Signature	Date
Signature	Date

POLLAK ENGINEERING CO.

Project No. 1038
9 January 2006

Mr. Greg Maples
[redacted]

Subject: Proposed New Residence
17064 Shady Lane Drive
Santa Clara County, California
GEOLOGIC & GEOTECHNICAL INVESTIGATION

References: 1) Site Plan
By *David Kesler*
Dated 20 October 2003

Dear Mr. Maples:

In accordance with your authorization, ***Pollak Engineering Co.*** has conducted a geologic and geotechnical investigation of the subject property, located at 17064 Shady Lane Drive, in Santa Clara County, California.

The accompanying report presents our conclusions and recommendations based on our investigation. Our findings indicate that the site is suitable for the proposed construction from geologic and geotechnical perspectives provided the recommendations contained in this report are carefully followed and are incorporated into the project plans and specifications. It should be noted that because of the steep gradients on this site, the site in its present condition does not demonstrate a sufficient factor of safety against landslides. This report contains recommendations to increase the factor of safety to an acceptable level and those recommendations must be incorporated into the project plans. All plans must be reviewed by the Soil Engineer prior to submittal. In addition, the applicable setbacks, easements, and requirements set by the County of Santa Clara and any other governmental agencies should be followed.

Should you have any questions relating to the contents of this report or should you require additional information, please do not hesitate to contact our office at your convenience.

Very truly yours,
Pollak Engineering Co.

Robert Pollak, P.E.
Principal Engineer

Lawrence D. Pavlak, C.E.G.
Engineering Geologist

Copies: 5 to Addressee

Geotechnical Engineering

Engineering Geology

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GEOLOGIC & GEOTECHNICAL INVESTIGATION

Purpose and Scope

This report presents the results of our Geologic and Geotechnical Investigation for the proposed new residence to be located at 17064 Shady Lane Drive, in the County of Santa Clara, California. The purpose of this investigation was to determine the site geologic factors that may affect the project development and to determine the site soil conditions in order to establish geotechnical recommendations for the new construction. Based on the results of the investigation, criteria were established for increasing the site factor of safety against landslides, and for the foundation design. The enclosed geotechnical recommendations are based on our evaluation and investigation, on the referenced site plan, and on our geotechnical experience with similar projects.

Our geologic investigation included:

1. Review of pertinent published and unpublished geologic and geotechnical data related to the site vicinity in our office and made available by the Santa Clara County Department of Planning;
2. A review of aerial photographs of the site and vicinity;
3. Geologic mapping of the site and vicinity;
4. Analysis of the data and formulation of conclusions and recommendations;

Our geotechnical investigation included:

a. A field reconnaissance by the Soil Engineer;
b. Drilling of four exploratory borings;
c. Laboratory testing of selected soil samples;
d. Analysis of site slope stability
e. Development of geotechnical criteria; and
f. Preparation of this written report.

Site Location and Description

The site is irregular in shape and approximately 0.7 acre in areal extent. The relatively long and narrow lot includes southeast and northwest facing slopes with a creek bed dividing them. The area to receive the residence is located near the elevation of Shady Lane Drive on the southeast-facing slope. Site gradients are on the order of 1.5:1 (horizontal:vertical) and are locally steeper. The lower portion of the southeast-facing slope on the subject site and on adjacent lots contains several, relatively shallow landslides. Crude graded roads cross the southeast-facing slope in two locations.

Based upon the U.S. Geological Survey 7.5' topographic quadrangle for the area, the highest elevation on the subject lot is approximately 760 feet above mean sea level (USGS, 1971) at the southwestern property corner, near Shady Lane Drive. The lowest elevation is approximately 635 feet, in the creek bed crossing the eastern portion of the site.

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The area to receive the residence is currently occupied by several trees, various shrubs and grasses, and a small wooden shed.

The location and description of the site is based on the referenced plans, maps and on field observations made during our investigation.

Proposed Construction

It is anticipated that the new residence will be two stories in height with a detached garage, and will be of conventional wood frame construction. It is our understanding that no grading will be performed on this site and that the proposed garage will be structural and will not incorporate slab on grade construction.

Actual building loads are not known, however, relatively light loads typical of this type of residential construction are anticipated.

Subsurface Conditions

Based on our exploratory borings and site observations, the sub-surface soil conditions in the area to receive the proposed new residence were observed to consist primarily of approximately 5 feet of clayey colluvial material overlaying weak clayey sandstone identified as belonging to the Santa Clara Formation. The outboard portion of the crude graded roads contain minor wedge fills.

Plasticity testing of the near surface clay soil indicated that the soil is highly expansive and has a high propensity to experience volume changes with changes in moisture content. Expansive clay soils are not expected to affect the project development, however care should be taken to ensure that water is not permitted to pond or collect at any location on this site. Ponding water can be expected to exacerbate local slope instabilities.

No groundwater was encountered in our borings. Groundwater issues are not expected to affect the proposed construction.

REGIONAL GEOLOGY

The site is located in the southwestern foothills of the Diablo Mountain Range next to the northeastern edge of Santa Clara Valley. This range of mountains was formed by an uplifted block of complexly folded and faulted marine and terrestrial rocks of Jurassic to Quaternary age.

The Diablo Mountain Range along with Santa Clara Valley, the Santa Cruz Mountains, and San Francisco Bay are part of the Coast Ranges Geomorphic Province, which extends through northern and central California and makes up one of eleven geomorphic provinces in the State. The subject site is within the San Francisco Bay block, a large structural depression lying between northwest-trending uplands of the Diablo Range to the northeast and the Santa Cruz Mountains to the southwest.

In the San Francisco Bay Area the Coast Ranges geomorphic province is seismically impacted by several regional fault systems, trending generally northwest southeast. The largest and most active of these faults are the San Andreas, Hayward, and Calaveras. Geologic mapping by Dibblee, 1973, Rogers and Williams, 1974, Hart, et al, 1981, Pacific Geotechnical Engineering, 1991, and Woodard-Clyde, 1993, indicate that the Calaveras fault is about 1,300 feet to the northeast. The Coyote Creek and San Andreas faults are mapped approximately 2,500 feet and 12.5 miles to the southwest of the subject property, respectively.

Dibblee, 1973, indicates that the site is underlain by the Quaternary Santa Clara Formation composed of gravel, sand, and clay. Rogers and Williams, 1974, described this unit as being conglomerate, sandstone, siltstone, and claystone. Franciscan Formation rocks consisting of pervasively sheared shale and greywacke as well as serpentinite were mapped by Dibblee near the site to the west while Rogers and Williams described these materials as Franciscan mélange and serpentinite. The geologic maps prepared by Dibblee, 1973, Nilsen, 1975,and Pacific Geotechnical Engineering, 1991, identified landslides on or near the site.

The maps prepared for the City of Morgan Hill by Pacific Geotechnical Engineering, dated 1991, place the site within a zone of "relatively unstable surficial deposits or bedrock materials including landslide debris, colluvium, and weak bedrock". Two moving landslides are mapped on the site, one designated as shallow and the other deep. The presence of these landslides was confirmed by surface mapping during the course of this investigation.

The site is not mapped within a State of California Special Studies Zone (1982) a zone encompass the mapped trace of the Calaveras Fault, northeast of the parcel. The property is located within a Santa Clara County Fault Rupture Hazard Zone but not in Liquefaction Hazard Zone as shown on maps dated 2005.

SITE GEOLOGY

The site geologic conditions were investigated by:

a) Stereoscopic examination of aerial photographs;
b) Surface geologic mapping;

Air Photo Study: Four stereo pairs of vertical-angle air photos were studied for this investigation at the United States Geologic Survey library in Menlo Park, California and our office. Descriptive data for these photosets are as follows:

DATE FLOWN	APPROX. SCALE	SOURCE*	SERIAL NUMBERS
5-27-65	1:12,000	USGS	SCL 24-104, 105
5-10-73	1:20,000	TI	3146-4-1, 2
6-26-74	1:20,000	USGS	9-194, 195 4 (color)
4-30-81	1:24, 000	USGS	4 274, 275 GS VEZR

*Source Code: USGS = U.S. Geological Survey, TI = Towill, Inc.

The earliest photo set examined during this investigation, dated 1965, showed very minor residential development in the site vicinity. The site itself was undeveloped at that time, as were the adjacent lots to the north and south. Lots across Shady Lane Drive and Dunne Avenue from the site were also undeveloped. Surface features of the site were generally obscured by trees. Some apparent dozer trails wee observed crossing the adjacent lots to the north and south. No signs of geologic hazards were observed on or adjacent to the site but topographic lineations were observed to the mapped locations of the nearby Calaveras and Coyote Creek faults. The slopes above the site to the east and west appeared to be stable.

The 1973 and 74 photos revealed that residential development in the vicinity has increased moderately but none has occurred adjacent to the site. Dense tree growth was still obscuring the surface of the site but apparent erosion along the creek channel is visible.

The 1981 photo set indicates that residential development has increased substantially in the site vicinity. Tree growth is still dense on the site but the largest of the landslides on the property appears to be partially visible. The air photo evaluation did not identify any other features indicative of possible geologic hazards, such as faults, within or adjacent to the site boundaries and the slopes above the site to the east and west appeared to be stable.

Surface Reconnaissance and Mapping: The multi-level parcel slopes to the east from Shady Lane Drive to a creek channel at gradients as steep as approximately 1.5:1 (horizontal to vertical) though they are locally steeper.

The Dibblee, 1973 and Rogers and Williams, 1973, maps have identified the geologic unit underlying the site as Quaternary Santa Clara Formation. This geologic unit is described, as consisting of gravel, sand, and clay by Dibblee and conglomerate, sandstone, siltstone, and claystone by Rogers and Williams. Erosional and landslide scarps on the site exposed up to 12 vertical feet of apparent Santa Clara Formation material consisting of yellow-brown to reddish-brown gravelly clay with sub angular to well rounded, fine to coarse gravel. Scattered boulders were observed within the unit, particularly in the banks of the creek. The gravel and boulders were composed of sandstone, graywacke, greenstone, claystone shale, and serpentinite.

The presence of two landslides was confirmed on the site, similar to those depicted on the Pacific Geotechnical Engineering, 1991, map. In addition, a possible, shallow, smaller landslide was observed near the northwestern property corner, just below Shady Lane Drive. These features may be the result of weak subsurface materials in conjunction with steep slopes, erosion at the base of the slope by the creek, and improper drainage.

A 6-inch diameter cast iron or steel pipe was observed at the ground surface on the adjacent lot to the north, just above the largest landslide on the site. The pipe appeared to project toward the subject site under the surface.

Faults and Seismicity: The published geologic literature does not identify any fault traces within the site boundaries. However, geologic mapping by, Dibblee, 1973, Rogers and Williams, 1974, Hart, et al, 1981, Pacific Geotechnical Engineering, 1991, and Woodard-Clyde, 1993, indicate that the Calaveras fault is about 1,300 feet to the northeast. The Coyote Creek and San

Andreas faults are mapped approximately ¾ kilometer and 22 kilometers to the southwest of the subject property, respectively.

The Calaveras and San Andreas faults are classified as active. Woodward-Clyde, 1993, stated that the Coyote Creek fault has not conclusively exhibited displacement during Holocene time. It is described as a moderately to steeply dipping reverse fault, offsetting serpentinite on the east, over Santa Clara Formation.

The study area is located in one of the most seismically active regions in the United States. These faults have repeatedly generated earthquakes in excess of magnitude 7.0. A moderate size earthquake (magnitude 5.3 to 6.5) on an adjacent segment of the northern Calaveras Fault would be expected to generate very strong to violent ground shaking at the site.

Based on our current knowledge of earthquake mechanisms, the recorded history of the Bay Area, and geologic information that has been developed about Northern California, it is reasonable to expect that the study area will experience at least one major earthquake (magnitude 6.9 to 7.5) in the next 100 years. A nearby earthquake of this magnitude will cause violent ground shaking capable of causing significant damage to residential structures and infrastructure. It is also our opinion that the site will periodically experience moderate earthquakes that will cause strong ground shaking capable of toppling unsecured objects.

Faults can cause a variety of seismic hazards based on 1) the earthquake magnitude, depth, and distance, 2) the local soil and rock conditions, and 3) the duration and type of ground movement. Primary seismic hazards include surface ruptures along a fault during an earthquake and damage produced directly from seismic shaking. Secondary seismic hazards include landslides, liquefaction, lateral spreading, lurching, settlement, and flooding caused by seismic shaking.

Landslides and Slope Stability: Our geologic review of the available literature and serial photographs identified two mapped landslides on the site and several more in the vicinity. The surface reconnaissance by our engineering geologist confirmed that two and possibly three landslides are located on the site.

Site Drainage: Drainage is by sheet flow from the eastern and western ends of the lot towards the creek crossing the central portion of the site. Slope erosion was observed in conjunction with landslides on the property.

Site Slope Stability

Analysis:

The site is has been identified as being underlain by terrestrial terrace deposits belonging to the Santa Clara Formation. This material is typified by relatively weak, poorly cemented granular material, often containing rounded clasts and clayey components. Site geotechnical data for our analysis were obtained from published strength values as referenced below.

The following is our approach and assigned parameters for the above items:

Our analysis was performed based on recommendations and procedures from the California Division of Mines and Geology Special Publication 117, *Guidelines for Analyzing and Mitigating Landslide Hazards in California,* and *Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Landslide Hazards in California,* published in June 2002. Strengths were taken from material identified as belonging to the Santa Clara Formation as published in 2000 in the *Seismic Hazard Zone Report for the East San Jose 7.5 Minute Quadrangle, Santa Clara County, California.* Our analysis used a value of phi (ø) of 21° with a cohesion (c) of 750 psf. A groundwater elevation of 15 feet below the ground surface was assumed.

Our analysis for this site, based on the referenced criteria, indicate a static factor of safety against slope instabilities on this site of 1.26 (FS=1.26) < 1.75; which is below the State of California guideline for slope stability and therefore this site as it now exists does not have the required factor of safety against slope instability.

Discussion:

In addition to being susceptible to relatively shallow landslides as observed on this and adjacent sites, stability analysis of this site indicates that the factor of safety for gross stability on this site is 1.26 and is not within the safety requirements of the State of California or the current standard of care in the geotechnical industry. The site may be developed, however site development must include provisions for improving the factor of safety against slope instability to an acceptable level.

Conclusions and Recommendations:

1. The site will probably be subjected to severe seismic shaking during the economic lifetime of the project. Hence, structural designs should employ current, acceptable design parameters.
2. The Calaveras and Coyote Creek faults are mapped approximately 1,300 feet northeast and 2,500 feet southwest of the site, respectively. They are trending generally northwest – southeast.
3. Our review of geologic maps and literature pertaining to the site vicinity, surface mapping of the site determined that the potential for faults to adversely affect the property is low to moderate. The potential for landslides to adversely affect the site is high. The potential for the secondary seismic hazard of soil creep to adversely the site is moderate to high
4. Based on our analysis, performed using XSTABL, version 5, the calculated factor of safety against slope failures on this site is 1.26 and is not within the guidelines required by state and local jurisdictions.
5. The factor of safety against slope failures may be improved to an acceptable level greater than 2.1 by using a foundation system consisting of a grid of drilled friction piers with connecting perimeter grade beams and incorporating soldier piers into the design. (See below and Figure 8)
6. Soldier piers should be placed in a row along the southeast perimeter of the grid, and at the northwest and southwest corners.
7. The soldier piers should have a minimum diameter of 30 inches. Those piers along the southeast perimeter must extend to a minimum depth of 65 feet below the ground surface.

Piers at the northwest and southwest corners must extend to a minimum depth of 50 feet below the ground surface.

8. Soldier piers along the southeast perimeter should be spaced 3 pier diameters apart as measured center to center.
9. Soldier piers on the southeast perimeter should be designed to resist shear stresses due to lateral forces in the down slope direction. For design purposes, lateral forces of 1150 kips applied over a 10 foot span for depths below 25 feet should be used.
10. Grade beams connecting the soldier piers at the southeast perimeter to the piers at the northwest and southwest corners should be designed to resist lateral loads in the down slope direction of 100 kips each. The upper connection to the grade beam and the upper 15 feet of the soldier piers at the northwest and southwest corners should be designed to accommodate lateral loads from the grade beams of 100 kips in the down slope direction.
11. Provided that the recommendations contained in this report are incorporated into the project plans and specifications, our preliminary geologic investigation of the subject site did not identify any geologic hazards that would preclude development of the site as planned. Additionally, it will be the responsibility of the owner to ensure that adverse drainage conditions do not develop and that all site slopes are properly maintained.

UBC Seismic Design Criteria

The subject site has been determined to lie approximately 0.6 kilometer from the Calaveras Fault, a type B fault, and 22 kilometers from the San Andreas Fault, an A-type fault. Based on Tables 16-R, S, and T of the 1997 UBC, and the data presented in this report, the design criteria for the proposed addition are as follows:

Seismic Zone:	4
Soil Profile Type:	S_D
Near Source Factor (N_a):	1.3
Near Source Factor (N_v):	1.6

REFERENCES

California Division of Mines and Geology, 1978, "Environmental Geologic Analysis of Diablo Range Study Area II, Southern Santa Clara County, California".

California Division of Mines and Geology, 1982 "Special Studies Zones, Mt. Sizer Quadrangle ": Revised Official Map Effective January 1, 1982.

California Division of Mines and Geology, 1997, "Guidelines for Evaluating and Mitigating Seismic Hazards in California": Special Publication 117.

Dibblee, T.W., Jr., 1973, "Geologic Map of the Mt. Sizer Quadrangle, Santa Clara County, California": U.S. Geological Survey Open file report.

Hart, E.W., 1981, "Summary Report: Fault Evaluation Program, 1979-1980 Area (Southern San Francisco Bay Region)", C.D.M.G. Open File Report OFR 81-3 SF, July 1981.

Nilsen, T.H., 1975, "Preliminary Photointerpretation Map of Landslide and Other Surficial Deposits of the Mt. Sizer 7½' Quadrangle, Santa Clara County, California"

Rogers, T. H., and Williams, J.W., 1974, "Potential Seismic Hazards in Santa Clara County, California", California Division of Mines and Geology, Special Report 107.

Santa Clara County Planning Commission, 2002, "Geologic Hazard Zones", dated August 15, 2005.

U.S. Geological Survey, 1997, "TOPO!, Interactive Maps on CD-ROM, San Francisco Bay Area", Distributed by Wildflower Productions.

U.S. Geological Survey, 1999, "Major Quake Likely to Strike Between 2000 and 2030": Fact Sheet 152-99.

Woodward-Clyde, 1993, "Summary Report, Selected Known or Reported Faults, Southern San Franciscan Bay Region", Technical report prepared for the Santa Clara Valley Water District, Project 91C-0682-R, dated December 9, 1993.

GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

1. From a geotechnical perspective, the site is suitable for the proposed construction provided the recommendations presented in this report are incorporated into the project plans and specifications. In addition, the applicable set backs, easements, and any other requirements set by the County of Santa Clara and any other governmental agencies should be followed.

General

2. The most prominent geotechnical feature affecting this site is the potential of slope instability due to the steep site gradients and the relatively weak soil material. Recommendations included above under <u>Slope Stability Analysis</u> must be included in the project design and specifications. Additionally the Soil Engineer must review all project plans and specifications and the Soil Engineer or Engineering Geologist must observe all pier drilling operations. Site drainage design and maintenance will be also important to reducing shallow slope failures in the lower portion of the southeast facing slope.

3. The new residence should be supported on a drilled friction pier and grade beam type foundation system incorporated into a soldier pier and grade beam grid. Specific foundation recommendations are provided below under <u>Foundations</u> and above under Slope Stability, <u>Conclusions and Recommendations</u>.

Site Clearing and Preparation

4. It our understanding that the new residence and garage will be supported on drilled friction piers and that no changes in site grade elevations are anticipated. A number of trees are in the footprint of the proposed structures however, and it is anticipated that some or all of those trees will be removed. Additionally, prior to pier drilling operations, the location of any possible piping or utility lines including the piping exposed on the lot to the east should be determined and abandoned or moved as required. Any possible demolition operations including tree root removal should be approved by the Soil Engineer prior to commencing grading operations. Any resulting excavations for areas to receive fill should be properly backfilled with engineered fill under the observation of the Soil Engineer.

5. Materials generated from loose/soft soils may be used as engineered fill with the approval of the Soil Engineer provided they do not contain debris.

6. Following removal of any loose and/or soft soil, the top 8 inches of exposed native ground for any areas to receive fill should be compacted to a minimum relative compaction of 90% as determined by ASTM D1557-98 Laboratory Test Procedure. After compacting the native sub-grade, the site may be brought to the desired finished grades by placing engineered fill in lifts not to exceed 8 inches in **uncompacted** thickness and compacted to the relative compaction requirements in accordance with the aforementioned test procedures.

7. All fill soils are to be placed in accordance with recommendations included under Grading Specifications below.

8. Fill must be placed at a minimum relative compaction of 90% as determined by Laboratory Test Procedure ASTM D1557-98.

Foundations

Drilled Friction Pier Foundations

9. Drilled friction piers should a have a minimum diameter of 16 inches and should extend a minimum of 12 feet into competent native material. Because of the 5 foot thickness of colluvium in the footprint of the proposed residence, pier depths of approximately 17 feet should be anticipated.

10. Piers should be designed on the basis of skin friction acting between the soil and that portion of the pier that extends below a depth of 5 feet.

11. For the soils at the subject site, an allowable skin friction value of 650 psf. can be used for combined dead and sustained live loads. This value can be increased by one third for total loads which include wind or seismic forces.

12. Friction pier spacing should be no closer than 3 pier diameters center-to center.

13. Reinforcing steel should be provided as determined by structural requirements and the project Structural Engineer. Reinforcement for friction piers should extend for the full depth of the piers.

14. The upper 5 feet of the piers should be designed to resist lateral forces in the down slope direction, equivalent to that exerted by a fluid medium with a density of 35 pcf .

15. To resist lateral forces, passive earth pressures can be assumed to act against the sides of the drilled piers. An allowable passive resistance of 325 pcf. per foot acting on a projection of 2 pier diameters of embedment against the sides of drilled piers can be used for that portion of the pier two feet or greater below the ground surface.

16. Reinforced concrete grade beams are required for the foundation perimeters. Specific recommendations for perimeter grade beams are provided above under Slope Stability, Conclusions and Recommendations. Additional grade beams that may be incorporated into the foundation design may be designed based on structural requirements and the enclosed recommendations. Reinforcing steel should be provided as necessary for structural support and continuity of pier and grade beam. The final design for reinforcing steel for the pier and grade beam should be determined by the project Structural Engineer.

17. Grade-beams should be designed to resist an uplift pressure of 2000 psf acting against the bottoms of the grade-beams and an uplift adhesion of 300 psf. acting along the upper 2 feet of the pier. Resistance to uplift is to be provided by that portion of the pier foundation extending deeper than 5 feet, and the structural loading.

18. The use of a void beneath the grade beam is not recommended as this may allow surface water to migrate below the structure.

19. Prior to placing reinforcing steel and pouring concrete, the bottoms of the pier holes should be cleaned and/or tamped. Also, care must be taken to avoid and remove any concrete spills created during the pour so that no "mushrooming" effects are allowed to remain near the top of the piers, or the bottoms of the grade beams. It is the responsibility of the contractor to ensure that this condition does not occur.

Utility Trenches

20. Applicable safety standards require that trenches in excess of 5 feet in depth must be properly shored or that the walls of the trench slope back to provide safety for installation of lines. If trench wall sloping is performed, the inclination should vary with the soil type. The underground contractor should request an opinion from the Soil Engineer as to the type of soil and the resulting inclination.

21. With respect to state-of-the-art construction or local requirements, utility lines are generally bedded with granular materials. These materials can convey surface or subsurface water beneath the structures. It is, therefore, recommended that all utility trenches which possess the potential to transport water be sealed with grout where the trench enters/exits the building perimeter. This impervious seal should extend a minimum of 2 feet away from the building perimeter and must be observed and approved by the Soil Engineer.

22. Utility trenches must be backfilled with native or approved import material and compacted to relative compaction of 90% in accordance with Laboratory Test Procedure ASTM D1557-98. Backfilling and compaction of these trenches must meet the requirements set forth by the Santa Clara County, Building and Engineering Services Department.

General Construction Requirements

23. It is important to control surface water runoff at the site. During the grading operations, observations should be made by the Soil Engineer to provide additional recommendations as dictated by the field conditions. Water must not be allowed to collect on any portion of a building pad. Additionally, concentrated water must not be allowed to flow over a slope face.

24. Liberal drainage gradients must be provided by the project Civil Engineer to remove all storm water from the downspouts and any other source.

25. Continuous roof gutters are required. Downspouts from the gutters should be provided with adequate, non-perforated pipe conduits to carry storm water away from the structures and should discharge to an approved location near the base of the slope.

GUIDELINES FOR REQUIRED SERVICES

The following list of services are the services required and must be provided by ***Pollak Engineering Co.***, during the project development. These services are presented in check list format as a convenience to those entrusted with their implementation.

The items listed are included in the body of the report in detail. This list is intended only as an outline of the required services and does not replace specific recommendations and, therefore, must be used with reference to the total report. The degree of observation and frequency of testing services would depend on the construction methods and schedule, and the item of work.

The importance of careful adherence to the report recommendations cannot be overemphasized. It should be noted, however, that this report is issued with the understanding that each step of the project development will be performed under the direct observation of ***Pollak Engineering Co.***

The use of this report by others presumes that they have verified all information and assume full responsibility for the total project.

Item Description	Required	Not Required	Not Anticipated
1. Provide foundation design parameters	X		
2. Review grading plans and specifications	X		
3. Review foundation plans and specifications	X		
4. Observe and provide recommendations regarding demolition	X		
5. Observe and provide recommendations regarding site stripping			X
6. Observe and provide recommendations on moisture conditioning, removal, and/or compaction of unsuitable existing soils			X
7. Observe and provide recommendations on the installation of sub-drain facilities(if necessary)			X
8. Observe and provide testing services on fill areas and/or imported fill materials			X
9. Review as-graded conditions and provide additional foundation recommendations, if necessary			X
10. Observe and provide compaction tests on sanitary sewers, storm drain, water lines and PG&E trenches	X		
11. Observe foundation excavations and provide supplemental recommendations, if necessary prior to placing concrete	X		
12. Observe and provide moisture conditioning recommendations for foundation areas prior to placing concrete			X
13. Provide design parameters for retaining walls			X
14. Provide geologic observations and recommendations for keyway excavations and cut slopes during grading			X
15. Excavate and recompact all geologic trenches and/or test pits			X
16. Observe installation of sub-drain behind retaining walls			X

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. It should be noted that it is the responsibility of the owner or his representative to notify ***Pollak Engineering Co.***, in writing, a minimum of two working days before any clearing, grading, or foundation excavations can commence at the site.

2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the test pits and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the development of the site, ***Pollak Engineering Co.***, will provide supplemental recommendations as dictated by the field conditions.

3. 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 contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.

5. Notwithstanding, all the foregoing applicable codes must be adhered to at all times.

APPENDIX A

Field Investigation

Location Map

Geologic Figures

Site Plan

Cross Section

Boring Logs

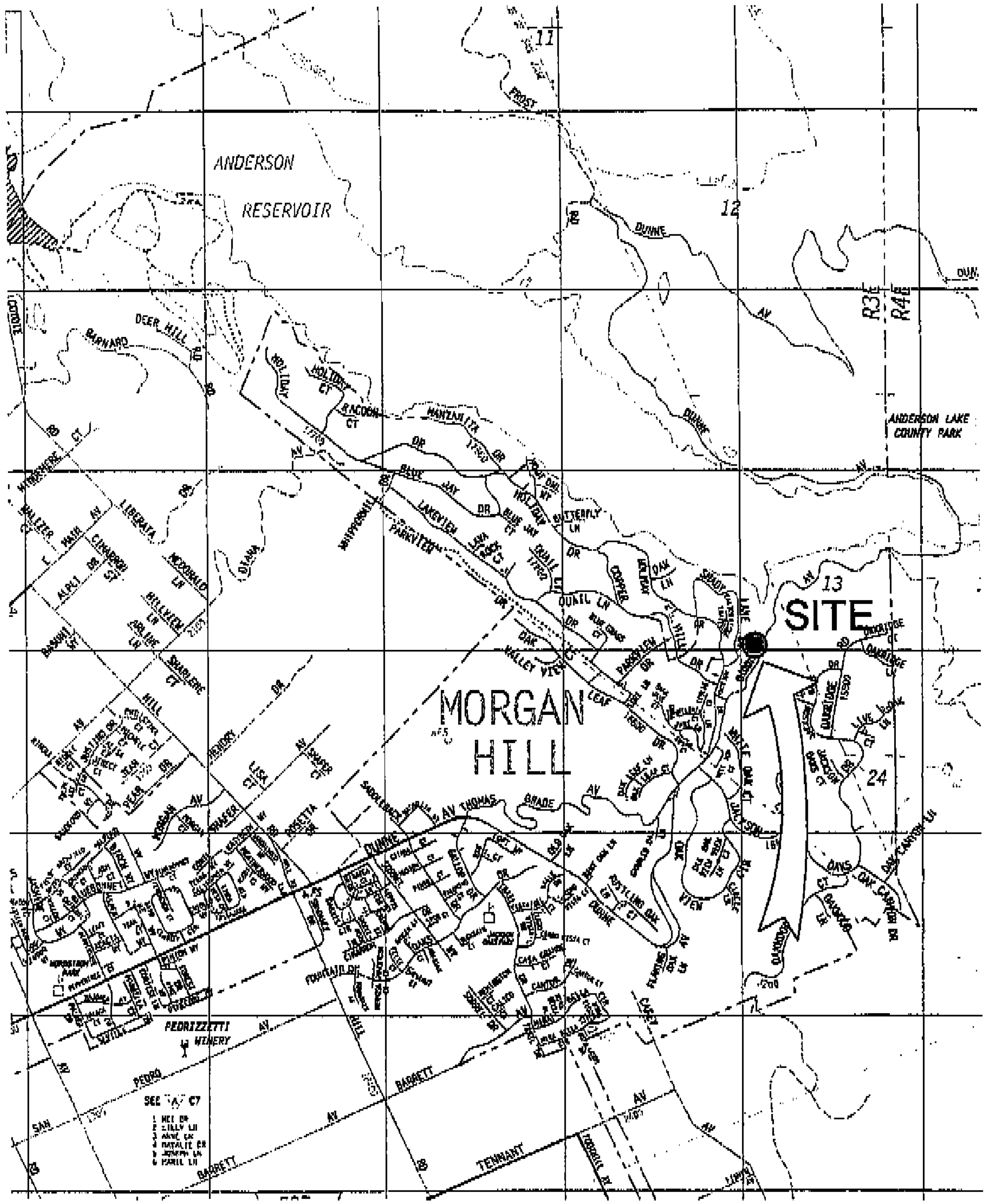
FIELD INVESTIGATION

The field investigation was performed on 27 December 2005, and included a reconnaissance of the site and the drilling of four exploratory borings at the approximate location shown on Figure 3, "Site Plan."

The borings were drilled to a maximum depth of 12 feet below the existing ground surface. The drilling was performed with a portable "Minuteman" drill rig advancing 3 inch, 2-1/2 inch O.D. Modified California split-tube sampler containing 2-inch O.D. brass liners, and 2" O.D. Standard Penetration Test split spoon sampler. The samplers were advanced into the soil at various depths under the impact of an automatic hammer using a 140 pound hammer having a free fall of 30 inches. The number of blows required to advance the *California*, and *California Modified* samplers 12 inches into the soil, after seating the sampler 6 inches, were adjusted to the standard penetration resistance (N-value).

The samples from the test borings were sealed and returned to our laboratory for testing. Classifications made in the field were verified in the laboratory after further examination and testing.

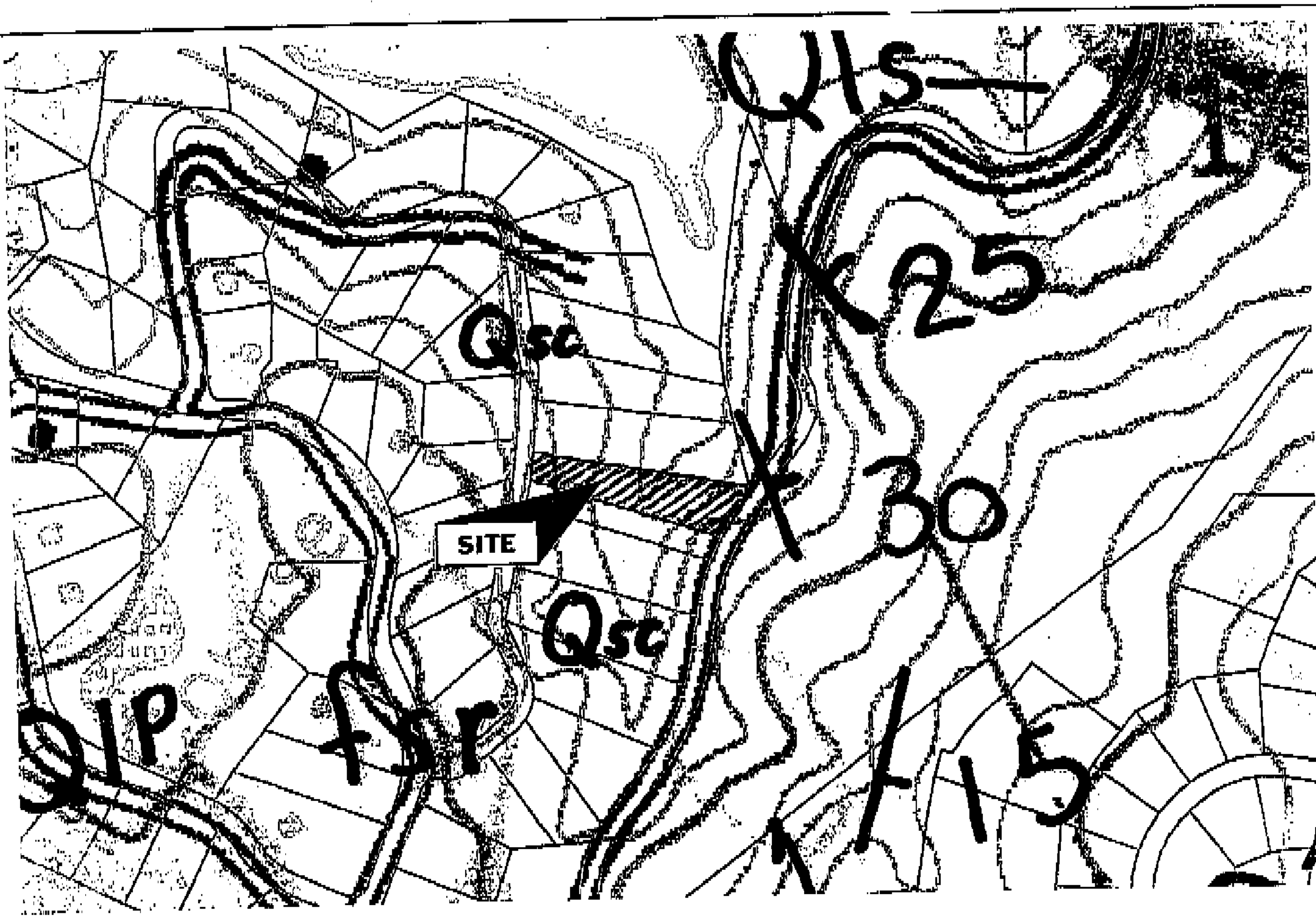
The stratification of the soils, descriptions, and location of undisturbed soil samples are shown on the respective "Logs of Test Borings" contained within this appendix.



BASE: Thomas Brothers Guide

1" = 2400'

Project No. 1038	January 2006	**Location Map** 17064 Shady Lane Drive Santa Clara County, California	FIGURE NO. 1
Pollak Engineering Co.			



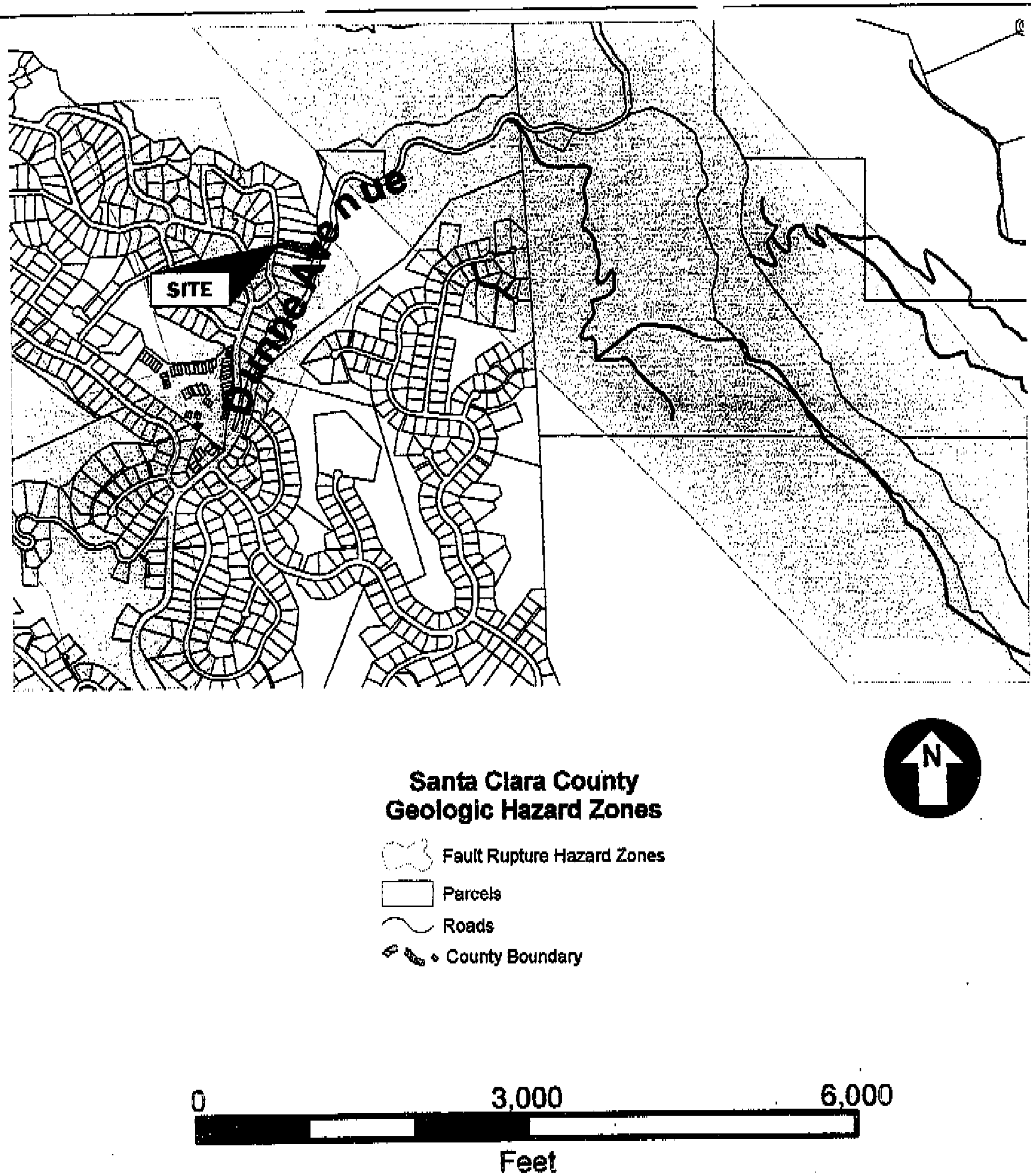
LEGEND

Qls	Landslide debris
Qlp	Landslide of serpentinite debris
Qsc	Santa Clara Formation, sand, gravel, clay
Qsb	Santa Clara Formation, gravel with basalt detritus
Fsr	Franciscan Formation, sheared shale and graywacke
30	Strike and dip of bedding

Base: Dibblee, 1973

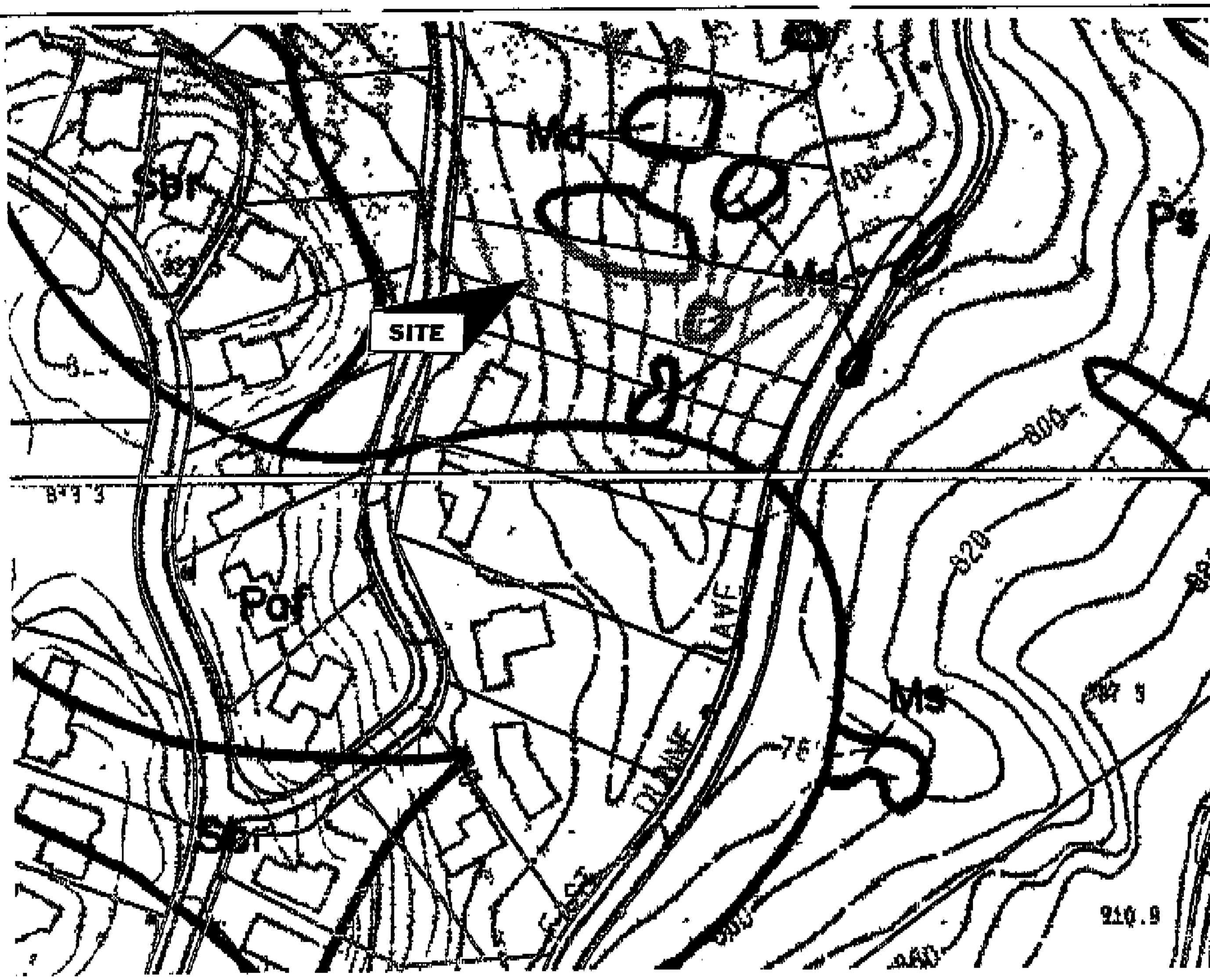
Scale: 1" ≈ 330'

Project No. 1038	January 2006	Regional Geology 17064 Shady Lane Drive Santa Clara County, California	FIGURE NO. 2
Pollak Engineering Co.			



Base: Santa Clara County Planning Office, 2005

Project No. 1038	January 2006	Fault Hazard Rupture Zones 17064 Shady Lane Drive Santa Clara County, California	FIGURE NO. 3
Pollak Engineering Co.			



LEGEND

Md Moving deep landslide

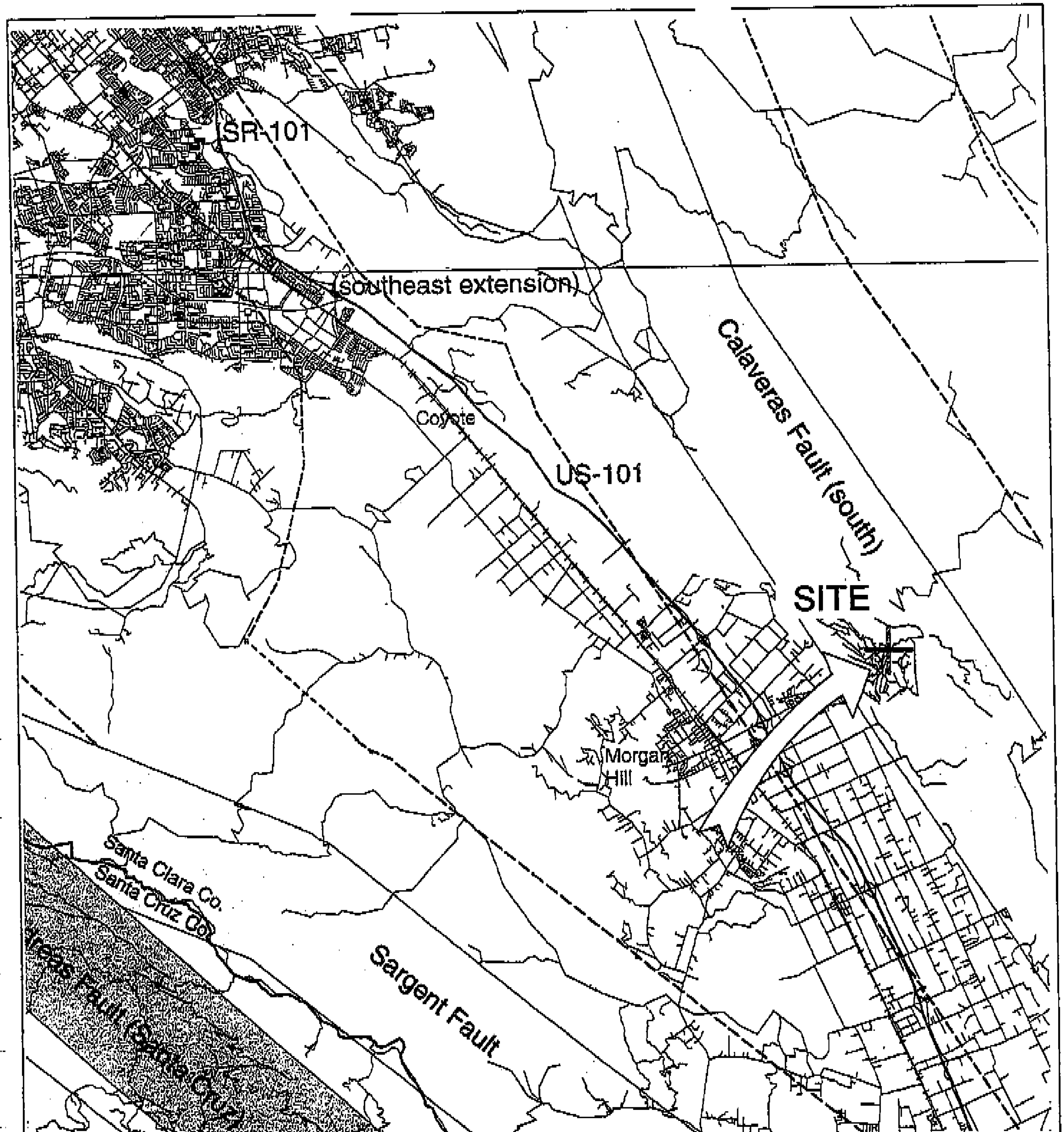
Ms Moving shallow landslide

Ps Relatively unstable surficial deposits or bedrock materials including landslide debris, colluvium, and weak bedrock

Base: Pacific Geotechnical Engineering, 1991

Scale: 1" ≈ 165'

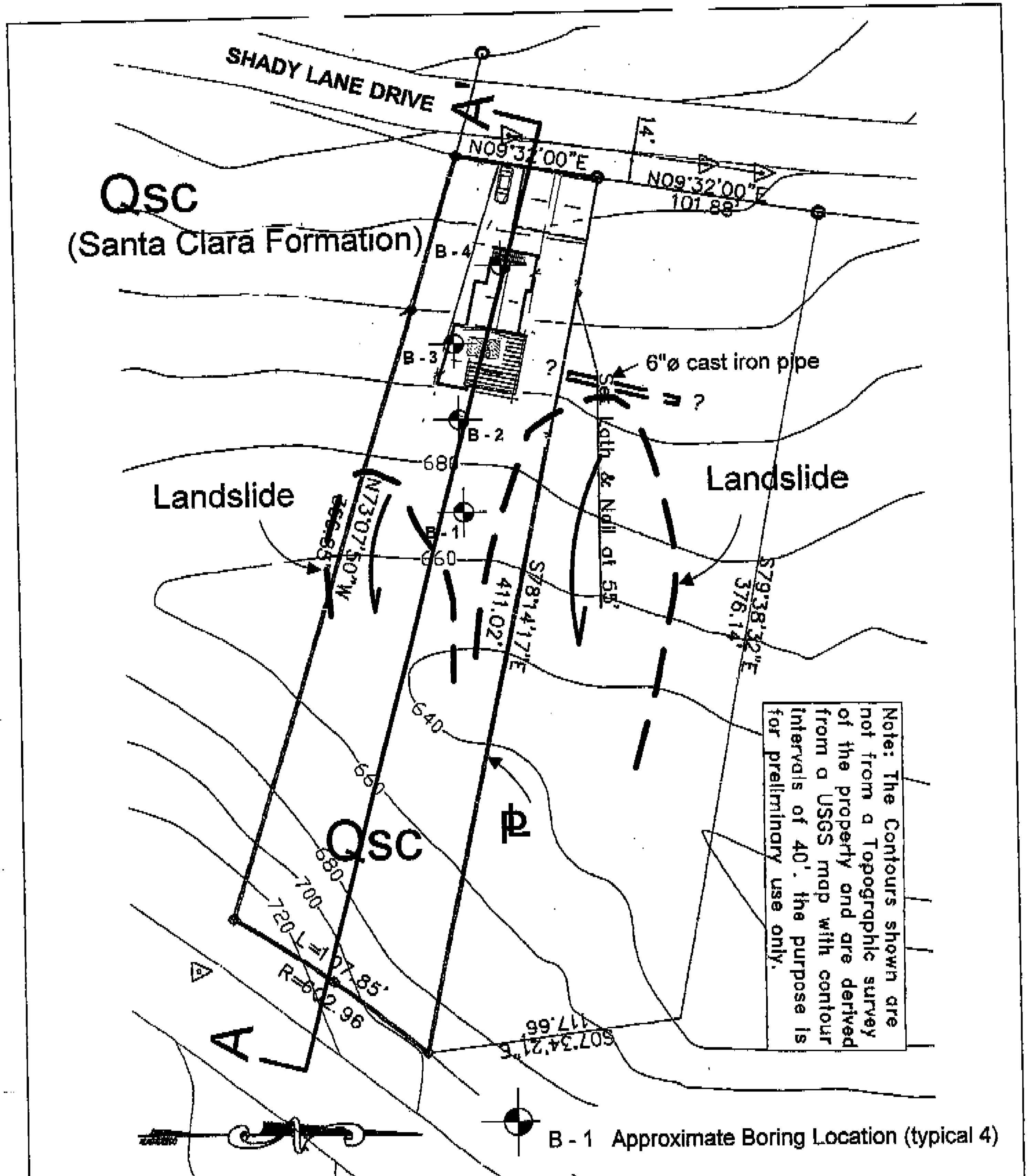
Project No. 1038	January 2006	Landslide Hazards Map	FIGURE NO. 4
Pollak Engineering Co.		17064 Shady Lane Drive Santa Clara County, California	



Type A Fault   Type B Fault   1" ~ 4km

BASE: Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada (UBC 97)

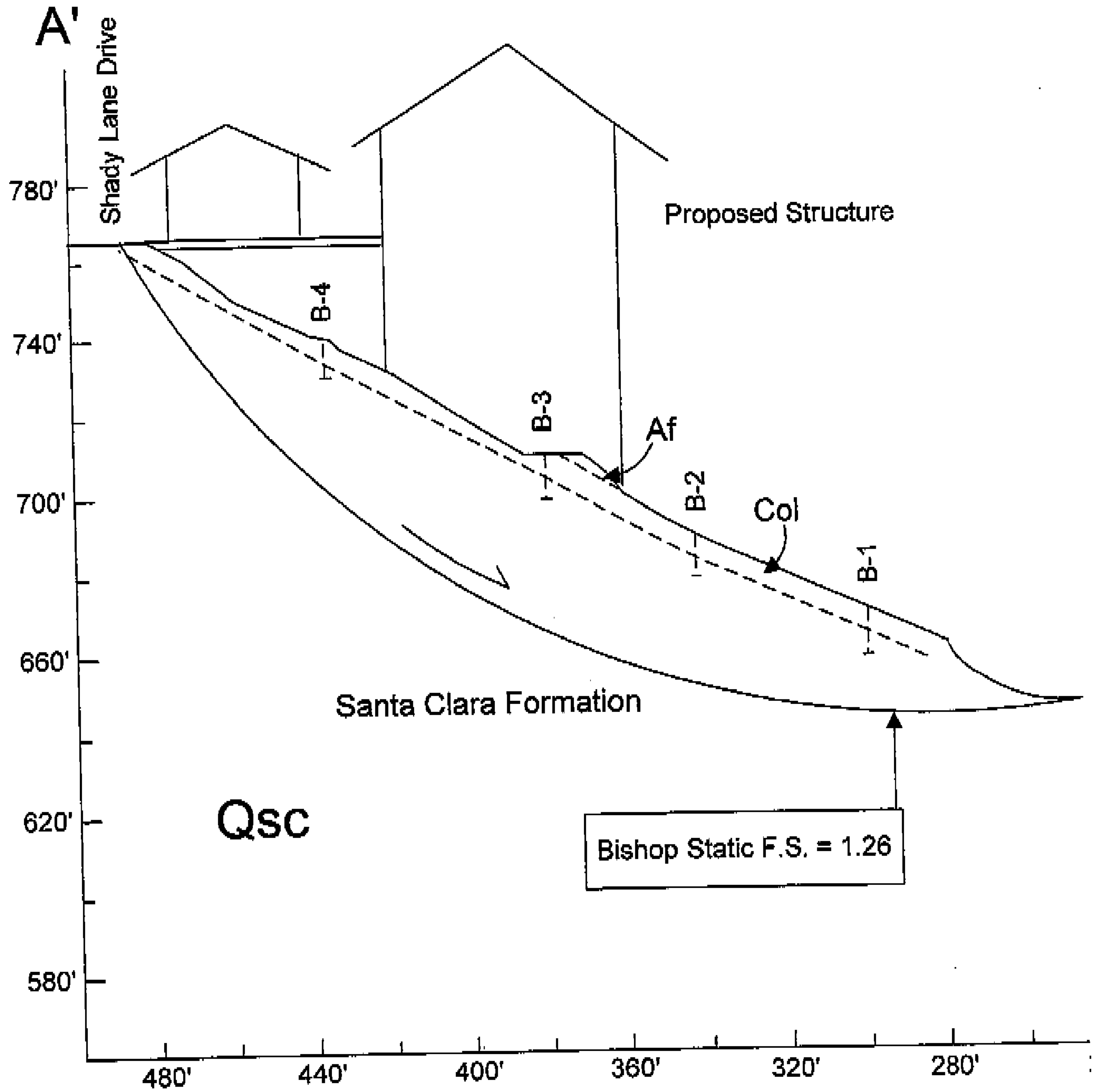
Project No. 1038	January 2006	**UBC Seismic Map** 17064 Shady Lane Drive Santa Clara County, California	FIGURE NO. 5
Pollak Engineering Co.			



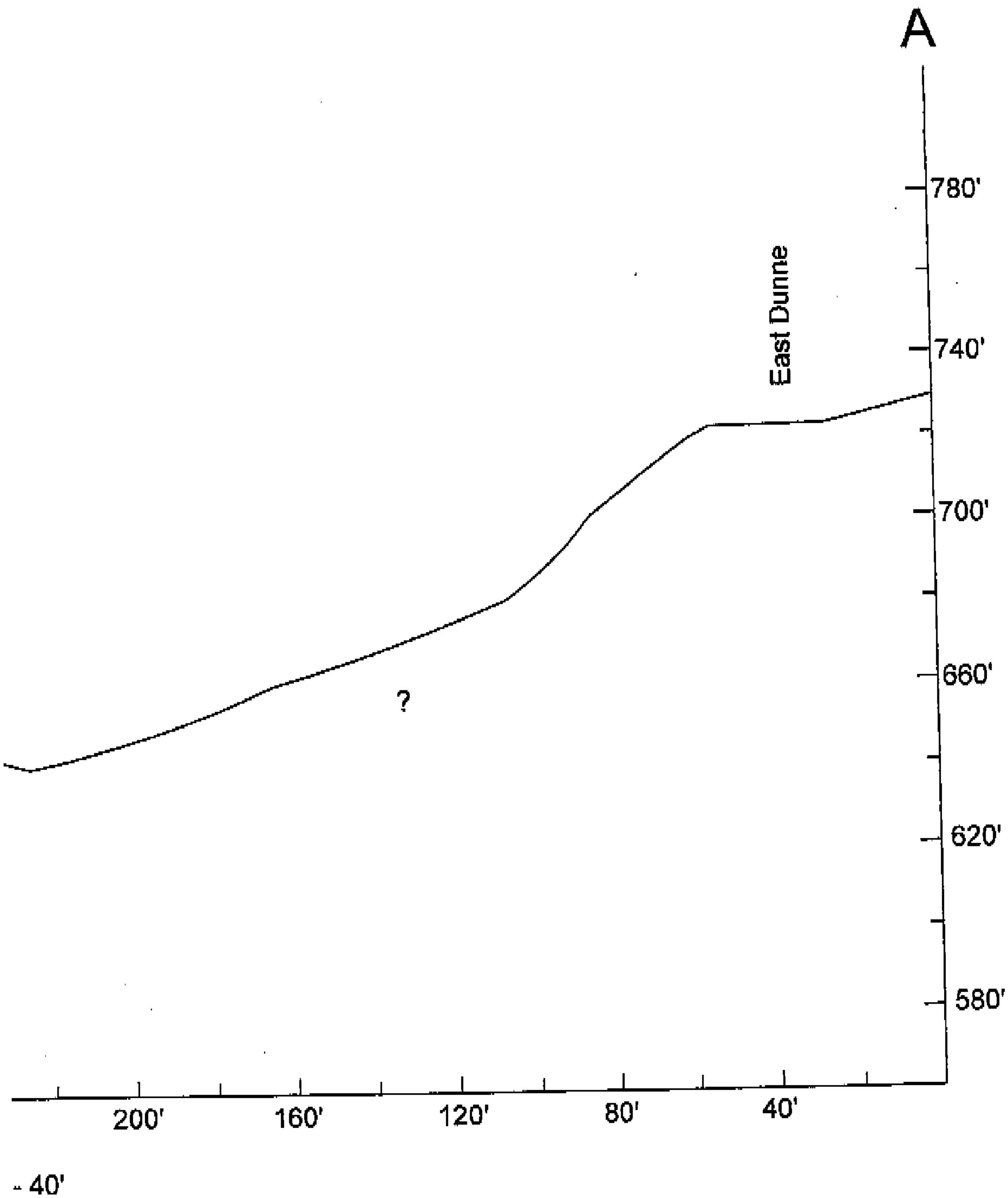
1" ~ 61'

BASE from David Kessler, Architect and from USGS Map

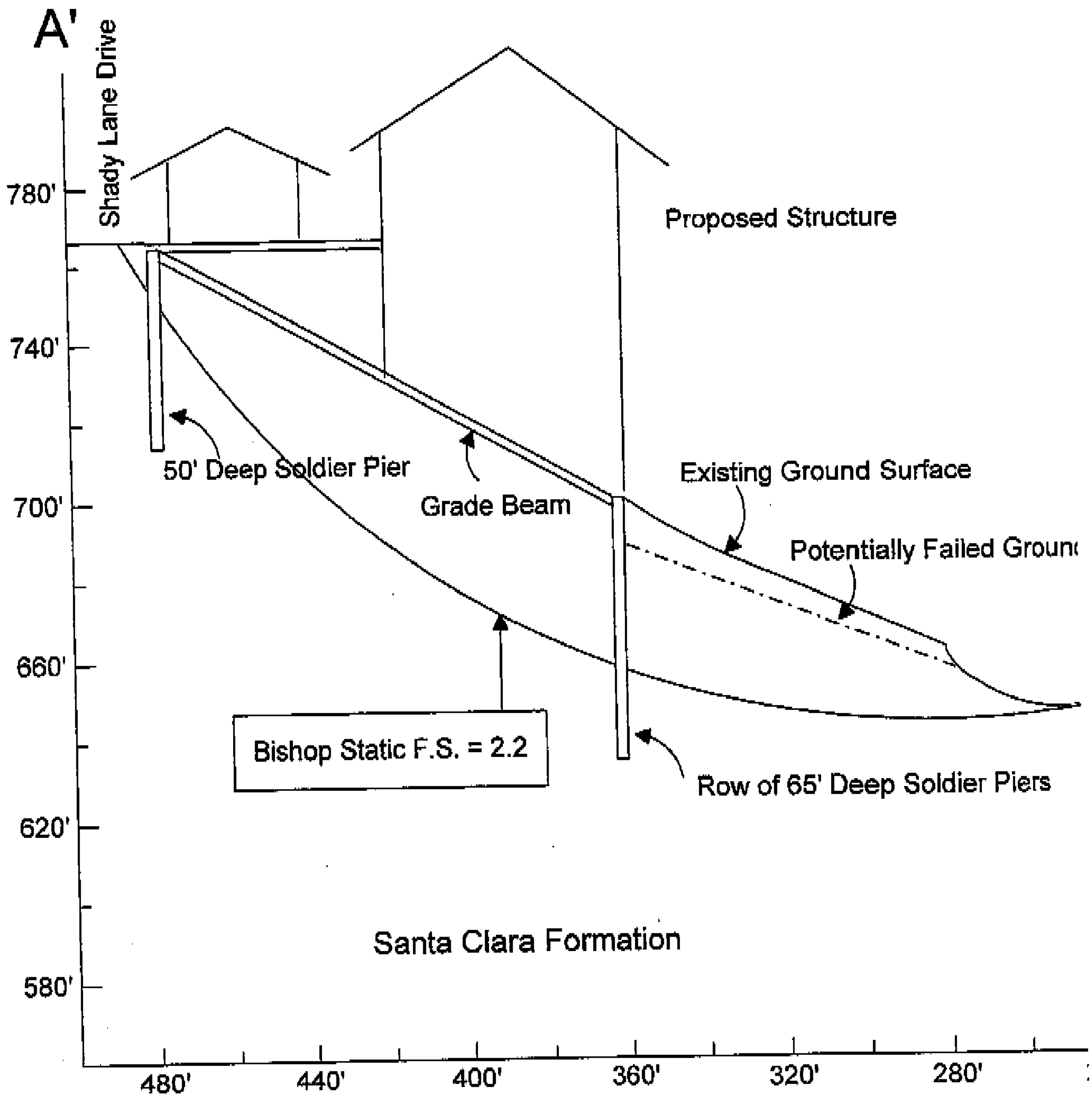
Project No. 1038	Site Plan/Geology Map	FIGURE 6
Pollak Engineering Co. Campbell, California (408) 866-6623	17064 Shady Lane Drive Santa Clara County, California	

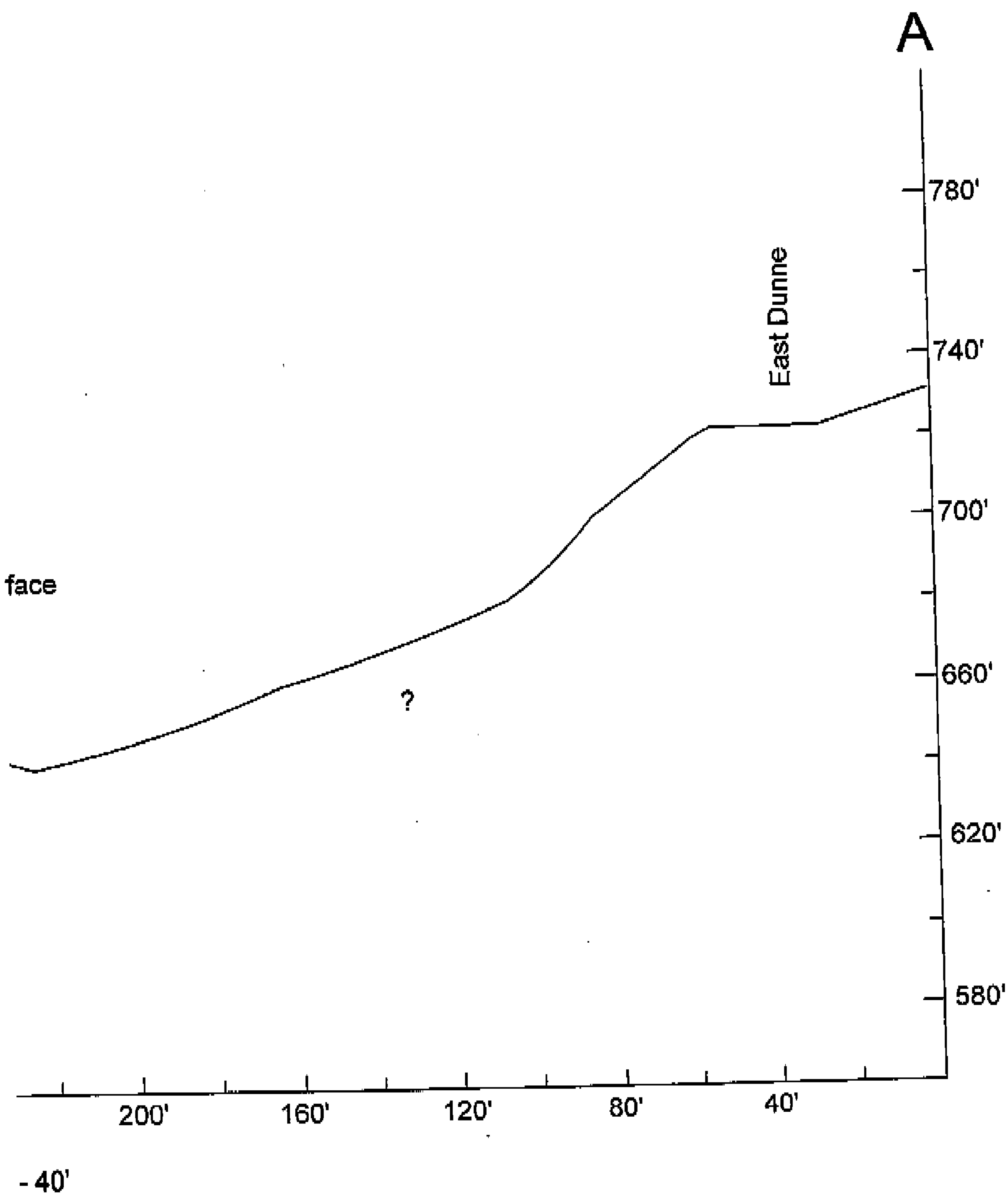


A'
Shady Lane Drive
Proposed Structure
780'
740'
700'
660'
620'
580'
B-4
B-3
B-2
B-1
Af
Col
Santa Clara Formation
Qsc
Bishop Static F.S. = 1.26
480'
440'
400'
360'
320'
280'



Project No. 1038	January 2006	**CROSS SECTION A' - A**	Figure 7
Pollak Engineering Co.		17064 Shady Lane Drive Santa Clara County, California	


A'
Shady Lane Drive
780'
740'
700'
660'
620'
580'
Proposed Structure
50' Deep Soldier Pier
Grade Beam
Existing Ground Surface
Potentially Failed Groun
Bishop Static F.S. = 2.2
Row of 65' Deep Soldier Piers
Santa Clara Formation
480'
440'
400'
360'
320'
280'



Project No. 1038	January 2006	**Proposed Soldier Piers**	Figure 8
Pollak Engineering Co.		17064 Shady Lane Drive Santa Clara County, California	

LOGGED BY RJP   DATE DRILLED 27 December 2005   BORING DIAMETER 3"   BORING NO. B-1

Depth, ft.	Sample No. and Type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	Qu - tsf Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
			Medium to dark brown Sandy CLAY; moist, soft, some gravel (topsoil)	CL	5 11				
	■		Orange brown Sandy CLAY/Clayey SAND; moist, stiff, some gravel (col.)	CL / SC	10 17		98.7	10.3	
5			Orange mottled light brown Clayey SAND; moist, medium dense	SC	21 26				
	■ ■		Weathered orangish brown Clayey SANDSTONE; damp		22 47		111.6 116.8	8.8 13.9	
			Orange brown Clayey SILTSTONE		35				
			Medium brown SANDSTONE; damp		67				
10			Terminated @ 10 ft. No G.W.						
15									
20									
25									
30									

Pollak Engineering Co.   **PROJECT NO. 1038**   **FIGURE NO. 9**

LOGGED BY RJP DATE DRILLED 27 December 2005 BORING DIAMETER 3" BORING NO. B-2

Depth, ft.	Sample No. and Type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	Qu - tsf Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
			Orange brown Sandy CLAY/Clayey SAND; moist, stiff, some gravel (col.)	CL / SC	4				
					8				
					10				
					22				
	■				28		105.4	14.8	LL = 42 PI = 24
5					32				
	■		Reddish Orange CLAYSTONE, moist		18		104.2	18.1	
	■		Orange Sandy CLAYSTONE; damp		37		115.7	12.7	
					23				
			Orange and Green mottled Clayey SANDSTONE; damp		59				
10					101				
			Refusal @ 11 ft. No G.W.						
15									
20									
25									
30									

Pollak Engineering Co. **PROJECT NO. 1038** **FIGURE NO. 10**

LOGGED BY RJP DATE DRILLED 27 December 2005 BORING DIAMETER 3" BORING NO. B-3

Depth, ft.	Sample No. and Type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	Qu - tsf Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
			Medium brown Sandy CLAY; moist, soft, some gravel (topsoil)	CL	4 5				
			Orange brown Sandy CLAY; moist, firm, some gravel (col.)	CL	6 13				
5	■		Medium brown Clayey SAND; moist, firm, some gravel (col.)	SC	18 25		100.3	10.5	
	■		Orange brown SANDSTONE; damp		34 63 51 97 >100		107.2	8.6	
10									
			Refusal @ 11 ft. No G.W.						
15									
20									
25									
30									

Pollak Engineering Co. | PROJECT NO. 1038 | FIGURE NO. 11

LOGGED BY RJP DATE DRILLED 27 December 2005 BORING DIAMETER 3" BORING NO. B-4

Depth, ft.	Sample No. and Type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	Qu - tsf Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
			Medium brown Sandy CLAY; moist, soft, some gravel (topsoil)	CL	2				
					5				
			Orange brown Sandy CLAY; moist, firm, some gravel (col.)	CL	7				
					8				
					12				
5							109.6	9.4	
			Orange brown and tannish brown SANDSTONE; damp		25				
					29				
					54				
							105.8	9.8	
					39				
					48				
10					49				
					81				
			Terminated @ 12 ft. No G.W.						
15									
20									
25									
30									

Pollak Engineering Co. | PROJECT NO. 1038 | FIGURE NO. 12

APPENDIX B

Laboratory Investigation

Summary of Laboratory Test Results

LABORATORY INVESTIGATION

The laboratory testing program was directed towards providing sufficient information for the determination of the engineering characteristics of the site soils so that the recommendations outlined in this report could be formulated.

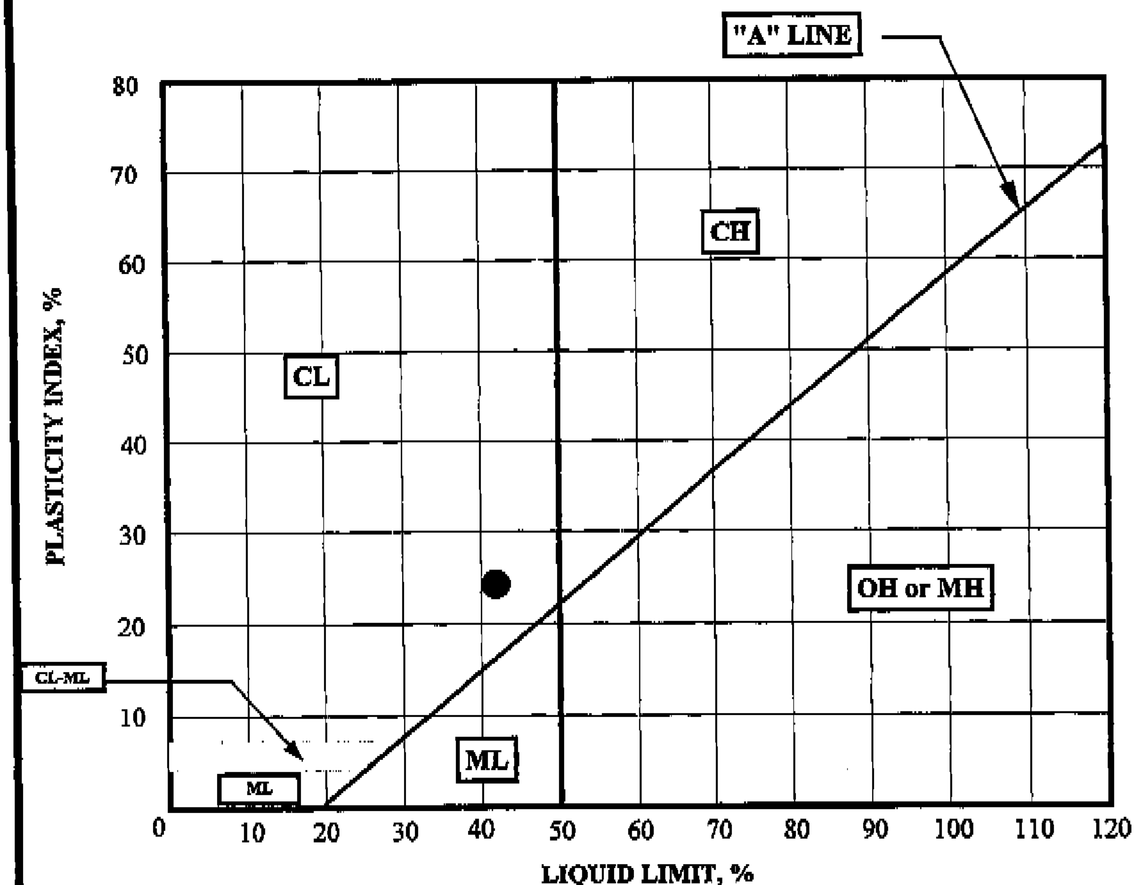
Moisture content and dry density tests (ASTM D2937-83) were performed on representative relatively undisturbed soil samples in order to determine the consistency of the soil and the moisture variation throughout the explored soil profile as well as estimate the compressibility of the underlying soils.

The strength parameters of the foundation soils were determined from blow counts taken during our field investigation and were confirmed by penetrometer readings from relatively undisturbed soil samples.

A summary of all laboratory test results is presented in this appendix and on the respective "Logs of Borings", Appendix A.

Summary of Laboratory Test Results

				Atterberg Limits	
Sample No.	Depth (ft.)	Dry Density (pcf.)	Moisture Content (% Dry Wt.)	Liquid Limit (%)	Plasticity Index
1-1	3	98.7	10.3		
1-2	6	111.6	8.8		
1-3	7½	116.8	13.9		
2-1	4	105.4	14.8	42	24
2-2	5½	104.2	18.1		
2-3	7	115.7	12.7		
3-1	5	100.3	10.5		
3-2	7	107.2	8.6		
4-1	5	109.6	9.4		
4.2	7	105.8	9.8		



KEY SYMBOL	BORING NUMBER	DEPTH FEET	NATURAL MOISTURE CONTENT, %	PLASTIC LIMIT, PL, %	LIQUID LIMIT, LL, %	PLAST. INDEX, PI, %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
●	B-2	4.0	14.8	18	42	24	0.00	CL

Pollak Engineering Co.
Campbell, California
(408) 866-6623

PLASTICITY CHART AND DATA

Proposed New Residence
17064 Shady Lane Drive, Santa Clara County

PROJECT	DATE	FIGURE	PAGE
1038	1/9/2006	13	1 of 1

APPENDIX C

<u>The Grading Specifications</u>

THE GRADING SPECIFICATIONS
for
Proposed New Residence
at 17064 Shady Lane Drive
Santa Clara County, California

1. General Description

1.1 These specifications have been prepared for the grading and site development of the subject project. ***Pollak Engineering Co.***, hereinafter described as the Soil Engineer, should be consulted prior to any site work connected with site development to ensure compliance with these specifications.

1.2 The Soil Engineer should be notified at least two working days prior to any site clearing or grading operations on the property in order to observe the stripping of organically contaminated material and to coordinate the work with the grading contractor in the field.

1.3 This item shall consist of all clearing or grubbing, preparation of land to be filled, filling of the land, spreading, compaction and control of fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades, and slopes as shown on the accepted plans. The Soil Engineer is not responsible for determining line, grade elevations, or slope gradients. The property owner, or his representative, shall designate the person or organizations who will be responsible for these items of work.

1.4 The contents of these specifications shall be integrated with the soil report of which they are a part, therefore, they shall not be used as a self-contained document.

2. Tests

The standard test used to define maximum densities of all compaction work shall be the ASTM D1557-98 Laboratory Test Procedure. All densities shall be expressed as a relative compaction in terms of the maximum dry density obtained in the laboratory by the foregoing standard procedure.

3. Clearing, Grubbing, and Preparing Areas To Be Filled

3.1 All vegetable matter, trees, root systems, shrubs, debris, and organic topsoil shall be removed from all structural areas and areas to receive fill. The depth or organic topsoil to be removed will be determined in the field by the Soil Engineer but, in general, will be on the order of 4 to 6 inches.

3.2 Any soil deemed soft or unsuitable by the Soil Engineer shall be removed. Any existing debris or excessively wet soils shall be excavated and removed as required by the Soil Engineer during grading.

If any underground structures are discovered during stripping and grading operations such as old foundations, abandoned pipe lines, septic tanks, and leach fields, they shall be removed from the site.

3.4 The final stripped excavation shall be approved by the Soil Engineer during construction and before further grading is started.

3.5 After the site has been cleared, stripped, excavated to the surface designated to receive fill, and scarified, it shall be disked or bladed until it is uniform and free from large clods. The native sub-grade soils shall be moisture conditioned and compacted to the requirements as specified in the grading section of this report. Fill can then be placed to provide the desired finished grades. The contractor shall obtain the Soil Engineer's approval of sub-grade compaction before any fill is placed.

4. Materials

4.1 All fill material shall be approved by the Soil Engineer. The material shall be a soil or soil-rock mixture which is free from organic matter or other deleterious substances. The fill material shall not contain rocks or lumps over 6 inches in greatest dimension and not more than 15% larger than 2-1/2 inches. Materials from the site below the stripping depth are suitable for use in fills provided the above requirements are met.

4.2 Materials existing on the site are suitable for use as compacted engineered fill after the removal of all debris and organic material. All fill soils shall be approved by the Soil Engineer in the field.

4.3 Should import material be required, it must meet the requirements as specified in the body of this report prior to transporting it to the project.

5. Placing, Spreading, and Compacting Fill Material

5.1 The fill materials shall be placed in uniform lifts of not more than 8 inches in uncompacted thickness. Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to obtain uniformity of material in each layer. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either (a) aerating the material if it is too wet, or (b) spraying the material with water if it is too dry.

5.2 After each layer has been placed, mixed, and spread evenly, either import material or native material shall be compacted to a relative compaction of 90% at 3% above optimum moisture content as determined by ASTM D1557-98 Laboratory Test Procedure.

5.3 Compaction shall be by footed rollers or other types of acceptable compacting rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to ensure that the required density has been obtained. No ponding or jetting shall be permitted.

5.4 Field density tests shall be made in each compacted layer by the Soil Engineer in accordance with Laboratory Test Procedure ASTM D2922-98 and D3017-88. When footed rollers are used for compaction, the density tests shall be taken in the compacted material below the surface disturbed by the roller. When these tests indicate that the compaction requirements on any layer of fill, or portion thereof, has not been met, the particular layer, or portion thereof, shall be reworked until the compaction requirements have been met.

5.5 No soil shall be placed or compacted during periods of rain nor on ground which contains free water. Soil which has been soaked and wetted by rain or any other cause shall not be compacted until completely drained and until the moisture content is within the limits hereinbefore described or approved by the Soil Engineer. Approval by the Soil Engineer shall be obtained prior to continuing the grading operations.

6. Graded Slopes

6.1 Cut and fill slopes shall be graded at a gradient no steeper than 2:1 (horizontal to vertical). Slope rounding is required on all cut slopes.

6.2 Grading shall be performed in such a manner as to prevent water from flowing directly over the top of any slope. No slope shall be left to stand through a winter season without erosion control measures being provided.

7.1 Sub-drain Installation

7.1 Provide and install perforated PVC pipes or perforated metal pipe and filter material for sub-drains, as shown on the grading plans or as directed by the Soil Engineer and as specified in Section 68 of the Standard Specifications of the State of California, Department of Transportation, current edition, except as modified in the following paragraphs.

7.2 Clay drain tile, concrete drain tile, perforated clay pipe, porous concrete pipe, perforated asbestos-cement pipe, and perforated bituminous fibre pipe will not be permitted.

7.3 Perforated PVC pipe will not be permitted in locations where the subgrade soils are compressible or where the depth of overburden or engineered fill soils exceed 10 feet. In any event, use of these materials will be permitted only upon authorization of the Soil Engineer.

7.4 The following alternate materials will be allowed for permeable filter material:

Use Class II material as specified in Section 68-1.025 of the Standard Specifications of the State of California.

Use a ¾-inch minus concrete mix type aggregate filter material.

Delete requirements of State Specifications for quality testing using Los Angeles rattler or sand equivalent tests.

7.5 Unless directed otherwise, use pipes no less than 4 inches in diameter for laterals up to 100 feet in length. Use pipes of no less than 6 inches in diameter for laterals greater than 100 feet in length. The use of wyes, elbows, tees, cleanouts, or other pipe fittings shall be allowed at the discretion of the Soil Engineer based on field conditions.

7.6 Non-perforated PVC or perforated metal pipe shall be used at the outlet of all subdrains at the toe of engineered fill slopes and at other locations when required by the Soil Engineer. Compacted engineered trench backfill using native soils may be required by the Soil Engineer in lieu of permeable material in locations where non-perforated pipe is specified.

7.7 The subdrain trench width shall be not less than one foot plus outside diameter of pipe. The gradient of the pipe shall be not less than 2.0%. The pipe shall be bedded on 6 inches of filter materials and installed at such depth that not less than 2 feet of filter material exists over the pipe. Greater depth may be required by the Soil Engineer.

8. Pavement

8.1 The proposed subgrade under pavement sections, native soil, and/or fill shall be compacted to a minimum relative compaction of 95% at a moisture content slightly above optimum for a depth of 6 inches.

8.2 All aggregate base material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM Test Procedure D1557-98. The construction of the pavement in the parking and traffic areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California and/or County of Santa Clara, Building and Engineering Services Department.

9. Utility Trench Backfill

9.1 The utility trenches extending under concrete slabs-on-grade shall be backfilled with native on-site soils or approved import materials and compacted to the requirements pertaining to the adjacent soil. No ponding or jetting will be permitted.

9.2 Utility trenches extending under all pavement areas shall be backfilled with native or approved import material and properly compacted to meet the requirements set forth by the Santa Clara County, Building and Engineering Services Department.*

*NOTE: Requirements of County to be added.

9.3 Where any opening is made under or through the perimeter foundations for such items as utility lines and trenches, the openings must be resealed so that they are watertight to prevent the possible entrance of outside irrigation or rain water into the underneath portion of the structures.

10. Unusual Conditions

In the event that any unusual conditions not covered by the special provisions are encountered during the grading operations, the Soil Engineer shall be immediately notified for additional recommendations.

GEOTECHNICAL UPDATE &
SUPPLEMENTAL RECOMMENDATIONS
For
PROPOSED NEW RESIDENCE
17064 Shady Lane
Santa Clara County, California
for
MR. BRYAN HANSON

By

Pollak Engineering, Inc.

Project No. 1038
17 October 2008

POLLAK ENGINEERING, INC.

Project No. 1038
17 October 2008

Mr. Bryan Hanson
[redacted]

Subject: Proposed New Residence
17064 Shady Lane
Santa Clara County, California
GEOTECHNICAL UPDATE &
SUPPLEMENTAL RECOMMENDATIONS

References:
1) Geologic & Geotechnical Investigation
By *Pollak Engineering Co.*
Dated 9 January 2006
2) Proposed Architectural Plans; Shts. A2.00, A3.00 &A6.00
Supplied by Owner
Shts. A2.00 & A3.00 dated 13 September 2008
Sht. A6.00 dated 14 September 2008

Dear Mr. Hanson:

In accordance with your authorization, ***Pollak Engineering, Inc.*** has conducted a supplementary sub-surface investigation and geotechnical update of the subject property, located at 17064 Shady Lane, in the County of Santa Clara, California. The purpose of the supplementary investigation and geotechnical update was to extend the sub-surface investigation beyond the depths obtained in the referenced report and to provide geotechnical design parameters for the new building design. The accompanying report presents our conclusions and recommendations based on our boring, the referenced report and the proposed architectural plans. Our findings indicate that the site is suitable for the proposed construction from a geological and geotechnical perspective, provided the recommendations contained in this update report are carefully followed and are incorporated into the project plans and specifications. In addition, the applicable setbacks, easements, and requirements set by the County of Santa Clara and any other governmental agencies should be followed.

Should you have any questions relating to the contents of this report or should you require additional information, please do not hesitate to contact our office at your convenience.

REGISTERED GEOLOGIST
LAWRENCE D. PAVLAK
No 1187
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. POLLAK
No. 61831
Exp. 6-30-09
CIVIL
STATE OF CALIFORNIA

Very truly yours,
Pollak Engineering, Inc.

Lawrence D. Pavlak

Lawrence D. Pavlak, C.E.G.
Engineering Geologist

Robert J. Pollak

Robert Pollak, P.E.
Principal Engineer

Copies: 4 to Addressee

Geotechnical Engineering

Engineering Geology

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Los Gatos, CA 95030

Phone: 408-354-0420
Fax: 408-354-0408

GEOTECHNICAL UPDATE & SUPPLEMENTAL RECOMMENDATIONS

Purpose and Scope

This report presents the Geotechnical Update recommendations for a proposed new residence and associated improvements to be located at 17064 Shady Lane, in the County of Santa Clara, California. The purpose of this update report was to re-evaluate the site slope stability based on new data from the supplementary boring and to establish geotechnical recommendations for the new building design. The enclosed geotechnical recommendations are based on the referenced Geologic & Geotechnical Report, the referenced Architectural drawings, and our supplementary boring.

Due to limited site access and the site surface gradients, slope stability analysis performed in the referenced Geologic & Geotechnical Report was based on shallow borings advanced with "Minuteman" portable drilling equipment that could not practicably drill to the depths desired. The near surface material encountered in the shallow borings was consistent with Santa Clara Formation as mapped; however the supplementary boring, drilled on 30 September 2008 confirmed that Santa Clara Formation material is overlaying Franciscan Melange at shallow depths, and that no groundwater or wet zones were encountered to the depths explored.

Our geotechnical update included:

a. A field reconnaissance by the Soil Engineer;
b. Drilling of a supplementary boring;
c. Review of the referenced Report and Architectural Plans;
d. Engineering analysis of the field investigations; and
e. Preparation of these supplemental Recommendations

Proposed Construction

The proposed improvements are understood to consist of a two-story residence equipped with a "daylight" basement (three floors total), a detached garage and associated improvements. It is anticipated that the new residence will be of wood framed construction and that the basement will utilize concrete slab-on-grade construction. The basement retaining walls will vary in height from full height of 31 feet on the west (inboard from the slope face) side of the structure to zero height for the east side where the basement daylights to the slope at foundation level. Based on the referenced architectural drawings, the design basement retaining walls will also support the upper two stories.

The proposed garage pad and driveway are of cut and fill design with retained fill soil for the outboard perimeter of the garage and driveway, and retaining walls of variable height for the excavated inboard walls.

Actual building loads are not known, however light loads typical of this type of residential construction are anticipated.

CBC Seismic Design Criteria

The subject site has been determined to lie approximately 0.6 kilometer from the Calaveras Fault, a type B fault, and 22 kilometers from the San Andreas Fault, an A-type fault. Based on the Java Motion Parameter Calculator software, version 5.0.7 supplied by the USGS in accordance with 2007 CBC (2006 IBC) requirements, latitude and longitude from *Google Earth*, and the data presented in this report, the design criteria for the proposed residence are as follows:

Latitude		37.149°
Longitude		-121.592°
Seismic Zone:		4
Soil Profile Type:		S_C
Spectral Accelerations	S_S	1.771
	S_1	0.780
Site Coefficients	Fa	1.0
	Fv	1.3
Short Period (0.2sec) Spectral Design Acceleration	SD_S	1.181
One Second Period Spectral Design Acceleration	SD1	0.520
Occupancy Category		II
Seismic Design Category*		E

Site Slope Stability

The site is has been identified as being underlain by a thin mantle of terrestrial terrace deposits belonging to the Santa Clara Formation, overlying bedrock material identified as Franciscan Melange. Santa Clara Formation material is typified by relatively weak, poorly cemented granular material, and localized failures of this material occur on this and adjoining lots; however Franciscan Melange has greater strength and is known to be less susceptible to slope failures. Site geotechnical data for our analysis were obtained from published strength values as referenced below.

The following is our approach and assigned parameters for the above items:

Our analysis was performed based on recommendations and procedures from the California Division of Mines and Geology Special Publication 117, *Guidelines for Analyzing and Mitigating Landslide Hazards in California,* and *Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Landslide Hazards in California*, published in June 2004. Strengths were taken from material identified as belonging to the Santa Clara Formation and to Franciscan Melange as published in 2000 in the *Seismic Hazard Zone Report for the Morgan Hill 7.5 Minute Quadrangle, Santa Clara County, California,* 2004. Our analysis used a value of phi (ø) of 21° with a cohesion (c) of 550 psf. for Santa Clara Formation material, and a phi (ø) of 28° with a cohesion (c) of 750 psf for Franciscan Melange. Our borings encountered neither water nor moist zones.

Our analysis for this site, based on the referenced criteria, indicate a static factor of safety against slope instabilities on this site of 1.88 (FS=1.99) > 1.75; which satisfies the State of California guideline for slope stability and therefore no further analysis is required.

Discussion:

The site is susceptible to relatively shallow landslides as observed on this and adjacent sites; however stability analysis of this site indicates that the factor of safety for gross stability on this site is 1.99 and is within the safety requirements of the State of California or the current standard of care in the geotechnical industry.

Conclusions and Recommendations:

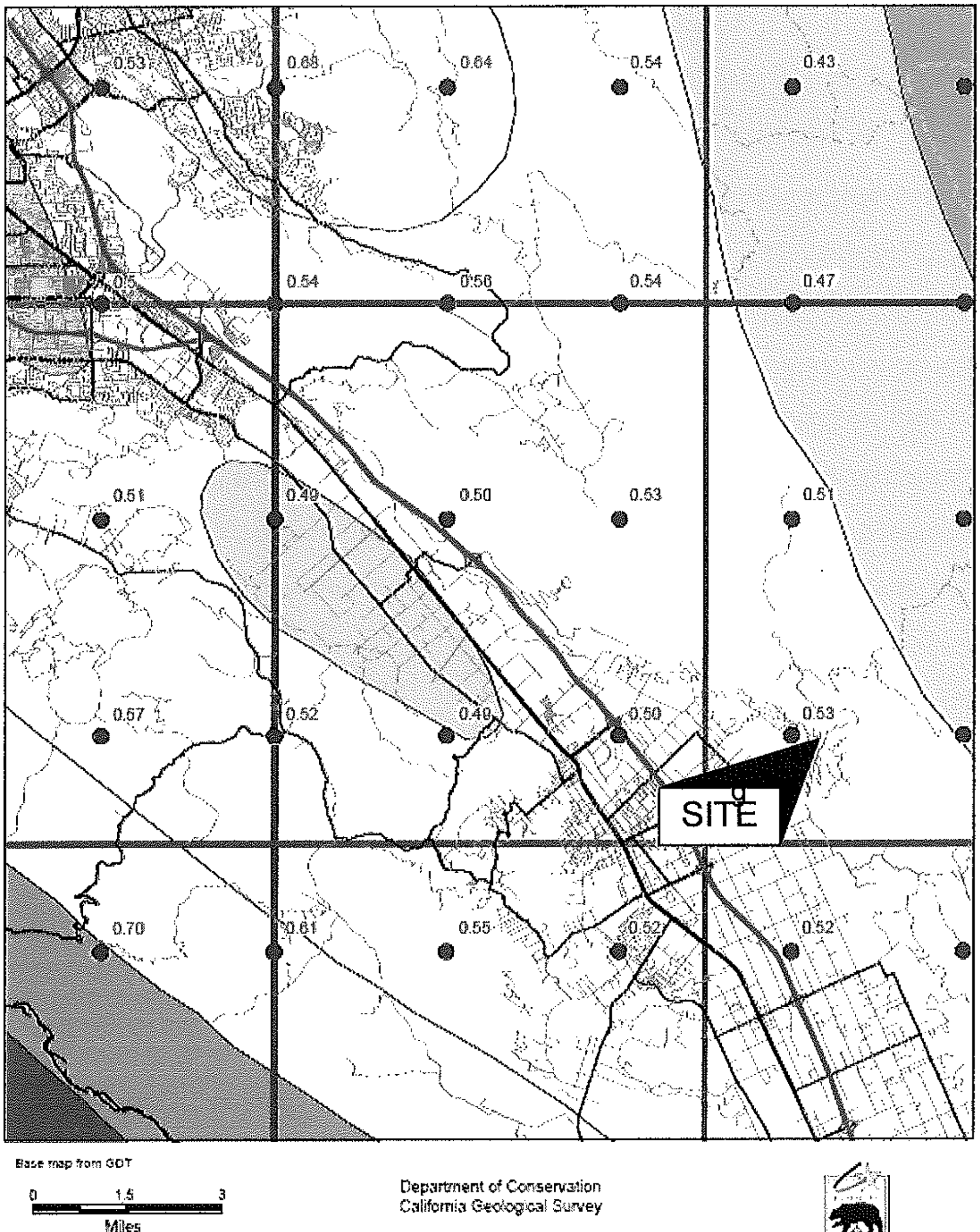
1. Based on our analysis, performed using XSTABL, version 5, the subject site passes the static screening analysis and no further analysis is required.
2. This analysis addresses the local gross site stability only and is not meant to serve any other purpose beyond that analysis.
3. The project engineering geologist should observe all excavations and provide additional recommendations if necessary.
4. The site will probably be subjected to severe seismic shaking during the design lifetime of the project. Hence, structural designs should employ current, acceptable design parameters.
5. The site is susceptible to shallow, nuisance landslides; however the proposed building configuration will remove the unstable material in the area of the building footprint and will improve overall site stability.
6. Provided that the recommendations contained in this report are incorporated into the project plans and specifications, our preliminary geologic investigation of the subject site did not identify any geologic hazards that would preclude development of the site as planned. Additionally, it will be the responsibility of the owner to ensure that adverse drainage conditions do not develop and that all site slopes are properly maintained.

MORGAN HILL 7.5-MINUTE QUADRANGLE AND PORTIONS OF ADJACENT QUADRANGLES

10% EXCEEDANCE IN 50 YEARS PEAK GROUND ACCELERATION (g)

1998

FIRM ROCK CONDITIONS



Department of Conservation
California Geological Survey

Figure 3.1

Project No. 1038	October 2008	Seismic Acceleration 17064 Shady Lane Santa Clara County, California	Figure No. 1
Pollak Engineering, Inc.			

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

1. From a geotechnical perspective, the site is suitable for the proposed construction provided the recommendations presented in this report are incorporated into the project plans and specifications. In addition, the applicable set backs, easements, and any other requirements set by the County of Santa Clara and any other governmental agencies should be followed.

General

2. The most prominent geotechnical features affecting the proposed development are the relatively steep site gradients and the probability of a major seismic event occurring during the structure design life. Site drainage design and maintenance will also be important to the long-term stability of the site.

3. The residence including the basement retaining walls may be founded on a structural mat foundation. The structural mat must be supported entirely on the underlying Franciscan bedrock material. Based on the referenced architectural drawings, the outboard edge of the mat extends onto and beyond the soil mantle. In order to support the entire mat foundation on Franciscan bedrock, the outboard perimeter the mat must be equipped with drilled piers extending into the underlying bedrock. Detailed foundation design parameters are provided below under Foundations. Specific retaining wall recommendations are provided below.

4. To reduce the height of the residence retaining wall and to simplify construction, it is recommended that consideration be given to tiering the rear basement retaining wall. Consideration should also be given to incorporating structural elements rather than retained soil between the residence and the garage. Incorporation of structural elements into the project design could reduce the height of retainment to approximately 24 feet.

5. Due to the relatively steep gradients of the subject site, it is recommended that the basement retaining wall be constructed from the top using tieback construction techniques. Other techniques will require construction of temporary shoring. Recommendations for temporary shoring will be provided upon request. Recommendations contained below under Vertical Excavations must be adhered to at all times.

6. Incorporation of a retaining wall into the residence and garage design increases the possibility of introducing condensation effects in the structures including possible dampness, mold and discoloration of flooring near the retaining wall. The retaining wall sub-drain is important for minimizing these effects which may be exacerbated with shotcrete construction techniques, often used in this type of construction. Potential condensation effects may be mitigated by equipping the wall with heating elements, by construction of a ventilated space between the retaining wall and the living area, or any other method as may be determined by the design engineer.

7. If desired, lateral forces against the basement retaining wall may be opposed in part by designing and constructing the basement and basement walls to resist those forces as a unit.

Grading

8. It is anticipated that grading operations will consist primarily of excavation operations; and fill placed on the outboard areas of the driveway and garage pad. All fill soil placed must be placed in accordance with recommendations contained in this update report.

9. The grading requirements presented herein are an integral part of the grading specifications presented in Appendix B of this report and should be considered as such.

10. All grading and foundation plans for the development must be reviewed by the Soil Engineer prior to contract bidding or submittal to governmental agencies so that plans are reconciled with site conditions and sufficient time is allowed for suitable mitigative measures to be incorporated into the final grading specifications.

11. ***Pollak Engineering, Inc.*** should be notified at least two working days prior to site clearing, grading, and/or foundation operations on the property. This will give the Soil Engineer ample time to discuss the problems that may be encountered in the field and coordinate the work with the contractor.

12. Grading activities during the rainy season may be hampered by surface run off. Grading activities may be performed during the rainy season, however, measures to control potential erosion and concentrated storm water must be provided. Grading performed during the dry months is recommended and will minimize the occurrence of surface run off problems.

13. Field observations during the grading operations must be provided by representatives of ***Pollak Engineering, Inc.***, to enable them to form an opinion regarding the adequacy of the site preparation, and the extent to which the earthwork construction complies with the specification requirements. Any work related to the grading or foundation operations performed without the full knowledge and under the direct observation of the Soil Engineer will render the recommendations of this report invalid. The degree of observation and frequency of testing services will depend on the construction methods and schedule, and the item of work.

Engineered Fill

14. All fill soils are to be placed in accordance with recommendations included under Grading Specifications below.

15. Engineered fill soil must be placed at a minimum relative compaction of 90% as determined by Laboratory Test Procedure ASTM D1557-98. The upper 6 inches of any fill to receive flatwork and all fill to support structures must be placed at a minimum relative compaction of 95%.

16. Any soil placed on the slope face must be supported. Recommendations for unsupported fill will be provided upon request.

Driveway & Garage Cut & Fill Operations

17. It is anticipated that up to 10 feet of fill soil will be placed as part of the driveway construction and five feet of soil for the most easterly portion of the garage pad. Even with careful construction practices and modern equipment, settlement should be expected over time. Typical settlement for soil compacted at 90% relative compaction may be on the order of 1-1½%. Settlement on the order of ½-¾% may be expected for soil compacted to 95% relative compaction. Driveway and garage pavement and drainage design should anticipate this degree of settlement. If desired, the effects of differential settlement in the pavement sub-grade can be moderated by over excavating the cut portion of sub-grade and replacing it with engineered fill. Typical over excavation depths are from 18 to 24 inches.

Foundations

18. The proposed residence including the basement retaining walls may be supported on a structural mat foundation. The structural mat must be founded entirely on Franciscan bedrock. To accomplish this, it is anticipated that the outboard perimeter of the structural mat will be equipped with drilled end-bearing piers. Drilled piers for the structural mat should be a minimum of 18 inches in diameter, and should be designed for an allowable bearing pressure of 4000psf for combined dead and live loads. This value may be increased by one third to include temporary loads such as wind and seismic. Drilled end-bearing piers must extend a minimum of 8 feet into Franciscan bedrock material. Drilled piers should be no closer than 3 pier diameters measured from center to center apart. The Soil Engineer will determine final pier depths during pier drilling operations; however depths of 12 to 16 feet or more should be anticipated.

19. The structural mat should have a minimum thickness of 14 inches, and should be designed based on a modulus of sub-grade reaction of 200 pci. Design bearing pressures should not exceed 3500 psf.

Residence Retaining Walls

20. Retaining walls incorporated into the residence should be designed to resist "at rest" pressures and should be designed based on a coefficient of lateral earth pressure (K_O) of 0.58 and soil densities of 125pcf. Pressures exerted during compaction of backfill and all pressures due to any surcharge loads must be considered in the design of the walls.

21. Because of the height of the proposed retaining wall, and the difficulty in constructing a wall of this height, it is recommended that a tiered wall configuration be considered. This would both ease in the construction of the walls, and reduce the loading.

22. Historically, basement retaining walls have tended to perform well under seismic loading. It is assumed that the walls and enclosing soil move together, thus minimizing damage. In the case of the subject residence however, the basement retaining walls range from full building height on the west to zero height on the east perimeter. The lack of symmetry prevents the soil and structure from moving as a uniform body and exerts an additional seismic load to the wall. Additionally, increased lateral earth pressures imposed on a restrained retaining wall become "locked" into the soil and should not be considered as temporary loading.

23. Lateral seismic forces on the basement retaining walls may be calculated based on the simplified Mononobe-Okabe relationship proposed by Seed and Whitman (1970)

$$\Delta P_{AE} \sim (1/3)\, K_h \gamma H^2$$

where ΔP_{AE} is the dynamic component, K_h is the horizontal ground acceleration divided by/gravitational acceleration (0.53); γ is the soil density (125pcf); and H is the height of the wall. A triangular stress distribution should be assumed for the seismic loading with the vertex at the base of the wall and the resultant 0.6H from the base of the wall.

Tie Back Design Parameters

24. It is anticipated that the residence retaining walls will incorporate tie-back construction.

25. Tie-back anchors must have a minimum bonded length of 15 feet. For design purposes the active wedge may be calculated based on a phi value of 28° resulting in an angle 62° from horizontal as measured from an elevation one foot below the basement excavation elevation. Tieback anchors may be designed based on a cohesion of 750 psf acting on the bonded portion of the tieback.

26. A minimum of 15% of the tieback anchors must be proof tested to a minimum of 130% of the design load and held for a minimum duration of 15 minutes. It will be the contractor's responsibility to provide the proof testing. The Soil Engineer must observe the proof testing operations.

Retaining Walls

27. The residence basement retaining wall is anticipated to incorporate a tie-back design. Retaining walls that are not part of the residence may be of conventional design. All project retaining walls must be founded on Franciscan bedrock material.

28. The outboard portion of the garage and driveway will utilize fill soil and retaining wall construction. The outboard retaining walls should be founded on a drilled end-bearing pier and grade-beam foundation system.

29. Drilled piers for the outboard driveway retaining walls should be a minimum of 16 inches in diameter, and should be designed for an allowable bearing pressure of 4000psf for combined dead and live loads. This value may be increased by one third to include temporary loads such as wind and seismic. Drilled end-bearing piers must extend a minimum of 8 feet into Franciscan bedrock material. Drilled piers should be no closer than 3 pier diameters measured from center to center apart. The Soil Engineer will determine final pier depths during pier drilling operations; however depths or 12 to 16 feet or more should be anticipated.

30. To resist lateral forces, passive earth pressures can be assumed to acting against the sides of the drilled piers. It is recommended that a passive pressure equivalent to that of a fluid with a density of 325 pcf. be used acting on a projection of 2 pier diameters of embedment against the

sides of the drilled piers below which a lateral projection from the front of the pier to daylight is 10 feet or greater.

31. Those portions of the drilled piers above which a lateral projection to daylight is less than 10 feet should be designed to resist lateral forces in the downslope direction equivalent to forces exerted by a medium weighing 35 pcf.

32. The driveway access retaining walls and the inboard garage retaining walls may be supported on a drilled pier and grade-beam foundation in accordance with the recommendations given above, or if founded entirely on Franciscan material they may be founded on a spread footing foundation. It should be anticipated however, that a change in foundation types from drilled pier to conventional spread footings will result in some differential movement at the foundation transition.

33. Spreading footings must extend a minimum of 24 inches into Franciscan material. Design bearing pressures for footings on bedrock should not exceed 3200 psf. due to dead plus sustained live loads. These values may be increased by one third due to all loads which include wind or seismic.

34. To accommodate lateral loads, the passive resistance of the foundation soil can be utilized. For spread footings for landscape retaining walls, the passive soil pressures can be assumed to act against the front face of the footing below a depth of one foot below the ground surface. It is recommended that a passive pressure equivalent to that of a fluid weighing 325 pcf. be used. For design purposes, an allowable friction coefficient of 0.30 can be assumed at the base of the spread footings.

35. Reinforcing steel should be provided as determined by structural requirements and the project structural engineer. Reinforcement for drilled piers should extend for the full depth of the piers.

36. Retaining walls not part of a structure should be designed to resist lateral pressures exerted from a medium having an equivalent fluid weight as follows:

Gradient of Back Slope	Equivalent Fluid Weight (p.c.f.)		
	Unrestrained Condition (Active)	**Passive Resistance**	**Coefficient of Friction**
Flat	45	325	0.30
2:1	65	325	0.30

37. Retaining walls incorporated into the garage should be designed to resist "at rest" pressures and should be designed based on a coefficient of lateral earth pressure (K_O) of 0.58 and soil densities of 125pcf. Pressures exerted during compaction of backfill and all pressures due to any surcharge loads must be considered in the design of the walls

38. Pressures exerted during compaction of backfill and all pressures due to any surcharge loads must be considered in the design of the walls.

39. If the retaining wall between the garage and Shady Lane is supported on a conventional spread footing, it may impose a surcharge load on the adjacent garage retaining wall. If a spread footing is utilized for this wall, additional loading information will be provided upon request during the design phase and will depend on the final design geometry.

Retaining Wall Sub-drains

40. The above criteria are based on fully drained conditions. It is imperative that the walls be fully drained.

41. In order to achieve fully drained conditions, a drainage filter blanket must be placed behind the wall. The blanket should be a minimum of 12 inches thick and should extend the full height of the wall to within 12 inches of the surface. If the excavated area behind the wall exceeds 12 inches, the entire excavated space behind the 12-inch blanket should consist of compacted engineered fill or blanket material. The drainage blanket material should consist of granular crushed rock and drain pipe fully encapsulated in geotextile filter fabric. A 4-inch perforated drainpipe should be installed in the bottom of the drainage blanket and should be underlain by 2 inches of filter type material. A 12-inch cap of native soil should be placed over the blanket. For areas where the drainage blanket will be capped with concrete, the crushed rock may be brought to sub-grade elevation, and the concrete cast directly onto the crushed rock. To reduce the possibility of moisture intrusions and condensation effects in the basement, the retaining wall sub-drain should extend a minimum of 6 inches below the bottom of the basement slab.

42. Piping with adequate gradient shall be provided to discharge water that collects behind the walls to an adequately controlled approved location away from the structure foundation.

Slab-on-Grade Construction

43. Slab on grade construction is anticipated for the basement mat slab, the garage slab and for exterior flatwork. To reduce the potential cracking of the concrete slabs, the following recommendations are made:

a) A minimum of 4 inches of gravel or clean crushed rock material should be placed over the finished sub-grade, between the sub-grade and the slab. The purpose of the gravel is to provide a capillary break and a cushion between the sub-grade soil and the slab. See the "Guide Specifications for Rock Under Floor Slabs", Appendix B. In the case of the basement slab, 6" of gravel is recommended. The gravel should be allowed to freely drain to the retaining wall sub-drain system. The use of aggregate base material is not allowed.
b) Concrete slabs should be reinforced as determined by the project Structural Engineer.
c) Any structural slabs including concrete thickness and reinforcing steel are to be designed by the project Structural Engineer.
d) The garage slab should be "free floating" and not attached to the garage foundations. Use of a felt, or similar spacer is recommended.

Utility Trenches

44. Applicable safety standards require that trenches in excess of 5 feet in depth must be properly shored or that the walls of the trench slope back to provide safety for installation of lines. If trench wall sloping is performed, the inclination should vary with the soil type. The underground contractor should request an opinion from the Soil Engineer as to the type of soil and the resulting inclination.

45. With respect to state-of-the-art construction or local requirements, utility lines are generally bedded with granular materials. These materials can convey surface or subsurface water beneath the structures. It is, therefore, recommended that all utility trenches which possess the potential to transport water be sealed with grout where the trench enters/exits the building perimeter. This impervious seal should extend a minimum of 2 feet away from the building perimeter and must be observed and approved by the Soil Engineer.

46. Utility trenches must be backfilled with native or approved import material and compacted to relative compaction of 90% in accordance with Laboratory Test Procedure ASTM D1557-98. Backfilling and compaction of these trenches must meet the requirements set forth by the County of Santa Clara, Building and Engineering Services Department.

Vertical Excavations

47. Vertical excavations may be made for constructing the retaining walls provided:

   a. ***Pollak Engineering, Inc.*** is present to observe the cut and evaluate its stability.
   b. The maximum height (vertical) of an unsupported cut does not exceed 5 feet. At a height of 5 feet, the excavation must be laid back or supported. The degree that the cut is laid back will be determined by the Soil Engineer during construction. .
   c. The cut is open for the least amount of time possible in order to construct the wall and emplace the backfill.
   d. As an alternative, temporary shoring may be provided during construction.

General Construction Requirements

48. It is important to control surface water runoff at the site. During the grading operations, observations should be made by the Soil Engineer to provide additional recommendations as dictated by the field conditions. Water must not be allowed to collect on any portion of the site. Additionally, concentrated surface water must not be allowed to sheet flow over any slope face.

49. Liberal drainage gradients must be provided by the project Civil Engineer to remove all storm water from the vicinity of the slope and to prevent storm and/or irrigation water from seeping beneath the residence. All finished grades should be sloped at a minimum 2% gradient away from exterior foundations for a minimum distance of 3 feet.

50. Continuous roof gutters are required. Downspouts from the gutters should be provided with adequate, non-perforated pipe conduits to carry storm water away from the structures and graded areas and, thus, reduce the possibility of soil saturation adjacent to the foundation and engineered fills.

51. A maintenance program including regular cleaning and testing is recommended for the drainage system.

GUIDELINES FOR REQUIRED SERVICES

The following list of services are the services required and must be provided by ***Pollak Engineering, Inc.***, during the project development. These services are presented in check list format as a convenience to those entrusted with their implementation.

The items listed are included in the body of the report in detail. This list is intended only as an outline of the required services and does not replace specific recommendations and, therefore, must be used with reference to the total report. The degree of observation and frequency of testing services would depend on the construction methods and schedule, and the item of work.

The importance of careful adherence to the report recommendations cannot be overemphasized. It should be noted, however, that this report is issued with the understanding that each step of the project development will be performed under the direct observation of ***Pollak Engineering, Inc.***

The use of this report by others presumes that they have verified all information and assume full responsibility for the total project.

	Item Description	Required	Not Required	Not Anticipated
1.	Provide foundation design parameters	X		
2.	Review grading plans and specifications	X		
3.	Review foundation plans and specifications	X		
4.	Observe and provide recommendations regarding demolition			X
5.	Observe and provide recommendations regarding site stripping			X
6.	Observe and provide recommendations on moisture conditioning, removal, and/or compaction of unsuitable existing soils			X
7.	Observe and provide recommendations on the installation of sub-drain facilities (if necessary)	X		
8.	Observe and provide testing services on fill areas and/or imported fill materials	X		
9.	Review as-graded conditions and provide additional foundation recommendations, if necessary	X		
10.	Observe and provide compaction tests on sanitary sewers, storm drain, water lines and PG&E trenches	X		
11.	Observe foundation excavations and provide supplemental recommendations, if necessary prior to placing concrete	X		
12.	Observe and provide moisture conditioning recommendations for foundation areas prior to placing concrete			X
13.	Provide design parameters for retaining walls	X		
14.	Provide geologic observations and recommendations for keyway excavations and cut slopes during grading	X		
15.	Excavate and recompact all geologic trenches and/or test pits			X
16.	Observe installation of sub-drain behind retaining walls	X		

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. It should be noted that it is the responsibility of the owner or his representative to notify ***Pollak Engineering, Inc.***, in writing, a minimum of two working days before any clearing, grading, or foundation excavations can commence at the site.

2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the referenced reports and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the development of the site, ***Pollak Engineering, Inc.*** will provide supplemental recommendations as dictated by the field conditions.

3. 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 contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.

5. Notwithstanding, all the foregoing applicable codes must be adhered to at all times.

APPENDIX A

Field Investigation

Location Map

Site Plan

Log of Test Boring

FIELD INVESTIGATION

The field investigation was performed on 30 September 2008, and included the drilling of one supplementary exploratory boring at the approximate location shown on Figure 3, "Site Plan".

The boring was drilled to a maximum depth of 29½ feet below the existing ground surface using a CME53, track mounted drill rig equipped with solid stem flight augers. As the drilling proceeded, undisturbed core samples were obtained with a inch, 2-1/2 inch O.D. Modified California split-tube sampler containing 2-inch O.D. brass liners, and 2" O.D. Standard Penetration Test split spoon sampler standard penetration sampler equipped to accept liners. Samplers were driven into the in-situ soils under the impact of an automatic hammer rated at an efficiency of 81%. The number of blow-counts required to advance the sampler 12 inches into the soil after a 6 inch seating were recorded. Field blow-counts were adjusted to the standard penetration resistance (N-Value). Visual classifications were made from auger cuttings and the samples in the field and were verified in the laboratory after further examination.

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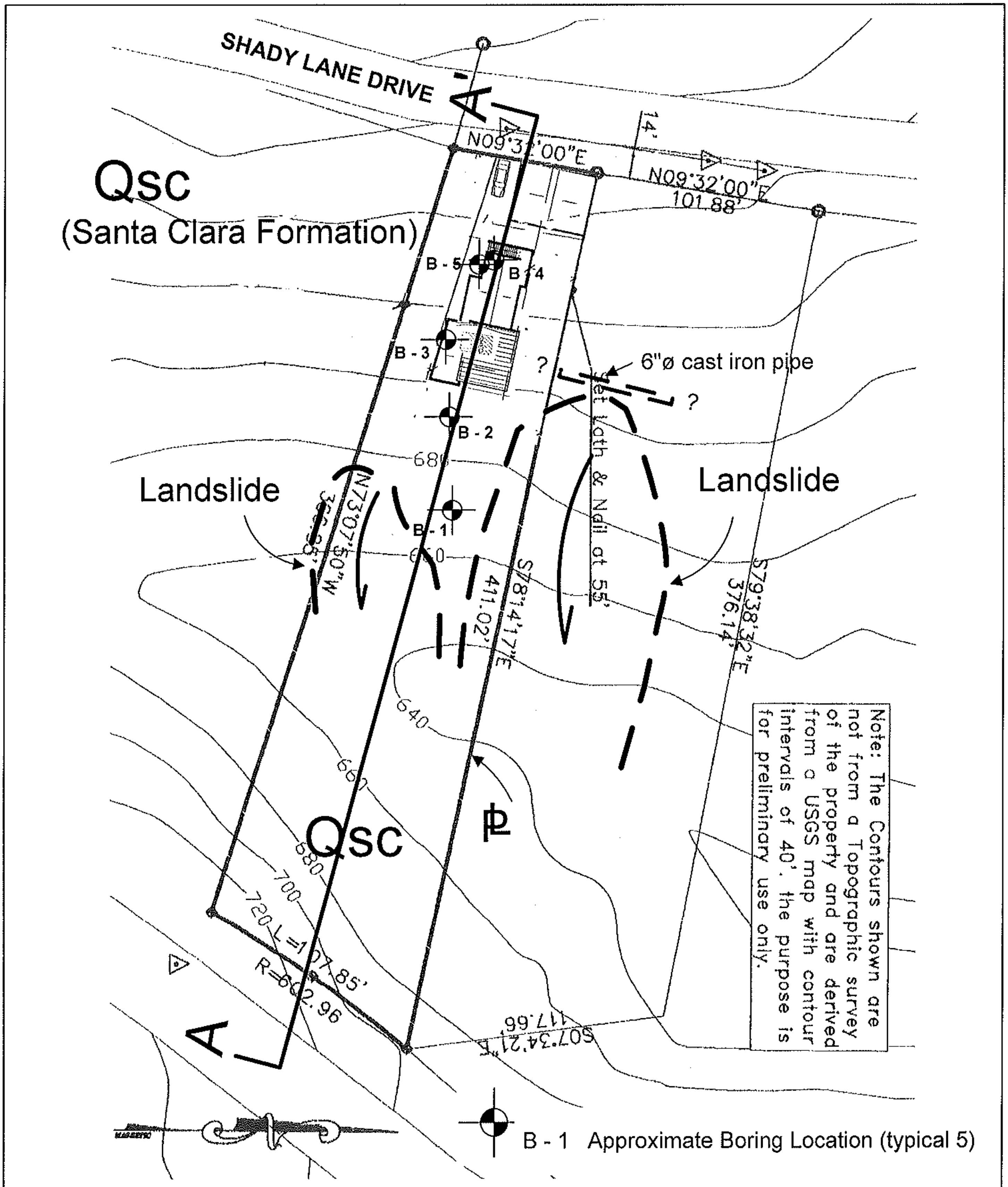
The stratification of the soils, descriptions, and location of undisturbed soil samples are shown on the "Log of Test Boring" contained within this appendix..

BASE: Thomas Brothers Guide

1" = 2400'

Project No. 1038	October 2008	Location Map 10764 Shady Lane Santa Clara County, California	Figure No. 2
Pollak Engineering, Inc.			



1" ~ 61'

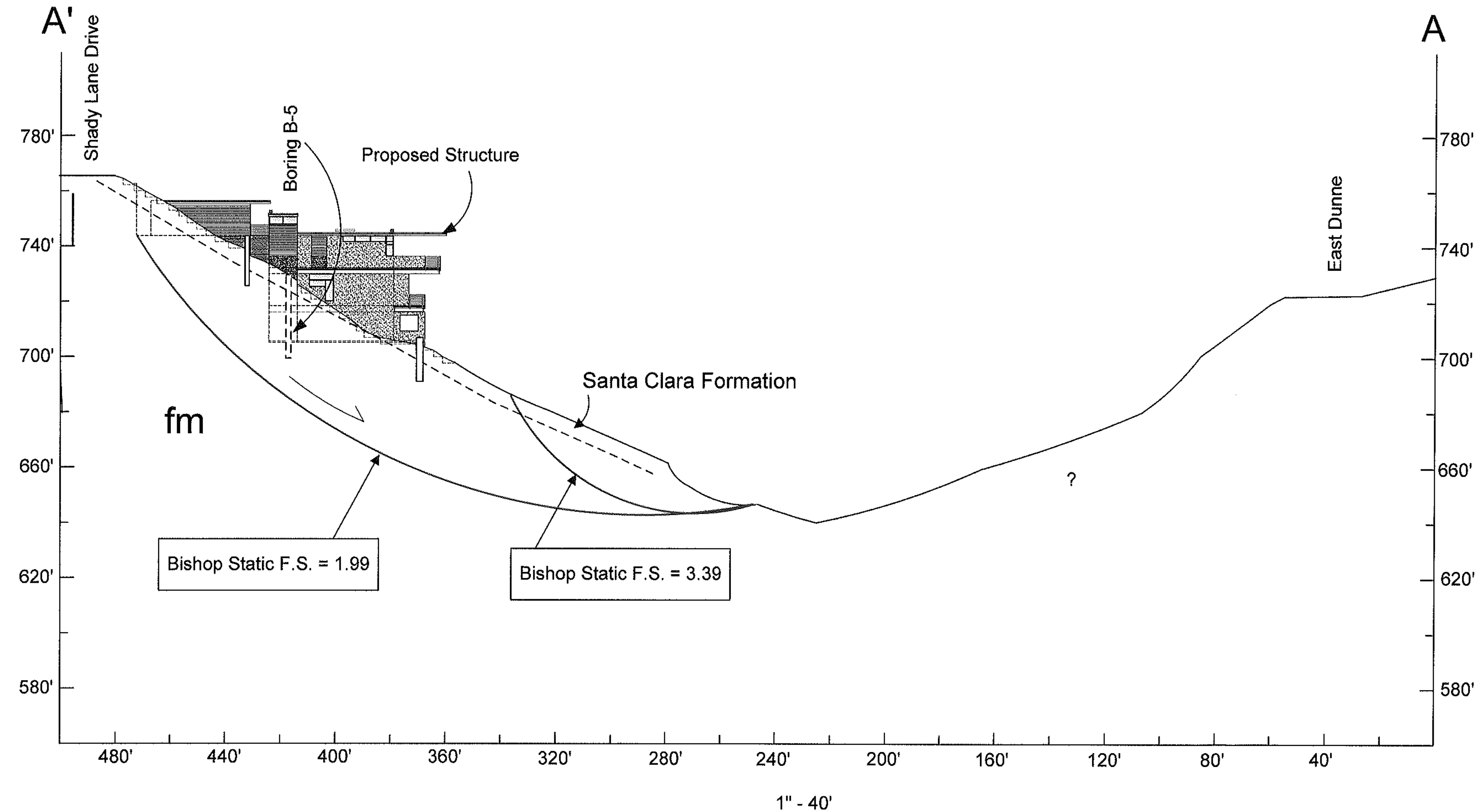
BASE from David Kessler, Architect and from USGS Map

Project No. 1038	Site Plan/Geology Map	Figure No. 3
Pollak Engineering, Inc. Campbell, California (408) 866-6623	17064 Shady Lane Drive Santa Clara County, California	

LOGGED BY RP DATE DRILLED 30 September 2008 BORING DIAMETER 4" BORING NO. B-5

Depth, ft.	Sample No. and Type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs	Qu - tsf Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
			Medium brown, clayey SAND & GRAVEL; damp, angular gravel	SC					
5			Brown Sandstone, damp, weathered		49				
10			Orange brown Claystone/Siltstone, damp with rounded gravel to 1"ø		79				
			Orange brown Sandstone, damp		>100				
15			Orange brown Claystone/Siltstone, damp						
20					>100				
25			Green with orange mottling, Sandy claystone		79				
					81				
30			Terminated @ 29½ ft. No G.W. encountered						

Pollak Engineering, Inc. | **Project No. 1038** | **Figure No. 4**



Project No. 1038	October 2008	**CROSS SECTION A' - A**	Figure 5
Pollak Engineering, Inc.		17064 Shady Lane Drive Santa Clara County, California	

APPENDIX B

<u>The Grading Specifications</u>

THE GRADING SPECIFICATIONS
for
Proposed New Improvements
at 17064 Shady Lane
Santa Clara County, California

1. General Description

1.1 These specifications have been prepared for the grading and site development of the subject project. ***Pollak Engineering, Inc.***, hereinafter described as the Soil Engineer, should be consulted prior to any site work connected with site development to ensure compliance with these specifications.

1.2 The Soil Engineer should be notified at least two working days prior to any site clearing or grading operations on the property in order to observe the stripping of organically contaminated material and to coordinate the work with the grading contractor in the field.

1.3 This item shall consist of all clearing or grubbing, preparation of land to be filled, filling of the land, spreading, compaction and control of fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades, and slopes as shown on the accepted plans. The Soil Engineer is not responsible for determining line, grade elevations, or slope gradients. The property owner, or his representative, shall designate the person or organizations who will be responsible for these items of work.

1.4 The contents of these specifications shall be integrated with the soil report of which they are a part, therefore, they shall not be used as a self-contained document.

2. Tests

The standard test used to define maximum densities of all compaction work shall be the ASTM D1557-98 Laboratory Test Procedure. All densities shall be expressed as a relative compaction in terms of the maximum dry density obtained in the laboratory by the foregoing standard procedure.

3. Clearing, Grubbing, and Preparing Areas To Be Filled

3.1 All vegetable matter, trees, root systems, shrubs, debris, and organic topsoil shall be removed from all structural areas and areas to receive fill. The depth or organic topsoil to be removed will be determined in the field by the Soil Engineer but, in general, will be on the order of 4 to 6 inches.

3.2 Any soil deemed soft or unsuitable by the Soil Engineer shall be removed. Any existing debris or excessively wet soils shall be excavated and removed as required by the Soil Engineer during grading.

If any underground structures are discovered during stripping and grading operations such as old foundations, abandoned pipe lines, septic tanks, and leach fields, they shall be removed from the site.

3.4 The final stripped excavation shall be approved by the Soil Engineer during construction and before further grading is started.

3.5 After the site has been cleared, stripped, excavated to the surface designated to receive fill, and scarified, it shall be disked or bladed until it is uniform and free from large clods. The native subgrade soils shall be moisture conditioned and compacted to the requirements as specified in the grading section of this report. Fill can then be placed to provide the desired finished grades. The contractor shall obtain the Soil Engineer's approval of sub-grade compaction before any fill is placed.

4. Materials

4.1 All fill material shall be approved by the Soil Engineer. The material shall be a soil or soil-rock mixture which is free from organic matter or other deleterious substances. The fill material shall not contain rocks or lumps over 6 inches in greatest dimension and not more than 15% larger than 2-1/2 inches. Materials from the site below the stripping depth are suitable for use in fills provided the above requirements are met.

4.2 Materials existing on the site are suitable for use as compacted engineered fill after the removal of all debris and organic material. All fill soils shall be approved by the Soil Engineer in the field.

4.3 Should import material be required, it must meet the requirements as specified in the body of this report prior to transporting it to the project.

5. Placing, Spreading, and Compacting Fill Material

5.1 The fill materials shall be placed in uniform lifts of not more than 8 inches in uncompacted thickness. Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to obtain uniformity of material in each layer. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either (a) aerating the material if it is too wet, or (b) spraying the material with water if it is too dry.

5.2 After each layer has been placed, mixed, and spread evenly, either import material or native material shall be compacted to a relative compaction of 90% at 3% above optimum moisture content as determined by ASTM D1557-98 Laboratory Test Procedure.

5.3 Compaction shall be by footed rollers or other types of acceptable compacting rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to ensure that the required density has been obtained. No ponding or jetting shall be permitted.

5.4 Field density tests shall be made in each compacted layer by the Soil Engineer in accordance with Laboratory Test Procedure ASTM D2922-98 and D3017-88. When footed rollers are used for compaction, the density tests shall be taken in the compacted material below the surface disturbed by the roller. When these tests indicate that the compaction requirements on any layer of fill, or portion thereof, has not been met, the particular layer, or portion thereof, shall be reworked until the compaction requirements have been met.

5.5 No soil shall be placed or compacted during periods of rain nor on ground which contains free water. Soil which has been soaked and wetted by rain or any other cause shall not be compacted until completely drained and until the moisture content is within the limits hereinbefore described or approved by the Soil Engineer. Approval by the Soil Engineer shall be obtained prior to continuing the grading operations.

6. Graded Slopes

6.1 Cut and fill slopes shall be graded at a gradient no steeper than 2:1 (horizontal to vertical). Slope rounding is required on all cut slopes.

6.2 Grading shall be performed in such a manner as to prevent water from flowing directly over the top of any slope. No slope shall be left to stand through a winter season without erosion control measures being provided.

7.1 Subdrain Installation

7.1 Provide and install perforated PVC pipes or perforated metal pipe and filter material for subdrains, as shown on the grading plans or as directed by the Soil Engineer and as specified in Section 68 of the Standard Specifications of the State of California, Department of Transportation, current edition, except as modified in the following paragraphs.

7.2 Clay drain tile, concrete drain tile, perforated clay pipe, porous concrete pipe, perforated asbestos-cement pipe, and perforated bituminous fibre pipe will not be permitted.

7.3 Perforated PVC pipe will not be permitted in locations where the subgrade soils are compressible or where the depth of overburden or engineered fill soils exceed 10 feet. In any event, use of these materials will be permitted only upon authorization of the Soil Engineer.

7.4 The following alternate materials will be allowed for permeable filter material:

Use Class II material as specified in Section 68-1.025 of the Standard Specifications of the State of California.

Use a ¾-inch minus concrete mix type aggregate filter material.

Delete requirements of State Specifications for quality testing using Los Angeles rattler or sand equivalent tests.

7.5 Unless directed otherwise, use pipes no less than 4 inches in diameter for laterals up to 100 feet in length. Use pipes of no less than 6 inches in diameter for laterals greater than 100 feet in length. The use of wyes, elbows, tees, cleanouts, or other pipe fittings shall be allowed at the discretion of the Soil Engineer based on field conditions.

7.6 Non-perforated PVC or perforated metal pipe shall be used at the outlet of all subdrains at the toe of engineered fill slopes and at other locations when required by the Soil Engineer. Compacted engineered trench backfill using native soils may be required by the Soil Engineer in lieu of permeable material in locations where non-perforated pipe is specified.

7.7 The subdrain trench width shall be not less than one foot plus outside diameter of pipe. The gradient of the pipe shall be not less than 2.0%. The pipe shall be bedded on 6 inches of filter materials and installed at such depth that not less than 2 feet of filter material exists over the pipe. Greater depth may be required by the Soil Engineer.

8. Pavement

8.1 The proposed subgrade under pavement sections, native soil, and/or fill shall be compacted to a minimum relative compaction of 95% at a moisture content slightly above optimum for a depth of 6 inches.

8.2 All aggregate base material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM Test Procedure D1557-98. The construction of the pavement in the parking and traffic areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California and/or County of Santa Clara, Building and Engineering Services Department.

9. Utility Trench Backfill

9.1 The utility trenches extending under concrete slabs-on-grade shall be backfilled with native on-site soils or approved import materials and compacted to the requirements pertaining to the adjacent soil. No ponding or jetting will be permitted.

9.2 Utility trenches extending under all pavement areas shall be backfilled with native or approved import material and properly compacted to meet the requirements set forth by the ounty of Santa Clara Building and Engineering Services Department.*

*NOTE: Requirements of County to be added.

9.3 Where any opening is made under or through the perimeter foundations for such items as utility lines and trenches, the openings must be resealed so that they are watertight to prevent the possible entrance of outside irrigation or rain water into the underneath portion of the structures.

10. Unusual Conditions

In the event that any unusual conditions not covered by the special provisions are encountered during the grading operations, the Soil Engineer shall be immediately notified for additional recommendations.

GUIDE SPECIFICATIONS FOR ROCK UNDER FLOOR SLABS

Definition

Graded gravel or crushed rock for use under slabs-on-grade shall consist of a minimum thickness of mineral aggregate placed in accordance with these specifications and in conformance with the dimensions shown on the plans. The minimum thickness is specified in the accompanying report.

Material

The mineral aggregate shall consist of broken stone, crushed or uncrushed gravel, quarry waste, or a combination thereof. The aggregate shall be free from deleterious substances. It shall be of such quality that the absorption of water in a saturated dry condition does not exceed 3% of the oven dry weight of the sample.

Gradation

The mineral aggregate shall be of such size that the percentage composition by dry weight, as determined by laboratory sieves (U.S. Sieves) will conform to the following gradation:

Sieve Size	Percentage Passing
¾"	90-100
No. 4	25-40
No. 8	18-33
No. 200	0-3

Placing

Sub-grade, upon which gravel or crushed rock is to be placed, shall be prepared as outlined in the accompanying soil report.

PSEUDO-STATIC SLOPE STABILITY SCREENING ANALYSIS & SUPPLEMENTAL RECOMMENDATIONS

For

PROPOSED NEW RESIDENCE

17064 Shady Lane

Santa Clara County, California

for

MR. BRYAN HANSON

By

Pollak Engineering, Inc.

Project No. 1038

25 October 2010

POLLAK ENGINEERING, INC.

Project No. 1038
25 October 2010

Mr. Bryan Hanson
[redacted]

Subject: Proposed New Residence
17064 Shady Lane
Morgan Hill, California
SCREENING SLOPE STABILTY ANALYSIS & SUPPLEMENTAL RECOMMENDATIONS

References:
1) Geologic & Geotechnical Investigation
By *Pollak Engineering Co.*
Dated 9 January 2006
2) Proposed Architectural Plans; Shts. A6.0 &A6.2
Supplied by Owner
Progress Dated 12 August 2010

Dear Mr. Hanson:

In accordance with your authorization, ***Pollak Engineering, Inc.*** has conducted a pseudo-static slope stability screening analysis of the site and proposed development in accordance with the evaluation procedure as outlined in California Division of Mines and Geology *Special Publication 117a*, published September 2008, and to satisfy requirements by the City of Morgan Hill.

This letter presents our conclusions and recommendations based on our analysis. Our analysis indicates an adequate factor of safety against slope instability, provided the recommendations contained in this report are incorporated into the project design and construction, and that from the perspective of slope stability, the project is feasible.

Should you have any questions relating to the contents of this report or should you require additional information, please do not hesitate to contact our office at your convenience.

Very truly yours,
Pollak Engineering, Inc.

REGISTERED PROFESSIONAL ENGINEER
ROBERT JOSEPH POLLAK
C 61831
EXP. 6-30-11
CIVIL
STATE OF CALIFORNIA

Robert Pollak, P.E.
Principal Engineer

Copies: 2 to Addressee

Geotechnical Engineering

Engineering Geology

555 No. Santa Cruz Ave.
Los Gatos, CA 95030

Phone: 408-354-0420

PSEUDO-STATIC SLOPE STABILITY ANALYSIS

The site slope stability was re-evaluated by means of a pseudo-static analysis performed in accordance with procedures outlined in California Division of Mines and Geology Special Publication 117a, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, published in September 2008, and the *Seismic Hazard Zone Report for the Morgan Hill 7.5 Minute Quadrangle, Santa Clara County, California,* published 2004. For the subject analysis, a cohesion value of 674 psf and an internal friction angle of 23° were used. No seeps are known to exist in this area and the site borings did not encounter any water to a depth of 29½ feet.

Based on information provided by the Department of Conservation, Division of Mining and Geology, *Seismic Hazard Evaluation of the Morgan Hill 7.5 Minute Quadrangle, Santa Clara County, California.* the site Pga for soft rock conditions on this site is 0.58 (Figure 4).

The coefficient "k_{eq}" was derived from $k_{eq} = f_{eq} * MHA r,$ where f_{eq} was taken from the *Magnitude and Distance for Threshold Displacements of 5cm* chart (Modified from Blake and others, 2002), MHA is the soft rock acceleration (from *Seismic Hazard Zone Report for the San Jose East 7.5 Minute Quadrangle, Santa Clara County, California*, and r is the distance from the fault.

Based on the above method, a value of 0.251 was obtained for $k_{eq.}$ The pseudo-static slope stability was then evaluated using XSTABL, version 5. The calculated pseudo-static factor of safety for gross slope stability was determined to be f.s.= 0.92 (≤ 1.00); the pseudo-static factor of safety for surficial slope stability was determined to be f.s. = 0.9 (≤ 1.00).

<u>Conclusions:</u>

1. Based on our analysis, the pseudo-static factor of safety for gross slope stability F.S. = 0.92 ≤ 1.00. The pseudo-static surficial slope stability was determined to be 0.90 (≤ 1.00).

2. The site does not pass the pseudo-static screening procedure for either gross stability, or for surficial stability.

<u>Discussion:</u>

Provided the recommendations contained in this screening analysis are incorporated into project design and construction, surficial slope stability is not anticipated to significantly affect site development; however, there is a potential for nuisance slope movements downslope of the proposed residence.

The factor of safety against gross slope failure may be improved to an acceptable level by strengthening the slope through the use of "stitch piers", designed and constructed to extend through and below the projected failure plane (see Figure 3).

Recommendations:

1. Gross site stability may be improved by use of a row of “stitch piers” designed and constructed in accordance with the recommendations contained in this letter report.

2. Stitch piers should be placed in a row near the rear (inboard) basement retaining wall. If desired, the piers may be incorporated into the foundation/retaining wall construction.

3. Stitch piers should have a minimum diameter of 30 inches and must extend to a minimum depth of 50 feet below the bottom of the basement excavation.

4. Stitch piers should be spaced 3 pier diameters apart as measured center to center.

5. The upper 25 feet of the stitch piers should be designed to resist lateral forces in the down slope direction equivalent to those forces imposed by a fluid medium weighing 15pcf. For design purposes, the lateral forces may be resisted by that portion of the stitch pier below a depth of 25 feet.

6. This analysis is based on current site gradients and drainage conditions. Water may not be allowed to pond or collect at any location on this site, nor may concentrated surface water be allowed to flow over the slope face. Should water be allowed to pond, or if concentrated surface water is permitted to flow over a slope face, the factor of safety against localized slope failures will decrease.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

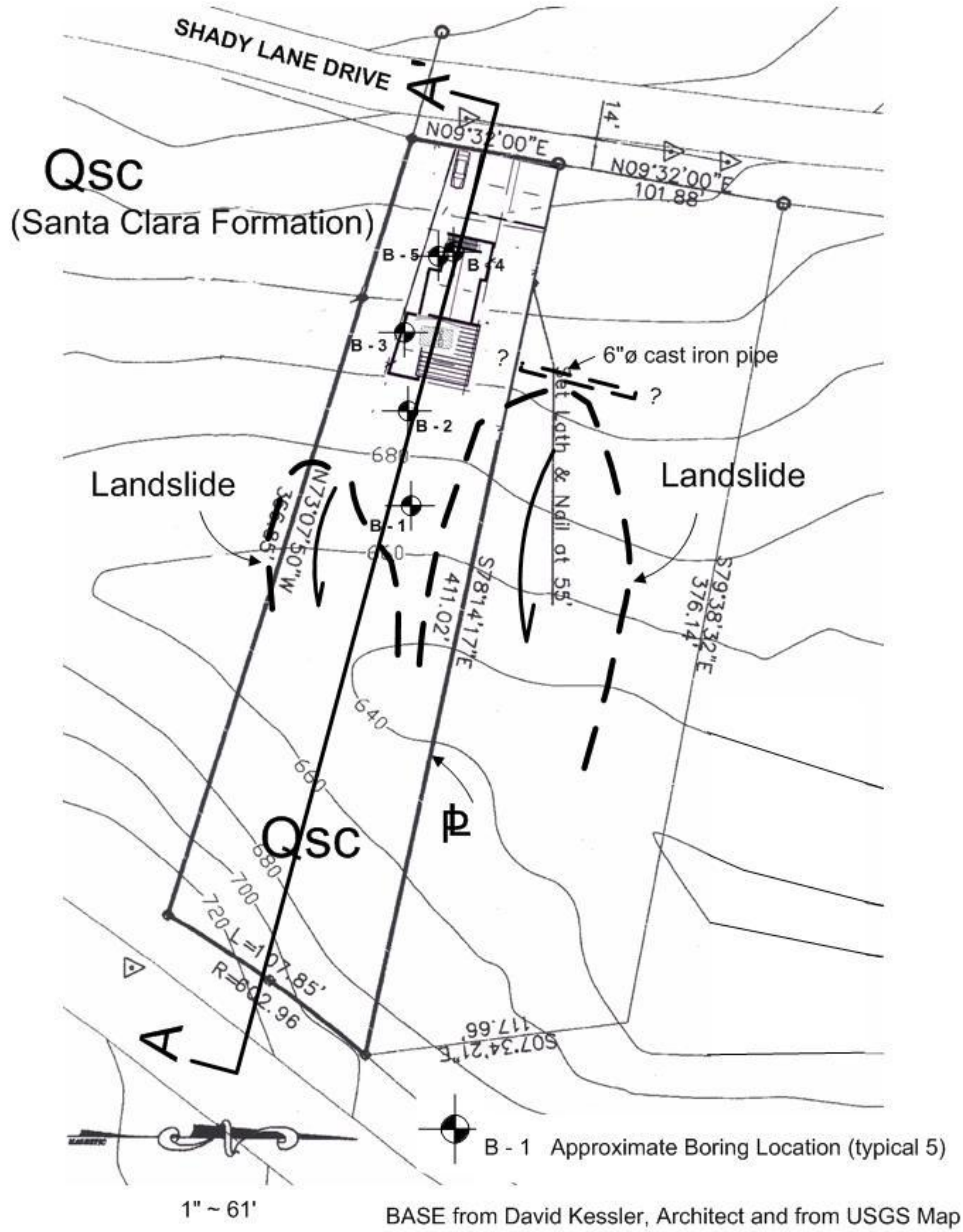
1. It should be noted that it is the responsibility of the owner or his representative to notify ***Pollak Engineering, Inc.***, in writing, a minimum of two working days before any clearing, grading, or foundation excavations can commence at the site.

2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the referenced reports and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the development of the site, ***Pollak Engineering, Inc.***, will provide supplemental recommendations as dictated by the field conditions.

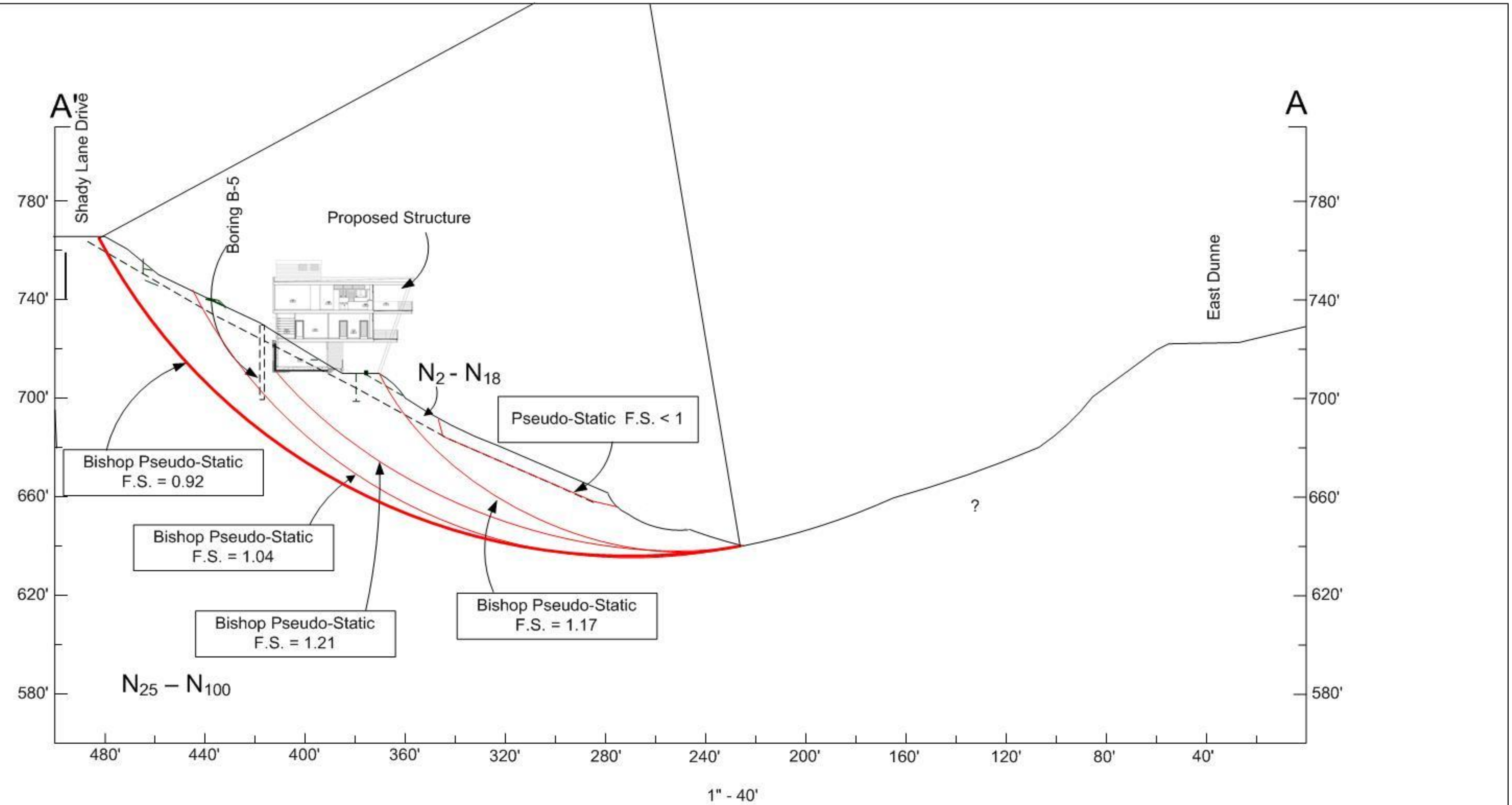
3. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.

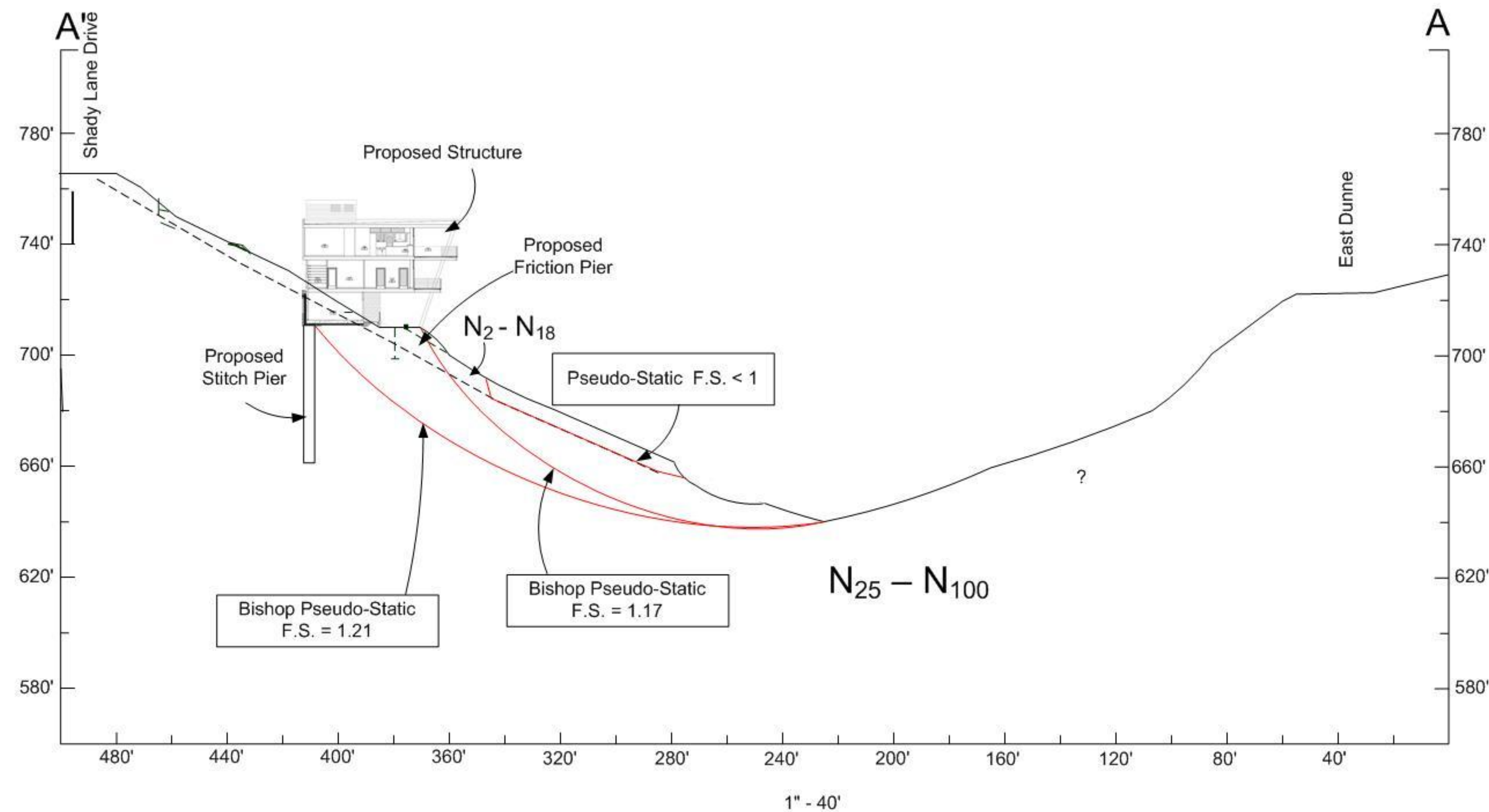
5. Notwithstanding, all the foregoing applicable codes must be adhered to at all times



Project No. 1038	Site Plan/Geology Map	Figure No. 1
Pollak Engineering, Inc. Campbell, California (408) 866-6623	17064 Shady Lane Drive Santa Clara County, California	



Project No. 1038	October 2010	CROSS SECTION A' - A	Figure 2
Pollak Engineering, Inc.		17064 Shady Lane Drive Santa Clara County, California	



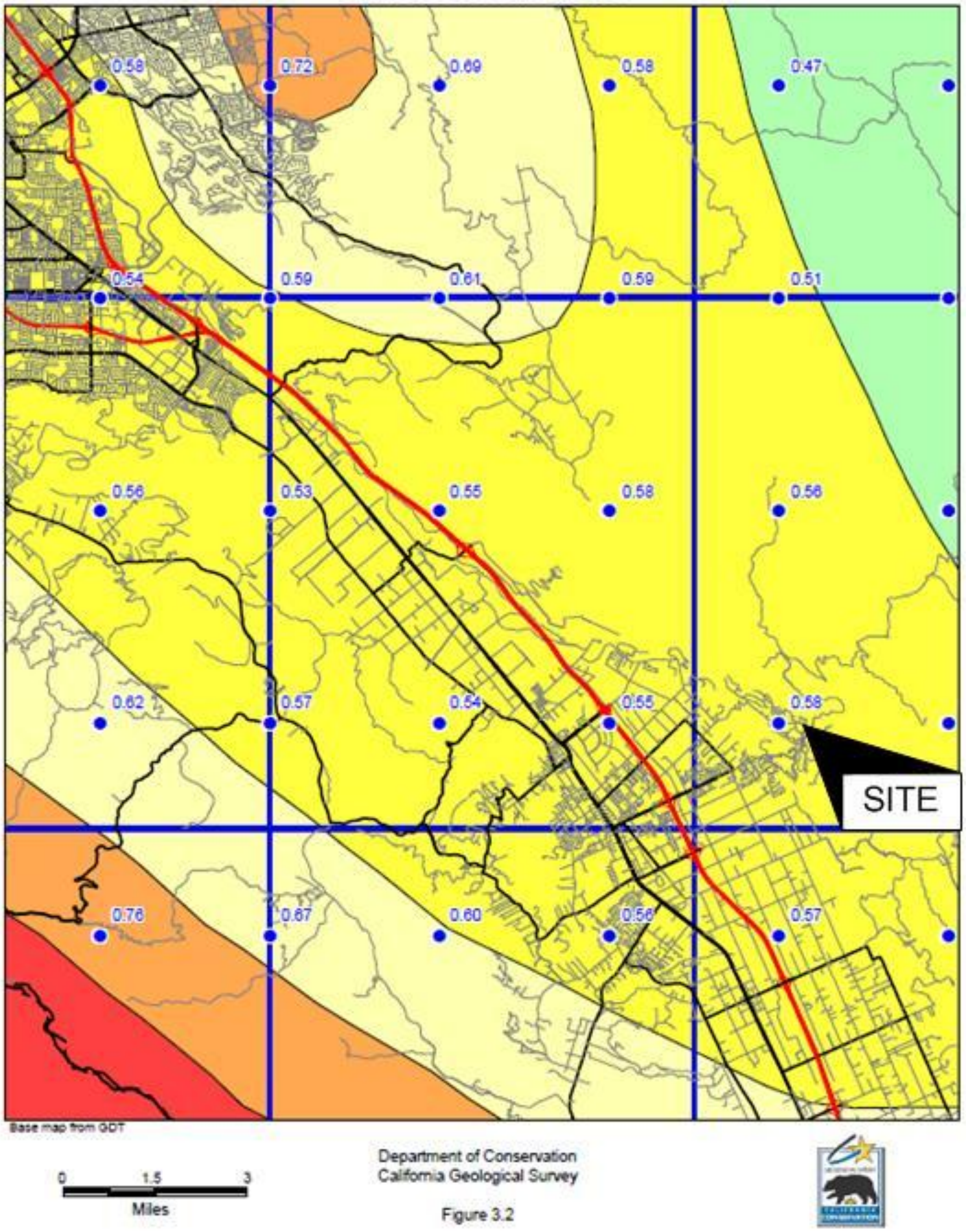
Project No. 1038	October 2010	CROSS SECTION A' - A 17064 Shady Lane Drive Santa Clara County, California	Figure 3
Pollak Engineering, Inc.			

MORGAN HILL 7.5-MINUTE QUADRANGLE AND PORTIONS OF ADJACENT QUADRANGLES

10% EXCEEDANCE IN 50 YEARS PEAK GROUND ACCELERATION (g)

1998

SOFT ROCK CONDITIONS



Department of Conservation
California Geological Survey

Figure 3.2

Project No. 1038	October 2010	Seismic Acceleration 17064 Shady Lane Santa Clara County, California	Figure No. 4
Pollak Engineering, Inc.			

MORGAN HILL 7.5-MINUTE QUADRANGLE AND PORTIONS OF ADJACENT QUADRANGLES

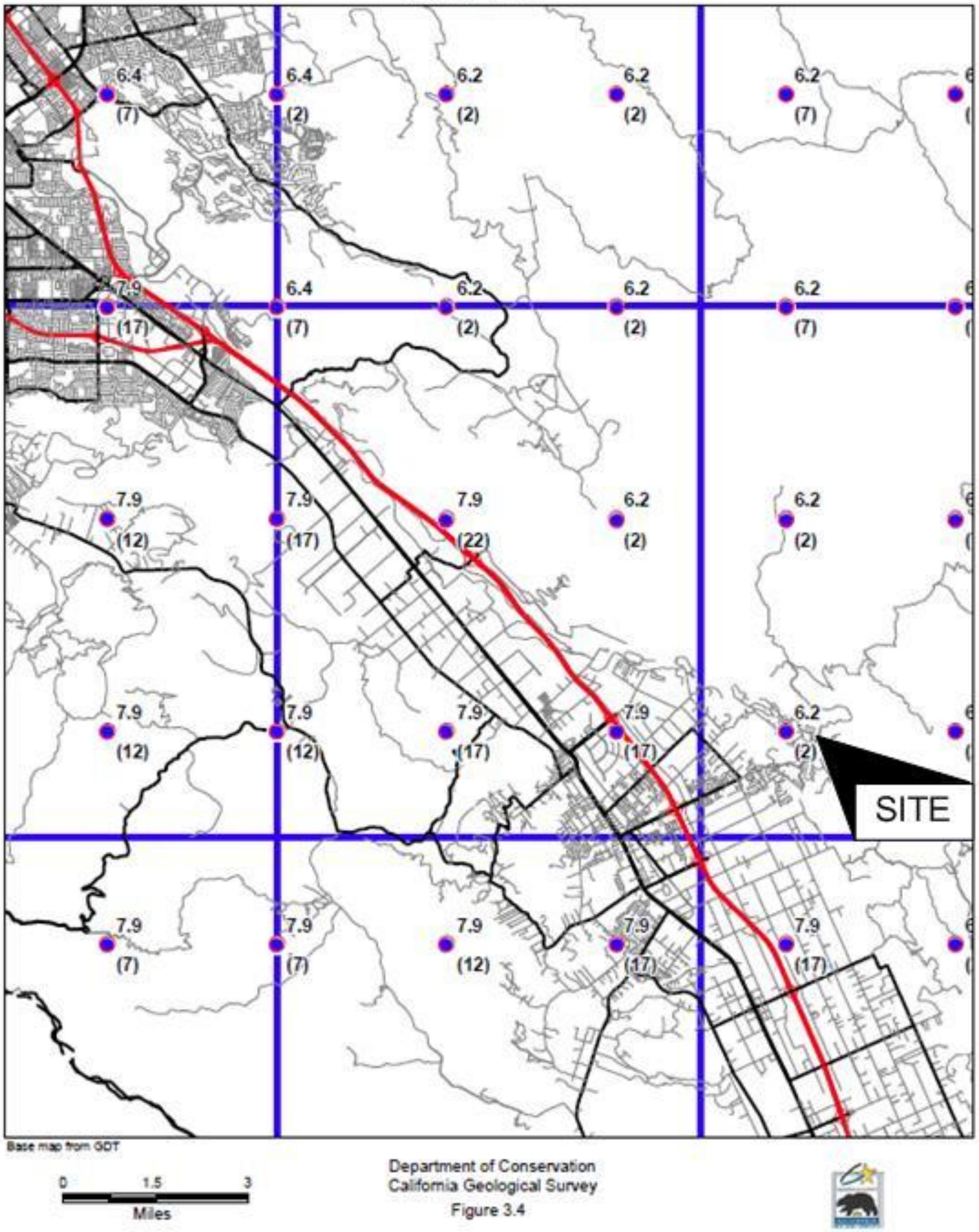
10% EXCEEDANCE IN 50 YEARS PEAK GROUND ACCELERATION

1998

PREDOMINANT EARTHQUAKE

Magnitude (Mw)

(Distance (km))



Department of Conservation
California Geological Survey
Figure 3.4

Project No. 1038	October 2010	Predominate Earthquake Magnitude 17064 Shady Lane Santa Clara County, California	Figure No. 5
Pollak Engineering, Inc.			

where *NRF* is a factor that accounts for the nonlinear response of the materials above the slide plane; u is displacement; and $D_{5\text{-}95}$ is the duration of strong shaking, a function of earthquake magnitude and distance.

Blake and others (2002) have simplified the process of estimating f_{eq} for ranges of magnitude and distance by preparing sets of curves for two displacement (u) values, 5 cm and 15 cm. These curves are reproduced in Figure 1.

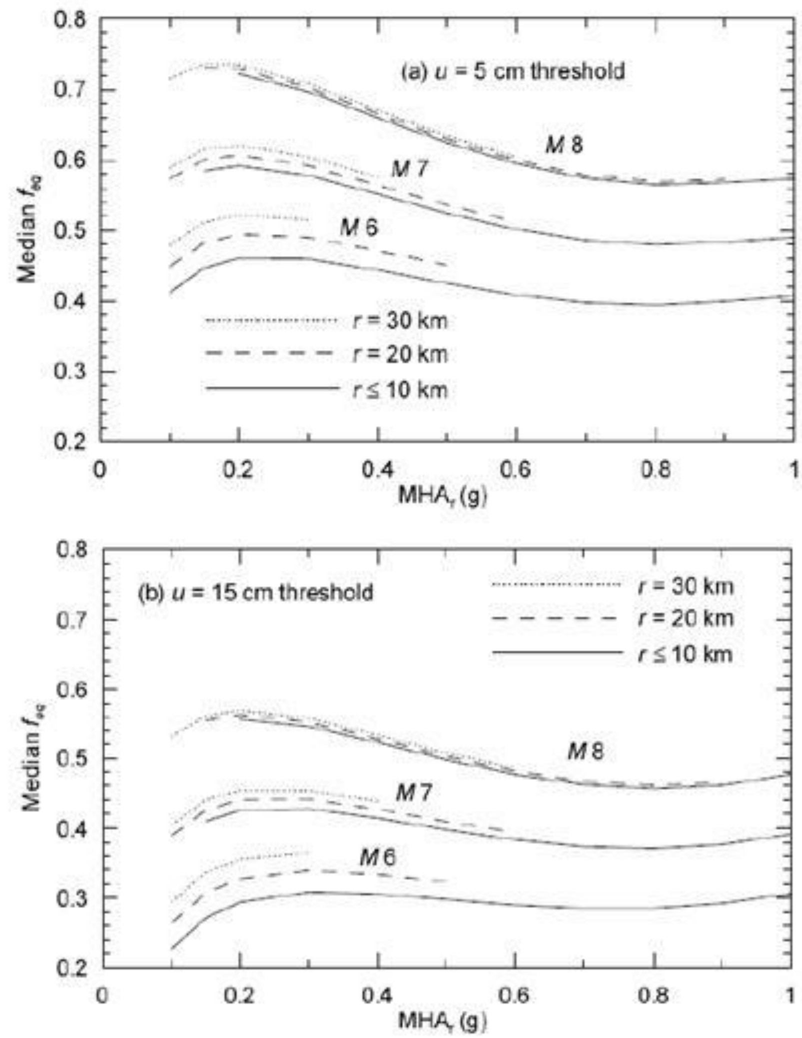


Figure 1. Values of f_{eq} as a Function of MHA_r, Magnitude and Distance for Threshold Displacements of (a) 5 cm and (b) 15 cm (Modified from Blake and others, 2002).

POLLAK ENGINEERING, INC.

Project No. 1038
1 November 2010

Mr. Bryan Hanson
[redacted]

Subject: Proposed New Residence
17064 Shady Lane
Morgan Hill, California
SUPPLEMENTAL RECOMMENDATIONS

References:
1) Architectural Plans; Shts. A0.3, A0.4, A2.00 & A6.1 - A6.5, Sheet A6.1 to A6.5 Dated 12 August 2010, Shts. A0.3 & A0.4 Dated 1 September 2010, A2.00 Dated 13 September 2008
By Bryan Hanson
2) Geologic & Geotechnical Investigation
By *Pollak Engineering Co.*
Dated 9 January 2006
3) Geotechnical Update
By *Pollak Engineering, Inc.*
Dated 17 October 2008

Geotechnical Engineering

Engineering Geology

555 No. Santa Cruz Ave.
Los Gatos, CA 95030

Phone: 408-354-0420

Dear Mr. Hanson:

In accordance with your authorization, ***Pollak Engineering, Inc.*** has reviewed the referenced Project Plans, Geotechnical Report, and Geotechnical Update for the subject development and is herein providing supplemental geotechnical recommendations appropriate to the new design.

The new design includes a "day lighted" basement for the residence, with a much reduced height in retainment allowing conventional residential retaining wall design and construction, use of drilled pier foundations for that portion of the residence that extends beyond the basement footprint, and a free standing, structural garage and partial driveway. Additionally, a series of stitch piers are recommended to increase the factor of safety against a slope failure under seismic conditions.

Recommendations:

1. The garage and driveway structural slabs, and those portions of the residence not supported by the basement retaining walls, the may be supported on drilled friction piers.

Drilled Friction Piers

2. Drilled friction piers should a have a minimum diameter of 18 inches and should extend a minimum of 12 feet into competent native material. Because of the 5 foot thickness of colluvium in the area of the proposed residence and garage, pier depths of approximately 17 to 18 feet should be anticipated.

3. Piers should be designed on the basis of skin friction acting between the soil and that portion of the pier that extends below a depth of 5 feet.

4. For the soils at the subject site, an allowable skin friction value of 650 psf. can be used for combined dead and sustained live loads. This value can be increased by one third for total loads which include wind or seismic forces.

5. Friction pier spacing should be no closer than 3 pier diameters center-to center.

6. Reinforcing steel should be provided as determined by structural requirements and the project Structural Engineer. Reinforcement for friction piers should extend for the full depth of the piers.

7. The upper 5 feet of the piers should be designed to resist lateral forces in the down slope direction, equivalent to that exerted by a fluid medium with a density of 35 pcf.

8. To resist lateral forces, passive earth pressures can be assumed to act against the sides of the drilled piers. An allowable passive resistance of 325 pcf. per foot acting on a projection of 2 pier diameters of embedment against the sides of drilled piers can be used for that portion of the pier two feet or greater below the ground surface.

Stitch Piers

9. Stitch piers should be placed in a row near the rear (inboard) basement retaining wall. If desired, the piers may be incorporated into the foundation/retaining wall construction.

10. Stitch piers should have a minimum diameter of 30 inches and must extend to a minimum depth of 50 feet below the bottom of the basement excavation.

11. Stitch piers should be spaced 3 pier diameters apart as measured center to center.

12. The upper 25 feet of the stitch piers should be designed to resist lateral forces in the down slope direction equivalent to those forces imposed by a fluid medium weighing 15pcf. For design purposes, the lateral forces may be resisted by that portion of the stitch pier below a depth of 25 feet.

Retaining Walls

13. Basement retaining walls may be founded on the basement structural mat foundation.

14. It is anticipated that basement retaining walls will be unrestrained, and may be designed to resist active earth pressures. Active earth pressures for walls with horizontal backfill may be

designed to resist lateral forces equivalent to those imposed by a fluid medium with a density of 45 pcf. Those walls retaining backfill with gradients of 2:1 (h:v) or may be designed to resist lateral forces equivalent to those imposed by a fluid medium with a density of 65 pcf.

15. Because of the project location, site conditions and building design (day lighted basement), it is recommended that the basement retaining walls be designed to resist seismic forces.

16. Lateral seismic forces on the basement retaining walls may be calculated based on the simplified Mononobe-Okabe relationship proposed by Seed and Whitman (1970)

$$\Delta P_{AE} \sim (1/3)\, K_h\, \gamma H^2$$

where ΔP_{AE} is the dynamic component, K_h is the horizontal ground acceleration divided by/gravitational acceleration (0.53); γ is the soil density (125pcf); and H is the height of the wall. A triangular stress distribution should be assumed for the seismic loading with the vertex at the base of the wall and the resultant 0.6H from the base of the wall.

17. The above criteria are based on fully drained conditions. It is imperative that the walls be fully drained.

18. In order to achieve fully drained conditions, a drainage filter blanket must be placed behind the wall. The blanket should be a minimum of 12 inches thick and should extend the full height of the wall to within 12 inches of the surface. If the excavated area behind the wall exceeds 12 inches, the entire excavated space behind the 12-inch blanket should consist of compacted engineered fill or blanket material. The drainage blanket material should consist of granular crushed rock and drain pipe fully encapsulated in geotextile filter fabric. A 4-inch perforated drainpipe should be installed in the bottom of the drainage blanket and should be underlain by 2 inches of filter type material. A 12-inch cap of native soil should be placed over the blanket. For areas where the drainage blanket will be capped with concrete, the crushed rock may be brought to sub-grade elevation, and the concrete cast directly onto the crushed rock. To reduce the possibility of moisture intrusions and condensation effects in the basement, the retaining wall sub-drain should extend a minimum of 6 inches below the <u>bottom</u> of the basement slab.

19. Piping with adequate gradient shall be provided to discharge water that collects behind the walls to an adequately controlled approved location away from the structure foundation.

Should you have any questions relating to the contents of this report or should you require additional information, please do not hesitate to contact our office at your convenience.

Very truly yours,
Pollak Engineering, Inc.

REGISTERED PROFESSIONAL ENGINEER
ROBERT JOSEPH POLLAK
C 61831
EXP. 6-30-11
CIVIL
STATE OF CALIFORNIA

Robert Pollak, P.E.

Principal Engineer

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. It should be noted that it is the responsibility of the owner or his representative to notify ***Pollak Engineering, Inc.***, in writing, a minimum of two working days before any clearing, grading, or foundation excavations can commence at the site.

2. The recommendations contained herein are based upon the assumption that the soil conditions do not deviate from those disclosed in the referenced reports and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the development of the site, ***Pollak Engineering, Inc.***, will provide supplemental recommendations as dictated by the field conditions.

3. 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 contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.

5. Notwithstanding, all the foregoing applicable codes must be adhered to at all time.

POLLAK ENGINEERING, INC.

Geotechnical Engineering

Engineering Geology

555 No. Santa Cruz Ave.
Los Gatos, CA 95030

Phone: 408-354-0420

Project No. 1038
11 November 2011

Mr. Bryan Hanson
[redacted]

Subject: Proposed New Residence
17064 Shady Lane
Morgan Hill, California
RECOMMENDATIONS FOR REINFORCED SOIL BUTTRESS

References:
1) Grading & Drainage Plan, Sheet 2
By MH Engineering
Dated March 2009
2) Geologic & Geotechnical Investigation
By *Pollak Engineering, Co.*.
Dated 9 January 2006
3) Geotechnical Update
By *Pollak Engineering, Inc*.
Dated 17 October 2008

Dear Mr. Hanson:

At your request, ***Pollak Engineering, Inc.*** is herein providing geotechnical design parameters for constructing a geo-grid reinforced soil buttress on the east facing slope, descending from the subject residence. It is our opinion that the proposed geo-grid reinforced buttress is feasible from a geotechnical perspective provided the recommendations provided below are incorporated into the reinforced buttress construction.

Should you have any questions relating to the contents of this analysis or should you require additional information, please do not hesitate to contact our office at your convenience.

Very truly yours,
Pollak Engineering, Inc.

REGISTERED PROFESSIONAL ENGINEER
ROBERT JOSEPH POLLAK
C 61831
EXP. 6-30-13
CIVIL
STATE OF CALIFORNIA

Robert Pollak, P.E.
Principal Engineer

The subject reinforced buttress configuration was evaluated using *StrataSlope* 2.1 software and a site seismic factor of 0.251 (h).

GEO-GRID REINFORCED BUTTRESS RECOMMENDATIONS

1. Soil sub-grade preparation in area to receive the geo-grid reinforced buttress fill and tiered retaining walls must include the removal of all colluvial/topsoil material, and all material susceptible to downslope movement. Excavation depths of 15 to 17 feet or more should be anticipated. Final excavation depths will be determined during grading operations by the Soil Engineer and/or Engineering Geologist. All fill soil material must be founded on a keyway excavated entirely into bedrock. The keyway should slope downward and into the slope with gradients of approximately 3° to 5° from horizontal.

2. Geo-grid reinforcement shall consist of a minimum of *Stratagrid* SG550 or equivalent (LTDS = 4346 lbs/ft.) with the first course placed on the bottom of the keyway, and additional courses spaced every 3 feet vertically. Geo-grid placement and sub-grade preparation must be observed and approved by the Soil Engineer.

3. Minimum length for all geo-grid reinforcement shall be 10 feet. In all cases, geo-grid reinforcement must extend from the outboard portion of the geo-grid reinforced buttress to the sub-drain at the rear of the fill in accordance with Figure 1. Note that the geo-grid does not extend to daylight, and should be placed to create a reinforced section of fill that is at an angle of 70° from horizontal as indicated in Figure 1.

4. A continuous sub-drain must be provided for the geo-grid reinforced buttress in accordance with Figure 1. Sub-drain material may consist of a 4 inch diameter, perforated pipe encapsulated in ¾" crushed rock encapsulated in filter fabric. The reinforced slope sub-drains must extend the entire height of the buttress fill to within 36 inches of the ground surface. Additionally, engineered fill soil placed outboard of the buttress, and placed without geo-grid reinforcement must be equipped with a sub-drain constructed in accordance with Figure 1.

5. Minimum relative compaction for geo-grid reinforced soil shall be 95% as determined by Laboratory Test Procedure ASTM D1557-98.

6. Maximum height for any non-reinforced vertical excavation is 5 feet. At a height of 5 feet, the excavation shall be supported or laid back as directed by the Soil Engineer during grading operations

7. The Soil Engineer must observe and approve the sub-grade preparation and sub-drain construction prior to the placement of any soil. All soil placement and reinforced soil construction must be observed and approved by the Soil Engineer.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

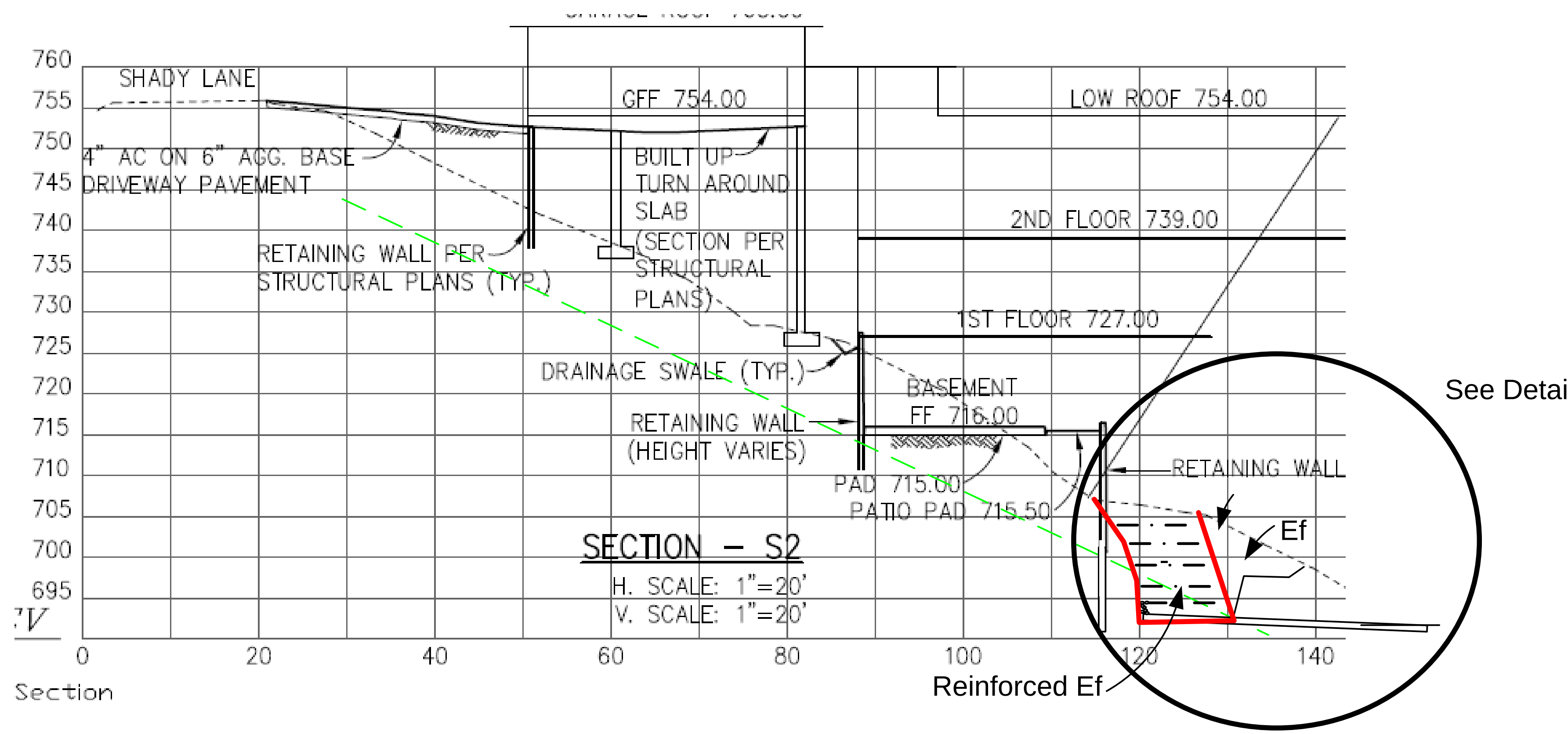
1. It should be noted that it is the responsibility of the owner or his representative to notify ***Pollak Engineering, Inc.***, in writing, a minimum of two working days before any clearing, grading, or foundation excavations can commence at the site.

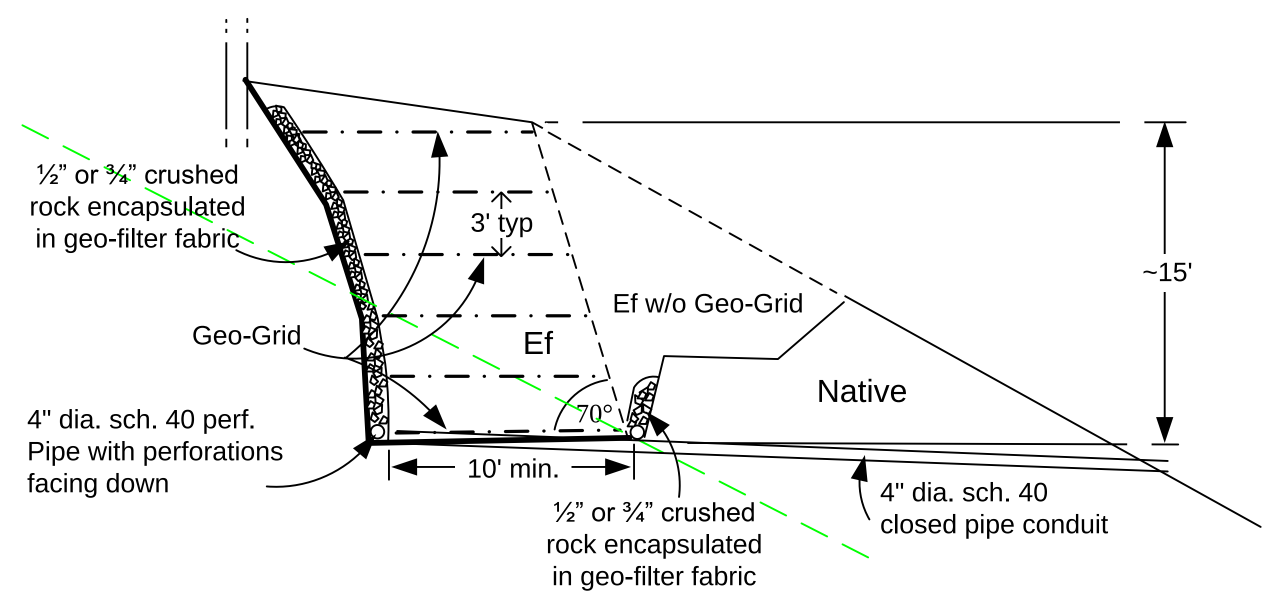
2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the referenced reports and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the development of the site, ***Pollak Engineering, Inc.*** will provide supplemental recommendations as dictated by the field conditions.

3. 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 contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.

5. Notwithstanding, all the foregoing applicable codes must be adhered to at all times

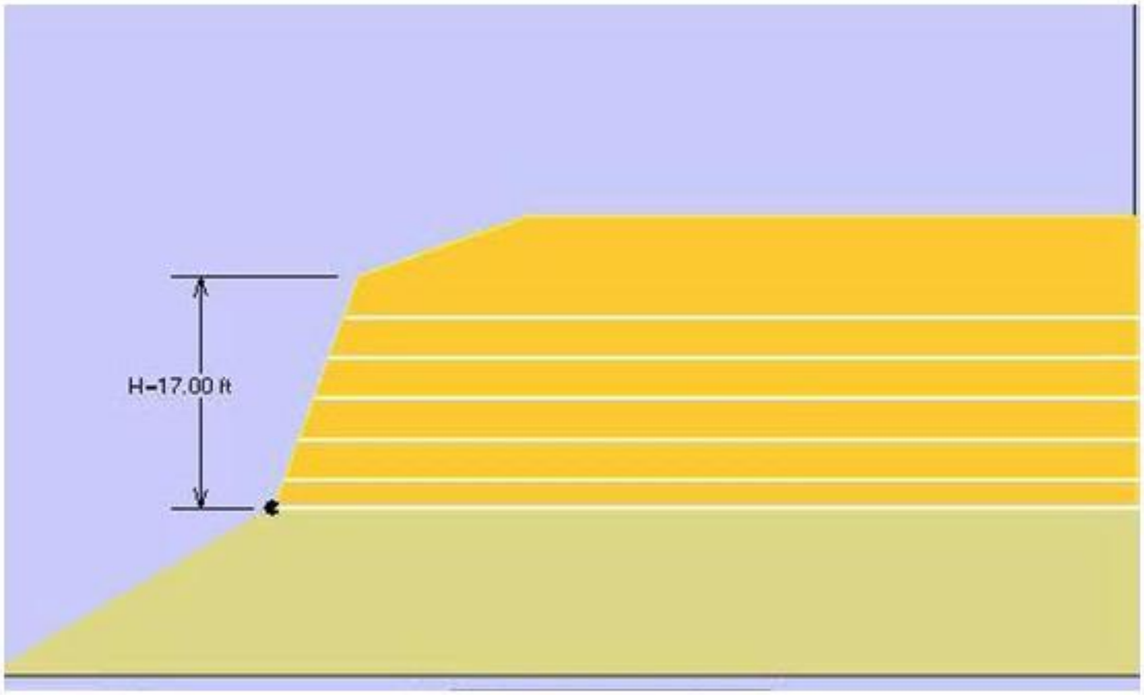




DETAIL

1. Keyway is to be provided with 3° to 5° gradient sloping downward into slope
2. Geo-grid to be minimum of *Stratagrid* SG550 or equivalent.
3. Geo-grid to be spaced at 3' intervals.
4. Soil relative compaction min. 95%.
5. Soil Engineer must observe and approve keyway, soil placement and compaction, and all sub-drain operations

Project No. 1038	November 2011	Geo-Grid Reinforced Buttress 17064 Shady Lane Morgan Hill, California	Figure No. 1
Pollak Engineering, Inc.			



					Strength:				
#	Elevation [ft]	Name	Length [ft]	Mode of Failure	Required Tr [lb/ft]	Available Ultimate, T-ult [lb/ft]	Available Long-term (design) T-ltds [lb/ft]	Actual Overall Fs	Status
1	0.00	SG550	110.12	Compound	3341.86	8150.00	4344.42	> 1.30	☑
2	2.00	SG550	110.12	Compound	3341.86	8150.00	4344.42	> 1.30	☑
3	5.00	SG550	110.12	Compound	3341.86	8150.00	4344.42	> 1.30	☑
4	8.00	SG550	110.12	Compound	3341.86	8150.00	4344.42	> 1.30	☑
5	11.0C	SG550	110.12	Tieback	1523.13	8150.00	4344.42	2.85	☑
6	14.0C	SG550	110.12	Tieback	1024.89	8150.00	4344.42	4.24	☑

$$T_{ltds} = \frac{T_{ult}}{RF_{id} \cdot RF_d \cdot RF_c} = T_{available}$$

$$T_r \leq T_{allowable}$$

Limit Equilibrium $F_s = \frac{T_{ltds}}{T_r} = F_r$ BS 8006

Project No. 1038	November 2011	Geo-Grid Reinforced Buttress 10764 Shady Lane Morgan Hill, California	Figure No. 2
Pollak Engineering, Inc.			