REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION

Proposed 2-Story Valley View Office Building
Palmer Way North of Impala Drive
Carlsbad, California
Assessor's Parcel No. 209-040-43-00

JOB NO. 18-11749
23 February 2018

Prepared for:

Land Development, LLC

Geotechnical Exploration, Inc.

SOIL AND FOUNDATION ENGINEERING ● GROUNDWATER ● ENGINEERING GEOLOGY

23 February 2018

Land Development, LLC
c/o OPP Management
1059 Tierra Del Rey, Suite L
Chula Vista, CA 91910
Attn: Mr. Solomon Levy

Job No. 18-11749

Subject: **Report of Preliminary Geotechnical Investigation**
Proposed 2-Story Valley View Office Building
Palmer Way North of Impala Drive
Carlsbad, California
Assessors Parcel No. 209-040-43-00

Dear Mr. Levy:

In accordance with your request ***Geotechnical Exploration, Inc***. has performed a preliminary geotechnical investigation for the subject project in Carlsbad, California. The fieldwork was performed on January 22 and 26, 2018.

If the conclusions and recommendations presented in this report are incorporated into the design and construction of the proposed development, it is our opinion that the site is suitable for the project.

This opportunity to be of service is sincerely appreciated. Should you have any questions concerning the following report, please do not hesitate to contact us. Reference to our **Job No. 18-11749** will expedite a response to your inquiries.

Respectfully submitted,

GEOTECHNICAL EXPLORATION, INC.

Wm. D. Hespeler, G.E. 396
Senior Geotechnical Engineer

Jonathan A. Browning
C.E.G. 2615/P.G. 9012
Senior Project Geologist

7420 TRADE STREET ● SAN DIEGO, CA. 92121 ● (858) 549-7222 ● FAX: (858) 549-1604 ● EMAIL: geotech@gei-sd.com

TABLE OF CONTENTS

FIGURES

APPENDICES

REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION
Proposed 2-Story Valley View Office Building
Palmer Way North of Impala Drive
Carlsbad, California
Assessor's Parcel No. 209-040-43-00

JOB NO. 18-11749

The following report presents the findings and recommendations of ***Geotechnical Exploration, Inc.*** for the subject project.

I. PROJECT SUMMARY AND SCOPE OF SERVICES

Based on our review of preliminary plans provided us, the project will be a two-story structure consisting of office space over on-grade parking with associated pavements and other exterior improvements. We anticipate that maximum combined dead plus live column loads will be on the order of 100 kips and maximum combined dead and live wall loads will be on the order of 8 kips per lineal foot. Preliminary grading plans provided to us indicate cuts and fills up to about 5 feet deep will be required to achieve the desired elevations.

Based on the preceding, the scope of work performed for this investigation included a site reconnaissance and subsurface exploration program, laboratory testing, geotechnical engineering analysis of the field and laboratory data, and the preparation of this report. The data obtained and the analyses performed were for the purpose of providing design and construction criteria for the project earthwork, building foundations, slab on-grade floors, retaining/basement walls, and pavements.

II. SITE DESCRIPTION AND HISTORY

The site of the proposed office building is a currently vacant lot located on the northeast side of Palmer Way about 600 feet north of the intersection with Impala Drive in Carlsbad, California (see Vicinity Map, Figure No. I).

The property is known as Assessor's Parcel No. 209-040-43-00, Parcel 4, per Recorded Map 18059 in the City of Carlsbad, County of San Diego, State of California.

The irregular crescent-shaped parcel consists of approximately 6.34 acres. The parcel is bordered on the north by a northerly descending slope; on the east by an easterly descending slope and an existing office building slightly higher in elevation; and on the south and west by Palmer Way at approximately the same elevation (see Figure No. II, the Site Plan). Vegetation across the site primarily consists weeds, native shrubbery and a few mature trees.

The proposed building site consists of approximately 14,000 square feet along the upper southwest portion of the parcel on a gentle northwesterly sloping building pad with approximate elevations ranging from 260 to 277 feet above Mean Sea Level (MSL). Elevations across the entire parcel range from approximately 130 feet above (MSL) in the northwest corner of the property to approximately 298 feet above (MSL) in the southeast corner of the property. Survey information concerning approximate elevations across the site was obtained from a *"Conceptual Grading Plan"* prepared by K&S Engineering, Inc.

III. FIELD INVESTIGATION

The field investigation consisted of a surface reconnaissance and a subsurface exploration program utilizing a truck-mounted, continuous-flight auger drill rig and a backhoe. One exploratory boring was drilled at the site to a depth of 37 feet on January 26, 2018, and eight exploratory test pits were excavated across the building site on January 22, 2018, to depths of 6½ to 10½ feet. It should be noted that the test pits were backfilled with spoils in an uncompacted condition and will require removal and recompaction during the site grading work. The soils encountered in the boring and test pits were continuously logged in the field by our geologist and described in accordance with the Unified Soil Classification System (refer to Appendix A). The approximate locations of the boring and test pits are shown on Figure No. II.

Representative samples were obtained from the exploratory boring and test pits at selected depths appropriate to the investigation. All samples were returned to our laboratory for evaluation and testing. Disturbed bag samples were obtained in the test pits and drive samples were obtained in the boring.

Samples contained in liners were recovered by driving a 3-inch O.D. modified California sampler 18 inches into the soil using a 140-pound hammer dropping through a 30-inch free fall. The sampler was driven a maximum of 18 inches and the number of blows for each 6-inch interval was recorded. The blows per foot indicated on the boring logs represent the accumulated number of blows that were required to drive the last 12 inches or portion thereof.

Boring and test pit logs have been prepared on the basis of our observations and laboratory test results. Logs of the boring and test pits are attached as Figure Nos.

IIIa-j. The following chart provides an in-house correlation between the number of blows and the relative density of the soil for the Standard Penetration Test and the 3-inch sampler.

SOIL	***DENSITY DESIGNATION***	***2-INCH O.D. SAMPLER BLOWS/FOOT***	***3-INCH O.D. SAMPLER BLOWS/FOOT***
Sand and Nonplastic Silt	Very loose	0-4	0-7
	Loose	5-10	8-20
	Medium	11-30	21-53
	Dense	31-50	54-98
	Very Dense	Over 50	Over 98
Clay and Plastic Silt	Very soft	0-2	0-2
	Soft	3-4	3-4
	Firm	5-8	5-9
	Stiff	9-15	10-18
	Very stiff	16-30	19-45
	Hard	31-60	46-90
	Very Hard	Over 60	Over 90

IV. LABORATORY TESTS

Laboratory tests were performed on relatively undisturbed and bulk samples of the soils encountered in order to evaluate their index, strength, expansion, and compressibility properties. The following tests were conducted on the sampled soils:

1. *Determination of Percentage of Particles Smaller than No. 200 Sieve (ASTM D1140-14)*
2. *Grain size analysis (ASTM D422-07)*
3. *Standard Test Methods for Laboratory Determination of Density (Unit Weight) of Soil Specimens (ASTM D7263-09)*
4. *Direct Shear Test (ASTM D3080-11)*
5. *Laboratory Compaction Characteristics (ASTM D1557-12)*

The particle size smaller than a No. 200 sieve grain size analyses aid in classifying the tested materials in accordance with the Unified Soil Classification System and provides qualitative information related to engineering characteristics such as expansion potential, permeability, and shear strength. The test results are presented on the test pit logs at the appropriate sample depths.

The grain size analysis aids in classifying the tested materials in accordance with the Unified Soil Classification System and provides qualitative information related to engineering characteristics such as expansion potential, permeability, and shear strength. The test results are presented on Figure No IV.

Standard Test Methods for Laboratory Determination of Density (Unit Weight) of Soil Specimens (ASTM D7263-09) were performed on selected relatively undisturbed samples of the formational materials encountered to aid in evaluating their densities and strength properties. The test results are presented on the test pit logs at the appropriate sample depths.

Two laboratory direct shear tests were performed to aid in evaluating the strength properties of the on-site formational materials. The tests were performed on relatively undisturbed samples of the formational materials encountered in the boring. The test results are shown on Figure No. V.

Laboratory compaction tests establish the laboratory maximum dry density and optimum moisture content of the tested soils and are also used to aid in evaluating the strength characteristics of the soils. The test results are presented on the test pit log at the appropriate sample depth.

V. SOIL DESCRIPTION

The materials encountered in exploratory trench excavations T-1, T-3, T-4 and T-6 through T-8, consisted of loose to medium dense clayey sand fill soils ranging in depths of 1 to 3 feet, underlain by dense to very dense sands of the Lusardi Formation (Kl) materials. The materials encountered in exploratory trench excavations T-2 and T-5, consisted of loose clayey sand and sandy clay topsoils to a depth of ½ foot, underlain by dense to very dense sands of the Lusardi Formation (Kl) materials.

The materials encountered in exploratory boring B-1, consisted of dense to very dense sands of the Lusardi Formation (Kl) from the surface to the maximum depth of exploration of 37 feet. Refer to Figure Nos. IIIa-j for details.

The exploratory boring and test pit logs and related information depict subsurface conditions only at the specific locations shown on the site plan and on the particular dates designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these boring and test pit locations. Also, the passage of time may result in changes in the subsurface conditions due to environmental changes.

VI. GROUNDWATER

Free groundwater was not encountered in the exploratory boring or test pits. It must be noted, however, that fluctuations in the level of groundwater may occur due to variations in ground surface topography, subsurface stratification, rainfall, and other possible factors which may not have been evident at the time of our field investigation.

It should be kept in mind that grading operations can change surface drainage patterns and/or reduce permeabilities due to the densification of compacted soils. Such changes of surface and subsurface hydrologic conditions, plus irrigation of landscaping or significant increases in rainfall, may result in the appearance of surface or near-surface water at locations where none existed previously. The appearance of such water is expected to be localized and cosmetic in nature, if good positive drainage is implemented, as recommended in this report, during and at the completion of construction.

It must be understood that unless discovered during initial site exploration or encountered during site grading operations, it is extremely difficult to predict if or where perched or true groundwater conditions may appear in the future. When site fill or formational soils are fine-grained and of low permeability, water problems may not become apparent for extended periods of time.

Water conditions, where suspected or encountered during construction, should be evaluated and remedied by the project civil and geotechnical consultants. The project developer and property owner, however, must realize that post-construction appearances of groundwater may have to be dealt with on a site-specific basis.

VII. GEOLOGIC HAZARDS AND SEISMIC CONSIDERATIONS

Our review of some available published information including a geologic map of the area, *"Geologic Map of Oceanside, 30'x60' Quadrangle,* (Kennedy and Tan, 2007) Figure No. VI, indicates that the site is underlain by materials of the Cretaceous-age Lusardi Formation (Kl). Based on the *"Geologic Map of Oceanside",* there are no faults mapped on the site.

The Carlsbad area, as most of California, is located in a seismically active region. The San Diego area has been referred to as the eastern edge of the Southern California Continental Borderland, an extension of the Peninsular Ranges Geomorphic Province. The borderland is part of a broad tectonic boundary between the North American and Pacific Plates. The plate boundary is dominated by a complex system of active major strike-slip (right lateral), northwest-trending faults extending from the San Andreas Fault about 70 miles east, to the San Clemente Fault, about 50 miles west of the San Diego metropolitan area.

The prominent fault zones generally considered having the most potential for earthquake damage in the vicinity of the site are the active Rose Canyon and Coronado Bank fault zones mapped approximately 7 and 23 miles southwest of the site, respectively, and the active Elsinore and San Jacinto fault zones mapped approximately 22 and 45 miles northeast of the site, respectively.

Although research on earthquake prediction has greatly increased in recent years, geologists and seismologists have not yet reached the point where they can predict when and where an earthquake will occur. Nevertheless, on the basis of current technology, it is reasonable to assume that the site may be subject to the effects of at least one moderate to major earthquake during the design life of the project. During such an earthquake, the danger from fault offset through the site is remote, but relatively strong ground shaking is likely to occur.

Strong ground shaking not only can cause structures to shake, but it also has the potential for including other phenomena that can indirectly cause substantial ground movements or other hazards resulting in damage to structures. These phenomena include seismically induced waves such as tsunamis and seiches, inundation due to dam or embankment failure, soil liquefaction, landsliding, lateral

spreading, differential compaction and ground cracking. Available information indicates that the location of, and geotechnical conditions at the site, are not conducive to any of these phenomena.

VIII. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the field investigation conducted by our firm, our laboratory test results, our analysis of the field and laboratory data, and our experience with similar soils and formational materials.

The opinions, conclusions, and recommendations presented in this report are contingent upon ***Geotechnical Exploration, Inc.*** being retained to review the final plans and specifications as they are developed and to observe the site earthwork and installation of foundations. Accordingly, we recommend that the following paragraph be included on the grading and foundation plans for the project.

> *If the geotechnical consultant of record is changed for the project, the work shall be stopped until the replacement has agreed in writing to accept responsibility within their area of technical competence for approval upon completion of the work. It shall be the responsibility of the permittee to notify the City Engineer in writing of such change prior to the recommencement of grading and/or foundation installation work.*

A. Preparation of Soils for Site Development

1. *Clearing and Stripping:* The building site should be cleared of any miscellaneous debris that may be present at the time of construction and stripped of all vegetation. The cleared and stripped materials should be properly disposed of off-site.

2. *Excavation:* Based on the results of our exploratory boring and test pits, as well as our experience with similar materials, it is our opinion that the natural formational materials can be excavated utilizing ordinary heavy earthmoving equipment. Contractors should not, however, be relieved of making their own independent evaluation of the excavatability of the on-site materials prior to submitting their bids.

3. *Removal and Recompaction of Existing Fill Soils:* In order to provide suitable foundation support for the proposed office building and other improvements (such as exterior flatwork and pavements), we recommend that all existing fill soils, including the exploratory test pit backfills, that remain after the necessary site excavations have been made be removed and recompacted. The areal extent and depth required to remove the fill soils should be determined by our representatives during the excavation work based on their examination of the soils being exposed. Any unsuitable materials (such as oversize rubble and/or organic matter) should be selectively removed as directed by our representative and disposed of off-site.

4. *Subgrade Preparation:* After the site has been cleared, stripped, and the required excavations made, the exposed subgrade soils in areas to receive fill and/or building improvements should be scarified to a depth of 8 inches, moisture conditioned to at least 2 percent above the laboratory optimum, and compacted to the requirements for structural fill.

5. *Material for Fill:* All existing on-site soils with an organic content of less than 3 percent by volume are suitable for use as fill. Any required imported fill materials should not contain rocks or lumps more than 6 inches in greatest dimension, not more than 15 percent larger than 2½ inches, and no more

than 25 percent of the fill should be larger than ¼-inch. All materials for use as fill should be approved by our representative prior to filling.

6. *Fill Compaction:* All structural fill should in general be compacted to a minimum degree of compaction of 90 percent at a moisture content at least 2 percent above the optimum based upon ASTM D1557-12. All fill soil in the proposed building area and 5 feet beyond the building limits, as well as the upper 6 inches of subgrade soil beneath pavements should be scarified, moisture conditioned, and compacted to a minimum degree of compaction of 95 percent. Fill material should be spread and compacted in uniform horizontal lifts not exceeding 8 inches in uncompacted thickness. Before compaction begins, the fill should be brought to a moisture content that will permit proper compaction by either: (1) aerating and drying the fill if it is too wet, or (2) moistening the fill with water if it is too dry. Each lift should be thoroughly mixed before compaction to ensure a uniform distribution of moisture.

7. *New Permanent Slopes:* We recommend that any required new permanent cut and fill slopes be constructed to an inclination no steeper than 2.0:1.0 (horizontal to vertical). The project plans and specifications should contain all necessary design features and construction requirements to prevent erosion of the on-site soils both during and after construction. Slopes and other exposed ground surfaces should be appropriately planted with a protective groundcover.

   Fill slopes should be constructed to assure that the recommended minimum degree of compaction is attained out to the finished slope face. This may be accomplished by "backrolling" with a sheepsfoot roller or other suitable

equipment as the fill is raised. Placement of fill near the tops of slopes should be carried out in such a manner as to assure that loose, uncompacted soils are not sloughed over the tops and allowed to accumulate on the slope face.

8. *Existing Formational Slopes:* Based on our subsurface investigation work, laboratory test results, and engineering analysis, we have analyzed the stability of the steep natural formational slopes which descend down from the building development area along the north and east. The location of the cross sections analyzed are shown on Figure No. VII. The geologic cross sections are presented on Figures Nos. VIIIa-c. The results of our stability analyses are presented in Appendix B and indicate a factor of safety against mass instability of greater than 1.5.

9. *Trench and Retaining/Basement Wall Backfill:* All backfill soils placed in utility trenches or behind retaining/basement walls should be compacted to a minimum degree of compaction of 90 percent. Backfill material should be placed in lift thicknesses appropriate to the type of compaction equipment utilized and compacted to a minimum degree of 90 percent by mechanical means. In pavement areas, that portion of the trench backfill within the pavement section should conform to the material and compaction requirements of the adjacent pavement section.

   Our experience has shown that even shallow, narrow trenches, such as for irrigation and electrical lines, that are not properly compacted can result in problems, particularly with respect to shallow groundwater accumulation and migration.

10. *Surface Drainage:* Positive surface gradients should be provided adjacent to the building, and roof gutters and downspouts should be installed so as to direct water away from foundations and slabs toward suitable discharge facilities. Ponding of surface water should not be allowed anywhere on the site. Appropriate erosion control measures should be taken at all times during and after construction to prevent surface runoff waters from entering footing excavations or ponding on finished building pad areas.

11. *Storm Water Infiltration:* In our opinion, any infiltration of storm water at the site would result in an unmitigateable geotechnical hazard with regard to the stability of the steep natural slopes which descend down from the building development area along the north and east and therefore should not be allowed. In keeping with the preceding, we recommend that the driveway not be constructed with permeable pavers as currently shown on the site plan and instead consist of PCC pavement.

B. Foundation Recommendations

12. *Footings:* We recommend that the proposed building be supported on conventional, individual-spread and/or continuous footing foundations bearing on dense undisturbed formational sandstone materials and/or fill soils compacted to a minimum degree of compaction of 95 percent. All footings should be founded at least 24 inches below the lowest adjacent finished grade.

At the recommended depths, footings may be designed for allowable bearing pressures of 3,500 pounds per square foot (psf) for combined dead and live loads and 4,700 psf for all loads, including wind or seismic. The footings should, however, have a minimum width of 12 inches.

13. *General Criteria for All Footings*: Footings located adjacent to the tops of slopes should be extended sufficiently deep so as to provide at least 10 feet of horizontal cover or 1½ times the width of the footing, whichever is greater, between the slope face and outside edge of the footing at the footing bearing level. Footings located adjacent to utility trenches should have their bearing surfaces situated below an imaginary 1.5 to 1.0 plane projected upward from the bottom edge of the adjacent utility trench.

All continuous footings should contain top and bottom reinforcement to provide structural continuity and to permit spanning of local irregularities. We recommend that a minimum of two No. 5 top and two No. 5 bottom reinforcing bars be provided in the footings. A minimum clearance of 3 inches should be maintained between steel reinforcement and the bottom or sides of the footing. In order for us to offer an opinion as to whether the footings are founded on soils of sufficient load bearing capacity, it is essential that our representative inspect the footing excavations prior to the placement of reinforcing steel or concrete.

NOTE: The project Civil/Structural Engineer should review all reinforcing schedules. The reinforcing minimums recommended herein are not to be construed as structural designs, but merely as minimum reinforcement to reduce the potential for cracking and separations.

14. *Seismic Design Criteria:* Site-specific seismic design criteria for the proposed structure are presented in the following table in accordance with the 2016 CBC, which incorporates by reference ASCE 7-10 for seismic design. We have determined the mapped spectral acceleration values for the site, based on a latitude of 33.1409 degrees and longitude of -117.2729 degrees, utilizing a tool provided by the USGS, which provides a solution for ASCE 7-10 (2013 CBC) utilizing digitized files for the Spectral Acceleration maps. We have assigned a Site Soil Classification of C.

TABLE I
Mapped Spectral Acceleration Values and Design Parameters

S_s	S_1	F_a	F_v	S_{ms}	S_{m1}	S_{ds}	S_{d1}
1.057g	0.409g	1.000	1.391	1.057g	0.569g	0.705g	0.379g

15. *Lateral Loads:* Lateral load resistance for the structure supported on footing foundations may be developed in friction between the foundation bottoms and the supporting subgrade. An allowable friction coefficient of 0.35 is considered applicable. An additional allowable passive resistance equal to an equivalent fluid weight of 350 pounds per cubic foot (pcf) acting against the foundations may be used in design provided the footings are poured neat against the adjacent undisturbed compacted fill or formational materials. These lateral resistance values assume a level surface in front of the footing for a minimum distance of three times the embedment depth of the footing and any shear keys. Retaining wall footings where the surface in front of the walls slopes down toward the steep natural slopes should be designed using a passive pressure of 50 pcf.

14. *Settlement:* Settlements under building loads are expected to be within tolerable limits for the proposed structure. For footings designed in accordance with the recommendations presented in the preceding paragraphs, we anticipate that total settlements should not exceed 1 inch and that post-construction differential settlements should be less than ¼-inch in 25 feet.

15. *Retaining/Basement Walls*: Retaining and basement walls must be designed to resist lateral earth pressures and any additional lateral pressures caused by surcharge loads on the adjoining retained surface. We recommend that unrestrained (cantilever) walls with level backfill be designed for an equivalent fluid pressure of 35 pcf. We recommend that restrained walls (i.e., basement walls or any walls with angle points or that are curvilinear that restrain them from rotation) with level backfill be designed for an equivalent fluid pressure of 35 pcf plus an additional uniform lateral pressure of 8H pounds per square foot, where H is equal to the height of backfill above the top of the wall footing in feet. Wherever walls will be subjected to surcharge loads, they should also be designed for an additional uniform lateral pressure equal to one-third the anticipated surcharge pressure in the case of unrestrained walls and one-half the anticipated surcharge pressure in the case of restrained walls.

    For seismic design of unrestrained walls, we recommend that the seismic pressure increment be taken as a fluid pressure distribution utilizing an equivalent fluid weight of 11 pcf. For restrained walls we recommend that the seismic pressure increment be taken as a fluid pressure distribution utilizing an equivalent fluid weight of 17 pcf added to the active static fluid pressure utilizing an equivalent fluid weight of 35 pcf.

The preceding design pressures assume that the walls are backfilled with low expansion potential materials (Expansion Index less than 50) and that there is sufficient drainage behind the walls to prevent the build-up of hydrostatic pressures from surface water infiltration. We recommend that wall drainage be provided using J-Drain 200/220 and J-Drain SWD. No gravel or pipe is used with the J-Drain system. The drain material should terminate 12 inches below the finish surface where the surface is covered by slabs or 18 inches below the finish surface in landscape areas.

Backfill placed behind the walls should be compacted to a minimum degree of compaction of 90 percent using light compaction equipment. If heavy equipment is used, the walls should be appropriately temporarily braced.

C. Concrete Slab-on-grade Criteria

16. *Minimum Floor Slab Thickness and Reinforcement:* Based on our experience, we have found that, for various reasons, floor slabs occasionally crack, causing brittle surfaces such as ceramic tiles to become damaged. Therefore, we recommend that all slabs-on-grade contain at least a minimum amount of reinforcing steel to reduce the separation of cracks, should they occur.

16.1 Interior floor slabs should be a minimum of 5 inches actual thickness and be reinforced with No. 4 bars on 24-inch centers, both ways, placed at midheight in the slab. Slab subgrade soil should be verified by a ***Geotechnical Exploration, Inc.*** representative to have the proper moisture content within 48 hours prior to placement of the vapor barrier and pouring of concrete.

16.2 Following placement of any concrete floor slabs, sufficient drying time must be allowed prior to placement of floor coverings. Premature placement of floor coverings may result in degradation of adhesive materials and loosening of the finish floor materials.

17. *Concrete Isolation Joints:* We recommend the project Civil/Structural Engineer incorporate isolation joints and sawcuts to at least one-fourth the thickness of the slab in any floor designs. The joints and cuts, if properly placed, should reduce the potential for and help control floor slab cracking. We recommend that concrete shrinkage joints be spaced no farther than approximately 20 feet apart, and also at re-entrant corners. However, due to a number of reasons (such as base preparation, construction techniques, curing procedures, and normal shrinkage of concrete), some cracking of slabs can be expected.

18. *Slab Moisture Protection and Vapor Barrier Membrane:* Although it is not the responsibility of geotechnical engineering firms to provide moisture protection recommendations, as a service to our clients we provide the following discussion and suggested minimum protection criteria. Actual recommendations should be provided by the architect and waterproofing consultants.

Soil moisture vapor can result in damage to moisture-sensitive floors, some floor sealers, or sensitive equipment in direct contact with the floor, in addition to mold and staining on slabs, walls and carpets. The common practice in Southern California is to place vapor retarders made of PVC, or of polyethylene. PVC retarders are made in thickness ranging from 10- to 60-mil. Polyethylene retarders, called visqueen, range from 5- to 10-mil in

thickness. These products are no longer considered adequate for moisture protection and can actually deteriorate over time.

Specialty vapor retarding products possess higher tensile strength and are more specifically designed for and intended to retard moisture transmission into and through concrete slabs. The use of such products is highly recommended for reduction of floor slab moisture emission.

The following American Society for Testing and Materials (ASTM) and American Concrete Institute (ACI) sections address the issue of moisture transmission into and through concrete slabs: ASTM E1745-97 (2009) Standard Specification for Plastic Water Vapor Retarders Used in Contact Concrete Slabs; ASTM E154-88 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth; ASTM E96-95 Standard Test Methods for Water Vapor Transmission of Materials; ASTM E1643-98 (2009) Standard Practice for Installation of Water Vapor Retarders Used in Contact Under Concrete Slabs; and ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

18.1 Based on the above, we recommend that the vapor barrier consist of a minimum 15-mil extruded polyolefin plastic (no recycled content or woven materials permitted). Permeance as tested before and after mandatory conditioning (ASTM E1745 Section 7.1 and sub-paragraphs 7.1.1-7.1.5) should be less than 0.01 perms (grains/square foot/hour in Hg) and comply with the ASTM E1745 Class A requirements. Installation of vapor barriers should be in accordance with ASTM E1643. The basis of design is 15-mil StegoWrap vapor barrier placed per the manufacturer's guidelines. Reef Industries Vapor Guard

membrane has also been shown to achieve a permeance of less than 0.01 perms. We recommend that the slab be poured directly on the vapor barrier, which is placed directly on the prepared subgrade soil.

18.2 Common to all acceptable products, vapor retarder/barrier joints must be lapped and sealed with mastic or the manufacturer's recommended tape or sealing products. In actual practice, stakes are often driven through the retarder material, equipment is dragged or rolled across the retarder, overlapping or jointing is not properly implemented, etc. All these construction deficiencies reduce the retarder's effectiveness. In no case should retarder/barrier products be punctured or gaps be allowed to form prior to or during concrete placement.

18.3 Vapor retarders/barriers do not provide full waterproofing for structures constructed below free water surfaces. They are intended to help reduce or prevent vapor transmission and/or capillary migration through the soil and through the concrete slabs. Waterproofing systems must be designed and properly constructed if full waterproofing is desired. The owner and project designers should be consulted to determine the specific level of protection required.

18.4 Following placement of concrete floor slabs, sufficient drying time must be allowed prior to placement of any floor coverings. Premature placement of floor coverings may result in degradation of adhesive materials and loosening of the finish floor materials.

19. *Exterior Slab Thickness and Reinforcement:* As a minimum for protection of on-site improvements, we recommend that all exterior pedestrian concrete slabs be 4½ inches thick, founded on properly compacted and tested fill, and contain No. 4 bars at 24-inch centers, both ways, at the center of the slab, and contain adequate isolation and control joints. The performance of on-site improvements can be greatly affected by soil base preparation and the quality of construction. It is therefore important that all improvements are properly designed and constructed for the existing soil conditions. The improvements should not be built on loose soils or fills placed without our observation and testing.

For exterior slabs with the minimum shrinkage reinforcement, control joints should be placed at spaces no farther than 15 feet apart or the width of the slab, whichever is less, and also at re-entrant corners. Control joints in exterior slabs should be sealed with elastomeric joint sealant. The sealant should be inspected every 6 months and be properly maintained.

D. Pavements

20. *Concrete Pavement:* We recommend that concrete pavements, including the garage slab, subject only to automobile and light truck traffic be 6 inches thick and be supported directly on properly prepared on-site subgrade soils. The concrete for areas subject to occasional heavy truck loading (such as trash trucks) should have a minimum thickness of 7 inches. The upper 8 inches of the subgrade below the slab should be compacted to a minimum degree of compaction of 95 percent just prior to paving. The concrete should conform to Section 201 of The Standard Specifications for Public Works Construction, 2000 Edition, for Class 560-C-3250.

In order to control shrinkage cracking, we recommend that saw-cut, weakened-plane joints be provided at about 15-foot centers both ways. The pavement slabs should be saw-cut as soon as practical but no more than 24 hours after the placement of the concrete. The depth of the joint should be one-quarter of the slab thickness and its width should not exceed 0.02-foot. Reinforcing steel is not necessary unless it is desired to increase the joint spacing recommended above.

E. General Recommendations

21. *Project Start Up Notification:* In order to minimize any work delays during site development, this firm should be contacted 24 hours prior to any need for observation of footing excavations or field density testing of compacted fill soils. If possible, placement of formwork and steel reinforcement in footing excavations should not occur prior to observing the excavations; in the event that our observations reveal the need for deepening or redesigning foundation structures at any locations, any formwork or steel reinforcement in the affected footing excavation areas would have to be removed prior to correction of the observed problem (i.e., deepening the footing excavation, recompacting soil in the bottom of the excavation, etc.).

IX. GRADING NOTES

Geotechnical Exploration, Inc. recommends that we be retained to verify the actual soil conditions revealed during site grading work and footing excavations to be as anticipated in this "*Report of Preliminary Geotechnical Investigation*" for the project. In addition, the compaction of any fill soils placed during site grading work must be observed and tested by the soil engineer. It is the responsibility of the

grading contractor to comply with the requirements on the grading plans and the local grading ordinance. All retaining wall and trench backfill should be properly compacted. ***Geotechnical Exploration, Inc.*** will assume no liability for damage occurring due to improperly or uncompacted backfill placed without our observations and testing.

X. LIMITATIONS

Our conclusions and recommendations have been based on available data obtained from our document review, field investigation and laboratory analysis, as well as our experience with similar soils and formational materials located in this area of Carlsbad. Of necessity, we must assume a certain degree of continuity between exploratory excavations. It is, therefore, necessary that all observations, conclusions, and recommendations be verified at the time grading operations begin or when footing excavations are placed. In the event discrepancies are noted, additional recommendations may be issued, if required.

The work performed and recommendations presented herein are the result of an investigation and analysis that meet the contemporary standard of care in our profession within the City of Carlsbad. No warranty is provided.

This report should be considered valid for a period of two (2) years, and is subject to review by our firm following that time. If significant modifications are made to the building plans, especially with respect to the height and location of any proposed structures, this report must be presented to us for immediate review and possible revision.

It is the responsibility of the owner and/or developer to ensure that the recommendations summarized in this report are carried out in the field operations and that our recommendations for design of this project are incorporated in the structural plans. We should be retained to review the project plans once they are available, to verify that our recommendations are adequately incorporated in the plans and to provide additional recommendations if needed.

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

The firm of ***Geotechnical Exploration, Inc.*** shall not be held responsible for changes to the physical condition of the property, such as addition of fill soils or changing drainage patterns, which occur subsequent to issuance of this report and the changes are made without our observations, testing, and approval.

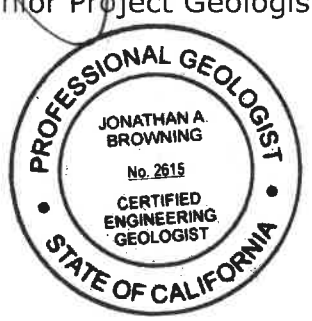
Once again, should any questions arise concerning this report, please feel free to contact the undersigned. Reference to our **Job No. 18-11749** will expedite a reply to your inquiries.

Respectfully submitted,

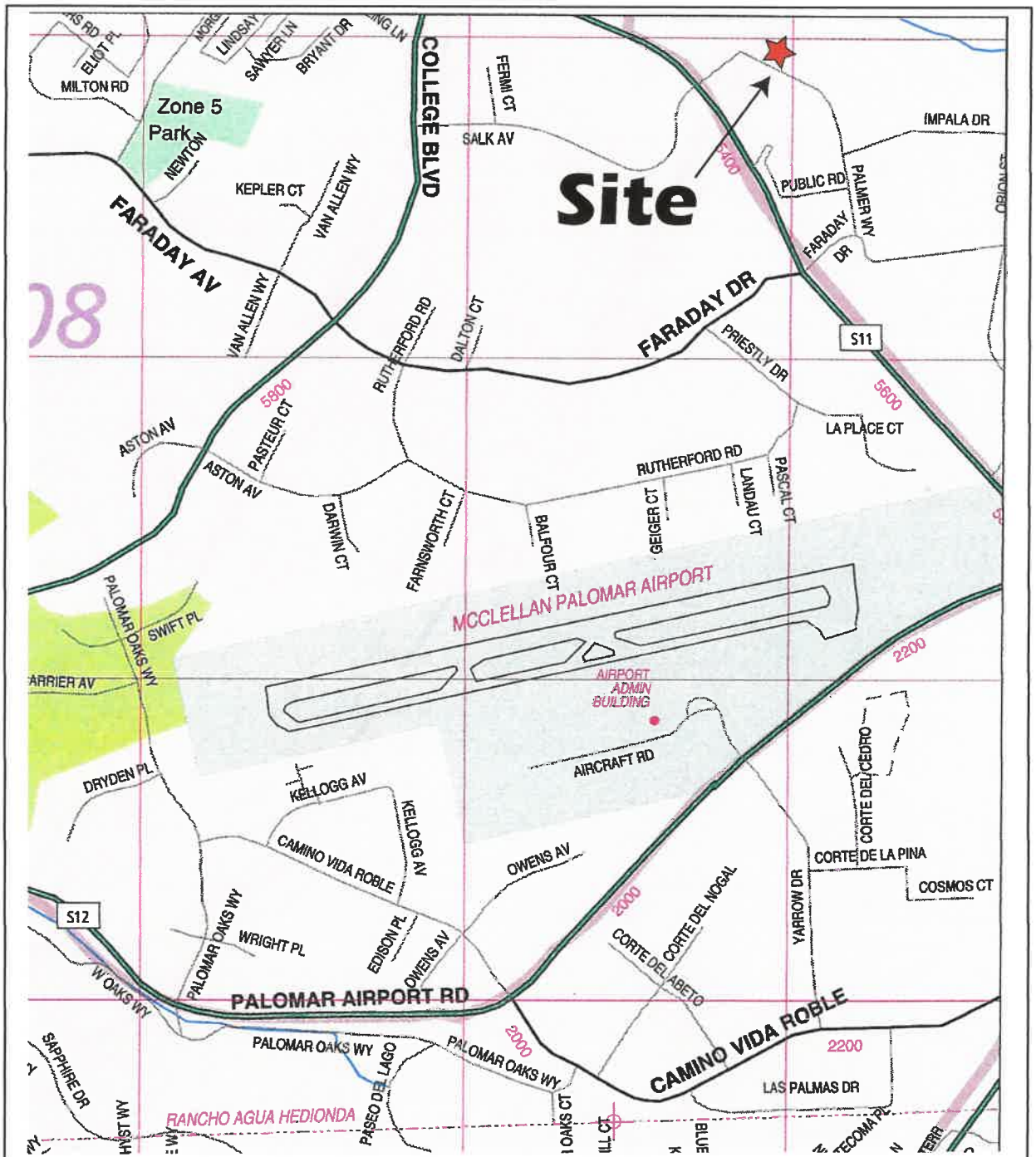
GEOTECHNICAL EXPLORATION, INC.

Wm. D. Hespeler, G.E. 396
Senior Geotechnical Engineer

Jonathan A. Browning
C.E.G. 2615/P.G. 9012
Senior Project Geologist



VICINITY MAP



Thomas Bros. Guide San Diego County, pg 1127-E1

Proposed 2-Story Valley View Office Building
Palmer Way North of Impala Drive
Carlsbad, CA.

Figure No. I
Job No. 18-11749

CONCEPTUAL GRADING PLAN
VALLEY VIEW PROJECT

LEGEND

T-8 — Indicates Approximate Location of Exploratory Trench

B-1 — Indicates Approximate Location of Exploratory Boring

SITE PLAN

Proposed 2-Story
Valley View Office Building
Palmer Way North of Impala Avenue
Carlsbad, CA.
Figure No. II
Job No. 18-11749

Geotechnical Exploration, Inc.

(February 2018)

PALMER WAY

PROPERTY LINE (TYP)

EXIST. 40% SLOPE LIMIT

OUTDOOR EATING AREA

PRP. PERVIOUS PAVERS

PRP. RIP-RAP

PRP. CONCRETE SPILLWAY

PRP. STORM DRAIN PIPE @ 0.5%

PROP. WATER LATERAL

PROP. SEWER LATERAL

PROP. SIDEWALK PER C-7 (TYP.)

EXIST. STREET LIGHT

T-1 T-2 T-3 T-4 T-5 T-6 T-7 T-8

B-1

K&S ENGINEERING, INC.
Planning . Engineering . Surveying
7801 Mission Center Court, Suite 100 San Diego, CA 92108
(619) 296-5565 Fax: (619) 296-5564

Z:\Data-Z\Acad-Z\Project-Z\00-102\dwg\00-102base.dwg 9/2/2008 11:41:49 AM PDT

SHEET 2 OF 2

MS 08-___
SDP 07-04 HDP 08-___
GPA 07-06 HMP 08-___
ZC 07-05

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)

Scale: 1" = 40'
(approximate)

REFERENCE: This PLOT PLAN was prepared from an existing CONCEPTUAL GRADING PLAN by K & S ENGINEERING, INC. dated 9/2/2008 and from on-site field reconnaissance performed by GEI.

NOTE: This Plot Plan is not to be used for legal purposes. Locations and dimensions are approximate. Actual property dimensions and locations of utilities may be obtained from the Approved Building Plans or the "As-Built" Grading Plans.

18-11749-1-to-40-p.ai

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Truck-mounted Auger Drill Rig	**8-inch diameter Boring**	**1-26-18**
SURFACE ELEVATION	**GROUNDWATER/ SEEPAGE DEPTH**	**LOGGED BY**
± 269' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
0			**SANDY CLAY** , fine- to coarse-grained sand, trace subrounded to rounded gravel; severely weathered. Stiff to very stiff. Moist. Dark red-brown.	CL								
2			**LUSARDI FORMATION (KI)**	SC								
4			**CLAYEY SAND** , with gravel, fine- to coarse-grained, subrounded to rounded gravel, trace caliche. Dense. Slightly moist. Light yellow-brown.									
6			**LUSARDI FORMATION (KI)**									
8												
10			**CLAYEY SAND** , fine- to coarse-grained, trace subrounded to rounded gravel, some caliche, some iron oxide staining. Very dense. Slightly moist. Light gray.	SC							95/ 10"	3"
12			**LUSARDI FORMATION (KI)**									
14												
16												
18												

PERCHED WATER TABLE
BULK BAG SAMPLE
1 IN-PLACE SAMPLE
MODIFIED CALIFORNIA SAMPLE
S NUCLEAR FIELD DENSITY TEST
STANDARD PENETRATION TEST

JOB NAME	
Proposed 2-Story Valley View Office Building	
SITE LOCATION	
Palmer Way North of Impala Drive, Carlsbad, CA	
JOB NUMBER **18-11749**	REVIEWED BY **JAB/WDH**
FIGURE NUMBER **IIIa**	Geotechnical Exploration, Inc.
LOG No. **B-1**	

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Truck-mounted Auger Drill Rig	**8-inch diameter Boring**	**1-26-18**
SURFACE ELEVATION	**GROUNDWATER/ SEEPAGE DEPTH**	**LOGGED BY**
± 269' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
22			@ 20' - some pink staining. **CLAYEY SAND** , fine- to coarse-grained, trace subrounded to rounded gravel, some caliche, some iron oxide staining. Very dense. Slightly moist. Light gray. **LUSARDI FORMATION (KI)**	SC							99/ 9"	3"
24												
26			@ 25' - becomes dark red-brown.									
28												
30			@ 30' - some pink and yellow staining.								120/ 8"	3"
32			-- hard drilling @ 32'. **CLAYEY SAND** , with gravel, fine- to coarse-grained, subrounded to rounded gravel, some cobbles. Very dense. Slightly moist. Dark red-brown. **LUSARDI FORMATION (KI)**	SC								
34												
36			-- Cal sampler refusal @ 37'.									
38			Bottom @ 37'									

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

- PERCHED WATER TABLE
- BULK BAG SAMPLE
- IN-PLACE SAMPLE
- MODIFIED CALIFORNIA SAMPLE
- NUCLEAR FIELD DENSITY TEST
- STANDARD PENETRATION TEST

JOB NAME
Proposed 2-Story Valley View Office Building

SITE LOCATION
Palmer Way North of Impala Drive, Carlsbad, CA

JOB NUMBER
18-11749

REVIEWED BY **JAB/WDH**

FIGURE NUMBER
IIIb

Geotechnical Exploration, Inc.

LOG No.
B-1

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Rubber-tire Backhoe	**23' X 2' X 9' Trench**	**1-22-18**
SURFACE ELEVATION	GROUNDWATER/ SEEPAGE DEPTH	LOGGED BY
± 262.5' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
			CLAYEY SAND , fine- to medium-grained, trace subrounded to rounded gravel, trace aphalt debris. Loose to medium dense. Moist. Dark yellow-brown with some light gray fragments.	SC								
			FILL (Qaf)	CL								
2			**SANDY CLAY** , fine- to coarse-grained sand, trace rounded to subrounded gravel; severely weathered, trace caliche. Stiff to very stiff. Moist. Dark red-brown.									
			LUSARDI FORMATION (Kl)									
			-- 69% passing #200 sieve.									
4			**CLAYEY SAND** , fine- to coarse-grained. Dense. Dry to slightly moist. Light yellow-brown.	SC								
			LUSARDI FORMATION (Kl)									
6												
8												
10			Bottom @ 9'									

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

- PERCHED WATER TABLE
- BULK BAG SAMPLE
- [1] IN-PLACE SAMPLE
- MODIFIED CALIFORNIA SAMPLE
- [S] NUCLEAR FIELD DENSITY TEST
- STANDARD PENETRATION TEST

JOB NAME
Proposed 2-Story Valley View Office Building

SITE LOCATION
Palmer Way North of Impala Drive, Carlsbad, CA

JOB NUMBER
18-11749

REVIEWED BY
JAB/WDH

LOG No.
T-1

FIGURE NUMBER
IIIc

Geotechnical Exploration, Inc.

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Rubber-tire Backhoe	**27' X 2' X 10.5' Trench**	**1-22-18**
SURFACE ELEVATION	**GROUNDWATER/ SEEPAGE DEPTH**	**LOGGED BY**
± 261' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
0			**SANDY CLAY.**	CL								
			TOPSOIL	SC								
2			**CLAYEY SAND** , fine- to coarse-grained, subrounded to rounded gravel, some iron oxide staining. Dense. Slightly moist. Light yellow-brown.									
			LUSARDI FORMATION (KI)									
4												
6												
			CLAYEY SAND , fine- to medium-grained, some iron oxide staining along fractures, some caliche. Very dense. Slightly moist. Gray.	SC								
8			**LUSARDI FORMATION (KI)**									
			-- 23.6% passing #200 sieve.		5.9	122.3						
10												
			Bottom @ 10.5'									
12												

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

- PERCHED WATER TABLE
- BULK BAG SAMPLE
- IN-PLACE SAMPLE
- MODIFIED CALIFORNIA SAMPLE
- NUCLEAR FIELD DENSITY TEST
- STANDARD PENETRATION TEST

JOB NAME
Proposed 2-Story Valley View Office Building

SITE LOCATION
Palmer Way North of Impala Drive, Carlsbad, CA

JOB NUMBER	REVIEWED BY	LOG No.
18-11749	**JAB/WDH**	**T-2**

FIGURE NUMBER
IIId

Geotechnical Exploration, Inc.

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Rubber-tire Backhoe	**23' X 2' X 9.5' Trench**	**1-22-18**
SURFACE ELEVATION	**GROUNDWATER/ SEEPAGE DEPTH**	**LOGGED BY**
± 267.5' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
2			**CLAYEY SAND** , fine- to coarse-grained, some subrounded to rounded gravel, trace cobbles, trace trash debris. Loose to medium dense. Slightly moist. Yellow-brown. **FILL (Qaf)** -- 2-inch diameter PVC conduit.	SC								
4			**CLAYEY SAND WITH GRAVEL** , fine- to coarse-grained, subrounded gravel, trace cobbles. Dense. Slightly moist. Red-brown. **LUSARDI FORMATION (Kl)**	SC								
6												
8			**SILTY SAND** , fine- to medium-grained, some caliche, some iron oxide staining. Very dense. Dry. Light gray. **LUSARDI FORMATION (Kl)**	SM								
10			Bottom @ 9.5'									

- PERCHED WATER TABLE
- BULK BAG SAMPLE
- [1] IN-PLACE SAMPLE
- MODIFIED CALIFORNIA SAMPLE
- [S] NUCLEAR FIELD DENSITY TEST
- STANDARD PENETRATION TEST

JOB NAME: **Proposed 2-Story Valley View Office Building**

SITE LOCATION: **Palmer Way North of Impala Drive, Carlsbad, CA**

JOB NUMBER: **18-11749**

REVIEWED BY: **JAB/WDH**

FIGURE NUMBER: **IIIe**

GEI Geotechnical Exploration, Inc.

LOG No. **T-3**

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Rubber-tire Backhoe	**18' X 2' X 6.5' Trench**	**1-22-18**
SURFACE ELEVATION	**GROUNDWATER/ SEEPAGE DEPTH**	**LOGGED BY**
± 271' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
1			**CLAYEY SAND** , fine- to coarse-grained, some subrounded to rounded gravel, trace trash debris. Loose to medium dense. Moist. Red-brown.	SC								
			FILL (Qaf)									
2			**CLAYEY SAND WITH GRAVEL** , fine- to coarse-grained, subrounded to rounded gravel, trace cobbles; slightly cemented, some caliche. Dense to very dense. Slightly moist. Red-brown.	SC								
			LUSARDI FORMATION (Kl)									
3												
4												
5			-- some interbedded well-cemented conglomerate layers.									
6												
7			Bottom @ 6.5'									
8												

PERCHED WATER TABLE
BULK BAG SAMPLE
1 IN-PLACE SAMPLE
MODIFIED CALIFORNIA SAMPLE
S NUCLEAR FIELD DENSITY TEST
STANDARD PENETRATION TEST

JOB NAME
Proposed 2-Story Valley View Office Building

SITE LOCATION
Palmer Way North of Impala Drive, Carlsbad, CA

JOB NUMBER
18-11749

REVIEWED BY **JAB/WDH**

FIGURE NUMBER
IIIf

Geotechnical Exploration, Inc.

LOG No.
T-4

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Rubber-tire Backhoe	**24' X 2' X 8' Trench**	**1-22-18**
SURFACE ELEVATION	**GROUNDWATER/ SEEPAGE DEPTH**	**LOGGED BY**
± 280' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
			CLAYEY SAND.	SC								
			TOPSOIL	CL								
			SANDY CLAY WITH GRAVEL , fine- to coarse-grained sand, subrounded to rounded gravel, severely weathered. Stiff to very stiff. Moist. Dark red-brown.									
2			**LUSARDI FORMATION (KI)**	SC								
			CLAYEY SAND , fine- to medium-grained, trace subrounded to rounded gravel, highly fractured to 6', abundant caliche infilling of fractures to 6'. Dense. Slightly moist. Light gray.									
4			**LUSARDI FORMATION (KI)**									
6			-- becomes less fractured, some iron oxide staining.									
8			Bottom @ 8'									
10												

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

- PERCHED WATER TABLE
- BULK BAG SAMPLE
- [1] IN-PLACE SAMPLE
- MODIFIED CALIFORNIA SAMPLE
- [S] NUCLEAR FIELD DENSITY TEST
- STANDARD PENETRATION TEST

JOB NAME
Proposed 2-Story Valley View Office Building

SITE LOCATION
Palmer Way North of Impala Drive, Carlsbad, CA

JOB NUMBER	REVIEWED BY	LOG No.
18-11749	**JAB/WDH**	**T-5**

FIGURE NUMBER
IIIg

Geotechnical Exploration, Inc.

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Rubber-tire Backhoe	**20' X 2' X 6.5' Trench**	**1-22-18**
SURFACE ELEVATION	**GROUNDWATER/ SEEPAGE DEPTH**	**LOGGED BY**
± 273' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
1			**CLAYEY SAND** , fine- to coarse-grained, some subrounded to rounded gravel, some PVC and trash debris. Loose to medium dense. Moist. Dark red-brown.	SC								
			FILL (Qaf)	SM								
2			**SILTY SAND WITH GRAVEL** , fine- to coarse-grained, subrounded to rounded gravel, severley weathered, trace cobbles. Dense. Moist. Dark red-brown. **LUSARDI FORMATION (Kl)**									
3			**CLAYEY SAND** , fine- to coarse-grained, some subrounded to rounded gravel, trace cobbles and boulders, some caliche, some iron oxide staining. Dense to very dense. Slightly moist. Light yellow-brown.	SC								
4			**LUSARDI FORMATION (Kl)**									
5			-- 14% passing #200 sieve.									
6												
7			Bottom @ 6.5'									
8												

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

- PERCHED WATER TABLE
- BULK BAG SAMPLE
- [1] IN-PLACE SAMPLE
- MODIFIED CALIFORNIA SAMPLE
- [S] NUCLEAR FIELD DENSITY TEST
- STANDARD PENETRATION TEST

JOB NAME
Proposed 2-Story Valley View Office Building

SITE LOCATION
Palmer Way North of Impala Drive, Carlsbad, CA

JOB NUMBER
18-11749

REVIEWED BY **JAB/WDH**

FIGURE NUMBER
IIIh

Geotechnical Exploration, Inc.

LOG No.
T-6

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Rubber-tire Backhoe	**20' X 2' X 8' Trench**	**1-22-18**
SURFACE ELEVATION	**GROUNDWATER/ SEEPAGE DEPTH**	**LOGGED BY**
± 273' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
0			**CLAYEY SAND** , fine- to coarse-grained, some subrounded to rounded gravel, some concrete and trash debris. Loose to medium dense. Moist. Dark red-brown. **FILL (Qaf)**	SC								
2			**CLAYEY SAND WITH GRAVEL** , fine- to coarse-grained, subrounded to rounded gravel, trace cobbles and boulders, some decomposed cobbles and boulders, some caliche. Dense to very dense. Dry to slightly moist. Light red-brown. **LUSARDI FORMATION (KI)**	SC								
4												
6												
8			Bottom @ 8'									
10												

PERCHED WATER TABLE
BULK BAG SAMPLE
1 IN-PLACE SAMPLE
MODIFIED CALIFORNIA SAMPLE
S NUCLEAR FIELD DENSITY TEST
STANDARD PENETRATION TEST

JOB NAME	
Proposed 2-Story Valley View Office Building	
SITE LOCATION	
Palmer Way North of Impala Drive, Carlsbad, CA	
JOB NUMBER **18-11749**	REVIEWED BY **JAB/WDH**
FIGURE NUMBER **IIIi**	Geotechnical Exploration, Inc.
	LOG No. **T-7**

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18

EQUIPMENT	DIMENSION & TYPE OF EXCAVATION	DATE LOGGED
Rubber-tire Backhoe	**20' X 2' X 6.5' Trench**	**1-22-18**
SURFACE ELEVATION	GROUNDWATER/ SEEPAGE DEPTH	LOGGED BY
± 273' Mean Sea Level	**Not Encountered**	**JAB**

DEPTH (feet)	SYMBOL	SAMPLE	FIELD DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS (Grain size, Density, Moisture, Color)	U.S.C.S.	IN-PLACE MOISTURE (%)	IN-PLACE DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)	DENSITY (% of M.D.D.)	EXPAN. + (%) CONSOL. -	BLOW COUNTS/FT.	SAMPLE O.D. (INCHES)
1			**CLAYEY SAND** , fine- to coarse-grained, some subrounded to rounded gravel, trace cobbles and boulders, some trash debris. Loose to medium dense. Moist. Dark red-brown. **FILL (Qaf)**	SC								
2			**SILTY SAND** , fine- to coarse-grained, some subrounded to rounded gravel, trace cobbles and boulders, some iron oxide staining, some decomposed cobbles and boulders. Dense to very dense. Slightly moist. Light red-brown to gray. **LUSARDI FORMATION (Kl)**	SM								
3												
4												
5		1	-- 21% passing #200 sieve.		7.9	128.3	10.7	123.4				
6												
7			Bottom @ 6.5'									
8												

PERCHED WATER TABLE
BULK BAG SAMPLE
1 IN-PLACE SAMPLE
MODIFIED CALIFORNIA SAMPLE
S NUCLEAR FIELD DENSITY TEST
STANDARD PENETRATION TEST

JOB NAME
Proposed 2-Story Valley View Office Building

SITE LOCATION
Palmer Way North of Impala Drive, Carlsbad, CA

JOB NUMBER
18-11749

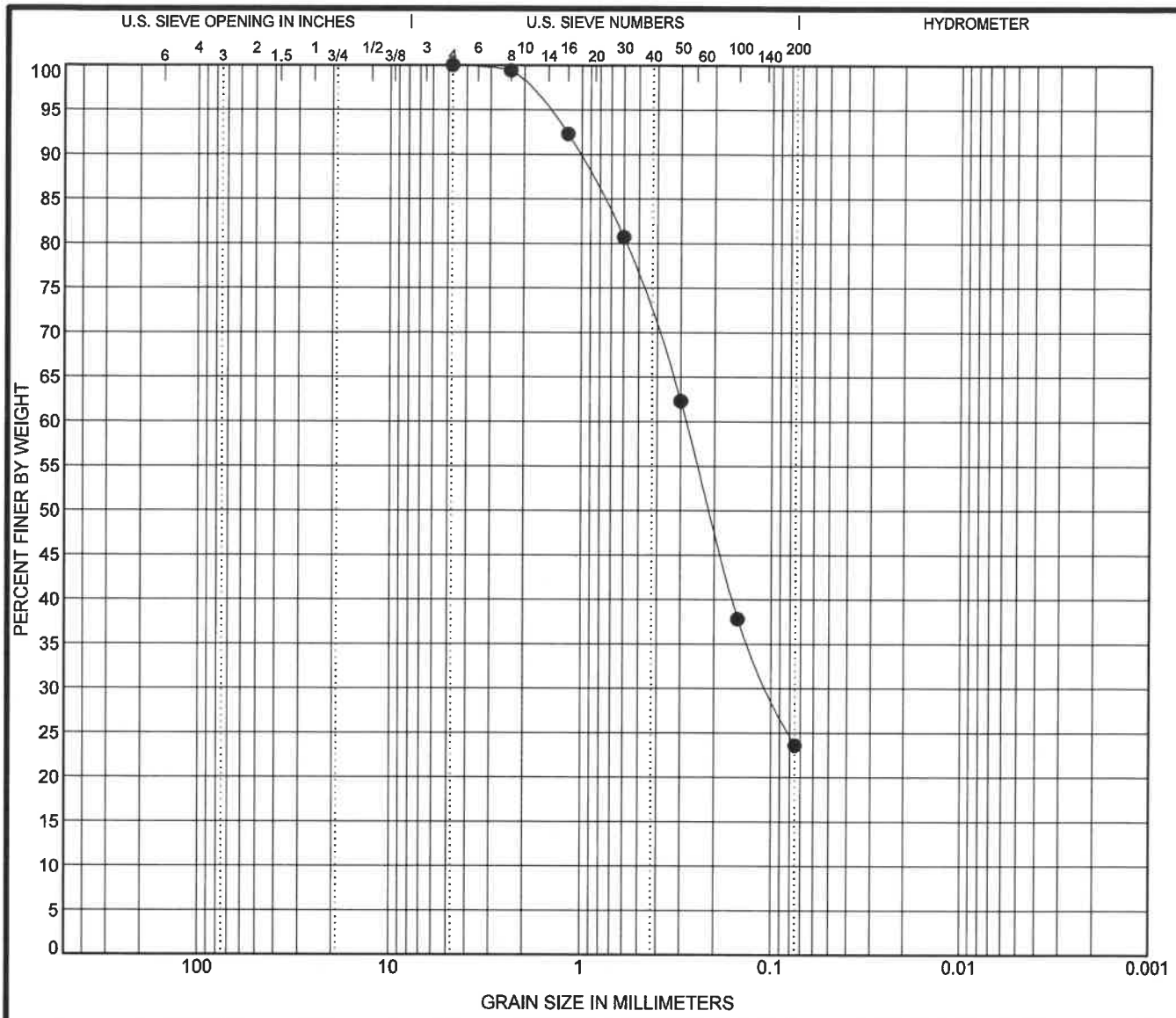
REVIEWED BY
JAB/WDH

LOG No.
T-8

FIGURE NUMBER
IIIj

Geotechnical Exploration, Inc.

EXPLORATION LOG 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/23/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**T-2 @ 9.5'**	**CLAYEY SAND (SC), Light gray-brown**					

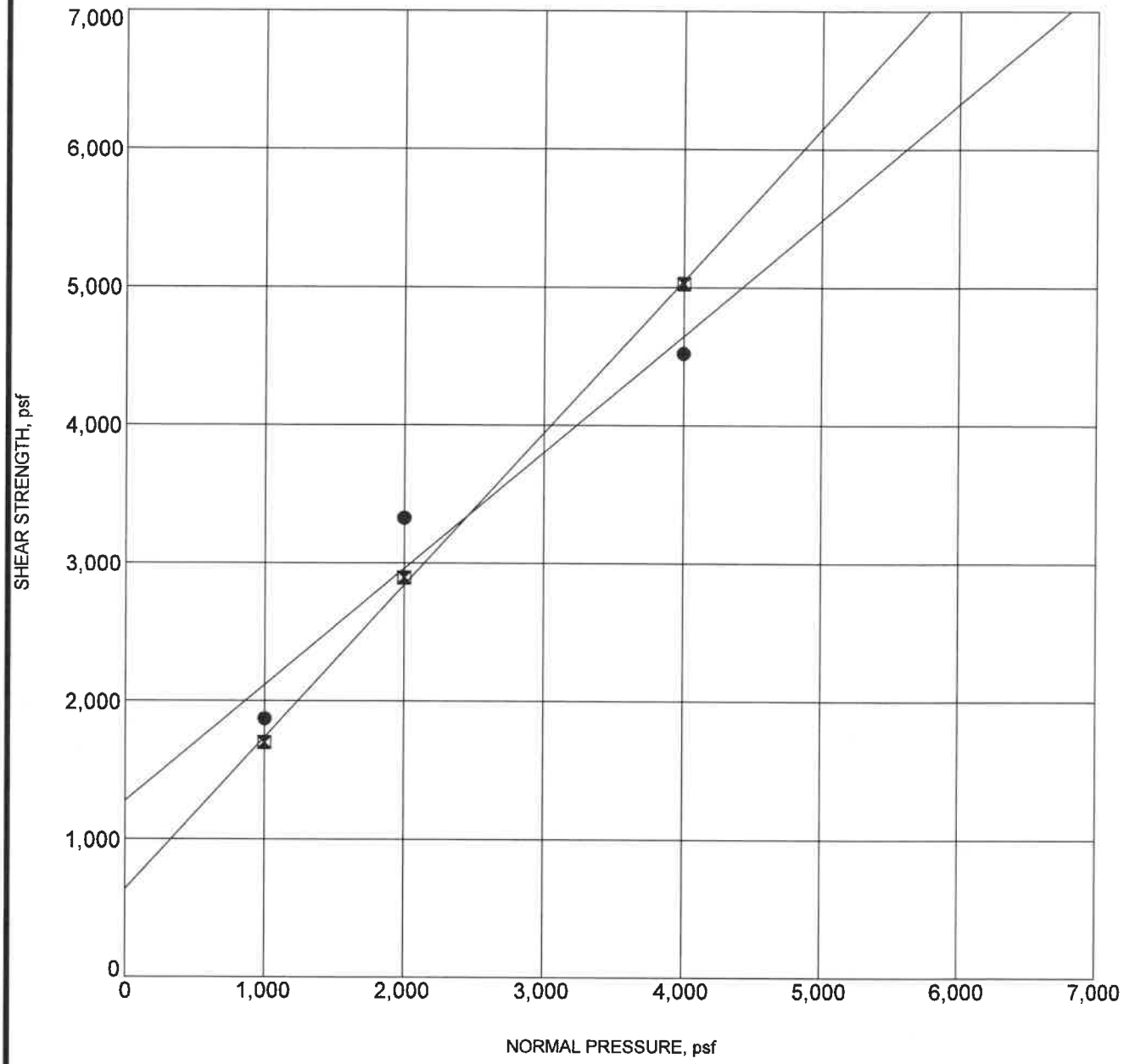
	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**T-2 @ 9.5'**	**4.75**	**0.281**	**0.103**		**0.0**	**76.4**	**23.6**	

Geotechnical Exploration, Inc.

GRAIN SIZE DISTRIBUTION

Figure Number: IV
Job Name: Proposed 2-Story Valley View Office Building
Site Location: Palmer Way North of Impala Drive, Carlsbad, C
Job Number: 18-11749

US_GRAIN_SIZE 11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18



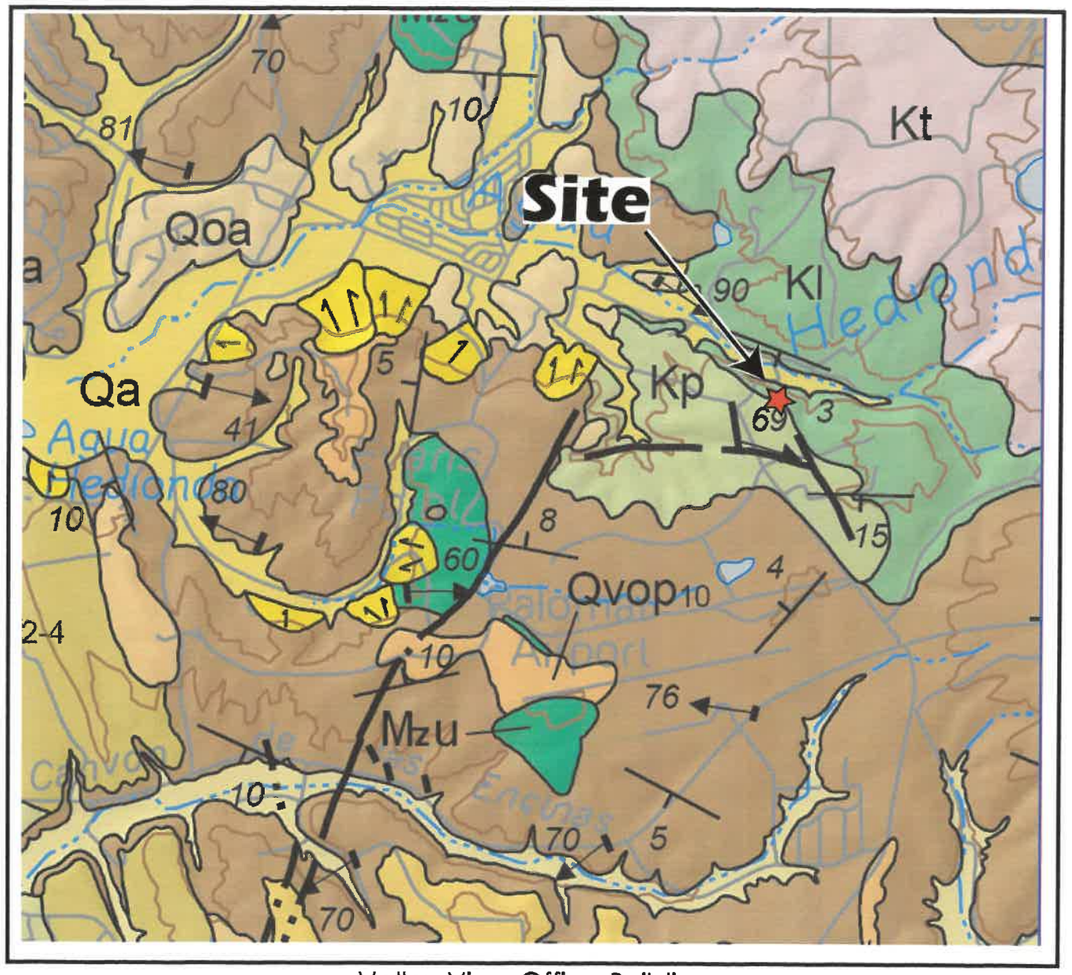
Specimen Identification		Classification	γ_d	MC%	c	ϕ
●	B-1 @ 20.3'	CLAYEY SAND (SC), Light gray			1274	40
⊠	B-1 @ 30.3'	CLAYEY SAND (SC), Yellow-brown			634	48

Geotechnical Exploration, Inc.

DIRECT SHEAR TEST

Figure Number: V
Job Name: Proposed 2-Story Valley View Office Building
Site Location: Palmer Way North of Impala Drive, Carlsbad, C
Job Number: 18-11749

US_DIRECT_SHEAR_11749 VV OFFICE BLDG.GPJ GEO_EXPL.GDT 2/14/18



Valley View Office Building
Palmer Way
North of Impala Drive
Carlsbad, CA.

EXCERPT FROM GEOLOGIC MAP OF THE OCEANSIDE 30' × 60' QUADRANGLE, CALIFORNIA

Compiled by
Michael P. Kennedy[1] and Siang S. Tan[1]
2007
Digital preparation by
Kelly R. Bovard[2], Rachel M. Alvarez[2], Michael J. Watson[2], and Carlos I. Gutierrez[1]

1. Department of Conservation, California Geological Survey
2. U.S. Geological Survey, Department of Earth Sciences, University of California, Riverside

APPROXIMATE MEAN DECLINATION, 2007

ONSHORE MAP SYMBOLS

Contact—Contact between geologic units; dotted where concealed.

Fault—Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.

Anticline—Solid where accurately located; dotted where concealed.

Syncline—Solid where accurately located; dotted where concealed.

Kgd—granite pegmatite dike

Closed depression—Closed depression in Elsinore fault zone.

Landslide—Arrows indicate principal direction of movement. Queried where existence is questionable.

Strike and dip of beds
- Inclined
- Overturned
- Vertical
- Horizontal

Strike and dip of igneous foliation
- Inclined
- Vertical

Strike and dip of igneous joints
- Inclined
- Vertical

Strike and dip of metamorphic foliation
- Inclined

Strike and dip of sedimentary joints
- Vertical

Description of Units

- Kp — Point Loma Formation
- Kl — Lusardi Formation

Base Map

Onshore base (hypsography, hydrography, and transportation) from U.S.G.S. digital line graph (D.L.G) data, Oceanside 30' x 60' metric quadrangle. Shaded topographic base from U.S.G.S. digital elevation models (DEM's). Offshore bathymetric contours and shaded bathymetry from N.O.A.A. single and multibeam data. Projection is UTM, zone 11, North American Datum 1927.

This map was funded in part by the U.S. Geological Survey National Cooperative Geologic Mapping Program, STATEMAP Award no. 01NGAG0092.

Prepared in cooperation with the U.S. Geological Survey, Southern California Areal Mapping Project.

Valley-View-oceanside-2007-geo.ai

Figure No. VI
Job No. 18-11749

Geotechnical Exploration, Inc.

February 2018

PLOT PLAN

Proposed 2-Story
Valley View Office Building
Palmer Way North of Impala Drive
Carlsbad, CA.
Figure No. VII
Job No. 18-11749

Geotechnical Exploration, Inc.

(February 2018)

NOTE: This Plot Plan is not to be used for legal purposes. Locations and dimensions are approximate. Actual property dimensions and locations of utilities may be obtained from the Approved Building Plans or the "As-Built" Grading Plans.

LEGEND

A — A' Indicates Cross Section Location

GRAPHIC SCALE
(1" = 50')

PALMER WAY

PROPERTY LINE (TYP)

S03°21'51"E
208.54'

S79°32'50"E
149.93'

S6[illegible]°00'38"E
5[illegible].69'

PROP. STORM DRAIN PIPE Ø 0.[illegible]

PROP. PERMEABLE PAVERS

PROP. RIP-RAP

PROP. CONCRETE SPILLWAY

EXIST. 40X SLOPE LIMIT

OUTDOOR EATING AREA

PROP. SIDEWALK

PROP. WATER LATERAL

PROP. SEWER LATERAL

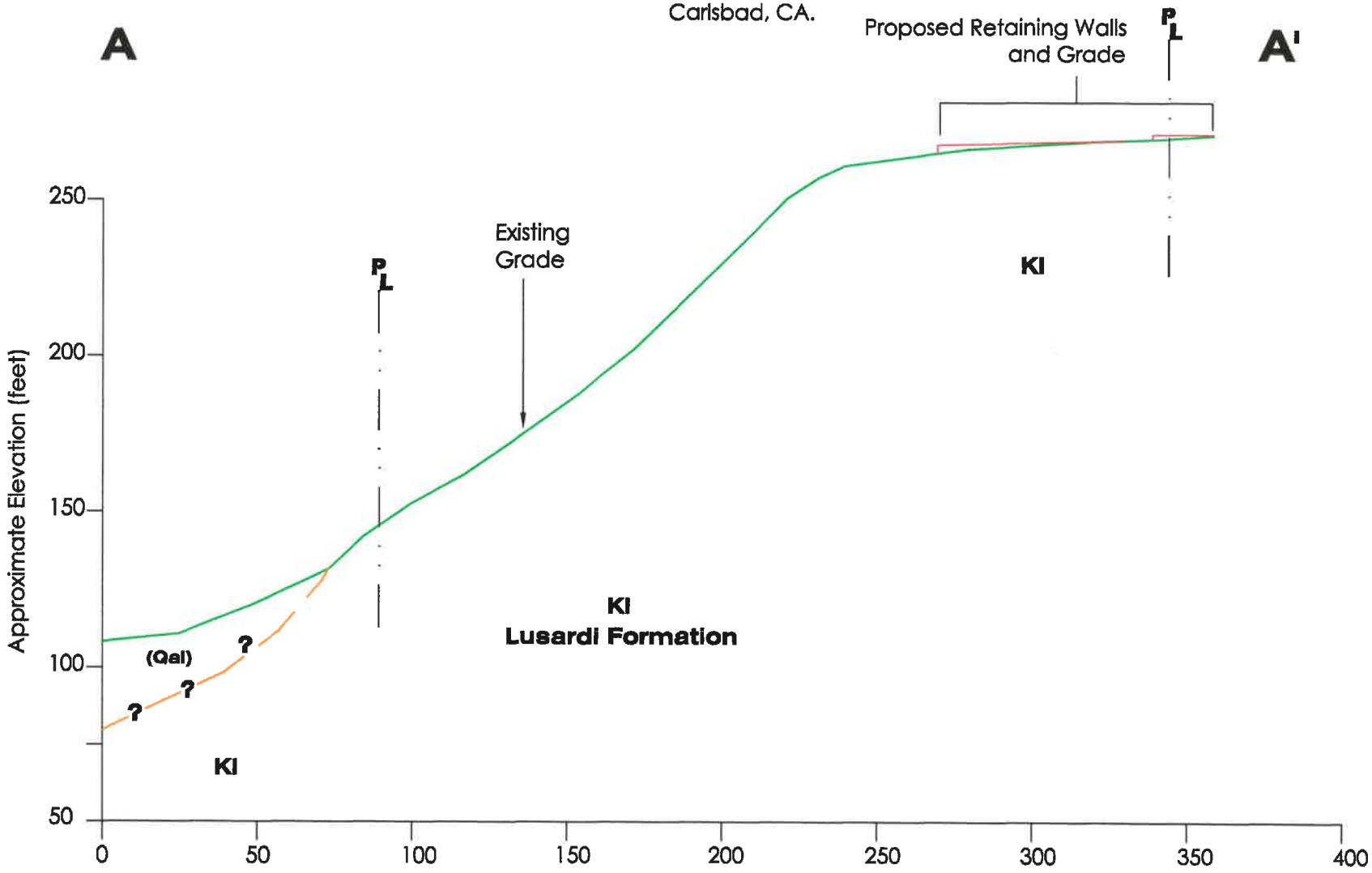
EXIST. STREET LIGHT

EXIST. FIRE HYDRANT

18-11749-VII(-2.ai

CROSS SECTION A-A'

Proposed 2-Story Valley View Office Building
Palmer Way North of Impala Drive
Carlsbad, CA.



Relative Horizontal Distance (feet)
Scale: 1" = 50'
(Horizontal and Vertical)

NOTE: This Cross Section is not to be used for legal purposes. Locations and dimensions are approximate. Actual property dimensions and locations of utilities may be obtained from the Approved Building Plans or the "As-Built" Grading Plans.

Figure No. VIIIa
Job No. 18-11749

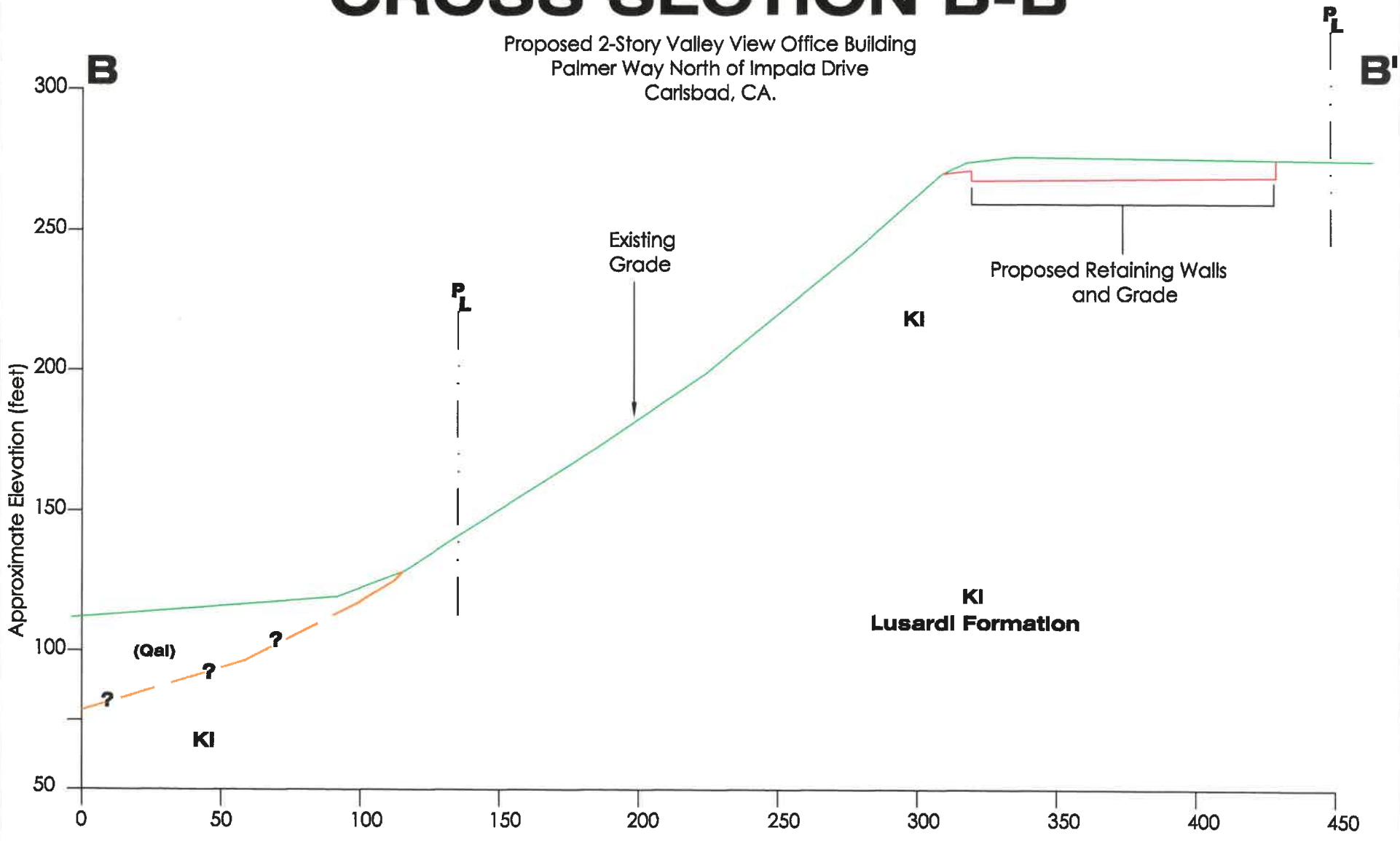
Geotechnical Exploration, Inc.

February 2018

17-11522-AA

CROSS SECTION B-B'

Proposed 2-Story Valley View Office Building
Palmer Way North of Impala Drive
Carlsbad, CA.



Relative Horizontal Distance (feet)
Scale: 1" = 50'
(Horizontal and Vertical)

NOTE: This Cross Section is not to be used for legal purposes. Locations and dimensions are approximate. Actual property dimensions and locations of utilities may be obtained from the Approved Building Plans or the "As-Built" Grading Plans.

Figure No. VIIIb
Job No. 18-11749

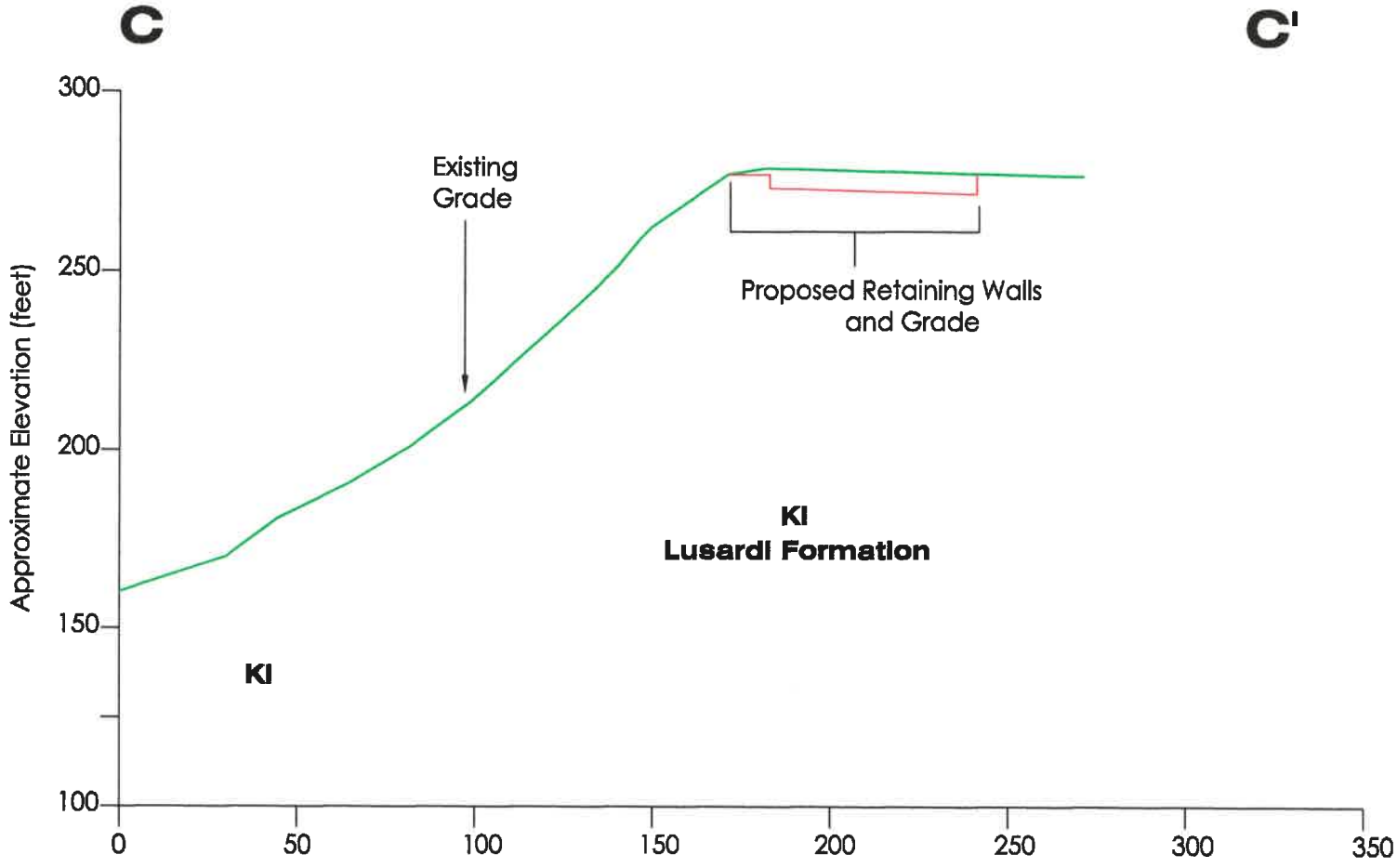
Geotechnical Exploration, Inc.

February 2018

17-11522-BB

CROSS SECTION C-C'

Proposed 2-Story Valley View Office Building
Palmer Way North of Impala Drive
Carlsbad, CA.



NOTE: This Cross Section is not to be used for legal purposes. Locations and dimensions are approximate. Actual property dimensions and locations of utilities may be obtained from the Approved Building Plans or the "As-Built" Grading Plans.

Figure No. VIIIc
Job No. 18-11749

Geotechnical Exploration, Inc.

February 2018

17-11522-CC

SLOPE STABILITY CALCULATIONS

SECTION A – A’

XSTABL File: VALLEYA1 2-09-18 13:19

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*                using the              *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 1358  *
*****************************************
```

Problem Description : Valley View Section A

SEGMENT BOUNDARY COORDINATES

11 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	107.0	25.0	110.0	2
2	25.0	110.0	55.0	120.0	2
3	55.0	120.0	75.0	130.0	1
4	75.0	130.0	85.0	140.0	1
5	85.0	140.0	100.0	150.0	1
6	100.0	150.0	160.0	190.0	1
7	160.0	190.0	172.0	200.0	1
8	172.0	200.0	223.0	250.0	1
9	223.0	250.0	240.0	260.0	1
10	240.0	260.0	290.0	265.0	1
11	290.0	265.0	360.0	268.0	1

1 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	52.0	75.0	130.0	1

ISOTROPIC Soil Parameters

2 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	125.0	600.0	40.00	.000	.0	0
2	120.0	125.0	200.0	28.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.
3600 trial surfaces will be generated and analyzed.

60 Surfaces initiate from each of 60 points equally spaced
along the ground surface between x = 1.0 ft
and x = 100.0 ft

Each surface terminates between x = 223.0 ft
and x = 350.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *
17.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined
are displayed below - the most critical first

Failure surface No. 1 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	58.05	121.53
2	74.92	123.61
3	91.61	126.87
4	108.02	131.29
5	124.09	136.84
6	139.74	143.49
7	154.88	151.22
8	169.44	159.99
9	183.36	169.76
10	196.56	180.47
11	208.98	192.07
12	220.56	204.51
13	231.25	217.74
14	240.99	231.67
15	249.73	246.25
16	257.43	261.40
17	257.58	261.76

** Corrected JANBU FOS = 1.668 ** (Fo factor = 1.054)

Failure surface No. 2 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	22.81	109.74
2	39.81	109.87
3	56.76	111.19
4	73.58	113.67

5	90.18	117.32
6	106.50	122.10
7	122.44	128.01
8	137.93	135.01
9	152.90	143.06
10	167.28	152.13
11	180.99	162.18
12	193.98	173.15
13	206.17	185.00
14	217.51	197.66
15	227.95	211.08
16	237.43	225.19
17	245.91	239.93
18	253.35	255.21
19	255.92	261.59

** Corrected JANBU FOS = 1.668 ** (Fo factor = 1.061)

Failure surface No. 3 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	59.73	122.36
2	76.57	124.69
3	93.22	128.13
4	109.60	132.68
5	125.63	138.32
6	141.26	145.01
7	156.40	152.74
8	171.00	161.46
9	184.97	171.14
10	198.27	181.73
11	210.83	193.19
12	222.59	205.46
13	233.51	218.49
14	243.53	232.22
15	252.61	246.60
16	260.71	261.54
17	260.97	262.10

** Corrected JANBU FOS = 1.668 ** (Fo factor = 1.053)

Failure surface No. 4 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	32.88	112.63
2	49.88	112.81
3	66.82	114.22
4	83.62	116.86
5	100.18	120.70
6	116.42	125.72
7	132.25	131.91
8	147.60	139.23
9	162.37	147.63
10	176.50	157.09
11	189.91	167.53
12	202.53	178.93
13	214.30	191.20

14	225.14	204.29
15	235.01	218.13
16	243.86	232.65
17	251.63	247.77
18	257.58	261.76

** Corrected JANBU FOS = 1.669 ** (Fo factor = 1.061)

Failure surface No. 5 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	29.53	111.51
2	46.47	112.86
3	63.30	115.28
4	79.94	118.77
5	96.32	123.31
6	112.38	128.89
7	128.05	135.48
8	143.27	143.05
9	157.97	151.58
10	172.11	161.03
11	185.61	171.36
12	198.43	182.52
13	210.51	194.48
14	221.80	207.19
15	232.27	220.59
16	241.85	234.63
17	250.53	249.25
18	256.87	261.69

** Corrected JANBU FOS = 1.669 ** (Fo factor = 1.055)

Failure surface No. 6 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	34.56	113.19
2	51.48	114.84
3	68.26	117.54
4	84.84	121.30
5	101.15	126.09
6	117.13	131.89
7	132.72	138.68
8	147.84	146.44
9	162.45	155.13
10	176.49	164.72
11	189.90	175.17
12	202.62	186.45
13	214.61	198.50
14	225.83	211.27
15	236.21	224.73
16	245.74	238.81
17	254.36	253.46
18	258.62	261.86

** Corrected JANBU FOS = 1.669 ** (Fo factor = 1.054)

Failure surface No. 7 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	53.02	119.34
2	69.89	121.44
3	86.59	124.62
4	103.05	128.87
5	119.20	134.17
6	134.98	140.49
7	150.32	147.82
8	165.15	156.12
9	179.43	165.36
10	193.07	175.50
11	206.04	186.49
12	218.27	198.29
13	229.72	210.86
14	240.34	224.14
15	250.08	238.07
16	258.90	252.60
17	264.02	262.40

** Corrected JANBU FOS = 1.671 ** (Fo factor = 1.053)

Failure surface No. 8 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	39.59	114.86
2	56.59	115.38
3	73.50	117.08
4	90.25	119.95
5	106.77	124.00
6	122.96	129.19
7	138.74	135.50
8	154.05	142.90
9	168.80	151.35
10	182.92	160.81
11	196.35	171.24
12	209.01	182.58
13	220.85	194.78
14	231.81	207.78
15	241.83	221.51
16	250.86	235.91
17	258.86	250.91
18	264.00	262.40

** Corrected JANBU FOS = 1.671 ** (Fo factor = 1.059)

Failure surface No. 9 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	27.85	110.95
2	44.79	112.29
3	61.62	114.70
4	78.26	118.19
5	94.64	122.74

6	110.70	128.32
7	126.36	134.92
8	141.58	142.51
9	156.27	151.05
10	170.39	160.52
11	183.88	170.87
12	196.68	182.06
13	208.73	194.05
14	220.00	206.78
15	230.42	220.21
16	239.97	234.27
17	248.60	248.92
18	254.96	261.50

** Corrected JANBU FOS = 1.672 ** (Fo factor = 1.056)

Failure surface No.10 specified by 16 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	61.41	123.20
2	78.17	126.01
3	94.73	129.88
4	111.01	134.78
5	126.94	140.69
6	142.48	147.60
7	157.54	155.48
8	172.08	164.29
9	186.03	174.00
10	199.35	184.57
11	211.97	195.96
12	223.84	208.13
13	234.93	221.02
14	245.18	234.58
15	254.55	248.76
16	262.28	262.23

** Corrected JANBU FOS = 1.672 ** (Fo factor = 1.050)

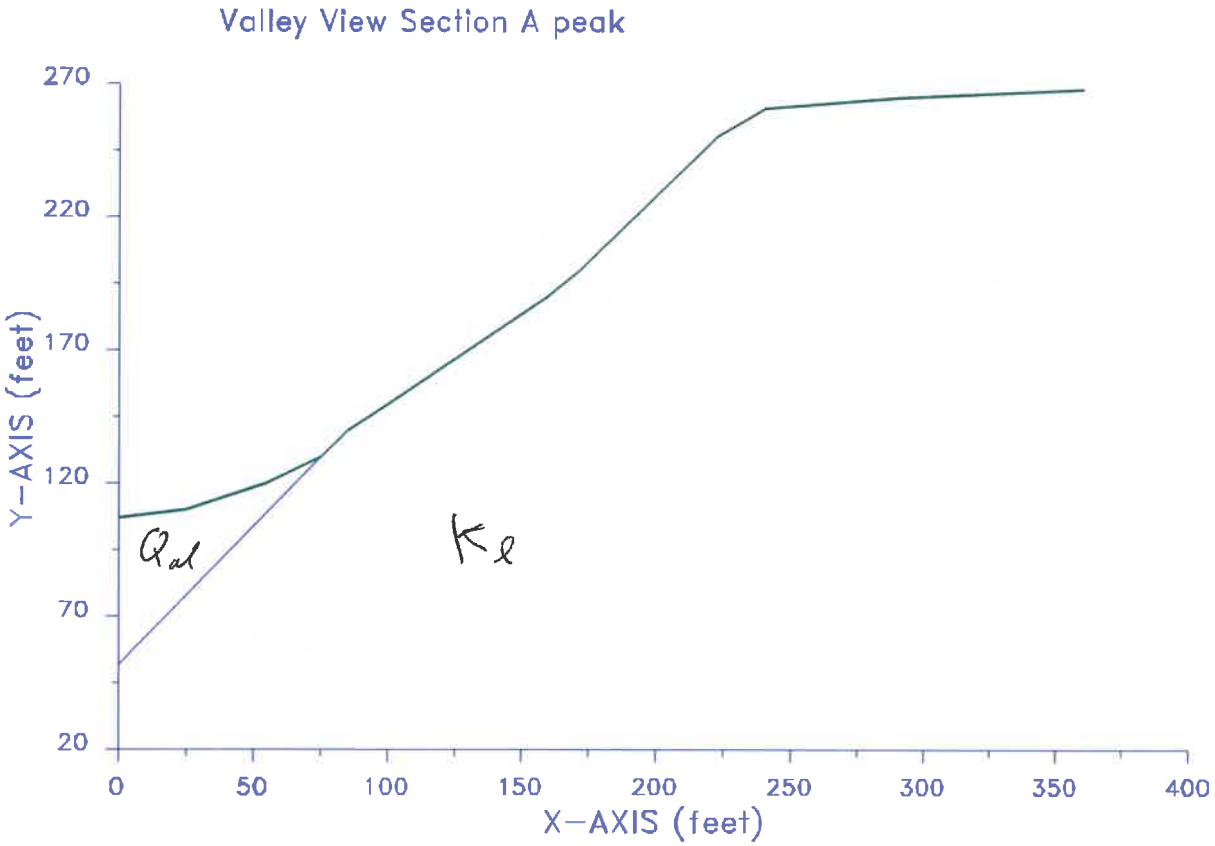
The following is a summary of the TEN most critical surfaces

Problem Description : Valley View Section A peak

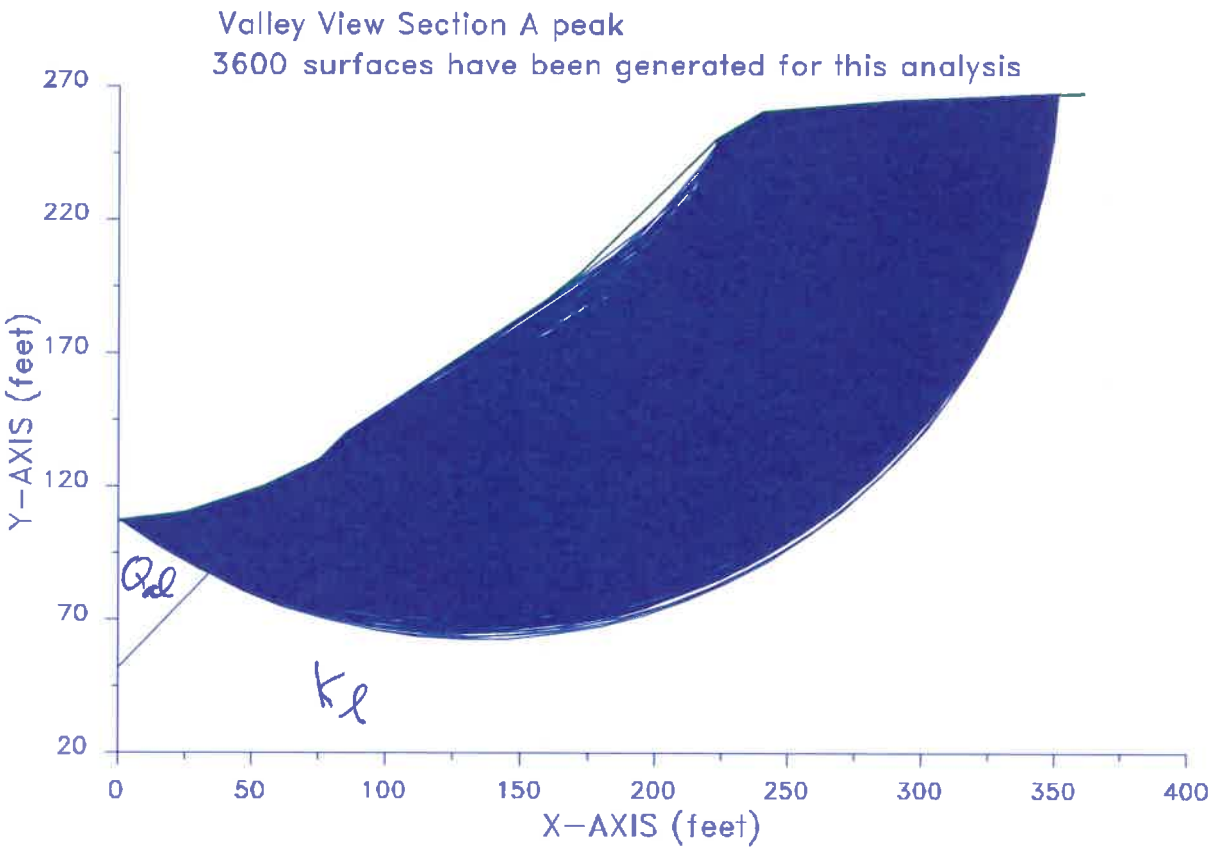
	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.668	1.054	58.05	257.58	6.396E+05
2.	1.668	1.061	22.81	255.92	7.719E+05
3.	1.668	1.053	59.73	260.97	6.439E+05
4.	1.669	1.061	32.88	257.58	7.865E+05
5.	1.669	1.055	29.53	256.87	6.843E+05
6.	1.669	1.054	34.56	258.62	6.758E+05
7.	1.671	1.053	53.02	264.02	6.914E+05
8.	1.671	1.059	39.59	264.00	8.112E+05
9.	1.672	1.056	27.85	254.96	6.697E+05
10.	1.672	1.050	61.41	262.28	6.175E+05

* * * END OF FILE * * *

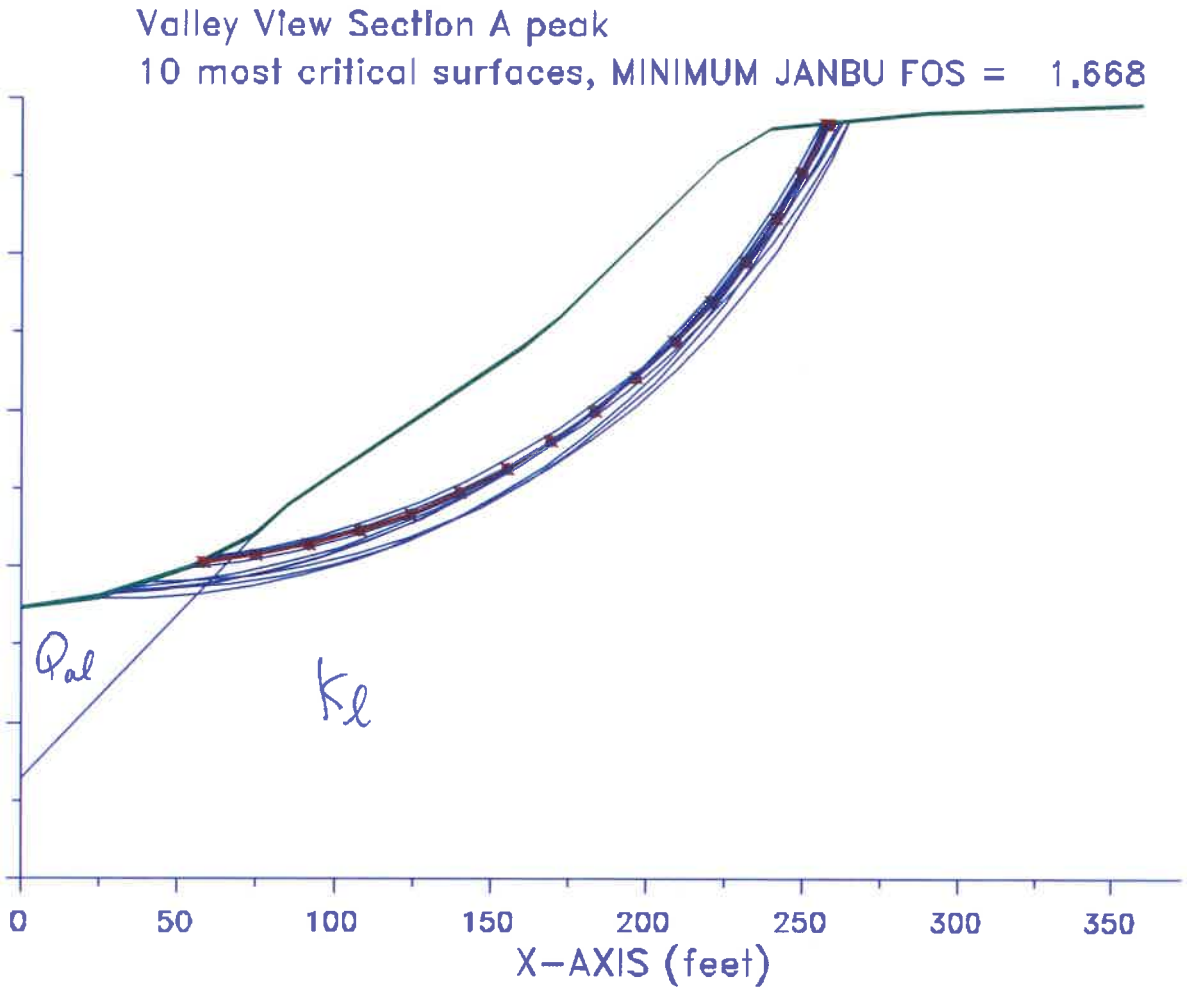
VALLEYA1 2-09-18 13:19



VALLEYA1 2-09-18 13:19



A1 2-09-18 13:19



SECTION B – B′

XSTABL File: VALLEYB1 2-12-18 13:42

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 1358  *
*****************************************
```

Problem Description : Valley View Section B

SEGMENT BOUNDARY COORDINATES

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	112.0	93.0	120.0	2
2	93.0	120.0	117.0	130.0	2
3	117.0	130.0	140.0	140.0	1
4	140.0	140.0	225.0	200.0	1
5	225.0	200.0	310.0	270.0	1
6	310.0	270.0	320.0	275.0	1
7	320.0	275.0	335.0	279.0	1
8	335.0	279.0	465.0	275.0	1

2 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	80.0	65.0	100.0	1
2	65.0	100.0	117.0	130.0	1

ISOTROPIC Soil Parameters

2 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	125.0	600.0	40.00	.000	.0	0
2	120.0	125.0	200.0	28.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

5400 trial surfaces will be generated and analyzed.

90 Surfaces initiate from each of 60 points equally spaced along the ground surface between x = 30.0 ft and x = 150.0 ft

Each surface terminates between x = 300.0 ft and x = 390.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

17.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined
are displayed below - the most critical first

Failure surface No. 1 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	131.69	136.39
2	148.60	138.15
3	165.35	141.05
4	181.87	145.09
5	198.07	150.24
6	213.88	156.48
7	229.24	163.77
8	244.06	172.10
9	258.28	181.41
10	271.84	191.67
11	284.66	202.83
12	296.70	214.83
13	307.90	227.62
14	318.20	241.15
15	327.56	255.34
16	335.93	270.13
17	340.10	278.84

** Corrected JANBU FOS = 1.694 ** (Fo factor = 1.055)

Failure surface No. 2 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	123.56	132.85
2	140.48	134.45
3	157.27	137.17

4	173.83	140.99
5	190.11	145.89
6	206.03	151.86
7	221.51	158.87
8	236.50	166.89
9	250.93	175.88
10	264.74	185.80
11	277.85	196.62
12	290.22	208.27
13	301.80	220.72
14	312.53	233.91
15	322.36	247.78
16	331.25	262.27
17	339.17	277.31
18	339.86	278.85

** Corrected JANBU FOS = 1.697 ** (Fo factor = 1.055)

Failure surface No. 3 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	141.86	141.32
2	158.79	142.92
3	175.55	145.75
4	192.06	149.79
5	208.24	155.01
6	224.00	161.39
7	239.25	168.90
8	253.92	177.49
9	267.93	187.12
10	281.21	197.73
11	293.68	209.29
12	305.28	221.71
13	315.96	234.95
14	325.64	248.92
15	334.29	263.55
16	341.86	278.78
17	341.86	278.79

** Corrected JANBU FOS = 1.698 ** (Fo factor = 1.056)

Failure surface No. 4 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	127.63	134.62
2	144.44	137.13
3	161.07	140.64
4	177.46	145.15
5	193.55	150.64
6	209.29	157.09
7	224.60	164.46
8	239.44	172.75
9	253.76	181.91
10	267.50	191.92
11	280.62	202.74
12	293.06	214.33
13	304.78	226.64

14	315.74	239.63
15	325.90	253.27
16	335.22	267.48
17	341.70	278.79

** Corrected JANBU FOS = 1.698 ** (Fo factor = 1.050)

Failure surface No. 5 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	135.76	138.16
2	152.73	139.22
3	169.57	141.56
4	186.18	145.18
5	202.47	150.04
6	218.34	156.13
7	233.70	163.41
8	248.47	171.84
9	262.55	181.36
10	275.87	191.92
11	288.35	203.47
12	299.91	215.93
13	310.50	229.23
14	320.04	243.30
15	328.49	258.05
16	335.79	273.40
17	337.92	278.91

** Corrected JANBU FOS = 1.699 ** (Fo factor = 1.059)

Failure surface No. 6 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	119.49	131.08
2	136.45	132.20
3	153.30	134.46
4	169.96	137.87
5	186.35	142.39
6	202.39	148.02
7	218.01	154.73
8	233.14	162.48
9	247.71	171.24
10	261.65	180.97
11	274.89	191.62
12	287.39	203.15
13	299.07	215.51
14	309.88	228.62
15	319.78	242.44
16	328.72	256.90
17	336.65	271.94
18	339.72	278.85

** Corrected JANBU FOS = 1.700 ** (Fo factor = 1.057)

Failure surface No. 7 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	129.66	135.50
2	146.59	137.10
3	163.35	139.91
4	179.88	143.91
5	196.07	149.08
6	211.85	155.39
7	227.14	162.82
8	241.86	171.33
9	255.94	180.86
10	269.29	191.38
11	281.86	202.83
12	293.58	215.15
13	304.38	228.27
14	314.22	242.14
15	323.04	256.67
16	330.79	271.80
17	333.71	278.66

** Corrected JANBU FOS = 1.701 ** (Fo factor = 1.057)

Failure surface No. 8 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	129.66	135.50
2	146.62	136.66
3	163.45	139.07
4	180.05	142.74
5	196.33	147.65
6	212.19	153.76
7	227.55	161.04
8	242.32	169.45
9	256.43	178.95
10	269.78	189.47
11	282.30	200.97
12	293.93	213.37
13	304.60	226.60
14	314.24	240.60
15	322.81	255.28
16	330.26	270.57
17	333.44	278.59

** Corrected JANBU FOS = 1.702 ** (Fo factor = 1.059)

Failure surface No. 9 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	117.46	130.20
2	134.44	131.01
3	151.32	132.97
4	168.04	136.08
5	184.50	140.31
6	200.64	145.66
7	216.38	152.09
8	231.64	159.57

9	246.36	168.07
10	260.47	177.56
11	273.90	187.98
12	286.59	199.29
13	298.49	211.44
14	309.53	224.36
15	319.66	238.01
16	328.85	252.32
17	337.04	267.21
18	342.41	278.77

** Corrected JANBU FOS = 1.702 ** (Fo factor = 1.058)

Failure surface No.10 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	115.42	129.34
2	132.38	130.62
3	149.20	133.03
4	165.84	136.55
5	182.20	141.16
6	198.22	146.85
7	213.82	153.60
8	228.95	161.36
9	243.52	170.11
10	257.48	179.82
11	270.76	190.42
12	283.31	201.89
13	295.07	214.17
14	305.99	227.20
15	316.02	240.92
16	325.12	255.29
17	333.24	270.22
18	337.25	278.93

** Corrected JANBU FOS = 1.703 ** (Fo factor = 1.057)

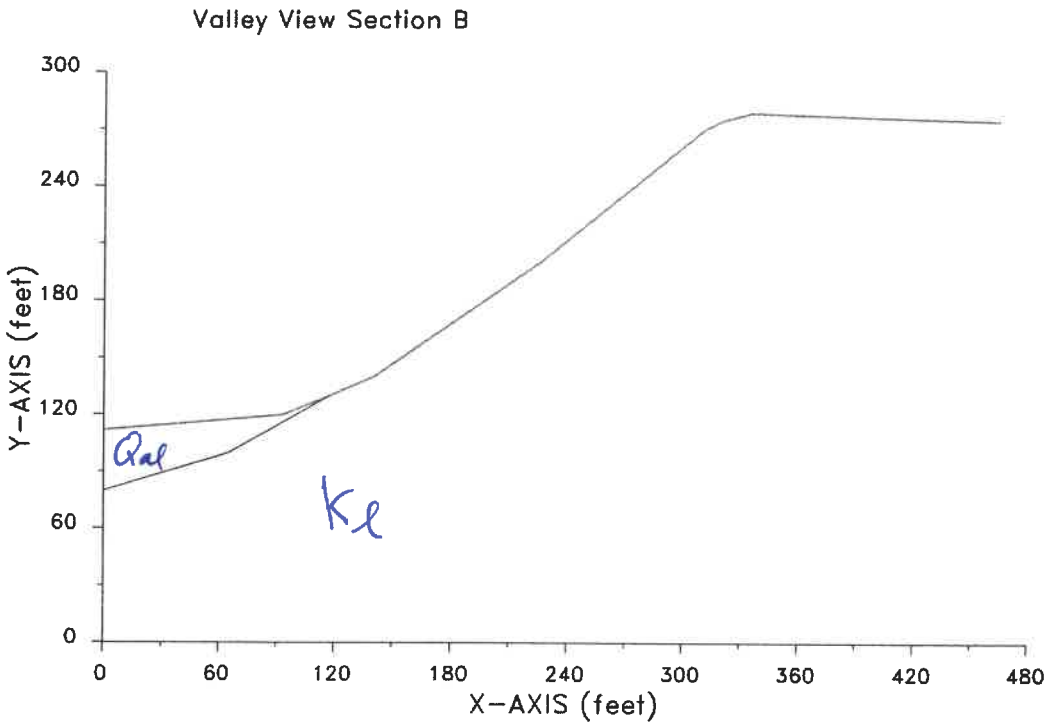
The following is a summary of the TEN most critical surfaces

Problem Description : Valley View Section B

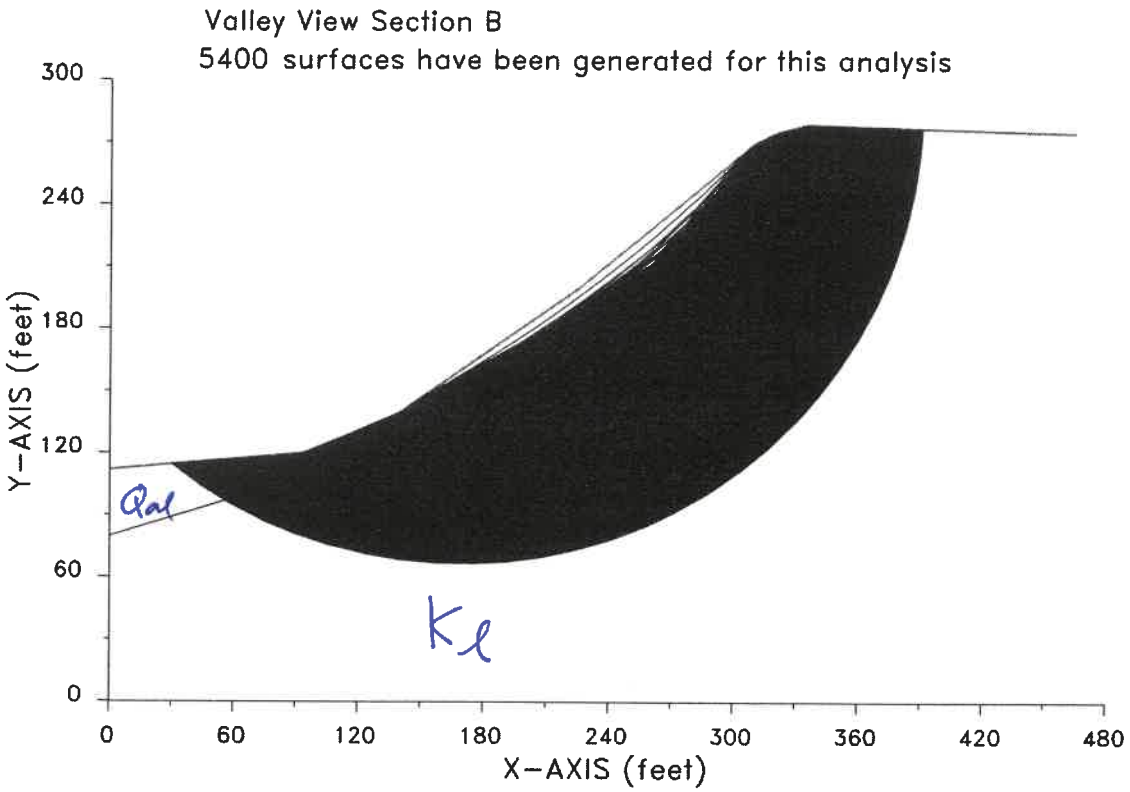
	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.694	1.055	131.69	340.10	7.117E+05
2.	1.697	1.055	123.56	339.86	7.345E+05
3.	1.698	1.056	141.86	341.86	7.115E+05
4.	1.698	1.050	127.63	341.70	6.752E+05
5.	1.699	1.059	135.76	337.92	7.384E+05
6.	1.700	1.057	119.49	339.72	7.803E+05
7.	1.701	1.057	129.66	333.71	6.780E+05
8.	1.702	1.059	129.66	333.44	7.084E+05
9.	1.702	1.058	117.46	342.41	8.324E+05
10.	1.703	1.057	115.42	337.25	7.539E+05

* * * END OF FILE * * *

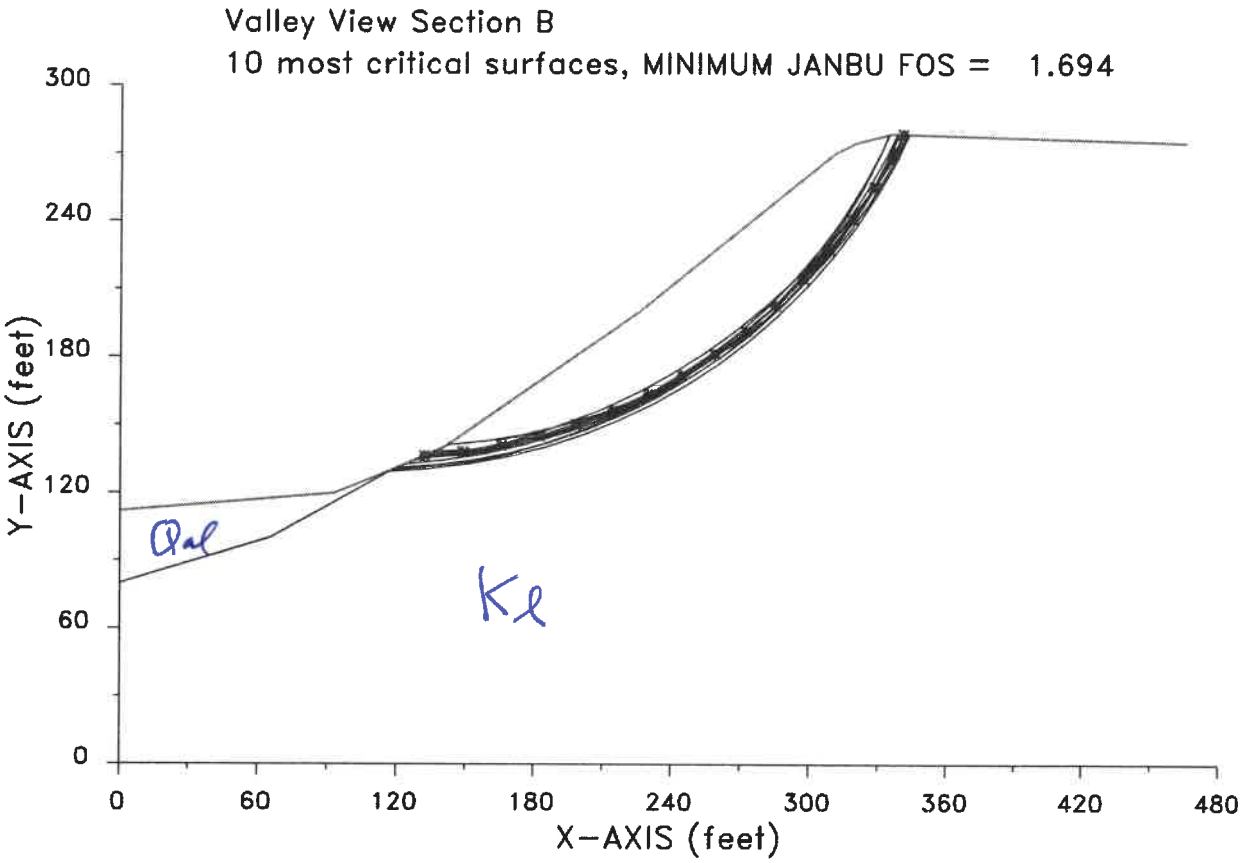
VALLEYB1 2-12-18 13:42



VALLEYB1 2-12-18 13:42



VALLEYB1 2-12-18 13:42



SECTION C – C'

XSTABL File: VALLEYC1 2-12-18 14:23

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*            Method of Slices           *
*                                       *
*        Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.208                96 - 1358  *
*****************************************
```

Problem Description : Valley View Section C

SEGMENT BOUNDARY COORDINATES

---

8 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	160.0	30.0	170.0	1
2	30.0	170.0	45.0	180.0	1
3	45.0	180.0	83.0	200.0	1
4	83.0	200.0	140.0	250.0	1
5	140.0	250.0	148.0	260.0	1
6	148.0	260.0	172.0	275.0	1
7	172.0	275.0	182.0	278.0	1
8	182.0	278.0	270.0	275.0	1

ISOTROPIC Soil Parameters

---

1 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	125.0	600.0	40.00	.000	.0	0

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

3600 trial surfaces will be generated and analyzed.

60 Surfaces initiate from each of 60 points equally spaced along the ground surface between x = 1.0 ft
and x = 85.0 ft

Each surface terminates between x = 150.0 ft
and x = 240.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

12.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED JANBU METHOD * * * * *

The 10 most critical of all the failure surfaces examined are displayed below - the most critical first
*

Failure surface No. 1 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	30.90	170.60
2	42.87	171.39
3	54.77	172.97
4	66.53	175.33
5	78.12	178.44
6	89.48	182.31
7	100.56	186.92
8	111.32	192.24
9	121.70	198.26
10	131.67	204.94
11	141.18	212.26
12	150.19	220.19
13	158.66	228.69
14	166.55	237.72
15	173.84	247.26
16	180.49	257.25
17	186.47	267.65
18	191.38	277.68

** Corrected JANBU FOS = 1.795 ** (Fo factor = 1.057)

Failure surface No. 2 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	30.90	170.60
2	42.89	170.99
3	54.83	172.20
4	66.66	174.23
5	78.32	177.06
6	89.76	180.68
7	100.93	185.07
8	111.77	190.22

9	122.23	196.09
10	132.27	202.67
11	141.84	209.91
12	150.88	217.79
13	159.37	226.28
14	167.26	235.32
15	174.51	244.88
16	181.09	254.92
17	186.97	265.38
18	192.13	276.21
19	192.69	277.64

** Corrected JANBU FOS = 1.798 ** (Fo factor = 1.059)

Failure surface No. 3 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	30.90	170.60
2	42.90	170.78
3	54.85	171.79
4	66.71	173.63
5	78.41	176.30
6	89.90	179.78
7	101.11	184.05
8	112.00	189.10
9	122.51	194.89
10	132.59	201.40
11	142.19	208.60
12	151.27	216.45
13	159.77	224.91
14	167.67	233.95
15	174.91	243.51
16	181.47	253.56
17	187.31	264.04
18	192.41	274.91
19	193.45	277.61

** Corrected JANBU FOS = 1.802 ** (Fo factor = 1.061)

Failure surface No. 4 specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	59.37	187.56
2	71.35	188.38
3	83.20	190.21
4	94.86	193.06
5	106.23	196.90
6	117.23	201.70
7	127.77	207.43
8	137.79	214.04
9	147.20	221.49
10	155.93	229.72
11	163.93	238.67
12	171.13	248.27
13	177.47	258.45
14	182.92	269.14
15	186.46	277.85

** Corrected JANBU FOS = 1.804 ** (Fo factor = 1.060)

Failure surface No. 5 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	22.36	167.45
2	34.34	168.02
3	46.27	169.34
4	58.09	171.39
5	69.77	174.17
6	81.24	177.67
7	92.48	181.88
8	103.44	186.78
9	114.07	192.35
10	124.33	198.56
11	134.19	205.41
12	143.60	212.85
13	152.54	220.86
14	160.96	229.41
15	168.83	238.47
16	176.12	247.99
17	182.81	257.96
18	188.87	268.32
19	193.56	277.61

** Corrected JANBU FOS = 1.805 ** (Fo factor = 1.057)

Failure surface No. 6 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	25.20	168.40
2	37.20	168.82
3	49.14	170.00
4	60.98	171.93
5	72.68	174.61
6	84.18	178.02
7	95.45	182.16
8	106.43	187.00
9	117.08	192.53
10	127.36	198.72
11	137.22	205.56
12	146.64	213.00
13	155.56	221.02
14	163.95	229.59
15	171.79	238.68
16	179.04	248.25
17	185.66	258.26
18	191.64	268.66
19	196.01	277.52

** Corrected JANBU FOS = 1.806 ** (Fo factor = 1.058)

Failure surface No. 7 specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	46.56	180.82
2	58.51	181.93
3	70.35	183.89
4	82.01	186.69
5	93.45	190.33
6	104.60	194.77

7	115.40	200.00
8	125.80	205.99
9	135.74	212.71
10	145.17	220.13
11	154.05	228.20
12	162.33	236.89
13	169.96	246.15
14	176.92	255.93
15	183.15	266.18
16	188.63	276.86
17	189.02	277.76

** Corrected JANBU FOS = 1.807 ** (Fo factor = 1.056)

Failure surface No. 8 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	26.63	168.88
2	38.60	169.68
3	50.49	171.29
4	62.25	173.70
5	73.82	176.88
6	85.15	180.84
7	96.19	185.54
8	106.88	190.98
9	117.19	197.12
10	127.07	203.94
11	136.46	211.41
12	145.34	219.49
13	153.65	228.14
14	161.36	237.34
15	168.44	247.03
16	174.85	257.17
17	180.56	267.72
18	185.22	277.89

** Corrected JANBU FOS = 1.807 ** (Fo factor = 1.058)

Failure surface No. 9 specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	23.78	167.93
2	35.78	167.79
3	47.76	168.48
4	59.66	170.00
5	71.43	172.34
6	83.01	175.50
7	94.34	179.45
8	105.37	184.18
9	116.04	189.66
10	126.31	195.88
11	136.12	202.78
12	145.43	210.36
13	154.19	218.56
14	162.36	227.35
15	169.90	236.68
16	176.77	246.52
17	182.95	256.81
18	188.39	267.50
19	192.70	277.64

** Corrected JANBU FOS = 1.807 ** (Fo factor = 1.062)

Failure surface No.10 specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	36.59	174.40
2	48.59	174.19
3	60.57	174.95
4	72.44	176.68
5	84.14	179.35
6	95.59	182.96
7	106.70	187.48
8	117.42	192.88
9	127.67	199.12
10	137.38	206.17
11	146.49	213.98
12	154.95	222.49
13	162.69	231.66
14	169.66	241.43
15	175.83	251.72
16	181.15	262.48
17	185.59	273.63
18	186.88	277.83

** Corrected JANBU FOS = 1.808 ** (Fo factor = 1.065)

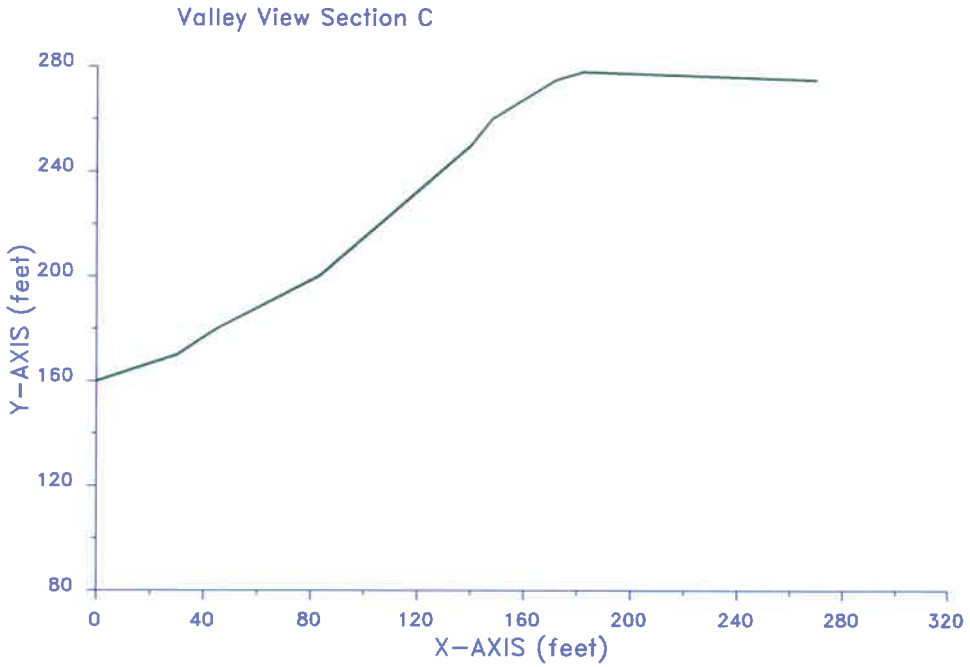
The following is a summary of the TEN most critical surfaces

Problem Description : Valley View Section C

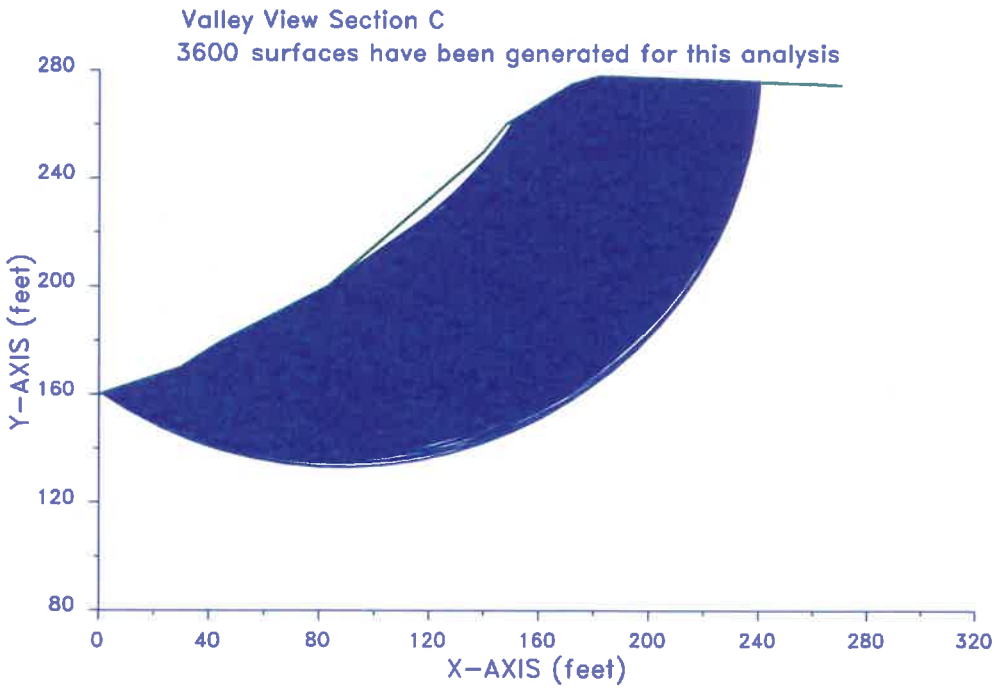
	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.795	1.057	30.90	191.38	4.631E+05
2.	1.798	1.059	30.90	192.69	4.966E+05
3.	1.802	1.061	30.90	193.45	5.157E+05
4.	1.804	1.060	59.37	186.46	3.379E+05
5.	1.805	1.057	22.36	193.56	5.002E+05
6.	1.806	1.058	25.20	196.01	5.246E+05
7.	1.807	1.056	46.56	189.02	3.680E+05
8.	1.807	1.058	26.63	185.22	4.295E+05
9.	1.807	1.062	23.78	192.70	5.424E+05
10.	1.808	1.065	36.59	186.88	4.685E+05

* * * END OF FILE * * *

VALLEYC1 2-12-18 14:23



VALLEYC1 2-12-18 14:23



VALLEYC1 2-12-18 14:23