GEOTECHNICAL EVALUATION

PASCUA YAQUI HEALTH CLINIC
CAMINO DE OESTE & CALLE TETAKUSIM
PASCUA YAQUI INDIAN RESERVATION, ARIZONA

WT JOB NO. 2925JM399

Western Technologies Inc.
The Quality People
Since 1955

TUCSON – ARIZONA
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Prepared For:

CDG ARCHITECTS

October 20, 1995

Registered Professional Engineer (Civil)
CERTIFICATE NO. 12474
JON C. SCHWINDT
Date Signed 10/20/95
ARIZONA, U.S.A.

Jon C. Schwindt, P.E.
Senior Geotechnical Engineer

Bruce M. Mac Ilroy, P.E.
Vice President

Western Technologies Inc.
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Since 1955

3480 South Dodge Boulevard
Tucson, Arizona 85713-5435
(520) 748-2262 • fax 748-0435

October 20, 1995

CDG Architects
345 East Toole, Suite 202
Tucson, Arizona 85701

Attn: Mr. David Hazeltine

Re: Geotechnical Evaluation
Pascua Yaqui Health Clinic
Camino de Oeste and Calle Tetakusim
Pascua Yaqui Indian Reservation, Arizona

Job No: 2925JM399

Western Technologies Inc. has completed the geotechnical evaluation for the proposed Pascua Yaqui Health Clinic to be located in Pima County, Arizona. This study was performed in general accordance with our proposal number 2925PX419, dated September 5, 1995. The results of our evaluation, including the boring logs, boring location diagram, laboratory test results, and the 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 testing, inspection, design and 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

Jon C. Schwindt, P.E.
Senior Geotechnical Engineer

Registered Professional Engineer (Civil)
CERTIFICATE NO.
12474
JON C.
SCHWINDT
Date Signed 10/23/95
ARIZONA, U.S.A.

Copies to: Addressee (3)

TABLE OF CONTENTS

GEOTECHNICAL EVALUATION
PASCUA YAQUI INDIAN RESERVATION
CAMINO DE OESTE & CALLE TETAKUSIM
PASCUA YAQUI INDIAN RESERVATION, ARIZONA
JOB NO. 2925JM399

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the proposed Health Clinic to be located in Pima County, 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
- Seismic conditions
- Excavation conditions

2.0 PROJECT DESCRIPTION

Project information supplied by the client and Mark Turner with Turner Structural Engineering Company on August 31, 1995 indicates the proposed building is to be a single-story structure. Minor cuts and/or fills are expected with the finished floor level near existing grade. The building will be about 30,000 square feet and will be of metal frame and adobe wall construction. The maximum wall and column loads will be about 2.5 klf and 20 to 40 kips, respectively.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Four borings were drilled to depths of about 15 feet below existing site grade in proposed building areas. In addition, 4 borings were drilled to depths of 3 feet in proposed paved parking and drive areas. 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 specifications. The following tests were performed and the results are presented in Appendix B.

- Water content
- Soluble Salts content
- Expansion
- Minus #200 determination
- Dry density
- Compression
- Plasticity

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 DESCRIPTION

4.1 Surface

At the time of our exploration, the site was partially developed with a two-lane separated roadway and an unpaved parking area. The ground surface was flat and contained a sparse growth of brush and weeds on the south portion of the site. Site drainage was to the north and west as sheet surface flow, although shallow depressions existed.

4.2 Subsurface

As presented on the Boring Logs, surface and subsurface soils extending to the full depth of exploration consisted of loose to very dense Clayey SAND. Zones of light to moderate carbonate cementation were encountered.

4.3 Groundwater

Groundwater was not encountered in any test boring at the time of exploration. These observations represent the groundwater conditions at the time of measurements and may not be indicative of other times. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions.

4.4 Testing

Laboratory test results indicate that native subsoils near shallow foundation level exhibit medium compressibility at existing water contents. Low to medium additional compression occurs when the water content is increased. When water is added to compacted near-surface soils, medium expansion occurs.

5.0 RECOMMENDATIONS

5.1 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 so we can 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 movement.

5.2 Foundations

Conventional spread-type footings may be used to support the proposed structures. Since the native soils exhibit substantial settlement potentials, the footings should bear on engineered fills achieved by removal and recompaction of the soils below footings. The depth and lateral extent of the engineered fills is presented in the **Earthwork** section of this report.

Alternative footing depths and design bearing capacities 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.

Total or differential settlements resulting from the assumed loads are estimated to be about one-half inch provided that:

- Foundations are constructed as we recommend, and
- Essentially no changes occur in water contents of foundation soils.

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.

Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings. The design bearing capacities apply to dead loads plus design live load conditions. The design bearing capacity may be increased by one-third when considering total loads that include wind or seismic. Recommended minimum widths of column, masonry and wood-frame wall footings are 24, 16 and 12 inches respectively.

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

- Loads do not exceed 700 plf
- Thickened sections have a minimum width of 12 inches, and
- Thickness and reinforcement are consistent with structural requirements.

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 opening 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. It should be determined whether the soils exposed are similar to those anticipated for support of the footings. Any soft, loose or unacceptable soils should be undercut to suitable materials and backfilled with approved fill materials or lean concrete. Soil backfill should be properly compacted.

5.3 Lateral Design Criteria

For cantilevered 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 subsoils . . . . . 35 psf/ft
  Compacted granular backfill . . . . . 30 psf/ft
  Compacted site soils (non-clay) . . . . . 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.

We recommend a free-draining soil layer or manufactured geosynthetic material, be constructed adjacent to the back of any wall. A filter may be required between the soil backfill and drainage layer. This drainage zone should help prevent hydrostatic pressure buildup. This vertical drain should be tied into a gravity drainage system at the base of the wall. It is important that all backfill be properly placed and compacted. Backfill should be mechanically compacted in layers. Flooding or jetting should not be permitted. Care should be taken not to damage the walls when placing the backfill. Backfills should be inspected and tested during placement.

Fill against footings, stem walls and retaining walls should be compacted to densities specified in "**Earthwork**." Medium to high plasticity clay soils should not be used as backfill against retaining walls. 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 which could result in wall movements.

5.3.1 Seismic Considerations

The project site located in Seismic Risk Zone 2A, of the Seismic Zone Map of the United States as indicated by the Uniform Building Code. Based upon the nature of the subsurface materials, we recommend using a seismic site coefficient, "s" of 1.2 for the design of structures for the proposed development (Uniform Building Code, 1991, Table No. 23-J).

5.4 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.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (high water-cement ratio) could cause excessive shrinkage, cracking or curling. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

Compacted subgrade soils expand when the water content increases. Therefore, exterior concrete grade slabs may heave, resulting in cracking or vertical offsets. This potential would be greatest where slabs overlie compacted clay subgrade soils or in areas where passage of construction equipment has inadvertently densified subsoils. To reduce the potential for damage, we recommend:

- use of fill with low expansion potential
- placement of effective control joints on relatively close centers
- moisture-density control during placement of subgrade fills
- provision for adequate drainage in areas adjoining the slabs
- use of designs which allow vertical movement between the exterior slabs and adjoining structural elements

5.5 Drainage

The major cause of soil problems in this vicinity is moisture increase in soils below structures. Therefore, it is extremely important that positive drainage be provided during construction and maintained throughout the life of the proposed structure. Infiltration of water into utility or foundation excavations must be prevented during construction. No planters or other surface features which could retain water adjacent to the building should be constructed.

In areas where sidewalks or paving do not immediately adjoin the structure, protective slopes should be provided with an outfall of about 10 percent for a least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line

trenches should be well compacted and free of all construction debris to minimize the possibility of moisture infiltration.

5.6 Corrosivity

We recommend a Type II portland cement be used for all concrete on and below grade.

The soluble salts concentration of subsoils indicates low corrosive potential for underground metallic conduits, and only minor additional corrosion of buried conduits would be expected in areas where soils become moist. Special protection does not appear necessary for copper piping except where dissimilar metals are joined or placed in close proximity. Wrappings or protective coatings could be used to extend the life expectancy of galvanized or black steel piping.

5.7 Pavements

Based on existing subgrade conditions, the following pavement sections are recommended:

TRAFFIC AREA	ASPHALTIC CONCRETE PAVEMENT (inches)	BASE COURSE (inches)
Passenger car parking and drives (low traffic frequency)	2	4
Major access drives (medium traffic frequency)	3	4

Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphaltic concrete. Base course and asphaltic concrete should conform with Pima County Standard Specifications.

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. The native (clayey)

subgrade soils will soften and lose stability if subjected to conditions which result in an increase in water content.

6.0 EARTHWORK

6.1 General

The conclusion contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance which 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, grading or backfilling occurs. Although fills or underground facilities such as septic tanks, cesspools, basements, utilities, and dry wells were not observed, such features might be encountered during construction.

6.2 Site Clearing

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

6.3 Excavation

We anticipate that shallow excavations for the proposed construction can be accomplished with conventional equipment.

Excavations into the on-site soils will encounter a variety of conditions. The individual contractor should be made responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavations sides and bottom. All excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

6.4 Foundation Preparation

The following criteria should be used in determining the minimum extent of any engineered fill below and beyond the edges of the shallow footings. It may be more practical to remove soils to the maximum depth beneath all portions of the structure area. If this is done, the removal and recompaction should extend at least five feet beyond the perimeter footings.

	Continuous (Wall) Footings	Rectangular (Column) Footings
Minimum depth of recompaction/engineered fill required below the footing base.	Equal to the footing width (but not less than 2.0 feet)	Equal to ½ the footing length (but not less than 2.0 feet)
Minimum width of recompaction/engineered fill required beyond the footing edge.	Equal to 0.6 times the depth of recompaction below footings (but not less than 2.0 feet)	Equal to 0.6 times the depth of recompaction below footings (but not less than 2.0 feet)

After any overexcavation has been accomplished, the exposed soils should be scarified, moistened or dried as required, and compacted to a minimum depth of eight inches. This eight inch depth may be included in the minimum required depth of compaction below footings.

6.5 Interior Slab Preparation

Scarify, moisten or dry as required, and compact all subgrade soils to a minimum depth of 8 inches. The subgrade preparation is to be accomplished in a manner which will result in uniform water contents and densities after compaction.

6.6 Pavement Preparation

The subgrade should be scarified, moistened as required, and recompacted for a minimum depth of 8 inches prior to placement of fill and pavement materials.

6.7 Materials

a. Clean granular on-site native soils (minus 6 inches) or imported materials may be used as fill material for the following:

- Foundation areas
- Pavement areas

b. On-site soils are not recommended for fill material in the following:

- Interior slab areas
- Backfill

Should you decide to use these soils in compacted fills beneath floor slabs, slab movements of one-half inch to three-quarters of an inch per foot of fill thickness could occur if the water content of the fill increases. Therefore, we recommend that fill below slabs-on-grade be imported soils.

c. 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	50 (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.

d. Base course should conform to the following:

- Gradation (ASTM C136)

	percent finer by weight
1 ½"	100
No. 4 Sieve	45-90
No. 200 Sieve	12 (max)

- Plasticity Index ..... 5 (max)

6.8 Placement and Compaction

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

a. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D698)
• On-site soils, reworked and fill:	
Below footings	95
Below slabs-on-grade	90
Below pavement	95
• Imported fill:	
Below footings	95
Below slabs-on-grade	90
Below pavement	95
• Base Course	95

- Miscellaneous backfill 90

b. On-site clay soils should be compacted within a water content range of 1 percent below to 4 percent above optimum. Imported soils should be compacted within a water content range of 3 percent below to 3 percent above optimum.

6.9 Compliance

Recommendations for slabs-on-grade, 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.

7.0 OTHER SERVICES

It is recommended that the Geotechnical Engineer be provided the opportunity for a general review of final design plans and specifications in order that grading and foundation recommendations may be interpreted and implemented.

The Geotechnical Engineer should be retained to provide services during excavation, grading, foundation and construction phases of the work. Examination of footing excavations should be performed prior to placement of reinforcing and concrete to confirm that satisfactory bearing materials are present. Field and laboratory testing of concrete should be performed to determine whether applicable requirements have been met. It would be logical for Western Technologies Inc. to provide these services since we are most qualified to determine consistency of field conditions with those data used in our analysis.

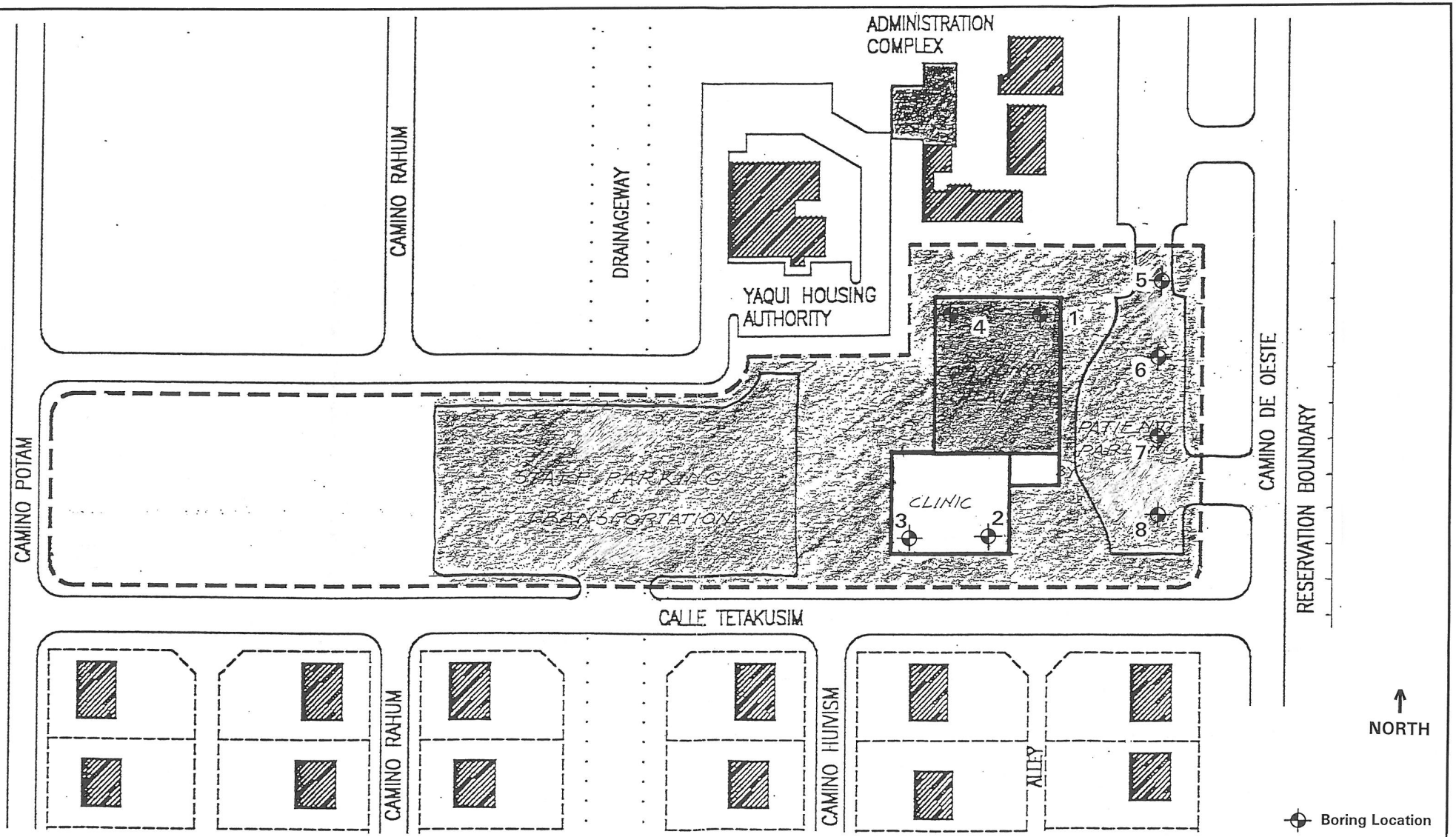
8.0 CLOSURE

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.

In the event that changes in the proposed project occur, the conclusions and recommendations contained in this report should be reviewed and the report should be modified or supplemented as necessary. Variations from the field conditions represented by the borings may become evident during construction. If variations appear, we should be contacted to reevaluate our recommendations. We believe the findings in our report address the requirements for this project and are responsive to your concerns.

This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding the site conditions and specific construction techniques to be used on this project.



Scale: 1 inch equals approximately 80 feet

REFERENCE: ANDERSON DEBARTOLO PAN, INC.

PASCUA YAQUI CLINIC	
Boring Location Diagram	
Western Technologies Inc.	
Job No.: 2925JM399	Plate: 1

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 & 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.

PASCUA YAQUI HEALTH CLINIC	
Definition of Terminology	
Western Technologies Inc.	
Job No.: 2925JM399	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, etc.)

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 limits 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. to 12 in.
GRAVEL	No. 4 to 3 in.
Coarse	3/4 in. to 3 in.
Fine	No. 4 to 3/4 in.
SAND	No. 200 to No. 4
Coarse	No. 10 to No. 4
Medium	No. 40 to No. 10
Fine	No. 200 to 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/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/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" 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

PASCUA YAQUI HEALTH CLINIC

Method of Soil Classification

Western Technologies Inc.

Job No.: 2925JM399 | Plate: A-2

BORING LOG NOTES

The number shown on the Boring Logs refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by measurements from property lines and/or existing features.

"ELEVATION" refers to ground surface elevation at the boring location relative to the indicated "DATUM" established by interpolation from contours on the "Site Plan." (Reference Christensen-Owens.)

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

"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

R = Ring sample **G = Grab Sample**

"Dry Density, pcf" refers to the laboratory-determined dry density in pounds per cubic foot.

"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.

In general, terms and symbols on the boring logs conform with "Standard Definitions of Terms and Symbols Relating to Soil and Rock Mechanics" (ASTM D653).

PASCUA YAQUI HEALTH CLINIC	
Boring Log Notes	
Western Technologies Inc.	
Job No.: 2925JM399	Plate: A-3

DATE DRILLED: **10-05-1995**

DRILL RIG TYPE: **CME-75**

BORING TYPE/SIZE: **Hollow Stem Auger 7"**

BORING NO. 1

LOCATION: **See Boring Location Diagram**

ELEVATION: **65.5**

FIELD ENGR: **J. Reynolds**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							SC		CLAYEY SAND; trace gravel, reddish-brown, loose, slightly damp
8.1	90	R		11					light cementation
		R		45		5			light brown, moderate cementation
						10			
						15			**Stopped Auger At 15 Feet**
						20			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:10-20-1995

NOTES

PASCUA YAQUI HEALTH CLINIC

Boring Log

Western Technologies Inc.

Job No.: 2925JM399 | Plate: A-4

THIS 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: **10-05-1995**

DRILL RIG TYPE: **CME-75**

BORING TYPE/SIZE: **Hollow Stem Auger 7"**

BORING NO. 2

LOCATION: **See Boring Location Diagram**

ELEVATION: **63.5**

FIELD ENGR: **J. Reynolds**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		R		32		0	SC		CLAYEY SAND; trace gravel, reddish-brown, medium dense, slightly damp, light cementation
									light brown, increase in gravel
		R		45		5			moderate cementation
		R		34		10			light cementation
						15			**Stopped Auger At 15 Feet**
						20			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 10-05-1995

NOTES

PASCUA YAQUI HEALTH CLINIC

Boring Log

Western Technologies Inc.

Job No.: 2925JM399 | Plate: A-5

THIS 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: **10-05-1995**

DRILL RIG TYPE: **CME-75**

BORING TYPE/SIZE: **Hollow Stem Auger 7"**

BORING NO. 3

LOCATION: **See Boring Location Diagram**

ELEVATION: **65.9**

FIELD ENGR: **J. Reynolds**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; trace silt and gravel, reddish-brown, very dense, slightly damp
		R		50/9"					light cementation
7.4	98	R		40		5			moderate cementation
		R		50/9"		10			light brown, slightly damp
						15			**Stopped Auger At 15 Feet**
						20			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 10-05-1995

NOTES

PASCUA YAQUI HEALTH CLINIC

Boring Log

Western Technologies Inc.

Job No.: 2925JM399 | Plate: A-6

THIS 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: **10-05-1995**

DRILL RIG TYPE: **CME-75**

BORING TYPE/SIZE: **Hollow Stem Auger 7"**

BORING NO. 4

LOCATION: **See Boring Location Diagram**

ELEVATION: **64.5**

FIELD ENGR: **J. Reynolds**

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					SC		CLAYEY SAND; trace gravel, reddish-brown, medium dense, slightly damp
9.0	106	R		30					light cementation
						5			brown
		R		50/10"					moderate cementation
						10			
						15			**Stopped Auger At 15 Feet**
						20			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 10-05-1995

NOTES

PASCUA YAQUI HEALTH CLINIC

Boring Log

Western Technologies Inc.

Job No.: 2925JM399 Plate: A-7

THIS 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: **10-05-1995**

DRILL RIG TYPE: **CME-75**

BORING TYPE/SIZE: **Hollow Stem Auger 7"**

BORING NO. 5

LOCATION: **See Boring Location Diagram**

ELEVATION: **63.5**

FIELD ENGR: **J. Reynolds**

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					SC		CLAYEY SAND; trace gravel and silt, reddish-brown, slightly damp
									Stopped Auger At 3 Feet

THIS 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.

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 10-05-1995

NOTES

PASCUA YAQUI HEALTH CLINIC

Boring Log

Western Technologies Inc.

Job No.: 2925JM399 | Plate: A-8

DATE DRILLED: **10-05-1995**

DRILL RIG TYPE: **CME-75**

BORING TYPE/SIZE: **Hollow Stem Auger 7"**

BORING NO. 6

LOCATION: **See Boring Location Diagram**

ELEVATION: **63.5**

FIELD ENGR: **J. Reynolds**

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					SC		CLAYEY SAND; trace gravel, reddish-brown, slightly damp
									light cementation, light brown
									Stopped Auger At 3 Feet

5

10

15

20

THIS 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.

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 10-05-1995

NOTES

PASCUA YAQUI HEALTH CLINIC

Boring Log

Western Technologies Inc.

Job No.: 2925JM399 | Plate: A-9

DATE DRILLED: **10-05-1995**

DRILL RIG TYPE: **CME-75**

BORING TYPE/SIZE: **Hollow Stem Auger 7"**

BORING NO. 7

LOCATION: **See Boring Location Diagram**

ELEVATION: **65**

FIELD ENGR: **J. Reynolds**

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					SC		CLAYEY SAND; trace gravel, reddish-brown, slightly damp
									Stopped Auger At 3 Feet

5

10

15

20

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 10-05-1995

NOTES

PASCUA YAQUI HEALTH CLINIC

Boring Log

Western Technologies Inc.

Job No.: 2925JM399 | Plate: A-10

THIS 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: **10-05-1995**

DRILL RIG TYPE: **CME-75**

BORING TYPE/SIZE: **Hollow Stem Auger 7"**

BORING NO. 8

LOCATION: **See Boring Location Diagram**

ELEVATION: **65.5**

FIELD ENGR: **J. Reynolds**

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					SC		CLAYEY SAND; trace gravel, reddish-brown, slightly damp
									Stopped Auger At 3 Feet

THIS 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.

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 10-05-1995

NOTES

PASCUA YAQUI HEALTH CLINIC

Boring Log

Western Technologies Inc.

Job No.: 2925JM399 | Plate: A-11

SOIL PROPERTIES

Boring No.	Depth (ft.)	Soil Class.	Initial Dry Density (pcf)	Initial Water Content (%)	Compression Properties			Expansion Properties		Plasticity		Percent Passing #200	Soluble Salts (ppm)	Remarks
					Surcharge (ksf)	Total Compression (%)		Surcharge (ksf)	Expansion (%)	Liquid Limit	Plasticity Index			
						In-Situ	After Saturation							
1	2-3	SC	90	8.1	2.0	8.6	13.2							
3	5-6	SC	98	7.4	2.5	3.8	5.5							
4	0-3	SC	126	5.7				0.1	4.3	33	16	33.4	440	1, 2
4	2-3	SC	106	9.0	2.0	4.1	5.3							
5	0-3	SC								27	10	31.9		
8	0-3	SC								30	14	37.9		

Note: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.
NP: Non-Plastic

Remarks

1. Compacted Density (approx. 95% of ASTM D698 max. density at moisture contenct slightly below optimum.
2. Submerged to approximate saturation.
3. Slight rebound after saturation.

PASCUA YAQUI HEALTH CLINIC

Soil Properties

Western Technologies Inc.

Job No.: 2925JM399 | Plate: B-1