PRELIMINARY GEOTECHNICAL EVALUATION FOR VISTANCIA

LAKELAND VILLAGE, PARCEL D-13 WATER RESERVOIRS MARICOPA COUNTY, ARIZONA

WT JOB NO. 2122JN215

Western Technologies Inc.
The Quality People
Since 1955

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Prepared for:

SHEA SUNBELT PLEASANT POINT, LLC

October 7, 2002

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October 7, 2002

Shea Sunbelt Pleasant Point, LLC
9051 West Kelton Lane, Suite 4
Peoria, Arizona 85382-3575

Attn: Mr. Mike Brilz, P.E.

WT Job No. 2122JN215

Re: Geotechnical Evaluation For Vistancia
Lakeland Village, Parcel D-13
Water Reservoirs
Maricopa County, Arizona

Western Technologies, Inc. (WT) has completed the preliminary geotechnical evaluation for the proposed Water Reservoirs and associated small structures to be located at Lakeland Village in Maricopa County, Arizona. This study was performed in general accordance with our proposal number 2122PC493, dated July 1, 2002. The results of our evaluation, including the boring location diagram, boring logs, laboratory test results, and geotechnical recommendations are attached.

We appreciate being of service to you in the geotechnical engineering phase of this project and are prepared to assist you during the construction phases as well. If design conditions change, or if you have any questions concerning this report or any of our materials testing, special inspection, or consulting services, please do not hesitate to contact us. We look forward to working with you on future projects.

Sincerely,
WESTERN TECHNOLOGIES, INC.
Geotechnical Engineering Services

Mark Hartig, E.I.T.
Geotechnical Engineer

Randolph Marwig, P.E.
Senior Geotechnical Engineer

Copies to: Addressee (15)

Shea Sunbelt Pleasant Point, LLC
Job No. 2122JN215

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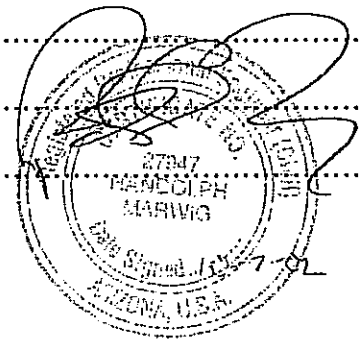

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PRELIMINARY GEOTECHNICAL EVALUATION
FOR VISTANCIA

LAKELAND VILLAGE, PARCEL D-13
WATER RESERVOIRS
MARICOPA COUNTY, ARIZONA

WT JOB NO. 2122JN215

1.0 PURPOSE

This report contains the results of our preliminary geotechnical evaluation for the proposed Water Reservoirs and associated small structures to be located at Lakeland Village in Peoria, Arizona. The purpose of these services is to provide information and recommendations regarding:

- foundation design parameters
- lateral earth pressures
- earthwork
- pavement sections
- drainage
- corrosivity
- slabs-on-grade
- cut and fill slopes
- excavation conditions
- seismic conditions

Our services included obtaining information on site conditions, performing field and laboratory testing, performing engineering analyses, providing recommendations for use in foundation, floor slab, and on-site pavement design, and presenting earthwork guidelines. Results of the field exploration, field tests, and laboratory testing program are presented in the Appendices.

2.0 PROJECT DESCRIPTION

Information supplied by Shea Sunbelt Pleasant Point, LLC on July 1, 2002, indicates the project will consist of the construction of two 2,700,000-gallon water tanks. The proposed water reservoirs will be 16 feet tall, 170 feet in diameter, and will be above grade. Additionally, small associated structures will be constructed near the reservoirs. We anticipate that the ground floor level will be at or slightly above existing site grade.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Nine borings were drilled to depths ranging from 5 to 12 feet below existing grade in the proposed parcel area. The borings were at the approximate locations shown on the attached

Boring Location Diagram. A field log was prepared for each boring. These logs contain visual classifications of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples. Final logs, included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thickness', and the locations where samples were obtained.

The Unified Soil Classification System was used to classify soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A. Local and regional geologic characteristics were used to estimate the seismic design criteria.

3.2 Laboratory Analyses

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. Testing was performed in general accordance with applicable ASTM test methods. The following tests were performed and the results are presented in Appendix B.

- Water Content
- Dry Density
- Plasticity
- Minus #200 Sieve
- pH
- Electrical Resistivity
- Soluble Chlorides Content
- Soluble Sulfates Content

3.3 Analyses and Report

Analyses were performed and this report was prepared for the exclusive purpose of providing geotechnical engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken. We are available to discuss the scope of such studies with you.

This geotechnical engineering report includes a description of the project, a discussion of the field and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as required to satisfy the purpose previously described.

4.0 SITE CONDITIONS

4.1 Surface

At the time of our exploration, the site was undeveloped native desert. The ground surface was relatively flat and rocky and contained a light growth of native desert trees, shrubs, grass, and cacti. Site drainage trended to the south via small washes and sheet surface flow.

4.2 Subsurface

As presented on the boring logs, surface soils to the full depth of exploration were found to be very dense silty sands and hard sandy silts. Zones of light carbonate cementation were encountered in all of the borings at depths ranging from 0 to 2 feet below existing grade and extending to the full depth of exploration. Refusal on cemented materials was also encountered in all of the borings. Groundwater was not encountered in any boring at the time of exploration.

4.3 Geology

The site is located in the Basin and Range Geologic Province. The Basin and Range Province is characterized by a modern landscape consisting of broad alluvial valleys bound by steep, relatively rugged mountain ranges. The trend of the valleys and mountain ranges is generally in a north-south to northwest-southeast direction. The modern landscape was formed primarily by middle and late Cenozoic extensional tectonism, which resulted in high angle normal faults. The site is located in Recent and Pleistocene Age alluvial materials which are of substantial thickness. These sediments are well consolidated and, in places, are lightly cemented.

5.0 GEOTECHNICAL PROPERTIES & ANALYSIS

5.1 Laboratory Tests

Near-surface soils range from non plastic to very low in plasticity. These soils are expected to exhibit low expansion potential when recompacted, confined by loads approximating floor loads and saturated. Slabs-on-grade supported on recompacted native soils have a low potential for heaving if the water content of the soil increases.

5.2 Field Tests

Undisturbed samples for compression testing were not obtained due to the granular nature of the soils. Native subsoils near shallow foundation level exhibited high resistance to penetration using the standard penetration test method (ASTM D1586) and ring-lined barrel

sampling (ASTM D3550). These soils correlate to have a high bearing capacity in their present condition.

6.0 RECOMMENDATIONS

6.1 General

Our recommendations are based on the assumption that the subsurface conditions are similar to those disclosed by the borings. If variations are noted during construction, or if changes are made in the site plan, structural loading, foundation type or floor level, we should be notified to supplement our recommendations, as applicable. This report does not encompass the effects, if any, of underlying geologic hazards or regional groundwater withdrawal and expresses no opinion regarding their effects on surface movements at the project site.

6.2 Foundations

The proposed reservoirs can be supported by ring type spread footings bearing on dense native soils or properly compacted engineered fills. The associated structures can be supported on conventional shallow spread footing type foundations bearing on dense native soils or properly compacted engineered fills. Alternative footing depths and allowable bearing capacities for both are presented in the following tabulation:

Footing Depth Below Finished Grade (ft)*	Allowable Bearing Capacity (psf)**
1.5	2000
2.0	2500
2.5	3000

* Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

** Allowable bearing capacities assume fulfillment of **Earthwork** recommendations.

The allowable bearing capacities apply to dead loads plus design live load conditions. The allowable bearing capacity may be increased by one-third when considering total loads that include wind or seismic. Recommended minimum widths of column and wall footings are 24 inches and 16 inches, respectively.

For foundations adjacent to slopes, a minimum horizontal setback of five 5 feet should be maintained between the foundation base and slope face. In addition, the setback should be

such that an imaginary line extending downward at 45 degrees from the nearest foundation edge does not intersect the slope.

Thickened slab sections can be used to support interior partitions, provided that:

- loads do not exceed 900 plf,
- thickened sections have a minimum width of 12 inches, and
- thickness and reinforcement are consistent with structural requirements.

We anticipate that differential movement of the proposed structures, supported as recommended, should be less than three-quarters of one inch. Additional foundation movements could occur if water from any source infiltrates the foundation soils. Therefore, proper drainage should be provided in the final design and during construction.

All footings, stem walls, and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movements. The use of joints at openings or other discontinuities in masonry walls is recommended.

We recommend that the geotechnical engineer or his representative observe the footing excavations before reinforcing steel and concrete are placed. This observation is to determine whether the materials exposed are similar to those anticipated for support of the footings. Any soft, loose or unacceptable materials should be undercut to suitable materials and backfilled with approved fill materials or lean concrete. Soil backfill should be properly compacted.

6.3 Lateral Design Criteria

The only anticipated retaining walls for the project are short landscape walls. For cantilevered retaining walls above any free water surface, with level backfill and no surcharge loads, recommended equivalent fluid pressures and coefficients of base friction for unrestrained elements are:

- Active:
  - Undisturbed subsoil ..... 35 psf/ft
  - Compacted granular backfill ..... 30 psf/ft
  - Compacted site soils ..... 35 psf/ft

- Passive:
  - Shallow wall footings ..... 250 psf/ft
  - Shallow column footings ..... 400 psf/ft

- Coefficient of base friction 0.40*

*The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.

The equivalent fluid pressures presented herein do not include the lateral pressures arising from the presence of:

- hydrostatic conditions, submergence or partial submergence
- sloping backfill, positively or negatively
- surcharge loading, permanent or temporary
- seismic or dynamic conditions

Fill against footings, stem walls, and retaining walls should be compacted to densities specified in **Earthwork**. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction may cause excessive lateral earth pressures that could result in wall movements.

6.4 Seismic Considerations

For structural designs based upon the International Building Code 2000, the following criteria will apply. The soil site class is C. S_s, the spectral acceleration for short periods, is 0.25. S_1, the spectral acceleration for a 1-second period, is 0.08. F_a and F_v, in accordance with Table 1615.1.2 (1) and 1615.1.2 (2), are 1.2 and 1.7, respectively.

6.5 Conventional Slab-on-Grade Support

Floor slabs can be supported on properly placed and compacted fill or approved natural soils. The slab subgrade should be prepared by the procedures outlined in this report. A minimum 4-inch layer of base course should be provided beneath all slabs to help prevent capillary rise and a damp slab.

If moisture sensitive floor coverings are used on interior slabs, consideration should be given to the use of vapor barriers. Final determination on the use of vapor barriers should be left to the slab designer.

The recommended modulus of subgrade reaction (k) is 350 pounds per cubic inch.

6.6 Drainage

It is important that positive drainage be provided during construction and maintained throughout the life of the proposed development. Infiltration of water into utility or foundation excavations must be prevented during construction.

6.7 Corrosivity

Laboratory test results indicate site soils exhibit a low corrosion potential to concrete. For these soils, the American Concrete Institute (ACI) recommends a Type II Portland Cement be used for all concrete on and below grade. Corrosion protection for buried metallic piping should be designed by a qualified corrosion engineer.

6.8 Pavements

No pavement sections are anticipated for this site. If a paved access road is to be built, it is assumed that the types of traffic anticipated to use the access road are maintenance trucks on a very occasional basis. Using this assumption, a 2.5-inch asphalt concrete pavement may be used over the native undisturbed or recompacted soil. Another alternative is to use a 2-inch asphalt concrete pavement over 4 inches of base course.

Material and compaction requirements should conform to recommendations presented under **Earthwork**. The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections.

7.0 EARTHWORK

7.1 General

The conclusions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted and tested in accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, earthwork activities or backfilling occurs.

7.2 Site Clearing

Strip and remove any existing vegetation, organic topsoils, debris, and any other deleterious materials from the building and pavement areas. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

Sloping areas steeper than 5:1 (horizontal:vertical) should be benched to reduce the potential for slippage between existing slopes and fills. Benches should be level and wide enough to accommodate compaction and earth moving equipment.

7.3 Excavation

Excavations penetrating the underlying cemented materials may require the use of heavy-duty, specialized equipment, possibly together with drilling and blasting, to facilitate removal. The speed and ease of excavation is dependent on the nature of the deposit, the type of equipment used, and the skill and experience of the equipment operator.

The soils to be penetrated by the proposed excavations may vary significantly across the site. Our soil classifications are based solely on the materials encountered in widely spaced exploratory test borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are found at the time of construction, we should be contacted immediately to evaluate the conditions encountered.

7.4 Foundation Preparation

Specialized treatment of existing soils within foundation areas is not required. Footings should bear upon undisturbed native soils.

7.5 Conventional Interior Slab Preparation

Prior to the placement of fill or aggregate base course, the exposed soil should be scarified a minimum depth of 10 inches, moisture conditioned and recompacted as recommended herein.

7.6 Pavement Preparation

Specialized treatment of existing soils within pavement areas is not required. Pavements should bear upon undisturbed native soils or aggregate base.

7.7 Materials

Clean on-site native soils with low expansive potentials and six-inch minus or imported materials may be used as fill material for the following:

- foundation areas
- interior slab areas
- pavement areas
- backfill

Imported soils should conform to the following:

- Gradation (ASTM C136):

	percent finer by weight
6"	100
4"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	40 (max)

- Maximum expansive potential (%)* 1.5

- Maximum soluble sulfates (%) 0.10

*Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 100 psf surcharge and submerged.

Oversize material, greater than 6 inches, may be used in the lower portions of the tank pads, below 3 feet, provided that the particles are distributed throughout the fill and no nesting of oversize material occurs.

The materials used in the upper 3 feet of the tank pads should be reasonably free of rocks or lumps having a particle diameter greater than 6 inches. Acceptance of the quantity of oversize material shall be at the discretion of the geotechnical engineer.

Base course should conform to the Maricopa Association of Governments (MAG) specifications.

7.8 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.

b. Uncompacted fill lifts should not exceed 10 inches.

c. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D698)
• On-site soil, reworked and fill:	
Below footings	95
Below slabs-on-grade	90
Below pavement	95
• Imported soil:	
Below footings	95
Below slabs-on-grade	90
Below pavement	95
• Aggregate base course below slabs-on-grade	95
• Aggregate base below pavement	100
• Nonstructural backfill	90

On-site and imported soils should be compacted within a water content range of 3 percent below to 3 percent above optimum.

7.9 Cut and Fill Slopes

The stability of any cut and fill slopes at the project site will dependent upon the properties of the materials comprising the slope face and the susceptibility of slope soils to erosion. For permanent cut slopes in the typical cemented soil matrix encountered and less than six feet in vertical height, slopes no steeper than 2.5:1 (horizontal:vertical) are recommended. Fill slopes should not be steeper than 3:1. It is assumed that appropriate slope erosion protection and/or planting will be utilized.

Where exposed slopes are predominantly made up of bare soil, slopes should be covered as quickly as possible with temporary or permanent protection in order to avoid unnecessary soil loss. If during construction, rains are anticipated, flows over graded or disturbed areas should be minimized by diverting upslope surface water through the use of berms, ditches, or other diversion devices.

Erosional activity, if allowed to form and propagate, will increase soil loss and could result in loss of support to structures, streets and other facilities. Periodic maintenance and prompt repair of erosional features is important to prevent soil loss. The effectiveness of erosion control measures should be evaluated after heavy or prolonged rains.

7.10 Compliance

Recommendations for slabs-on-grades, foundations and pavement elements supported on compacted fills or prepared subgrade depend upon compliance with **Earthwork** recommendations. To assess compliance, observation and testing should be performed under the direction of a geotechnical engineer.

8.0 LIMITATIONS

This report has been prepared based on our understanding of the project criteria as described in Section 2.0. Others may make changes in the project criteria during design or construction, and substantially different subsurface conditions may be encountered or become known. The conclusions and recommendations presented herein shall not continue to be valid unless all variations are brought to our attention in writing, and we have had an opportunity to assess the effect such variations may have on our conclusions and recommendations and respond in writing.

The recommendations presented are based upon data derived from a limited number of samples obtained from widely spaced subsurface explorations. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. The geotechnical engineer necessarily makes assumptions as to the uniformity of the geology and soil structure between explorations, but variations can exist. Accordingly, whenever any deviation or change is encountered or becomes known during design or construction, the conclusions and recommendations presented herein shall not continue to be valid unless WT is notified in writing, has actually reviewed the matter, and has issued a written response.

This report does not provide information relative to construction methods or sequences. Any person reviewing this report must draw his/her own conclusions regarding site conditions as they relate to the employment or development of construction techniques. This report is valid for one year after the date of issuance unless there is a change in circumstances or discovered variations justifying an earlier expiration of validity. After expiration, no person or entity has any right to rely on this report without further review and reporting by WT under a separate contract.

9.0 OTHER SERVICES

The geotechnical engineer should be retained for a general review of final plans and specifications to evaluate compliance with our recommendations.

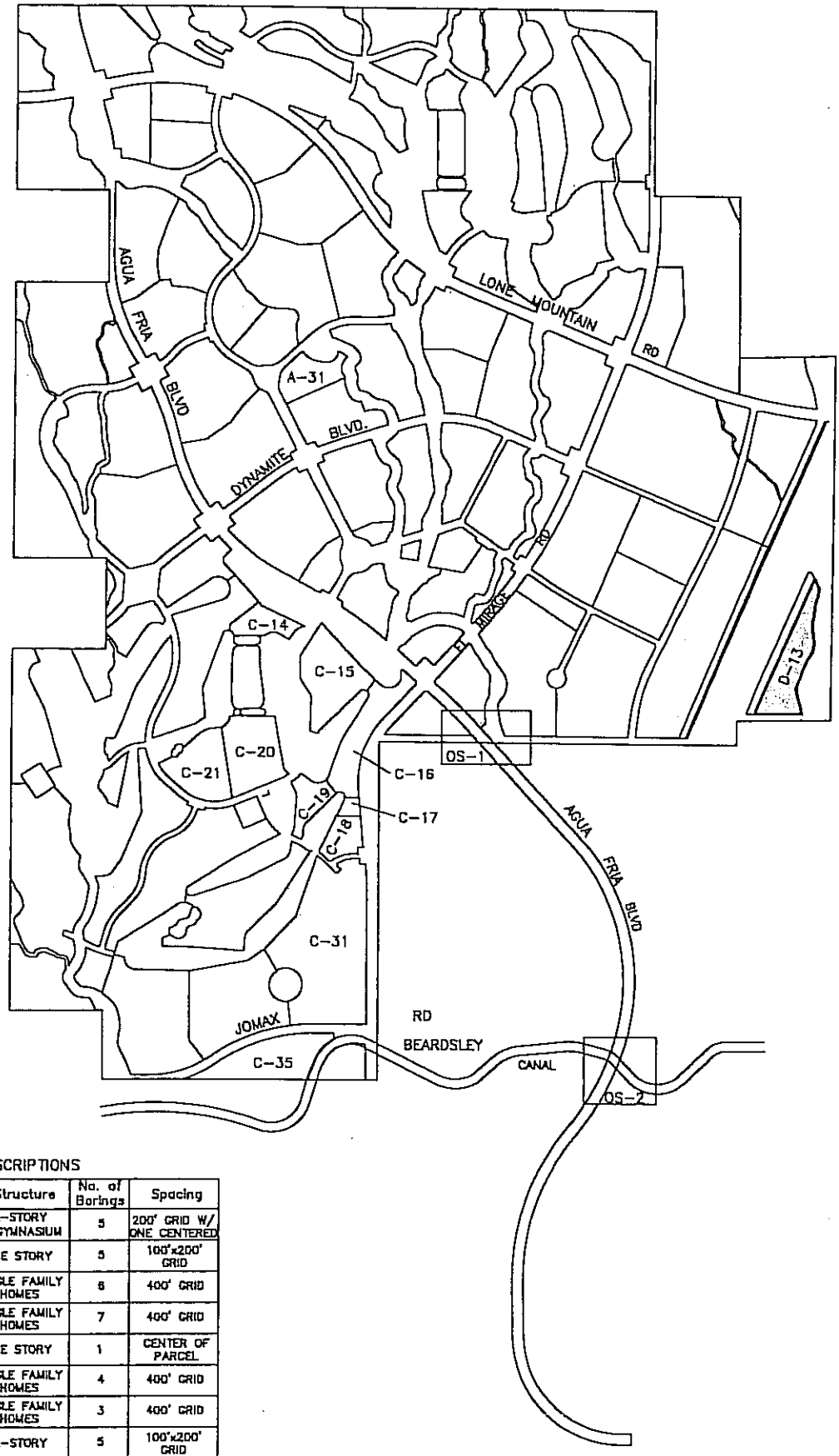
The geotechnical engineer should also be retained to provide observation and testing services during excavation, earthwork operations, foundation and construction phases of the project. Observation

of footing excavations should be performed prior to placement of reinforcing and concrete to confirm that satisfactory bearing materials are present.

10.0 CLOSURE

We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon conditions at the location of specific tests, observations and data developed to satisfy the scope of services defined by the contract documents. Work on your project was performed in accordance with generally accepted industry standards and practices by professionals providing similar services in this locality. No other warranty, express or implied, is made.

The recommendations contained herein may be based upon government regulations in effect at the time of this report. Future changes or modifications to these regulations may require modification of this report.



PARCEL DESCRIPTIONS

Parcel No.	Type	Structure	No. of Borings	Spacing
A-31	REC/COMMUNITY CENTER	2-STORY W/GYMNASIUM	5	200' GRID W/ ONE CENTERED
C-14	GOLF CLUB/ HOUSE	ONE STORY	5	100'x200' GRID
C-15	RESIDENTIAL	SINGLE FAMILY HOMES	6	400' GRID
C-16	RESIDENTIAL	SINGLE FAMILY HOMES	7	400' GRID
C-17	GOLF MAINTENANCE	ONE STORY	1	CENTER OF PARCEL
C-18	RESIDENTIAL	SINGLE FAMILY HOMES	4	400' GRID
C-19	RESIDENTIAL	SINGLE FAMILY HOMES	3	400' GRID
C-20	REC/COMMUNITY CENTER	2-STORY	5	100'x200' GRID
C-21	MODEL COMPLEX	SINGLE FAMILY HOMES	6	400' GRID
C-31	RESIDENTIAL	SINGLE FAMILY HOMES	18	400' GRID
C-35	WATER RECLAMATION FACILITY		15	AS SHOWN
D-13	WATER RESERVOIRS		6	AS SHOWN
OS-1	AGUA FRIA BLVD./ TWIN BUTTES WASH	BRIDGE	4	2 EACH LANE EACH SIDE OF WASH
OS-2	AGUA FRIA BLVD./ BEARDSLEY CANAL	BRIDGE	2	40 FT FROM CANAL LINING

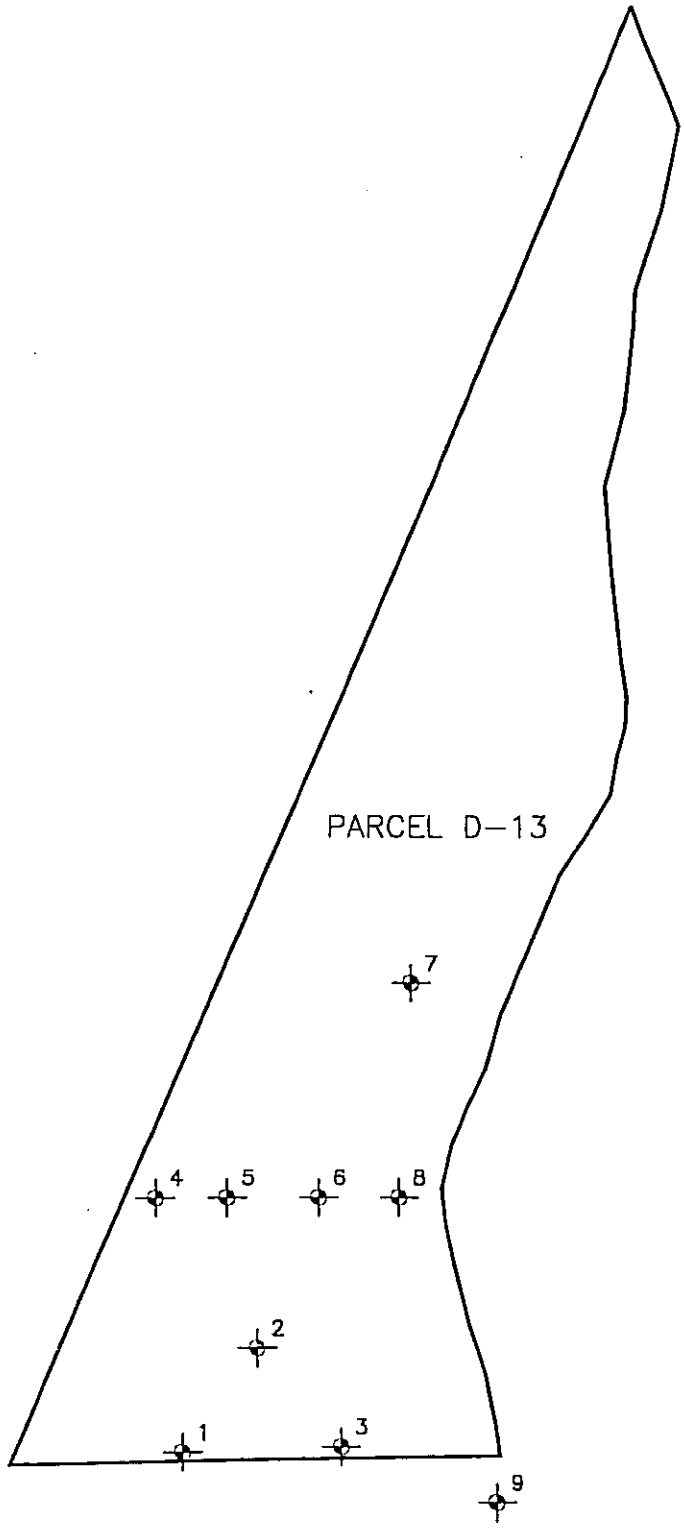
N

Not to Scale

LAKELAND VILLAGE, PARCEL D-13

Vicinity Map

Western Technologies Inc.



LEGEND:

APPROXIMATE LOCATION OF TEST BORING

N

Not to Scale:

LAKELAND VILLAGE, PARCEL D-13	
Boring Location Diagram	
Western Technologies Inc.	
Job No. 2183 IN 5	Plate 2

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson	A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier.
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon a base, subbase or subgrade.
Crushed Rock Base Course	A base course composed of crushed rock of a specified gradation.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Engineered Fill	Specified material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
Existing Fill	Materials deposited through the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.
Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Fill	Materials deposited by the actions of man.
Finished Grade	The final grade created as a part of the project.
Gravel Base Course	A base course composed of naturally occurring gravel with a specified gradation.
Heave	Upward movement
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Rock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Sand and Gravel Base	A base course of sand and gravel of a specified gradation.
Sand Base Course	A base course composed primarily of sand of a specified gradation.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Soil	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
Strip	To remove from present location.
Subbase	A layer of specified material placed to form a layer between the subgrade and base course.
Subbase Grade	Top of subbase.
Subgrade	Prepared native soil surface.

LAKELAND VILLAGE, PCL D-13	
Definition of Terminology	
Western Technologies Inc.	
Job No.: 2122JN215	Plate: A-1

COARSE-GRAINED SOILS

LESS THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% FINES	
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% FINES	
SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	
SM	SILTY SANDS, SAND-SILT MIXTURES, MORE THAN 12% FINES	
SC	CLAYEY SANDS, SAND-CLAY MIXTURES, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

FINE-GRAINED SOILS

MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL	ORGANIC SILTS OR ORGANIC SILT-CLAYS OF LOW PLASTICITY	
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics.

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	3/4 in. – 3 in.
Fine	No. 4 – 3/4 in.
SAND	No. 200 – No. 4
Coarse	No. 10 – No. 4
Medium	No. 40 – No. 10
Fine	No. 200 – No. 40
*Fines (Silt or Clay)	Below No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS PER FOOT*
VERY SOFT	0 – 2
SOFT	2 – 4
FIRM	4 – 8
STIFF	8 – 16
VERY STIFF	16 – 32
HARD	Over 32

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT*
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	30 – 50
VERY DENSE	Over 50

*Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch ID) split spoon (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 25	MEDIUM
Over 25	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

LAKELAND VILLAGE, PARCEL D-13

Method of Classification

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-2

The number shown in "**BORING NO.**" refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by pacing from property lines and/or existing features.

"**TYPE SIZE BORING**" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger.**

"**N" in Blows/Foot**" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a two-inch-outside diameter split-barrel sampler a distance of 1 foot. Standard Penetration Test (ASTM D1586). Refusal to penetration is defined as more than 100 blows per foot.

"**R" in Blows/Foot**" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a 2.42-inch-inside-diameter ring sampler a distance of 1 foot. Refusal to penetration is considered more than 50 blows per foot.

"**Sample Type**" refers to the form of sample recovery, in which **N = Split-barrel sample, R = Ring sample, G = Grab Sample.**

"**Dry Density, pcf**" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol "**NR**" indicates that no sample was recovered. The symbol "**DU**" indicates that determination of dry density was not possible.

"**Water Content, %**" refers to the laboratory-determined moisture content in percent (ASTM D2216).

"**Unified Classification**" refers to the soil type as defined by "Method of Soil Classification". The soils were classified visually in the field and, where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and soil characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring logs represent our interpretation of the approximate boundary between soil types based upon visual field classification. The transition between materials is approximate and may be far more or less gradual than indicated.

LAKELAND VILLAGE, PCL D-13	
Boring Log Notes	
Western Technologies Inc.	
Job No.: 2122JN215	Plate: A-3

DATE DRILLED: 08-15-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 1

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					ML		SANDY SILT; trace gravel, trace white carbonates, brown, hard, slightly damp
4.5	98	R		50/11"					light cementation
	NR	R		50/2"		5			light brown
									Refusal At 8 Feet On Cemented Material
						10			
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-15-2002

NOTES Latitude 33 44' 22.5"

Longitude -112 18' 23.0"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-4

SUMMARIES OF SUBSURFACE CONDITIONS AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 08-15-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 2

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							SM		SAND; with silt, with white carbonates, light brown, very dense, slightly damp
		G							light cementation
3.2	102	R		50/3"					occasional cobbles
	NR	R		50/2"		5			increase cementation, white
	NR	R		50/2"		10			
									Refusal At 12 Feet On Cemented Material
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-15-2002

NOTES Latitude 33 44' 24.0"

Longitude -112 18' 22.2"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-5

SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 08-15-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 3

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							SM		SILTY SAND; trace gravel, with white carbonates, brown, very dense, slightly damp
		N		50/2"					light cementation
									increase cementation, increase gravel
		N		50/1"		5			
									Refusal At 5.5 Feet On Cemented Material
						10			
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-15-2002

NOTES Latitude 33 44' 22.6"

Longitude -112 18' 21.5"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-6

SUMMARIES AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 08-15-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 4

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		N		50/2"			SM		SILTY SAND; trace gravel, with white carbonates, light cementation, brown, very dense, slightly damp
									with gravel
									white
	NR	N		50/0"		5			
									Refusal At 7.5 Feet On Cemented Material
						10			
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-15-2002

NOTES Latitude 33 44' 24.9"

Longitude -112 18' 24.5"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-7

THE SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 08-15-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 5

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					SM		SILTY SAND; light cementation, light brown, very dense, slightly damp
		N		50/1"					light brown to white
	NR	N		50/0"		5			
									Refusal At 8 Feet On Cemented Material
						10			
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-15-2002

NOTES Latitude 33 44' 24.9"

Longitude -112 18' 23.4"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-8

DATE DRILLED: 08-16-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 6

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					SM		SAND; with silt, with cobbles, with gravel, with white carbonates, light brown, very dense, slightly damp
		N		50/3"					light cementation, white
		N		50/1"		5			
									Refusal At 6 Feet On Cemented Material
						10			
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-16-2002

NOTES Latitude 33 44' 25.0"

Longitude -112 18' 21.5"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-9

DATE DRILLED: 08-16-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 7

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					SM		SAND; and gravel, with silt, light cementation, light brown, very dense, slightly damp
		N		50/3"					white
	NR	N		50/0"		5			**Refusal At 5 Feet** On Cemented Material
						10			
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-16-2002

NOTES Latitude 33 44' 27.5"

Longitude -112 18' 21.6"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-10

DATE DRILLED: 08-16-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 8

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		N		50/3"			SM		SILTY SAND; and gravel, with white carbonates, light cementation, light brown, very dense, slightly damp
	NR	N		50/0"		5			white
									Refusal At 7 Feet On Cemented Material
						10			
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-16-2002

NOTES Latitude 33 44' 25.2"

Longitude -112 18' 21.1"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-11

DATE DRILLED: 08-16-2002

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: HSA/8"

BORING NO. 9

LOCATION: See Location Diagram

ELEVATION: Not Determined

FIELD ENGR: L. Maniet

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							SM		SILTY SAND; with white carbonates, with cobbles, light brown, very dense, slightly damp
									light cementation
	NR	R		50/5"					
									white
	NR	R		50/1"		5			
									Refusal At 5.5 Feet On Cemented Material
						10			
						15			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 08-16-2002

NOTES Latitude 33 44' 21.8"

Longitude -112 18' 20.5"

LAKELAND VILLAGE, PCL D-13

Boring Log

Western Technologies Inc.

Job No.: 2122JN215 | Plate: A-12

PHYSICAL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Particle Size Distribution (%) Passing by Weight					Atterberg Limits		Moisture-Density Relationship			R-Value	Remarks
			3/4"	#4	#10	#40	#200	LL	PI	Dry Density (pcf)	Optimum Moisture (%)	Method		
1	0 – 5	ML					51	NV	NP					2,3
2	1 – 3	SM					20	NV	NP					2,3
5	0 – 5	SM					27	NV	NP					2,3
6	0 – 5	SM					17	NV	NP					2,3
7	0 – 5	SM					24	27	1					2,3

NOTE: NV – no value NP – nonplastic

REMARKS

Classification / Particle Size

1. Visual

2. Laboratory Tested

3. Minus #200 Only

Moisture-Density Relationship

4. Tested ASTM D698/AASHTO T99

5. Tested ASTM D1557/AASHTO T180

LAKELAND VILLAGE, PARCEL D-13

Physical Properties

Western Technologies Inc.

Job No.: 2122JN215 Plate: B-1

PHYSICAL PROPERTIES

Boring No.	Depth (ft)	pH	Soluble Salts (ppm)		Minimum Resistivity (Ohm-Cm)
			Sulfate	Chloride	
1	0 - 5	8.2	6.7	3.6	4636
2	1 - 3	8.1	6.3	4.1	
5	0 - 5	7.7	210	998	467
6	0 - 5	8.0	47	452	
7	0 - 5	8.5	5.1	28	

LAKELAND VILLAGE, PARCEL D-13

Physical Properties

Western Technologies Inc.

Job No.: 2122JN213 | Plate: B-2