Western Technologies Inc.

GEOTECHNICAL EVALUATION REPORT

BUCKSKIN SANITARY DISTRICT IMPROVEMENTS
A Portion of the River Road Subdivisions in the Phase 4 Expansion
SR95A – Sandpiper WWTP to the Sundance Resort
Parker, Arizona
WT Reference No. 4155JZ116

PREPARED FOR:
Buckskin Sanitary District
P.O. Box 5368
Parker, Arizona 85344
Attn: Mr. Wayne Posey

December 14, 2014

Dustin Johnson, E.I.
Materials Specialist

Reviewed By: Donald J. Spadola, P.E.
Director of Geotechnical Services

Western Technologies Inc.
The Quality People
Since 1955

1524 East Drinda Way, No. 113
Fort Mohave, Arizona 86426
(928) 758-8378 • fax 758-1666

December 14, 2015

Buckskin Sanitary District
P.O. Box 5368
Parker, Arizona 85344

Attn: Mr. Wayne Posey
District Manager

Re: Geotechnical Evaluation — WT Job No. 4155JZ116
Buckskin Sanitary District Improvements
A Portion of the River Road Subdivisions in the Phase 4 Expansion
SR95A – Sandpiper WWTP to the Sundance Resort
Parker, Arizona

Western Technologies Inc. (WT) has completed the geotechnical evaluation for the proposed Buckskin Sanitary District Improvements. This study was performed in general accordance with our contract. The results of our evaluation, including the boring location diagram, boring logs, laboratory test results, and geotechnical recommendations are attached.

Please contact us if design conditions change, or if you have any questions concerning this report or any of our materials testing, special inspection, or consulting services. We look forward to working with you on future projects.

Sincerely,
WESTERN TECHNOLOGIES INC.
Geotechnical Engineering Services

Dustin Johnson, E.I.
Materials Specialist

Copies to: Addressee (1, electronic)

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GEOTECHNICAL EVALUATION
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A PORTION OF THE RIVER ROAD SUBDIVISIONS IN THE PHASE 4 EXPANSION
SR95A – SANDPIPER WWTP TO THE SUNDANCE RESORT
PARKER, ARIZONA
WT REFERENCE NO. 4155JZ116

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the proposed Buckskin Sanitary District Improvements. WT previously prepared a comprehensive geotechnical evaluation report for the project (WT project no. 4192JG096, dated September 6, 2012). The purpose of this report is to provide additional information for areas not covered by the original report and provide recommendations regarding:

- Subsurface conditions
- Groundwater
- Geologic hazards
- Corrosivity
- Excavation conditions
- Trench backfill
- Earthwork, including trench backfill placement, and suitability of existing soils for backfill materials, and compaction
- Cut and fill slopes
- Slope stability

Results of the field exploration, field tests, and laboratory testing program are presented in the Appendices.

2.0 PROJECT DESCRIPTION

We understand that the project consists of a new sewer force main extending approximately 4 miles from the Sandpiper Wastewater Treatment Plant along Riverside Drive to the Sundance Resort. The general location of the area is shown on Figure 1, Site Vicinity Map. The pipeline improvements will include manholes, three lift stations along the force main alignment, and a gravity collection system running parallel to the force main alignment. We anticipate that the force main invert will typically be within the upper 5 feet of the existing site grades, the gravity

main invert will typically be within 10 to 20 feet of the existing site grades, and the depth of the lift station structures will be within the range of 20 to 25 feet below the existing site grades. Borings were requested by the Client at the depths performed. Should any of our information or assumptions not be correct, the Client will notify WT immediately.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Four borings were drilled to depths ranging from 1.5 to 10 feet below the existing site grade at the approximate locations shown on the attached Figure 2, Boring Location Diagram. A field log was prepared for each boring by a field engineer. 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 thicknesses, 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.

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 methods. The following tests were performed and the results are presented in Appendix B.

- Gradation
- Plasticity
- Corrosivity

Test results were utilized in the development of the recommendations contained in this report.

3.3 Analyses and Report

This geotechnical evaluation 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.

This report is 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.

4.0 SITE CONDITIONS

4.1 Surface

Boring 1 was drilled at the Roadrunner RV Park. This area was graded relatively flat with multiple unpaved lots and paved driveways. Borings 2 and 3 were drilled along Arete Road. This area was a steep, two-lane road with single-family residences. Rock areas were observed along Arete Road. Boring 4 was drilled in a vacant lot behind Branson's Resort.

4.2 Subsurface

As presented on the boring logs, the materials encountered at Borings 1 and 4 consisted of silty sand, sandy clay and sandy silt. The materials encountered at Borings 2 and 3 consisted of 1 to 2 feet of poorly graded gravel over rock. Groundwater was not encountered in the borings at the time of the field exploration. The logs in Appendix A show details of the subsurface conditions encountered during the field exploration.

4.3 Geologic Hazards

No known or mapped earth subsidence fissures, due to regional groundwater withdrawal exist in the Site vicinity. No evidence has been noted of distress arising from areal subsidence due to regional groundwater withdrawal.

Observation of the ground surface indicated no readily discernible evidence of recent compaction faulting or fissuring. Compaction faults are generally accepted as features resulting from deep-seated differential consolidation of alluvial materials with dissimilar

grain-size and compressibility characteristics. Fissures are understood to be the results of a subsurface erosion process occurring in tension fractures at or near the surface of uncemented, relatively fine-grained soils.

5.0 GEOTECHNICAL PROPERTIES

5.1 Laboratory Tests

Laboratory test results indicate that the sandy and silty soils are non-plastic.

The boring logs included in this report are indicators of subsurface conditions only at the specific location and date noted. Variations from the field conditions represented by the borings may become evident during construction. If variations appear, we should be contacted to re-evaluate our recommendations.

6.0 RECOMMENDATIONS

6.1 General

Recommendations contained in this report are based on our understanding of the project criteria described in **Section 2.0**, and the assumption that the soil and subsurface conditions are those disclosed by the borings. Others may change the plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing. This report does not encompass the effects, if any, of underlying geologic hazards and expresses no opinion regarding their effects on surface movements at the Site.

6.2 Corrosivity to Concrete

The chemical test results indicate that the soils at the Site classify as negligibly corrosive to concrete. In keeping with local practice, we recommend that Type II Portland cement be utilized in all concrete in contact with site soils.

6.3 Pipe Bedding and Compaction

The soils encountered in our test borings at the site varied from granular sands to fine-grained silts and clays. In accordance with Maricopa Association of Governments (MAG)

specifications section 601.4.2, soils used for pipe bedding may consist of the granular site soils provided that that the soils do not contain any gravel or rock larger than 1½ inches in maximum dimension, and provided that the soils are free of broken concrete or pavement, wood, or deleterious material. Compaction of pipe bedding materials should be as recommend in Section 7.3 of this report, in accordance with the MAG specifications. Water consolidation is not recommended as a means of compaction for the soil conditions encountered at the site; mechanical compaction is recommended.

7.0 EARTHWORK

7.1 General

The validity of the conclusions contained in this report are based on compliance with the 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. If any unobserved and untested earthwork, trenching, or backfilling occurs, then the conclusions and recommendations in this report may not be relied on.

7.2 Excavation

We anticipate that excavations into the upper 8 feet of the site soils in the vicinity of Borings 1 and 4 can be accomplished with conventional equipment. Excavations in the vicinity of Borings 2 and 3 will likely require heavy duty equipment with ripping capabilities. Excavations in granular material may be susceptible to cave-in and sloughing and may require support to maintain sidewalls.

7.2.1 Temporary Excavations and Slopes

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 excavation 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.

For this site, the sands and gravels can be considered Type C soils and the silts and clays can be considered Type B soils when applying the OSHA regulations. OSHA recommends a maximum slope inclination of 1.5:1 (horizontal:vertical) for Type C

soils, and 1:1 for Type B soils. Excavations into stable rock may be excavated vertically. These maximum inclinations assume that the soils have been sufficiently dewatered. Shallower slopes may apply if the soils are not sufficiently dewatered.

If any excavation is extended to a depth of more than 20 feet, it will be necessary to have the side slopes or shoring designed by a professional engineer.

As a safety measure, it is recommended that all vehicles and soil piles be kept a minimum lateral distance back from the crest of the slopes or excavations at least equal to the slope or excavation height. Slope faces should be protected against the elements.

We recommend that the contractor retain a geotechnical engineer to observe the soils exposed in all excavations and provide engineering design for the slopes where applicable. This will provide an opportunity to classify the soil types encountered, and to modify the excavation slopes as necessary. This also allows the opportunity to analyze the stability of the excavation slopes during construction.

7.3 Materials

a. Clean on-site soils with a maximum dimension of 6 inches or imported materials may be used as fill material for the following:

- backfill

b. Imported soils should conform to the following:

- Gradation (ASTM C136): percent finer by weight

6"	100
4"	85-100
3/4"	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 D1557 maximum dry density at about 3 percent below optimum water content and then oven dried. The sample is then confined under a 100 psf surcharge and submerged.

c. Base course should conform to the MAG or other local governing specifications.

7.4 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. Pipe bedding and trench backfill materials should be compacted in accordance with MAG Table 601-2.
d. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D698)
• On-site and imported soils, reworked and fill: Below pavement	95
• Aggregate base: Below pavement	95
• Miscellaneous backfill	90

d. On-site and imported soils with low expansive potential should be compacted with a moisture content that facilitates proper compaction to the required density.

7.5 Compliance

Our recommendations 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 assuming the project criteria described in Section 2.0. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, WT should be contacted in order to assess the effect that such variations may have on our conclusions and recommendations.

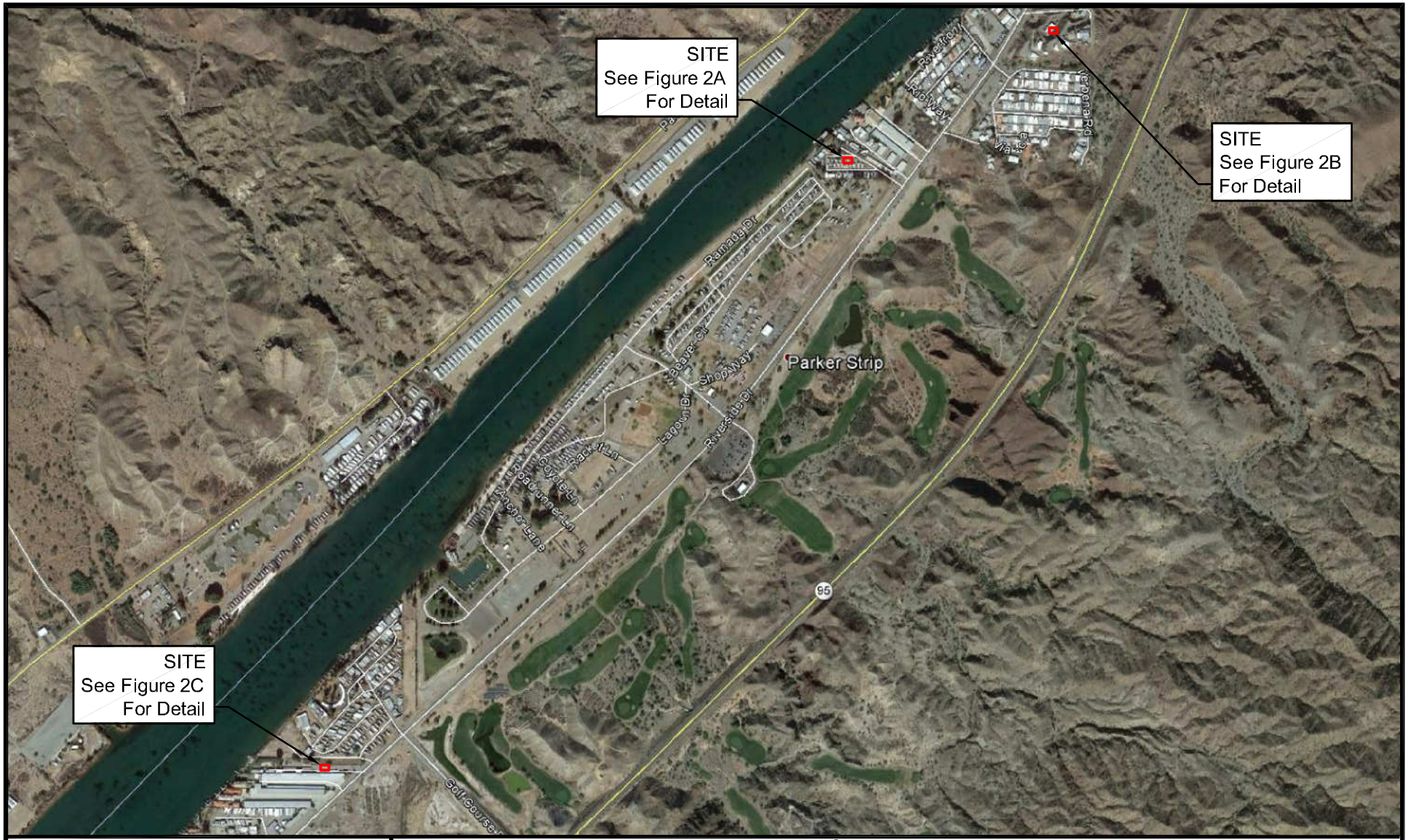
The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced borings. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology and soil structure between borings, however variations can and often do exist. Whenever any deviation, difference or change is encountered or becomes known, WT should be contacted.

This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report, and nothing contained in the contract or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

This report is valid for the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall rely on this report without the express written authorization of WT.

9.0 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 data obtained at the location of the borings, and from laboratory tests. Work on your project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.



NORTH

NOT TO SCALE

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Environmental
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FIGURE 1. SITE VICINITY MAP

Buckskin Sanitary District Improvements
A Portion of The River Road Subdivision in
The Phase 4 Expansion
SR95A - Sandpiper WWTP To The Sundance Resort
Parker, Arizona

WT Job No. 4155JZ116

LEGEND

Approximate Boring Location

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FIGURE 2A. BORING LOCATION DIAGRAM
Buckskin Sanitary District Improvements
A Portion of The River Road Subdivision in
The Phase 4 Expansion
SR95A-Sandpiper WWTP To The Sundance Resort
Parker, Arizona

WT Job No. 4155JZ116

LEGEND

Approximate Boring Location

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FIGURE 2B. BORING LOCATION DIAGRAM
Buckskin Sanitary District Improvements
A Portion of The River Road Subdivision in
The Phase 4 Expansion
SR95A-Sandpiper WWTP To The Sundance Resort
Parker, Arizona

WT Job No. 4155JZ116

LEGEND

Approximate Boring Location

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FIGURE 2C. BORING LOCATION DIAGRAM
Buckskin Sanitary District Improvements
A Portion of The River Road Subdivision in
The Phase 4 Expansion
SR95A-Sandpiper WWTP To The Sundance Resort
Parker, Arizona

WT Job No. 4155JZ116

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 aggregate material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson/Drilled Shaft	A concrete foundation element cast in a circular excavation which may have an enlarged base (or belled caisson).
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon base course, 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 soil or aggregate 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 Course	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.

COARSE-GRAINED SOILS

LESS THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVEL OR WELL-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVEL OR POORLY-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	
GM	SILTY GRAVEL OR SILTY GRAVEL WITH SAND, MORE THAN 12% FINES	
GC	CLAYEY GRAVEL OR CLAYEY GRAVEL WITH SAND, MORE THAN 12% FINES	
SW	WELL-GRADED SAND OR WELL-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SAND OR POORLY-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	
SM	SILTY SAND OR SILTY SAND WITH GRAVEL, MORE THAN 12% FINES	
SC	CLAYEY SAND OR CLAYEY SAND WITH GRAVEL, 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	SILT, SILT WITH SAND OR GRAVEL, SANDY SILT, OR GRAVELLY SILT	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	LEAN CLAY OF LOW TO MEDIUM PLASTICITY, SANDY CLAY, OR GRAVELLY CLAY	
OL	ORGANIC SILT OR ORGANIC CLAY OF LOW TO MEDIUM PLASTICITY	
MH	ELASTIC SILT, SANDY ELASTIC SILT, OR GRAVELLY ELASTIC SILT	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	FAT CLAY OF HIGH PLASTICITY, SANDY FAT CLAY, OR GRAVELLY FAT CLAY	
OH	ORGANIC SILT OR ORGANIC CLAY OF HIGH PLASTICITY	
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics (e.g. CL-ML).

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	¾ in. – 3 in.
Fine	No. 4 – ¾ 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	3 – 4
FIRM	5 – 8
STIFF	9 – 15
VERY STIFF	16 – 30
HARD	OVER 30

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

NOTE: Number of blows using 140-pound hammer falling 30 inches to drive a 2-inch-OD (1⅜-inch ID) split-barrel sampler (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 20	MEDIUM
Over 20	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

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 or measurement from property lines and/or existing features, or through the use of Global Positioning System (GPS) devices. The accuracy of GPS devices is somewhat variable.

"DRILLING TYPE" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger**, and the dimension presented is the outside diameter of the HSA used.

"N" in "BLOW COUNTS" refers to a 2-inch outside diameter split-barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows, or "blow count", of the hammer is recorded for each of three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2nd and 3rd increments) is defined as the Standard Penetration Test (SPT) "**N**"-Value. Refusal to penetration is considered more than 50 blows per 6 inches. (Ref. ASTM D1586).

"R" in "BLOW COUNTS" refers to a 3-inch outside diameter ring-lined split barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 12 inches is achieved or until refusal. The number of blows required to advance the sampler 12 inches is defined as the "**R**" blow count. The "**R**" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows per foot. (Ref. ASTM D3550).

"CS" in "BLOWS/FT." refers to a 2½-in. outside diameter California style split-barrel sampler, lined with brass sleeves, driven into the ground with a 140-pound hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows of the hammer is recorded for each of the three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2nd and 3rd increments) is defined as the "CS" blow count. The "CS" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D 3550)

"SAMPLE TYPE" refers to the form of sample recovery, in which **N** = Split-barrel sample, **R** = Ring-lined sample, **"CS"** = California style split-barrel sample, **G** = Grab sample, **B** = Bucket sample, **C** = Core sample (ex. diamond bit rock coring).

"DRY DENSITY (LBS/CU FT)" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol **"NR"** indicates that no sample was recovered.

"WATER (MOISTURE) CONTENT" (% of Dry Wt.) refers to the laboratory-determined water content in percent using the standard test method ASTM D2216.

"USCS" refers to the "Unified Soil Classification System" Group Symbol for the soil type as defined by ASTM D2487 and D2488. 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 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 or rock types based upon visual field classification at the boring location. The transition between materials is approximate and may be more or less gradual than indicated.

DATE DRILLED: **11-11-15**
LOCATION: **See Figure 2**
ELEVATION: **Not measured**

Boring No. 1A

EQUIPMENT TYPE: **CME-75**
EXCAVATION TYPE: **8" HSA**
FIELD ENGINEER: **D. Johnson**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	MOISTURE	CONSISTENCY
		B			0	ML		SANDY SILT; fine sand, non-plastic, brown	slightly damp	stiff
					5	CL		SANDY LEAN CLAY; fine sand, low-plasticity, brown	damp	
					10			**Stopped at 10 feet**		

N- STANDARD PENETRATION TEST
R- RING SAMPLE
C- CORE: %RECOVERY/%RQD
B- BAG
BN- BULL NOSE

NOTES: **Water not encountered.**

WESTERN TECHNOLOGIES INC.

PROJECT NO. **4155JZ116**

PROJECT:
Buckskin Sanitary District Improvements
Boring Log

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: **11-11-15**
LOCATION: **See Figure 2**
ELEVATION: **Not measured**

Boring No. 2A

EQUIPMENT TYPE: **CME-75**
EXCAVATION TYPE: **8" HSA**
FIELD ENGINEER: **D. Johnson**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	MOISTURE	CONSISTENCY
					1	GP		POORLY-GRADED GRAVEL; coarse gravel, non-plastic	slightly damp	dense
					2			**Rock refusal at 1.5 feet**		
					3					
					4					
					5					
					6					
					7					
					8					
					9					
					10					
					11					
					12					
					13					
					14					

N- STANDARD PENETRATION TEST
R- RING SAMPLE
C- CORE: %RECOVERY/%RQD
B- BAG
BN- BULL NOSE

NOTES: **Water not encountered.**

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.

WESTERN TECHNOLOGIES INC.

PROJECT NO. **4155JZ116**

PROJECT:
Buckskin Sanitary District Improvements
Boring Log

PLATE
A-5

DATE DRILLED: **11-11-15**
LOCATION: **See Figure 2**
ELEVATION: **Not measured**

Boring No. 3A

EQUIPMENT TYPE: **CME-75**
EXCAVATION TYPE: **8" HSA**
FIELD ENGINEER: **D. Johnson**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	MOISTURE	CONSISTENCY
					1	GP		POORLY-GRADED GRAVEL; coarse gravel, non-plastic	slightly damp	dense
					2			**Rock refusal at 2 feet**		
					3					
					4					
					5					
					6					
					7					
					8					
					9					
					10					
					11					
					12					
					13					
					14					

N- STANDARD PENETRATION TEST
R- RING SAMPLE
C- CORE: %RECOVERY/%RQD
B- BAG
BN- BULL NOSE

NOTES: **Water not encountered.**

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.

WESTERN TECHNOLOGIES INC.

PROJECT NO. **4155JZ116**

PROJECT:
Buckskin Sanitary District Improvements
Boring Log

PLATE
A-6

DATE DRILLED: **11-11-15**
LOCATION: **See Figure 2**
ELEVATION: **Not measured**

Boring No. 4A

EQUIPMENT TYPE: **CME-75**
EXCAVATION TYPE: **8" HSA**
FIELD ENGINEER: **D. Johnson**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION	MOISTURE	CONSISTENCY
		B			1–3	SM		SILTY SAND; fine sand, non-plastic, brown	slightly damp	medium dense
					3–7	CL		SANDY LEAN CLAY; fine sand, medium plasticity, brown	damp	stiff
					7–10	ML		SANDY SILT; fine sand non-plastic, brown	wet	
					10			**Stopped at 10 feet**		

N- STANDARD PENETRATION TEST
R- RING SAMPLE
C- CORE: %RECOVERY/%RQD
B- BAG
BN- BULL NOSE

NOTES: **Water not encountered.**

WESTERN TECHNOLOGIES INC.

PROJECT NO. **4155JZ116**

PROJECT:
Buckskin Sanitary District Improvements
Boring Log

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.

Boring No.	Depth (ft.)	USCS Class.	Particle Size Distribution (Percent Passing by Weight)												Plasticity		Laboratory Compaction Characteristics		R Value	Remarks
			½ in.	⅜ in.	¼ in.	# 4	#8	#10	#16	#30	#40	#50	#100	#200	LL	PI	$Y_{d.max}$ (pcf)	w_{opt} (%)		
B-1	0-5	ML	99	98	98	98	97	97	97	97	96	96	88	53.3	NP	NP	-	-	-	2
B-4	0-3	SM	94	91	88	86	82	81	79	77	76	74	70	48.7	NP	NP	-	-	-	2

Note: NP = Non-Plastic

Remarks

1. Visual
2. Laboratory tested
3. Minus #200 only
4. ASTM D698 / AASHTO T99
5. ASTM D1557 / AASHTO T180

Geotechnical Environmental Inspections Materials

Western Technologies Inc. The Quality People Since 1955

wt-us.com

PROJECT: Buckskin Sanitary District Improvements

JOB NO.: 4155JZ116

SOIL PROPERTIES

PLATE

B-1

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: December 3, 2015

LABORATORY NO: 15-6745-1

CLIENT: Western Technologies, Inc.
1524 E. Drinda Way #113
Fort Mohave, AZ 86426

PAGE: 1 of 1

CLIENT PROJECT: 4133J2116

CLIENT PO #:

ANALYST: SW/LB

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 11/30/15
Time Received: 1415

Sample ID: 10427, B1 0-3

Analysis	Result	Unit	Method
Sodium	<.01	%	ASTM D2791
Water Soluble Sulfate (SO_4)	0.05	%	SM 4500 E
Total Available Water Soluble Sodium Sulfate (Na_2SO_4)	<0.01	%	Calculation
Total Salts (Solubility)	0.26	%	SM2540B
Soluble Soil Chlorides	674	mg/kg	SM4500Cl^-D
pH	8.30	S.U.	SM9045C
Resistivity	369	Ω-cm	ASTM G57

NOTES: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director
EPA: NV00930

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

SilverState Analytical Laboratories

LABORATORY REPORT

DATE: December 3, 2015

LABORATORY NO: 15-6745-2

CLIENT: Western Technologies, Inc.
1524 E. Drinda Way #113
Fort Mohave, AZ 86426

PAGE: 1 of 1

CLIENT PROJECT: 4133J2116

CLIENT PO #:

ANALYST: SW/LB

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 11/30/15
Time Received: 1415

Sample ID: 10427, B2 0-3

Analysis	Result	Unit	Method
Sodium	<.01	%	ASTM D2791
Water Soluble Sulfate (SO_4)	0.09	%	SM 4500 E
Total Available Water Soluble Sodium Sulfate (Na_2SO_4)	<0.01	%	Calculation
Total Salts (Solubility)	0.51	%	SM2540B
Soluble Soil Chlorides	1249	mg/kg	SM4500Cl^-D
pH	8.47	S.U.	SM9045C
Resistivity	190	Ω-cm	ASTM G57

NOTES: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director
EPA: NV00930

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