GEOTECHNICAL INVESTIGATION
On
PROPOSED 12 UNITS RESIDENTIAL DEVELOPMENT
CALLE SIENA
EAST MAIN AVENUE
MORGAN HILL, CALIFORNIA

For
GLENROCK BUILDERS

By

TMakdissy Consulting, Inc.

Project No. E 199-1
May 8, 2012

T. MAKDISSY CONSULTING, INC.
Geotechnical Consultants

Project No. E 199-1
May 8, 2012

Mr. Rocke Garcia
Glenrock Builders
1000 Old Quarry Road
San Jose, California

Subject: Proposed 12 Unit Residential Development
CALLE SIENA
605 E. Main Avenue
Morgan Hill, California
GEOTECHNICAL INVESTIGATION

Dear Mr. Garcia:

In accordance with your request, ***TMakdissy Consulting, inc.***, has investigated the geotechnical conditions at the subject site located in Morgan Hill, California.

The accompanying report presents our conclusions and recommendations based on our investigation. Our findings indicate that construction of the proposed development is feasible, from a geotechnical standpoint, provided the recommendations of this report are carefully followed and are incorporated into the project plans and specifications.

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

Very truly yours
TMakdissy Consulting, Inc.

Tom Makdissy, P.E., G.E.
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
TOM S. MAKDISSY
No. 556
Exp: 3/31/14
GEOTECHNICAL
STATE OF CALIFORNIA

Copies: 5 to Glenrock Builders

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GEOTECHNICAL INVESTIGATION

Purpose and Scope

The purpose of the investigation for the proposed single-family residential development located at 605 E. Main Ave. between East Main Ave and Calle Siena, in Morgan Hill, California, was to determine the surface and subsurface soil conditions at the subject site. Based on the results of the investigation, criteria were established for grading the site, foundation design, pavement design, and the construction of other related facilities on the property.

Our investigation included the following:

a) Field reconnaissance by the Soil Engineer;
b) Evaluating the general geology and seismicity of the site;
c) Field exploration of 5 drilled exploratory test borings and sub-surface soils sampling;
d) Laboratory testing of selected soil samples;
e) Engineering analysis of the data obtained and formulation of conclusions and recommendations;
f) Preparation of this written report.

Details of our field and laboratory investigation are presented in Appendices A and B.

Proposed Development

The proposed project is understood to consist of developing the site by constructing 12 detached, single family residences, with internal streets and other associated improvements. The one or two story residential units will be of wood-frame construction and will therefore have relatively light loads typical of this type of construction.

Site Location and Description

The subject property is situated in the greater San Francisco Bay region. The property is located between East Main and Calle Siena, at 605 E. Main Avenue in Morgan Hill, California.

The irregular shaped site comprises of approximately 3.64 acres of relatively flat ground. A open space easement is situated east of the property which consist of 1.4 acres. The site is bound by Calle Siena to the north, E. Main to the south and developed properties to the east and west. The property is occupied by four structures, consisting of two residences, one old water tank tower and a garage. A former green house used to cultivate carnations was situated on the northern portion of the property, has been removed. A ground water-supply well is located near the old water tower building. A number of young and mature trees occupy the property.

The site location and description are based on a site reconnaissance by the soil engineer and on a utilization site plan provided by HMH Civil Engineers. This plan is the basis for our site plan Fig. No.1 in appendix A.

Subsurface Conditions

The near surface soil conditions, as encountered in the five (5) borings, were found to be relatively consistent across the site, and consisted of brown silty sand with gravel which grades to rusty brown silty sand with increasing amounts of gravel to the full depth of the borings. The material encountered is dense to very dense for the full depth explored.

Groundwater was not encountered in any of the test borings at the depth explored. However, fluctuations in the groundwater level can occur due to variations in seasonal rainfall and urbanization of the subject property and surrounding area.

A more thorough description and stratification of the soils encountered along with the results of the laboratory tests are presented on the respective "Logs of Test Borings," Appendix A. The approximate locations of the borings are shown on Figure 1, "Site Plan," Appendix A.

Seismic Considerations

Because of its proximity to the San Andreas Fault system, the entire Bay Area including Santa Clara County is considered to be one of the most seismically active regions in the United States. Since historic records haven been kept in California, a major earthquake has been recorded on the San Andreas Fault.

The San Andreas Fault, located about 18 kilometers southwest of the site is the most likely fault to affect the site with strong ground motions, however the Calaveras Fault (south), located approximately 5 kilometers to the northwest, and the Sargent Fault, located approximately 13 kilometers southwest may also affect the site.

Seismic Hazards

Seismic hazards can be divided into two broad classifications; 1) Primary hazards such as seismic shaking and damage produced directly from fault surface ruptures, and 2) Secondary hazards produced by seismic shaking including landslides, lurches floods, subsidence, liquefaction, and lateral spreading.

Primary Hazards

The project site is not within the boundaries of the Alquist-Priolo studies zone and no faults are known to lie within the site. The likelihood of a surface fault rupture occurring on this site is considered nill. Based on historical evidence however, it is likely that at least one significant earthquake will produce strong ground motions at this site during the design life of the proposed structures. Structural considerations for construction on this site should include the design parameters listed under.

Secondary Hazards

The distance of the subject site from large bodies of water, the absence of high ground water makes secondary earthquake hazards from, flooding (from tsunamis, seiches, and dam failures) improbable. The absence of high ground water and loose granular soils near the ground surface makes lateral spreading improbable.

Seismic Conclusions

The most significant seismic hazard is that of shaking. The structural designs for the proposed development should anticipate repeatable horizontal ground accelerations. Prudent structural designs should incorporate the current state of practice for seismic loads.

UBC Earthquak Design Criteria

The 2010 California Building Code (CBC) Chapter 16, Section 1613, Earthquake Design, requires that structures be designed using certain earthquake design criteria. The criteria are based in part on the seismic ground motion values and site soil properties.

Based on the geotechnical data in the referenced report and the selection of criteria of the 2010 CBC, a summary of the earthquake design criteria for use in the design of the proposed structures is as follows:

SEISMIC CRITERIA 2010 CBC

Latitude: 37.1374 N Longitude: -121.6466 W	**2010 CBC Table/Figure/Equation**	**Factor/Coefficient/ Type**	**Value***
Short-Period MCE at 0.2s	Figure 1613.5(3)	S_s	1.500
1.0s Period MCE	Figure 1613.5(4)	S_1	0.600
Site Class	Table 1613.5.2		D
Site Coefficient	Table 1613.5.3(1)	F_a	1.000
Site Coefficient	Table 1613.5.3(2)	F_v	1.500
Adjusted MCE Spectral Response Parameters	Equation 16-37	S_{MS}	1.500
	Equation 16-38	S_{M1}	0.900
Design Spectral Acceleration Parameters	Equation 16-39	S_{DS}	1.000
	Equation 16-40	S_{D1}	0.600
Seismic Design Category	Table 1613.5.6(1)	Occupancy I to IV	D
Seismic Design Category	Table 1613.5.6(2)	Occupancy I to IV	D

Liquefaction Potential

Liquefaction describes the phenomenon wherein soils lose their supportive strength and become incapable of bearing the load of the overlying soils or structures. Liquefaction occurs during earthquake conditions in saturated, relatively loose, sandy soils located near the ground surface. Evaluation of liquefaction potential on this site was based on the soil type, density of the site soils, and the absence of groundwater at shallow depth.. Based on the data obtained during our field and laboratory investigations, it is our opinion that the liquefaction potential at this site is nil.

DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

General

1. From a geotechnical point of view, construction of the proposed residential development on the site is feasible provided the recommendations presented in this report are incorporated into the project plans and specifications.

2. The most prominent geotechnical feature of the site is that of seismic shaking. Design parameters contained in the CBC Design Criteria section should be used in the structural design.

3. The proposed structures may be satisfactorily supported on any type of conventional foundation system. Specific foundation design recommendations are provided under the heading Foundations.

Demolition / Site Preparation

4. There are several existing features on the site such as the existing structures, concrete slabs, mature trees, existing water tank tower, water well and underground utilities. Prior to any grading, demolition of the existing features on the site should be completed. Demolition should include the complete removal of all surface and subsurface structures. If any of the following are encountered: concrete, septic tanks, storm inlets, foundations, asphalt, machinery, equipment, debris, and trash, these should also be removed with the exception of items specified by the owner for salvage. If any trees are to be removed they should be properly grubbed to adequately remove all major root systems. The owner should specify the saving or removal of shrubs or trees on the site. In addition, all known underground structures must be located on the grading plans so that proper removal may be carried out. It is vital that ***TMakdissy Consulting, Inc.*** intermittently observe the removal of subsurface structures and be notified in ample time to ensure that no subsurface structures are covered and that the root systems from grubbing operations are completely removed. If ***TMakdissy Consulting Inc.*** is not contacted to observe the demolition and removal of subsurface structures, further backhoe exploratory investigation will need to be performed prior to the commencement of development.

4. Excavations made by the removal of any structure or tree root systems should be left open by the contractor for backfill in accordance with the requirements for engineered fill. The removal of underground structures should be done under the observation of the Soil Engineer to verify adequacy of the removal and that subsoils are left in proper condition for placement as engineered fills. Any soil exposed by the removal operations which are deemed soft or unsuitable by the Soil Engineer, shall be excavated as uncompacted fill or saturated soil and be removed as required by the Soil Engineer during grading. Any resulting excavations should be properly backfilled with engineered fill under the observation of the Soil Engineer. It is important that ***TMakdissy Consulting, Inc.*** be present during removal activities to verify that **all** excavations created by grubbing or removal of subsurface structures are left open and located on a grading plan. If any excavations are loosely backfilled without our knowledge and these excavations are not located and backfilled during grading, future settlement of these loosely filled excavations could occur and may cause damage to structures and improvements

Grading

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

6. Grading activities during the rainy season will be hampered by excessive moisture. Grading activities may be performed during the rainy season, however, achieving proper compaction may be difficult due to excessive moisture, and delays may occur. Grading performed during the dry months will minimize the occurrence of the above problems.

7. Following clearing, grubbing and removal of any loose and/or soft soil, the top 8 inches of exposed native ground for areas to receive fill should be scarified and compacted to a minimum degree of relative compaction of 90% at a moisture content slightly above optimum as determined by ASTM D1557-914 Laboratory Test Procedure. After re-compacting the native subgrade, the site may be brought to the desired finished grades by placing engineered fill in lifts not to exceed 8 inches in un-compacted thickness. All soils encountered during our investigation would be suitable for use as engineered fill when placed and compacted at the recommended moisture content.

8. Should select import material be required to establish any adjacent of the existing grade, the soil should be approved by the Soil Engineer before it is brought to the site.

Foundations

Conventional Spread Footings:

9. Provided the site is prepared as previously recommended, a continuous spread footing foundation system is suitable for the support of the proposed residences. Spread footing should extend to a minimum depth of 24 inches below lowest adjacent pad grade (i.e., trenching depth) for one-story and for two-story houses. At these depths, the recommended design bearing pressure for continuous footings should not exceed 3,000 p.s.f due to dead plus live loads, and 4,000 p.s.f. for all loads which include wind seismic. The design bearing pressure for isolated spread footings (such as those that support columns) should not exceed 3,200 p.s.f. for dead plus sustained live loads and 4,200 p.s.f. due to all loads which include wind and seismic. Perimeter footings are to be reinforced with a minimum of two No.5 bars, one at the top and one near the bottom of the footing. Additional reinforcement will be as required by the structural engineer and in accordance with structural requirements.

10. To accommodate lateral building loads, the passive resistance of the foundation soil can be utilized. The passive soil pressure can be assumed to act against the front face of the footing below a depth of one foot below the ground surface. It is recommended that a passive pressure equivalent to that of a fluid weighing 300 p.c.f. be used. For design purposes, an allowable friction coefficient of 0.40 can be assumed at the base of the spread footings.

Structural Mat:

11. The design of the structural mat foundation should be based on the provisions of the 1997 UBC Chapter 18, Division III, "Division of Slab-on-Grade Foundations to Resist the Effects of expansive Soils" and consideration of the following factors:

a) Expansion potential of near surface soils

b) The absence of soft clays within the upper 8 feet of sub-grade.

12. Based on the above, it is recommended that the structural mat foundation be designed for weighted plasticity index (PI) of 10. The maximum allowable bearing pressure at the base of the mat should not exceed 2000 p.s.f. for dead plus sustained live loads.

Post-Tensioned Slab Design Criteria:

13. The post-tensioned slab design is based on the design method of the 3rd Edition Post-Tensioning Institute (PTI) manual for post-tensioned slab design, which is incorporated into the 2007 California Building Code (CBC). Post-tensioned slabs should be a minimum 10 inches in thickness and designed using the following criteria:

	Center Lift	Edge Lift
Allowable Bearing capacity	1,500 p.s.f	1,500 p.s.f.
Edge Moisture Variation Distance (e_m)	9.0 feet	5.0 feet
Differential Soil Movement (Y_m)	0.47 inches	1.1 inches

The above design values are based on the following soil and climate parameters:

Parameter	Calculated or Assumed Value
Thornthwaite Moisture Index (I_m)	-20
Soil Suction at depth based on (I_m)	3.5 pF
Driest Soil Suction	4.5 pF
Wettest Soil Suction	3.0 pF
Percent Passing # 200 Sieve	20%

Percent Clay	10%
Average Plasticity Index	<5
Average Liquid Limit	<10

Construction Requirements for Mat Slab and Post-Tensioned Slab Foundations

14. A minimum of two inches of wetted sand should be placed over the prepared subgrade to facilitate curing of the concrete and to act as a cushion. The perimeter of the slab should be thickened to bear on the prepared building pad and to confine the sand. The use of a capillary break for slabs eight (8) inches or more in thickness is optional.

15. Structural mat slabs and post-tensioned slabs on grade supporting floor coverings should be provided with measures to prevent condensation caused by temperature differentials from harming floor coverings. One method to reduce condensation is to place a minimum of 10 mil. waterproof membrane between the sand cushion and the compacted subgrade. The waterproof membrane shall be overlapped adequately to provide a continuous waterproof membrane barrier under the entire slab. Care must be taken to ensure that the waterproof membrane does not become torn and entangled with the reinforcing.

Concrete Slab-on-Grade Construction and Exterior Flatwork

16. Concrete slabs-on-grade are expected for use in conjunction with spread footing foundations (if used) and also for exterior flatwork. To reduce any potential cracking of concrete, the following are recommended:

a. The near surface soil is non expansive and therefore no slab subgrade saturation is anticipated prior to pouring the slab, however wetting the subgrade is desirable.

b. Slabs, (non structural and less than 8 inches in thickness) should be underlain by a minimum of 4 inches of gravel or clean crushed rock material placed between the finished subgrade and the slabs to serve as a capillary break between the subsoil and the slab. See the "Guide Specifications for Rock Under Floor Slabs", Appendix C.

c. Concrete slab reinforcement should be determined by the project structural engineer. The reinforcement should be placed in the center of the slab section unless otherwise designated by the design engineer.

d. Where floor coverings are anticipated, a Visqueen-type membrane should be placed between the rock cushion and the slab to provide an effective vapor barrier, and to minimize moisture condensation under the floor covering. It is suggested that a two inch thick sand layer be placed on top of the membrane to assist in the curing of the concrete and to prevent puncture of the membrane.

e. Slabs at door openings should be constructed with a curl or a thickened edge extending a minimum of 12 inches into native ground or compacted fill.

f. Slabs in garage areas should be poured structurally independent of the foundations. A 30- pound felt strip, expansive joint material, or other positive separator should be provided around the edge of all floating slabs to prevent bond to the foundation.

Retaining Walls

17. If any retaining walls are to be constructed, they should be designed to resist lateral pressures exerted from a media having an equivalent fluid weight as follows:

Gradient of Back Slope	Equivalent Fluid Weight (p.c.f)			Friction Coefficient
	Unrestrained Condition (Active)	Restrained Conditions (At Rest)	Passive Resistance	
Horizontal	40	65	300	0.40
2:1	55	80	300	0.40

18. Active conditions occur when the top of the wall is free to move outward. At-rest conditions apply when the top of the wall is restrained from any movement.

19. It should be noted that the effects of any surcharge or compaction loads behind the walls must be accounted for in the design of the walls.

20. The above criteria are based on fully drained conditions. If drained conditions are not possible, then the hydrostatic pressure must be included in the design of the wall. A linear distribution of hydrostatic pressure of 63 p.c.f should be adopted.

21. In order to achieve fully-drained conditions, a drainage filter blanket should be placed behind the wall. The blanket should be a minimum of 12 inches thick and should extend the full height of the wall to within 12 inches of the surface. If the excavated area behind the wall exceeds 12 inches, the entire excavated space behind the 12-inch blanket should consist of compacted engineered fill or blanket material. The drainage blanket material may consist of either granular crushed rock and drain pipe fully encapsulated in geotextile filter fabric or Class I permeable material that meets CalTrans Specification, Section 68, with drainage pipe and optional fabric. A 4-inch perforated drain pipe should be installed in the bottom of the drainage blanket and should be underlain by at least 4 inches of filter type material. A 12-inch cap of clayey soil material should be placed over the drainage blanket.

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

23. The retaining walls may be founded on a spread footing foundation using the criteria previously presented under "Foundations."

Utility Trenches

24. With respect to state-of-the-art construction or local requirements, utility lines are generally bedded with granular materials. These materials can convey surface or subsurface water beneath the structures. It is, therefore, recommended that all utility trenches which possess the potential to transport water be sealed with a compacted impervious cohesive soil material or lean concrete where the trench enters/exits the building perimeter. This

impervious seal should extend a minimum of 2 feet away from the building perimeter and must be observed by the Project Soil Engineer.

25. Utility trenches extending underneath all traffic areas must be backfilled with native or approved import material and compacted to 95% relative compaction in accordance with Laboratory Test Procedure ASTM D1557-91. Backfilling and compaction of these trenches must meet the requirements set forth by the City of Morgan Hill, Building and Engineering Services Department. Utility trenches within landscape areas may be compacted to a relative compaction of 85%.

Pavement Design

26. After underground facilities have been placed in the areas to receive pavement and removal of excess material has been completed, the upper 6 inches of the subgrade soil should be scarified, moisture conditioned and compacted to a minimum relative compaction of 95% at moisture content above optimum in accordance with the grading recommendations specified in this report. The pavement subgrade should not be allowed to dry excessively before covering with aggregate base.

27. All aggregate base material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM D1557-91 Test Procedure. The construction of the pavement areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California and/or City of Morgan Hill, Department of Public Works.

28. Since the extent of planned grading was not known at the time of our investigation, no testing was performed to determine the actual R-Values for the site. For design purposes, an R-Value of 15 can be assumed for the near surface soils of the site. The recommended design thicknesses presented in Table 1 were calculated in accordance with the methods presented in Topic 608 of the California Department of Transportation Highway Design Manual." Once rough subgrade is established, representative samples of subgrade soil should be collected and tested to determine the actual R-Value's so that a final design may be obtained for

specific streets. It is our understanding that the city of Morgan Hill requires a minimum pavement section of 4 inches of Asphaltic Concrete over 8 inches of Aggregate Base

TABLE I
Recommended Asphalt Concrete Pavement Sections

Design Traffic Index	Asphalt Concrete Type B	Aggregate Base Class II
4.5	3.0	6.5
5.0	3.0	7.5
6.0	3.5	10.0

29. If planter areas are provided within or immediately adjacent to the pavement areas, provisions should be made to control irrigation water from entering the pavement subgrade. Water entering the pavement section at subgrade level, which does not have a means for discharge, could cause softening of this zone and accelerate pavement degradation.

General Construction Requirements

30. Liberal lot slopes and drainage must be provided by the project Civil Engineer to remove all storm water from the pads and to prevent storm and/or irrigation water from seeping beneath the structures. Should surface water be allowed to seep under the structures, foundation movement resulting in structural damage will occur. All finished grades should be compacted and sloped at a minimum 2% gradient away from the exterior foundation for a distance of 3 feet. Should the recommended surface gradient not be constructed by the developer as designed by the project Civil Engineer, or should the homeowner alter the surface drainage provided by the developer, then a subdrain system will be required around the perimeter of the residence. Specific recommendations for subdrain construction will be provided upon request.

31. Where roof gutters are used, downspouts from the gutters should be provided with closed pipe conduits to carry storm water away from the structures and graded areas and, thus, reduce the possibility of soil saturation adjacent to the foundations and engineered fills.

32. Flower beds or planters are not recommended adjacent to the building foundations because of the possibility of irrigation water affecting the foundations or slabs. Should planters be constructed, foliage requiring little irrigation should be planted. It is preferred that irrigation adjacent to the building foundations consist of a drip system. Sprinkler systems may be used; however, it is preferred that sprinkler heads do not water closer than 3 feet from the building foundations. If sprinklers are used within 3 feet, then excessive watering should not be allowed; and good surface drainage in the planter area must be provided. In any case, it is recommended that area surface drains be incorporated into the landscaping to discharge any excessive irrigation or rainwater that may accumulate in the planter area. These surface drains must be constructed in a manner that easy flow of surface water runoff is allowed into the pipe inlets.

Project Review and Construction Monitoring

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

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

35. Field observation and testing during the grading and/or foundation operations must be provided by representatives of *TMakdissy Consulting, inc.* to enable them to form an opinion regarding the adequacy of the site preparation, the acceptability of fill materials, and the extent to which the earthwork construction and the degree of compaction comply with the specification requirements. Any work related to the grading and/or foundation operations performed without the full knowledge and under the direct observation of the Soil Engineer will render the recommendations of this report invalid. The degree of observation and frequency of testing services would depend on the construction methods and schedule, and the item of work. Please refer to "Guidelines For Required Services" for an outline of our involvement during project development.

36. Should another geotechnical consultant be engaged to perform project review and/or construction monitoring, then *TMakdissy Consulting Inc.* must receive a letter of indemnification releasing us of any responsibility on the project.

GUIDELINES FOR REQUIRED SERVICES

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

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

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

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

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

LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

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

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

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

5. Not withstanding all the foregoing, applicable codes must be adhered to at all times.

APPENDIX A

Field Investigation

Site Plan

Logs of Test Borings

Key to the Exploratory Boring Logs

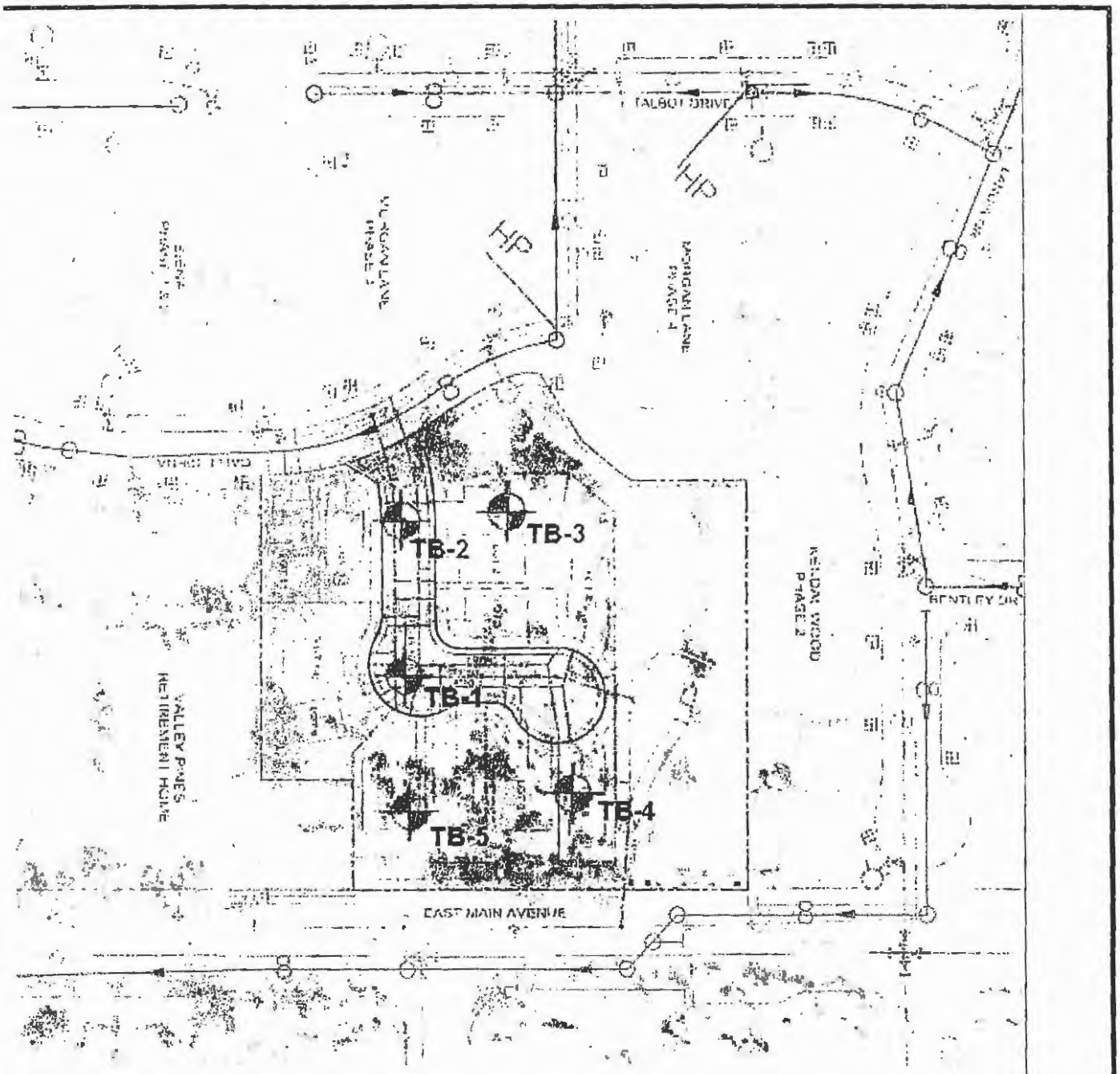
FIELD INVESTIGATION

The field investigation was performed on April 24, 2012 and included a reconnaissance of the site and the drilling of five (5) exploratory test borings at the approximate location shown on Figure 1, "Site Plan".

Three borings were drilled to a maximum depth of 25 feet below the existing ground surface. The drilling was performed using a power-driven 6 inch diameter, and solid flight augers. Visual classifications were made from cuttings and the samples in the field. As the drilling proceeded, undisturbed core samples were obtained by means of 3 inches O.D. split-tube sampler. The sampler was driven into the in-situ soils under the impact of a 140-pound hammer having a free fall of 30 inches. The number of blows required to advance the sampler 12 inches into the soil were adjusted to the standard penetration resistance (N-Value).

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

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



LEGEND

TB-1 Approximate boring location

1 INCH = 40 FEET

Proposed 12 Unit Residential Development
CALLE SIENA
605 E. Main Avenue
Morgan Hill, CA

T. MAKDISSY CONSULTING, INC.
Geotechnical Consultants

SITE PLAN

Project No.	Drawn by:	Figure No.
E 199-1	M.A	1
Scale: N/A	Date: MAY 8, 2012	

BOREHOLE LOG

LOCATION : See Site Plan
DATE DRILLED 4/24/12
DRILL RIG : Mobile CME-55
HAMMER: 140 lbs/30" drop
BORING BACKFILL METHOD: Soil Cutting

ELEVATION:
Logged By: G.M.
Drilling Method: Solid Flight
Drilling Contractor: Britton Exploration

BORING No.: TB-1
Sheet 1 of 1
Total Depth of Boring: 20 feet

DRILLING DETAILS	DEPTH	SAMPLER NO.	BLOW COUNT	GRAPHIC LOG	MATERIAL DESCRIPTION	LAB TESTS: DRY DENSITY	LAB TESTS: MOISTURE CONTENT	OTHER NOTES REMARKS
					Tan silty sand with gravel. Damp, very dense.			
		1-1	36		2½ Inch cobbles	145.24	6.3	
	5				Gravelly with fractured sandstone fragments.			
		1-2	50/6		Less Gravel	118.09	6.00	
	10				Tan brown. Silty sand with gravel.			
	15				Hard drilling.			
	20				Bottom of hole at 20 feet. No ground water			
	25							
	30							
	35							
	40							

T. MAKDISSY CONSULTING, INC.
Geotechnical Consultants

Proposed 12 Unit Residential Development
CALLE SIENA
605 E. Main Avenue
Morgan Hill, CA

Date 5/8/12	Drawn by: M.A	Project No.	Figure No 2

BOREHOLE LOG

LOCATION : See Site Plan
DATE DRILLED 4/24/12
DRILL RIG : Mobile CME-55
HAMMER: 140 lbs/30" drop
BORING BACKFILL METHOD: Soil Cutting

ELEVATION:
Logged By: G.M.
Drilling Method: Solid Flight
Drilling Contractor: Britton Exploration

BORING No.: TB-2
Sheet 1 of 1
Total Depth of Boring: 21.5 feet

DRILLING DETAILS	DEPTH	SAMPLER NO.	BLOW COUNT	GRAPHIC LOG	MATERIAL DESCRIPTION	LAB TESTS: DRY DENSITY	LAB TESTS: MOISTURE CONTENT	OTHER NOTES REMARKS
		2-1	29		Brown silty sand with gravel. Very dense, dry.	124.06	7.45	Atterberg limits% L.L=19.82 PI=<5
	5	2-2	34		Increase in gravel content	119.04	10.35	
	10	2-3	42			122.30	7.91	
	15							
	20	2-4	71					
					Bottom of hole at 21.5 feet. No ground water			
	25							
	30							
	35							
	40							

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Proposed 12 Unit Residential Development
CALLE SIENA
605 E. Main Avenue
Morgan Hill, CA

Date	Drawn by: M.A	Project No.	Figure No.3

BOREHOLE LOG

LOCATION : See Site Plan
DATE DRILLED 4/24/12
DRILL RIG : Mobile CME-55
HAMMER: 140 lbs/30" drop
BORING BACKFILL METHOD: Soil Cutting

ELEVATION:
Logged By: G.M.
Drilling Method: Solid Flight
Drilling Contractor: Britton Exploration

BORING No.: TB-3
Sheet 1 of 1
Total Depth of Boring: 15 feet

DRILLING DETAILS	DEPTH	SAMPLER NO.	BLOW COUNT	GRAPHIC LOG	MATERIAL DESCRIPTION	LAB TESTS: DRY DENSITY	LAB TESTS: MOISTURE CONTENT	OTHER NOTES REMARKS
	5	3-1	62		Brown silty sand with gravel, very dense, dry.	122.69	9.01	Direct Shear test ∅= 40° C = 300 PSI
	10	3-2	61		Increase in gravel to bottom of boring.	119.47	6.09	
	15				Bottom of hole at 15 feet. No ground water.			
	20							
	25							
	30							
	35							
	40							

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Date 5/8/12	Drawn by: M.A	Project No.	Figure No.4

BOREHOLE LOG

LOCATION : See Site Plan
DATE DRILLED 4/24/12
DRILL RIG : Mobile CME-55
HAMMER: 140 lbs/30" drop
BORING BACKFILL METHOD: Soil Cutting

ELEVATION:
Logged By: G.M.
Drilling Method: Solid Flight
Drilling Contractor: Britton Exploration

BORING No.: TB-4
Sheet 1 of 1
Total Depth of Boring: 25 feet

DRILLING DETAILS	DEPTH	SAMPLER NO.	BLOW COUNT	GRAPHIC LOG	MATERIAL DESCRIPTION	LAB TESTS: DRY DENSITY	LAB TESTS: MOISTURE CONTENT	OTHER NOTES REMARKS
	0				Brown silty sand with slight clay binder, dense, damp.			
		4-1	26			114.08	12.5	
	5				Silty sand, dense, damp, cemented with gravel.			
		4-2	60			127.60	6.76	
	10							
					Increasing gravel.			
	15							
					Same to bottom of boring.			
	20							
	25				Bottom of hole at 25 feet. No water.			
	30							
	35							
	40							

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CALLE SIENA
605 E. Main Avenue
Morgan Hill, CA

Date 5/8/12 | Drawn by: M.A. | Project No. | Figure No.

BOREHOLE LOG

LOCATION : See Site Plan
DATE DRILLED 4/24/12
DRILL RIG : Mobile CME-55
HAMMER: 140 lbs/30" drop
BORING BACKFILL METHOD: Soil Cutting

ELEVATION:
Logged By: G.M.
Drilling Method: Solid Flight
Drilling Contractor: Britton Exploration

BORING No.: TB-5
Sheet 1 of 1

Total Depth of Boring: 20 feet

DRILLING DETAILS	DEPTH	SAMPLER NO.	BLOW COUNT	GRAPHIC LOG	MATERIAL DESCRIPTION	LAB TESTS: DRY DENSITY	LAB TESTS: MOISTURE CONTENT	OTHER NOTES REMARKS
	0	5-1	10		Topsoil in upper 6 inches. Brown silty sand with gravel, dense, damp. Increase in gravel. Continues to bottom of boring.	98.58	11.84	Atterberg limits% L.L 18.5% PI=<5%
	20				Bottom of boring at 20 feet. No ground water.			

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Proposed 12 Unit Residential Development
CALLE SIENA
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Morgan Hill, CA

Date 5/8/12	Drawn by: M.A	Project No.	Figure No 6

APPENDIX B

Laboratory Investigation

Summary of Laboratory Test Results

LABORATORY INVESTIGATION

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

Moisture content and dry unit weight tests were performed on undisturbed soil samples in order to determine the consistency of the soil and moisture variation throughout the explored soil profile and estimate the compressibility of the underlying soils.

The strength parameters of the foundation soils were determined from in situ penetration resistance of the soil, and on a Direct Shear test.
The expansion characteristics of the near-surface soils were evaluated by means of Atterberg Limits Tests performed in accordance with ASTM D4318.

A summary of all laboratory test results is presented on TABLE 1 of this appendix and on the respective "Logs of Test Borings", Appendix A.

APPENDIX C

The Grading Specifications

Guide Specifications for Rock Under Floor Slabs

THE GRADING SPECIFICATIONS
On
CALLE SIENA
Proposed 12 Unit Residential Development
605 E. Main Avenue
Morgan Hill, California

1. General Description

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

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

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

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

2. Tests

The standard test used to define maximum densities of all compaction work shall be the ASTM D1557-91 Laboratory Test Procedure. All densities shall be expressed as a relative compaction in terms of the maximum dry density obtained in the laboratory by the foregoing standard procedure.

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

3.1 If encountered, all vegetable matter, trees, root systems, shrubs, debris, and organic topsoil shall be removed from all structural areas and areas to receive fill.

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

3.3 All underground structures shall be removed from the site such as old foundations, abandoned pipe lines, septic tanks, and leach fields.

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

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

4. Materials

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

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

4.3 Should import material be required, it must meet the specifications as delineated in the body of this report.

5. Placing, Spreading, and Compacting Fill Material

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

5.2 After each layer has been placed, mixed, and spread evenly, either import material or native material shall be compacted to a relative compaction designated for engineered fill.

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

5.4 Field density tests shall be made in each compacted layer by the Soil Engineer in accordance with Laboratory Test Procedure ASTM D1556-64 or D2922-71. When footed rollers are used for compaction, the density tests shall be taken in the compacted material below the surface disturbed by the roller. When these tests indicate that the compaction requirements on any layer of fill, or portion thereof, has not been met, the particular layer, or portion thereof, shall be reworked until the compaction requirements have been met.

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

6. Pavement

6.1 The proposed subgrade under pavement sections, native soil, and/or fill shall be compacted to a minimum relative compaction of 95% at 3% above optimum moisture content for a depth of 6 inches.

6.2 All aggregate base material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM Test Procedure D1557-91. The construction of the pavement in the parking and traffic areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California and/or City of Morgan Hill, Department of Public Works.

6.3 It is recommended that soils at the proposed subgrade level be tested for a pavement design after the preliminary grading is completed and the soils at the site design subgrade levels are known.

7. Utility Trench Backfill

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

7.2 Utility trenches extending under all pavement areas shall be backfilled with native or approved import material and properly compacted to meet the requirements set forth by the City of Morgan Hill, Department of Public Works.*

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

8. Subsurface Line Removal

8.1 The methods of removal will be designated by the Soil Engineer in the field depending on the depth and location of the line. One of the following methods will be used.

8.2 Remove the pipe and fill and compact the soil in the trench according to the applicable portions of sections pertaining to compaction and utility backfill.

8.3 The pipe shall be crushed in the trench. The trench shall then be filled and compacted according to the applicable portions of Section 5.

8.4 Cap the ends of the line with concrete to prevent entrance of water. The length of the cap shall not be less than 5 feet. The concrete mix shall have a minimum shrinkage.

9. Unusual Conditions

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

10. General Requirements

Dust Control

10.1 The contractor shall conduct all grading operations in such a manner as to preclude wind blown dirt and dust and related damage to neighboring properties. The means of dust control shall be left to the discretion of the contractor and he shall assume liability for claims related to wind blown material.

GUIDE SPECIFICATIONS FOR ROCK UNDER FLOOR SLABS

Definition

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

Material

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

Gradation

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

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

Placing

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