FINAL ENVIRONMENTAL IMPACT REPORT

Volume II

SCH #2004071095

West Haven Specific Plan

(PSP03-006)

APPENDIX E

Geology/Soils Supporting Documentation:

- **Due Diligence Review of Geotechnical Data**
- **Results of a Due-Diligence Geotechnical Study**
- **Engineering Geologic and Soils Foundation Investigation**

URS Corporation

ancw 7 - sms soils feasibility

ASSOCIATED SOILS ENGINEERING, INC.
Consulting Foundation Engineers

CORPORATE: 3320 AIRPORT WAY - LONG BEACH, CALIF. 90806 - PHONE 562/426-7990 - FAX 562/426-1842
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April 21, 2004
Project No. 04-5643

Centex Homes
250 Commerce, Suite 100
Irvine, California 92602

Attention: Mr. Dave Hutchins

Subject: Due Diligence Review of Geotechnical Data Regarding Proposed Development of APN 218-151-19 & 23, a Portion of the Proposed West Haven Project, City of Ontario, County of San Bernardino, California

References: See Attached List

Gentlemen:

In accordance with your request and authorization, Associated Soils Engineering, Inc. (ASE) presents this letter of preliminary geotechnical findings based on a review of the subject site. This report is based on site reconnaissance and review of other available geotechnical data (See attached List of References).

SITE LOCATION & PROPOSED GRADING

The subject 40± acre site is located east of Turner Avenue and north of the future intersection with Shaefer Avenue in City of Ontario, California. The site was previously located in an unincorporated area of San Bernardino County but appears to have been annexed by the City of Ontario within the past few years. To the north of the property are existing single family residential homes and to the east is an active dairy. The relatively flat site was previously utilized for agricultural purposes, reportedly vineyards. Typical cut/fill grading operations are to be utilized to develop 143 individual building pads as well as associated streets, parkways, slopes and common areas, for future construction of single family residential structures. According to the Preliminary Site Plan, prepared by M.J. McKeever, Inc., and dated February 6, 2004, cuts and fills are planned up to approximately five feet. Permanent cut and fill slopes are presumed at slope ratios varying to as steep as 2:1 (horizontal:vertical) and as high as approximately five feet. The plans depict easements 175 feet wide along the southern and eastern sides of the property for Southern California Edison Power lines.

Geotechnical Studies and Reports

The subject property has been previously studied by at least one other geotechnical consultant, LOR Geotechnical Group, Inc. (LGG). LGG also has completed a Preliminary Environmental Site Assessment of the property. It is not known as to whether the geotechnical reports have been reviewed by the City of Ontario or the County of San Bernardino. Only the reports referenced were available for our review.

Seismic Hazards

The subject project is not located within an Alquist-Priolo Earthquake Fault Zone. The closest known active faults are the Chino and the Whittier Elsinore Fault Zones, which are approximately 7 and 9 miles southwest of the site, respectively. As such, the site may be expected to experience strong shaking over the life of the structures.

The site is in an unmapped area with respect to the State of California Seismic Hazard Zones Mapping program, which show areas that, during an earthquake, have an increased susceptibility to landslides or liquefaction. According to the previous investigation by LGG, static ground water levels at the site are on the order of 130 feet below the ground surface and thus the potential for liquefaction is negligible. Due to the relatively low relief across the site and presuming any proposed slopes are constructed according to the recommendations of the project geotechnical consultant, the potential for earthquake induced landslides is considered very low. Other seismic hazards such as tsunami, seiche, or lurching are considered remote.

According to the ERSI/FEMA Project Impact Hazard Information and Awareness Site, the western portion site is located within the 500-year Flood Zone while the remainder of the site to the east is in Flood Zone C.

Site Soils

The site soils expected to be encountered during grading consist of a variety of artificial fills, as well as younger and older alluvial sediments throughout the site. The site appears to have been recently cleared of weds. Although the previous investigation determined that the site had not been used as a dairy farm, a few of the test pits noted manure at the surface varying in thickness up to three inches. All manure is required to be removed from the site. There were several dumped piles on the site noted during our reconnaissance, particularly near the southerly end of Turner Avenue. The stockpiles appear to contain significant construction debris and other deleterious materials. A serious effort by the contractor may be required to remove deleterious materials from the existing artificial fills prior to their placement as compacted fill onsite.

General Grading Procedures

Remedial removals in general are to consist of complete removal and disposal of any manure trash. According to the Preliminary Geotechnical Investigation (LGG, 2000), removals within the native soils are generally anticipated to be on the order of four (4) feet below existing grades, with the loose sands in the northeastern portion of the site requiring removals of up to eight (8) feet. Many of the proposed lots are designed as cut/fill transition lots and will require overexcavation of the cut portions. Additional lots will need to be overexcavated due to skin fills, and transitions created during remedial removals. All proposed cut lots are recommended to be overexcavated at least three (3) feet below proposed pad grades.

Settlement Considerations

Subsequent to remedial grading, anticipated total and differential settlements should be well within tolerable limits under static conditions. Typical conventional and/or post-tensioned foundation systems would be suitable for the currently proposed single family residential construction over most of the project.

Expansive Soils, Sulfates & Corrosivity

Soil types encountered in the previous investigation, and typical for the area based on our experience, are "Very Low" in expansion potential according to Table 18-I-B of the 1997 Uniform Building Code (UBC). The soluble sulfate content of the site soils was found to be "Negligible". However, it should be noted that subsequent to the proposed grading, additional testing would be required and the assumed classifications within the referenced report may change. Whereas the site was used as a vineyard, it is unknown what type of chemicals may have been used during the farming and subsequently leached into the soils onsite. Due to that unknown, the client should have provisions within the budget to account for the potential extra costs of sulfate rich soils.

The Preliminary Investigation Report does not address corrosivity. In lieu of actual test results and for budgetary purposes, we recommend that you assume values corresponding to a Severely Corrosive potential of the site soils to buried metal pipe.

Slope Stability

The site is relatively flat so there will only be minor slopes. Proposed grading within the subject site will likely include cut and fill slopes at a slope ratio of 2:1 and up to approximately five (5) feet high. Planned cut slopes may expose loose younger alluvium which may not be surficially stable. Upon completion of a more accurate grading plan, many of the cut slopes may remain as cut slopes, however at this time, for budgetary purposes, it should be assumed that cut slopes may require replacement with stabilization fills.

Closing

It is the opinion of ASE that the project is feasible, provided appropriate remedial measures are addressed during the grading operation. The information provided herein was based on review of the available geotechnical data presented in the referenced report and plans.

This opportunity to be of service is sincerely appreciated. If you have any questions or comments regarding the geotechnical information provided herein, please feel free to call us at (562) 426-7990.

Respectfully Submitted,

ASSOCIATED SOILS ENGINEERING, INC.

REGISTERED GEOLOGIST
E.C. RIDDELL
No. 1775
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIF

Edward C. (Ted) Riddell
Engineering Geologist, CEG 1775

Distribution: (4) Addressee

LIST OF REFERENCES

California Division of Mines and Geology, 1991, Geologic Map of the Santa Ana 1:100,000 Quadrangle, California, DMG Open-File Report 91-17.

California Division of Mines and Geology, Revised 1994, Fault Rupture Hazard Zones in California, Special Publication 42.

California Division of Mines and Geology, 1994, Fault Activity Map of California and Adjacent Areas, Scale 1:750,000, California Data Map Series, Map No. 6.

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

LOR Geotechnical Group, Inc., 2000, Engineering Geologic and Soils Foundations Investigation, Minaberry Trust Property, APN 218-151-19, 23, San Bernardino County, California, Project No. 31396.1, dated September 15.

LOR Geotechnical Group, Inc., 2000, Phase I Environmental Site Assessment; 35± Acre Minaberry Trust Property, APN 218-151-19, 23, San Bernardino County, California, Project No. 31396.2, dated September 8.

W. J. McKeever, Inc., 2004, 100-Scale Topographic-Boundary Survey, Minaberry Trust, dated April 7.

W. J. McKeever, Inc., 2004, 80-Scale Preliminary Site Plan, JMS Properties, Ontario, California, dated February 6.

RESULTS OF A DUE-DILIGENCE GEOTECHNICAL STUDY FOR THE PROPOSED 26-ACRE RESIDENTIAL DEVELOPMENT, SOUTHWEST OF RIVERSIDE DRIVE AND HAVEN AVENUE, CITY OF ONTARIO, CALIFORNIA

Prepared for:

CENTEX HOMES
7555 Irvine Center Drive, Suite 100
Irvine, California 92618

Project No. 020796-001

November 15, 2002

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

November 15, 2002

Project No. 020796-001

To: Centex Homes
7555 Irvine Center Drive, Suite 100
Irvine, California 92618

Attention: Ms. Susan Lindquist

Subject: Results of a Due-Diligence Geotechnical Study for the Proposed 26-Acre Residential Development, Southwest of Riverside Drive and Haven Avenue. City of Ontario, California

Introduction

In response to your request, Leighton and Associates, Inc. (Leighton) has performed a due-diligence-level geotechnical investigation of a 26-acre site, currently a dairy, located southwest of Riverside Drive and Haven Avenue in the City of Ontario, California. The purpose of this study has been to evaluate the general geotechnical conditions at the site and to evaluate whether there are major geotechnical or geologic issues at the site that would have significant impact to site development. No project plans were available at the time of our investigation, however, we understand a residential development is planned. An undated site map of the existing improvements provided by you was used for reference during our field investigation. This map serves as a base for our Geotechnical Map (Figure 2).

In general, development of the site is feasible from a geotechnical standpoint. While there are geotechnical constraints to the development, these constraints are typical for the area and can be overcome with appropriate planning, design and grading.

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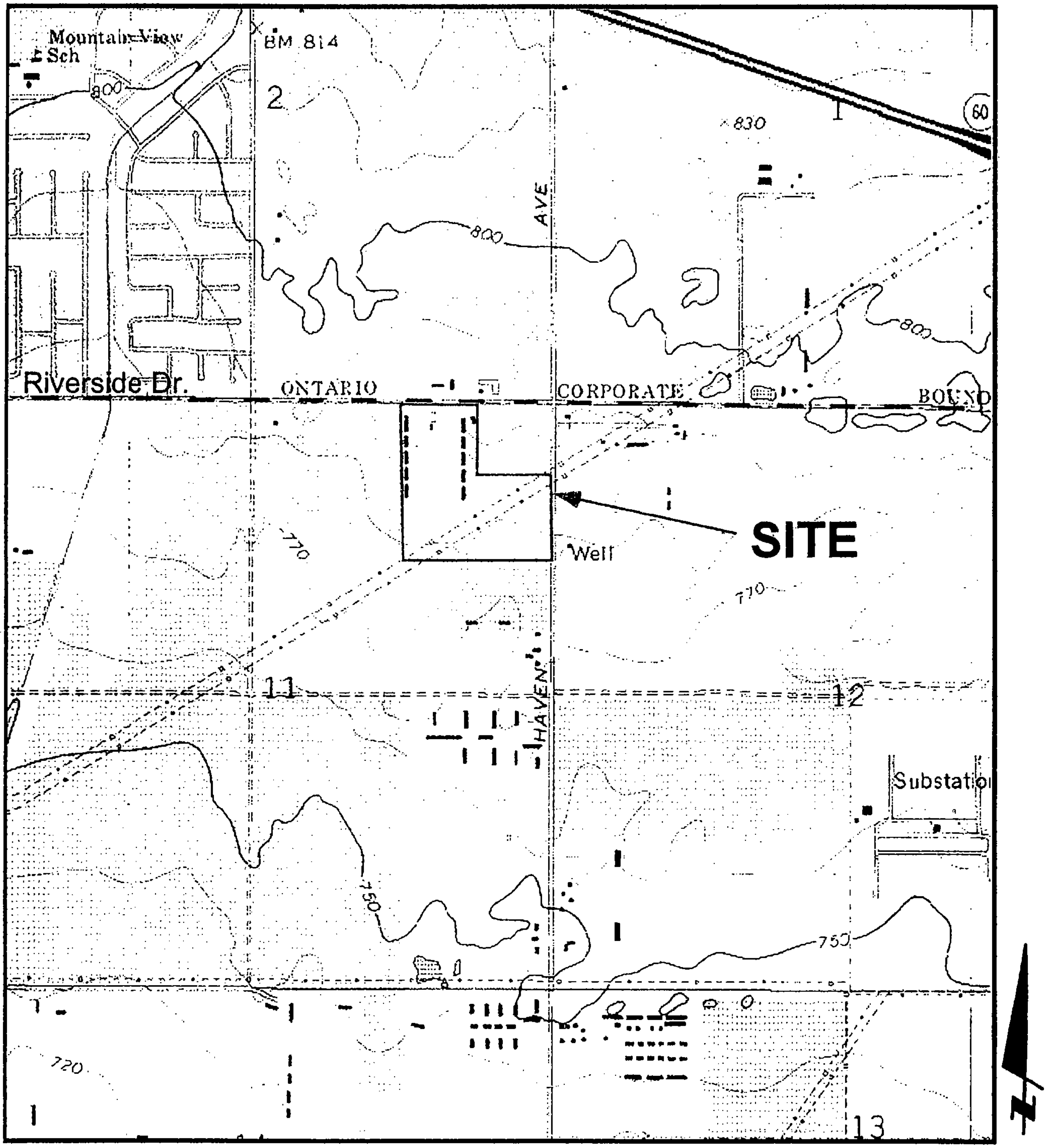
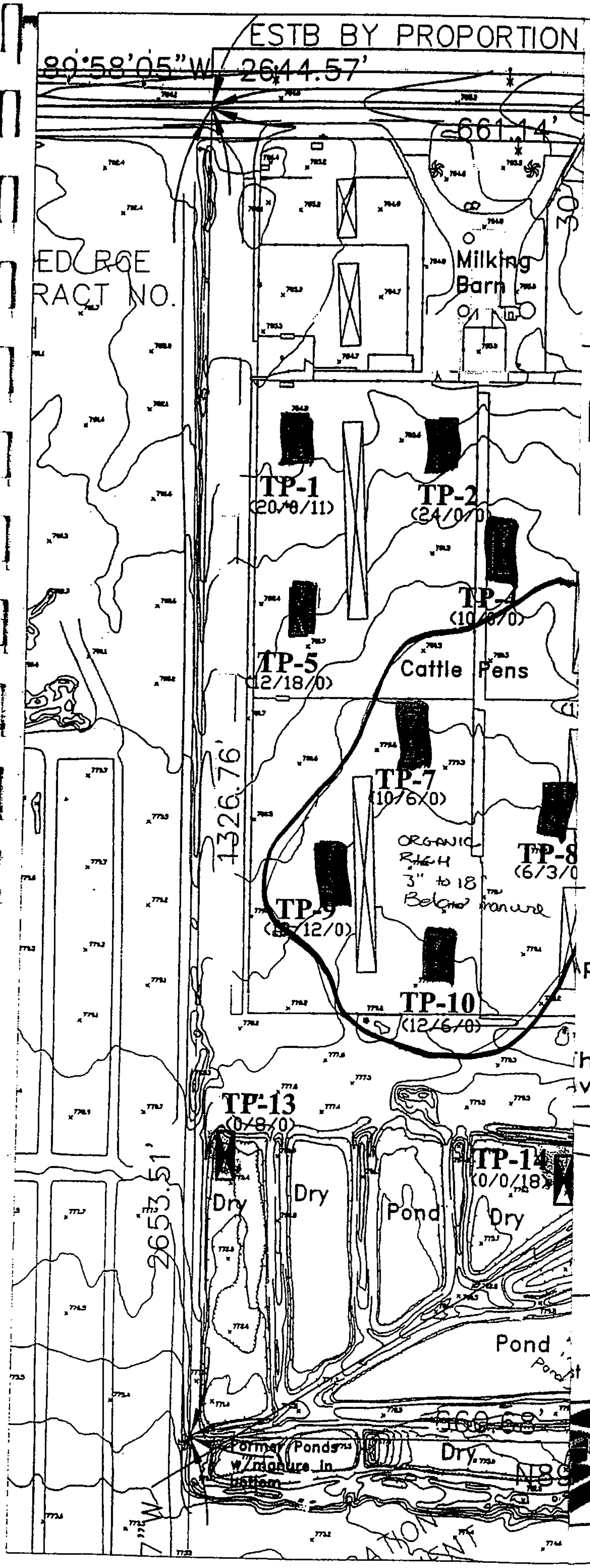


BASE MAP: 2001, Topo! Intereractive CD-ROM, Los Angeles, Santa Barbara, and Surrounding Rec. Areas.

NO SCALE

PROPOSED 26-ACRE RESIDENTIAL DEVELOPMENT Southwest of Riverside Drive and Haven Avenue, City of Ontario, California	SITE LOCATION MAP	PROJECT NO. 020796-001 DATE Nov. 2002 Figure 1



6 - 24" manure

4 - 10" manure

0" manure

organic rich soil 3-18" Below manure

manure - very high organic content > 10%

organic Rich Soil = 3-10%

without significant organic Content < 3%

Approximate test pit location

Thicknesses (inches) of surficial earth materials overlying alluvium within test pits:
Thickness of Manure, over
Organic-Rich Soil, over
Uncontrolled Artificial Fill without significant organic content (inches).

FIGURE 2

Geotechnical Map

Proposed 26-Acre Residential Development

...st of Riverside Drive and Haven Avenue, City of Ontario, California

Proj.: 020796-001	Scale: 1" = 150'
Engineer/Geologist: JDH/PB	11-2002
Leighton and Associates	

Project Location and Description

The site is located south of Riverside Drive and west of Haven Avenue in the City of Ontario, California. The subject site is approximately 26 acres, L-shaped, and extends to Riverside Drive on the north and Haven Avenue on the east (see Site Location Map, Figure 1). A roughly square, 10-acre commercial site (currently part of the same dairy) is planned at the southwest corner of Riverside Drive and Haven Avenue and is not a part of the proposed development. Electric power transmission lines are to the west of the site, and open land is to the south.

The site is relatively flat and generally drains to the south. An active dairy occupies the northern portion of the site. A barn and residence are present near Riverside Drive. Cattle pens, feed barns and haystacks are also present in the active dairy portion of the site. Stockpiles and berms of soil and manure and dairy settling ponds are present in the southwestern and southern portions of the site. Most of the southeastern portion of the site is vacant. A buried, 36-inch-diameter, high-pressure, natural gas transmission line extends across the southern and eastern portions of the site. The principal site features are depicted on the Geotechnical Map (Figure 2). Appendix D of this report presents selected photographs of current site conditions.

Based on our review of historic aerial photographs of the site vicinity, the site was undeveloped and possibly used for small crop cultivation during 1938. A house was present in the general area of the existing house on the south side of Riverside Drive. The surrounding area was largely undeveloped with sporadically spaced houses and was either vacant or used for citrus or small crop cultivation. It appears that the dairy onsite was constructed between 1966 and 1969. During 1969, the southern and eastern portions of the site appeared to have been cultivated. The site appeared to have changed very little between 1969 and 1981. The dairy ponds on the southern portion of the site were constructed sometime between 1980 and the present.

Scope of Investigation

The scope of our investigation has included the following tasks:

- Reviewed pertinent, readily available published and unpublished geologic reports covering the site. These included regional data prepared by others as well as reports prepared by us for similar sites. Our review also included analysis of in-house, historic, aerial photographs covering the site.

- Located and marked the test pit locations and coordinated with Underground Service Alert (USA) and the dairy owner to have underground utilities marked prior to our fieldwork.

- Excavated, logged, and sampled 20 backhoe test pits to a maximum depth of 10 feet to observe subsurface soil conditions. The test pits were excavated in the cattle pens and open areas across the site. The test pits were logged by a qualified member of our technical staff to observe the subsurface conditions. In situ moisture and density tests were performed in the upper 4 to 5 feet of the test pits during excavation with a nuclear test gauge, the results of which are shown on the test pit logs provided in Appendix B. Representative bulk soil samples were collected from the test pits and transported to our affiliate laboratory for testing. The approximate location of the test pits are shown on the Geotechnical Map, Figure 2.

- Laboratory testing of selected representative soil samples to determine organic content, sieve analysis, maximum dry density and optimum moisture content, sulfate content. resistivity, pH, and chloride content. Results of the organic content tests are indicated on the test pit logs in Appendix B. Results of the other laboratory tests are presented in Appendix C of this report.

- Evaluation and analysis of the collected data by Professional Engineers and a Certified Engineering Geologist.

- Preparation of this report presenting our geotechnical findings and conclusions regarding the suitability of the site for development.

Geologic Setting

The site is located within the Chino Basin in the northern portion of the Peninsular Range geomorphic province of California. Major structural features surrounding this region include the Cucamonga fault and the San Gabriel Mountains to the north, the Chino fault and Puente/Chino Hills to the west, and the San Jacinito fault to the east. In addition, this is an area of large-scale crustal disturbance as the relatively northwestward moving Peninsular Range Province, collides with the Transverse Range Province (including the San Gabriel Mountains) to the north. Several active or potentially active faults have been mapped in the region and are believed to accommodate compression associated with this collision. The site is located approximately 16 kilometers south of the Cucamonga Fault Zone. This is a major active fault zone forming the steep escarpment between the San Gabriel Mountains to the north and the basin floor on the south.

The site is underlain by younger alluvial soil deposits eroded from the San Gabriel Mountains and deposited in the site vicinity. The Holocene alluvium is underlain by Pleistocene alluvium to a depth of approximately 550 feet below the ground surface. As a result of Santa Ana Winds, a thin veneer of windblown sand may be present in the area.

We appreciate the opportunity to work with you on the development of this project. If you have any questions regarding this report, please call us at your convenience.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

REGISTERED PROFESSIONAL ENGINEER
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No. 61778
Exp. 6-30-05
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Philip A. Buchiarelli, CEG 1715
Senior Project Geologist

David C. Smith, RCE 46222
Vice President/Principal Engineer

PP/JDH/PB/DCS/rsh

Attachments: Figure 1 - Site Location Map - Page 2
Figure 2 - Geotechnical Map - Rear of Text
Appendix A - References
Appendix B - Test Pit Logs
Appendix C - Laboratory Test Results
Appendix D - Selected Site Photographs
Appendix E - General Earthwork and Grading Specifications

Distribution: (4) Addressee

We appreciate the opportunity to work with you on the development of this project. If you have any questions regarding this report, please call us at your convenience.

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Respectfully submitted,

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PP/JDH/PB/DCS/rsh

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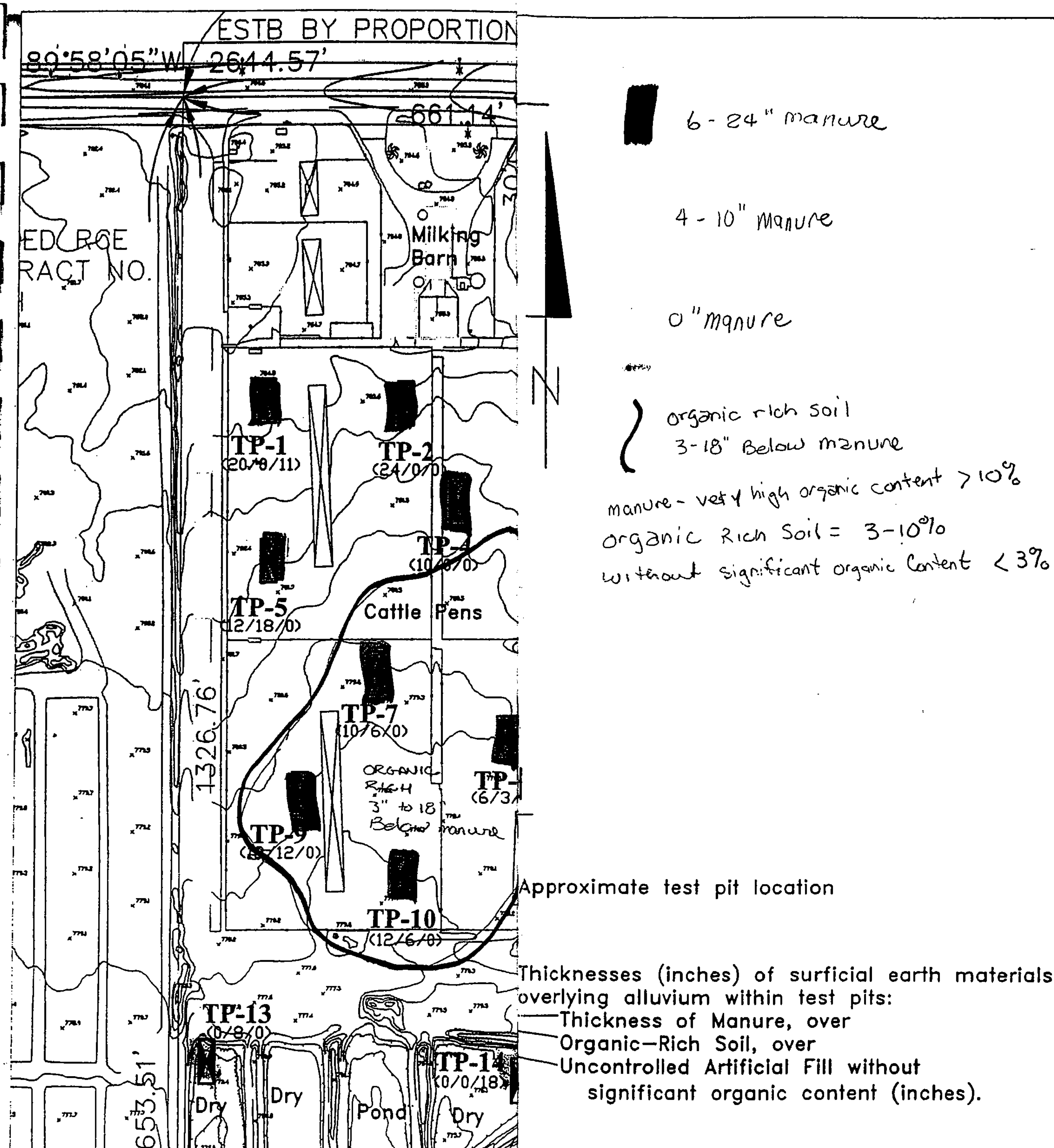

FIGURE 2

Geotechnical Map

Proposed 26-Acre Residential Development

...st of Riverside Drive and Haven Avenue, City of Ontario, California

Proj.: 020796-001	Scale: 1" = 150'
Engineer/Geologist: JDH/PB	11-2002

Leighton and Associates

APPENDIX A

References

Blake, T. F., 2000, EQFAULT, A Computer Program for the Estimation of Peak Horizontal Acceleration from 3-D Fault Sources, Windows 95/98 Version, User's Manual, April 2000.

California Department of Water Resources (CDWR), 1970, Meeting Water Demands in Chino-Riverside Area, Bulletin No. 104-3, Appendix A; Water Supply, dated September 1970.

Fife, D. L., Rogers, D. A., Chase, G. W., Chapman, R. H., Sprotte, E. C., 1976, Geologic Hazards in Southwestern San Bernardino County, California, CDMG Special Report 113.

Hart, E. W., and Bryant, W. A., 1997, Fault Rupture Hazard Zones in California, California Division of Mines and Geology Special Publication 42.

Mendenhall, W. C, 1908, Ground Waters and Irrigation Enterprises in the Foothill Belt, Southern California, United States Geological Survey, Water-Supply Paper 219.

Sadigh, K., Chang, C.-Y., Egan, J.S., Makdisi, F., and Youngs, R.R., 1997, "Attenuation Relations for Shallow Crustal Earthquakes Based on California Strong Motion Data," *Seismological Research Letters,* Vol. 68, No. 1, January/February, pp. 180-189.

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United States Geologic Survey, 1981, 7.5 Minute Series, Topographic Map of the Guasti Quadrangle, Original Map, 1967, Photorevised 1981, Scale 1:24,000.

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Ziony, J. I., and Jones, C. M., 1989, Map Showing Late Quaternary Faults and 1978-84 Seismicity of the Los Angeles Region, California, USGS Miscellaneous Field Studies Map MF-1964.

Aerial Photographs

Flight	Frames	Date	Source
RIV-38	A-6-6	1938	Unknown
C-293	16	1/30/69	San Bernardino County
C-295	89	2/27/69	San Bernardino County
RCFC 80	2 through 4	1/23/80	Riverside County Flood Control District

Appendix B

Geotechnical Test Pit Logs

Centex, Ontario
Project No. 020796-001

Test Pit TP-1

Location: See Geotechnical Map

Depth		Soil	Description	Test Results			
Top (ft)	Bottom (ft)	Symbol (USCS)		Depth, (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	1.7		Manure, blackish brown, moist, loose to medium dense, pieces of grass, urine scent				
1.7	2.6	SM	Fill, Silty SAND, blackish tan, moist, medium dense, fine to medium sand, mild urine scent	2-2.5			0.9
2.6	4.6	SM	Alluvium, Silty SAND, tan, moist, loose, fine to coarse sand	3	97.2	5.7	
				3-4			1.3
4.6	6	SP-SM	Alluvium, SAND with silt, gravel and cobbles, tan, moist, loose, fine to coarse sand, fine gravel	5	92.3	9.9	
				4-5			0.7

Total Depth (ft): 6.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-2

Location: See Geotechnical Map

Depth		Soil	Description	Test Results			
Top (ft)	Bottom (ft)	Symbol (USCS)		Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	2		Manure, some mixed soil, gray/black, very dense				
2	5.5	SM	Alluvium, Silty Sand, tan, moist, loose to moderately dense	2.5			1.2
				3	96.5	6.3	
				5	93.4	6.9	

Total Depth (ft): 5.5
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-3

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	2		Manure, dark brown-black, urine scent				
2	5	SM	Alluvium, Silty Sand, light brown, slightly moist to moist, loose to moderately dense	2.5			0.9
				3	98.8	5.4	
				5	97.1	6.1	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-4

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.8		Manure, dark brown-black, grass mix				
0.8	5	SM	Alluvium, Silty Sand, light brown-gray, moist, loose, becoming moderately dense at 5'	1.2			1.0
				3	89.8	8.7	
				4.5			2.1
				5	93.6	6.6	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-5

Location: See Geotechnical Map

Depth		Soil	Description	Test Results			
Top (ft)	Bottom (ft)	Symbol (USCS)		Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	1		Manure, dark blackish brown, dry at the top to moist at the bottom, loose to medium dense, urine scent, pieces of grass or wood				
1	2.5	SM	Manure with soil, Silty SAND, dark tan, moist, fine to medium sand, loose				
2.5	5	SM	Alluvium, Silty SAND, fine to medium sand, tan, moist, loose to medium dense	2.5-4			1.4
				3	96.5	8.6	
				5	95.5	9.5	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-6

Location: See Geotechnical Map

Depth		Soil	Description	Test Results			
Top (ft)	Bottom (ft)	Symbol (USCS)		Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	1		Manure, brown, dry, pieces of grass or wood				
1	2		Manure with soil, black with light gray areas, pieces of grass or wood				
2	4	SM	Alluvium, Silty SAND, light brown, moist, loose	2.5			1.1
				3	96.3	5.9	
4	5	SM	Alluvium, Silty SAND, light brown, moist, loose to moderately dense	5	96.4	15	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-7

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.8		Manure, dark blackish brown, dry, loose, urine scent, pieces of grass or wood				
0.8	1.3	SM	Manure with soil, Silty SAND, tan, dry to slightly moist, loose, fine to medium sand				
1.3	5	SM	Alluvium, Silty SAND, light tan, moist, loose, fine to medium sand	1.5			0.9
				2.0			0.7
				3	93.7	6.2	
				5	93.7	10.4	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-8

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.5		Manure				
0.5	0.7		Manure with soil				
0.7	2.5	SM	Alluvium, Silty SAND, tan, moist, loose, fine sand, urine scent	1.0			1.1
2.5	5	SM/ML	Alluvium, Silty Sand/Sandy SILT, tan, moist, loose to moderately dense, fine sand	3	92.9	10.9	
				5	90.5	17.5	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-9

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	1		Manure, blackish dark brown, medium dense, moist, pieces of grass or wood, urine scent				
1	2	SM	Manure with soil, Silty SAND, blackish tan, moist, fine to medium sand				
2	3.5	SM	Alluvium, Silty SAND, tan, moist, loose to mederately dense, fine to medium sand	3	95.8	7.1	
				3-4			1.0
3.5	5	ML	Alluvium, Sandy SILT, tan, moist, loose, fine sand	5	87.7	18.5	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-10

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	1		Manure, blackish dark brown, loose, dry at the top to moist at the bottom, pieces of grass or wood, urine scent				
1	1.5	SM	Fill with Manure, Silty SAND, blackish tan, moist, medium dense, fine to coarse sand, urine scent	1-1.5			4.4
1.5	3	SM	Alluvium, Silty SAND, tan, moist, loose, fine to medium sand				
				3	96.5	16.0	
3	5	ML	Alluvium, Sandy Silt, tan, moist, loose	5	91.2	17.8	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-11

Location: See Geotechnical Map

Depth		Soil	Description	Test Results			
Top (ft)	Bottom (ft)	Symbol (USCS)		Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.7		Manure				
0.7	1.6	SM	Fill, Silty Sand, gray, moist, slightly cemented, hard, no visible organic content	1.0			1.5
1.6	5	ML	Alluvium, Silty SAND, tan, moist, loose	3 5	93.9 87.8	11.7 9.1	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-12

Location: See Geotechnical Map

Depth		Soil	Description	Test Results			
Top (ft)	Bottom (ft)	Symbol (USCS)		Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.7	SM	Tilled Soil, Silty SAND, light grayish brown, dry, cemented, rootlets	0.5			1.8
0.7	1.5	SM	Alluvium, Silty SAND, light grayish brown, dry, slightly cemented, rootlets	1.3			1.2
1.5	5	SM	Alluvium, Silty SAND, light gray, slightly moist, moderately dense	2.5 5	94.0 99.5	4.9 2.7	
5	10	SP	Alluvium, Sand with silt, some gravel, trace cobbles				
			* Test Pit walls caved.				

Total Depth (ft): 10.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Subsurface Conditions

Based upon our review of pertinent geotechnical literature and our subsurface exploration, the site is underlain by native alluvial soil deposits (alluvium) generally mantled by surficial layers of uncontrolled artificial fill (with or without significant amounts organic material) and/or manure. The principal earth materials encountered in our test pits onsite are described below. Detailed descriptions of the earth materials encountered are presented in the test pit logs (Appendix B). For your convenience, the thicknesses of surficial materials (manure, organic-rich soil, and artificial fill without significant organic material) overlying the alluvium are depicted on the Geotechnical Map (Figure 2).

Manure

For purposes of this report, "manure" is defined as material considered to have a very high organic content by visual inspection or by laboratory testing (greater than 10 percent by weight). The term "manure" is used to identify materials such as pure manure, soil mixed with substantial amounts of manure, and peat. These materials are considered unsuitable for support of new improvements and for use as compacted fill.

The thickness of the manure onsite varies significantly over short distances. Within each of our test pits excavated within the livestock corrals and pens onsite (TP-1 through TP-11), a surface layer of manure on the order of 6 to 24 inches thick was encountered.

Within four of the test pits (TP-16, 18, 19, and 20) excavated in the southeastern quadrant of the site, the ground was covered by approximately 4 to 10 inches of manure (or soil containing substantial quantities of manure). In the other test pits (TP-12 through 15 and 17) in this area we did not encounter manure. Thus, it appears that manure irregularly covers this portion of the site.

Manure (or organic-rich material) is expected to be present within the pond areas of the site. However, due to the presence of water, we could not determine the thickness of the organic-rich material in the ponds. Based on our experience at similar sites, this organic material is often on the order of 1 to 3 feet in thickness. However, it could be thicker.

The berms and stockpiles onsite within the southern portion of the site were observed to have significant quantities of manure, organic material, vegetation, trash, and debris. These berms and stockpiles are considered unsuitable for use as compacted fill.

Organic-Rich Soil

For purposes of this report, "organic-rich" soil is defined as soil that contains at least 3 percent but less than 10 percent organic content by weight or contains visible organic material by inspection. Organic-rich soil has significantly less organic content than "manure" (as defined above). The organic-rich soil encountered onsite is generally surficial uncontrolled artificial fill. We assume that the organic-rich fill soil was placed during minor grading operations performed by the dairy operator over the years to level areas, or it was created in the process of cleaning up the pen areas. In addition, portions of the southeastern area of the site contained very shallow organic-rich tilled soil (as discussed below). The thickness of the onsite organic-rich soil varies significantly over short distances.

Over half of the test pits (TP-6 through 10) excavated in the cattle pen areas (northern portion) of the site encountered organic-rich soil below the surficial layer of manure. The organic-rich soil in these areas ranged from approximately 3 to 18 inches in thickness.

Most of the test pits (6 out of 9 test pits) in the southern and eastern portions of the site encountered organic-rich soil. This organic-rich soil ranged from 4 to 36 inches in thickness. This soil appears to be either tilled soil (generally on the order of ½ foot) or uncontrolled artificial fill (up to 36 inches in thickness).

Uncontrolled Artificial Fill Without Significant Organic Content

For purposes of this report, soil without significant organic content is defined as soil that contains less than 3 percent organic content by weight and appears to be void of organic material by visual inspection. Uncontrolled fill soil without significant organic content was encountered in one-forth of our test pits across the site (TP-1, 11, 14, 16, and 19) and ranged in thickness from approximately 8 to 18 inches. This soil was generally covered by either manure or organic-rich soil, and in all cases where it was encountered, this artificial fill was directly on top of alluvial soil.

The dairy operator indicated that feeding and watering areas in cattle pens are covered by crushed rock/gravel approximately 3 feet thick. This gravel was placed to alleviate muddy conditions that frequently occurred in those areas. However, due to the presence of buried water lines, we were not able to excavate test pits in those areas.

Alluvium

Based upon our review of pertinent geotechnical literature and our subsurface explorations, the site is underlain by younger alluvial soil deposits (alluvium) mantled by uncontrolled artificial fill or manure (as discussed above). Based upon our field investigation, the alluvial soils generally consist of silty sand, sand and silt. The allüvium is generally slightly moist to moist and loose in the near-surface, becoming moderately dense at depths ranging from 4 to 5 feet. The alluvium in the upper 5 feet typically had moisture contents on the order of 2 to 19 percent. Two representative samples tested during this investigation had optimum moisture contents of 9.5 and 12.5 percent.

Dairy Ponds

Several dairy ponds are present on the south side of the site. The ponds are used to detain dairy rinse wastewater and rain runoff. As discussed above, manure (or organic-rich material) is expected to be present within the ponds. However, due to the presence of water, we could not determine the thickness of the organic-rich material in the ponds. Based on our experience at similar sites, this organic-rich material is often on the order of 1 to 3 feet in thickness, but could be thicker.

In addition, loose, saturated soils are probably present below the ponds onsite. The depth of loose soils in these areas is unknown at this time and should be reviewed during a future geotechnical investigation.

Groundwater

Groundwater was not encountered during our field investigation to a maximum depth of 10 feet below the ground surface. During 1997, the local groundwater table was approximately 180 feet below the ground surface (Wildermuth, 1997). During 1933 and 1960, the local groundwater level was approximately 120 and 150 feet below the ground surface, respectively (CDWR, 1970). Circa 1904, groundwater was on the order of 80 to 90 feet below the ground surface (Mendenhall, 1908); this is expected to be the historically highest groundwater level at the site.

Faulting and Seismicity

Our review of available in-house literature indicates that there are no known active or potentially active faults that traverse the site, and the site is not located within an Alquist-Priolo Earthquake Fault Zone. The principal seismic hazard that could affect the site is ground shaking resulting from an earthquake occurring along several major active or potentially active faults in southern California. The known regional active and potentially active faults that could produce the most significant ground shaking at the site include the Chino-Central Avenue, Cucamonga, Sierra Madre, Whittier, Elsinore, and San Jose faults.

Peak Horizontal Ground Accelerations (PHGA) for the site were estimated using a deterministic seismic hazard analysis, based on currently available earthquake and fault information. The deterministic analysis computes the site PHGA that could be expected to result from an earthquake on a specific fault using the estimated maximum magnitude earthquake event. PHGA's were estimated using the EQFAULT computer program (Blake, 2000), based on the attenuation relationship by Sadigh et al. (1997). Based on the analysis, the Chino-Central Avenue fault is potentially capable of producing the greatest PHGA at the site, due to its proximity, fault type, and estimated maximum earthquake magnitude of 6.7 (M_W). It is estimated that such an earthquake on this fault near the site could produce seismic shaking with a PHGA of 0.34g.

Design of the development in accordance with current UBC requirements will reduce the impact of seismic shaking on the site improvements. UBC seismic parameters for the site are as follows:

1997 UBC Seismic Parameters:	
Seismic Zone:	4
Soil Profile Type:	S_D
Seismic Sources	
Cucamonga Fault:	Type A; 16 km from site
Chino-Central Avenue Fault:	Type B; 11 km from site
Near Source Factor, N_a:	1.0
Near Source Factor, N_v:	1.0

Secondary Seismic Hazards

Liquefaction Potential

Liquefaction is a phenomenon in which loose, saturated, granular soils temporarily behave similarly to a fluid when subjected to high intensity ground shaking. Liquefaction occurs when three general conditions exist: 1) shallow groundwater, 2) low-density silty or fine sandy soils, and 3) high intensity ground motion. The site is not located in an area mapped as potentially liquefiable in the San Bernardino County Official Land Use Plan for the Guasti quadrangle (San Bernardino County Planning Department, 1994). In addition, regional groundwater maps indicate that shallow groundwater conditions do not currently exist, nor have they existed historically (as discussed above). As such, the site is not considered potentially susceptible to liquefaction.

Seismically Induced Settlement

Seismically induced settlement generally occurs in either saturated or unsaturated loose sand deposits subjected to earthquake shaking. It is our experience that the soils in this area are not generally susceptible to significant seismically induced settlement due to their relatively dense nature at depth. However, additional geotechnical investigation and analysis will be required to further evaluate the potential for seismically induced settlement.

Expansive Soils

Based upon our field observations, the near-surface soils are expected to have a low to very low expansion potential. As such, expansive soils are not expected to have an adverse impact on the planned development. Additional testing will be required during a future geotechnical investigation at the site.

Soluble Sulfates

Water-soluble sulfates in soil can react adversely with concrete. However, concrete structures in contact with soils containing sulfate concentrations of less than 0.10 percent are considered to have negligible sulfate exposure (UBC, 1997 edition, Chapter 19).

Two representative, near-surface soil samples tested for soluble sulfates during this investigation had a soluble sulfate content of less than 0.02 percent by weight, indicating negligible sulfate exposure. Based on these results, Type II cement should be adequate. Additional testing will be required during subsequent geotechnical studies.

Resistivity and pH

Soil corrosivity to ferrous metals can be estimated by the soil's pH level, electrical resistivity, and chloride content. In general, soil having a minimum resistivity under 1,000 ohm-cm is considered severely corrosive, and soil with a chloride content of 500 ppm or more is considered corrosive to ferrous metals.

As a screening for potentially corrosive soil, two representative soil samples were tested during this investigation to determine minimum resistivity, chloride content, and pH level. The minimum soil resistivity of the samples ranged from 540 to 2550 ohm-cm, the chloride content ranged from 134 to 461 ppm, and the pH level ranged from 5.1 to 9.6. Based on these results, the onsite soils are expected to be severely corrosive to ferrous metals. Consultation with a corrosion engineer may be warranted to provide recommendations to protect improvements in contact with the soil.

CONCLUSIONS AND RECOMMENDATIONS

General Conclusion

Based upon our review, development of the site appears to be feasible from a geotechnical standpoint. Geotechnical constraints to development are present and include compressible soils, the possibility for methane in the soil, corrosive soils, and the potential for high levels of seismic shaking. These conditions are common for this area and do not typically present unusual constraints for development. Good planning and design of the project can limit the impact of these constraints.

Organic and Compressible Soils

We anticipate that the most significant geotechnical condition at the site that will impact the proposed development is the presence of compressible surficial soils. As discussed above, much of the site is covered by manure and/or organic-rich soils. In addition, the berms and stockpiles onsite have significant quantities of manure, organic-rich soil, vegetation, trash, and debris. Organic material is compressible and is prone to settlement as it decomposes over time. For this reason, manure and organic-rich soil are considered unsuitable for support of new improvements and for use as compacted fill.

We anticipate that the manure, stockpiles, and berms onsite, and highly organic material within the dairy ponds will require complete removal and disposal offsite.

In addition, the organic-rich soil onsite (soil with an organic content of 3 to 10 percent by weight) will require removal and should not be used as structural fill for the project. This material must be disposed of offsite or in nonstructural open areas, such as park sites or greenbelts.

As noted, the thickness of the onsite manure and organic-rich soil varies significantly over short distances. The actual removals will be determined during grading. When estimating removal quantities, we suggest including a contingency for unexpected removals. On similar sites, we have encountered buried trash and manure during grading that was not found during preliminary investigations. A contingency should also be included to account for clean soil that is inadvertently removed with manure or organic-rich soil. Removal and disposal of manure and organic-rich soil should be monitored by Leighton during grading. Additional organic content testing should be performed during grading to guide disposal operations.

Uncontrolled artificial fill (without significant organic content) and the near-surface native alluvial soil are also compressible. In general, removal and recompaction of these soils will be required in

Test Pit TP-13

Location: See Geotechnical Map

Depth		Soil	Description	Test Results			
Top (ft)	Bottom (ft)	Symbol (USCS)		Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.7	SM	Tilled Soil, Silty SAND, light gray, dry, cemented, rootlets, some organics				
0.7	3	SM	Alluvium, Silty SAND, light gray, slightly moist, loose, becoming sandier at 2'	1.0			1.4
				3	87.5	5.7	
3	5	SM/SP	Alluvium, Silty SAND to SAND, tan, moist. loose to moderately dense	5	83.6	16.8	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-14

Location: See Geotechnical Map

Depth		Soil	Description	Test Results			
Top (ft)	Bottom (ft)	Symbol (USCS)		Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	1.5	SM	Alluvium/Fill, Silty SAND, light gray, dry at the top, loose	1-1.5			1.7
1.5	3	SM	Alluvium, Silty SAND, light gray, moist, loose				
3	5	ML	Alluvium, grades to Sandy SILT, light gray, moist, loose to moderately dense				

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-15

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	3		Fill with organics, Silty SAND, brown, moist, lenses of organic material				
3	5	SM	Alluvium, Silty SAND, light olive gray, very moist, loose to moderately dense				

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-16

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.3	SM	Tilled Soil with manure, Silty SAND, gray, dry, rootlets	0-0.5			9.9
0.3	1	SM	Fill, Silty SAND, dry, light gray, cemented, trace organics				
1	3	ML	Alluvium, Sandy SILT, light olive gray, stiff, slightly moist, porous	2.5			1.7
				3	96.4	5.1	
3	5		Alluvium, Sandy SILT, tan, moist, stiff	5	92.9	7.7	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-17

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.3		Tilled Soil, Silty SAND, gray, some organics				
0.3	3	SM	Alluvium, Silty SAND, light gray, slightly moist, loose				

Total Depth (ft): 3
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-18

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.5		Soil with manure, tilled, dark brown, dry, rootlets				
0.5	2.7	SM	Fill, Silty SAND, light brown, dry, loose, organics	2-2.5			4.7
2.7	3.5	ML	Alluvium, Sandy SILT, light olive-gray, slightly moist, very stiff, slightly porous	2.5	97.6	5.5	
3.5	5	SM	Alluvium, Silty SAND, tan, moist, loose to moderately dense	5	94.4	5.7	

Total Depth (ft): 5.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

Test Pit TP-19

Location: See Geotechnical Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.7		Tilled Soil/Manure, dark brown, dry, very loose				
0.7	1.5	SM	Fill, Silty SAND, light brown, slightly moist, some oraganics	1.0			2.3
1.5	3.5	SM	Alluvium, Silty SAND, light brown, moist, medium dense	3	100.4	9.2	
3.5	7		Sandier	5	96.6	8.3	
7	10	ML	Alluvium, Sandy SILT/Silty SAND, light gray, moist, moderately dense				

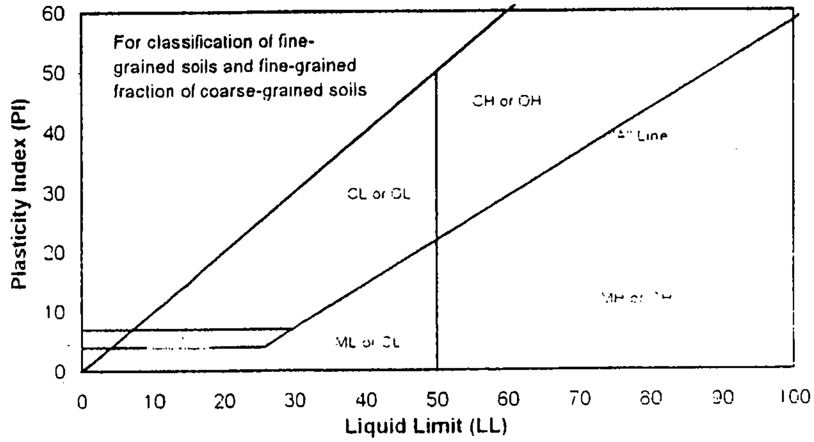
Total Depth (ft): 10.0
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.

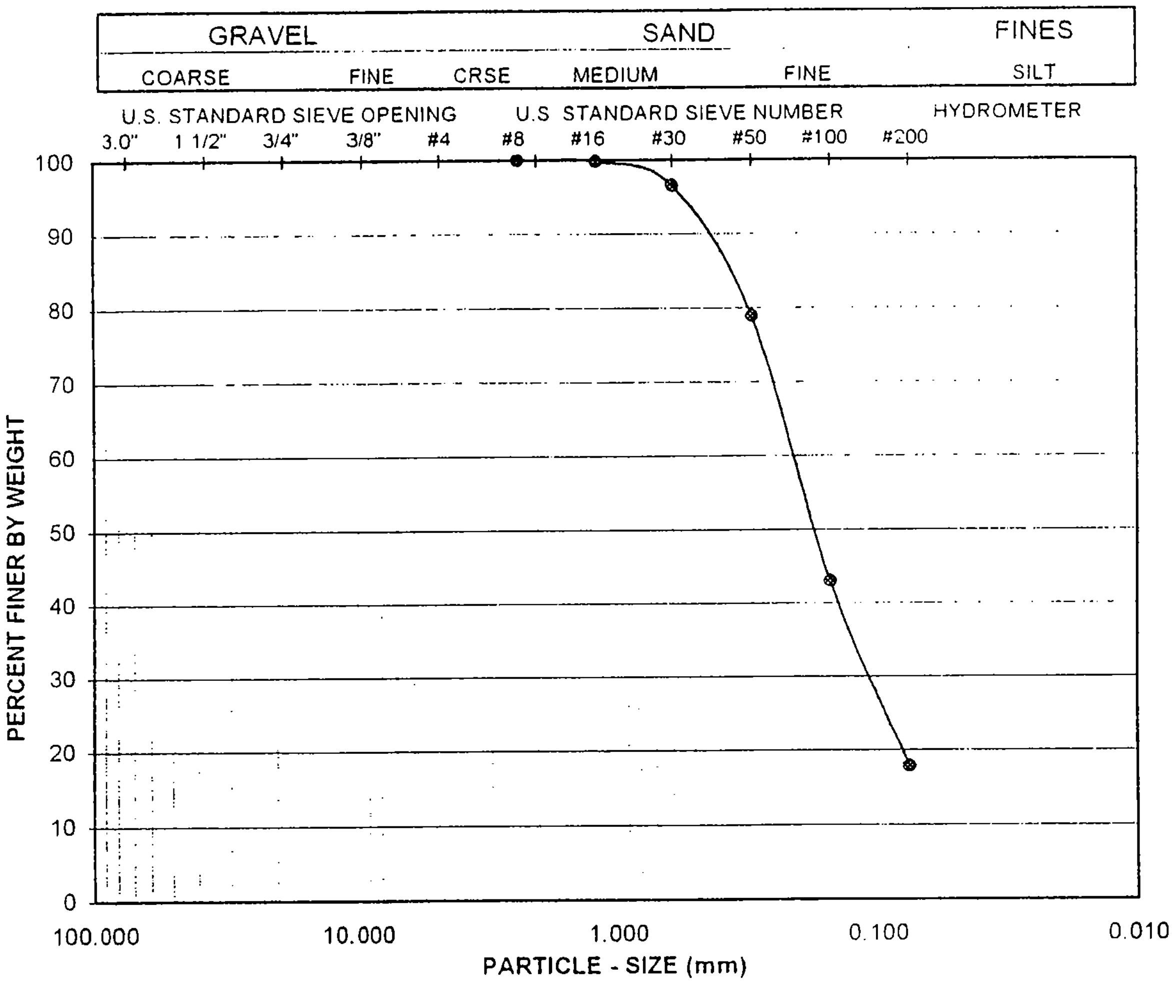
Test Pit TP-20

Location: See Test Pit Location Map

Depth Top (ft)	Depth Bottom (ft)	Soil Symbol (USCS)	Description	Test Results Depth (ft)	Dry Dens. (pcf)	Moisture Cont. (%)	Organic Cont. (%)
0	0.8	SM	Tilled Soil with manure, Silty SAND, dark brown, dry, very loose, rootlets				
0.8	2.5	SM	Fill, Silty SAND, tan, slightly moist, very loose, trace of manure, rootlets	1.0			4.7
2.5	4.5	SM	Alluvium, Silty SAND, tan, slightly moist, loose to moderately dense, no organics	2.8			1.6
				3	89.5	6.7	
				4.5	92.2	8.7	

Total Depth (ft): 4.5
No ground water encountered.
Test pit backfilled, tamped with bucket, wheel rolled at surface.





Boring No.:	Sample No.:	Depth (ft.):	Soil Type	GR:SA:FI	LL.PL.PI
TP-4	SB-1	1.2	SM	0 : 82 : 18	,N/A,

Project No.: 020796-001

Centex / Ontario

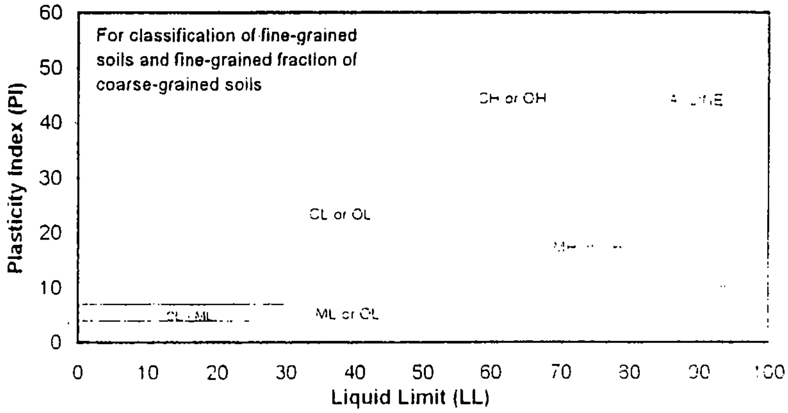
Visual Sample Description:

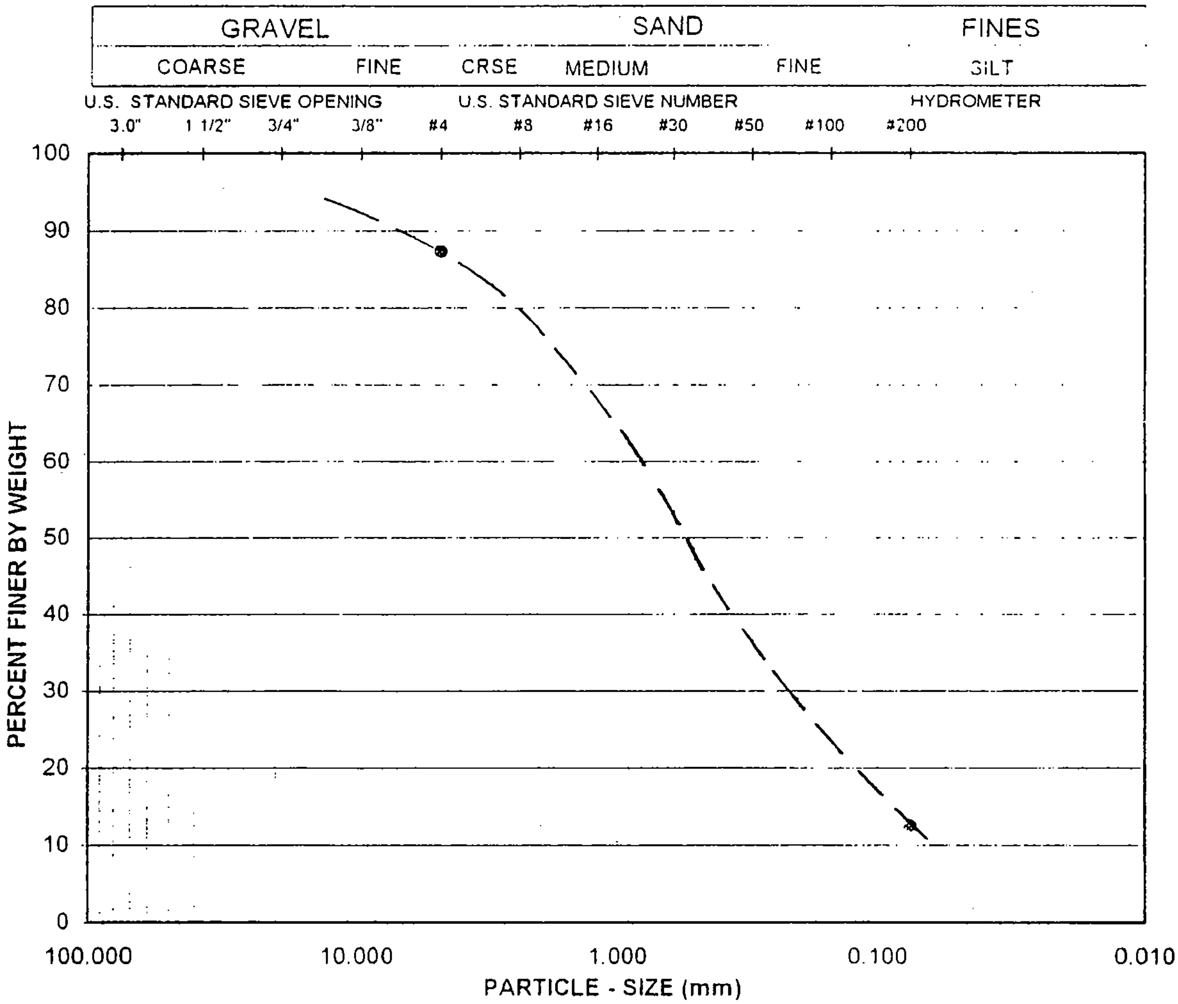
Yellowish brown silty sand (SM)

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

SA TP-4 SB-1.xls





Borehole No.	Sample No.	Depth (ft.)	Soil Type	GR:SA:FI (%)	LL,PL,PI
TP-1	Bag 1	5-6	SP-SM	13:75:12	N/A

Sample Description:

Pale olive poorly graded sand with silt (SP-SM)

Project No.: 020796-001

Centex / Ontario

ATTERBERG LIMITS, PARTICLE - SIZE CURVE

ASTM D 4318, D 422

Boring No.	TP-6	TP-20				
Sample No.	SB-1	Bag 1				
Depth (ft.)	2.5	4.5				
Sample Type	S. Bag	Bulk				
Visual Soil Classification	Olive brown silty sand (SM)	Yellowish brown silty sand (SM)				
Moisture Correction						
Wet Weight of Soil + Container (gm.)	198.58	174.37				
Dry Weight of Soil + Container (gm.)	193.76	168.98				
Weight of Container (gm)	55.93	58.18				
Moisture Content (%)	3.50	4.86				
Container No.:						
Sample Dry Weight Determination						
Weight of Sample + Container (gm.)	272.80	363.25				
Weight of Container (gm.)	76.79	75.03				
Weight of Dry Sample (gm.)	189.39	274.85				
Container No.:						
After Wash						
Dry Weight of Sample + Container (gm)	240.46	294.83				
Weight of Container (gm)	76.79	75.03				
Dry Weight of Sample (gm)	163.67	219.80				
% Passing No. 200 Sieve	**13.6**	**20.0**				
% Retained No. 200 Sieve	86.4	80.0				

L&A

PERCENT PASSING No. 200 SIEVE
ASTM D 1140

Project Name: Centex / Ontario
Project No.: 020796-001
Client Name: L & A / Irvine
Tested By: VJ

COMPACTION TEST

ASTM D 1557

Leighton and Associates, Inc.

Project Name:	Centex/Ontario	Tested By :	JRS
Project No.:	020796-001	Calculated By :	MTR
Boring No.:	TP-1	Depth (ft.)	5-6'
Sample No. :			

Visual Sample Description: Brown sand

Preparation Method: Moist / X Dry — X Mechanical Ram / Manual Ram

Mold Volume (ft ³) 0.03322 — *Ram Weight 10 LBS Drop 18 inches*

TEST NO.		1 (+0%)	2 (+2.5%)	3 ('+5%)	4 (+7.5%)	5 (+10%)	6
Wt. Comp. Soil + Mold	(gm.)	3477.0	3521.0	3571.0	3648.0	3680.0	
Wt. of Mold	(gm.)	1803.0	1803.0	1803.0	1803.0	1803.0	
Net Wt. of Soil	(gm.)	1674.0	1718.0	1768.0	1845.0	1877.0	
Wet Wt. of Soil + Cont.	(gm.)	431.80	494.60	509.80	493.90	499.90	
Dry Wt. of Soil + Cont.	(gm.)	417.70	467.60	471.90	447.60	445.10	
Wt. of Container	(gm.)	49.50	52.50	51.40	52.40	53.80	
Moisture Content	(%)	3.83	6.50	9.01	11.72	14.00	
Wet Density	(pcf)	111.1	114.0	117.3	122.4	124.6	
Dry Density	(pcf)	107.0	107.0	107.6	109.6	109.3	

Maximum Dry Density (pcf) 110.0 **Optimum Moisture Content (%)** 12.5

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + #4 > 20% and + 3/8 " < 20%

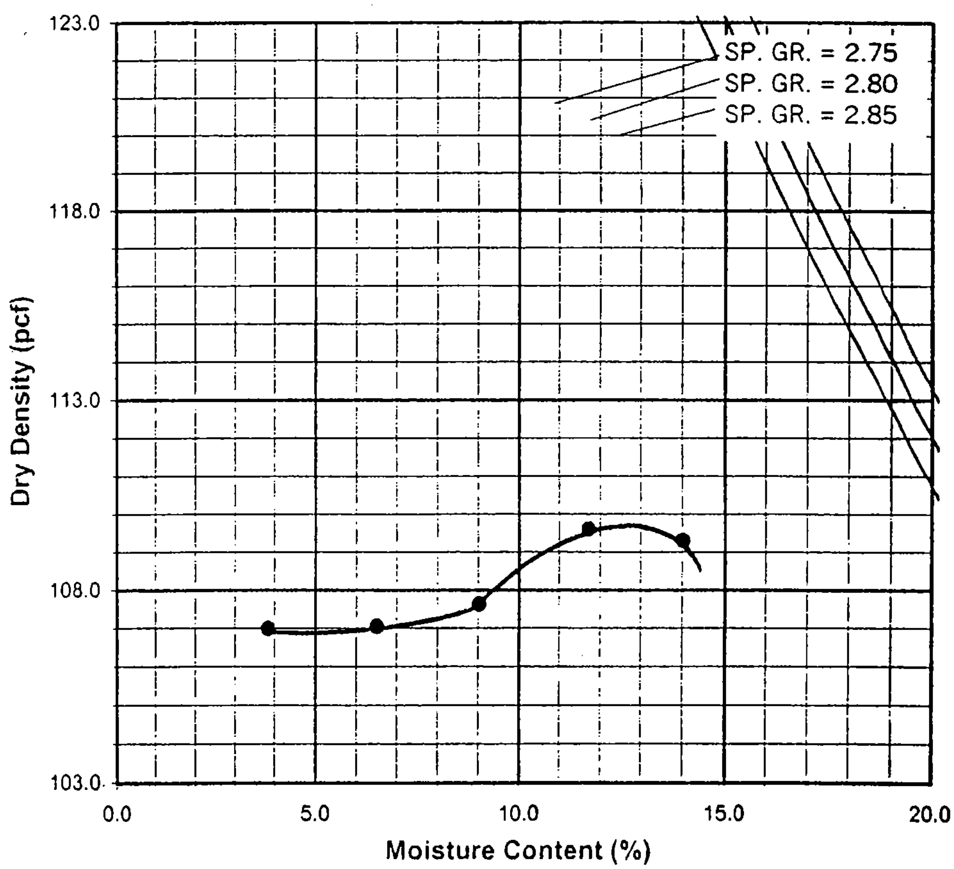
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + ¾ in <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



Mx Ip-1

COMPACTION TEST

ASTM D 1557

Leighton and Associates, Inc.

Project Name:	Centex Ontario	Tested By :	MR/JS
Project No.:	020796-001	Calculated By :	MTR
Boring No.:	TP-20	Depth (ft.)	4.5'
Sample No. :	Bag 1		

Visual Sample Description: Brown si sand

Preparation Method: **Moist** / X **Dry** — X **Mechanical Ram** / **Manual Ram**

Mold Volume (ft ³) 0.03322 — *Ram Weight 10 LBS Drop 18 inches*

		+0%	+2.5%	+5%	+7.5%		
TEST NO.		1	2	3	4	5	6
Wt. Comp. Soil + Mold	(gm.)	3678.0	3765.0	3818.0	3788.0		
Wt. of Mold	(gm.)	1803.0	1803.0	1803.0	1803.0		
Net Wt. of Soil	(gm.)	1875.0	1962.0	2015.0	1985.0		
Wet Wt. of Soil + Cont.	(gm.)	396.30	406.20	511.00	562.20		
Dry Wt. of Soil + Cont.	(gm.)	379.30	381.20	468.80	504.50		
Wt. of Container	(gm.)	51.90	54.60	54.80	51.80		
Moisture Content	(%)	5.19	7.65	10.19	12.75		
Wet Density	(pcf)	124.4	130.2	133.7	131.7		
Dry Density	(pcf)	118.3	120.9	121.4	116.8		

Maximum Dry Density (pcf) 122.5 **Optimum Moisture Content (%)** 9.5

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + #4 > 20% and + 3/8 " < 20%

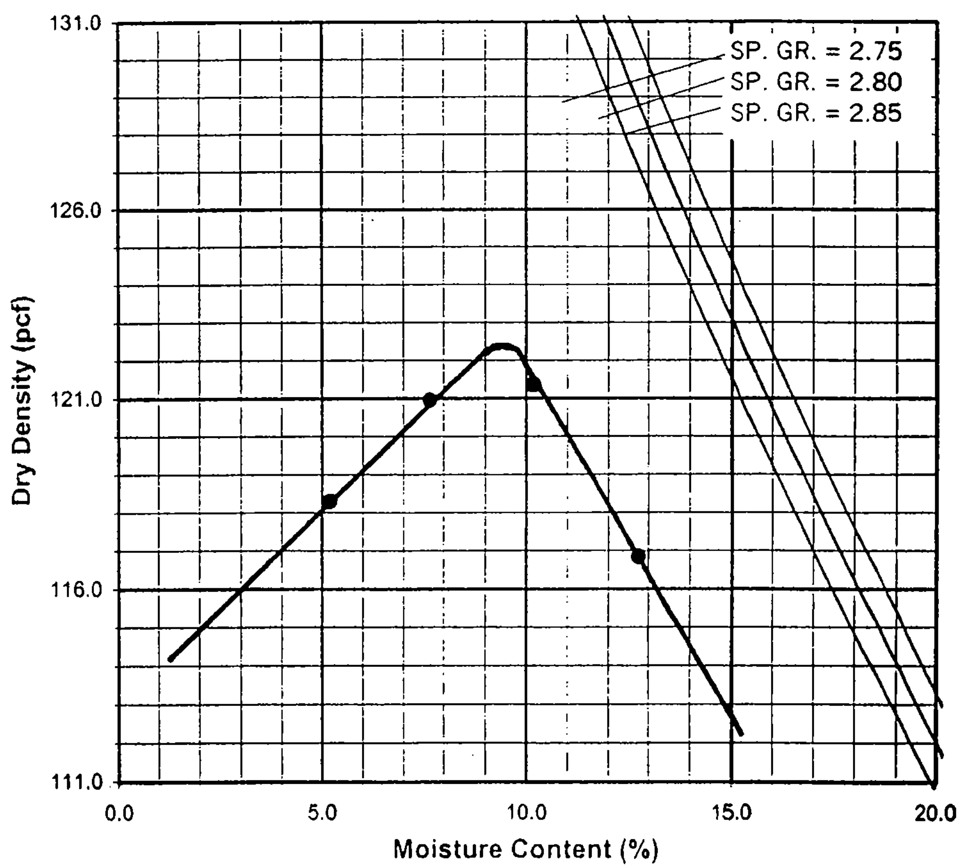
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + ¾ in <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



MX TP-20 Bag-1

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

Project Name: Centex / Ontario
Project No. : 020796-001
Boring No.: TP-7
Sample No. : Bag 1
Visual Soil Identification: SP

Tested By : VJ
Data Input By: LF
Checked By: LF
Depth (ft.) : 2-5

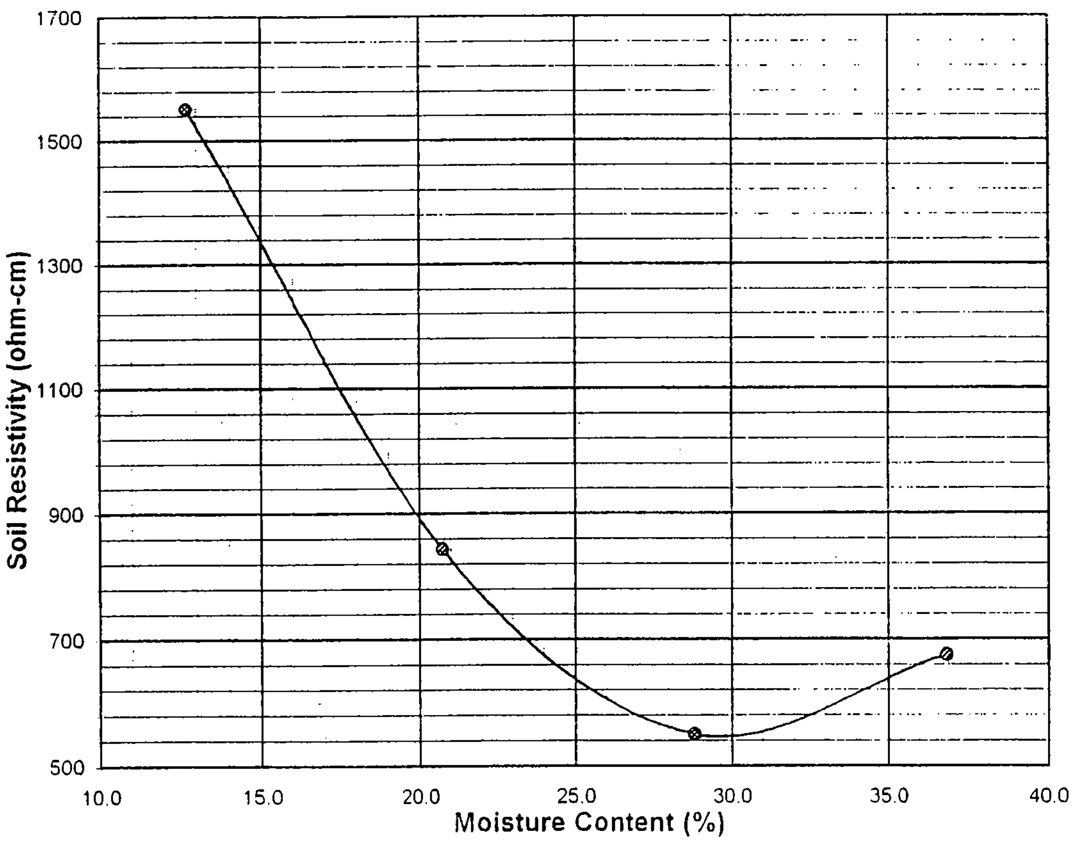
Initial Moisture Content (%)

Wet Wt. of Soil + Cont. (gm.)		141.58
Dry Wt. of Soil + Cont. (gm.)		137.57
Wt. of Container	(gm.)	51.28
Moisture Content (%)	(MCi)	4.65

Initial Soil Weight (gm)(Wt)	1300.00
Box Constant:	6.7460

MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100

Remolded Specimen		Moisture Adjustments			
Water Added (ml)	(Wa)	100	200	300	400
Adj. Moisture Content	(MC)	12.70	20.75	28.80	36.85
Resistance Rdg. (ohm)		230	125	82	100
Soil Resistivity (ohm-cm)		1552	843	550	675



Minimum Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532/643
540	29.5	186	461	9.61 @ 22.3 °C

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

Project Name: Centex / Ontario
Project No. : 020796-001
Boring No.: TP-14
Sample No. : Bag 1
Visual Soil Identification: SM

Tested By : VJ
Data Input By: LF
Checked By: LF
Depth (ft.) : 5.0

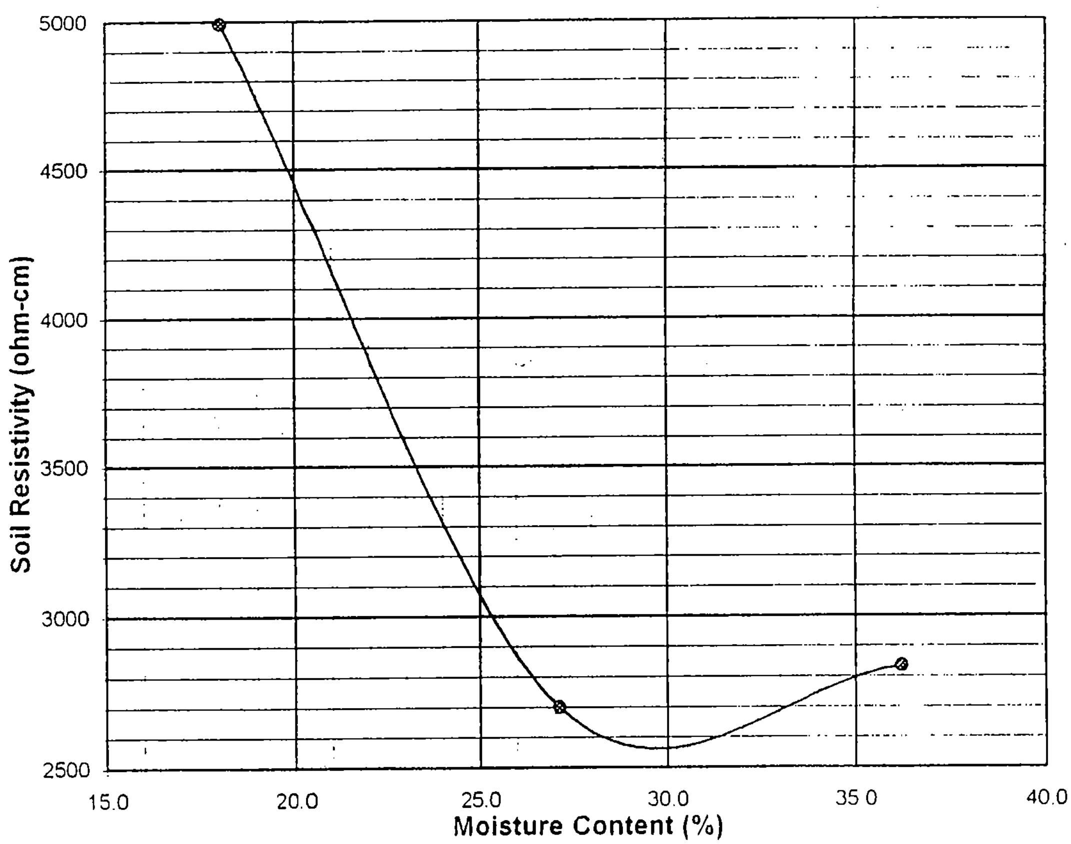
Initial Moisture Content (%)

Wet Wt. of Soil + Cont. (gm.)	209.80
Dry Wt. of Soil + Cont. (gm.)	183.17
Wt. of Container (gm.)	35.66
Moisture Content (%) (MCi)	18.05

Initial Soil Weight (gm)(Wt)	1300.00
Box Constant:	6.7460

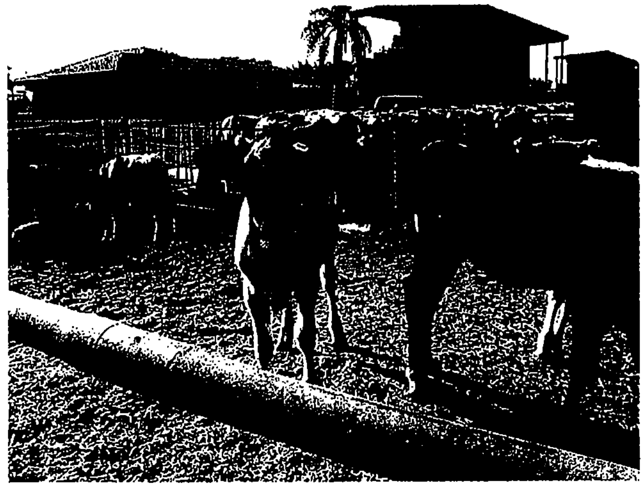
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100

Remolded Specimen	Moisture Adjustments		
Water Added (ml) (Wa)	0	100	200
Adj. Moisture Content (MC)	18.05	27.13	36.22
Resistance Rdg. (ohm)	740	400	420
Soil Resistivity (ohm-cm)	4992	2698	2833



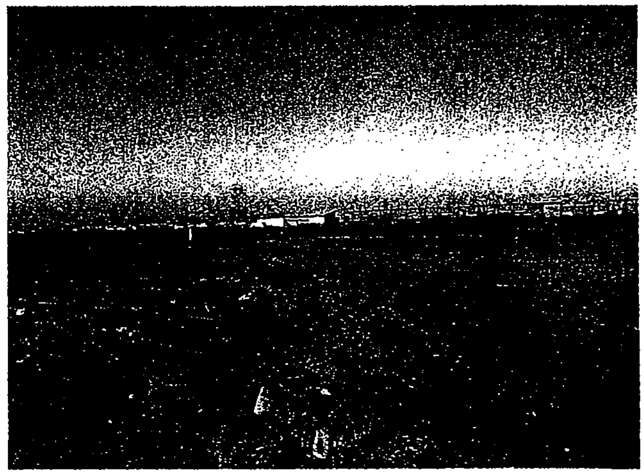
Minimum Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532/643
2550	29.7	**90**	**134**	**5.09 @ 22.7 °C**

(a)



(b)

(c)



(d)

(e)

Description:

a) Typical dairy corral scene looking north
b) Typical dairy corral scene looking south
c) Dairy corral scene with backhoe used to excavate geotechnical test pits
d) Eastern portion of site looking west
e) Test pit excavated within dairy corral. (Note darker color of manure at surface.)

Appendix D
Selected Site Photographs

Proposed 26-Acre Residential Development, Southwest of Riverside Drive and Haven Avenue, City of Ontario, California

Project No.: 020796-001
Date: 11-2002

Figure D1

(a)

(b)

(c)

(d)

(e)

Description:

a) Easternmost portion of the site looking south.
b) Typical stockpile with a significant quantity of manure on the southern portion of the site.
c) Same
d) Same
e) Same. Note significant debris.

Appendix D (continued)
Selected Site Photographs

Proposed 26-Acre Residential Development, Southwest of Riverside Drive and Haven Avenue, City of Ontario, California

Project No.: 020796-001
Date: 11-2002

Figure D2

(a)

(b)

(c)

(d)

(e)

Description:

a) Eastern portion of the site looking west.
b) Southeastern portion of the site showing one of the dairy ponds.
c) A muddy area where rinse water is discharged into the dairy ponds.
d) A dry pond for runoff in the southwestern corner of the site.
e) Same.

Appendix D (continued)
Selected Site Photographs

Proposed 26-Acre Residential Development,
Southwest of Riverside Drive and Haven Avenue,
City of Ontario, California

Project No.: 020796-001
Date: 11-2002

Figure D3

APPENDIX E

LEIGHTON AND ASSOCIATES, INC.

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

Table of Contents

1.0 General

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record: Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the gectechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The

Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan. soft. loose. dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General: Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope. unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Safety: The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill: All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.3 Lift Thickness: Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.4 Observation and Testing: The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

work 9 JMS orig. soils

LOR GEOTECHNICAL GROUP, INC.
Soil Engineering ▲ Geology ▲ Environmental

ENGINEERING GEOLOGIC AND SOILS FOUNDATIONS INVESTIGATION MINABERRY TRUST PROPERTY APN 218-151-19, 23 SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO. 31396.1
SEPTEMBER 15, 2000

Prepared For:

JMS Turner, LLC
P.O. Box 10757
Costa Mesa, California 92627

Attention: Mr. Jim Fahs

6121 Quail Valley Court ▲ Riverside, CA 92507 ▲ (909) 653-1760 ▲ Fax (909) 653-1741

LOR GEOTECHNICAL GROUP, INC.
Soil Engineering ▲ Geology ▲ Environmental

September 15, 2000

JMS Turner, LLC
P.O. Box 10757
Costa Mesa, California 92627

Attention: Mr. Jim Fahs

Gentlemen:

Transmitted with this letter is our report entitled Engineering Geology and Soils Foundation Investigation, Acre Minaberry Trust property, APN 218-151-19, 23 San Bernardino County, California, prepared for JMS Properties, Project No. 31396.1.

This report was based upon a scope of services generally outlined in our proposal letter dated August 17, 2000 and other written and verbal communications.

It has been our pleasure assisting you on this project. If you have any questions or comments concerning the information in this report, please contact us.

Respectfully submitted,
LOR Geotechnical Group, Inc.

John P. Leuer, GE
President

JPL:qam

Distribution: Addressee (6)

TABLE OF CONTENTS

INTRODUCTION

During August and September of 2000, an Engineering Geologic and Soils Foundation Investigation was performed by LOR Geotechnical Group, Inc. for the proposed Minaberry Trust property site located east of Turner Avenue and north of Schaefer Avenue, in the unincorporated San Bernardino County area just southeast of the City of Ontario, California. The site is composed of two separate parcels each about 20 acres in size. These are referred to by the APN 218-151-19, and 23.

The purpose of this investigation was to provide a technical evaluation of the geologic setting of the site and to provide geotechnical design recommendations for the proposed residential development. The scope of our services included:

- Review of available pertinent geotechnical literature, reports, maps, and agency information pertinent to the study area;
- Interpretation of stereo aerial photograph pairs of the site and surrounding regions dated 1962 through 2000;
- Geologic field reconnaissance mapping to verify the areal distribution of earth units and significance of surficial features as compiled from documents, literature and reports reviewed,
- A subsurface field investigation to determine the physical soil conditions pertinent to the proposed development;
- Laboratory testing of selected soil samples obtained during the field investigation;
- Development of geotechnical recommendations for site grading and foundation design; and
- Preparation of this report summarizing our findings, and providing conclusions and recommendations for site development.

The approximate location of the site is shown on the attached Index Map, Enclosure A-1 within Appendix A.

PROJECT CONSIDERATIONS

At the time of our investigation no development or grading plans were available for the site. However it is our understanding that the site is proposed to be developed with the construction of a large tract of homes for single family residences. The structures are anticipated to be wood frame and stucco or of similar type construction. Light to moderate foundation loads are anticipated with such structures. Grading of interior streets are anticipated along with the widening of Turner Avenue along the west.

To orient our investigation at the site, a 200-scale Survey Boundary Map, prepared by L.D. King Inc., was furnished for our use. As noted on this plan, the site is relatively planar, falling to the south, with about 15 feet of relief across the site. Therefore minimal cuts and fills are anticipated during grading of the site to create level pads for development.

EXISTING SITE CONDITIONS

The subject site consist of two, 20 acre, parcels of land located at the far southern terminus of Turner Avenue, just outside of the city of Ontario. The dimensions of the two parcels are rectangular, each one about 667 feet by 1320 feet. Therefore the entire parcel is a square 1320-feet by 1320-feet. At the time of our visit the site had a dense covering of sticker "tumbleweed" brush and weeds. These were from 3 to 6 feet high. Running north and south there were six rows of old grapevine plants. Sand was piled up between these plants creating a series of north south wind rows which were about 3 feet high. Along the far northeast corner of the site the ground was slightly higher, about 6 feet, in what appeared to be an old sand dune. Due to the dense covering of brush, the majority of the site was difficult to observe for low lying structures, such as possible agricultural lines, groundwater wells, etc. However no structures were observed on the site with the exception of two Edison high power lines, one along the south and one along the east property line. On the far southeast corner of the site there were two large Edison towers, with one additional tower noted on the far north east corner of the site. There was a small east-west dirt road crossing the center of the site, at the junction of the two parcels. A small amount of trash, containing wood, concrete, and old tiles, was noted dumped along this dirt road. In addition a small amount of "end-dumped" construction trash was noted on the site along the south end of Turner Avenue.

The site is bordered on the north by the backyards of a series of residential homes, and a small nursery on the far northeast. The nursery was situated under the Edison easement north east of the site. The areas across Turner avenue, west of the site, was occupied by a similar tract of residential homes. South of the site was a large dairy, with a residential home located just south of the site southwest corner, a large milking barn just east of the residence, and barns and cattle stock yards south and east of the barn. Another similar dairy was located adjacent the site on the eastern property line. There were two very large ponds, each about 150 feet in diameter, associated with this dairy. One of these was adjacent the southeastern corner of the site, with the other pond adjacent the northeast corner. These appeared to be facilities designed to capture run-off water from the dairy and hold the water. These did not appear to be lined. Therefore water would be allowed to infiltrate into the subsurface, and most likely flows below the subject site in this area.

AERIAL PHOTOGRAPH ANALYSIS

During the course of this study, an analysis of time-sequential stereoscopic aerial photograph pairs of the site and surrounding region, on file at the Riverside County Flood Control District were reviewed. Stereoscopic aerial photograph pairs of the site and surrounding region dating from 1962 to January of 2000 were examined. A complete list of the photographs studied is given in the reference at the back of this report. No unusual features were noted in these photographs. In the 1962 photographs, the southern portion of the site was covered with grape vineyards. The remainder of the site had faint indications of vineyards. This may indicated that a large portion of the grapes were inundated with wind blown sand at that time. In addition at this time there was a small dairy approximately 1/4 mile east of the site. The photographs from 1974 noted the entire site, along with much of the surrounding area had vineyards. Also by this time the site was bordered on the east and south by dairies. The dairy to the east of the site has two large ponds adjacent to the site, one just east of the northeast corner of the site and one adjacent the southeast corner of the site. These appear to have been excavated to trap and hold surface water run-off from the dairy. In the late 1980's and early 1990's the vineyards north and west of the site were removed and residential homes were constructed. In the January 2000 photographs the site had been cleared of the vineyards, with the exception of six, north-south, rows.

SUBSURFACE FIELD INVESTIGATION

Our subsurface field exploration program was conducted on August 24, and on September 6 of 2000. The work consisted of excavating 12 exploratory trenches using a tractor-mounted backhoe and drilling of four borings using a CME 55 truck mounted drill rig. The approximate locations of our exploratory trenches and borings are presented on the enclosed Plat, Enclosure A-2, within Appendix A.

Logs of the subsurface conditions encountered in the exploratory trenches and borings were maintained by an engineering geologist from this firm. The trenches were excavated to depths ranging from 15 feet to 16 feet below the existing ground surface. A total of 25 in-place density tests were taken in the trenches in accordance with ASTM D 2922, the Nuclear Density Method. Bulk samples of the encountered materials were obtained and returned to the laboratory in sealed containers for further testing and evaluation.

The borings were drilled to depths ranging from 16.5 feet to 51.5 feet below the existing ground surface. In-place samples of the various soils encountered were obtained from the borings at selected depths and returned to the laboratory in sealed containers for further testing and evaluation. In several of the exploratory trenches a finer grained, silty sand to sandy silt, layer was noted at depths ranging from 8 to 14 feet. Therefore continuous samples were taken in the borings from 5 to 15 feet were conducted using a split spoon sampler. A detailed description of the subsurface field exploration program and trench and boring logs are presented in Appendix B.

LABORATORY TESTING PROGRAM

Selected soil samples obtained during the field investigation were subjected to laboratory testing to evaluate their physical and engineering properties. Laboratory testing included moisture content, dry density, laboratory compaction, direct shear, gradation, sand equivalent, R-Value, consolidation, and soluble sulfate. A detailed description of the laboratory testing program and the test results are presented in Appendix C.

GEOLOGIC CONDITIONS

Regional Geologic Setting

The proposed 40± acre residential site is located near the far north end of the Peninsular Ranges Geomorphic Province of southern California. This province is characterized by a series of northwest trending low mountain ranges and intervening valleys that stretch from the Los Angeles basin south into Baja California. This province is bounded on the north by the Los Angeles Basin and the Transverse Ranges Province. This next province is characterized by a series of east-west trending mountains such as the San Gabriel Mountains which lie north of the site. The site is situated on the southern end of a large alluvial fan emanating from the eastern end of the San Gabriel Mountains approximately 11 miles to the north. This fan is composed of relatively young, unconsolidated sediments eroded from the mountains and deposited over much older sedimentary and crystalline rocks. The depth to these older rocks at the site was not determined during this investigation, but is anticipated to be on the order of several thousand feet or more.

The nearest known active earthquake fault in relation to the site is the Chino fault located approximately 11 kilometers (7 miles) to the west. Other faults in the region include the Whittier-Elsinore fault located approximately 15 kilometers (9 miles) to the southwest, the Cucamonga fault located near the base of the San Gabriel Mountains approximately 15 kilometers (11miles) to the north, the San Jacinto fault approximately 25 kilometers (10 miles) to the northwest, and the San Andreas fault located approximately 30 km (19 miles).

Site Geologic Conditions

As noted above, the subject site is underlain by a thick sequence of relatively unconsolidated alluvial sediments. Where encountered in our exploratory trenches and borings these typically consisted of a loose, dry, sandy topsoil layer, overlying relatively fine grained silty sand and sand. A thick layer of poorly graded sand was noted in many of the excavations across the site at depths from 4 to 7 feet. These upper soils were typically in-place in a loose to medium dense compacted state, becoming denser with depth. In addition, coarser grained sediments of silty sand to sand with gravel were noted at depths of greater than 14 feet in many of the excavations.

Consolidation testing conducted on samples of the fine grained soils indicated that these soils will be subject to normal consolidation when subjected to a surcharge load and inundate.

A long narrow mound of wind blown sand, approximately 6 to 8-feet tall was noted along the north east portion of the site. This mound was noted to be composed of very loose dry sand which caved easily.

Groundwater Hydrology

A search of local groundwater wells was conducted on the Cooperative Well Measuring Program database, coordinated by the Western Municipal water district. The nearest well on this database in references to the site lies just west of the site along Schaefer Avenue. The depth to groundwater was last measured in this well in spring of 1997 at a depth of 149 feet below the existing ground surface. Another well on this list is located approximately 1/4 south of site, just south of Edison Avenue. The depth to groundwater was last measured in this well in spring of 1997 at a depth of 135 feet below the existing ground surface. A third well was noted located approximately ½ mile north of the site off Haven Avenue. The depth to groundwater was last measured in this well in spring of 1997 at a depth of 157 feet below the existing ground surface.

Groundwater was not encountered in any of our exploratory trenches or borings which ranged in depth from 15 feet to 50. However the materials in trench number 7 were moist at a depth of 8.5 feet and a slight amount of seepage was noted in our trench number 8 at a depth of 9 feet. These two trenches were placed adjacent to and/or down-gradient from the two ponds on the adjacent dairies.

Based on the evidence above, the depth to the groundwater table underlying the subject site is anticipated to be on the order of 130 feet or greater. However the two dairy ponds located adjacent the site appear to percolate into subsurface of the far south eastern portions of the site, leaving these materials moist to wet.

Mass Movement

The site lies on a relatively flat surface with no adjacent highlands or other relief. The occurrence of mass movement failures such as landslides, rockfalls or debris flows within such areas are generally not considered a factor.

Faulting

There are no known active faults at the site. In addition, according to the Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California (DMG CD 2000-0003) the subject site does not lie within a current State of California Earthquake Fault Zone.

As previously mentioned, the closest known active fault is the Chino fault, which is a splay of the Whittier-North Elsinore fault zone, located approximately 11 kilometers (7 miles) to the west. The main splay of the Whittier-Elsinore fault is located approximately 15 km (9 miles) to the southwest. In addition, other known active earthquake faults in the region include the Cucamonga fault located near the base of the San Gabriel Mountains approximately 15 kilometers (11miles) to the north, the San Jacinto fault approximately 25 kilometers (10 miles) to the northwest, and the San Andreas fault located approximately 30 km (19 miles) to the northwest.

Historical Seismicity

In order to obtain a general perspective of the historical seismicity of the site and surrounding region a search was conducted for seismic events at and around the area within various radii. This search was conducted utilizing the historical seismic search program by EPI Software, Inc. This program conducts a search of a user selected cataloged seismic events database, within a specified radius and selected magnitudes, and then plots the events onto an overlay map of known faults. For this investigation the database of seismic events utilized by the EPI program was obtained from the Southern California Seismic Network (SCSN) available from the Southern California Earthquake Center. At the time of our search the data base contained data from January 1, 1932 through April 2000.

In our first search the general seismicity of the region was analyzed by selecting an epicenter map listing all events of magnitude 4.0 and greater, recorded since 1932, within a 100 kilometer (62 mile)radius of the site, in accordance with guidelines of the California Division of Mines and Geology. This map illustrates the regional seismic history of moderate to large events. As noted on Enclosure A-3, within Appendix A, the site lies within a relatively active region of southern California with numerous medium and larger sized events. Of these events, the closest was a magnitude 4.1 located approximately 4.0 kilometers (2.5 miles) to the southwest of the site.

In the second search, the micro seismicity of the area lying within a 20 kilometer (12 mile) radius of the site was examined by selecting an epicenter map listing events on the order of 0.0 and greater since 1975. In addition, only the "A" events, or most accurate events were selected. Caltech indicates the accuracy of the "A" events to be approximately 1 km. The results of this search is a map that presents the seismic history around the area of the site with much greater detail, not permitted on the larger map. The reason for limiting the events to the last 25 years on the detail map is to enhance the accuracy of the map. Events recorded prior the mid 1970's are generally considered to be less accurate due to advancements in technology. As noted on this map, Enclosure A-4, the San Jacinto system is clearly evident by a clustering of small events along a northwest trending lineament located just outside of the search area approximately 25 km to the northeast. While not as distinct, the Whittier Elsinore and Chino faults are conspicuous as a northwest trending lineation of small seismic events located southwest of the site. In addition to these events there is a distinct band of very small seismic events which begins near the site and extend off to the northeast ending just south of the mouth of Lytle Creek. While this very wide band nearly 3 to 5- km (2 -to 3 mile) is not known to be associated with any surface fault features, it may represent a buried fault.

In summary, the historical seismicity of the site entails numerous small to medium magnitude earthquake events occurring around the subject site, predominately associated with various known faults around the site. In addition, a relatively un-documented buried fault may underlie the region. While it is doubtful that this fault would be suspect of surface rupture, any future developments at the subject site should anticipate that moderate to large seismic events could occur very near the site.

Secondary Seismic Hazards

Other secondary seismic hazards generally associated with severe ground shaking during an earthquake include liquefaction, seiches and tsunamis, earthquake induced flooding, landsliding and rockfalls, and seismic-induced settlement.

Liquefaction. The potential for liquefaction generally occurs during strong ground shaking within fine-grained loose sediments where the groundwater is usually less than 50-feet. As the depth to current groundwater levels is in excess of 100 feet, the possibility of liquefaction at the site is considered nil.

Seiches/Tsunamis. The potential for the site to be effected by a seiche or Tsunamis (earthquake generated wave) is considered nil due to absence of any large bodies of water near the site.

Flooding (Water Storage Facility Failure). There are no large water storage facilities located on or near the site which could possibly rupture during in earthquake and effect the site by flooding.

Seismically-Induced Landsliding. Due to the low relief of the site and surrounding region, the potential for landslides to occur at the site is considered nil.

Rockfalls. No large, exposed, loose or unrooted boulders are present above the site that would affect the integrity of the site.

Seismically-Induced Settlement. Settlement generally occurs within areas of loose, granular soils with relatively low density. Since the site is underlain by relatively medium dense to dense units, the potential for settlement is considered low, however the earthwork operations during the development of the site most probably mitigated any such loose soil conditions.

SOILS AND SEISMIC DESIGN CRITERIA (Uniform Building Code)

Design requirements for structures can be found within Chapter 16 of the 1997 Uniform Building Code (UBC) based on building type, use and/or occupancy. The classification of use and occupancy of all proposed structures at the site, and thus design requirements, shall be the responsibility of the structural engineer and the building official. For structures at the site to be designed in accordance with the provisions of Chapter 16, the subject site specific soils and seismic criteria are provided in the following sections.

UBC Divisions IV; Earthquake Design Criteria Selection

Procedure and limitations for the earthquake design of applicable structures can be obtained from Division IV of Chapter 16 of the 1997 Uniform Building Code (UBC). However, it should be noted that the building code requires the minimum design to allow a structure to remain standing after a seismic event, in order to allow for safe evacuation. As stated in section 1626.1,"The purpose of the earthquake provisions herein is primarily to safeguard against major structural failures and loss of life, not to limit damage or maintain function." Therefore a structure built to UBC code may still sustain damage which might ultimately result in the demolishing of the structure.

The UBC Division IV requires that all sites, unless exempted, be assigned a soil profile type and a regional seismic zone. The criteria for the selection of a site soil profile can be found in the 1997 UBC Division V, discussed in later sections.

Seismic Zone As shown on Figure 16-2 within Chapter 16 of the 1997 UBC, the site is located in Seismic Zone 4. Section 1629.4.2 of the 1997 UBC directs that all sites in Seismic Zone 4, unless exempted, shall have a near source factor determined.

Near Source Factor. Near source factors are determined based on the distance to the nearest type A, or B seismic source (earthquake fault). Once these are determined near source values can be obtained, dependent on structure type, from tables 16-S or 16-T within the 1997 UBC. Seismic source types are classified as A, B, or C, based on description, maximum anticipated magnitude, and slip rate. Type C sources are not considered as they do not increase the standard near source factor value of 1.0. The following table lists the seismic source type requirements.

Table 16-U Seismic Source Type[1]

Seismic Source Type	Seismic Source Description	Seismic Source Definitions	
		Maximum Magnitude	Slip Rate (mm/yr)
A	Faults capable of large magnitude events, and have a high rate of seismic activity.	M≥7.0	SR ≥5
B	All faults other than A and C.	M≥7.0 M<7.0 M≥6.5	SR <5 SR >5 SR <2
C	Faults that are not capable of producing large magnitude earthquakes and that have a relatively low rate of seismic activity.	M<6.5	SR ≤2

[1]Source 1997 UBC

Specific parameters for earthquake faults within the state of California can be obtained form the State of California Division of Mines and Geology Open File Report 96-08 (DMG 1996). As noted in our Faulting section of this report, the nearest known active fault to the site, is the Chino fault, located approximately 11 km (7 miles) to the west. According to the DMG Open File Report 96-08 the Chino fault has a slip rate of 2.0 mm/year, ± 1, and an estimated magnitude event of 6.5. According to the UBC table above, the Chino fault is therefore classified as a type B fault. The nearest known active type A fault, according to the table above and the UBC Maps of Known Active Fault Near-Source Zones (UBC, 1998), is the Cucamonga fault located approximately 15 km (11 miles) to the north. According to the DMG Open File Report 96-08 the Cucamonga fault has a slip rate of 5 mm/year, ± 2, and an estimated magnitude event of 7.0.

UBC Division V; Soil Profile

As noted in our excavations at the site and previously published literature, the subject site is thought to be underlain by several thousands of feet of alluvium. Therefore, the soil profile type of S_D should be used for the subject site.

UBC Earthquake Design Summary

As determined in the previous sections, the following earthquake design criteria have been formulated for the site. However, these values should be reviewed and the final design should be preformed by a qualified structural engineer familiar with the region.

Seismic and Soil Criteria			
Distance to A source (km)	Distance to B source (km)	Regional Seismic Zone	Soil Profile Type
10.5	3.0	4	S_D
*Distances rounded to nearest 0.5 km			

CONCLUSIONS

General

This investigation provides a broad overview of the geotechnical and geologic factors which are expected to influence future site planning and development. On the basis of our field investigation and testing program, it is the opinion of LOR Geotechnical Group, Inc., that the proposed development is feasible from a geotechnical standpoint, provided the recommendations presented in this report are incorporated into design and implemented during grading and construction.

The subsurface conditions encountered in our exploratory trenches and borings are indicative of the locations explored. The subsurface conditions presented here are not to be construed as being present the same everywhere on the site. If conditions are encountered during the construction of the project which differ significantly from those presented in this report. This firm should be notified immediately so we may assess the impact to the recommendations provided.

Foundation Support

Based upon the field investigation and test data, it is our opinion that the upper native soils will not, in their present condition, provide uniform and/or adequate support for the proposed structures. Our compaction test data indicated variable in-situ conditions of the upper native soils, ranging from dry and loose to medium dense states. This condition may cause unacceptable differential and/or overall settlements upon application of the anticipated foundation loads.

To provide adequate support for the proposed residential structures, we recommend a compacted fill mat be constructed beneath footings and slabs. This compacted fill mat will provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils. In addition, the construction of this compacted fill mat will allow for the recompaction of existing upper disturbed soils within building pad areas.

Conventional spread foundations, either individual spread footings and/or continuous wall footings, will provide adequate support for the anticipated downward and lateral loads when utilized in conjunction with the recommended fill mat.

<u>Geologic Mitigations</u>

No special mitigation methods are deemed necessary at this time, other than the geotechnical recommendations provided in the following sections.

<u>Seismicity</u>

Seismic ground rupture is generally considered most likely to occur along pre-existing active faults. Since no known faults are known to exist at, or project into the site, the probability of ground surface rupture occurring at the site is considered nil.

Due to the site's close proximity to the faults described above, it is reasonable to expect a strong ground motion seismic event to occur during the lifetime of the proposed development on the site. Large earthquakes could occur on other faults in the general area, but because of their lesser anticipated magnitude and/or greater distance, they are considered less significant than the faults described above from a ground motion standpoint.

The effects of ground shaking anticipated at the subject site, should be mitigated by the seismic design requirements and procedures outlined in Chapter 16 of the Uniform

Building Code. However, it should be noted that the current building code requires the minimum design to allow a structure to remain standing after a seismic event, in order to allow for safe evacuation. A structure built to code may still sustain damage which might ultimately result in the demolishing of the structure (Larson and Slosson 1992).

RECOMMENDATIONS

General Site Grading

It is imperative that no clearing and/or grading operations be performed without the presence of a qualified geotechnical engineer. An on-site, pre-job meeting with the developer, the contractor and soil engineer should occur prior to all grading related operations. Operations undertaken at the site without the geotechnical engineer present may result in exclusions of affected areas from the final compaction report for the project.

Grading of the subject site should be performed in accordance with the following recommendations as well as applicable portions of Appendix Chapter 33 of the Uniform Building Code, and/or applicable local ordinances.

All areas to be graded should be stripped of significant vegetation and other deleterious materials.

All uncontrolled fills encountered during site preparation should be completely removed, cleaned of significant deleterious materials, and may be reused as compacted fill. Cavities created by removal of subsurface obstructions should be thoroughly cleaned of loose soil, organic matter and other deleterious materials, shaped to provide access for construction equipment, and backfilled as recommended in the following Engineered Compacted Fill section of this report.

Initial Site Preparation

All loose, compressible alluvial material should be removed from areas to receive engineered compacted fill. The data developed during this investigation indicates that removals on the order of 4 feet will be required from currently planned fill areas. The noticeable exception would be the 6 to 8 feet high sand dune feature noted in the northeast portion of the site. The actual depths of removal should be verified during the grading operation by observation and in-place density testing. This 2 to 4 feet of removal will assist in identifying existing buried obstructions.

Alluvial removals for structures to be located outside the currently planned mass graded areas should be determined on a site specific basis. The actual depth of alluvial removal will be dependent on the type of structure planned and the proposed site grading.

Preparation of Fill Areas

After removals of the non-conforming soils and prior to placing fill, the surfaces of all areas to receive fill should be scarified to a depth of at least 6 inches. The scarified soil should be brought to near optimum moisture content and recompacted to a relative compaction of at least 90 percent (ASTM D 1557).

Preparation of Foundation Areas

All footings should rest upon at least 18 inches of properly compacted fill material. In areas where the required thickness is not accomplished by site rough grading, the footing areas should be further subexcavated to a depth of at least 18 inches below the proposed footing base grade, with the subexcavation extending at least 5-feet beyond the footing lines. The bottom of this excavation should then be scarified to a depth of at least 6 inches, brought to near optimum moisture content, and recompacted to at least 90 percent relative compaction (ASTM D 1557) prior to refilling the excavation to grade as properly compacted fill.

Engineered Compacted Fill

The on-site soils should provide adequate quality fill material, provided they are free from organic matter and other deleterious materials. Unless approved by the geotechnical engineer, rock or similar irreducible material with a maximum dimension greater than 6-inches should not be buried or placed in fills.

Import fill should be inorganic, non-expansive granular soils free from rocks or lumps greater than 6-inches in maximum dimension. Sources for import fill should be approved by the geotechnical engineer prior to their use.

Fill should be spread in maximum 8 inch loose lifts, each lift brought to near optimum moisture content, and compacted to a relative compaction of at least 90 percent in accordance with ASTM D 1557.

Based upon the relative compaction of the near surface soils determined during this investigation and the relative compaction anticipated for compacted fill soil, we estimate a compaction shrinkage of approximately 20 to 25 percent. Therefore, 1.20 cubic yards to 1.25 cubic yards of in-place materials would be necessary to yield one cubic yard of properly compacted fill material. In addition, we would anticipate subsidence of approximately 0.20 feet. These values are for estimating purposes only, and are exclusive of losses due to stripping or the removal of subsurface obstructions. These values may vary due to differing conditions within the project boundaries and the limitations of this investigation. Shrinkage should be monitored during construction. If percentages vary, provisions should be made to revise final grades or adjust quantities of borrow or export.

Short Term Excavations

Following the California Occupational and Safety Health Act (CAL-OSHA) requirements, excavations deeper than 5 feet should be sloped or shored. All excavations and shoring should conform to CAL-OSHA requirements.

Short term excavation greater than 5-feet deep shall conform to Title 8 of the California Code of Regulations, Construction Safety Orders, Section 1504 and 1539 through 1547. Based on our exploratory trenches it appears that type C soils are the predominant type of soil on the project and all short term excavation should be based on this type of soil. Deviation from the standard short term slopes are permitted using option 4, designed by a Registered Professional Engineer (Section 1541.1).

Slope Construction

Preliminary data indicates that cut and fill slopes should be constructed no steeper than two horizontal to one vertical. Fill slopes should be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction, then roll the final slopes to provide dense, erosion-resistant surfaces.

Slope Protection

Since the native materials are susceptible to erosion by running water, measures should be provided to prevent surface water from flowing over slope faces. Slopes at the project should be planted with a deep rooted ground cover as soon as possible after completion. The use of succulent ground covers such as iceplant or sedum is not recommended. If watering is necessary to sustain plant growth on slopes, then the watering operation should be monitored to assure proper operation of the irrigation system and to prevent over watering.

Soil Expansiveness

The upper materials encountered during this investigation were granular and considered to have a very low expansion potential, in accordance with Uniform Building Code, Standard 18-2. Therefore, specialized construction procedures to specifically resist expansive soil activity are not anticipated at this time. In order to verify this, additional evaluation of on-site and imported soils for their expansion potential should be conducted following completion of the grading operation.

Foundation Design

If the site is prepared as recommended, the proposed residential structures may be safely founded on conventional spread foundations, either individual spread footings and/or continuous wall footings, bearing either on a minimum of 18 inches of engineered compacted fill or bearing entirely on competent native materials. All foundations should have a minimum width of 12 inches and should be established a minimum of 12 inches below lowest adjacent grade.

For the minimum width and depth, footings may be designed using a maximum soil bearing pressure of 1800 pounds per square foot (psf) for dead plus live loads. Footings at least 15 inches wide, placed at least 18 inches below the lowest adjacent final grade, may be designed for a maximum soil bearing pressure of 2100 (psf) for dead plus live loads.

The recommended pressures apply for the total of dead plus frequently applied live loads, and incorporate a factor of safety of at least 3.0. The allowable bearing pressures may be increased by one-third for temporary wind or seismic loading.

Resistance to lateral loads will be provided by passive earth pressure and base friction. For footings bearing against compacted fill, passive earth pressure may be considered to be developed at a rate of 300 pounds per square foot per foot of depth. Base friction may be computed at 0.30 times the normal load. Base friction and passive earth pressure may be combined without reduction. These values are for dead load plus live load and may be increased by 1/3 for wind or seismic.

Settlement

Total settlement of individual foundations will vary depending on the width of the foundation and the actual load supported. Maximum settlement of shallow foundations designed and constructed in accordance with the preceding recommendations are estimated to be on the order of 0.5 inch. Differential settlements between adjacent footings should be about one-half of the total settlement. Settlement of all foundations is expected to occur rapidly, primarily as a result of elastic compression of supporting soils as the loads are applied, and should be essentially completed shortly after initial application of the loads.

Slabs-On-Grade

To provide adequate support, concrete slabs-on-grade should bear on a minimum of 12 inches of compacted soil. The final pad surfaces should be rolled to provide smooth, dense surfaces upon which to place the concrete.

Slabs to receive moisture-sensitive coverings should be provided with a moisture vapor barrier. This barrier may consist of an impermeable membrane. Two inches of sand over the membrane will reduce punctures and aid in obtaining a satisfactory concrete cure. The sand should be moistened just prior to placing of concrete.

The slabs should be protected from rapid and excessive moisture loss which could result in slab curling. Careful attention should be given to slab curing procedures, as the site area is subject to large temperature extremes, humidity, and strong winds.

Wall Pressures

The design of footings for walls below grade (retaining structures) should be performed in accordance with the recommendations described earlier under Preparation of Foundation Areas and Foundation Design. For design of retaining wall footings, the resultant of the applied loads should act in the middle one-third of the footing, and the maximum edge pressure should not exceed the basic allowable value without increase.

For design of retaining walls unrestrained against movement at the top, we recommend an equivalent fluid pressure of 35 pounds per cubic foot (pcf) be used. This assumes level backfill consisting of recompacted native soils placed against the structures and within the back cut slope extending upward from the base of the stem at 35 degrees from the vertical or flatter.

To avoid over stressing or excessive tilting during placement of backfill behind walls, heavy compaction equipment should not be allowed within the zone delineated by a 45 degree line extending from the base of the wall to the fill surface. The backfill directly behind the walls should be compacted using light equipment such as hand operated vibrating plates and rollers. No material larger than three inches in diameter should be placed in direct contact with the wall.

Wall pressures should be verified prior to construction, when the actual backfill materials and conditions have been determined. Recommended pressures are applicable only to level, properly drained backfill (with no additional surcharge loadings). If inclined backfills are proposed, this firm should be contacted to develop appropriate active earth pressure parameters. Toe bearing pressure for non-structural walls on soils, not prepared as described earlier under Preparation of Foundation Areas, should not exceed Uniform Building Code values, (UBC Table 18-1-A).

Preliminary Pavement Design

Testing and design for preliminary pavement was conducted in accordance with the California Highway Design Manual. Based upon our preliminary sampling and testing, and upon assumed Traffic Indices, it appears that the structural sections tabulated below should provide satisfactory pavements for the subject residential subdivision:

T.I.	Design R-value	Preliminary Section
5.0	50	0.25'AC/0.35'AB
6.0	50	0.25'AC/0.35'AB
7.0	50	0.30'AC/0.45'AB
8.0	50	0.40'AC/0.45'AB
AC - Asphalt Concrete		
AB - Class 2 Aggregate Base		

The above structural sections are predicated upon 90 percent relative compaction (ASTM D 1557) of all utility trench backfills and 95 percent relative compaction (ASTM D 1557) of the upper 12 inches of street subgrade soils and of any aggregate base utilized. In addition, the aggregate base should meet Caltrans specifications for Class 2 Aggregate Base.

The above pavement designs were based upon the results of preliminary sampling and testing, and should be verified by additional sampling and testing when the actual subgrade soils are exposed. Additional sections can be provided for the site if the actual traffic index assigned by the city differs from those above.

Sulfate Protection

The results of the sulfate tests conducted on selected subgrade soils expected to be encountered at foundation levels are presented in Appendix C.

> 50, > 200

Based on the test results the Cement Industry Committee of California, recommends Type I or II cement be used for concrete elements in contact with such materials.

Construction Monitoring

Post investigative services are an important and necessary continuation of this investigation. Project plans and specifications should be reviewed prior to construction to confirm that the intent of the recommendations presented herein have been incorporated into the design. Additional expansion testing and testing for on-site (street) pavement design should be performed after the site is rough graded.

During construction, sufficient and timely geotechnical observation and testing should be provided to correlate the findings of this investigation with the actual subsurface conditions exposed during construction. Items requiring observation and testing include, but are not necessarily limited to, the following:

1. Site preparation-stripping and removals.

2. Excavations, including approval of the bottom of excavation prior to backfilling.

3. Scarifying and recompacting prior to fill placement.

4. Subgrade preparation for pavements and slabs-on-grade.

5. Placement of engineered compacted fill and backfill, including approval of fill materials and the performance of sufficient density tests to evaluate the degree of compaction being achieved.

LIMITATIONS

This report contains geotechnical conclusions and recommendations developed solely for use by JMS Turner, LLC and their design consultants, for the purposes described earlier. It may not contain sufficient information for other uses or the purposes of other parties. The contents should not be extrapolated to other areas or used for other facilities without consulting LOR Geotechnical Group, Inc.

The recommendations are based on interpretations of the subsurface conditions concluded from information gained from subsurface explorations, and a surficial site reconnaissance. The interpretations may differ from actual subsurface conditions, which can vary horizontally and vertically across the site. Due to possible subsurface variations, all aspects of field construction addressed in this report should be observed and tested by the project geotechnical consultant.

If parties other than LOR Geotechnical Group, Inc. provide construction monitoring services, they must be notified that they will be required to assume responsibility for the geotechnical phase of the project being completed by concurring with the recommendations provided in this report or by providing alternative recommendations.

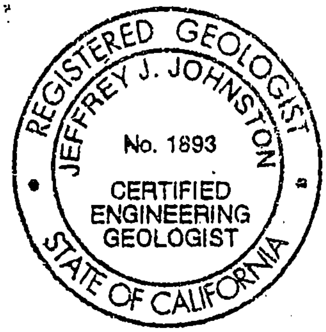
The report was prepared using generally accepted geotechnical engineering practices under the direction of a state licensed geotechnical engineer. No warranty, express or implied, is made as to conclusions and professional advice included in this report. Any persons using this report for bidding or construction purposes should perform such independent investigations as deemed necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project.

CLOSURE

It has been a pleasure to assist you with this project. We look forward to being of further assistance to you as construction begins. Should conditions be encountered during construction that appear to be different than indicated by this report, please contact this office immediately in order that we might evaluate their effect.

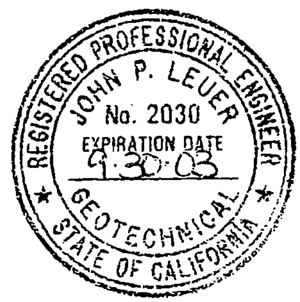
Should you have any questions regarding this report, please contact us.

Respectfully submitted,
LOR Geotechnical Group, Inc.



Jeffrey J. Johnston, CEG 1893
Engineering Geologist

John P. Leuer, GE 2030
President



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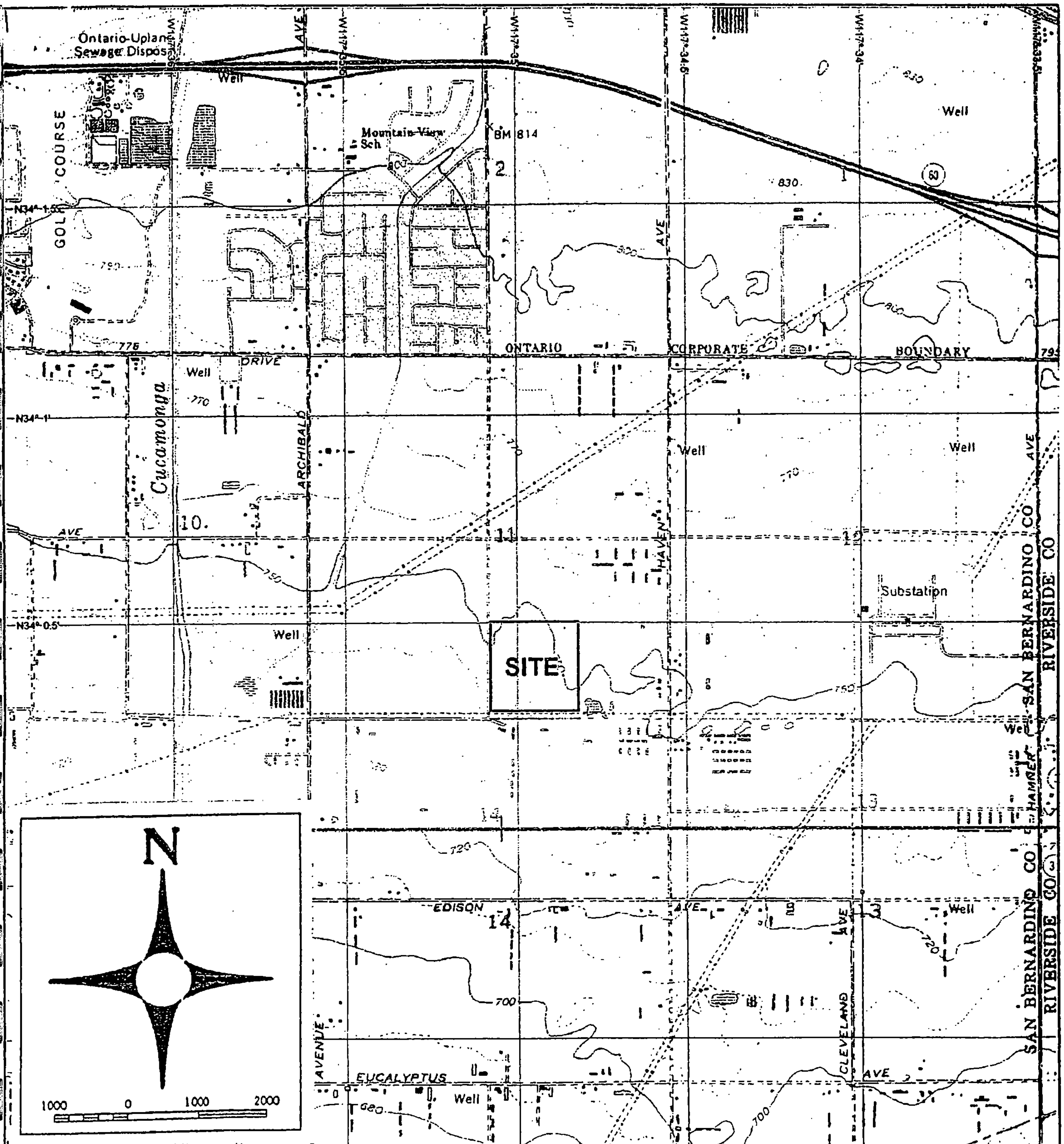
Petersen, M.D., W.A. Bryant, C.H. Cramer, T. Cao, M.S., Reichle, A.D. Frankel, J.J. Lienkaemper, P.A. McCrory, and D.P. Schwartz, 1996, Probabilistic seismic hazard assessment for the State of California, California Department of Conservation, Division of Mines and Geology, Open File Report 96-08 and U.S. Geological Survey Open File Report 96-706.

Reeder, W., 2000, Earthquake Plotting Program, EPI Software.

AERIAL PHOTOGRAPHS

Date	Flight No.	Photo Nos.	Scale
01/30/62	3	3-644	1" = 2000'
05/24/74		2-3	1" = 2000'
01/23/80		2-3	1" = 2000'
02/27/84		1778-1779	1" = 2000'
06/03/88		RAP J-22	1" = 1200'
01/21/90		2-1	1" = 1600'

APPENDIX A



INDEX MAP

PROJECT:	MINABERRY TRUST PROPERTY	PROJECT NO.:	31396.1
CLIENT:	JMS TURNER, LLC	ENCLOSURE NO:	A-1
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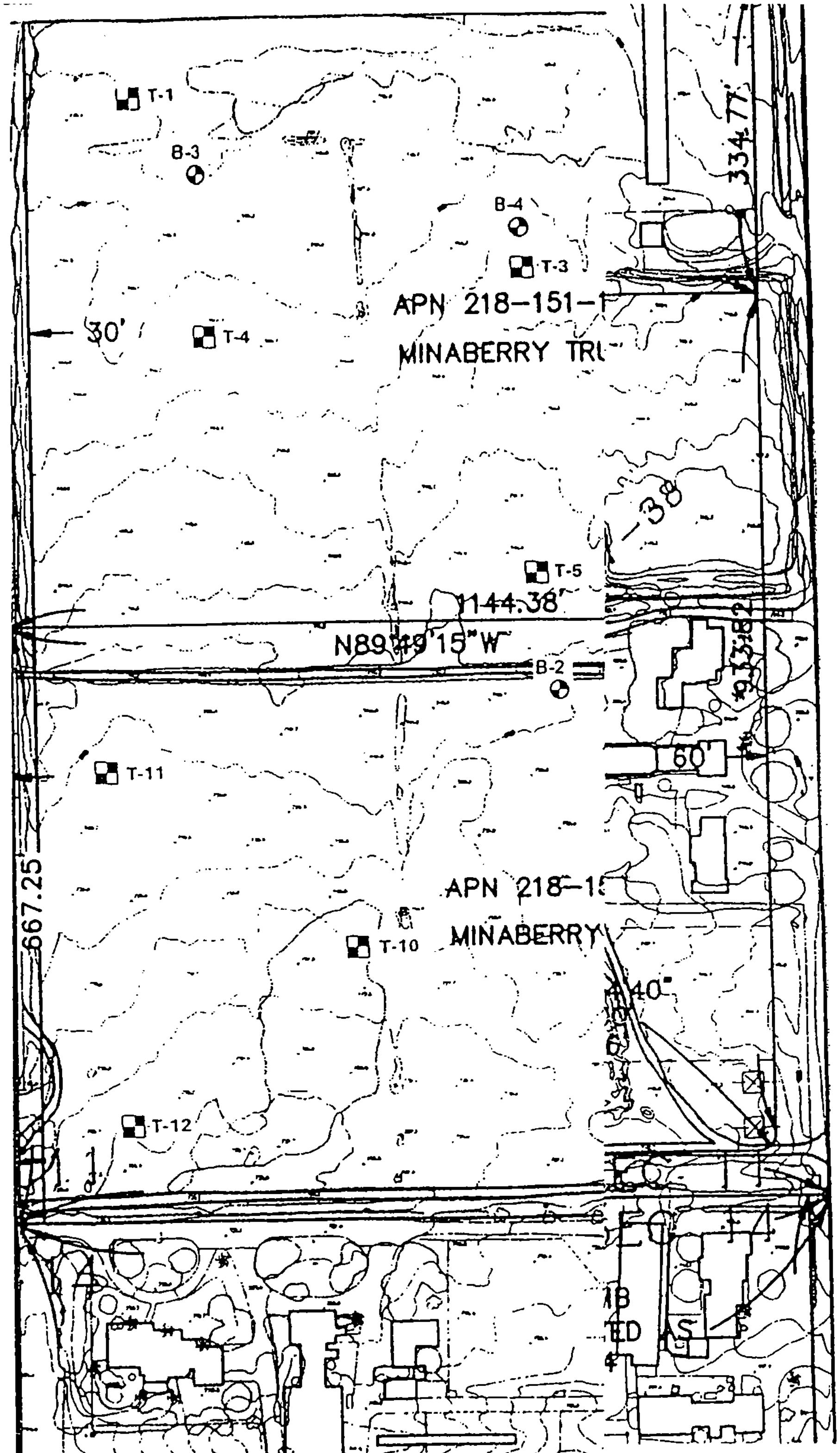
		SCALE:	1:24,000



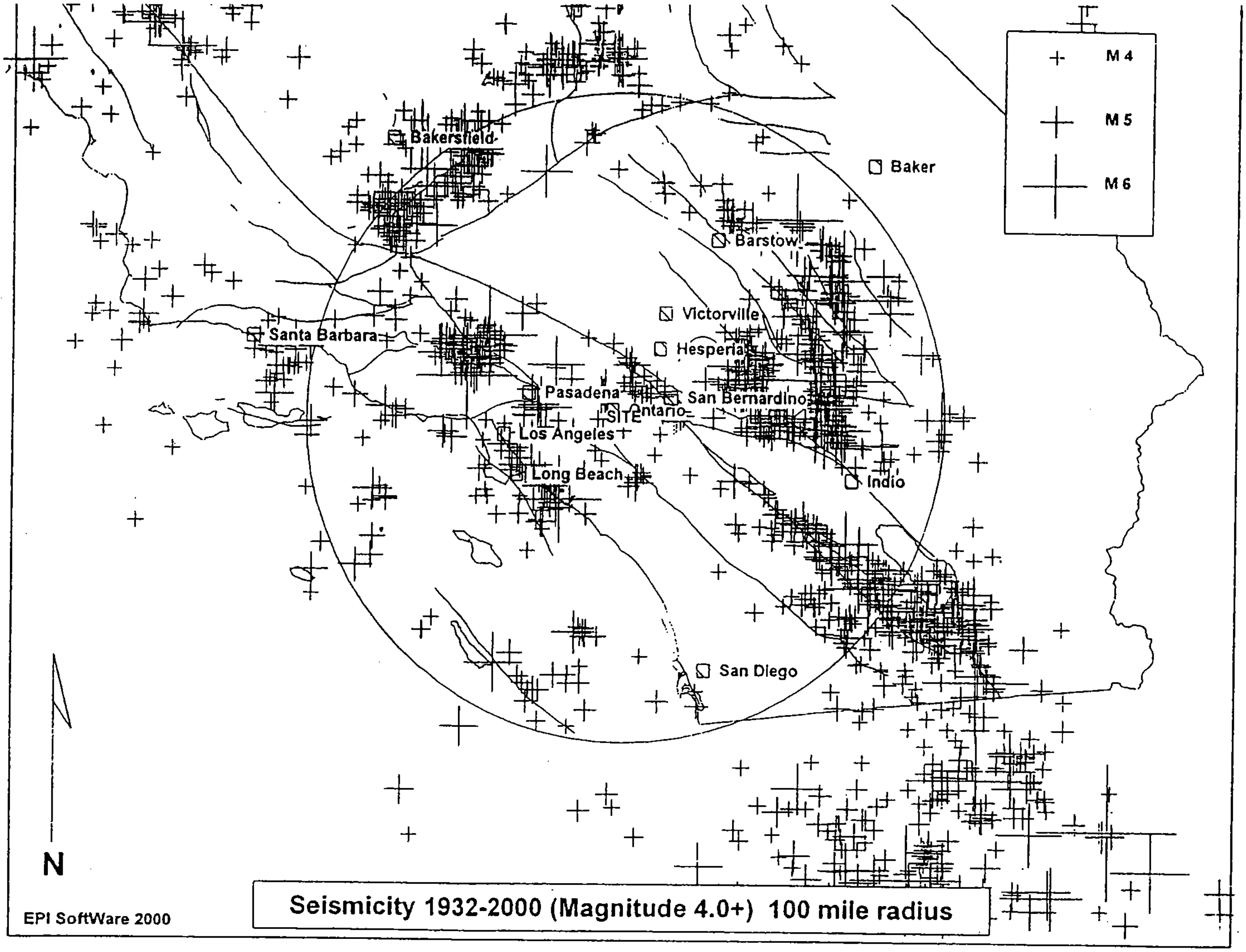
EXPLANATI

(Locations Appro

B-4 - Indicates Exploratory Bo

T-12 - Indicates Exploratory Tre

LAT	
NABERRY TRUST PROPERTY	PROJECT NO.: 31396.1
JMS TURNER, LLC	ENCLOSURE NO: A-2
	DATE: SEPTEMBER 2000
C.	SCALE: REDUCED COPY



SITE LOCATION: 34.008 LAT. -117.583 LONG.

MINIMUM LOCATION QUALITY: C

TOTAL # OF EVENTS ON PLOT: 2368

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 1286

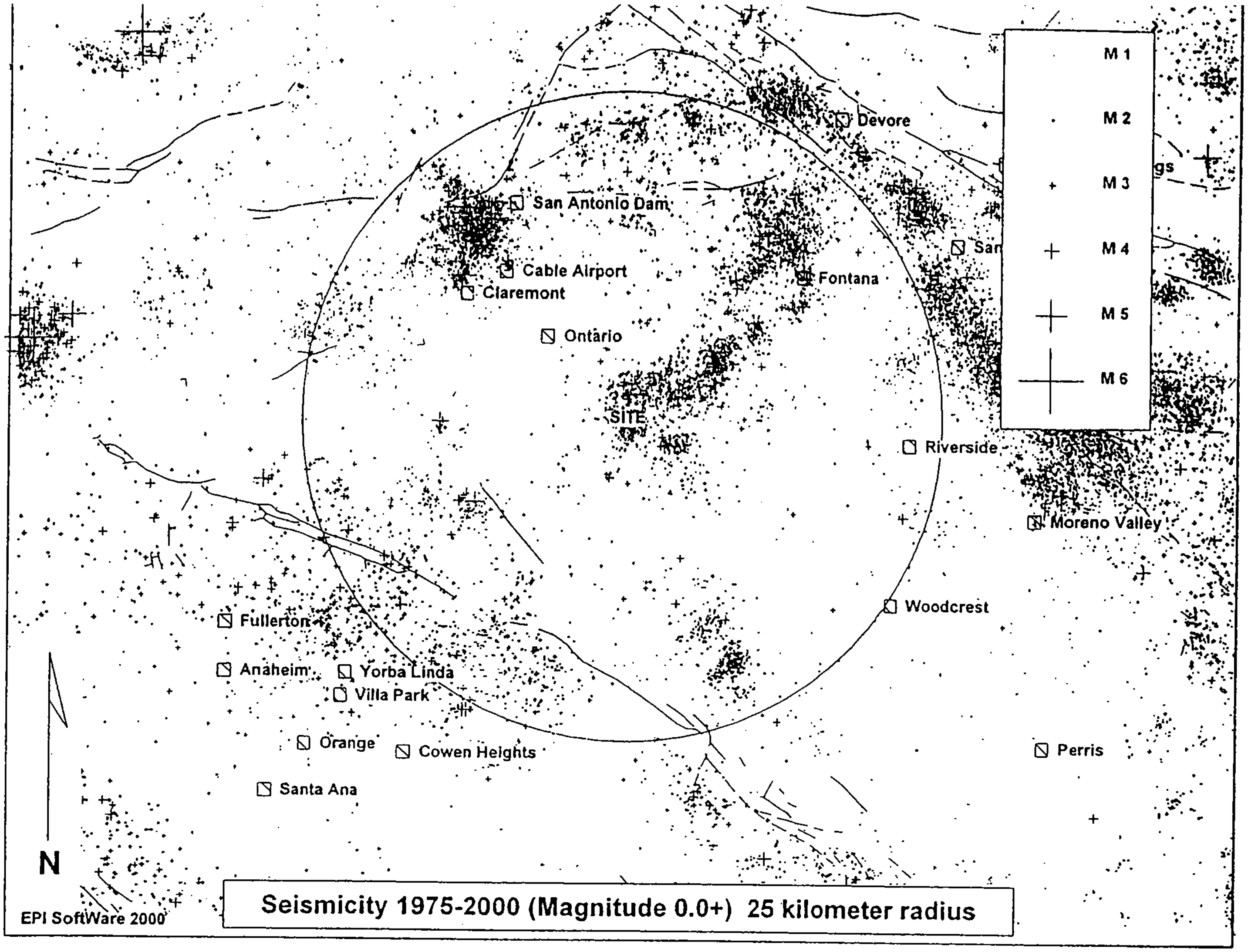
MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

4.0- 4.9 : 1159
5.0- 5.9 : 113
6.0- 6.9 : 12
7.0- 7.9 : 2
8.0- 8.9 : 0

CLOSEST EVENT: 4.0 ON FRIDAY, APRIL 11, 1941 LOCATED APPROX. 4 MILES SOUTH OF THE SITE

LARGEST 5 EVENTS:

7.3 ON SUNDAY, JUNE 28, 1992 LOCATED APPROX. 66 MILES EAST OF THE SITE
7.1 ON SATURDAY, OCTOBER 16, 1999 LOCATED APPROX. 84 MILES NORTHEAST OF THE SITE
6.7 ON MONDAY, JANUARY 17, 1994 LOCATED APPROX. 56 MILES WEST OF THE SITE
6.6 ON MONDAY, JANUARY 17, 1994 LOCATED APPROX. 56 MILES WEST OF THE SITE
6.6 ON TUESDAY, FEBRUARY 09, 1971 LOCATED APPROX. 54 MILES NORTHWEST OF THE SITE



SITE LOCATION: 34.008 LAT. -117.583 LONG.

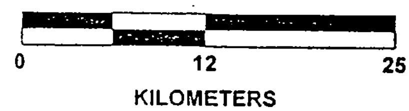
MINIMUM LOCATION QUALITY: C

TOTAL # OF EVENTS ON PLOT: 18251

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 7303

MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

0.0- .9 : 1083
1.0- 1.9 : 4944
2.0- 2.9 : 1166
3.0- 3.9 : 99
4.0- 4.9 : 10
5.0- 5.9 : 1
6.0- 6.9 : 0
7.0- 7.9 : 0
8.0- 8.9 : 0



CLOSEST EVENT: 2.2 ON MONDAY, OCTOBER 22, 1990 LOCATED APPROX. .1 KILOMETER OF THE SITE

LARGEST 5 EVENTS:

5.4 ON WEDNESDAY, FEBRUARY 28, 1990 LOCATED APPROX. 18 KILOMETERS NORTHWEST OF THE SITE
4.8 ON TUESDAY, APRIL 17, 1990 LOCATED APPROX. 16 KILOMETERS NORTHWEST OF THE SITE
4.7 ON FRIDAY, MARCH 02, 1990 LOCATED APPROX. 18 KILOMETERS NORTHWEST OF THE SITE
4.7 ON THURSDAY, MARCH 01, 1990 LOCATED APPROX. 20 KILOMETERS NORTHWEST OF THE SITE
4.7 ON SUNDAY, JUNE 26, 1988 LOCATED APPROX. 18 KILOMETERS NORTHWEST OF THE SITE

APPENDIX B

APPENDIX B
FIELD INVESTIGATION

Subsurface Exploration

The site was investigated on August 23 and August 31, 2000 and consisted of excavating 12 exploratory trenches to depths between 15 and 16 feet below the existing ground surface and 4 exploratory borings to depths of 16.5 feet to 51.5 feet. The approximate locations of the trenches and borings are shown on Enclosure A-2, within Appendix A.

The trench exploration was conducted using a New Holland 555E backhoe with a 24 inch bucket. The drilling operation was conducted using a CME-55 drill rig equipped for soil samples. The soil encountered were continuously logged by a geologist from this firm who visually observed the site, maintained detailed logs of the trenches and borings obtained soil samples for laboratory evaluation and testing, and classified the soils encountered by visual examination in accordance with the Unified Soil Classification System.

In-place density determinations were conducted at selected levels, within the trenches utilizing the Nuclear Gauge Method (ASTMD 2922). Disturbed soil samples were obtained at soil changes and other selected levels within the trenches. The samples were placed in sealed containers for transport to the laboratory.

Relatively undisturbed samples of the subsoils were obtained at selected intervals in the borings by driving a steel split-barrel sampler using a 140-pound automatic trip hammer dropping 30-inches. The maximum depth between the samples obtained was five feet. The soil samples were retained in brass sample rings of 2.41-inches in diameter and 1.00-inch in height, and placed in sealed plastic containers. Disturbed soil samples were obtained at selected levels within the borings and placed in sealed containers for transport to the laboratory.

All samples obtained were taken to our laboratory for storage and testing. Detailed logs of the trenches and borings are presented on the enclosed Trench and Boring Logs, Enclosures B-1 through B-16. A Sampling Key is presented on Enclosure B.

CONSISTENCY OF SOILS

SANDS

SPT BLOWS	CONSISTENCY
0 - 4	Very loose
4 - 10	Loose
10 - 30	Medium dense
30 - 50	Dense
Over 50	Very dense

COHESIVE SOILS

SPT BLOWS	CONSISTENCY
0 - 2	Very soft
2 - 4	Soft
4 - 8	Medium
8 - 15	Stiff
15 - 30	Very stiff
30 - 60	Hard
Over 60	Very Hard

SAMPLING KEY

SYMBOL	DESCRIPTION
	FOR BORINGS — INDICATES RELATIVELY UNDISTURBED SOIL SAMLE RETAINED IN BRASS SAMPLE RINGS OF 2.41 INCHES DIAMETER AND 1.00 INCH IN HEIGHT.
	FOR TRENCHES — INDICATES SAND CONE OR NUCLEAR DENSITY TEST
	INDICATES BAG SOIL SAMPLE
	INDICATES BULK SOIL SAMPLE

MAJOR DIVISIONS			LITHOLOGY	U.S.C.S.	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GARVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SAND, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF RICH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS AND MANURE WITH HIGH ORGANIC MATERIALS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

PARTICLE SIZE LIMITS

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" ¾" No. 4 No. 10 No. 40 200

(U.S. STANDARD SIEVE SIZE)

UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT:	MINABERRY TRUST PROPERTY	PROJECT NO.:	31396.1
CLIENT:	JMS TURNER, LLC	ENCLOSURE NO:	B
LOR Geotechnical Group, Inc.		DATE:	SEPTEMBER 2000
		SCALE:	NO SCALE

LOG OF TRENCH T-1

TEST DATA

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				0.2				SM	<u>ALLUVIUM:</u> SILTY SAND, approximately 10% medium grained sand, 70% fine grained sand, 20% silty fines, loose, caving, tan, dry. @ 1 foot becomes denser, no caving, some roots and pores, light brown, damp.
			79	2.3	104.9				
			86	1.8	102.4			SP	POORLY GRADED SAND with silt, approximately 10% coarse grained sand, 10% medium grained sand, 70% fine grained sand, 10% silty fines, tan, caving.
5								SM	SILTY SAND, approximately 5% medium grained sand, 50% fine grained sand, 45% silty fines, greenish tan to light brown, damp, no caving.
									@ 8 feet approximately 5% coarse grained sand, 15% medium grained sand, 45% fine grained sand, 35% silty fines, brown, trace of tiny pores.
10									@ 11 feet approximately 2% fine gravel, 8% coarse grained sand, 20% medium grained sand, 40% fine grained sand, 30% silty fines, reddish brown, damp.
15								SP	POORLY GRADED SAND, approximately 10% coarse grained sand, 30% medium grained sand, 55% fine grained sand, 5% silty fines, reddish brown, damp, caving.

END OF TRENCH
No fill
Caving 4-5'
No groundwater
No bedrock

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	August 23, 2000
		EQUIPMENT:	New Holland 555E
		BUCKET W.: 24"	ENCLOSURE: B-1

LOG OF TRENCH T-2

TEST DATA

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				0.6				SP	**FILL/WIND BLOWN SAND:** POORLY GRADED SAND with silt, approximately 15% medium grained sand, 80% fine grained sand, 5% silty fines, tan, dry.
									@ 1.2 feet new looking beer can.
			73	0.8	83.4				@ 3 feet very loose, caving to 5 feet.
5			86	2.2	102.1			SP	**ALLUVIUM:** POORLY GRADED SAND with silt, approximately 15% medium grained sand, 75% fine grained sand, 10% silty fines, tan, damp, moderately dense.
									@ 7 to 9 feet slowly grades to silty sand.
								SM	@ 9 feet approximately 85% fine grained sand, 15% silty fines, tan, damp, slight trace of very small pores.
10									
									@ 14 feet approximately 60% fine grained sand, 40% silty fines, brown, damp.
15									END OF TRENCH Fill 0-5' Caving 0-5' No groundwater No bedrock

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	August 23, 2000
		EQUIPMENT:	New Holland 555E
		BUCKET W.: 24"	ENCLOSURE: B-2

LOG OF TRENCH T-3

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				1.9				SM	**ALLUVIUM:** SILTY SAND, approximately 10% medium grained sand, 70% fine grained sand, 20% silty fines, tan, dry, loose, caving.
			74	2.7	99.0				@ 0.8 feet becomes denser, approximately 5% medium grained sand, 65% fine grained sand, 30% silty fines, tan, damp, no caving, moderately dense.
			75	2.4	99.7				
5									
									@ 8.5 feet approximately 55% fine grained sand, 45% silty fines, brown, damp, small amount of tiny pores, moderately dense to dense.
10									
									@ 11 feet becomes coarser grained, approximately 15% medium grained sand, 70% fine grained sand, 15% silty fines, reddish brown.
15								SP	POORLY GRADED SAND, approximately 5% fine gravel, 10% coarse grained sand, 30% medium grained sand, 50% fine grained sand, 5% silty fines, reddish tan, damp.

TEST DATA

END OF TRENCH
No fill
Slight caving
No groundwater
No bedrock

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	August 23, 2000
		EQUIPMENT:	New Holland 555E
		BUCKET W.: 24"	ENCLOSURE: B-3

LOG OF TRENCH T-4

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				0.5				SM	**TOPSOIL:** SILTY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 50% fine grained sand, 30% silty fines, dry, loose, tan, slight amount of organics.
								SM	**ALLUVIUM:** SILTY SAND, approximately 15% medium grained sand, 60% fine grained sand, 25% silty fines, tan, damp.
			76	2.0	101.0				
			82	2.9	97.9			SP	POORLY GRADED SAND with silt, approximately 5% medium grained sand, 85% fine grained sand, 10% silty fines, tan, damp, slight caving.
5									
								SM	SILTY SAND, approximately 60% fine grained sand, 40% silty fines, brown, damp. @ 8 feet porous, some voids up to 1/8" diameter, most much smaller. @ 9 feet thin silt lense, gray, damp.
10									
									@ 11 feet approximately 5% medium grained sand, 65% fine grained sand, 30% silty fines, reddish brown, damp.
15									@ 15 feet becomes coarser grained, approximately 15% medium grained sand, 10% fine grained sand, 15% silty fines, reddish tan, damp.

END OF TRENCH
No fill
No caving
No groundwater
No bedrock

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	August 23, 2000
		EQUIPMENT:	New Holland 555E
		BUCKET W.: 24"	ENCLOSURE: B-4

LOG OF TRENCH T-5

TEST DATA

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				3.4				SM	**TOPSOIL:** SILTY SAND, approximately 15% medium grained sand, 65% fine grained sand, 20% silty fines.
								SM	**ALLUVIUM:** SILTY SAND, approximately 15% medium grained sand, 60% fine grained sand, 25% silty fines, tan.
			74	2.2	98.2				
			71	2.2	94.4				
5			79	1.9	91.0				@ 5 feet approximately 60% fine grained sand, 40% silty fines, tan to white, loose, dry.
									@ 7 feet becomes slightly denser, light brown, damp.
10									
								SP	POORLY GRADED SAND, approximately 10% coarse grained sand, 20% medium grained sand, 65% fine grained sand, 5% silty fines, reddish tan, damp, caving.
15									
								SW	WELL GRADED SAND, approximately 10% gravel to 2" diameter, 20% coarse grained sand, 30% medium grained sand, 40% fine grained sand, trace cobbles.

END OF TRENCH
No fill
Slight caving
No groundwater
No bedrock

PROJECT: Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER: 31396.1
CLIENT: JMS Turner, LLC	
LOR GEOTECHNICAL GROUP INC.	DATE EXCAVATED: August 23, 2000
	EQUIPMENT: New Holland 555E
	BUCKET W.: 24" / ENCLOSURE: B-5

LOG OF TRENCH T-6

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				0.4				SM	**TOPSOIL/FILL:** Thin layer of cattle manure overlying SILTY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 65% fine grained sand, 15% silty fines, tan, loose, dry, caving.
								SP	**ALLUVIUM:** POORLY GRADED SAND, approximately 5% medium grained sand, 90% fine grained sand, 5% silty fines, tan, damp, loose, heavy caving, in laminated layers (old sand dune).
			82	1.9	98.1				
			76	3.9	101.1				@ 4 feet approximately 5% medium grained sand, 80% fine grained sand, 15% silty fines, tan, damp, moderately dense, slight caving.
5									
10									@ 10.5 feet approximately 95% fine grained sand, 5% silty fines, grayish brown, damp.
								SM	SILTY SAND, approximately 5% medium grained sand, 60% fine grained sand, 35% silty fines, brown, damp.
15									END OF TRENCH Fill 0-1' Slight caving No groundwater No bedrock

TEST DATA

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
		DATE EXCAVATED:	August 23, 2000
		EQUIPMENT:	New Holland 555E
		BUCKET W.: 24"	ENCLOSURE: B-6

LOR GEOTECHNICAL GROUP INC.

LOG OF TRENCH T-7

DEPTH IN FEET	TEST DATA		ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				33.3	-			SM	**TOPSOIL/FILL:** SILTY SAND, approximately 10% medium grained sand, 60% fine grained sand, 30% silty fines, dark brown, moist, slight organic odor.
								SM	**ALLUVIUM:** SILTY SAND, approximately 5% medium grained sand, 75% fine grained sand, 20% silty fines, grayish brown, damp.
			78	14.0	103.7				
			71	13.1	94.4				@ 4 feet color change to brown.
5									
									@ 8.5 feet approximately 55% fine grained sand, 45% silty fines, brown, moist, loose.
10								SM ML	SILTY SAND/SANDY SILT, approximately 50% fine grained sand, 50% silty fines, brown, moist, loose, some porosity.
								SM	SILTY SAND, approximately 2% coarse grained sand, 13% medium grained sand, 55% fine grained sand, 30% silty fines, damp, reddish brown, moderately dense.
15									END OF TRENCH Fill 0-1' No caving No groundwater No bedrock

PROJECT: Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER: 31396.1
CLIENT: JMS Turner, LLC	
LOR GEOTECHNICAL GROUP INC.	DATE EXCAVATED: August 23, 2000
	EQUIPMENT: New Holland 555E
	BUCKET W.: 24" — ENCLOSURE: B-7

LOG OF TRENCH T-8

Depth in Feet	Estimated Compaction (%)	Moisture Content (%)	Dry Density (PCF)	Sample Type	U.S.C.S	Description
0		1.5			SM	**TOPSOIL:** Thin layer cow manure over SILTY SAND, approximately 20% medium grained sand, 60% fine grained sand, 20% silty fines, tan, slight amount of organics.
	75	3.7	100.0		SM	**ALLUVIUM:** SILTY SAND, approximately 5% medium grained sand, 65% fine grained sand, 30% silty fines, tan, damp, moderately dense.
	79	3.2	104.5			
5						
						@ 6 feet becomes slightly coarser grained, approximately 10% medium grained sand, 70% fine grained sand, 20% silty fines, tan to light grayish brown, damp.
						@ 8 feet color change to brown, slight amount of porosity.
10						
					ML	SANDY SILT, approximately 45% fine grained sand, 65% silty fines, greenish brown, damp.
					SP	POORLY GRADED SAND with silt, approximately 5% fine gravel, 5% coarse grained sand, 15% medium grained sand, 65% fine grained sand, 10% silty fines, reddish tan, damp.
15					SW	WELL GRADED SAND, approximately 5% cobbles to 4" diameter, 10% coarse grained sand, 30% medium grained sand, 50% fine grained sand, 5% silty fines, reddish brown, damp.

END OF TRENCH
No fill
Slight caving
No groundwater
No bedrock

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	August 23, 2000
		EQUIPMENT:	New Holland 555E
		BUCKET W.: 24"	ENCLOSURE: B-8

LOG OF TRENCH T-9

DEPTH IN FEET	TEST DATA		ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				0.8				SM	**TOPSOIL:** SILTY SAND, approximately 15% medium grained sand, 60% fine grained sand, 25% silty fines, tan, dry, loose, caving.
								SM	**ALLUVIUM:** SILTY SAND, approximately 10% medium grained sand, 75% fine grained sand, 15% silty fines, tan, damp, moderately dense.
			75	13.6	100.1				
			73	15.0	97.4				
5									@ 5.5 feet color change to grayish tan, moist.
									@ 9 feet approximately 5% medium grained sand, 55% fine grained sand, 40% silty fines, moist, some slight seepage.
10									
15									@ 15 feet approximately 10% medium grained sand, 75% fine grained sand, 20% silty fines, brown, damp to moist.

END OF TRENCH
No fill
Slight caving
No groundwater
No bedrock

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	August 23, 2000
		EQUIPMENT:	New Holland 555E
		BUCKET W.: 24"	ENCLOSURE: B-9

LOG OF TRENCH T-10

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				2.5					**TOPSOIL:** Cow manure 3 inches thick.
			69	1.0	91.9			SM	**ALLUVIUM:** SILTY SAND, approximately 20% medium grained sand, 65% fine grained sand, 15% silty fines, tan, dry, loose.
			74	2.4	98.6				
5								SP	POORLY GRADED SAND with silt, approximately 25% medium grained sand, 65% fine grained sand, 10% silty fines, tan, damp.
								SM	SILTY SAND, approximately 10% medium grained sand, 60% fine grained sand, 30% silty fines, tan, damp, slight amount of porosity, some large holes up to 3/8" diameter.
10									
									@ 12 feet becomes coarser grained, approximately 15% medium grained sand, 20% fine grained sand, 15% silty fines, reddish brown, damp.
15									END OF TRENCH No fill Slight caving No groundwater No bedrock

PROJECT: Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER: 31396.1
CLIENT: JMS Turner, LLC	
LOR GEOTECHNICAL GROUP INC.	DATE EXCAVATED: August 23, 2000
	EQUIPMENT: New Holland 555E
	BUCKET W.: 24" — ENCLOSURE: B-10

LOG OF TRENCH T-11

Depth in Feet			Estimated Compaction (%)	Moisture Content (%)	Dry Density (PCF)	Sample Type	Lithology	U.S.C.S	Description
0				0.3				SM	**TOPSOIL:** SILTY SAND, approximately 5% coarse grained sand, 25% medium grained sand, 50% fine grained sand, 20% silty fines, tan, dry, loose, some organics.
								SM	**ALLUVIUM:** SILTY SAND with silt, approximately 10% medium grained sand, 70% fine grained sand, 20% silty fines, tan, damp, moderately dense, minor caving.
			75	1.9	99.9				@ 3.5 feet small WELL GRADED SAND lense with gravel approximately 1 foot thick and 3 feet wide.
5			78	1.4	92.5				@ 5 feet approximately 15% medium grained sand, 85% fine grained sand, tan to white, dry, moderately dense.
									@ 7 feet approximately 80% fine grained sand, 20% silty fines, brown to grayish tan, damp.
10									
								SP	POORLY GRADED SAND with silt, approximately 20% medium grained sand, 70% fine grained sand, 10% silty fines, brown, damp.
									@ 14 feet some gravel.
15									END OF TRENCH No fill Slight caving No groundwater No bedrock

PROJECT: Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER: 31396.1
CLIENT: JMS Turner, LLC	
LOR GEOTECHNICAL GROUP INC.	DATE EXCAVATED: August 23, 2000
	EQUIPMENT: New Holland 555E
	BUCKET W.: 24" — ENCLOSURE: B-11

LOG OF TRENCH T-12

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0				0.5				SM	**TOPSOIL:** SILTY SAND, approximately 20% medium grained sand, 60% fine grained sand, 20% silty fines, tan, dry, loose, some organics.
								SM	**ALLUVIUM:** SILTY SAND, approximately 10% medium grained sand, 70% fine grained sand, 20% silty fines, yellowish brown, dry.
			72	3.6	96.1				
			75	1.5	99.9				
5									
								SP	POORLY GRADED SAND with silt, approximately 10% medium grained sand, 80% fine grained sand, 10% silty fines, grayish tan, damp.
								SM	SILTY SAND, approximately 10% medium grained sand, 60% fine grained sand, 30% silty fines, grayish tan, damp.
10									
									@ 11 feet slight amount of tiny pores.
									@ 13 feet becomes coarser grained, approximately 15% medium grained sand, 70% fine grained sand, 15% silty fines, reddish brown, damp.
15									END OF TRENCH No fill No caving No groundwater No bedrock

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	August 23, 2000
		EQUIPMENT:	New Holland 555E
		BUCKET W.: 24"	ENCLOSURE: B-12

LOG OF BORING B-1

DEPTH IN FEET	BLOW COUNTS SPT		MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0			1.3					SM	**ALLUVIUM:** SILTY SAND, approximately 2% coarse grained sand, 18% medium grained sand, 65% fine grained sand, 15% silty fines, tan, dry, loose.
	18		1.2		107				
5	15		2.0		100				
	13		8.4		99				
10	20		7.5		100			SM ML	SILTY SAND/SANDY SILT, approximately 50% fine grained sand, 50% silty fines, brown, damp, slight amount of secondary deposits of calcite in thin stringers and nodules.
	11		18.9		106			ML	SANDY SILT, approximately 35% fine grained sand, 65% silty fines, brown, damp, very small amount of tiny pinhole sized pores.
15	16		11.5		118			SP	POORLY GRADED SAND, composition varies in thin lenses with some silty sand and well graded sand with fine gravel, overall average composition approximately 5% fine gravel, 5% coarse grained sand, 30% medium grained sand, 55% fine grained sand, 5% silty fines, tan, damp.
	22		3.2		107				
20									
	20		5.9		109				
25									
	21		16.4		107				@ 28 feet thin lenses of brown silty sand and tan poorly graded sand, damp, dense.
30									
35									
	28		13.6		95				
40									
45									
50	61		12.3		124			CL	CLAYEY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 50% fine grained sand, 30% clayey fines, reddish brown, damp, dense.
55									

END OF BORING
No fill
No caving
No groundwater
No bedrock

PROJECT:	Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER:	31396.1
CLIENT:	JMS Turner, LLC		
LOR GEOTECHNICAL GROUP INC.		DATE DRILLED:	August 31, 2000
		EQUIPMENT:	CME 55
		HOLE DIA.: 8"	ENCLOSURE: B-13

LOG OF BORING B-2

Depth in Feet	Blow Counts SPT	Moisture Content (%)	Dry Density (PCF)	U.S.C.S.	Description
0		6.9		SM	**ALLUVIUM:** SILTY SAND, approximately 5% medium grained sand, 65% fine grained sand, 30% silty fines, tan, damp, some organics, roots, etc.
	15	4.6	110		@ 2 feet large root in sample ring.
	12	4.0	100	SP	POORLY GRADED SAND with silt, approximately 10% medium grained sand, 80% fine grained sand, 10% silty fines, tan, damp.
5					
	11	9.1	101		
	14	12.7	112		
10	14	10.9	114	SM	SILTY SAND, approximately 60% fine grained sand, 40% silty fines, grayish tan, damp.
	11	7.3	111		@ 12 feet approximately 10% medium grained sand, 60% fine grained sand, 30% silty fines, brown, damp.
	18	6.5	107		
15					
	18	11.2	112	SP	POORLY GRADED SAND with silt, approximately 5% coarse grained sand, 20% medium grained sand, 65% fine grained sand, 10% silty fines, tan, damp.
20					
	25	21.4	104		
25					END OF BORING No fill No caving No groundwater No bedrock
30					

PROJECT: Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER: 31396.1
CLIENT: JMS Turner, LLC	
LOR GEOTECHNICAL GROUP INC.	DATE DRILLED: August 31, 2000
	EQUIPMENT: CME 55
	HOLE DIA.: 8" ENCLOSURE: B-14

LOG OF BORING B-3

DEPTH IN FEET	BLOW COUNTS SPT	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	U.S.C.S
0		3.8		SM
	16	4.8	112	
5	10	9.6	107	
	9	11.9	112	
10	10	9.6	110	
	11	13.1	113	
	13	4.8	109	
15				
	20	15.5	96	SM ML
20				
	25	3.4	109	SP
25				
30				
35				

DESCRIPTION

ALLUVIUM: SILTY SAND, approximately 5% coarse grained sand, 10% medium grained sand, 60% fine grained sand, 25% silty fines, tan, dry, very loose.

@ 8 feet becomes finer grained, approximately 2% coarse grained sand, 8% medium grained sand, 55% fine grained sand, 35% silty fines, brown, damp, slight trace of very small pores.

@ 14 feet becomes coarser grained, approximately 10% coarse grained sand, 30% medium grained sand, 40% fine grained sand, 20% silty fines.

SANDY SILT/SILTY SAND, approximately 50% fine grained sand, 50% silty fines, grayish tan and tan, damp, very slight trace of pores.

POORLY GRAINED SAND with silt, approximately 10% medium grained sand, 80% fine grained sand, 10% silty fines, tan, damp.

END OF BORING
No fill
No caving
No groundwater
No bedrock

PROJECT: Minaberry Trust (APN 218-151-19 & -23)
CLIENT: JMS Turner, LLC

LOR GEOTECHNICAL GROUP INC.

PROJECT NUMBER: 31396.1
DATE DRILLED: August 31, 2000
EQUIPMENT: CME 55
HOLE DIA.: 8"
ENCLOSURE: B-15

LOG OF BORING B-4

DEPTH IN FEET	BLOW COUNTS SPT		MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0								SM	ALLUVIUM: SILTY SAND, approximately 2% coarse grained sand, 18% medium grained sand, 20% silty fines, tan, dry.
5									
	39		6.1		115	■			
	27		9.1		111	■			@ 8 feet becomes finer grained, approximately 2% medium grained sand, 58% fine grained sand, 40% silty fines, slight trace of tiny pores.
10	16		8.8		112	■			
	19		8.7		115	■			
	22		3.5		106	■		SP	POORLY GRADED SAND, approximately 20% medium grained sand, 75% fine grained sand, 5% silty fines, tan, damp.
15	23		3.7		110	■			
									END OF BORING No fill No caving No groundwater No bedrock
20									

PROJECT: Minaberry Trust (APN 218-151-19 & -23)	PROJECT NUMBER: 31396.1
CLIENT: JMS Turner, LLC	
LOR GEOTECHNICAL GROUP INC.	DATE DRILLED: August 31, 2000
	EQUIPMENT: CME 55
	HOLE DIA.: 8" — ENCLOSURE: B-16

APPENDIX C

APPENDIX C
LABORATORY TESTING

General

Selected soil samples obtained from the trenches and borings were tested in our laboratory to evaluate the physical properties of the soils affecting foundation design and construction procedures. The laboratory testing program performed in conjunction with our investigation included moisture content, dry density, laboratory compaction, direct shear, sieve analysis, sand equivalent, percent passing No. 200 sieve, R-value, consolidation, and soluble sulfate tests. Descriptions of the laboratory tests are presented in the following paragraphs.

Moisture-Density Tests

The moisture content and dry density information provides an indirect measure of soil consistency for each stratum, and can also provide a correlation between soils on this site. The dry unit weight and field moisture content were determined for selected soil samples, and the results are shown on the trench and boring logs, Enclosures B-1 through B-16, for convenient correlation with the soil profile.

Laboratory Compaction

Selected soil samples were tested in the laboratory to determine compaction characteristics using the ASTM D 1557-91 compaction test method. The results are presented in the following table:

LABORATORY COMPACTION				
Trench Number	Sample Depth (feet)	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (percent)
T-1	3.0	(SM) SILTY SAND	133.0	9.0
T-1	4.5	(SP) SAND	119.0	8.5
T-5	5.5	(SM) SILTY SAND	115.0	12.5

Direct Shear Tests

Shear tests are performed with a direct shear machine at a constant rate-of-strain (usually 0.05 inches/minute). The machine is designed to test a sample partially extruded from a sample ring in single shear. Samples are tested at varying normal loads in order to evaluate the shear strength parameters, angle of internal friction and cohesion. Samples are tested in a remolded condition (90% relative compaction per ASTM D 1557) and soaked, according to conditions expected in the field.

The results of the shear tests are presented in the following table.

DIRECT SHEAR TESTS				
Trench Number	Sample Depth (feet)	Soil Description	Angle of Internal Friction (degrees)	Apparent Cohesion (psf)
T-1	3.0	(SM) SILTY SAND	32	300

Percent Passing No. 200 Sieve Tests

A quantitative determination of the percentage of soil passing the No. 200 sieve was performed for selected samples. The results indicate the percentage of fines in the soil. The results are presented in the following table:

PERCENT PASSING NO. 200 SIEVE TESTS			
Trench Number	Sample Depth (feet)	Soil Description	Percent by Weight Passing No. 200 Sieve (%)
T-1	4.0	(SP) SAND	12
T-2	3.0	(SP) SAND	4
T-6	2.0	(SP) SAND	4
T-11	3.0	(SM) SILTY SAND	23

R-Value Test

Soil samples were obtained at probable pavement subgrade level and sieve analysis and sand equivalent tests were conducted. Based on these indicator tests, a selected soil sample was tested to determine its R-value using the California R-Value Test Method, Caltrans Number 301-F. The results of the sieve analysis, sand equivalent and R-value tests are presented on Enclosure C-1.

Soluble Sulfate Content Tests

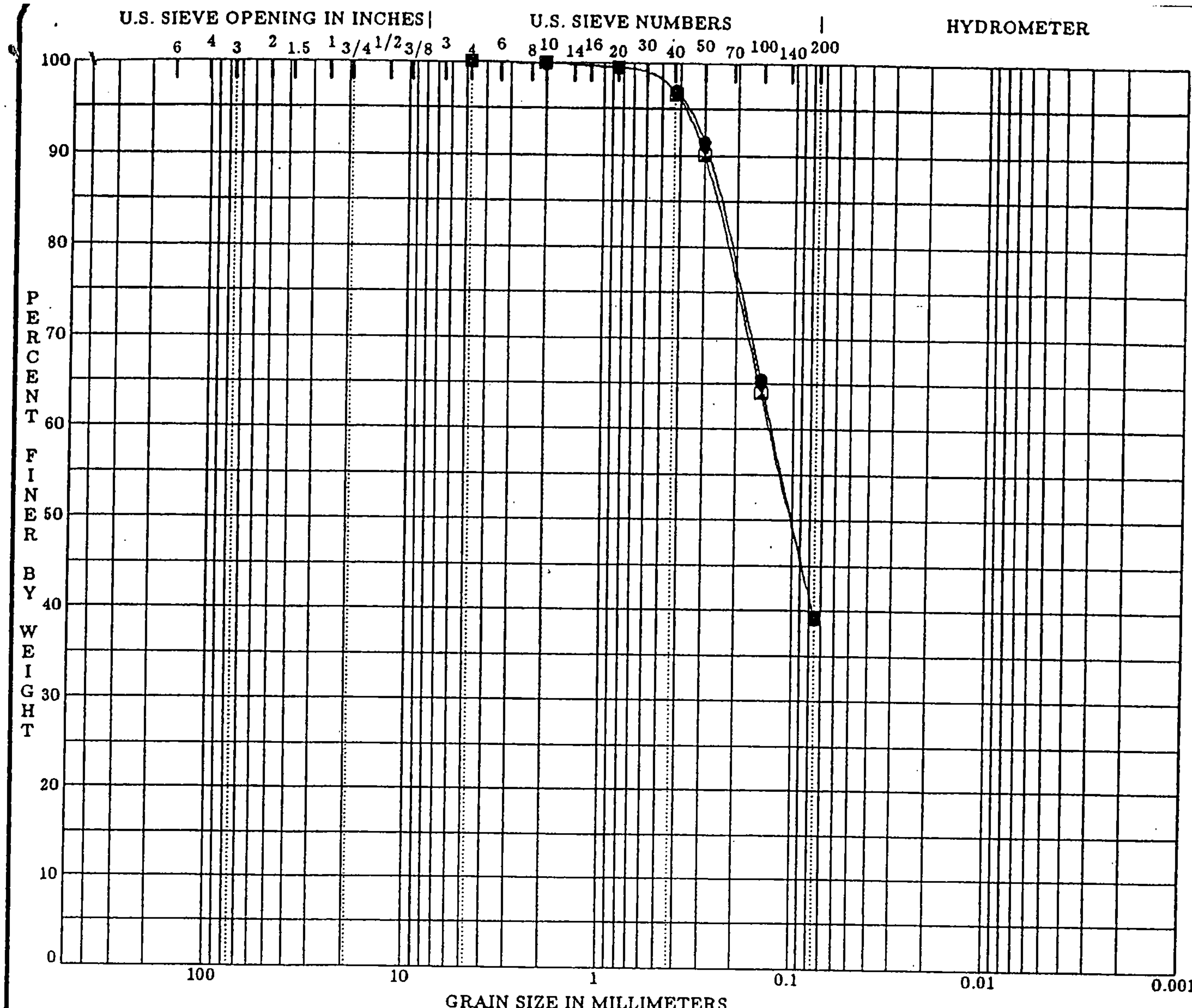
The soluble sulfate content of selected subgrade soils were evaluated. The concentration of soluble sulfates in the soils was determined by measuring the optical density of a barium sulfate precipitate. The precipitate results from a reaction of barium chloride with water extractions from the soil samples. The measured optical density is correlated with readings on precipitates of known sulfate concentrations. The test results are presented on the following table:

SOLUBLE SULFATE CONTENT TESTS			
Trench Number	Sample Depth (feet)	Soil Description	Sulfate Content
T-1	Surface	(SM) SILTY SAND	< 50 ppm
T-3	Surface	(SM) SILTY SAND	< 200 ppm
T-7	Surface	(SM) SILTY SAND	< 50 ppm

Consolidation Tests

The apparatus used for the consolidation tests (odometer) is designed to test a one-inch high portion of the undisturbed soil sample as contained in a sample ring. Porous stones and filler paper are placed in contact with the top and bottom of the specimen to permit the addition or release of water. Loads are applied to the test specimen in specified increments, and the resulting axial deformations are recorded. The results are plotted as log of axial pressure versus consolidation or compression, expressed as strain or sample height.

Samples are tested at field and greater-than field moisture contents. The results are shown on Enclosures C-2 through C-6.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	SE	RV			Cc	Cu
● T-12	1-3 FT.	(SM) SILTY SAND	17	68				
⊠ T-5	1-3 FT.	(SM) SILTY SAND	14	--				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● T-12	1-3 FT.	4.75	0.13			0.0	61.0	39.0	
⊠ T-5	1-3 FT.	4.75	0.13			0.0	60.8	39.2	

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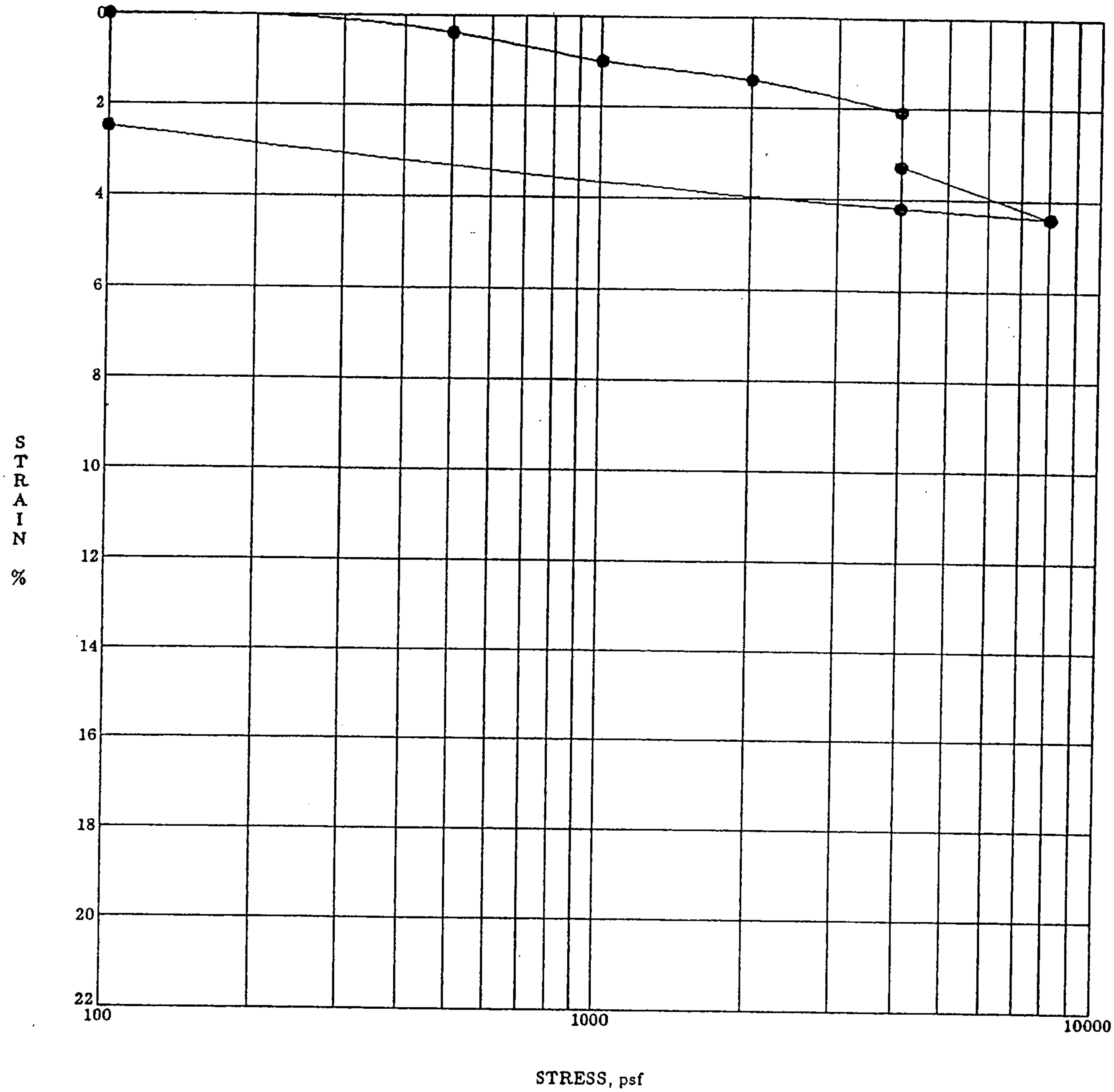
DATE 9/13/00

GRADATION CURVES

LOR Geotechnical Group, Inc.
Riverside, California

Enclosure C-1



Specimen Identification		Classification	DD	MC%
● B-1	10.0	(SM-ML) SILTY SAND- SANDY SILT	100	8

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PROJECT NO. 31396.1
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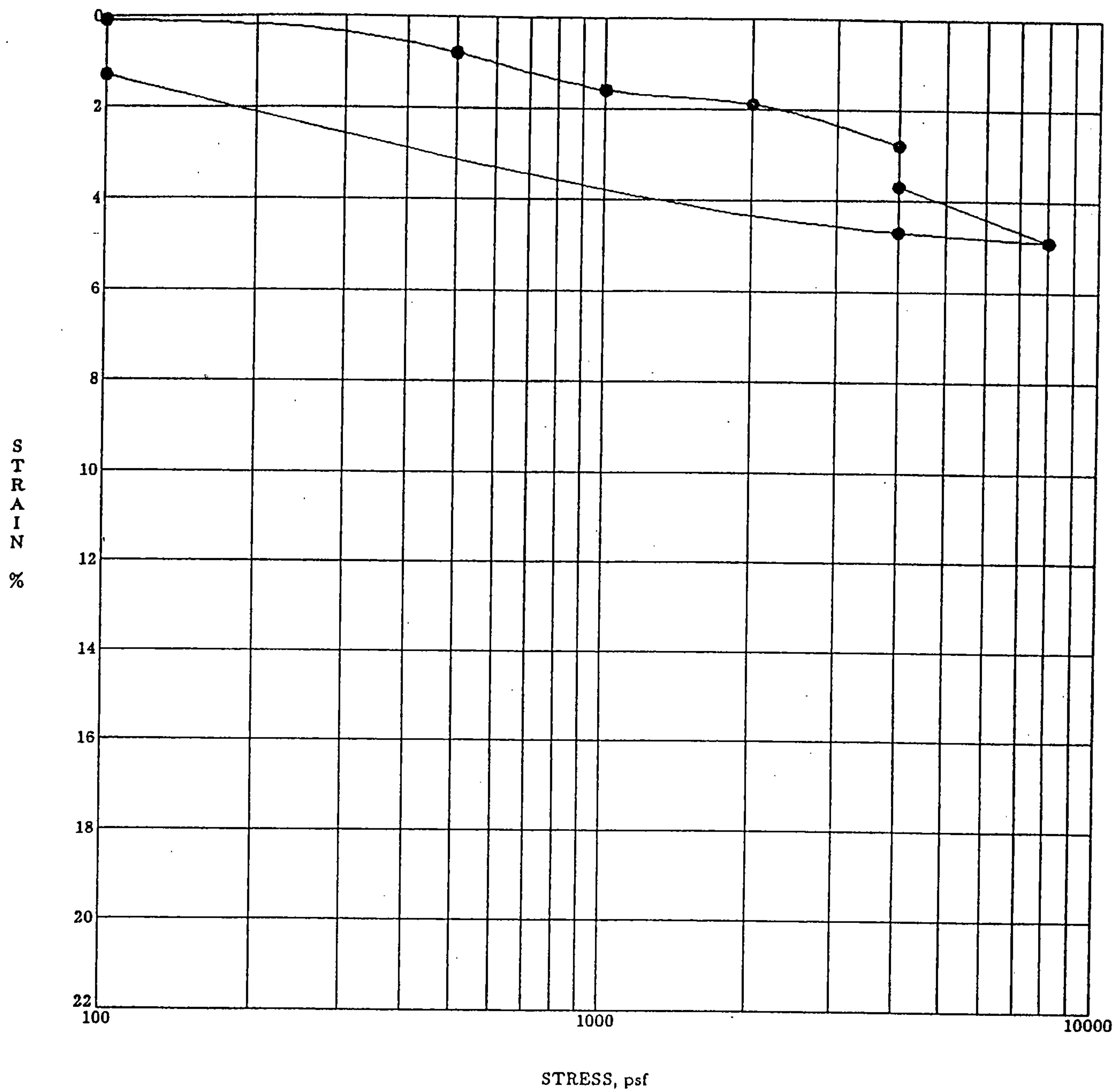
CONSOLIDATION TEST

LOR Geotechnical Group, Inc.
Riverside, California

Enclosure C-2



	Specimen Identification		Classification	DD	MC%
●	B-1	12.0	(ML) SANDY SILT	106	20

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PROJECT NO. 31396.1

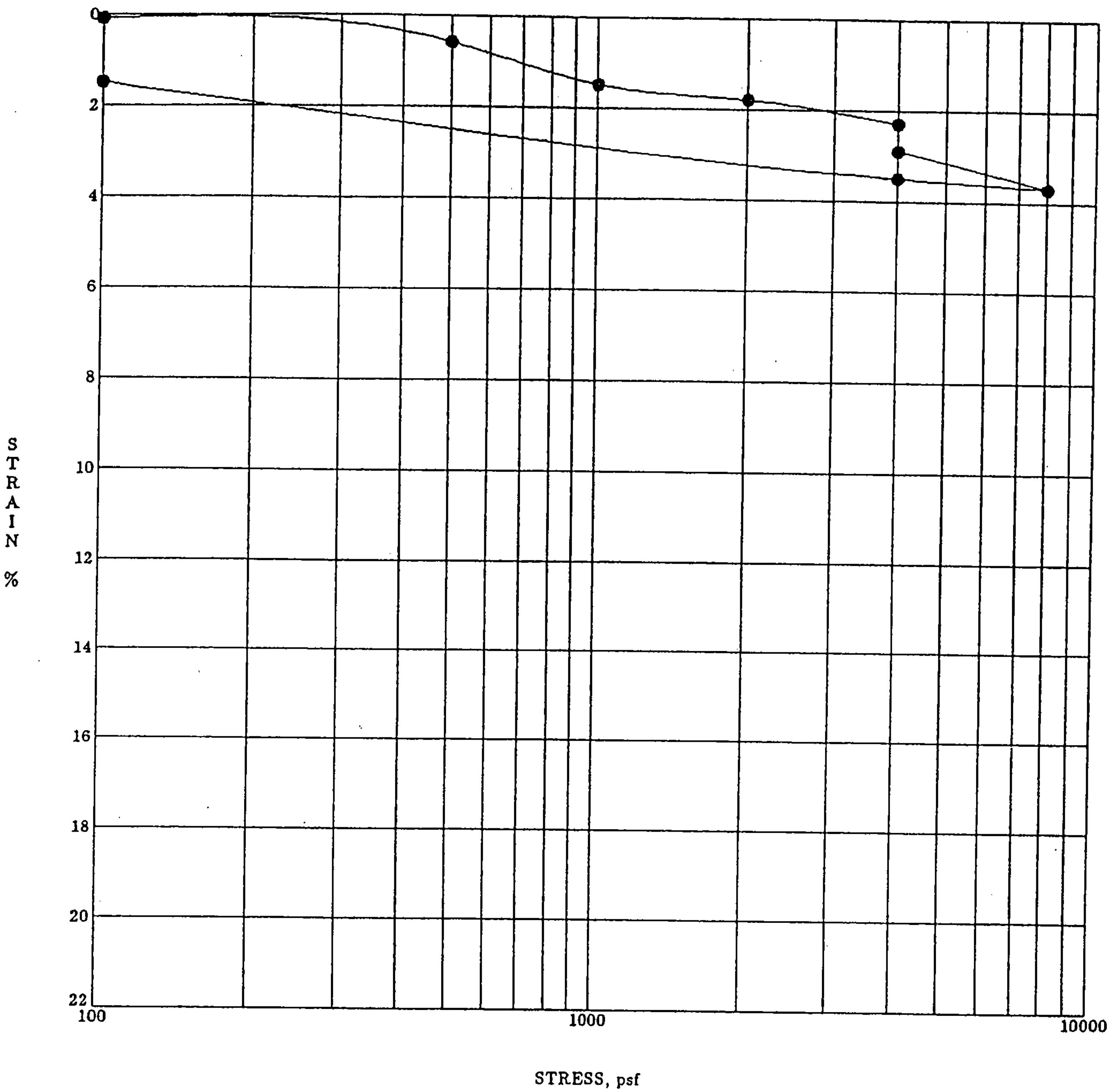
DATE 9/13/00

CONSOLIDATION TEST

LOR Geotechnical Group, Inc.

Riverside, California

Enclosure C-3



	Specimen Identification		Classification	DD	MC%
●	B-1	14.0	(SP) POORLY GRADED SAND	120	12

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PROJECT NO. 31396.1
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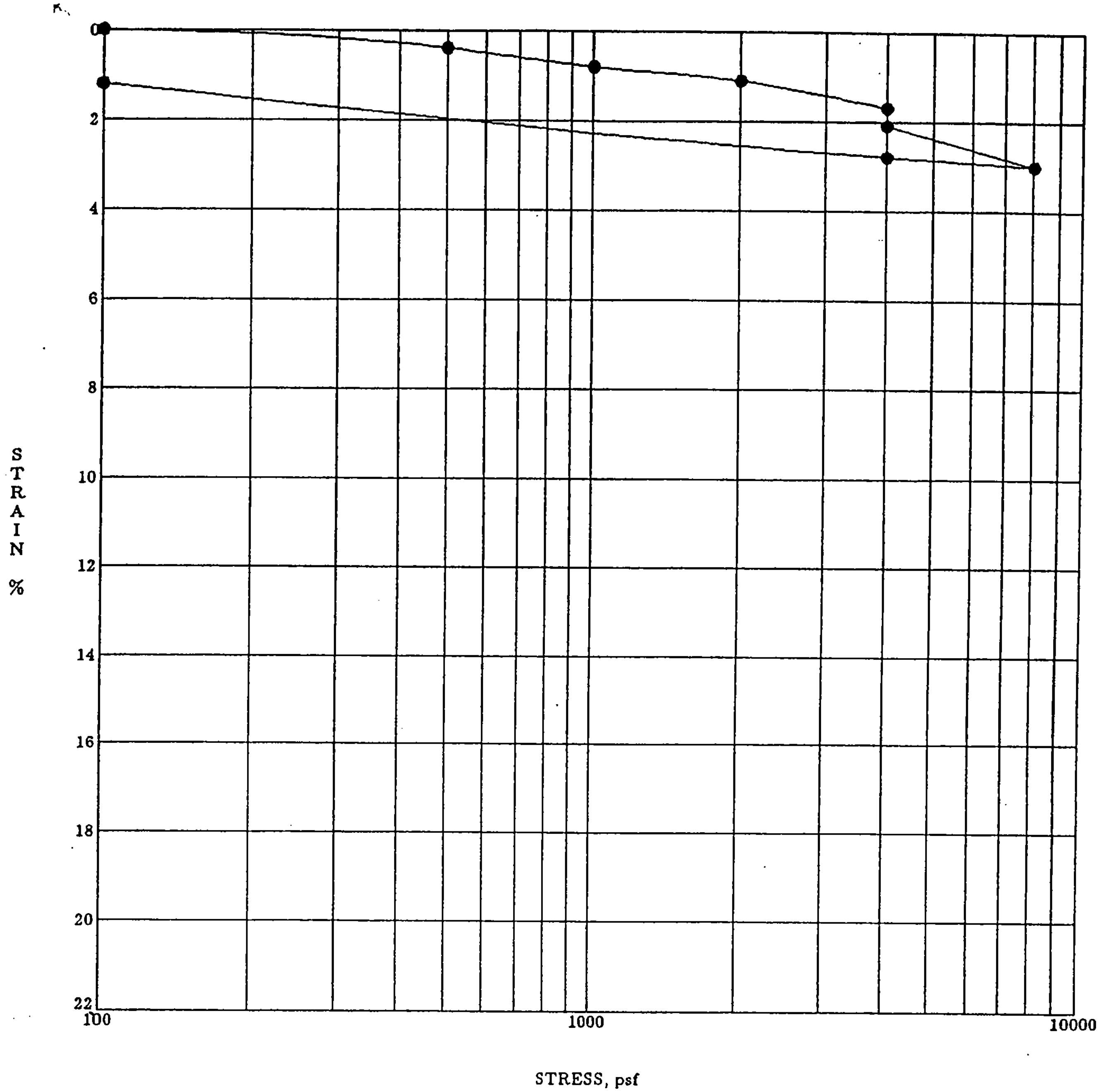
CONSOLIDATION TEST
LOR Geotechnical Group, Inc.
Riverside, California

Enclosure C-4



	Specimen Identification		Classification	DD	MC%
●	B-2	8.0	(SP) POORLY GRADED SAND	112	13

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PROJECT NO. 31396.1
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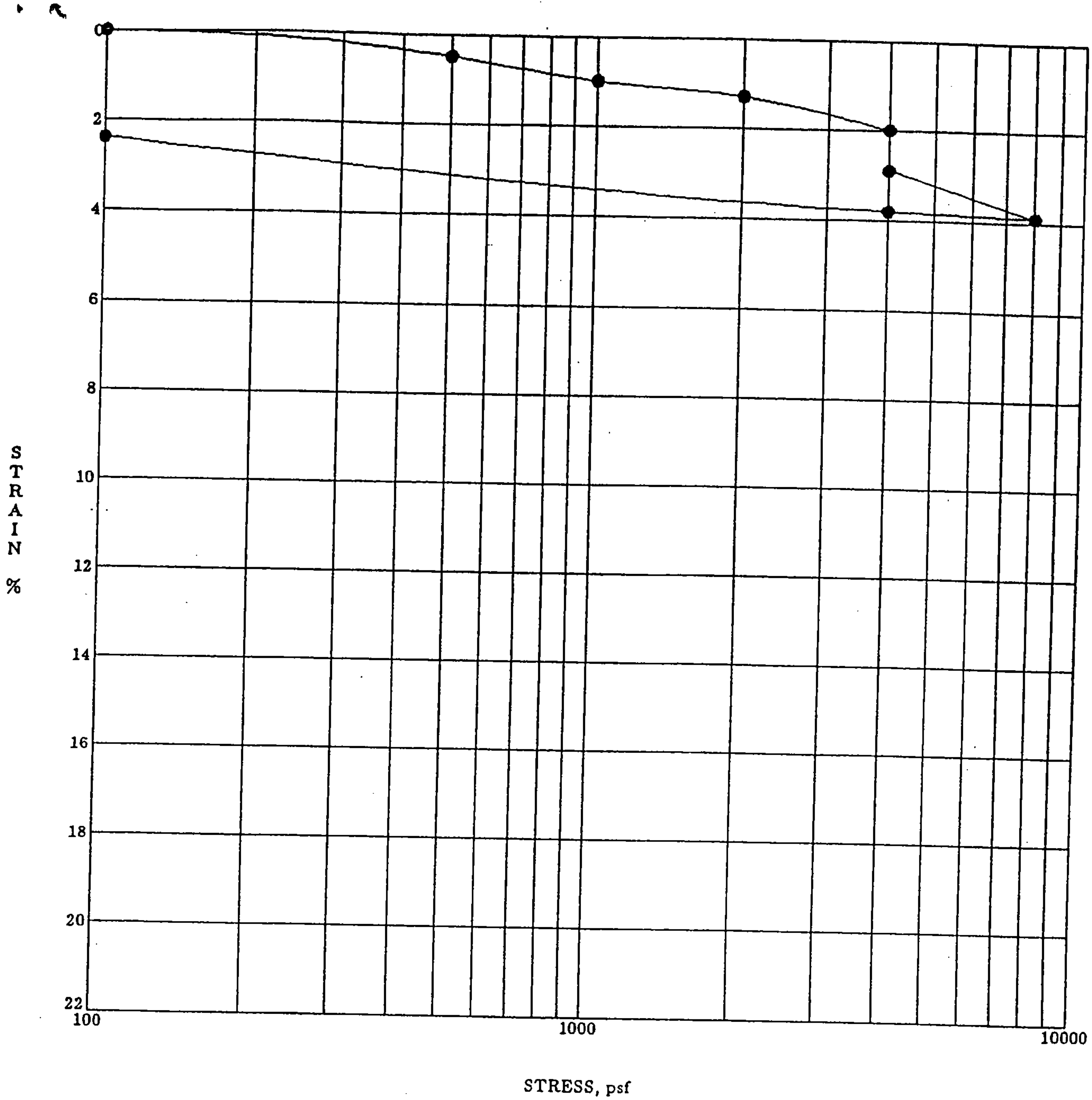
CONSOLIDATION TEST

LOR Geotechnical Group, Inc.
Riverside, California

Enclosure C-5



	Specimen Identification		Classification	DD	MC%
●	B-2	10.0	(SP) POORLY GRADED SAND	113	12

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CONSOLIDATION TEST

LOR Geotechnical Group, Inc.
Riverside, California

Enclosure C-6