Geologic/Geotechncial Report, "EIR-Level Review of Road Alignment for Via Princessa East from Golden Valley Road to 250 feet west of Sheldon Avenue," prepared by Allen E. Seward Engineering Geology, Inc., August 13, 2010

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GEOLOGIC/GEOTECHNICAL REPORT
EIR-Level Review of Road Alignment for Via Princessa East from Golden Valley Road to 250 Feet West Of Sheldon Avenue

City of Santa Clarita, California

Prepared for:

Impact Sciences
803 Camarillo Springs Road, Suite A
Camarillo, California 93012

Job No: 10-2254C
Dated August 13, 2010

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August 13, 2010 Job No.: 10-2254C

Impact Sciences
803 Camarillo Springs Road, Suite A
Camarillo, California 93012

Attention: Ms. Susan Tebo

Subject: **GEOLOGIC/GEOTECHNICAL SUMMARY REPORT**
EIR Level Review the Road Alignment for Via Princessa East from Golden Valley Road to 250 Feet West of Sheldon Avenue

Project: Via Princessa Road Extension
City of Santa Clarita, California

Dear Ms. Tebo:

This preliminary geologic and geotechnical evaluation of the subject site is provided for incorporation into an Environmental Impact Report (EIR) for the proposed extension of Via Princessa from its current terminus near the intersection of Sheldon Avenue westerly to Golden Valley Road. This report summarizes our opinions regarding geologic and geotechnical conditions at the site and their effects on the proposed development of the site.

1.0 SCOPE OF INVESTIGATION

This report summarizes geologic and geotechnical conditions in the vicinity of the proposed road alignment and provides general geologic and geotechnical recommendations for submittal in an Environmental Impact Report. Potential impacts caused by the proposed development have been identified. Mitigation measures to lesson or avoid impacts are also suggested in this report.

This investigation included the following tasks:

1. Coordination with the Supervising Environmental Consultant.

2. Review of pertinent in-house data compiled by this office.

3. Review of the published references and data listed at the end of this report.

4. Review of previous consultant data and reports acquired by this firm addressing the site and the mapped landslides referenced at the end of this report.

5. Review of oil well data in the Munger Map Book, California-Alaska, Oil and Gas Fields, 2003 and oil well data available online at the State of California Division of Oil, Gas and Geothermal Resources web site to assess if any oil wells have been drilled within the anticipated grading envelope for the proposed road alignment.

6. Review of Los Angeles County Flood Center District maps to assess if any water wells have been drilled within the anticipated grading envelope for the proposed road alignment.

7. Review of Los Angeles Department of Public Works water well location maps and data available at the Los Angeles Department of Public Works web site to assess if any water wells have been drilled within the anticipated grading envelope for the proposed road alignment.

8. Review of the following aerial photographs:

YEAR	PHOTOS	SCALE	AGENCY
1928	E-246 and E-247	1"=1,675' (±)	Fairchild
9/28/1959	AXJ-16W-63, 64and 65	1"=2,000' (±)	USDA
8/24/1980	780-213 and 780-214	1"=4,000'(±)	USDA

9. Geologic and Geotechnical review of the 1"=150' scale plan - Road Alignment for Via Princessa East from Golden Valley Road to 250 ft. West of Sheldon Avenue - dated 9/17/2009. This plan was prepared by Sikand Engineering and illustrates the alignment with proposed grading contours and preliminary limits of potential grading. This plan is used as the base map for our Geologic Map (**Plate I**). We make no representation regarding the accuracy of the base map.

10. Preparation of a Location Map, Regional Geologic Map (1”=2,000’), Geologic Overview Map (1”=500’), and Geologic Map (1”=150’), pertinent figures, and this Report.

2.0 BACKGROUND

This office previously performed limited geologic and geotechnical investigations for the large landside complex of which the road alignment traverses.

Previous engineering geology and geotechnical investigations for the site and vicinity include studies by Geolabs-Westlake Village, GeoKinetics, Kovacs-Byer & Associates, Converse Consultants, Petra Geotechnical, Robert Stone & Associates, Leighton and Associates, and RT Frankian and Associates. See references at the end of text for reviewed reports.

3.0 SITE DESCRIPTION

The subject road alignment is situated within the elevated hillside area located between Golden Valley Road to the west and southwest, undeveloped land to the north (the Santa Clarita Sports Complex is located approximately 1900 ft to the north) and Golden Valley High School to the south. Existing residential homes are located at the eastern end of the proposed road extension at Sheldon Avenue. The site is generally in an undeveloped state with the exception of dirt access roads and graded areas associated with the construction of Golden Valley Road and Golden Valley High School. The site is covered with moderate to dense growth of natural grasses and chaparral. Detailed topography of the site is shown on the attached **Location Map** and base maps for the Geologic Maps.

4.0 PROPOSED ALIGNMENT

The proposed alignment shown on the attached Road Alignment Plan for Via Princessa East consists of extending Via Princessa from the existing Golden Valley Road intersection, just north of Golden Valley High School, to the northeast connecting to the existing westernmost extension of Via Princessa located approximately 250 ft west Sheldon Avenue. The proposed alignment is approximately 4,570 feet (0.87 miles) long and traverses property owned by Pacific Crest Santa Clarita, LLC., Gunjit Sikand, NTS property and Golden Valley High School property. Proposed slopes are designed at 2:1 horizontal to vertical gradients (h:v). The maximum proposed cut-slope is approximately 125 ft high and the maximum proposed fill slope is approximately 100 ft high. The proposed design shown on the Road

Approximate Scale: 1"=1,500'

Aerial Photo dated July 27, 2008

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NOTE: THIS IS NOT A SURVEY OF THE PROPERTY

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LOCATION MAP

Job No.: 10-2254C	*Date:* 8/13/10

Alignment Plan encroaches into the City of Los Angeles Department of Water and Power (DWP) right-of-way easements. These easements are located at both the western and eastern portions of the proposed alignment. The proposed grading encroachments into the DWP easements include the construction of proposed slopes. It is our understanding that permission for these encroachments must to be obtained from DWP.

It is anticipated that mass grading by cut and fill techniques will be used to create the roadway and the associated cut and fill slopes. The Road Alignment Plan from Sikand Engineering is used as the base map for our Geologic Map and Geologic Overview Map.

5.0 GEOLOGY

5.1 Regional Geology

The subject road alignment is situated in the western Transverse Ranges geomorphic province in the extreme western portion of the Soledad Basin. The San Gabriel fault zone is mapped at the proposed intersection of Golden Valley Road and Via Princessa. Numerous east-west trending folds and reverse faults that are the result of on-going compressional tectonics characterize this region. The Soledad Basin is roughly a rectangular-shaped southwesterly plunging synclinal structure that extends between the San Gabriel fault in the Newhall-Saugus area and the San Andreas Fault near Palmdale. A thick accumulation of Cenozoic sedimentary rocks has accumulated in this structural/depositional basin and has subsequently been faulted and folded by repeated tectonic deformation. Quaternary alluvium covers the valley floors (see the Regional Geologic Map **Figure 1** for details).

The vicinity surrounding the road alignment has been affected by slope movements that range in size from small debris flows and surficial failures to large, deep-seated landslide failures.

5.2 Geomorphology

The site topography is dominated by northwesterly trending ridges, with minor canyon spurs and swales that descend towards the northwest towards the Santa Clara River which is located approximately 1.3 to 1.5 miles north of the site. Slope gradients in the hillside areas of the site are moderate with an average gradient of about 2:1 (h:v). Ground surface elevations located within preliminary limits of potential grading envelope noted on the road alignment map range from approximately 1495 ft within the narrow canyon at the vicinity of station 119+00 feet north of the alignment to approximately 1765 ft at a high point along the existing broad ridgeline at the vicinity of station 127+00, south of the road alignment. The topography of the site is shown on the attached Geologic Overview Map **Figure 2** and on the Geologic Map **Plate I**.

5.3 Geologic Units

5.3.1 Sunshine Ranch Member of the Saugus Formation (Tsr)

The Saugus Formation was first defined by Hershey (1902) and subsequently refined by Kew (1924) to describe the stratigraphic sequence overlying the Pico Formation and underlying Pleistocene terrace deposits. According to Oakeshott (1958), the term "Sunshine Ranch Formation" was first informally used by J.C. Hazzard in unpublished work to describe rocks exposed near Van Norman Dam. Oakshott used the term Sunshine Ranch for rocks intermediate between the Saugus and Pico Formations and included them as a member of the Pico Formation. Winterer and Durham subsequently reassigned the Sunshine Ranch member as the basal portion of the Saugus Formation and this usage is followed herein.

Saul (1983) defined a lower and upper facies within the Pliocene Sunshine Ranch member. The lower facies typically consists of massive to poorly bedded, yellowish-gray arkosic sandstone, light-brown silty sandstone and yellowish- to light-gray pebbly sandstone and conglomerate with iron-oxide stains. These deposits may represent a shallow marine or near shore depositional environment. The upper facies typically consists of nonmarine grayish-green mudstone, sandy siltstone and claystone with interbeds of light-brown silty sandstone, light-gray to yellowish-gray pebbly sandstone and sandy conglomerate, and reddish-brown sandy siltstone, mudstone and claystone. These units have been interpreted as brackish water deposits, which represent the transition from a marine to a non-marine depositional environment (Sexton, 1990).

The upper facies occurs at the site and was encountered at depth in the borings. The only place where it is exposed at the ground surface is located at the northeast corner of the site. The Sunshine Ranch member (Tsr) at the site consists primarily of massive silty sandstone, with interbeds of siltstone and clayey mudstones that dip gently (5-10º) to the northwest. This unit is significant in that it contains very weak, clay rich interbeds that act as the failure surface at the base of many of the mapped landslides in this area. The interpreted boundary/contact between the Sunshine Ranch Member of the Saugus Formation and the overlying portion of the Saugus Formation consists of a relatively continuous horizon informally called the Friendly Valley Horizon that contains very weak clay deposits.

Where these beds are oriented adversely to proposed cut slopes, such as on the northeastern portion of the site and adjacent to the existing development, unstable slope geometries may be produced. These slopes will need to be analyzed in detail and mitigation measures for temporary slope conditions during grading and permanent slope conditions will be required.

5.3.2 Saugus Formation (TQs)

The lower portion of the Plio-Pleistocene Saugus Formation occurs at the site and conformably overlies the upper facies of the Sunshine Ranch Member between the San Gabriel Fault and the Santa Clara River. The Saugus Formation was deposited in a fluvial environment between 0.7 and 2.5 Ma (Levi et al., 1986). The observed bedrock is dominated by moderately hard, light gray to yellowish-gray sandstone and conglomerate with local interbeds of greenish-gray siltstone and sandy siltstone, and uncommon reddish-brown mudstone in this area. Siltstone and mudstone units of the Saugus Formation are potentially expansive. Thin, low-strength clay seams occur in the mudstone units both as a result of original deposition and due to flexural slip along bedding during tectonic folding subsequent to deposition. These low strength clay layers may be fairly rare; however where they occur locally they have proven problematic relative to slope stability.

This formation is exposed at the surface of nearly the entire site but a large portion of it has been disturbed by landsliding. Intact Saugus Formation bedrock is located on the southwest portion of the site

5.3.3 Alluvium (Qal)

Minor amounts of recent river-channel deposits are present in the lower elevations of the property, largely underlying the immediate modern drainage and major tributaries of the Santa Clara River (see Geologic Map **Plate I)**. The alluvial deposits consist of interbeds of sandy, silty and clayey soils with gravels and pebbles

5.3.4 Slopewash (Qsw)

Swales and side-canyons at the vicinity of the proposed alignment commonly contain loose debris consisting of poorly sorted sand, silt and bedrock fragments. This material has accumulated via daily surface wash and periodic debris flows and is present above levels where they are incorporated and reworked by modern stream flow. They are generally poorly consolidated. Slopewash is not indicated on the Geologic Map.

5.3.5 Residual Soil

Ungraded areas of the site are mantled by surface soils consisting of moderate- to yellowish-brown and yellowish-gray silty sand with scattered pebbles. This unit is not shown on the Geologic Map. Soil developed in the alluvial flats and in the relatively flat mesa areas has been disturbed by past agricultural and grading activities.

5.3.6 Artificial Fill (af) and Debris

Non-compacted artificial fill may be present along the proposed road alignment. These deposits would include minor spill fills generated during past grading of minor access roads. In proposed fill areas, all artificial fill impacting the proposed development will be entirely removed prior to placement of compacted/certified fill material. If artificial fill is present below proposed cut grade elevations, it should be completely removed and replaced with compacted fill.

5.3.7 Certified Engineered Fill (Cef)

Certified engineered fill has been placed at the western portion of the proposed alignment during the construction Golden Valley Road and during the construction of Golden Valley High School. It is our understanding that the grading operations, including the placement of certified engineered fill, were observed by RT Frankian and Associates (see references).

5.4 Mass Movement Deposits

5.4.1 Landslides (Qls)

Numerous landslides including a large deep seated landslide complex have been mapped along the subject road alignment as shown on the attached Geologic Map (**Plate I)** and the Geologic Overview Map (**Figure 2**). These landslides are primarily translational failures controlled by the bedding orientation. The landslide materials vary from highly fractured and disrupted rock to large relatively intact appearing block resting above a low strength slip surface. The landslide complex has experienced multiple episodes of movement. Some of the landslide deposits appear recent exhibiting head scarps and local topographic depressions (grabens) and are currently active. Some exhibit typical lobe shaped geometries associated with paleo landslides. Voids created by dilation of the bedrock (grabens) are commonly backfilled with rock debris and colluvial material and occur throughout the site. Landslides were identified based on examination of field exposures and suggestive geomorphic features observed on aerial photographs and on topographic base maps and verified via subsurface explorations using a 24" diameter bucket-auger drill rig and downhole geologic logging. The mapped landslides range in size from small shallow failures to deep-seated failures.

Based on preliminary investigation of the large landslide complex by our office and based on review of previous geologic and geotechnical studies performed at the site and vicinity (see references), it is determined that the basal landslide plane consists of a relatively continuous geologic horizon containing very weak clay deposits informally called the Friendly Valley Horizon. This clay plane is located at the interpreted boundary between the upper facies of Sunshine Ranch member of the Saugus Formation and the overlying coarser-grained portion of the Saugus Formation. Based on preliminary geologic exploration, this landslide complex is estimated to be up to approximately 140 ft thick at the location of the proposed road alignment. Cross section 6-6' illustrates the three dimensional geometry of the deep seated landslide complex as well as the proposed grading design illustrated on the Road Alignment Plan. The Geologic Overview Map **(Figure 2)** illustrates the extent of the mapped landslides. The landslide complex will require mitigation measures to support the proposed roadway.

5.4.2 Surficial Failures (sf)

Shallow (5 to 13 feet in depth) surficial failures involving soil, slopewash and weathered bedrock were observed. Approximate locations and extent are shown on the Geologic Maps. Any of the surficial failure material, which exists below proposed grade, should be removed prior to the placement of compacted fill.

5.5 Geologic Structure

The northwest/southeast trending San Gabriel fault is located just beyond the western end of the proposed road alignment. Based on field mapping, subsurface exploration and a review of pertinent geologic data indicate that the Saugus Formation bedrock at the central to eastern portion of the alignment is strikes northeasterly and dips shallowly (5-10 degrees) to the northwest. The western portion of the proposed alignment, near the San Gabriel fault, the bedrock strikes north to northwesterly and dips 7 to 35 degrees west to southwest, dipping steeper closer to the fault (see the Regional Geologic Map by Dibblee **Figure 1** and the Geologic Overview Map **Figure 2** for details). The portion of the San Gabriel fault adjacent to the proposed roadway is not classified as active by California Geologic Survey (CGS).

5.6 Groundwater and Surface Water

Ground water beneath the proposed Via Princessa Road alignment can be grouped into two categories: 1) ground water contained in the recent alluvium; and 2) ground water perched above low permeability layers in the Saugus Formation and landslide deposits.

Most of the site is comprised of bedrock and or landslide deposits derived from bedrock and only a minor amount of alluvium is present within the narrow canyon located at the vicinity of station 119+00. Seeps have been mapped at the site by others at the vicinity of this narrow alluvial canyon along the lateral limit of the mapped landslides. The thickness of the alluvium is estimated to be approximately 25 ft, or less, beneath the subject road alignment. Review of the Los Angeles County Department of Public Works Water Wells Map, available online, indicates that the closest water well is located adjacent to the Santa Clara River approximately 1 mile north of the road alignment. Review of the Water-Resources Investigation report by Robson indicates that an alluvial aquifer is not present at the subject road alignment.

The narrow alluvial canyon located at the vicinity of the subject road alignment should be evaluated during the design phase of this project to determine the absence or presence of ground water. Dewatering may locally be required to complete the necessary removals. It should be noted that the ground water table will fluctuate up and down in response to natural recharge and water well pumping requirements. Both of these factors are altered as a result of urbanization. Due to the elevated nature of the proposed Via Princessa Road alignment, ground water is not expected to significantly affect the project, provided our recommendations are implemented during construction.

Perched ground water was encountered in the Saugus Formation bedrock and mapped landslide deposits during our preliminary limited subsurface exploration for the site. Perched ground water conditions can contribute to slope instability in proposed natural and proposed cut slopes. All Stability/Buttress Fills are required to have backdrains per applicable grading codes. Subdrains are required in fill areas.

Canyon subdrains will be required in canyon areas in which fill will be placed and back drains will be required in all Stability Fills and Buttress Fills, in accordance with applicable grading codes. Due to the elevated nature of the subject site, ground water is not expected to significantly affect the project, provided that GAI's recommendations are implemented during construction.

6.0 POTENTIAL GEOLOGIC AND GEOTECHNICAL HAZARDS/CONSTRAINTS AND POSSIBLE MITIGATION MEASURES

6.1 Seismicity

6.1.1 Introduction

The subject site is located in the seismically active southern California region. Earthquake-related hazards typically include ground rupture, ground shaking, and ground failure.

6.1.2 Ground Rupture

The subject site is not located in any State of California Alquist-Priolo Earthquake Fault Special Study Zones. It should be noted that the Alquist-Priolo Earthquake Fault Special Study Zone for the active segment of the San Gabriel fault terminates approximately 3,200 ft northwest of the subject road alignment. The closest known active fault to the site per Los Angeles County Seismic Safety Element (surface trace) is the San Gabriel fault, which has been mapped at the proposed intersection of Golden Valley Road and Via Princessa (western portion of the proposed alignment).

Regional geologic maps do not show any additional active faults or potentially active faults (i.e., faults that have offset geologic materials in the last 11,000 years and last 1 million years respectively) on or trending towards the site.

No evidence of active faulting or ground rupture was observed on the vicinity of the proposed alignment during our investigations for the site.

The potential for primary ground rupture at the site during the life of the proposed development is considered to be low.

6.1.3 Ground Shaking

The site is located in southern California, which is an **active** seismic area where large numbers of earthquakes are recorded each year. The area of the subject site experienced strong ground motion during the 1971 San Fernando earthquake (which was generated by the Sierra Madre-San Fernando fault), and more recently during the 1994 Northridge earthquake. **Table I** summarizes significant historical earthquakes that have occurred near the site. The Fault and Earthquake Epicenter Location Map **Figure 3** shows the most prominent faults and locations of earthquake epicenters within the Southern California region.

TABLE I - SIGNIFICANT HISTORICAL EARTHQUAKES

EARTHQUAKE	SITE TO EPICENTER DISTANCE (MILES)	EARTHQUAKE MAGNITUDE*	DATE
Fort Tejon	96	7.9	1857
Kern City	51	7.7	1952
Santa Barbara	76	7.0	1812
San Fernando	5.3	6.6	1971
Northridge	13.6	6.7	1994

*Moment Magnitude for earthquakes with magnitude greater than 6 or for earthquakes that occurred after 1933. Local Magnitude for earthquakes with magnitude less than 6 or for earthquakes that occurred before 1933 or (S.C.E.C., 2000).

Table II summarizes potential earthquake sources near the site, including estimates of maximum moment magnitude that are considered geologically feasible for these sources, per the State of California (Peterson, et al, 1996).

TABLE II - SIGNIFICANT REGIONAL FAULTS

FAULT	MAXIMUM MOMENT MAGNITUDE	APPROXIMATE DISTANCE TO SITE * (MILES)
San Gabriel	7.0	0.1
Holser	6.5	3.2
Northridge (East Oak Ridge)	6.9	5.6
Santa Susana	6.6	5.6
Sierra Madre-San Fernando	6.7	7.2
San Andreas	7.8	18.1

* Approximate closest distance to surface trace.

Based on a the Seismic Hazard Zone Report for the Mint Canyon Quadrangle, the peak horizontal ground surface acceleration with a 10% probability of exceedance in 50 years (475-year return period) is estimated to be 0.74g for the alluvial portions of the site and 0.73g for areas of the site where the Saugus Formation (TQs and Tsr) outcrops or is located close to the ground surface.

6.1.4 Ground Failure

Ground failure is a general term that refers to secondary, permanent ground deformation caused by strong earthquake shaking, including liquefaction of saturated granular deposits or fine-grained soils with low plasticity, lateral spreading, ground lurching, seismic settlement (dynamic densification) of loose, poorly consolidated materials, differential materials response, slope failure, sympathetic movement on weak bedding planes or non-causative faults, and shattered ridge effects. Potential for ground failure at the site is discussed below.

Most of the site is underlain by bedrock and or landslide deposits that are not susceptible to liquefaction. The alluvium present in the narrow canyon areas of the site (see Geologic Map (**Plate I**) and Geologic Overview Map (**Figure 2**) is not designated as potentially liquefiable on the State of California Seismic Hazard Zones Map (Mint and Newhall Quadrangles see **Figure 4**). Based on the preceding factors, it appears that potential for liquefaction of alluvium in the tributary canyons is low.

Relatively loose granular alluvial soils located within the minor tributary canyon traversing the road alignment may be prone to dynamic densification as a result of future earthquake shaking. A detailed evaluation of the potential for dynamic densification will need to be performed. Typically the potential for dynamic densification of these materials can be mitigated by removal of the materials and then replacing them as compacted fill. Potential for seismic settlement (dynamic densification) is negligible in the bedrock portions of the site.

Earthquake-induced slope failures include activation and reactivation of landslides, rock falls, debris flows and surficial failures. The potential for earthquake-induced slope failures is moderate to high on the landslide affected portions of the site and on the steep canyon slopes. Most of the hillside areas directly adjacent to the road alignment are designated on the State of California Seismic Hazard Zones Maps (Mint and Newhall Quadrangles see **Figure 4**) to have potential for earthquake-induced slope instability. Numerous large, deep seated landslides have been mapped at the subject road alignment. The proposed cut and fill grading for the development eliminates some of these areas. However, a detailed evaluation of the potential for earthquake-induced slope failures, reactivation of existing landslides, rock falls, debris flows and surficial failures on the natural and proposed design slopes will need to be performed. Cut and fill slopes constructed per the Uniform Building Code typically are not subject to earthquake-induced failures. However, the most critical proposed cut and fill slopes for the Via Princessa extension will need to be evaluated at the planning and design stage and, if necessary, mitigation measures will be recommended. Typical mitigation for slopes prone to earthquake-induced failures include avoidance, removal of surficially unstable materials, laying back the slope to a shallower gradient, buttressing, construction of shear keyways, or debris basins and walls that may be designed to divert and/or collect the calculated volume of material expected to fail.

6.2 Slope Stability

6.2.1 Landslides

A large landslide complex and smaller landslides have been mapped along the subject road alignment as previously discussed and as shown on the attached Geologic Map (**Plate I**) and the Geologic Overview Map (**Figure 2**). These landslides are primarily translational failures controlled by the bedding orientation. Based on our preliminary investigation of the large landslide complex and of review of previous geologic and geotechnical studies performed at the site and vicinity, it is determined that the basal landslide plane consists of a relatively continuous geologic horizon that contains very weak clay deposits informally called the Friendly Valley Horizon. This horizon is located at the boundary between the upper facies of the Sunshine Ranch member of the Saugus Formation and the overlying coarser-grained portion of the Saugus Formation. Based on preliminary geologic exploration, this landslide complex is estimated to be up to approximately 140 ft thick at the location of the proposed road alignment. Preliminary stability analyses performed on Cross Section 6-6' (**Plate II**) indicate that the gross stability of the landslide complex does not satisfy standard of practice/agency factory of safety requirements and will therefore require mitigation in the form of a shear keyway. This preliminary shear keyway is illustrated schematically on Cross Section 6-6'. Additional geologic and geotechnical studies will need to be performed in order to refine the three dimensional geometry and geotechnical characteristics of the various landslides within this landslide complex. Owing to the preliminary nature of performed investigation and evaluation studies of the landslide complex, the size and location of the shear keyway should be considered extremely preliminary. It should be noted that this shear keyway currently extends approximately 71 ft beyond (northerly) the preliminary limits of potential grading noted on the road alignment plan.

All mapped landslides will have to be investigated and evaluated and will require geologic and geotechnical analyses to determine stability and compressibility of the landslide material that will be exposed in the proposed graded areas. Several options are available to mitigate potential landslide failure in the proposed cut slopes. Landslides may be stabilized with Buttress Fills or Shear Keys designed by the Project Geotechnical Engineer based on results of slope stability analyses; landslide material can be entirely removed and replaced with certified compacted fill; or the slope can be redesigned to avoid the landslide. Landslides underlying cut pads or road areas may be removed, or partially removed if the project Geologist and Geotechnical Engineer conclude that the landslide is stable and sufficiently consolidated to build on. Landslides located in fill areas may be completely removed if the project Engineering Geologist and Geotechnical Engineer conclude that the landslide mass is susceptible to significant settlement and/or not stable to build upon. Landslides located in fill areas may be partially removed if the project Engineering Geologist and Geotechnical Engineer conclude that the landslide mass is stable and not susceptible to significant settlement. Some of the relatively intact landslide blocks appear to be suitable for support of fills and structures. Landslides located on ascending natural slopes above graded areas will either require stabilization, removal or Building/Structural Setbacks to mitigate potential hazards. Landslides, which will not affect the proposed grading concept, should be placed in "Restricted Use Areas".

6.2.2 Cut Slopes

Gradients of the proposed cut slopes shown on the Road Alignment Plan are 2:1 (h:v) or flatter. The tallest proposed cut slope is approximately 125 ft high.

Proposed cut slopes located easterly of the road alignment at station 123+00 are within the mapped landslide complex. Therefore, stability of these slopes should be investigated and evaluated to determine the potential for slope instability and appropriate mitigations.

Before it can be concluded that the proposed cut-slopes satisfy agency factor of safety requirements, the proposed cut slopes need to be evaluated from a geologic and geotechnical standpoint. Thus, subsurface geologic and geotechnical studies should be performed to determine stability of the landslide mass and proposed cut slopes.

Several options are available to mitigate potential landslide failure in the proposed cut slopes. Landslides may be stabilized with Buttress Fills or Shear Keys designed by the Project Geotechnical Engineer based on results of slope stability analyses; landslide material can be entirely removed and replaced with certified compacted fill; or the slope can be redesigned to avoid the landslide.

6.2.3 Natural Slopes and Debris Flow Hazards

The Road Alignment plan indicates the proposed grading design (cut slopes and fill slopes) will eliminate most of the natural slopes directly adjacent to the proposed Via Princessa. Proposed natural slopes exposing landslide material or adverse geologic bedding conditions should be evaluated. If it is determined that these areas do not satisfy required factor of safety requirements the natural slopes may be stabilized by removing the landslide deposits, constructing Buttress Fills or Shear Keys designed by the Project Geotechnical Engineer.

Steep natural slopes adjacent to the proposed road alignment should be evaluated for potential debris flow hazards. Avoidance of the hazard by selective structural locations, construction of impact or debris walls and/or debris basins, control of run-off or removal of loose surficial materials can be used to mitigate debris flow hazards.

6.2.4 Fill Slopes

Proposed fill slopes are designed at 2:1 gradients or shallower. Preliminary review of the proposed road alignment indicates that the highest proposed fill slope on the site is approximately 100 ft. Thin sliver fill slopes may require stability analysis if adverse bedding exists on slopes receiving this fill. If any fill slope areas are found to be surficially or grossly unstable, mitigation measures will have to be designed.

Laboratory testing of fill source materials is required to evaluate both gross and surficial stability of the proposed fill slopes. It is worthwhile to note that fill composed of mixtures of native material types typically has higher shear strength than fill composed of just one native material type. Therefore, additional shear strength testing should be performed on samples that represent the mixture of materials that will be placed in the proposed fills.

If surficial stability of the proposed fill slopes is determined to be insufficient, measures to mitigate surficial stability of these slopes will be required (see Section 6.2.5 of this report).

6.2.5 Surficial Stability

Surficial stability evaluations should be performed on the proposed cut and fill slopes. The following measures may be considered to mitigate surficial stability of proposed cut and fill slopes, as appropriate.

1. Avoidance.
2. Stability fills.
3. Flattening of slopes to 3:1 (h:v), or flatter.
4. Seeding/planting of slopes.
5. Guniting of slopes.
6. Mechanically Stabilized Earth (MSE) slopes.

6.3 Deep Fill Areas

Preliminary review of the Preliminary Grading Plan indicates that fill as deep as about 90 ft beneath final grade will be placed at the site. Fills deeper than 40 ft below proposed grade will need to be compacted to at least 93 percent of Maximum Dry Density (per ASTM Test Method D1557) in order to control settlement caused by the self-weight of overlying fill layers. Settlement of areas of fill that will be deeper than 40 ft should be monitored (by survey or settlement monuments) in order to determine when the settlement rate of the fill becomes tolerable for construction of road improvements.

6.4 Hydro-compression (Collapse) Settlement

Rapidly buried, unsaturated sediments such as slopewash, alluvium and landslide debris commonly contain extensive voids and, as a consequence, are subject to hydro-compression (collapse) settlement when inundated. Hydro-compression occurs when water enters sediments and reorients the sediment particles into a more compact arrangement with fewer and smaller voids. Structures constructed over deposits prone to hydro-compression may experience settlement-induced distress and damage. Potential for hydro-compression of soil deposits can be mitigated by removal and recompaction of the collapsible deposits.

Only one small canyon located at station 119+00 of the road alignment contains alluvium. All other alluvial soils are relatively shallow and typically would be removed from areas where fill is proposed on the Road Alignment Plan. Therefore, the risk of hydroc-compression of alluvial soils at the site is negligible.

The phenomenon of hydro-compression does not apply to the bedrock deposits that underlie most of the site. Further exploration should be performed at the site to evaluate if hydro-compression-prone materials, such as slopewash (colluvium), are present in the areas of proposed fill that have not yet been investigated. If it is determined that portions of the landslide will remain in place it should also be evaluated for hydro-compression in both proposed fill and cut areas.

6.5 Erosion Potential and Drainage

Evidence of erosion was observed in soil and landslide deposits that mantle slopes at the subject site. Bedrock at the site is expected to be less susceptible to erosion than the overlying soil and landslide material. However, fill, bedrock, landslide deposits and soil material at the site will be susceptible to erosion if drainage features to control sheet flow over the ground surface are not provided. The drainage features should be designed to prevent water from ponding on graded areas and from flowing over natural or constructed slopes, and should direct surface water to designed debris basins, where applicable.

Debris material generated by erosion of site materials should be contained inside the site boundaries.

6.6 Construction Considerations

6.6.1 Rippability

Bedrock and landslide-affected bedrock at the site range from soft to moderately to well consolidated. Therefore, it is anticipated that grading operations will be able to be performed using conventional equipment. Heavy single-shank ripping may be required for excavation of cut areas in the massive sandstone and conglomerate units of the Saugus Formations.

6.6.2 Oversize Material

Cobbles and small boulders may be present in the alluvium and in the Saugus Formation bedrock at the site. Although this oversize material may make excavation operations in cut areas difficult for some types of equipment, it is not considered to be a significant impediment to development of the site. Oversized material encountered during grading will require special treatment (placement in windrows in fill and/or removal from the project site).

6.6.3 Expansive Materials

Fine-grained units of the Saugus Formation are known to have significant expansion potential when exposed to water. In addition, artificial fill, slopewash, and alluvium deposits present at the site may contain material with significant expansion potential. Expansive materials at the site should be evaluated by the Project Geotechnical Engineer during the grading plan stage of development. Expansion potential of site soils can be mitigated by controlling the water content and density of fill soils, by specifying embedment and reinforcement of structures, and by removing the expansive materials and replacing them with compacted material with low expansion potential.

6.6.4 Shrinking/Bulking Characteristics of Earth Materials

Typically, soil, slopewash (colluvium), fill, and alluvial deposits reduce in volume ("shrink") by up to about 10 percent when excavated and subsequently recompacted. In contrast, Saugus Formation bedrock typically increases in volume ("bulk") by up to about 10 percent when excavated and recompacted. In order to evaluate the cut-fill balance of the proposed grading, shrinkage/bulking of on-site materials including landslide debris should be estimated during future planning stages.

6.6.5 Corrosion Potential of Site Materials to Concrete and Metals

Soils on site may be corrosive to concrete and ferrous metals. Soil moisture, chemistry, and other physical characteristics all have important effects on corrosivity. Testing during development will indicate what special measures, such as cement type in concrete and corrosion protection for metallic pipes, will be required for construction.

6.7 Oil Wells

Based on data in the 2003 Munger Map book and the Division of Oil, Gas and Geothermal Resources online resources there are no known oil wells located within the preliminary grading limits illustrated on the Road Alignment Plan. If any undocumented oil or gas wells are encountered during grading operations, their locations should be surveyed and the current well conditions evaluated immediately.

7.0 PROJECT FEASIBILITY

The proposed development is feasible from the geologic and geotechnical standpoint and will be safe from geologic hazards provided that the geologic and geotechnical recommendations provided in this report, along with the requirements of the appropriate building and grading codes, are taken into account during the planning, design, and construction phases of the project.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations summarize the primary geologic and geotechnical issues that may impact the proposed development:

1. Potential for primary ground rupture on a fault at the site is considered to be **low.**

2. Based on the Seismic Hazard Zone Report for the Mint Canyon Quadrangle, the peak horizontal ground surface acceleration for an earthquake with a 10% chance of

exceedance in 50 years (475-year return period) is expected to be 0.73g in alluvial portions of the site and 0.74g in portions of the site where bedrock outcrops or is present at shallow depth.

3. The alluvium present in the narrow small side canyon areas of the site (see Geologic Map **Plate I** and Geologic Overview Map **Figure 2**) is **not** designated as potentially liquefiable on the State of California Seismic Hazard Zones Map (Mint and Newhall Quadrangles see **Figure 4**). Therefore the potential for liquefaction of alluvium in the narrow minor canyon is considered low.

4. The potential for earthquake-induced slope failures is moderate to high on the moderate to steep canyon slopes. Much of the hillside area of the site is designated on the State of California Seismic Hazard Zone Map to have earthquake-induced slope instability. All slopes should be evaluated by the Project Geotechnical Engineer at the planning and design stages.

5. The potential for seismic settlement (dynamic densification) during future seismic events is non-existent in the bedrock portions for the site but should be evaluated in the alluvial, slopewash and landslide areas of the site.

6. Landslides have been mapped on the subject site. All mapped landslides should be confirmed by subsurface exploration relative to their existence at the planning and design stages. All confirmed landslides will need to be evaluated with respect to the proposed road alignment and mitigation measures provided where necessary. Mitigation measures consist of complete or partial removal, adding shear keyways, buttressing or avoidance. Restricted Use Areas will need to be established around any unmitigated landslides in open space areas.

7. Proposed cut slopes anticipated to expose landslide material should be evaluated. These cut slopes may be stabilized with Buttress Fills or Shear Keys designed by the Project Geotechnical Engineer. These cut slopes can also be redesigned to avoid landslides.

8. All cut slopes will require subsurface investigation at the planning and design stages to determine site-specific geologic conditions. Cut slopes with daylighted bedding conditions should be evaluated by the Geotechnical Engineer. Cut slopes that do not comply with agency's required minimum factors of safety for static and pseudo-static conditions and/or are anticipated to expose landslide material will require corrective

measures such as Buttresses or Stability Fills or will need to be redesigned to a more stable configuration.

9. A study should be conducted at the planning and design stages for all proposed natural slopes with daylighted bedding conditions. This study should include subsurface investigation to determine the specific geologic conditions for evaluation by the Geotechnical Engineer. Building/Structural Setbacks or remedial measures will be required where ascending or descending slopes are not stable as determined by geologic or geotechnical stability analyses.

10. A study should be conducted to evaluate potential debris flow hazards on the subject site. Avoidance of the hazard by selective structural locations, construction of impact or debris walls and/or debris basins, control of run-off or removal of loose surficial materials can be used to mitigate debris flow hazards.

11. Review of the technical appendix to the safety element of the Los Angeles County General Plan indicates the subject road alignment is not subject to dam inundation from Bouquet Canyon Reservoir if Dam Failure were to occur.

12. Rapidly buried silty sediments such as thick slopewash, alluvium and/or landslide debris may be subject to hydro-compression. Materials containing significant void space initially observed in the field and if characterized as susceptible to hydro-compression tests in the laboratory, should be removed prior to the placement of fill. A study should be conducted to evaluate the hydro-compression potential of the thick slopewash deposits and portions of the alluvium and landslide debris. Specific recommendations should be provided at the planning and design stages.

13. The existing provisions in the Grading Ordinance for planting and irrigation of cut slopes and fill slopes will reduce the potential for erosion.

14. The bedrock is moderately consolidated, which indicates that grading operations can be performed with conventional equipment. Heavy single shank ripping will probably be required if massive conglomerate units are encountered.

15. Cobbles and small boulders are present within the alluvium and the Saugus Formation on the site. This oversize material may present difficulties during cutting operations with

some types of equipment. In addition, oversize material will require special handling during fill construction.

16. A study should be conducted to evaluate the expansive potential of the fine-grained units of the Saugus Formations during the planning and design stages. If these potentially expansive units are encountered in the final pad or street grades during construction, they should be evaluated by Expansion Index (EI) tests by the Project Geotechnical Engineer relative to mitigations by special foundation designs and reinforcement. Alternatively, the expansive material can be removed to a specified depth determined by the Project Geotechnical Engineer and replaced with soil with very low to non-expansive characteristics. Alternatively, the expansive soil may be treated with additives to lower the expansion potential.

17. Soils on site may be corrosive to concrete and ferrous metals. Soil moisture, chemistry, and other physical characteristics all have important effects on corrosivity. Testing during development will indicate what special measures, such as cement type in concrete and corrosion protection for metallic pipes, may be required for construction.

18. Numerous landslides have been identified at the subject site. If unknown landslides are encountered during development their potential impact should be evaluated, including development of mitigation measures such as avoidance (setbacks), construction setbacks, complete or partial removal, construction of buttresses and or shear keyways, etc., where necessary. Restricted Use Areas will need to be established around any unmitigated landslides in open space areas that do not affect proposed development or adjacent properties.

19. All of the proposed cut slopes will need to be evaluated for gross and surficial stability and remediated where necessary. Cut slopes that do not comply with the applicable agency’s stability requirements will require corrective measures, such as avoidance (setbacks), cutting back to a shallower slope gradient, or constructing buttresses and/or shear keys with compacted fill.

20. Planting and irrigation of cut slopes and fill slopes should be included in future design phases in order to improve surficial stability of slopes and to mitigate potential for erosion.

9.0 LIMITATIONS

This report has been prepared by Allan E. Seward Engineering Geology, Inc. (AESEGI) for the exclusive use of Impact Sciences, Inc. for the specific site discussed herein. This report should not be considered to be transferable. Prior to use by others, AESEGI must be notified, since additional work may be required to update this report.

Additional investigation will be required to prepare recommendations for subsequent phases of development. In the event that any modifications in the design or location of the proposed development are planned, a written review by this firm will be required.

The proposed development is located in Southern California, a geologically and tectonically active region where large magnitude, potentially destructive earthquakes are common. Therefore, ground motions from moderate or large magnitude earthquakes could affect the project site during the design life of the proposed development.

Typically, faulting is confined to the area adjacent to a known fault. However, absolute assurance against future fault displacement is not possible in tectonically active regions because new faults can form over time as orientation and magnitude of deformational forces change in the earth's crust. Therefore, the location and magnitude of ground surface rupture during a seismic event cannot be forecast.

In performing these professional services, AESEGI has used the degree of care and skill ordinarily exercised under similar circumstances by reputable geologists and geotechnical engineers practicing in this or similar localities. The information and recommendations presented in this report are based on results of subsurface investigations and laboratory testing performed by AESEGI and presented in other consultants reports (see references), and on our experience and judgment. It should be recognized that subsurface conditions can vary in time, and laterally, and with depth at a given site. Since the conclusions and recommendations presented in this report are based on limited observations, our **conclusions** and **recommendations** are **professional opinions** and are **not meant** to be a control of nature. Therefore, AESEGI makes no other **warranty** either expressed or **implied**.

This report may not be duplicated without the written consent of this firm.

This opportunity to be of service is appreciated. If you have any questions regarding this report, please give us a call.

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The following Attachments complete this report.

Location Map		following page 3
References		
Regional Geologic Map by Dibblee		**Figure 1**
Geologic Overview Map (1”=500’)		**Figure 2**
Fault and Earthquake Epicenter Location Map		**Figure 3**
Seismic Hazard Zones Map		**Figure 4**
Geologic Map (1”=150’)	**Plate I**	(In Pocket)
Cross Section 6-6’	**Plate II**	(In Pocket)

Distribution: (2) Addressee (Via Email and CD)

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LEGEND

af | Qa | Qg

SURFICIAL SEDIMENTS

af *artificial cut and fill; includes areas of grading and/or development*
Qg *gravel and sand of major stream channels*
Qa *alluvial gravel, sand and clay of valley areas*

Qls

LANDSLIDE DEBRIS

does not include small landslides caused by 1994 Northridge earthquake (Harp and Jibson 1995)

Qoa | Qog

OLDER DISSECTED SURFICIAL SEDIMENTS

unconsolidated alluvial sediments deposited by streams; late Pleistocene age
Qoa *low terrace remnants of alluvial gravel and sand*
Qog *alluvial fan and high terrace deposits of gravel and sand of detritus mostly of crystalline basement rocks and some of Tertiary rocks*

—UNCONFORMITY—

QTs | Ts

SAUGUS FORMATION

(of Kew 1924; Oakeshott 1958)
terrestrial fluviatile, weakly indurated; Pliocene and Pleistocene age
QTs *light gray to light reddish brown pebble-cobble conglomerate, sandstone and siltstone; conglomerate composed of granitic, gneissic, metavolcanic, quartzitic, gabbroic, anorthositic and volcanic detritus; deposited by westward flowing streams; probably mostly of Pleistocene age; includes Sunshine Ranch Member of Saul 1990*
Ts *(south of San Gabriel fault) same as* **QTs**, *but contains much fine grained, light reddish-gray sandy siltstone; probably of Pliocene age*

—UNCONFORMITY (in cross-section A-B)—
Formations north of San Gabriel fault only

Tc | Tci

CASTAIC FORMATION

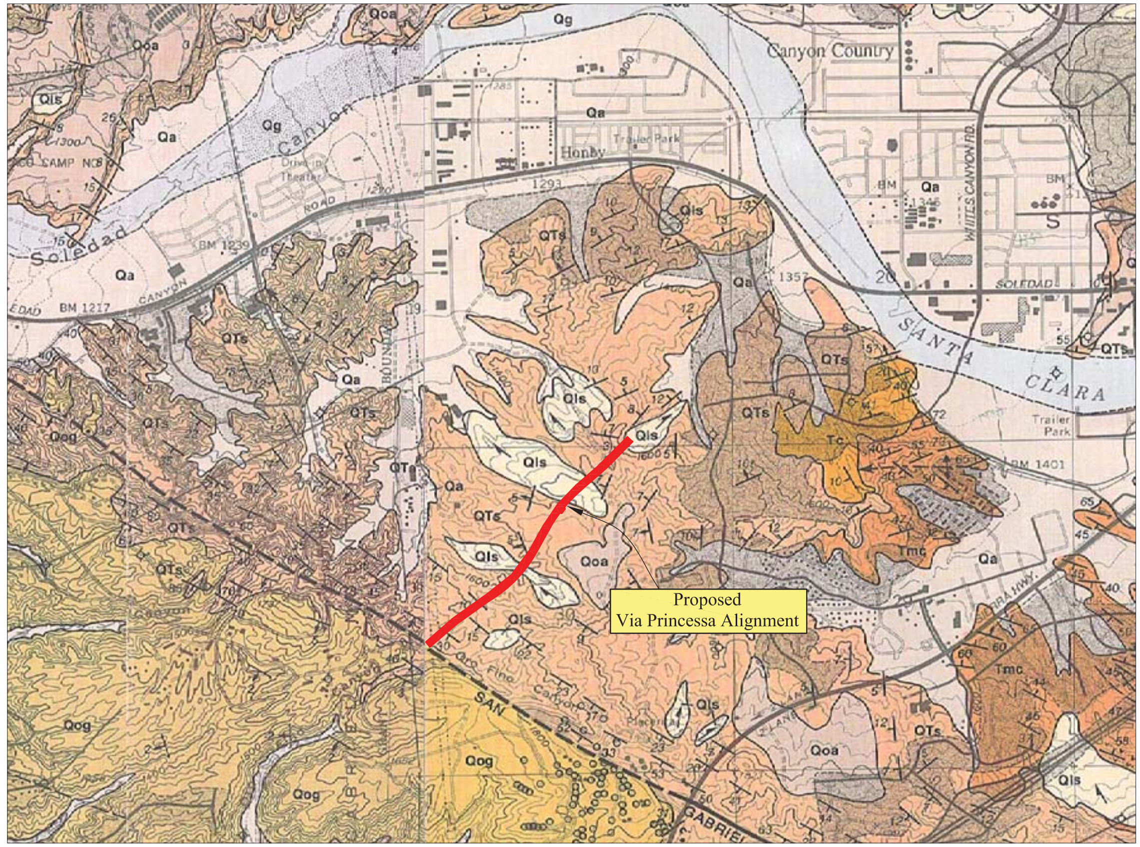
(of Crowell 1954; Modelo and Repetto Formations of Oakeshott 1958)
shallow marine clastic; late Miocene age (Mohnian-"Delmontian" Stage)
Tc *light gray claystone; minor thin light gray sandstone layers (some indicated by dotted symbol); sandstone at base*
Tci *claystone as above but includes gray-white, semi-siliceous shale; sandstone at base near Sand Canyon (shown as* **Tcai** *in Dibblee 1991)*

—UNCONFORMITY—

Tmc v·v·v·v | Tmcl

MINT CANYON FORMATION

(of Kew 1924; Jahns 1940; Oakeshott 1958; named for Mint Canyon, the type area, by Kew 1924)
terrestrial clastic valley sediments; middle to early late Miocene age, (Barstovian to Clarendonian vertebrate Stages [Durham et al. 1954])
Tmc *weakly lithified but coherent terrestrial sedimentary deposits that range from pebble-cobble conglomerate through sandstone to claystone, interbedded; conglomerate composed of subrounded pebbles and cobbles in light gray to pinkish-gray sandstone matrix; sandstones light gray to pinkish gray, semifriable, bedded to cross-bedded; claystone greenish to reddish gray, bedded to locally thin bedded with thin layers of nodular limestone; unit composed of coarse lower facies, gradational upward and in part westward into fine grained upper facies; lower facies deposited by westward flowing streams, in a valley; upper facies deposited in fresh water lake in valley bottom (Ehlig and Ehlert 1975; Ehlert 1989)*
Lower facies composed mostly of sandstone and conglomerate, with minor interbeds of claystone; conglomerate clasts composed mostly of basement rocks such as granite, Lowe granodorite and gneiss in most areas, and of gabbro, anorthosite and syenite in southeastern areas, of Pelona Schist and reworked clasts of metavolcanic rocks (from San Francisquito conglomerates) in northwestern area, as well as Tertiary volcanic rocks (Ehlig and Ehlert 1975, Ehlert 1989);
Upper facies composed of light gray fine grained sandstone and greenish to reddish-gray claystone; includes several strata as thick as 2 m of white tuff shown by symbol v·v·v·v fine sediments contains vertebrate fossil remains (Jahns 1940) and small fresh-water molluscs and ostracods (Ehlert 1989, Saul 1990)
Tmcl *in upper Mint Canyon area: basal unit of pinkish gray silty claystone and minor thin pinkish-gray sandstone (included in Tick Canyon Fm. by Saul 1990); west of Sand Canyon soft greenish gray claystone in lower part of formation, v·v·v·v = thin beds of white tuff, massive, coherent*



NOTE: THIS MAP IS FOR ILLUSTRATING REGIONAL GEOLOGY. LANDSLIDE LOCATIONS SHOWN ON THIS MAP HAVE NOT BEEN MODIFIED TO REFLECT OUR RECENT INVESTIGATION AND FINDINGS

Source: Geologic Map of the Newhall Quadrangle (DF-56) and the Mint Canyon Quadrangle (DF-57), 1996 by Dibblee.

Approximate Scale: 1"=2,000'

NOTE: THIS IS NOT A SURVEY OF THE PROPERTY

MAP SYMBOLS

FORMATION CONTACT *dashed where inferred or indefinite*

MEMBER CONTACT *between units of a formation*

CONTACT BETWEEN SURFICIAL SEDIMENTS *located only approximately in places*

FAULT: *Dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful. Parallel arrows indicate inferred relative lateral movement. Relative vertical movement is shown by* **U/D** *(* **U***=upthrown side,* **D***=downthrown side). Short arrow indicates dip of fault plane. Sawteeth are on upper plate of low angle thrust fault.*

FOLD: ANTICLINE SYNCLINE
arrow on axial trace of fold indicates direction of plunge; dotted where concealed by surficial sediments

STRIKE AND DIP OF STRATIFIED ROCKS 18 *inclined* 20 *inclined (approximate)* 80 *overturned* *vertical*
metamorphic foliation or igneous flow banding 75 *inclined* *approximate* *vertical*

Direction of landslide movement | *Landslide complex of Larson 1990* | *Vertebrate fossil locality* | *Sandstone marker bed or unit* | *Conglomerate marker bed or unit* | *Mudstone or shale unit (in cross-section)* | *Abandoned exploratory oil or gas wells; located approximately in places* | *Oil wells; may include some idle, converted or abandoned wells*

N

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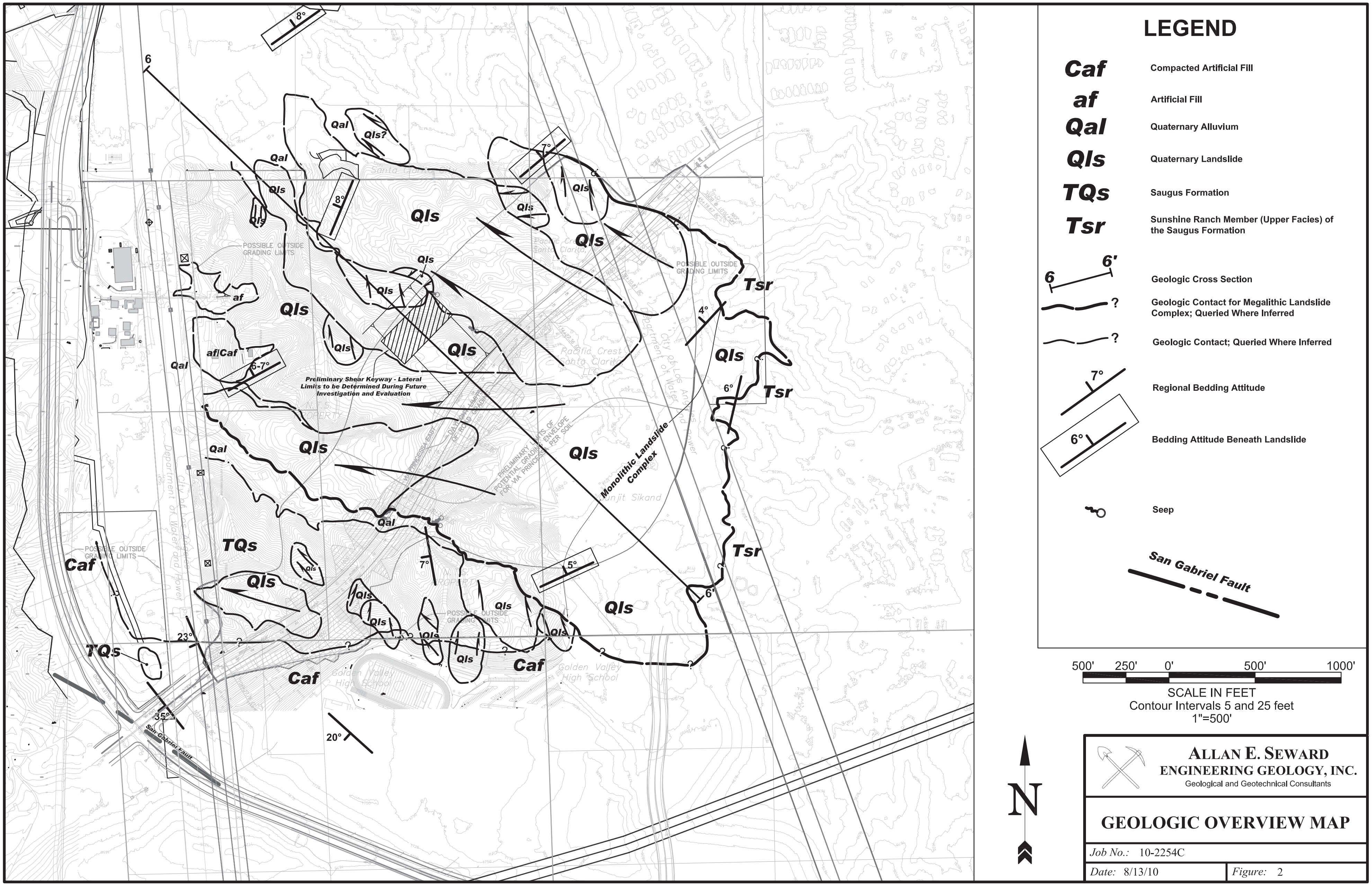
REGIONAL GEOLOGIC MAP

Job No.: 10-2254C
Date: 8/13/10 *Figure:* 1



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GEOLOGIC OVERVIEW MAP

Job No.: 10-2254C
Date: 8/13/10 Figure: 2

40 30 20 10 0 40 KILOMETERS

Approximate Scale 1 : 1,250,000

30 20 10 0 30 MILES

N

EXPLANATION

APPROXIMATE LOCATION OF MAJOR KNOWN FAULTS

San Andreas

EARTHQUAKE EPICENTERS

Location	Magnitude
	5.0 - 5.9
	6.0 - 6.9
	7.0 - 7.9

APPROXIMATE LOCATION OF SUBJECT SITE

Compiled and modified from: Jennings (1994), Real et al. (1978), Yerkes (1985), Ziony and Jones (1989), and Shakal et al. (1994)

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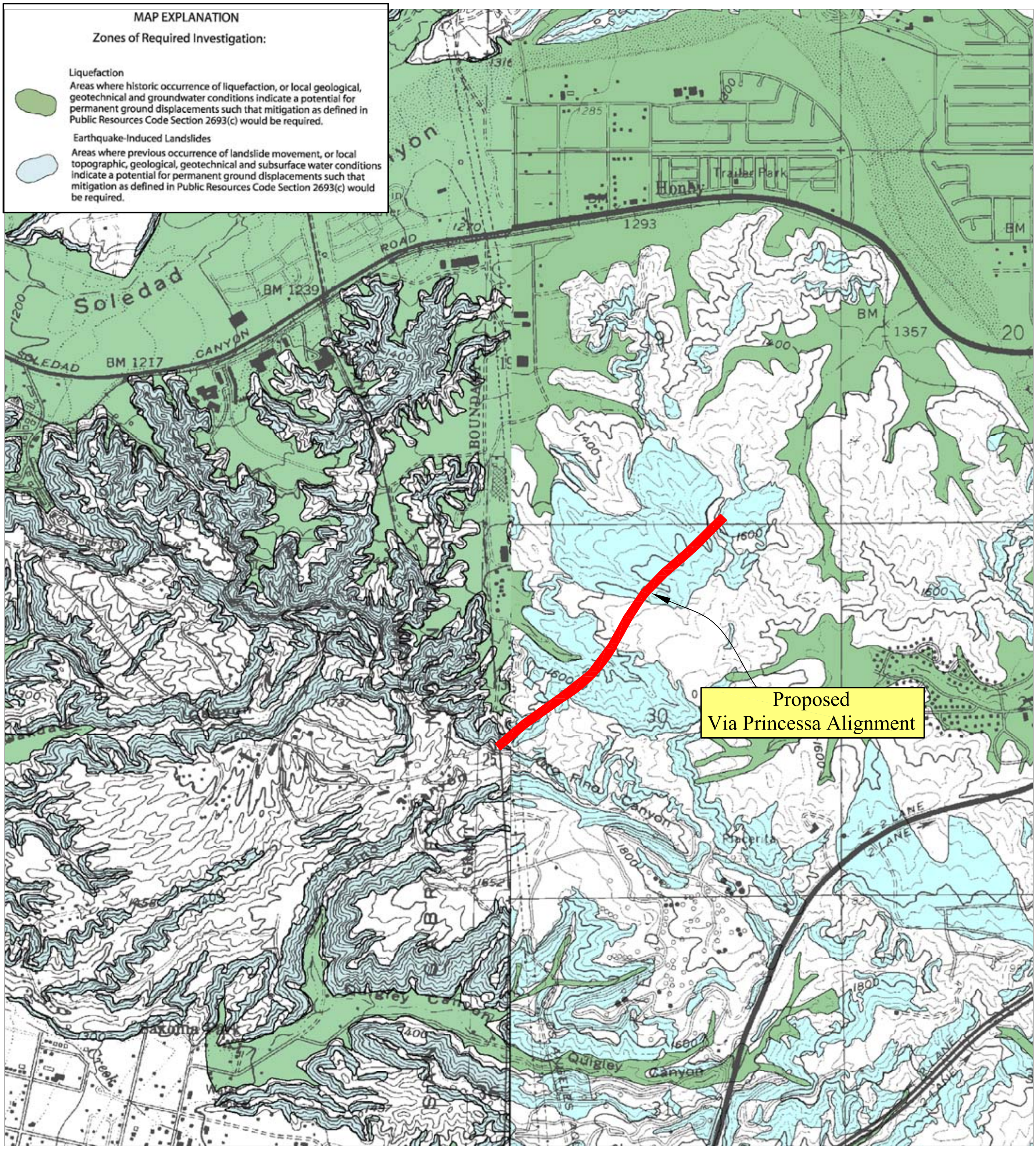
FAULT AND EARTHQUAKE
EPICENTER LOCATION MAP

Job No.: 10-2254C

Date: 8/13/10 | *Figure:* 3



Source: Seismic Hazard Zones Maps for the Newhall Quadrangle and Mint Canyon Quadrangle - Official Maps Released 1/1/98 and 3/25/99 Respectively

Approximate Scale: 1"=2,000'

N

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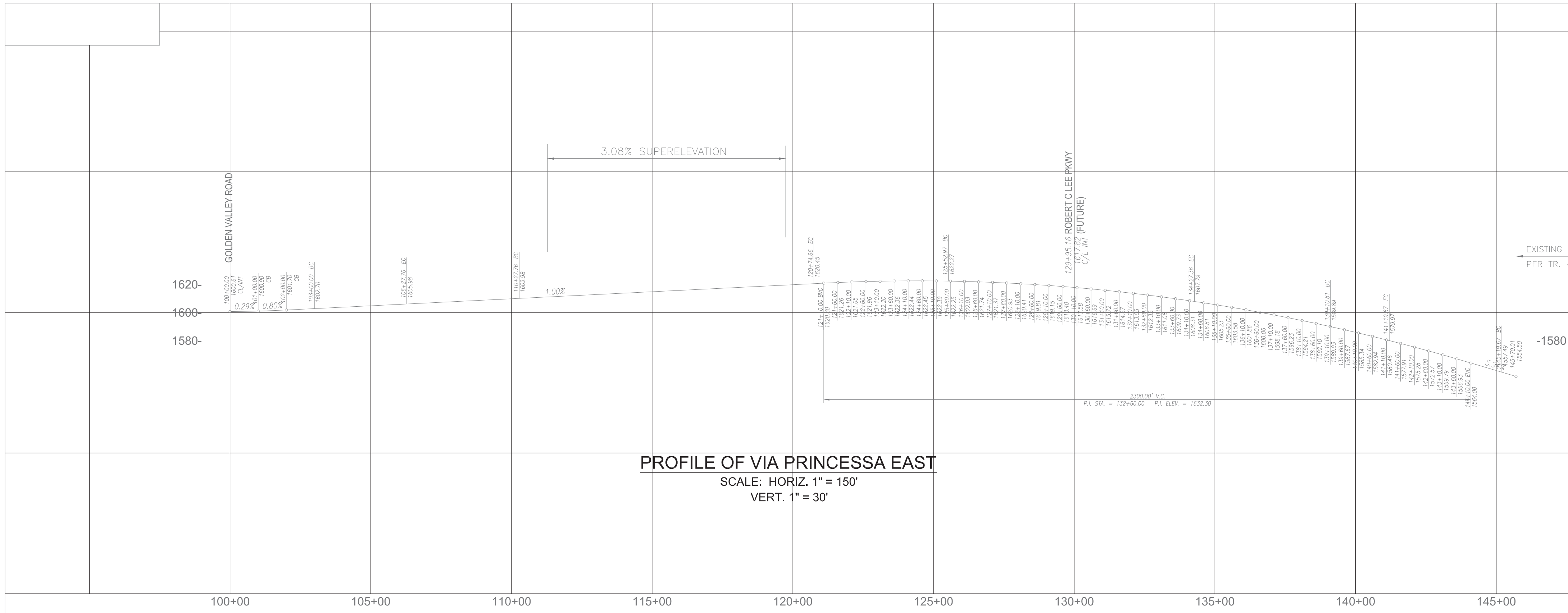
Figure 4 - Seismic Hazard Map

Job No.: 10-2254C	*Date:* 8/13/10

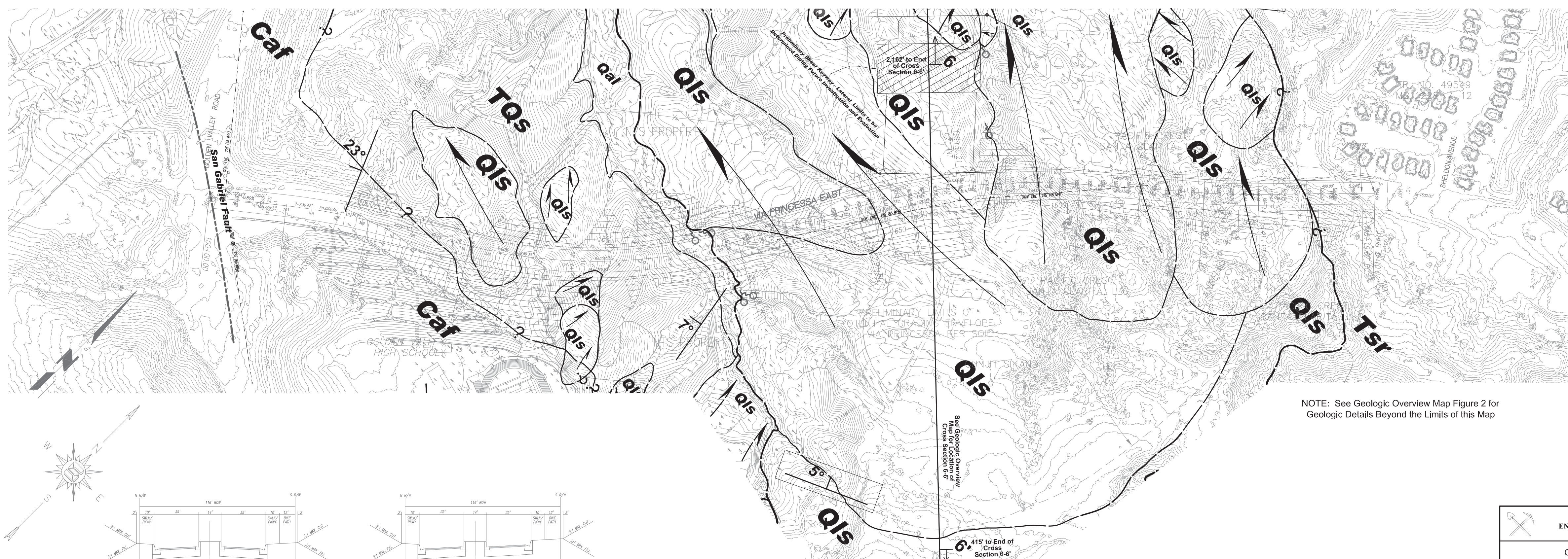


PROFILE OF VIA PRINCESSA EAST

SCALE: HORIZ. 1" = 150'
VERT. 1" = 30'

LEGEND

Caf	Compacted Artificial Fill
af	Artificial Fill
Qal	Quaternary Alluvium
Qls	Quaternary Landslide
TQs	Saugus Formation
Tsr	Sunshine Ranch Member (Upper Facies) of the Saugus Formation
6 — 6'	Geologic Cross Section
?	Geologic Contact for Monolithic Landslide Complex; Queried Where Inferred
?	Geologic Contact; Queried Where Inferred
7°	Regional Bedding Attitude
6°	Bedding Attitude Beneath Landslide
	Seep
San Gabriel Fault	



NOTE: See Geologic Overview Map Figure 2 for Geologic Details Beyond the Limits of this Map

TYPICAL 116' STREET SECTION
VIA PRINCESSA

116' STREET SECTION (SUPERELEVATION)
VIA PRINCESSA

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GEOLOGIC MAP

Date: 8/13/10 | Job No.: 10-2254C
Scale: 1" = 150'
PLATE I
Geology by: Staff
Drawn by: Staff

CITY OF SANTA CLARITA

PREPARED FOR:

LEGAL DESCRIPTION:

A PORTION OF SECTIONS 3, 9, 10, 16 & 34,
TOWNSHIP 4 NORTH, RANGE 15 WEST, S.B.B.M.
UNINCORPORATED AREA OF LOS ANGELES COUNTY

DATE:	REVISION:	BY:	APP.

SCALE:	CHK'D BY:	APPROVED BY:	DATE:	W.O.:	SHEET	of
1"=150'			09-17-09	5108-008-00	1	1

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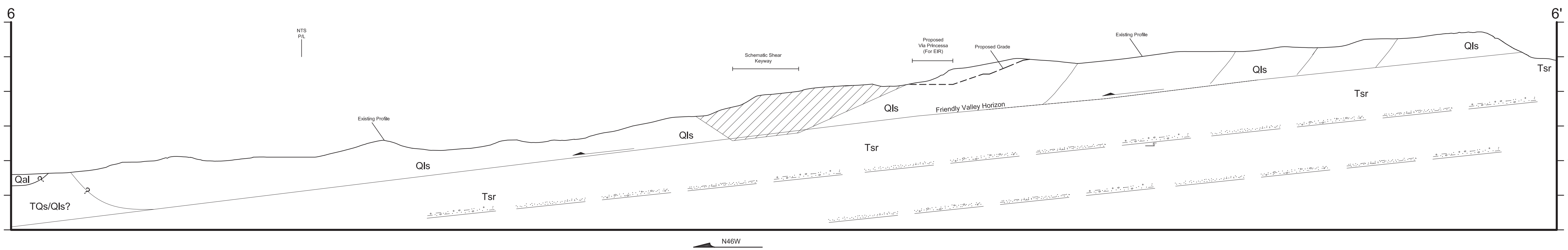
ROAD ALIGNMENT
FOR
VIA PRINCESSA EAST
FROM GOLDEN VALLEY ROAD
TO 250 FT W/O SHELDON AVENUE



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Cross Section 6-6'

Date: 8/13/10	*Job No.:* 10-2254C
Scale: 1"=150' (H=V)	*CAD File:* Plate II Section 6

Plate II

Geology by: Staff
Drawn by: Staff
Revised: