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PRELIMINARY GEOTECHNICAL INVESTIGATION AND FOUNDATION RECOMMENDATIONS
PROPOSED COMMERCIAL STRUCTURE
TO BE LOCATED AT
516 LA COSTA AVENUE
ENCINITAS, CALIFORNIA 92024

EDG Project No. 185881-1

February 27, 2018

PREPARED FOR:

dasMOD LLC
c/o Sven Simon
1650 N. Coast Highway 101
Encinitas, CA 92024

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Date: February 27, 2018

To: dasMOD LLC,
c/o Sven Simon
1650 N. Coast Highway 101
Encinitas, CA 92024

Re: Proposed new commercial structure to be located at 516 La Costa Avenue, Encinitas, California

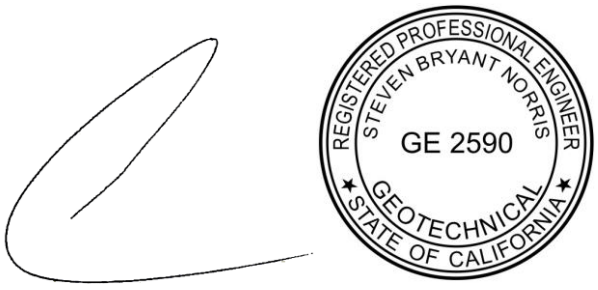
Subject: Geotechnical Investigation and Foundation Recommendations Report

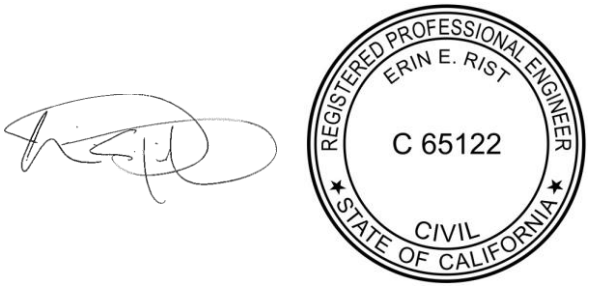
In accordance with your request and our signed proposal we have provided this preliminary geotechnical investigation and foundation recommendations report of the subject site for the proposed new commercial structure.

The findings of the investigation, earthwork recommendations and foundation design parameters are presented in this report. In general, it is our opinion that the proposed construction, as described herein, is feasible from a geotechnical standpoint, provided the recommendations of this report and generally accepted construction practices are followed.

If you have any questions regarding the following report please do not hesitate to contact our office.

Sincerely,
ENGINEERING DESIGN GROUP





Steven Norris
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1.0 SCOPE

This report gives our recommendations for the proposed new commercial development to be located at 516 La Costa Avenue, Encinitas, California. (See Figure No. 1, "Site Vicinity Map", and Figure No. 2, "Site Location Map"). The scope of our work conducted onsite to date has included a visual reconnaissance of the property and surrounding areas, review of geologic maps and aerial photographs, a limited subsurface investigation of the subject property, review of reports by others, laboratory tests and preparation of this report presenting our findings, conclusions and recommendations.

2.0 SITE AND PROJECT DESCRIPTION

The subject property is located at 516 La Costa Avenue, Encinitas, California. For the purposes of this report the lot is assumed to face south. The property is bordered to the east by a gas station, to the west by a nursery, to the north by a steeply descending slope and to the south by La Costa Avenue.

The general topography of the site area consists of coastal foothill terrain. At the time of this report the lot is generally undeveloped and appears to serve as a nursery/landscape capacity. Based upon review of site topography, a majority of the lot is generally flat, with steeply descending slopes at the north (rear) portion of the lot. Based upon our review of the proposed preliminary concept site plan, we understand the proposed development will consist of the construction of a new two-story hotel with associated accessory structures, typical parking, hardscape and landscape improvements.

3.0 FIELD INVESTIGATION

Our field investigation of the property consisted of a site reconnaissance, site field measurements, observation of existing conditions on-site and on adjacent sites and a limited subsurface investigation of soil conditions. Our subsurface investigation consisted of the visual observation of four exploratory borings and three exploratory test pits in the general areas of proposed construction and visual observation of the slopes at the north (rear) of the property, logging of soil types encountered, and sampling of soils for laboratory testing. The approximate location of the borings and test pits is given in Figure No. 3, "Approximate Borings and Test Pit Locations".

4.0 SUBSURFACE CONDITIONS

Fill soil and weathered profiles were encountered to an approximate depth of 3 to 18.5 feet below adjacent grade in our exploratory borings and test pits. Soil types encountered within our borings and test pits are described as follows:

4.1 Topsoil / Fill / Weathered

Topsoil, fill and weathered unsuitable materials were encountered to depths up to 18 feet below adjacent grade in our exploratory borings. These materials consist of brown to dark brown to dark brownish gray, dry to moist, very loose to medium dense, silty sands and sandy silts, with organics and debris. **In general, these materials are not considered suitable for the support of structures and structural improvements in their present state, but may be utilized as re-compacted fill if necessary, provided the recommendations of this report are followed.** Unsuitable soil materials classify as SW-SM per the Unified Soil Classification System, and based on visual observation, are considered to possess low to medium potential for expansion.

4.2 Terrace Deposits/Sandstone

Terrace deposits and sandstone were found to underlie the fill/weathered profiles material within the exploratory borings and test pits. The encountered terrace deposits and sandstone consist of brown to reddish brown to yellowish brown to grey, medium dense to dense, silty sands and slightly silty sandstone. **These materials are considered suitable for the support of structures and structural improvements, provided the recommendations of this report are followed.** These materials classify as SW-SM per the Unified Soil Classification System, and based on visual observation, possess a low potential for expansion.

Detailed logs of our exploratory borings and test pits, as well as a depiction of their locations, please see Figure No. 3, "Site Plan/Location of Borings and Test Pits", Boring Logs 1-4 and Test Pit Logs No. 1-3.

5.0 GEOLOGIC HAZARDS

As part of the preparation of this report we have reviewed geologic maps of the subject area. Our review of geologic maps does not indicate landslide deposits at the area in and around the subject site.

5.1 **FAULTS**

Our review of geologic literature pertaining to the general site area indicates the subject site is not within a mapped fault zone. It is our opinion that the site could be subjected to moderate to severe ground shaking in the event of a major earthquake along any of the faults in the Southern California region. The seismic risk at this site is similar to that of the surrounding developed area.

5.2 **LIQUEFACTION, LATERAL SETTLEMENT, SUBSIDENCE**

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose, granular soils underlain by a near-surface ground water table are most susceptible to liquefaction, while the stability of most silty sands and clays is not adversely affected by vibratory motion. Because of the dense nature of the soil materials underlying the site and the lack of near surface water, the potential for lateral spreading, liquefaction, subsidence or seismically-induced dynamic settlement at the site is considered low. The effects of seismic shaking can be reduced by adhering to the most recent edition of the California Building Code and current design parameters of the Structural Engineers Association of California.

5.3 **TSUNAMI**

Tsunami are sea waves generated by submarine earthquakes, landslides or volcanic activity. Submarine earthquakes are common along the edge of the Pacific Ocean and coastal areas are subject to potential inundation by tsunami. Most of the tsunamis recorded on the San Diego Bay tidal gauge have only been a few tenths of a meter in height. The possibility of a destructive tsunami along the San Diego coastline is considered low. Tsunami or storm waves (associated with winter storms), even in conjunction with high tides, do not have the potential for inundations of the site.

6.0 GROUND WATER

Static ground water was not encountered during our limited subsurface investigation. Groundwater is not anticipated to pose a significant constraint to construction, however based upon our experience, perched groundwater conditions can develop where no such condition previously existed. Perched groundwater conditions can develop over time and can have a significant impact. Waterproofing membrane shall be specifically detailed by waterproofing consultant. If groundwater conditions are encountered during site excavations, a slab underdrain system may be required. Trenches below slab should be detailed with perimeter and trench cut-off walls keyed into competent material.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 GENERAL

Based upon our review of the preliminary site plan, as referenced in Appendix A, we understand the proposed improvements include a two-story commercial structure, a pool, parking areas, driveways, and typical hardscape and landscape improvements. In general, it is our opinion that the proposed new structures and improvements, as discussed and described herein, are feasible from a geotechnical standpoint, provided the recommendations of this report and all applicable codes are followed.

We understand the site lies within the City of Encinitas Inland Bluff Overlay Zone. On the attached site plan (Figure 3), we have provided a plot of top of bluff based upon our subsurface investigation and review of historical aerial photos.

In the area of the proposed structures we anticipate a removal and recompaction of the upper 3-4 feet. The preliminary concept plan indicates the pool will be located at the north (rear) portion of the lot. We anticipate it will extend into areas of deep fills and pool foundations may need to be locally deepened adjacent to slopes to competent material and to maintain lateral support. Additionally, we anticipate footings adjacent to the existing retaining wall at the east portion of the lot, may require deepening so as not to surcharge existing retaining wall.

7.2 EARTHWORK

We anticipate grading will include removal and recompaction of the upper 3 to 4 feet in the area of the proposed structures. If cut/fill transitions occur, undercutting will be necessary. All grading shall be done in accordance with the recommendations below as well as Appendix B of this report and the standards of county and state agencies, as applicable.

7.2.a. Site Preparation

Prior to any grading, the areas of proposed improvements should be cleared of surface and subsurface debris (including organic topsoil, vegetative and construction debris). Removed debris should be properly disposed of off-site prior to the commencement of any fill operations. Construction debris should not generally be mixed with fill soils. Holes resulting from the removal of debris, existing structures, or other improvements, should be filled and compacted.

7.2.b. Removals

In areas of new proposed structures, topsoil/weathered and fill profiles found to mantle the site, are not suitable for the structural support of buildings or structural improvements in their present state. We anticipate a removal and re-compaction of unsuitable materials, on the order of 3 to 4 feet.

7.2.c. Transitions

All settlement sensitive improvements (including but not limited to building structure, retaining walls, pools, etc.), should be constructed on a uniform building pad. We anticipate building foundations will be placed on recompacted fill material. Removal depths should be visually verified by a representative of our firm prior to placement of fill. Where this condition is not met, undercuts may be necessary.

Undercuts should extend a minimum of 5 feet (or to a distance at least equal to the depth of the fill) beyond the footprint of the proposed structures (including exterior columns) and settlement sensitive improvements. Undercuts shall be made a minimum of 3 feet, or to a minimum depth of half the depth of the deepest fill. Undercut bottoms shall be sloped at a minimum of 1% to daylight and may require a subdrain (see Appendix B). Where this condition cannot be met, it should be reviewed by Engineering Design Group on a case by case basis.

7.2.d. Fills/Backfill

All fill/backfill material should be brought to approximately +2% of optimum moisture content and re-compacted to at least 90 percent relative compaction (based on ASTM D1557). Compacted fills should be cleaned of loose debris and oversize material more than 6 inches in diameter (oversize material is not anticipated), brought to near optimum moisture content, and re-compacted as described above.

Fills should generally be placed in lifts not exceeding 6-8 inches in thickness. Although not anticipated, imported soils should have a low potential for expansion (EI<50), free of debris and organic matter. Prior to importing soils, they should be visually observed, sampled and tested at the borrow pit area to evaluate soil suitability as fill. Onsite excavated fill materials are suitable for re-use as fill material during grading, provided they are cleaned of debris and oversize material in excess of 6 inches in diameter (oversize material is anticipated) and free of contamination (including organics). Although not anticipated, prior to importing soils, they should be visually observed, sampled and tested at the borrow pit area to evaluate soils suitability as fill, they should have a low potential for expansion (EI<50). Utility trenches should be

properly backfilled in accordance with the latest edition of Green Book standards.

7.2.e. Slopes

Where new slopes are constructed permanent slopes may be cut to a face ratio of 2:1 (horizontal to vertical). Permanent fill slopes shall be placed at a maximum 2:1 slope face ratio. All temporary cut slopes shall be excavated in accordance with OSHA requirements and shall not undermine adjacent property or structures without proper shoring of excavation and/or structures. Subsequent to grading, planting or other acceptable cover should be provided to increase the stability of slopes, especially during the rainy season (October thru April).

7.2.f. Flatwork, Driveways and Parking Areas

In the area of exterior flatwork, parking and driveways the upper 12 inches of concrete/pavement subgrade shall be ripped a minimum of 12 inches, moisture conditioned to near optimum moisture content and compacted to 90% minimum relative compaction (ASTM D1557 – latest edition).

7.3 **FOUNDATIONS**

The following design parameters may be utilized for new foundations founded on competent material.

7.3.a. Footings bearing uniformly in competent material may be designed utilizing maximum allowable soils pressure of 2,000 psf.

7.3.b. 2016 CBC Seismic Design Parameters

Site Class	D
Spectral Response Coefficients	
S_{MS} (g)	1.192
S_{M1} (g)	0.687
S_{DS} (g)	0.795
S_{D1} (g)	0.458

7.3.c. Bearing values may be increased by 33% when considering wind, seismic, or other short duration loadings.

7.3.d. The parameters in the table below should be used as a minimum for designing new footing width and depth below lowest adjacent grade into competent material. Footing depths are to be confirmed in the field by a representative of Engineering Design Group prior to the placement of form boards, steel and removal of excavation equipment.

No. of Floors Supported	Minimum Footing Width	*Minimum Footing Depth Below Lowest Adjacent Grade
1	15 inches	18 inches
2	15 inches	18 inches
3	18 inches	24 inches

*Footings area anticipated to be deepened to 4+ feet below existing grade

7.3.e. All footings founded into competent material should be reinforced with a minimum of two #4 bars at the top and two #4 bars at the bottom (3 inches above the ground). For footings over 30 inches in depth, additional reinforcement, and possibly a stemwall system will be necessary, and should be reviewed by project structural engineer prior to construction.

7.3.f. All isolated spread footings should be designed utilizing the above given bearing values and footing depths, and be reinforced with a minimum of #4 bars at 12 inches o.c. in each direction (3 inches above the ground). Isolated spread footings should have a minimum width and depth of 24 inches.

7.3.g. For footings adjacent to slopes a minimum of 10 feet (competent material) horizontal setback in competent material or properly compacted fill should be maintained. A setback measurement should be taken at the horizontal distance from the bottom of the footing to slope daylight. Where this condition cannot be met, it should be brought to the attention of the Engineering Design Group for review.

7.3.h. All excavations should be performed in general accordance with the contents of this report, applicable codes, OSHA requirements and applicable city and/or county standards.

7.3.i. All foundation subgrade soils and footings shall be pre-moistened to 2% over optimum to a minimum of 18 inches in depth prior to the pouring of concrete.

7.4 CORROSION AND VAPOR EMISSION

7.4.a. **Moisture Sensitive Areas – Foundations and Slabs**: (i.e. floors, below grade walls) Maximum water to cement ratio of 0.45 maximum. Compressive strength of 4,500 psi minimum (no special inspection required for water to cement ratio purposes, unless otherwise specified by the structural engineer). This recommendation is intended to achieve low permeability concrete.

7.4.b. **Non-Moisture Sensitive Areas – Foundations and Slabs**: Compressive Strength of 2,500 psi per ACI requirements. In moisture sensitive areas, the slab concrete should have a compressive strength of approximately 2,500 psi.

7.4.c. **Corrosion Potential – Foundations and Slabs**: Based upon laboratory testing conducted as part of the field investigation onsite soils indicate exposure categories S0 and C1, according to ACI 318 standards. The project structural engineer to note increased concrete protection requirements for corrosive environments, as applicable.

7.4.d. **Corrosion Potential – Buried Metals:** Where onsite improvements propose the use of reclaimed water, onsite soils are to be considered highly corrosive to buried metals. Precautions should be taken to protect all buried metals.

7.4.e. EDG is not an expert in corrosion protection, all corrosion recommendations shall be provided by the corrosion consultant.

7.4.f. **Slab Underlayment**: We recommend the following beneath proposed slab-on-grade floors.

7.4.f.i We recommend a **vapor barrier** layer (15 mil) placed below the upper one-inch of sand. The vapor barrier shall meet the following minimum requirements: Permeance of less than 0.01 perm [grains/(ft^2hr in/Hg)] as tested in accordance with ASTM E 1745 Section 7.1 and strength per ASTM 1745 Class A.

7.4.f.ii In areas of level slab on grade floors, we recommend a one-inch layer of coarse sand material, Sand Equivalent (S.E.) greater than 50 and washed clean of fine materials, should be placed beneath the slab in moisture sensitive areas, above the **vapor barrier**. There shall be not greater than a 2-inch difference across the sand layer.

7.4.f.iii The vapor barrier should extend down the interior edge of the footing excavations a minimum of 6 inches. The vapor barrier should lap a minimum of 8 inches, sealed along all laps with the manufacturer's recommended adhesive. Beneath the vapor barrier a uniform layer of 3 inches of pea gravel is recommended under the slab in order to more uniformly support the slab, help distribute loads to the soils beneath the slab, and act as a capillary break.

7.4.g. The project waterproofing consultant should provide all slab underdrain, slab sealers and various other details, specifications and recommendations (i.e. Moiststop and Linkseal) at areas of potential moisture intrusion. Engineering Design Group accepts no responsibility for design or quality control of waterproofing elements of the building.

7.5 CONCRETE SLAB-ON-GRADE

We anticipate all new concrete slab-on-grade floors will be placed on competent recompacted material. Where new slabs are proposed, we recommend the following as the minimum design parameters.

7.5.a. Concrete slab on grade of the proposed new additions should have a minimum thickness of 5 inches and should be reinforced with #4 bars at 18 inches o.c. placed at the midpoint of the slab.

7.5.a.i **Slump**: Between 3 and 4 inches maximum.

7.5.a.ii **Aggregate Size**: ¾ - 1 inch.

7.5.b. Adequate control joints should be installed to control the unavoidable cracking of concrete that takes place when undergoing its natural shrinkage during curing. The control joints should be well located to direct unavoidable slab cracking to areas that are desirable by the designer.

7.5.c. All required fills used to support slabs, should be placed in accordance with the grading section of this report and the attached Appendix B, and compacted to 90 percent Modified Proctor Density, ASTM D-1557, and as described in the Earthwork section of this report.

7.5.d. All subgrade soils to receive concrete slabs and flatwork are to be pre-soaked to 2 percent over optimum moisture content to a depth of 18 inches.

7.5.e. Exterior concrete flatwork, due to the nature of concrete hydration and minor subgrade soil movement, are subject to normal minor concrete cracking. To minimize expected concrete cracking, the following may be implemented:

7.5.e.iii New flatwork in areas of encountered expansive soil (not anticipated) should be detailed with 6 inches of base material.

7.5.e.iv Concrete may be poured with a 10-inch-deep thickened edge. Flatwork adjacent to top of a slope should be constructed with an outside footing to attain a minimum of 7 feet distance to daylight.

7.5.e.v Concrete slump should not exceed 4 inches.

7.5.e.vi Concrete should be poured during cool (40 - 65 degrees) weather if possible. If concrete is poured in hotter weather, a set retarding additive should be included in the mix, and the slump kept to a minimum.

7.5.e.vii Concrete subgrade should be pre-soaked prior to the pouring of concrete. The level of pre-soaking should be a minimum of 2% over optimum moisture to a depth of 18 inches.

7.5.e.viii Concrete should be constructed with tooled joints creating concrete sections no larger than 225 square feet. For sidewalks, the maximum run between joints should not exceed 5 feet. For rectangular shapes of concrete, the ratio of length to width should generally not exceed 0.6 (i.e., 5 ft. long by 3 ft. wide). Joints should be cut at expected points of concrete shrinkage (such as male corners), with diagonal reinforcement placed in accordance with industry standards.

7.5.e.ix Isolation joints should be installed at exterior concrete where exterior concrete is poured adjacent to existing foundations.

7.5.e.x Drainage adjacent to concrete flatwork should direct water away from the improvements. Concrete subgrade should be sloped and directed to the collective drainage system, such that water is not trapped below the flatwork.

7.5.e.xi The recommendations set forth herein are intended to reduce cosmetic nuisance cracking. The project concrete contractor is ultimately responsible for concrete quality and performance, and should pursue a cost-benefit analysis of these recommendations, and other options available in the industry, prior to the pouring of concrete.

7.6 **FLEXIBLE PAVEMENT**

R-Value testing of onsite samples was conducted as part of our subsurface investigation and evaluation. We have provided below, minimum pavement sections for flexible asphaltic concrete based upon R-Value test results and calculations.

Flexible Pavement Section			
Assumed TI		**5**	**6**
Option 1 (Full Depth)	Asphalt	4	5
	Class II Base	0	0
Option 2 (3" AC)	Asphalt	3	3
	Class II Base	4	6

7.6 RETAINING WALLS

New retaining walls up to 6 feet may de designed and constructed in accordance with the following recommendations and minimum design parameters.

7.6.a. Retaining wall footings should be designed in accordance with the allowable bearing criteria given in the *Foundations* section of this report, and should maintain minimum footing depths outlined in the *Foundations* section of this report. All retaining wall footings are anticipated to be placed on competent material. Where cut-fill transitions may occur, alternative detailing may be provided by the Engineering Design Group on a case by case basis.

7.6.b. Unrestrained cantilever retaining walls should be designed using an active equivalent fluid pressure of 40 pcf. This assumes that granular, free draining material with low potential for expansion (E.I. <50) will be used for backfill, and that the backfill surface will be level. Where soil with potential for expansion is not low (E.I. >50) a new active fluid pressure will be provided by the project soils engineer. Backfill materials should be considered prior to the design of the retaining walls to ensure accurate detailing. We anticipate onsite material ***may*** be utilized as retaining wall backfill.

7.6.c. Where the backfill behind the wall is sloped at a maximum slope of 2:1 (H:V) an active equivalent fluid pressure of 50 pcf, shall be utilized.

7.6.d. Any other surcharge loadings shall be analyzed in addition to the above values. These surcharge loads shall include foundations, construction equipment, vehicular traffic, etc.

7.6.e. If the tops of retaining walls are restrained from movement, they should be designed for a uniform at-rest soil pressure of 65 psf.

7.6.f. Retaining walls shall be designed for additional lateral forces due to earthquake, where required by code, utilizing the following design parameters.

7.6.f.i Yielding Walls = $P_E = (3/8)\ k_{AE}\ (\pi)\ H^2$ - applied at a distance of 0.6 times the height (H) of the wall above the base.

7.6.f.ii Horizontal ground acceleration value $k_H = 0.22g$.

7.6.f.iii Where non-yielding retaining walls are proposed, the specific conditions should be brought to the attention of Engineering Design Group for alternative design values.

7.6.f.iv The unit weight of 120 pcf for the onsite soils may be utilized.

7.6.f.v The above design parameters assume unsaturated conditions. Retaining wall designs for sites with a hydrostatic pressure influence (i.e groundwater within depth of retaining wall or waterfront conditions) will require special design considerations and should be brought to the attention of Engineering Design Group.

7.6.g. Passive soil resistance may be calculated using an equivalent fluid pressure of 350 pcf. This value assumes that the soil being utilized to resist passive pressures extends horizontally 2.5 times the height of the passive pressure wedge of the soil. Where the horizontal distance of the available passive pressure wedge is less than 2.5 times the height of the soil, the passive pressure value must be reduced by the percent reduction in available horizontal length.

7.6.h. A coefficient of friction of 0.35 between the soil and concrete footings may be utilized to resist lateral loads in addition to the passive earth pressures above.

7.6.i. All walls shall be provided with adequate back drainage to relieve hydrostatic pressure, and be designed in accordance with the minimum standards contained in the "Retaining Wall Drainage Detail", Appendix D. The waterproofing elements shown on our details are minimums, and are intended to be supplemented by the waterproofing consultant and/or architect. The recommendations should be reviewed in consideration of proposed finishes and usage, especially at basement levels, performance expectations and budget.

7.6.j. If deemed necessary by the project owner, based on the above analysis, and waterproofing systems can be upgraded to include slab under drains and enhanced waterproofing elements.

7.6.k. In moisture sensitive areas (i.e. interior living space where vapor emission is a concern), in our experience poured-in-place concrete provides a surface with higher performance-repairability of below grade waterproofing systems. The developer should consider the cost-benefit of utilizing cast in place building retaining walls in lieu of masonry as part of the overall construction of the commercial structure. Waterproofing at any basement floors is recommended in areas of moisture sensitive floor finishes.

7.7 **POOL**

Specific pool plans were not available at the time of this report, and therefore the specific pool recommendations are not included herein, but should be provided once the pool design is established. The following general design parameters are provided in consideration of the proposed new pool.

7.7.a. Pool should be founded on a uniform building pad as outlined in *Foundations* section of this report.

7.7.b. In consideration of adjacent descending slopes and deeper competent soil profiles at north (rear) portion of lot, pool foundations may require a deepened foundation system as to maintain minimum distance to daylight.

7.7.c. Flatwork around the proposed pool should be designed to be impervious and sloped away from the pool to an area drain system.

7.7.d. Additional recommendations may be necessary upon review of specific pool plans.

8.0 INFILTRATION

Bioretention/infiltration facilities shall maintain sufficient horizontal and vertical offset to the future structures to not create a groundwater condition. Infiltration facilities proposed within a 10-foot horizontal distance to a moisture sensitive structure should be lined with an impervious barrier, within the 10-foot zone.

Infiltration facilities should be offset from the top and toes of any slopes steeper than a 3:1 or lined with an impervious barrier. At tops of slopes minimum horizontal distance of 10 feet or a horizontal distance equal to the height of the slope, measured from the edge of infiltration basin to slope, up to a maximum of 40 horizontal feet. At the toe of new fill slopes infiltration facilities shall maintain a minimum 10 feet horizontal offset.

If permeable pavers are proposed in parking/driveway and/or rear patios. Specific paver detailing should be detailed and constructed per the minimum recommendations of the Interlocking Concrete Paver Institute and the specific concrete paver manufacturer, including edge restraints, minimum bedding specifications, base and subgrade requirements, installation tolerances, and drainage, etc. Where runoff and storm water is directed over permeable pavements and water is anticipated to flow through pavers into an aggregate base near and adjacent to foundations, detailing shall include systems to control and to prevent subsurface flow beneath the building. Generally, these systems, detailed as part of the specific building construction plans, may include the cut-off walls and underdrains.

Proper surface drainage and irrigation practices will play a significant role in the future performance of the project. Please note in the *Corrosion and Vapor Emission* section of this report for specific recommendations regarding water to cement ratio for moisture sensitive areas should be adhered. The project architect and/or waterproofing consultant shall specifically address waterproofing details.

9.0 SURFACE DRAINAGE

Adequate drainage precautions at this site are imperative and will play a critical role on the future performance of the proposed commercial structures. Under no circumstances should water be allowed to pond against or adjacent to tops of slopes and/or foundation walls.

The ground surface surrounding proposed improvements should be relatively impervious in nature, and slope to drain away from the structure in all directions, with a minimum slope of 2% for a horizontal distance of 7 feet (where possible). Area drains or surface swales should then be provided in low spots to accommodate runoff and avoid any ponding of water. Any french drains, backdrains and/or slab

underdrains shall **not** be tied to surface area drain systems. Roof gutters and downspouts shall be installed on the new and existing structures and tightlined to the area drain system. All drains should be kept clean and unclogged, including gutters and downspouts. Area drains should be kept free of debris to allow for proper drainage.

Over watering can adversely affect site improvements and cause perched groundwater conditions. Irrigation should be limited to only the amount necessary to sustain plant life. Low flow irrigation devices as well as automatic rain shut-off devices should be installed to reduce over watering. Irrigation practices and maintenance of irrigation and drainage systems are an important component to the performance of onsite improvements.

During periods of heavy rain, the performance of all drainage systems should be inspected. Problems such as gullying or ponding should be corrected as soon as possible. Any leakage from sources such as water lines should also be repaired as soon as possible. In addition, irrigation of planter areas, lawns, or other vegetation, located adjacent to the foundation or exterior flat work improvements should be strictly controlled or avoided.

10.0 LABORATORY TESTING

Laboratory tests were performed on samples of onsite material collected during our subsurface investigation. Test results are attached as Appendix C.

11.0 CONSTRUCTION OBSERVATION AND TESTING

The recommendations provided in this report are based on subsurface conditions disclosed by the investigation and our general experience in the project area. Interpolated subsurface conditions should be verified in the field during construction. The following items shall be conducted prior/during construction by a representative of Engineering Design Group in order to verify compliance with the geotechnical and civil engineering recommendations provided herein, as applicable. The project structural and geotechnical engineers may upgrade any condition as deemed necessary during the development of the proposed improvement(s).

11.1 Review of final approved grading and structural plans prior to the start of work for compliance with geotechnical recommendations.
11.2 Attendance of a pre-grade/construction meeting prior to the start of work.
11.3 Observation of keyways, subgrade and excavation bottoms.

11.4 Testing of any fill placed, including retaining wall backfill and utility trenches.
11.5 Observation of footing excavations prior to steel placement and removal of excavation equipment.
11.6 Field observation of any "field change" condition involving soils.
11.7 Walk through of final drainage detailing prior to final approval.

The project soils engineer may at their discretion deepen footings or locally recommend additional steel reinforcement to upgrade any condition as deemed necessary during site observations. Engineering Design Group shall, prior to the issuance of the certificate of occupancy, issue in writing that the above inspections have been conducted by a representative of their firm, and the design considerations of the project soils report have been met. The field inspection protocol specified herein is considered the minimum necessary for Engineering Design Group to have exercised due diligence in the soils engineering design aspect of this building. Engineering Design Group assumes no liability for structures constructed utilizing this report not meeting this protocol.

Before commencement of grading the Engineering Design Group will require a separate contract for quality control observation and testing. Engineering Design Group requires a minimum of 48 hours' notice to mobilize onsite for field observation and testing.

12.0 MISCELLANEOUS

It must be noted that no structure or slab should be expected to remain totally free of cracks and minor signs of cosmetic distress. The flexible nature of wood and steel structures allows them to respond to movements resulting from minor unavoidable settlement of fill or natural soils, the swelling of clay soils, or the motions induced from seismic activity. All of the above can induce movement that frequently results in cosmetic cracking of brittle wall surfaces, such as stucco or interior plaster or interior brittle slab finishes.

Data for this report was derived from surface and subsurface observations at the site and knowledge of local conditions. The recommendations in this report are based on our experience in conjunction with the limited soils exposed at this site. We believe that this information gives an acceptable degree of reliability for anticipating the behavior of the proposed improvement; however, our recommendations are professional opinions and cannot control nature, nor can they assure the soils profiles beneath or adjacent to those observed. Therefore, no warranties of the accuracy of these recommendations, beyond the limits of the obtained data, is herein expressed or implied. This report is based on the investigation at the

described site and on the specific anticipated construction as stated herein. If either of these conditions is changed, the results would also most likely change. Man-made or natural changes in the conditions of a property can occur over a period. In addition, changes in requirements due to state of the art knowledge and/or legislation are rapidly occurring. As a result, the findings of this report may become invalid due to these changes. Therefore, this report for the specific site, is subject to review and not considered valid after a period of one year, or if conditions as stated above are altered.

It is the responsibility of the owner or his/her representative to ensure that the information in this report be incorporated into the plans and/or specifications and construction of the project. It is advisable that a contractor familiar with construction details typically used to deal with the local subsoil and seismic conditions be retained to build the structure.

If you have any questions regarding this report, or if we can be of further service, please do not hesitate to contact us. We hope the report provides you with necessary information to continue with the development of the project.