, prepared by Ecosystems West, dated September 3, 2013. The assessment was required due to proposed development in an area mapped for woodland woollythreads (*Monolopia gracilens*), which is recognized by the California Native Plant Society as being fairly threatened, and as such is protected by the California Endangered Species Act and the County Sensitive Habitat Ordinance. A copy of the Biotic Assessment is attached:

This assessment focused on plant species only. The subject parcels are within the range of both the Santa Cruz long-toed salamander and the California red-legged frog, and these species are addressed in the biotic report submitted under application REV131064.

On May 7, 2013Bill Davilla of EcoSystems West and Bob Loveland of Santa Cruz County Planning Department accompanied me in conducting a field survey on the Johnson properties. Based upon that field review, review of other similar sites where listed species that had potential to occur were in bloom, and a review of the available records for surveys in the project vicinity, the County has determined that the proposed development will have no effect on listed plant species.

Please call me at 831-454-3201 if you have any questions.

A copy of this letter will be sent to your project planner so that she or he is aware of any biotic conditions on the parcel.

Sincerely,

Matthew Johnston
Environmental Coordinator

Cc: Robert Loveland

ATTACHMENT 8

Santa Cruz Long-toed Salamander and California Red-legged Frog Habitat Assessment, Johnson/Wei Property, Santa Cruz County, CA

Prepared for:
Ralph Johnson
60 Old Orchard Road
Los Gatos, CA 95033

Prepared by:
Biosearch Associates
PO Box 1220
Santa Cruz, CA 95061
(831) 662-3938

24 May 2013

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Santa Cruz Long-toed Salamander and California Red-legged Frog Habitat Assessment, Johnson/Wei Property, Santa Cruz County, CA

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Santa Cruz Long-toed Salamander and California Red-legged Frog Habitat Assessment, Johnson/Wei Property, Santa Cruz County, CA

SUMMARY

The Johnson/Wei property is situated along Freedom Boulevard near its intersection with Pleasant Valley Court in unincorporated Santa Cruz County, California. The ~20-acre property consists of nine parcels that support primarily nonnative grassland in hilly terrain that has been used to graze cattle for many years. The Johnson/Wei family intends to construct three single-family residences with associated driveways that will directly affect less than two acres. The remaining acreage will continue to be used for grazing. The study area is within the range of two special-status amphibians: the Santa Cruz long-toed salamander (SCLTS) (*Ambystoma macrodactylum croceum*) and California red-legged frog (CRLF) (*Rana draytonii*). The property does not provide habitat for any other special-status amphibians, including the foothill yellow-legged frog (*Rana boylii*). The County of Santa Cruz Planning Department requested an assessment for SCLTS and CRLF, which may be affected by the proposed development.

The project site is situated within the Freedom metapopulation of the SCLTS, near the northeastern edge of its range. The closest known breeding locations are Merk Pond, ~2,500' southeast and Millsap Pond, ~2,600' southwest. The property consists almost entirely of annual grassland and does not provide suitable breeding or over-summering habitat for the species. While the 0.1-acre riparian woodland in the northwest corner of the site provides marginal over-summering habitat for SCLTS, this area will not be affected by the project. SCLTS may pass through the property during migratory or dispersal movements between breeding and non-breeding habitats. The subject property is part of an extensive expanse of grassland, and if SCLTS do cross the property, relatively low numbers are expected only during the rainy season (typically October - March).

The project site is within the range of the CRLF, and the species is known to breed at the Millsap Pond, located ~2,600' southwest. The aquatic habitats onsite do not provide breeding habitat for CRLF. The 0.1-acre riparian woodland in the northwest corner of the site provides marginal foraging and sheltering habitat for CRLF when it holds water. CRLF may also use seasonal pool in the southwestern part of the site when standing water is present, but only temporarily during overland movements.

To minimize negative effects to SCLTS and CRLF that may pass through the property, all surface-disturbance associated with construction should be conducted during the dry season, when neither species is expected to be present. Construction inside previously established building footprints could occur during the rainy season. The buildings and driveways should be designed to reduce barriers to movements of SCLTS and CRLF, by limiting retaining walls to less than 100-feet and using rounded gutters. Restoration

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opportunities for both species are present, especially near the spring in the southwest corner of the property.

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Santa Cruz Long-toed Salamander and California Red-legged Frog Habitat Assessment, Johnson/Wei Property, Santa Cruz County, CA

INTRODUCTION

The ~20-acre Johnson/Wei property is located along Freedom Boulevard in unincorporated Santa Cruz County, California (Figure 1). The property includes nine connected parcels (APN # 108-161-32, -33, -34, -37, -38, -39, -40, -46 and -47) and consists primarily of hilly annual grassland. Development of three single-family residences, which will directly affect approximately two acres, is under review by the County of Santa Cruz Planning Department (County). The remaining land will continue to be used to graze cattle.

Since development may affect rare species, the County required an assessment for special-status amphibians as part of the development proposal. The project is within the range of the Santa Cruz long-toed salamander (SCLTS) (*Ambystoma macrodactylum croceum*) and California red-legged frog (CRLF) (*Rana draytonii*). The SCLTS is listed as Endangered under both federal and state Endangered Species Acts and is designated as Fully Protected under the Fish and Game Code of California. The CLRF is listed as Threatened under the federal endangered species act. The project site is outside the extant range of all other special-status amphibians known from Santa Cruz County, including the California tiger salamander (*Ambystoma californiense*) and foothill yellow-legged frog (*Rana boylii*).

Biosearch Associates was contracted to assess habitat for the SCLTS and CRLF, since both species inhabit the region. Recommendations to minimize potential negative effects to special-status amphibians are also provided. Methods follow survey protocols endorsed by the U. S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) (USFWS 2005; USFWS and CDFW 2012).

PROJECT AREA AND DESCRIPTION

The project is located along Freedom Boulevard near its intersection with Pleasant Valley Court in unincorporated Corralitos, Santa Cruz County, California (Figure 1). The undeveloped property consists primarily of nonnative annual grassland (Figures 3 and 4) with a small amount of seasonal wetland and willow riparian. The willows are in a swale below a spring located in the northwest corner of the property (Figure 5). Another seasonal spring is situated along the southern border of the property (Figure 6). Patches of Himalayan blackberry are scattered around the property, which is fenced to contain cattle. Topography is hilly and elevations range from 230 feet to 390 feet above sea level with a mostly southern aspect. An old irrigation system was present, with sprinkler heads arranged in a grid throughout most of the hillsides, that was presumably used to lengthen the grazing period (Johnson, pers. comm.).

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The Johnson/Wei family intends to construct three single-family residences that will be accessed by a shared driveway. No residence will be greater than 3,000 square feet and each will be fenced to promote cattle grazing. Access is currently achieved through a gate along Freedom Boulevard via a narrow, dedicated parcel between two existing residences, which is wide enough to accommodate a driveway in the future.

A significant portion of the central and southern portion of the property is in an area designated for ground water recharge, which will not be affected by development (Johnson, pers. comm.). Additional grazing land borders the property immediately north, east and south, and scattered single-family residences are present to the west along Freedom Boulevard.

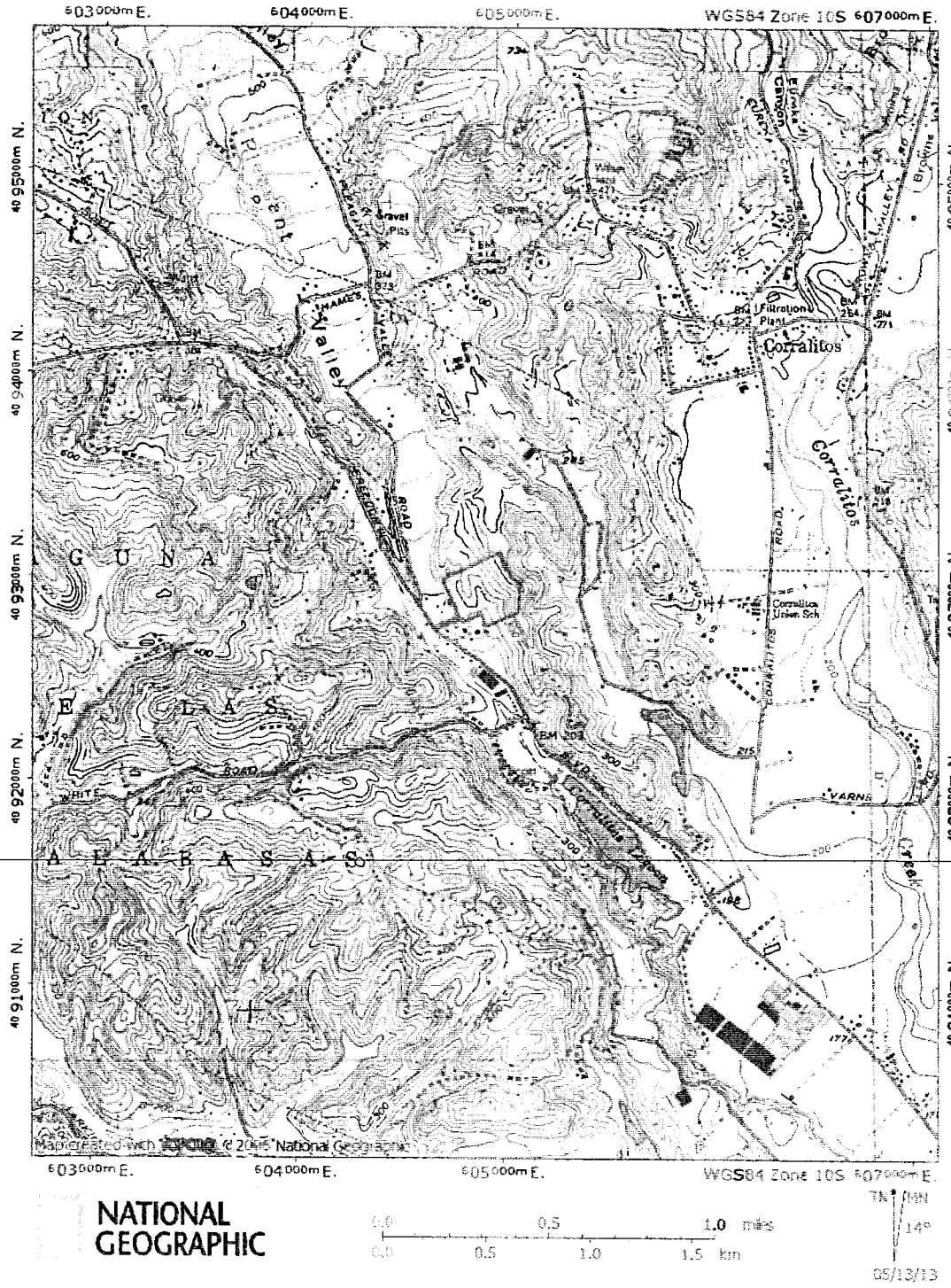

Figure 1. Location of Johnson/Wei Property, Corralitos, CA.

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Figure 2. Aerial image of Johnson/Wei property, Corralitos, CA.

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Figure 3. Project site from northern boundary looking south, Corralitos, CA.

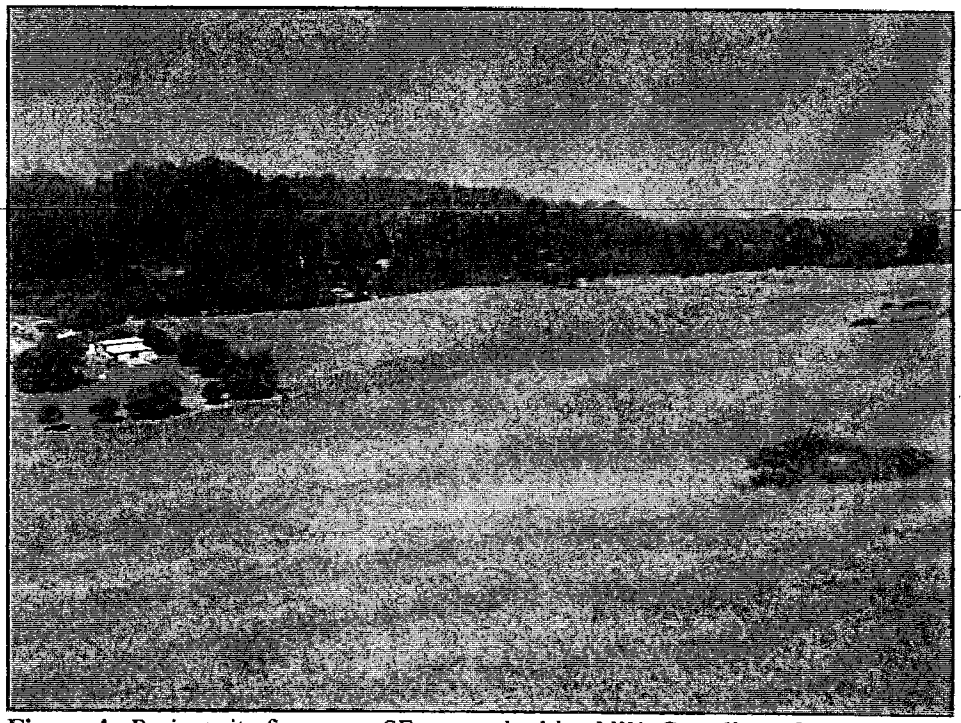

Figure 4. Project site from near SE corner looking NW, Corralitos, CA.

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Figure 5. Seasonal wetland and riparian woodland near NW corner of project site, Corralitos, CA.

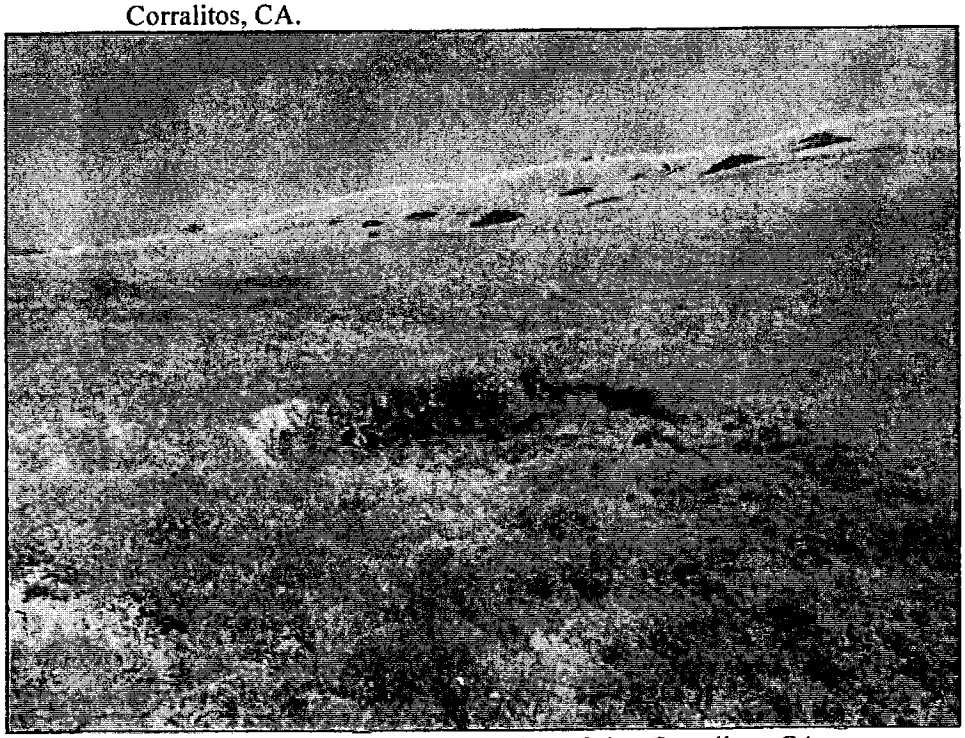

Figure 6. Seasonal wetland area in SW portion of site, Corralitos, CA.

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SANTA CRUZ LONG-TOED SALAMANDER

The SCLTS is a small salamander (2.5 to 5.5 inches total length) that inhabits oak woodland, willow riparian, and other moist habitats and breeds in ponds and sloughs (Stebbins 2003). Adults and post-metamorphic juveniles (metamorphs) are black with an irregular pattern of yellow-orange spots and stripes along the back. Ventral coloration is dark gray to black, while the sides have a fine white speckling. Females and males are of similar body length, while males possess a significantly longer, broader tail. In their aquatic life stage, larval SCLTS are olive gray or brownish gray above with bushy gills and a prominent dorsal fin that extends forward to the forelimbs.

The SCLTS breeds in seasonal, semi-permanent ponds and some perennial ponds and sloughs. Breeding sites generally lack exotic predators such as non-native fish and American bullfrogs (*Lithobates catesbeianus*). The few perennial ponds that support both SCLTS and invasive aquatic species have sufficient submergent and emergent vegetative cover to provide eggs and larvae with predator protection, although survivorship of larvae and recruitment of metamorphs is presumably low. Single eggs are deposited on submergent vegetation, sometimes in small clusters. Larvae require approximately 90 to 150 days to reach transformation (Ruth 1988). Larvae feed on a wide variety of aquatic organisms, including invertebrates and Pacific chorus tree frog (*Pseudacris regilla*) tadpoles (Anderson 1968). Growth rate and timing of metamorphosis vary with water temperature, food levels, larval densities and hydro-period (Petranka 1998). After metamorphosis, metamorphs settle under debris or underground in the vicinity of the breeding site until late summer or fall rains incite outward-bound dispersal (USFWS 1999).

SCLTS remain underground in rodent burrows and other moist refugia during the summer months and emerge during rainy nights in the fall and winter to migrate to breeding ponds. Habitats used by over-summering SCLTS include coast live-oak woodland, willow riparian, mixed evergreen forest and coastal scrub. Terrestrial individuals feed primarily on sow bugs, earthworms and other invertebrates (Anderson 1968). Although grassland does not provide over-summering habitat, adults will readily cross grassland, and is therefore likely to use grassland cover-sites as needed for days or weeks during breeding migrations interrupted by episodic rain events (Ruth 1989; Biosearch 2002; Allaback and Laabs, unpublished data). Following transformation, metamorphs may settle in grassland near their pond but survivorship is presumably greater for individuals that find underground retreats in dense scrub, willow or oak woodland.

The migration distance between over-summering and breeding habitat is not well understood, and primarily depends on availability of appropriate upland and barriers to terrestrial movements. Observations of adult SCLTS have been reported more than one mile from the nearest known breeding site (USFWS 1999), although these individuals may have been associated with breeding sites that were not identified at the time. A study conducted at the boundary between Willow Canyon and Seascape Uplands in the 2001-2002 breeding season demonstrated that between 26% and 36% of the SCLTS

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population breeding at the Seascape Uplands pond migrated at least 0.3 miles to and from the pond to over-summering habitats in Willow Canyon (Biosearch 2002). Relatively few studies have measured SCLTS activity in upland habitats in proximity to breeding sites. The most useful studies that collected upland data relative to a known breeding pond were conducted at Valencia Lagoon during the 1977-1978 breeding season (Reed 1978), Seascape Uplands pond during the 1987-1988 breeding season (Ruth 1989), and at Willow Canyon adjacent to Seascape Uplands during the 1991-1992 breeding season (Ruth 1994). In all three studies, the greatest distance that individual SCLTS travelled to or from breeding ponds was approximately 0.6 miles.

The SCLTS is one of five subspecies of the long-toed salamander distributed throughout northeastern California and north into British Columbia (Petranka 1998; Stebbins 2003). The subspecies *croceum* occupies a very small range that is limited to south Santa Cruz and extreme north Monterey Counties between Castroville and Aptos in the vicinity of the coast. It is isolated from other subspecies by more than 150 miles and recent genetic analysis indicates full species status is warranted (Savage, pers. comm.). In addition, genetic analysis within the extant range reveals distinct subpopulations that are isolated from one another, presumably by State Highway 1 as well as residential and agricultural areas (Savage, pers. comm.). Monterey County and Santa Cruz County populations are completely isolated by urbanization and intensive agriculture in the Pajaro River Valley. Eighteen breeding locales have been identified from Santa Cruz County, some of which may no longer support viable populations. Given its extremely small range, barriers to genetic flow between breeding populations and ongoing habitat fragmentation, the SCLTS is considered vulnerable to extinction (Savage, pers. comm.).

The subject property is within the Freedom metapopulation of the SCLTS (USFWS 2009). Two known breeding locations are present in the area Merk Pond, which is situated ~2,500 feet to the southeast, and Millsap Pond, which is located ~2,600' to the southwest. Although no population studies have been conducted at Merk Pond, the species has been periodically observed since 1996, which suggests a persistent population despite reports of predatory fish (D' Amore, pers. comm.; Miller, pers. comm.; Savage, pers. comm.). Of conservation concern is the presence of Freedom Boulevard, which is a well-traveled thoroughfare that likely results in road-kill of amphibians. However, significant amounts of appropriate upland border the road, and since SCLTS migrate and disperse only during nighttime rain events, Freedom Boulevard is considered to be a permeable barrier, particularly for dispersing metamorphs.

CALIFORNIA RED-LEGGED FROG

The CRLF is the largest native frog in California and can attain a length (snout-urostyle) of 5 ¼ inches (Stebbins 2003). The dorsal coloration of adults can be brown, brown olive or reddish, with black flecks or spots. The abdomen and legs of adults are often red, although the extent and intensity of this coloration varies greatly. The dorsolateral folds are well-developed and prominent. Tadpoles measure 0.5 to 3 inches and are typically dark brown or olive with black spots. The California red-legged frog occurs in the Coast

Ranges from Mendocino County south to Baja California and in the foothills of the Sierra Nevada.

California red-legged frogs require still or slow-moving water for egg deposition and larval development. Breeding habitats include marshes, ponds, sloughs, streams, ponds and reservoirs. Breeding typically occurs between December and early April, depending on local and annual environmental conditions. Females deposit large egg masses, usually attached to submergent or emergent vegetation. Eggs require 6 to 12 days before hatching and metamorphosis generally occurs 3.5 to 7 months after hatching between July and September, although tadpoles can over-winter at some locations (Fellers, et al. 2001; Stebbins 2003).

Non-breeding habitats are primarily riparian zones along permanent and seasonal streams, but also include any well-vegetated areas that remain moist and cool through the summer. California red-legged frogs may take refuge in small mammal burrows, leaf litter or other moist areas in order to avoid desiccation (Rathbun, et al. 1993; Jennings and Hayes 1994; Bulger et al. 2003). A radio-telemetry study in Santa Cruz County showed that individuals engage in straight-line movements often irrespective of riparian corridors, and that they may move up to two miles between non-breeding and breeding sites (Bulger, et al. 2003). They may move several hundred feet into surrounding uplands throughout the year and during the rainy season individuals may spend weeks in upland habitats (Bulger, et al. 2003; Fellers and Kleeman 2007). A radio-telemetry study in Marin County indicated that females were more likely than males to leave perennial ponds, often shortly after depositing eggs (Fellers and Kleeman 2007). Recently metamorphosed juveniles generally do not travel far from aquatic habitats. Movements of metamorphs and adults generally occur with the first rains of the weather-year, in response to receding water, or following the breeding season (Fellers and Kleeman 2007; Allaback *et al.* 2010; pers. obs.).

Threats to the California red-legged frog include degradation and loss of habitat, water diversions, and introduction of non-native aquatic species (USFWS 1996). Occurrence of this frog has shown to be negatively correlated with presence of introduced American bullfrogs (Moyle 1973; Hayes and Jennings 1986, 1988; Alvarez et al. 2003), although both species may persist at certain locations (Cook and Jennings 2007).

Recent genetic analysis was used to reclassify the California red-legged frog as a full species, separate from the northern red-legged frog, *Rana aurora* (Shaffer, et al. 2004; USFWS 2010). There are several morphological and behavioral differences between the species. California red-legged frogs possess paired vocal sacs and call in the air, while northern red-legged frogs do not have paired vocal sacs and call underwater (Hayes and Krempels 1986).

Although the California red-legged frog was historically widespread in California, it has been eliminated from ~70% of its range (USFWS 1996). It has been largely extirpated from the Sierra Nevada and from the southern quarter of its range (Fellers 2005). The California red-legged frog was listed as threatened by the United States Fish and Wildlife

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Service in 1996 (Miller, et al. 1996). Critical habitat was first established by USFWS in 2001, and subsequently revised, most recently in 2010 (USFWS 2006, 2010). The project site is not within designated Critical Habitat.

The subject property is within ~2,600' of Millsap Pond, which is known to support a small breeding population of CRLF (Biosearch 2001). Very few other CRLF records have been reported in the region and none around Corralitos. The nearest additional records are in lower Larkin Valley. Of conservation concern is the presence of Freedom Boulevard, which is a well-traveled thoroughfare that likely results in road-kill of amphibians. However, significant amounts of appropriate upland border the road, and CRLF move at night, Freedom Boulevard is considered to be a permeable barrier, particularly for dispersing metamorphs and subadults.

METHODS

Wildlife biologist Mark Allaback visited the site on 12 April and 1 May 2013. Wildlife Biologist David Laabs visited the site on 1 May 2013. The property was traversed on foot. Upland habitats were characterized within and adjacent to the property boundaries. Land uses were identified. Habitat connectivity between the subject property, suitable upland habitat and known and potential breeding sites was assessed in the field and using both aerial photographs and USGS topographic maps. The surrounding public roads were driven. Representative photographs of the property were recorded.

Methods followed survey protocols for the CRLF (USFWS 2005) and SCLTS (USFWS and CDFW 2012). Relevant literature and databases were searched for information regarding SCLTS and CRLF in proximity to the project area. The California Natural Diversity Database maintained by CDFW was searched. Previous field investigations and assessments in the project area were consulted (Biosearch Wildlife Surveys 2001; Bland 2005; Insignia 2011). Biologists with experience with the species were consulted for additional information (D' Amore, pers. comm.; Miller, pers. comm.; Savage, pers. comm.). All records of SLCTS and CRLF from the region were compiled and mapped. Aerial images of the project site and surrounding areas were used to assess wildlife habitats within 3.1 miles (5 km) of the project site.

RESULTS

Santa Cruz Long-toed Salamander Habitat Assessment

SCLTS Range

The Johnson/Wei property is near the northeast edge of the known range of the SCLTS (USFWS 1999; CDFG 2012). The project is situated within the Freedom metapopulation of the subspecies (USFWS 2009). This metapopulation includes Merk Pond, Millsap Pond, Tucker Pond, Palmer Pond and Racehorse Road Pond. The northern and eastern boundaries of the Freedom metapopulation are delineated by Freedom Boulevard, Hames Road and Corralitos Road (USFWS 2009).

SCLTS Breeding Ponds Within 3.1 Miles (5 km)

There are 12 known breeding ponds within 3.1 miles of the project site (Figure 7). The entire Larkin Valley and Freedom metapopulations of the species are within this distance. This includes Merk Pond (0.5 miles SE), Millsap Pond (0.5 miles SW), Tucker Pond (1.3 miles NW), Winterwind Way Pond (1.5 miles SSW), Calabassas Pond (1.7 miles SW), Olive's Pond (1.7 miles SW), Suess Pond (1.8 miles SW) and Racehorse Road Pond (2.1 miles W). Four breeding ponds in the Valencia-Seascape metapopulation are located between 2.6 and 3.1 miles west of the site. However, State Route 1 presents a barrier to SCLTS movements and genetic flow (USFWS 1999; Savage, pers. comm.).

Upland and Aquatic Habitat Onsite and Within 1.2 Miles (2 km)

Upland habitats onsite are primarily annual grassland, with a small amount of seasonal wetland and riparian woodland. No oak woodland or scrub habitats are present on the site. The riparian woodland covers ~0.1 acre and consists of an isolated grove of willow trees below a spring. Upland wildlife habitats within 1.2 miles of the project site include annual grassland, oak woodland, coastal scrub and eucalyptus grove. Native habitats are interspersed with areas converted to residential and agricultural uses.

The seasonal wetlands onsite do not hold water long enough to provide breeding habitat for the SCLTS. There are two aquatic sites within 1.2 miles of the project that are known breeding ponds: Merk Road Pond and Millsap Pond Pond (Figure 8). Merk Road Pond is the nearest known breeding site situated ~2,500 feet southeast along Merk Road. It is currently the only known breeding pond north and east of Freedom Boulevard. A small breeding population was first identified at Merk Road Pond in the 1990s and was studied more extensively in 2003 and 2005 (S. Miller, pers. comm.; W. Savage, pers. comm.). American bullfrogs (*Lithobates catesbeianus*) inhabit the pond, and catfish (*Ictalaurus* spp.) and bluegill (*Lepomis macrochirus*) have been reported in the past, which greatly depress SCLTS breeding success. Uplands at the site support oak woodlands, willow riparian and patches of dense coastal scrub, although some of the area surrounding the pond is developed for either agriculture or residences.

Millsap Pond is a small, seasonal pond located ~2,600' southwest of the project site (Biosearch 2001). A mark-recapture study in 2000-01 estimated a breeding adult population of 137 ± 21 (Biosearch 2001). The pond is very small and shaded. It is within a eucalyptus grove and oak woodland. Millsap Pond is within an ~50-acre preserve managed by CDFW, much of which provides suitable upland habitat for SCLTS.

There are seven other ponds that provide potential breeding habitat within 1.2 miles (Figure 8). None of these ponds have been sampled for SCLTS. A pond along Upper Merk Road, situated 0.3 mile north, appears to hold water year-round and is ringed with emergent vegetation. A pond situated 0.5 mile west also appears to be permanent and is ringed with emergent vegetation. Corralitos Lagoon (also called "Chandler Lake" and "Freedom Lake") is a 20-acre pond situated 0.5 mile SSE that was used for fishing for many years but now appears to be seasonal. A pond situated 0.8 mile NNE was surveyed for CRLF in 2011 (Pond 9; Insignia Environmental 2011). These surveys revealed a robust population of non-native mosquitofish (*Gambusia affinus*), as well as introduced Louisiana red swamp crayfish (*Procambarus clarkii*) and American bullfrogs. The presence of these non-native predators greatly reduces the likelihood that it provides breeding habitat for SCLTS; if the species does use the site, the breeding population is likely depressed. However, it is important to note that the Merk Road Pond, which supports a breeding SCLTS population, also reportedly contains introduced predatory fishes. A pond situated 0.8 mile to the NW was constructed in 2009, presumably to contain sediment. Aerial photographs show that it was inundated in June 2011, with little emergent vegetation. Two adjacent ponds, 0.9 miles west, are situated along Nunes Road. Based on their physical characteristics, all six ponds provide potential breeding sites for SCLTS.

Riparian woodland habitat is present within 1.2 miles along the watercourse that parallels Freedom Boulevard, the watercourse along Merk Road and along Corralitos Creek.

California Red-legged Frog Habitat Assessment

CRLF Range

The project site is within the range of the CRLF (Stebbins 2003; Jennings & Hayes 1994). The species was historically more widespread in southern Santa Cruz County, but has been extirpated from the coastal urbanized areas of Santa Cruz, Capitola and Aptos. It remains extant in the south county sloughs, but the population appears to be depressed due to introduced aquatic predators and conversion of upland habitats (pers. observ.). The project site is not in an area designated as Critical Habitat for the species (USFWS 2010).

CRLF Localities within 1 Mile (1.6 km)

The only CRLF within 1 mile of the project site is at Millsap Pond, located 0.5 mile SW. Low numbers of CRLF metamorphs were observed during pitfall trapping for SCLTS at

ATTACHMENT 9

Millsap Pond in 2000-01, indicating successful breeding (Biosearch 2001; CNDDB Occurrence #521).

Upland and Aquatic Habitat Onsite and within 1 Mile (1.6 km)

Upland habitats onsite are almost exclusively annual grassland, with a small amount of seasonal wetland and riparian woodland. No oak woodland or coastal scrub is present. The riparian woodland covers ~0.1 acre and consists of an isolated grove of willow trees below a spring in the northwest corner of the site. Upland wildlife habitats within 1 mile include annual grassland, oak woodland, coastal scrub and eucalyptus grove. Native habitats are interspersed with areas converted to residential and agricultural uses.

Millsap Pond, located 0.5 miles SW, is a known CRLF breeding pond that supports freshwater marsh habitat. There are five other aquatic sites within 1.2 miles that provide potential breeding habitat for CRLF. One of these ponds, situated 0.8 mile north was surveyed for CRLF in 2011 (Pond 9; Insignia Environmental 2011). These surveys revealed a robust population of non-native mosquitofish (*Gambusia affinus*), as well as introduced Louisiana red swamp crayfish (*Procambarus clarkii*) and American bullfrogs. The presence of these non-native predators greatly reduces the likelihood that it provides breeding habitat for CRLF; if the species does use the site, the breeding population is likely depressed.

There are eight other ponds that provide potential breeding habitat within one mile (Figure 8). One of these ponds, situated 0.8 mile NNE, was surveyed for CRLF in 2011 following USFWS survey guidelines that included eight visual surveys (Insignia Environmental 2011). The study revealed a robust population of non-native mosquitofish (*Gambusia affinus*), introduced Louisiana red swamp crayfish (*Procambarus clarkii*) and American bullfrogs. The presence of these non-native predators greatly reduces the likelihood that it provides breeding habitat for CRLF; if the species does use the site, the breeding population is likely depressed. A pond along Upper Merk Road, situated 0.3 mile north appears to hold water year-round and is ringed with emergent vegetation. Merk Pond, situated 0.5 mile SW, supports predatory fish, and is unlikely to support CRLF. Corralitos Lagoon (also called "Chandler Lake" and "Freedom Lake") is a 20-acre pond situated 0.5 mile SSE that was used for fishing for many years but now appears to be seasonal. A pond situated 0.5 mile west appears to be permanent and ringed with emergent vegetation. A pond situated 0.8 mile to the NW was constructed in 2009. Aerial photographs show that it was inundated in June 2011, with little emergent vegetation. Two adjacent ponds, 0.9 miles west, are situated along Nunes Road. Based on their physical characteristics, all eight ponds are potential breeding and/or sheltering sites for CRLF.

Riparian woodland habitat is present within 1.2 miles of the project site along the watercourse that parallels Freedom Boulevard, the watercourse along Merk Road and along Corralitos Creek.

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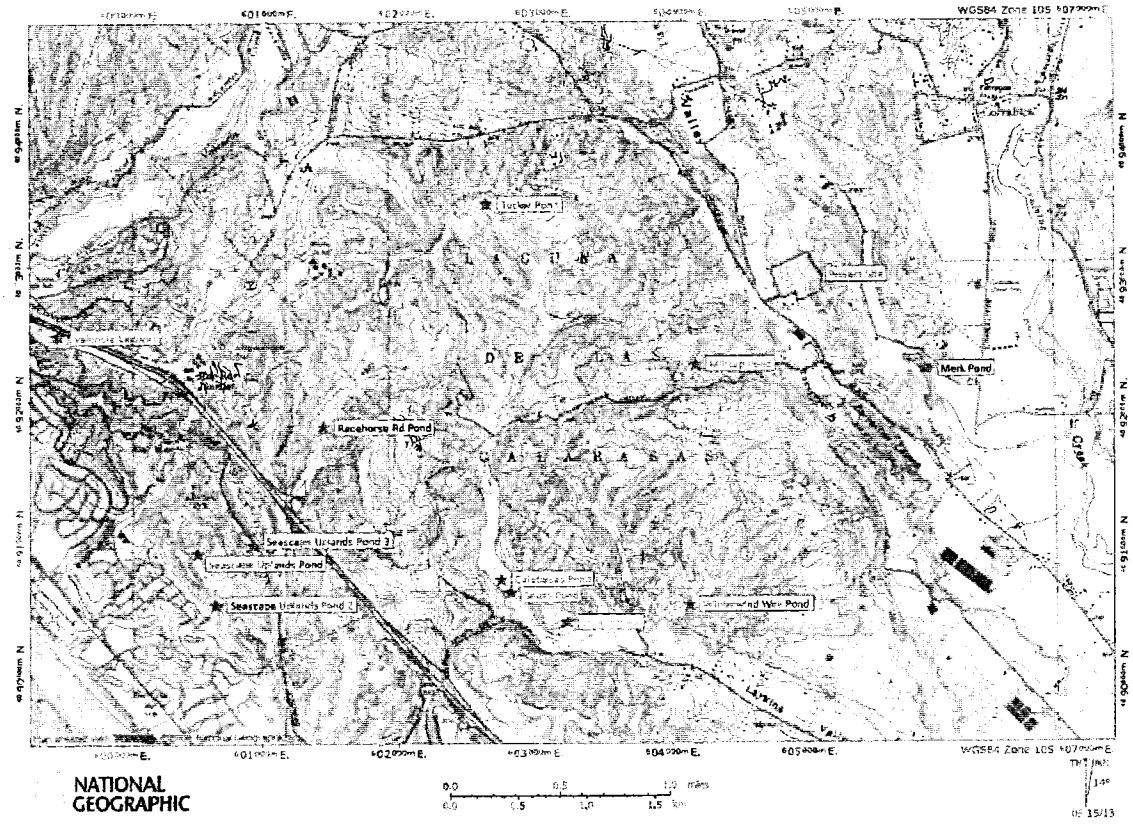

Figure 7. Known SCLTS breeding ponds (red stars) within 3.1 miles of project site, Santa Cruz County.

ATTACHMENT 9

Figure 8. Aerial image of area within 1.2 miles of project site. White circles = potential SCLTS and CRLF breeding ponds.

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DISCUSSION

The ~20-acre Johnson/Wei property is within the extant range of both the SCLTS and CRLF. Two known SCLTS breeding ponds (Merk Pond and Millsap Pond) are present within ½ mile of the site. Millsap Pond also supports breeding CRLF. The Johnson/Wei property consists almost entirely of annual grassland and does not provide suitable breeding or over-summering habitat for either species. While the 0.1-acre riparian woodland in the northwest corner of the site provides marginal over-summering habitat for SCLTS and foraging and sheltering habitat for CRLF, this area will not be impacted by the project. Use of the project site by either species is expected to be infrequent and temporary during migratory or dispersal movements between breeding and non-breeding habitats.

Given the presence of two known SCLTS breeding ponds within ½ mile the , SCLTS, especially metamorphs, could disperse across the site during fall and winter rains. During the winter migration, SCLTS will cross grassland to travel between appropriate upland and breeding habitat. The migration may take weeks or more, since movements are associated with rain events, and SCLTS may use Botta's pocket gopher (*Thomomys bottae*) burrows in the grassland for temporary cover (Allaback and Laabs, unpubl. data). If construction is restricted to the dry season, no direct take of SCLTS is anticipated. Given that the region already supports a mix of residential and agricultural uses, it is unlikely that the proposed development would affect the species in the long term.

CRLF may also periodically occur on the property, since there is a known breeding site within ½ mile. The two springs onsite provide minimal foraging and sheltering habitat when standing water is present. The springs do not provide suitable breeding habitat. CRLF appear to be uncommon in the surrounding region. If construction is restricted to the dry season, no direct "take" of CRLF is anticipated. Given that the region already supports a mix of residential and agricultural uses, it is unlikely that the proposed development would affect the species in the long term.

Two other special-status amphibians, the California tiger salamander (*Ambystoma californiense*) and foothill yellow-legged frog (*Rana boylii*), are known from southern Santa Cruz County. The California tiger salamander is known from only two locales in Santa Cruz County, Buena Vista Pond and Ellicott Pond, located 3.1 and 3.7 miles south of the project site, respectively, and the species is not expected. The project site is within the historic range of the FYLF (Stebbins 2003). There is a record of the FYLF from near the intersection of Buena Vista Rd and Harkins Slough Road from 1970, 3.7 miles south of the project site (MVZ Record 164868; NDDB Occurrence # 271). All other records from Santa Cruz County are from the upper reaches of the Aptos Creek and Soquel Creek watersheds, in habitats more typical of the species. No suitable aquatic habitat for foothill yellow-legged frogs is present on or near the project site, and the species is not expected.

RECOMMENDATIONS

The Resource Conservation District (RCD) of Santa Cruz County (Capitola, CA) should be contacted to consider restoration opportunities. Since grazing will continue, it may be beneficial to install a seasonal pond to provide water for cattle and habitat for amphibians and other wildlife. SCLTS may naturally colonize a seasonal pond that holds water through approximately June of each year. Portions of the property would also benefit from upland restoration to native scrub and oak woodland. Additional recommendations related to construction are provide below.

The SCLTS is listed as Endangered under both federal and state Endangered Species Acts and is designated as Fully Protected Species under the Fish and Game Code of California. No take of the species is allowed without appropriate permits from USFWS and CDFG. The CRLF is listed as Threatened and receives similar legal protections under the federal Endangered Species Act. The following measures are recommended to avoid or reduce potential impacts to SCLTS during and after project construction:

- Ground disturbance should not take place between 15 October and 15 March to avoid affecting SCLTS during their breeding migration or during outward-bound dispersal of post-metamorphic juveniles.

- Efforts should be made to design the residences and associated landscaping with minimal use of retaining walls or other barriers to movements of SCLTS that extend vertically above ground from at or below grade. Where such barriers are necessary, they should span less than 100 linear feet.

- The driveways should be designed similarly, with minimal use of retaining walls. If retaining walls are required, they should span less than 100 linear feet. If gutters are required to direct surface flow, they should be rounded.

- No night lighting should be installed along the driveways.

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ATTACHMENT 9

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 PREVISICH, PLANNING DIRECTOR

August 2, 2013

Mr. Kim Tschantz
Cypress Environmental and Land Use Planning
P.O. Box 1844
Aptos, CA 95003

Subject: Johnson/Wei Property Biotic Report, Application REV131064

Dear Mr. Tschantz:

The review of your biotic report, prepared by Biosearch Associates, dated May 24, 2013, has been completed. The report has been accepted.

The subject report evaluates the potential impact to the Santa Cruz long-toed salamander (SCLTS) and the California red-legged frog (CRLF) during and after construction of three proposed single family residences on approximately 20 acres of land along Freedom Boulevard in the unincorporated portion of Santa Cruz County, near Watsonville.

The proposed development is within ½ mile of two know SCLTS breeding ponds, one of which also supports breeding CRLF. While the subject parcels do not support breeding habitat for either species, the wetland area in the southwest corner of the parcels does provide marginal refuge that could be used by either species.

In order to minimize potential impacts to SCLTS and CRLF that may pass through the property, the following conditions shall be applied to any development permit:

1. All construction-related surface disturbance activities shall be conducted after April 15th and before October 15th or the first significant rain event of any given year.
2. Buildings and driveways shall be designed to reduce barriers to the movements of SCLTS and CRLF, by limiting retaining walls to less than 100-feet and using rounded gutters.
3. Any swimming pool or hot tub associated with the 3 houses shall be designed such that SCLTS cannot access that feature, either through a contiguous barrier around the pool or tub, or an elevated lip on at least 9 inches.
4. In order to be in conformance with General Plan Policy 5.1.12, restoration of the wetland area on the northwest corner of parcel 108-161-46 will be a condition of approval.
    a. A restoration plan shall be submitted to Environmental Planning as a component of the development application and it shall include an appropriate native planting pallet, success criteria, and a monitoring and maintenance program.
    b. Drainage features as necessary to ensure compliance with County design criteria

may be incorporated into the restoration plan through an addendum to the plan, submitted to Environmental Planning staff for review and approval.

Provided the conditions above are incorporated into the development proposal for the subject parcels, this project will have no significant biological impacts.

If you have any questions regarding this letter, please call me at 831-454-3201.

Sincerely,

Matthew Johnston
Environmental Coordinator

Cc: Robert Loveland

ATTACHMENT 10

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 PREVISICH, PLANNING DIRECTOR

Soils (Geotechnical) Engineer Plan Review Form

Project Information:

Application Number: 141037
Parcel # (APN): 108-161-32, 33-34, 37-40, 46-47
Owner Name: Yeelan & Ralph Johnson
Project Address / Location: Freedom Boulevard, Watsonville, Ca

Soils Report Information:

Soils Engineering Company Name: Rock Solid Engineering, Inc.
Name of Soils Engineer Who Signed Report: Yvette M. Wilson
Date of Soils Report: November 7, 2013
Date of Updates / Supplemental Info:

Project Plan Sheets Reviewed:

Plan Sheet Number	Plan Prepared By	Date of Latest Revision
C1 through C7	Roper Engineering	June 6, 2014

The plans sheets listed above for the specified project are in conformance with the recommendations of the soils report.

REGISTERED PROFESSIONAL ENGINEER
YVETTE M. WILSON
No. 60245
Exp. 9/14
CIVIL
STATE OF CALIFORNIA

Soils Engineer's Signature and Stamp — Date: 6-10-14

ATTACHMENT 11

ROCK SOLID ENGINEERING, INC.
Soil Reports · Site Assessments · Manufactured Home Foundations · Expert Witness · Real Estate Inspections

Project No. 13025
June 10, 2014

Ralph and Yeelan Johnson
60 Old Orchard Road
Los Gatos, California 95030

SUBJECT: **GEOTECHNICAL PLAN REVIEW**
Site Development
Freedom Boulevard, Aptos, California
A.P.N.'s: 108-161-32, 33-34, 37-40, 46, & 47

REFERENCES: Rock Solid Engineering, Inc., Geotechnical Investigation Report, Geotechnical Investigation - Design Phase, Three Proposed Single Family Residences, Freedom Boulevard, Aptos, California, A.P.N.'s: 108-161-32, 34, 37, 38, 40, 46, & 47, Project No. 13025, Dated November 7, 2013.

Dear Mr. & Mrs. Johnson:

1. INTRODUCTION

a. Per your request, we have reviewed the following project plans for the subject property:

i. Roper Engineering, Site Development, For Yeelan & Ralph Johnson, Freedom Blvd, A.P.N.'s: 108-161-32-34, 37-40, 46-47, Sheets C1 thru C7, Revised Dated June 6, 2014.

b. The purpose of our review was to ensure the conformance of the geotechnical aspects of the plans with the geotechnical conditions present on the site and with the recommendations provided in the referenced reports.

2. CONCLUSIONS AND RECOMMENDATIONS

a. It is our opinion that the plans reviewed are in general conformance with the geotechnical conditions present and with the recommendations presented in the referenced report. The proposed project is considered feasible from the geotechnical standpoint provided the site is graded in conformance with the County of Santa Cruz Grading Code and the recommendations of our report are incorporated in to the construction.

b. The recommendations presented herein and in the referenced report should not be considered to preclude more restrictive criteria by the governing agencies or by structural considerations.

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c. In the event that changes are made to the plans, the revised plans should be forwarded to the Geotechnical Consultant to review for conformance with the previous recommendations.

d. Observation and testing services should be provided by Rock Solid Engineering, Inc. during construction of the subject project. All earthwork must be observed and approved by the Geotechnical Consultant. Any earthwork performed without the full knowledge and observation of Rock Solid Engineering, Inc. will render the recommendations of this review invalid. During grading, all excavation, fill placement and compaction operations should be observed and field density testing should be performed to evaluate the suitability of the fill, and to determine that the applicable recommendations are incorporated during construction.

3. LIMITATIONS

a. Our review 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 review.

b. As in most projects, conditions revealed during construction may be at variance with preliminary findings. Should this occur, the changed conditions must be evaluated by the Geotechnical Consultant and revised recommendations provided as required.

c. This report is issued with the understanding that it is the responsibility of the Owner, or his Representative, to ensure that the information and recommendations presented herein are brought to the attention of the Architect and Engineers for the project and incorporated into the plans, and that the Contractor and Subcontractors implement such recommendations in the field.

d. 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.

e. The findings of this review are considered valid as of the present date. However, changes in the conditions of a site can occur with the passage of time, whether due to natural events or human activity on this or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur as a result of legislation or a broadening of knowledge. Accordingly, this review 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.

f. Our review addresses the geotechnical aspects of the plans **only**. Our firm makes no warranty, expressed or implied, as to the suitability or adequacy of any other aspect of the plans. All other aspects of the plans are specifically excluded from the scope of this review.

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,

ROCK SOLID ENGINEERING, INC.

Signed:

Yvette M. Wilson, PE
Principal Engineer
R.C.E. 60245

Distribution: (1) Addressee via email
(4) Dee Murray and via email
(1) Jeff Roper via email

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ATTACHMENT 11

• Engineering Geology
• Hydrogeology
• GIS Services

NOLAN ASSOCIATES

June 10, 2014 Job No. 13018

Ralph and Yeelan Johnson
60 Old Orchard Road
Los Gatos, CA 95030

Subject: **Plan Review Letter**
Proposed Single Family Residence
APN 108-161-32
Freedom Blvd.
Santa Cruz County, California

Ref: "*Site Development for*
Yeelan and Ralph Johnson
Freedom Blvd. APN 108-161-32, -34, -37-40, -46-47"
Plan by Roper Engineering, Watsonville, CA
Sheets C1-C4
Plan dated 2/25/14, revision of 6/6/14

*" **PRELIMINARY GEOLOGIC HAZARDS INVESTIGATION***
Proposed Single Family Residences
Freedom Blvd.
Corralitos
Santa Cruz County, California
APNs: 108-161-32, 33, 34, 37, 38, 39, 40, 46, & 47"
Geologic report by Nolan Associates, Santa Cruz, CA
Report dated 11/20/13

Dear Mr. and Ms. Johnson:

At your request, we have reviewed the above referenced plans of your proposed project for conformance with the recommendations of our November 20, 2013 geologic report.

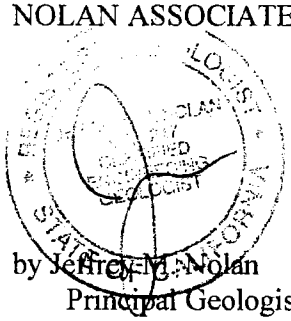
Based on our review of the plans, the foundation of the proposed home is properly located within our designated geologically feasible building envelope. Grading and drainage details are in general conformance with our report recommendations.

ATTACHMENT 11

Please note that we are not engineers and we have not, therefore, reviewed or approved any aspect of the project engineering, other than as noted above.

If you have any questions or comments regarding this letter, please contact us.

Very truly yours,
NOLAN ASSOCIATES



by Jeffrey M. Nolan
Principal Geologist
CEG #2247

cc: Dee Murray (4)
Yvette Wilson (1)