PIMA COUNTY
PROCUREMENT DEPARTMENT
DESIGN AND CONSTRUCTION DIVISION
130 W. CONGRESS STREET, 3rd FLOOR. TUCSON, AZ. 85701
PHONE: (520) 724-3731 FAX: (520) 724-4434

December 8, 2015

ADDENDUM NO. 02

PROJECT: IFB 197016 – CORONA DE TUCSON DISINFECTION AND SERVICE WATER PROJECT NO. 3CDT22

TO ALL CONTRACTORS:

Be advised of the additions, clarifications and/or changes to the above-referenced Invitation for Bid as stated in the following Addendum.

1. The *Bid Due Date and time* **REMAIN** *Wednesday, December 16, 2015 at 2:00 p.m.*

2. SITE VISIT: A Site Visit was conducted Monday, December 7, at 9:00 a.m. As a result of this Site Visit and other discussions the following Questions & Answers and Clarifications are provided:

   Q: Note 1 under FOUNDATIONS on Sheet G-4 of the plans references a soils report by ConformaTech. Will the County provide a copy of this report?
   A: Yes, the Geotechnical Evaluation report is made available as an attachment to this addendum.

   Q: General Notes 1 and 2 on Sheet C-1 directs the contractor to 2007 As-Built Drawings C-6 and C-7. With the County provide copies of these As-Builts?
   A: Yes, the As-Builts are made available as attachments to this addendum.

   Q: Potential Contractors have stated that the line items with quantities and unit pricing shown in EXHIBIT "B" – CONTRACTOR BID SHEET (IFB Pages 13-17) are confusing and are requesting that bids be Lump Sum for the groups as shown on page 18.
   A: The County is providing "REVISION 2 – EXHIBIT "B" – CONTRACTOR BID SHEET" as an attachment to this addendum.

   Q: Are Liquidated Damages applicable and, if so, how much?
   A: Liquidated Damages are applicable per the City of Tucson/Pima County "Standard Specifications For Public Improvements, 2003 Edition." Liquidated Damages are covered in Section 108-9 on pages 92 and 93.

   Clarification: Lightning Protection is not included in the Scope of Work for this project.

   Clarification: DWW (Domestic Well Water), not potable water, will be used to feed the eye wash station.

Clarification: Contractor's water for dust control and construction processes must be obtained from a hydrant, offsite, using a meter and backflow device.

Clarification: Dirt generated by construction will be kept on site and will not be hauled away.

Clarification: EXHIBIT "E" NON-DISCLOSURE AGREEMENT contains the following statement: "…Contractor is not authorized to publish, divulge, or disclose any Critical Infrastructure Information identified herein or any specific Facility documents or drawings conspicuously identified as Critical Infrastructure Information to any third party without the express, written permission of Pima County. No such permission will be granted by Pima County unless the third party recipient executes a Pima County Acknowledgement of Critical Infrastructure Status form."

To comply with this requirement, before divulging any information to potential sub-contractors or potential suppliers, potential bidders shall require Non-Disclosure Agreements to be executed and forward a copy to the Contracts Officer for this solicitation, Keith E. Rogers, to either keith.rogers@pima.gov or to 520-770-4012. Providing a copy of the executed Non-Disclosure Agreement shall constitute authorization to share any required information with the potential sub-contractor or supplier.

This addendum is a total of **44 pages,** including all attachments: "REVISION 2 – EXHIBIT "B" – CONTRACTOR BID SHEET" (2 pages); As-Built Drawing C-6 (1 page); As-Built Drawing C-7 (1 page), and; ConformaTECH Geotechnical Evaluation (35 pages).

Any questions regarding this addendum should be directed to keith.rogers@pima.gov or by fax to 520-770-4012.

Bidders must acknowledge receipt of this addendum on the bid form provided as part of REVISION 2 Exhibit "B" - Contractor Bid Sheet. Failure to do so may render the bid non-responsive.

Keith E. Rogers, CPPB
Contracts Officer

REVISION 2 **- EXHIBIT "B" - CONTRACTOR BID SHEET**

BID SCHEDULE

BID OF:_____

(CONTRACTOR'S NAME AND ADDRESS)

to install all materials and perform all work in accordance with the Contract Documents for construction of the:

IFB #197016 CORONA DE TUCSON WRF DISINFECTION AND SERVICE WATER PROJECT NO. 3CDT22

The bidder has carefully examined the form of Contract, Special Provisions, Specifications, and RWRD Engineering Design Standards and Standard Specifications and Details for Construction, 2012 edition, and Construction Drawings and will provide all necessary staffing, equipment, tools, apparatus, and other means of construction and complete all the work called for by said Documents in the manner prescribed therein, **COMPLETE, IN PLACE, AS FOLLOWS:**

General / Site Preparation and Completion	**Total Bid – General**	
Chlorine Contact Basin (CCB)	**Total Bid - CCB**	
Meter Vault	**Total Bid – Meter Vault**	
Effluent Parshall Flume	**Total Bid – Parshall Flume**	
Chemical Facility	**Total Bid – Chemical Facility**	
Service Water Facility	**Total Bid – Service Water**	
Civil / Yard Piping	**Total Bid – Civil / Yard Piping**	
Instrumentation and Electrical	**Total Bid – Instrumentation & Electrical**	
	PROJECT TOTAL BID	

TOTAL BID AMOUNT (IN WORDS): _____

(CONTINUED ON NEXT PAGE)

REVISION 2 **- EXHIBIT "B" - CONTRACTOR BID SHEET (Continued)**

BIDDER SHALL SIGNIFY RECEIPT OF ADDENDA (IF ANY). Failure to Acknowledge Receipt of any Material Addendum may result in rejection of the bid.

Addendum #	By (Name of Bidder's Personnel)	Date	Addendum #	By (Name of Bidder's Personnel)	Date

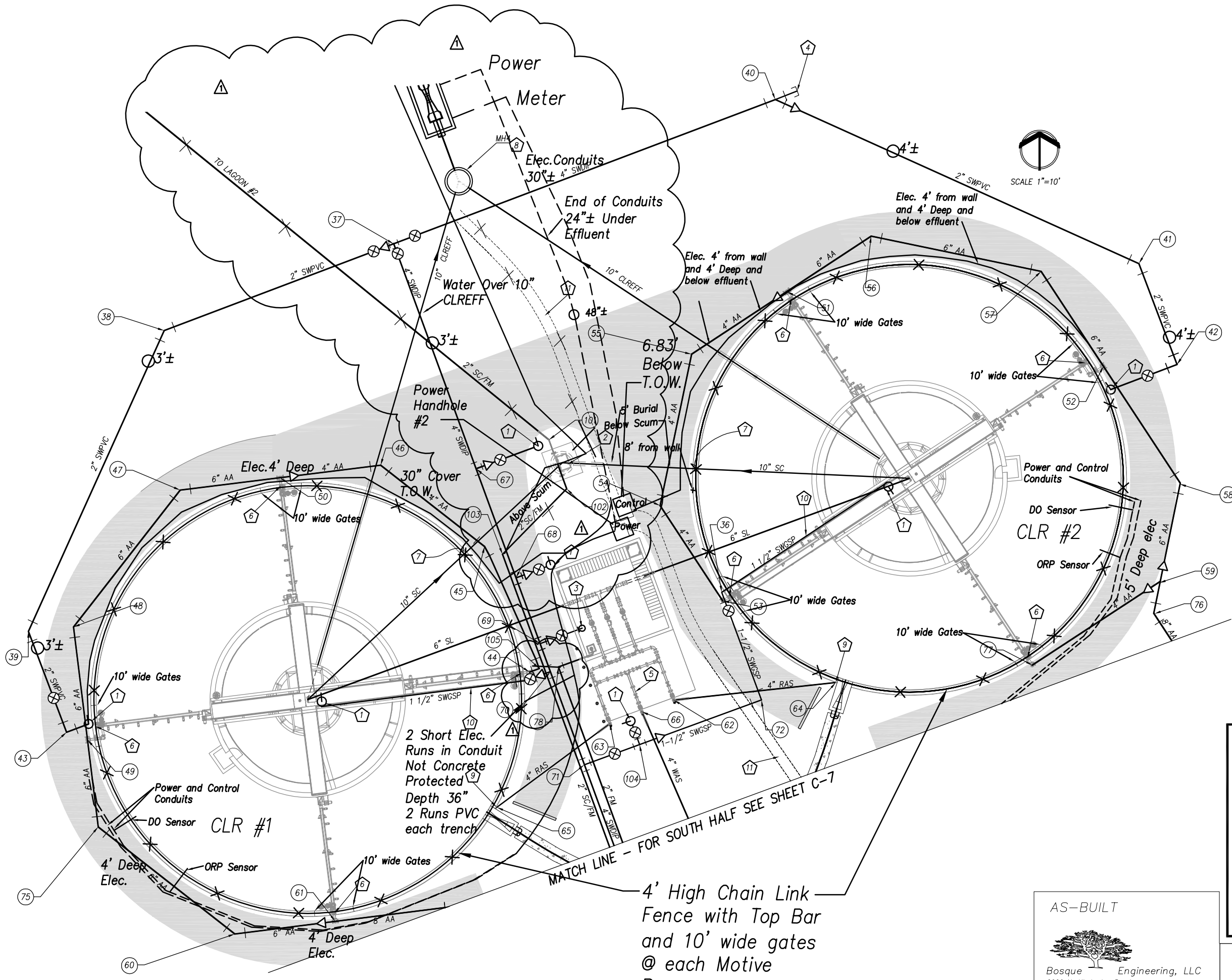
BIDS MUST BE SIGNED BY AN AUTHORIZED CONTRACTOR REPRESENTATIVE
Bidder hereby certifies that it has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

By submitting this bid, Bidder certifies that it possesses the appropriate license required by the Arizona Registrar of Contractors for the work herein.

Signature of Bidder: _____

Printed Name: _____Date:_____

Immediately Following This Page is As-Built Drawing C-6 (1 page)



SCALE 1"=10'

ABBREVIATIONS

AA	AERATION AIR	(SS)
GS	GRAVITY SEWER	(DIP)
EFF	SECONDARY EFFLUENT	(HDPE)
INF	INFLUENT	(DIP)
SL	SLUDGE	(DIP)
RAS	RETURN ACTIVATED SLUDGE (RESTRAIN ALL JOINTS)	(DIP)
SC	SCUM	(SS)
SI	SCREENED INFLUENT	(HDPE)
SNT	SUPERNATANT	(DIP)
SWDIP	SERVICE WATER DIP	(DIP)
SWPVC	SERVICE WATER PVC	(PVC)
SWGSP	SERVICE WATER GALV. STEEL	(GSP)
TS	THICKENED SLUDGE	(DIP)
WAS	WASTE ACTIVATED SLUDGE (RESTRAIN ALL JOINTS)	(DIP)
HCS	HOUSE CONNECTION SEWER	(DIP)
CF	CHEMICAL FEED	(POLYETHYLENE)
FM	FORCE MAIN	(PVC)
CLREFF	CLARIFIER EFFLUENT	(SS)
SC/FM	SCUM FORCE MAIN	(HDPE)
DS2	DIVERSION STRUCTURE #2	

KEYNOTES

1. SERVICE WATER HOSE BIBB. SEE DETAIL SHEET PM-16
2. SCUM PUMP STATION SEE SCUM PUMP DETAILS, SHEET PM-4
3. SERVICE WATER HOSE BIBB TO BE MOUNTED 3' FROM FLOOR OF THE RAS/WAS PUMPSTATION. SEE DETAIL SHEET PM-16
4. CAP & PLUG, 4" DIP SERVICE WATER
5. RAS/WAS PIPING MANIFOLD SEE SHEET PM-1
6. SEE CLR PLANT AIR PIPING DTL SHEET PM-6
7. INV OUT AT CLR WALL = 3125.00
8. MANHOLE #4 SEE SHEET C-2
9. SEE RAS CLR INLET DETAIL SHEET PM-18
10. CONTRACTOR SHALL MOUNT SERVICE WATER TO CATWALK
11. ELECTRICAL CONDUITS SEE ELECTRICAL SHEETS FOR ADDITIONAL INFORMATION

NOTES:

1. SEE SHEET C-4 FOR COORDINATES AND ADDITIONAL/INFORMATION
2. ALL PIPE TRENCHING TO BE PER TUCSON WATER SD-115.
3. FOR PRESSURE LINES RESTRAIN JOINTS PER TUCSON WATER STANDARD DETAIL SD-600 UNLESS OTHERWISE NOTED.
4. MINIMUM DEPTH OF COVER SHALL BE 3' UNLESS OTHERWISE NOTED.
5. CONTRACTOR SHALL ADJUST LOCATIONS OF ELECTRICAL CONDUITS, PULL BOXES AND VAULTS TO ELIMINATE CONFLICTS WITH PLANT PIPING. ADJUSTMENTS TO PLANT PIPING LOCATIONS MAY BE MADE IF ADJUSTMENTS TO ELECTRICAL CONDUIT, ETC., ARE IMPRACTICAL. CONTRACTOR SHALL DOCUMENT ALL RELOCATION FOR PREPARATIONS OF AS-BUILT PLANS.

AS-BUILT

Bosque Engineering, LLC
2000 N. Kimberlee Road
Tucson, Arizona 85749
Phone: (520) 909-7956
Fax: (520) 749-3961
E-mail: Bosqueeng@msn.com

Engineering and Environmental Consultants, Inc.
4625 E. FT. LOWELL RD.
TUCSON, ARIZONA 85712 520-321-4625

NO.	REVISION	APPVD.	DATE
	AS BUILT REVISION		08/2007

Registered Professional Engineer (Agricultural) PETER A. LIVINGSTON 20319 ARIZONA

PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
201 North Stone Avenue * Tucson, Arizona 85701-1207 * Phone: (520) 740-6500

CORONA DE TUCSON
WASTEWATER TREATMENT FACILITY
NORTH HALF
DETAILED YARD PIPING
AS-BUILT

PROJECT NO.: 204085
DATE: 8/2007
SCALE: HORIZ.: 1"=10' VERT.: N/A
SHEET NO.: C-6 OF 10

Immediately Following This Page is As-Built Drawing C-7 (1 page)

ABBREVIATIONS

		DIP
AA	AERATION AIR	~~(SS)~~
GS	GRAVITY SEWER	(DIP)
EFF	SECONDARY EFFLUENT	(HDPE)
INF	INFLUENT	(DIP)
SL	SLUDGE	(DIP)
RAS	RETURN ACTIVATED SLUDGE (RESTRAIN ALL JOINTS)	(DIP)
SC	SCUM	(SS)
SI	SCREENED INFLUENT	(HDPE)
SNT	SUPERNATANT	(DIP)
SWDIP	SERVICE WATER DIP	(DIP)
SWPVC	SERVICE WATER PVC Sch.80	(PVC)
SWGSP	SERVICE WATER GALV. STEEL	(GSP)
TS	THICKENED SLUDGE	(DIP)
WAS	WASTE ACTIVATED SLUDGE (RESTRAIN ALL JOINTS)	(DIP)
HCS	HOUSE CONNECTION SEWER	(DIP)
CF	CHEMICAL FEED	(POLYETHYLENE)
FM	FORCE MAIN	~~(PVC)~~ **HDPE**
CLREFF	CLARIFIER EFFLUENT	(SS)
SC/FM	SCUM FORCE MAIN	(HDPE)
DS2	DIVERSION STRUCTURE #2	

NOTES:

1. SEE SHEET C-4 FOR COORDINATES AND ADDITIONAL/INFORMATION
2. ALL PIPE TRENCHING TO BE PER TUCSON WATER SD-115.
3. FOR PRESSURE LINES RESTRAIN JOINTS PER TUCSON WATER STANDARD DETAIL SD-600 UNLESS OTHERWISE NOTED.
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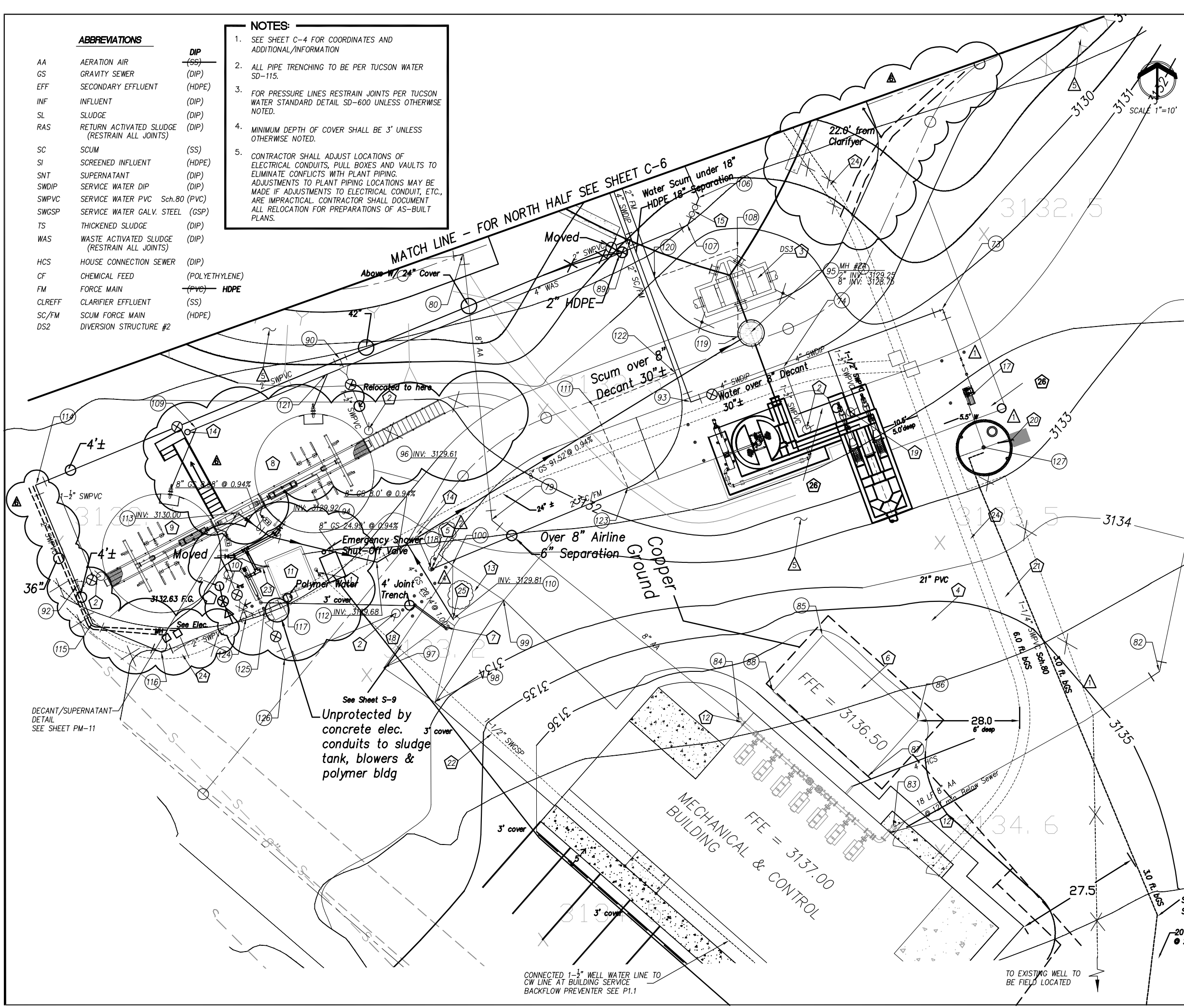
5. CONTRACTOR SHALL ADJUST LOCATIONS OF ELECTRICAL CONDUITS, PULL BOXES AND VAULTS TO ELIMINATE CONFLICTS WITH PLANT PIPING. ADJUSTMENTS TO PLANT PIPING LOCATIONS MAY BE MADE IF ADJUSTMENTS TO ELECTRICAL CONDUIT, ETC., ARE IMPRACTICAL. CONTRACTOR SHALL DOCUMENT ALL RELOCATION FOR PREPARATIONS OF AS-BUILT PLANS.



KEYNOTES

1. EMERGENCY EYEWASH AND SHOWER. SEE DETAIL SHEET PM-16
2. SERVICE WATER HOSE BIBB. SEE DETAIL SHEET PM-16
3. DIVERSION STRUCTURE WITH DESCRIPTOR SEE DETAIL SHEET PM-9
4. NEW 21" PVC SEWER SEE SHEET C-2
5. END OF 2" SCUM FORCE MAIN SEE DTL 5 SHEET PM-18
6. NEW 29' X 17' CONC. GENERATOR PAD. SEE STRUCTURAL SHEETS FOR ADDITIONAL INFORMATION
7. TRUCK FILL PIPE, SEE DETAIL SHEET PM-17.
8. SLUDGE HOLDING TANK NO. 1, SEE DTL SHEET PM-11
9. SLUDGE HOLDING TANK NO. 2, SEE DTL SHEET PM-11
10. SLUDGE FEED PUMP, SEE DETAIL SHEET PM-13
11. POLYMER AND STORAGE BUILDING, SEE SHEET PM-17
12. MECHANICAL AIR PIPING, SEE SHEET PM-7
13. ROLLOFF DEWATERING TANK PAD SEE STRUCTURAL FOR ADDITIONAL INFORMATION
14. CLEANOUT SEE DETAIL SHEET PM-15
15. 4" DOUBLE WYE CLEANOUT SEE DETAIL SHEET PM-15
16. RIP-RAP, SEE SHEET C-3
17. SERVICE WATER PUMP STATION, SEE SHEET PM-2 AND PM-3 PUMP DETAIL.
18. PIPE RISER WITH ECCENTRIC BALL VALVE AND END CAP. GEOTUBE CONNECTION BY OTHERS.
19. SEE SHEET PM-8 FOR CONNECTION TO MICROSCREENS
20. SERVICE WATER STORAGE TANK SHOP DRAWING REQUIRED
21. 1-1/4" PVC SCH. 40
22. 1-1/2" GSP, WELL WATER SERVICE TO EMERGENCY EYEWASH AND SHOWER STATION.
23. 2-1" HDPE POLYMER PIPE SEE DLT. SHEET PM-13
24. ELECTRICAL CONDUITS SEE ELECTRICAL SHEETS FOR ADDITIONAL INFORMATION
25. WADE # W-1104-TY-V06 FLOOR DRAIN W/NICKEL BRONZE STRAINER W/HINGE COVER
26. **Light Pole**

NO	REVISION	DATE
1	RELOCATION OF SERVICE WATER LINE, STORAGE TANK AND PUMP	11/1/06
2	KEYNOTE #19 CHANGE	11/8/06
3	KEYNOTE #5 CHANGE	12/7/06
4	KEYNOTE 25 ADDED	2/5/07
5	RIP-RAP DELETED	09/07
6	AS BUILT REVISIONS	

Registered Professional Engineer (Agricultural) CERTIFICATE NO. 20319 PETER A. LIMMASTON Date Signed ARIZONA

PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
201 North Stone Avenue * Tucson, Arizona 85701-1207 * Phone: (520) 740-6500

CORONA DE TUCSON
WASTEWATER TREATMENT FACILITY
SOUTH HALF
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E-mail: Bosqueeng@msn.com

Engineering and Environmental Consultants, Inc.
4625 E. FT. LOWELL RD.
TUCSON, ARIZONA 85712-3321-4625

PROJECT NO. : 204085
DATE : 8/2007
SCALE : HORIZ. : 1"=10'
VERT. : N/A
SHEET NO. : C-7 OF 10

Immediately Following This Page is the ConformaTECH Geotechnical Evaluation report (35 pages)

ConformaTECH

GEOTECHNICAL EVALUATION
CORONA DE TUCSON WRF UPGRADE
1100 WEST SAHUARITA ROAD
CORONA DE TUCSON, ARIZONA

Submitted To:

CH2MHill
1840 East River Road, Suite 200
Tucson, Arizona 85718

Submitted By:

ConformaTech, Inc.
1425 East Apache Park Place
Tucson, Arizona 85714

9 January 2015
CTEC Job No. 14-0429

ConformaTECH

9 January 2015
CTEC Job No. 14-0429

CH2MHill
1840 East River Road, Suite 200
Tucson, Arizona 85718

Attention: **Ms. Joy Terry**
Project Manager

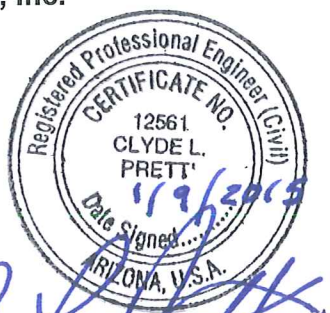
Re: **Geotechnical Evaluation**
Corona de Tucson WRF Upgrade
1100 West Sahuarita Road
Corona de Tucson, Arizona

Our geotechnical evaluation for the referenced project is herewith submitted. The report includes the results of test drilling, laboratory testing and engineering analyses. Recommendations for site grading and foundation, slab-on-grade and pavement design, based on the analyses, are presented.

This report was performed in general accordance with our proposal TG 14 12 02, dated 5 December 2014.

Should any questions arise concerning this report, we would be pleased to discuss them with you.

Respectfully submitted,
ConformaTech, Inc.



Clyde L. Pretti, P.E.
Geotechnical Engineer
Expires 12/31/2015

copies: Addressee (1-electronic)
File (1)

NOTICE
This is an electronic copy of a final document. The sealed original document is at ConformaTech, Inc. with Clyde L. Pretti Arizona Professional Engineer Number 12561.

ConformaTech, Inc.
1425 East Apache Park Place
Tucson, Arizona 85714

Phone 1.520.573.2045
Fax 1.520.573.0528

ConformaTECH

TABLE OF CONTENTS

APPENDICES

ConformaTECH

1.0 INTRODUCTION

This report presents the results of a geotechnical evaluation performed by ConformaTech, Inc. (CTEC) at the Corona de Tucson Water Reclamation Facility (WRF) located at 1100 West Sahuarita Road, in Corona de Tucson, Arizona. The purpose of the CTEC geotechnical services was to evaluate the physical properties of the soils underlying the site, in order to develop recommendations for site grading and foundation, slab-on-grade and pavement design.

This report was prepared for the exclusive use of our client for application only to the project discussed in the report. If changes in the nature, design or location of the site improvements as discussed in this report are planned or occur, the conclusions and recommendations of this report shall not continue to remain valid unless CTEC reviews the changes and provides a written verification or modification of the conclusions and recommendations of this report.

2.0 PROPOSED SITE IMPROVEMENTS

New upgrades are planned at this WRF. A new chlorine contact basin, chemical feed facility, hydropneumatic tank and associated mechanical\electrical equipment are planned.

The chlorine contact basin is a precast concrete tank that is approximately 26 feet long by 14 feet wide by 5 feet deep although excavating deeper than 5 feet may be necessary to construct the associated piping.

The chemical feed facility has a reinforced concrete floor slab with concrete side walls. The finished slab elevation will be a few feet below the surrounding finish grade. The facility will have a cover with light foundation loads. Small tanks and electrical/mechanical equipment associated with the facility are located on the floor slab.

A 1000 gallon hydropneumatic tank is also planned that will have an associated compressor. The tank and compressor are supported on shallow footing foundations.

There will be new mechanical/electrical equipment at this site as well as at-grade concrete service slabs. The area is serviced by delivery trucks traveling on paved surfaces.

No landscaping is planned in the new construction area.

Light foundation loads are anticipated for the above construction. The sizes and depths noted above for the planned upgrades are approximate and the final values likely will be somewhat larger or smaller that noted.

CTEC should be advised if the above understandings change so that additional design and earthwork recommendations can be provided.

ConformaTECH

3.0 SITE EXPLORATION

Two exploratory borings were drilled to depths of approximately 50 feet below existing grade. The exploratory borings were drilled with a CME-75 truck-mounted drill rig advancing a 7 inch diameter, continuous flight, hollow stem auger. Standard penetration testing and sampling and open-end drive sampling were performed at selected intervals in the borings. Upon completion of the drilling operation, the boreholes were backfilled with the drill cuttings.

The results of the field exploration are presented in Appendix A, which includes a brief description of drilling and sampling equipment and procedures, a site plan showing the boring locations and logs of the test borings.

4.0 LABORATORY TESTING

The laboratory analysis included testing for the following:

- insitu dry density and moisture content
- grain size analysis and Atterberg limits
- maximum density/optimum moisture (ASTM D698 Standard Proctor)
- consolidation
- dispersion
- sulfate and chloride

The laboratory test results are presented in Appendix B. The insitu moisture and dry density results are shown on the boring logs.

5.0 SITE CONDITIONS

5.1 Surface Conditions

The existing WRF has an office area, above ground tanks and two below ground, concrete reactors. There are large basins located on the north part of the WRF site.

The planned construction area is north of the existing reactors and is a relatively level area. There are below ground pipes and small wet wells in the area of new construction.

There was no vegetation in the new work area The new construction area was graded during construction of the existing WRF facility.

ConformaTECH

5.2 Subsurface Conditions

Based on the exploratory borings and the results of the laboratory analyses, the geotechnical profile underlying the project site generally consists of a deposit of silty and clayey sands with some sandy clays and silts. Generally, the soils exhibited a degree of lime cementation that was low or moderate. Soil plasticity varied from nonplastic to medium plasticity. The soils contained varying amounts of gravel and some cobbles.

Due to apparent previous grading activities at the site, old fills of unknown extent may be found.

No free groundwater was encountered in the borings advanced for this project.

The subsurface conditions described are based in part on the observations of the soils in widely spaced borings. Variations in the soils between borings can occur.

6.0 ANALYSIS & RECOMMENDATIONS

6.1 Analysis

The planned construction may be supported on shallow, spread footing foundations.

The foundation bearing soils should have a low settlement potential at the insitu moisture conditions under the anticipated foundation loading conditions. When wetted, the soils should have a low additional settlement potential.

Foundations for the proposed new structures may be supported on compacted native soils and/or on compacted structural fills.

Fills remaining from prior grading activities should be removed from below the new structures and replaced with structural fill.

6.2 Shallow Foundations

6.2.1 Design Criteria for Downward Loads

The soils below the bottom of the precast concrete chlorine contact basin and below the chemical feed facility foundations will provide an allowable bearing pressure of 2,500 pounds per square foot (psf).

Where spread footing foundations are planned, they may be designed using the following:

Minimum Foundation Depth (feet)	Allowable Soil Bearing Pressure (psf)
1.5	2,000
2.0	2,500

The **EARTHWORK** portion of this report presents recommendations regarding compaction of all soils below foundations.

The foundation depths noted above are referenced below the lowest adjacent grade within 5 feet of the foundation elements.

The minimum recommended widths of square and continuous footings are 2.0 and 1.33 feet, respectively.

The bearing pressures apply to dead loads plus design live loads. The above bearing pressures may be increased by one-third when considering total loads that include short term wind or seismic loads The above foundation bearing values represent average bearing conditions along the bottom of the footing. For eccentrically loaded foundations, the above bearing values may be used for design provided the resultant of the forces exerted on the bottom of the footing is located within the middle third of the footing.

Where foundations adjoin nearby sloping ground, a minimum horizontal setback of 5 feet should be maintained between the slope face and the edge of the footing adjoining the slope.

Foundation excavations should be observed by the geotechnical engineer during construction to verify bearing on compacted native soils or on structural fill.

If, during site inspections, soil conditions significantly different from those described in this report are found, additional recommendations will be provided.

6.2.2 Lateral Loads

The following lateral load values:

- do not include the effects of hydrostatic conditions
- do not apply for submerged or partially submerged conditions
- apply only for level backfill and do not apply for sloping backfill conditions (either positive or negative slope)
- do not apply for vibration or dynamic loading conditions
- do not apply for surcharge loading conditions
- do not apply for swelling soil pressure on walls

The passive resistance of properly compacted backfill or undisturbed native soils against the edges of footings, stem walls, and similar vertical foundation elements should be considered equivalent to the forces exerted by a fluid of 300 pounds per cubic foot (pcf/ft) unit weight.

The active earth pressure for properly compacted backfill or undisturbed native soils against the edges of footings, stem walls, and similar vertical foundation elements should be considered equivalent to the forces exerted by a fluid of 35 pcf/ft for unrestrained walls and 55 pcf/ft for restrained walls.

A coefficient of friction of 0.40 (if no passive resistance is used) is recommended for computing lateral resistance between the bases of footings and slabs and the soil in analyzing lateral loads. If passive resistance is used in lateral load calculations, the coefficient of friction should be reduced to 0.35.

6.2.3 Estimated Settlements

It is estimated that settlements of foundations designed in accordance with the criteria presented in this report should not exceed 3/4 inch for the soil moisture conditions encountered in native soils at the time of our field exploration, or for specified moisture contents anticipated in compacted site soils or structural fill. It is further anticipated that about 50 percent of the anticipated settlement will occur during construction.

Significant moisture increases in the structural fills and/or the native soils below foundations could result in additional settlements of foundations. Therefore, recommendations for site drainage and moisture protection, as presented in this report, are critical elements of design.

6.2.4 Seismic Design Values

Based on the nature of the subsoils encountered, a site class designation of D should be used for design.

6.3 Concrete Cast-On-Grade Slabs

6.3.1 Slab Construction and Curing

Concrete placement and curing should follow the recommendations of the American Concrete Institute. Improper placement and/or curing of slab concrete could cause excessive shrinkage, cracking and/or curling.

6.3.2 Slab Construction Recommendations

Provide control/construction joints in slabs. Separation or isolation joints between slabs and all slab penetrations should be provided so as to allow for the independent movement of the slab. The recommendations of the American Concrete Institute should be followed regarding joints in concrete slabs.

ConformaTECH

6.4 Pavement Design

The following conventional asphaltic concrete over granular base pavement structures are recommended:

Area	Asphaltic Concrete Thickness (inches)	Aggregate Base Course Thickness (inches)
Passenger car parking and traffic lanes	2	4
Delivery truck traffic	3	6

The asphaltic concrete and aggregate base course materials should comply with the latest requirements of the Standard Specifications for Public Improvements for Pima County/City of Tucson (PC/COT). Mix number 2 of Table 406-2 is recommended for the asphaltic concrete. For parking lots, the mix design properties for local streets are recommended-see Table 406-1.

The asphaltic concrete and aggregate base course should be placed and compacted per the PC/COT recommendations-see sections 303 and 406.

A maintenance program should be implemented for the site pavement. Periodic sealing of the asphaltic concrete pavement structure will be required to extend the pavement life. With time, the pavement will age and there will be cracking. Cracks should be sealed to prevent water infiltration. Eventually there would be a requirement for reconstruction or overlay of the original pavement.

Water should not be allowed to pond on or near the pavement surfaces. Intrusion of water into the subgrade soils below the pavement can cause failure.

7.0 EARTHWORK

7.1 Earthwork Construction

Areas of earthwork disturbance, trenching or excavation of fills that occur after completion of the earthwork should be backfilled and compacted in accordance with the recommendations of this report.

7.2 Site Clearing and Surface Preparation

The area of site clearing is below all new site improvements and should extend to a point at least 5 feet beyond the perimeter of the new construction.

The site should be cleared of all vegetation, debris and existing construction both above and below ground. All loose, soft or wet soils and all deleterious materials should also be removed.

Mounds and depressions should be removed to allow for uniform fill placement and compaction.

Ground sloping steeper than 5 Horizontal to 1 Vertical (5H:1V) should be benched. The benches should be level and of sufficient width to accommodate the earthwork equipment.

ConformaTECH

7.3 Existing Fill and Existing Utility Removal

Fills may be found at this site remaining from prior construction and site grading. Below ground utilities may also be found.

Existing fills and utilities should be removed from below new construction. The resulting excavations should be backfilled with structural fill.

When removing existing fills from below new construction, the removal should extend laterally beyond the perimeter of the new construction a distance equal to the depth of fill removed.

7.4 Surface Preparation

Below all new structures and in areas where new fills will be placed, the ground surface should be scarified, moisture conditioned and compacted to a minimum depth of 8 inches. The soil should be compacted to a minimum 95% of the maximum dry density determined per ASTM D698 at optimum moisture ±3%.

7.5 Foundation Area Soil Compaction

The soils in the bottom of all foundation excavations should be scarified to a minimum depth of 8 inches and compacted to a minimum 95% of the maximum dry density determined per the ASTM D698 test method at optimum moisture ±3%.

7.6 Granular Base Below Floor Slabs

Granular base below floor slabs should meet the following gradation requirements as determined by ASTM C136:

Sieve Size (square openings)	Percent Passing by Dry Weight
1 inch	100
3/4 inch	90-100
1/4 inch	45-75
No. 200	0-10

The plasticity index of the fraction of material passing the No. 40 sieve should not exceed 5 when tested by ASTM D4318. The coarse aggregate should have a percent of wear, when subjected to the Los Angeles Abrasion Test (ASTM C131) of no greater than 40 at 500 revolutions. Granular base should be free of vegetation, debris and other deleterious material.

7.7 Structural Fill

Imported soils to be used as structural fill should be free of vegetation, debris, and other deleterious materials. These soils should contain no particles larger than 6 inches in any dimension and should have a gradation that will allow material to be placed and compacted with no significant voids or nesting.

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Imported soils used as structural fill should also conform to the following:

Gradation (ASTM C136)

Sieve Size	Percent finer by weight
3"	100
No. 4	50-100
No. 40	20-65
No. 200	maximum of 30

Maximum expansive potential . . . . . 1.5% (see note * below)
Maximum soluble sulfates 0.10%

*The maximum expansive potential is measured on a soil sample compacted to approximately 95 percent of the maximum dry density determined per ASTM D698 at approximately 3 percent below optimum moisture. The compacted soil sample is confined under a 100 psf surcharge load and submerged in water.

7.8 Fill Placement, Moisture and Compaction

The recommended compaction and moisture criteria for compacted native soils and compacted structural fills are as follows:

Compacted Material	Per the ASTM D698 Standard Proctor Test Method		
	Minimum Compaction Requirement (%)	Percent Moisture Content Range Relative to Optimum Moisture	
onsite soils beneath foundations	95	-3	+3
onsite soils beneath slabs	95	-3	+3
onsite soils beneath asphalt pavements	95	-3	+1
imported soils beneath foundations	95	-3	+3
imported soils beneath slabs	95	-3	+3
imported soils beneath asphalt	95	-3	+1
aggregate base beneath pavement	100	-3	+3
aggregate base beneath concrete	95	-3	+3
all other backfill	95	-3	+3

Fill material should be placed in lifts no thicker than 8 inches where heavy compaction equipment is used. Where hand operated compactors are used, lifts should not exceed 6 inches in thickness. Fill lifts should be of uniform thickness when compacted.

If pumping of subgrade soils or structural fills occurs during compaction, the pumping soils should be removed and recompacted at a lower moisture that will not cause pumping or they should be replaced with structural fill.

7.9 Use of Onsite Soils as Structural Fill

Clean, onsite soils of low expansion potential may be used as structural fill.

Prior to using onsite soils as structural fill, the soils should be cleaned of deleterious materials and screened to remove all materials greater than 3 inches in any dimension.

7.10 Excavation Conditions

All prospective contractors and/or subcontractors should visit the site and determine the proper equipment and excavation techniques. It appears that excavations to depths anticipated for the construction area can be accomplished with standard equipment.

All excavations should be sloped or braced in accordance with the applicable state or federal regulations.

This report was not prepared for use as a bidding document.

7.11 Compliance

The recommendations of this report for design of foundations, slabs-on-grade, pavement and other site improvements that are supported on prepared subgrade or compacted fills are dependent on compliance with the earthwork recommendations of this report. To assess compliance with the recommendations, a qualified geotechnical engineer should be retained to observe the preparation of subgrade soils and the placement and compaction of fills during project earthwork.

8.0 SITE DRAINAGE & MOISTURE PROTECTION

Proper site drainage and moisture protection are important design considerations. Positive site drainage should be provided during construction and maintained thereafter. During construction, water should not be allowed to infiltrate into foundation or utility excavations.

The ground surface should slope away from the new structures at a minimum 5% slope for at least 10 feet away from the structure.

9.0 SLOPE RATIO FOR PERMANENT CUT OR FILL SLOPES

Permanent cut and fill slopes that will not be submerged under water should be constructed at a slope ratio of 2:1 (horizontal to vertical) or flatter. Where cut or fill slopes will be temporarily submerged under water, the slope ratio should be 4:1 (horizontal to vertical) or flatter.

The above recommendations do not apply for temporary construction excavations. These excavations should be constructed and maintained in accordance with the applicable provisions of the OSHA and State of Arizona regulations.

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10.0 LIMITATIONS

The services performed for this project included analysis of the field and laboratory data and presentation of professional opinions and recommendations based, in part, on the data collected. The nature and extent of the actual site conditions may vary from those presented in this report. If such variations become evident during later phases of this project, we should be notified to review and possibly modify our conclusions and recommendations.

Our services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No warranty, express or implied, is made. We prepared the report as an aid in the design of the proposed project. This report is not a bidding document. Contractors reviewing this report must draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

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 biological (e.g. mold, fungi, bacteria, endangered species) or 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.

Also, our services do not include evaluation of the consequences or effects of underlying geologic hazards or regional groundwater withdrawal.

Changes to site geotechnical conditions can be influenced by nearby construction. Also, the broadening of knowledge in engineering applications affects the information and recommendations of the profession. Accordingly, this document should not be used for design or construction after a period of five years beyond the report date.

APPENDIX A

⊕ Approximate borehole Location

REFERENCE: Google Earth, 2014

NORTH

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1425 EAST APACHE PARK PLACE
TUCSON, ARIZONA 85714

JOB NO.: 14-0429

FIGURE 1

Borehole Location Site Plan
Chlorine Contact basin
Corona de Tucson WRF
1100 West Sahuarita Road
Corona de Tucson, Arizona

PROJECT Chlorine Contact Basin
WRF at 1100 West Sahuarita Road
Corona de Tucson, Arizona

LOG OF TEST BORING NO. 1

JOB NO. 14-0429 **DATE** 12/23/14

LOCATION See Site Plan
RIG TYPE CME 75
BORING TYPE Hollow Stem auger
SURFACE ELEV. 3131 feet (Pima County MapGuide)
DATUM Mean Sea Level

Depth in Feet	Sampler Drive Length and Recovery (inches)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density (pcf)	Moisture (%)	Unified Soil Classification	Sample ID	VISUAL CLASSIFICATION
0								SC		**Clayey Sand with Gravel**, low plasticity, weak lime cementation, dark brown
								SM		**Silty Sand with Gravel**, weak or moderate lime cementation, nonplastic or low plasticity, light brown
5				S	50/4"		3.4			
10				S	17		1.7			
					13					
					11					
								SC		**Clayey Sand with Gravel** low plasticity, weak lime cementation, brown
15				U	95	106.8	5.8			
								SC		**Clayey Sand with Gravel**, medium or high plasticity, weak or moderate lime cementation, brown
20				S	22		2.6			
					41					
					32					
25				S	32		7.4			
					39					
					31					
30				S	50/5"		3.3			
35				S	18		3.7	CL-ML		**Clay and Silt**, low plasticity, weak lime cementation, light brown
					20					
					25					
40				S	23		9.7			
					23					
					30					
								SC		**Clayey Sand with Gravel**, low plasticity, weak lime cementation, brown
45				S	16		4.0			
					22					
					20					
50				U	57	108.6	7.0			
55										

BORING LOG 14 0429 CH2MHILL CHLORINE CONTACT BASIN.GPJ TUCSON.GDT 1/9/15

GROUNDWATER

	DEPTH	HOUR	DATE
▽	None		12/23/2014
▼			

SAMPLE TYPE
A - Auger cuttings; NR - No Recovery
S - 2" O.D. 1.38" I.D. tube sample
U - 3" O.D. 2.42" I.D. tube sample
T - 1" O.D. thin-walled tube sample
H - Hand Auger sample
C - Concrete Core sample

PROJECT Chlorine Contact Basin
WRF at 1100 West Sahuarita Road
Corona de Tucson, Arizona

LOG OF TEST BORING NO. 2

JOB NO. 14-0429 **DATE** 12/23/14

LOCATION See Site Plan
RIG TYPE CME 75
BORING TYPE Hollow Stem auger
SURFACE ELEV. 3131 feet (Pima County MapGuide)
DATUM Mean Sea Level

Depth in Feet	Sampler Drive Length and Recovery (inches)	Graphical Log	Sample	Sample Type	Blow Count	Dry Density (pcf)	Moisture (%)	Unified Soil Classification	Sample ID	VISUAL CLASSIFICATION
0								SC		**Clayey Sand with Gravel**, low plasticity, weak lime cementation, dark brown
5								SM		**Silty Sand with Gravel**, weak or moderate lime cementation, nonplastic or low plasticity, light brown
				S	14		2.2			
					12					
					9					
10				U	88		0.9			
15								SC		**Clayey Sand with Gravel** low plasticity, weak or moderate lime cementation, brown
				S	29		6.1			
					21					
					31					
20								SC		**Clayey Sand with Gravel**, medium or high plasticity, weak lime cementation, brown
				S	17		1.6			
					36					
					36					
25				S	33		4.3			
					50/2"					
30				S	43		9.7			
					21					
					27					
35				S	21		5.5			
					50					
40								CL-ML		**Clay and Silt**, low plasticity, weak lime cementation, light brown
				S	17		8.6			
					26					
					37					
45								SC		**Clayey Sand with Gravel**, low plasticity, weak lime cementation, brown
				U	90/9"	106.9	7.2			
50				S	21		5.5			
					21					
					25					
55										

BORING LOG 14 0429 CH2MHILL CHLORINE CONTACT BASIN.GPJ TUCSON.GDT 1/9/15

GROUNDWATER

	DEPTH	HOUR	DATE
▽	None		12/23/2014
▼			

SAMPLE TYPE
A - Auger cuttings; NR - No Recovery
S - 2" O.D. 1.38" I.D. tube sample
U - 3" O.D. 2.42" I.D. tube sample
T - 1" O.D. thin-walled tube sample
H - Hand Auger sample
C - Concrete Core sample

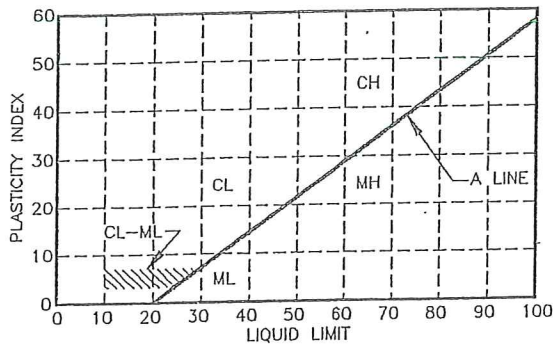
UNIFIED CLASSIFICATION SYSTEM FOR SOILS

Soils are visually classified by the Unified Soil Classification System on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" ASTM Designation: D2487.

MAJOR DIVISION				GRAPH SYMBOL	GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures or sand-gravel-cobble mixtures.
					GP	poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)			SW	Well graded sands, gravelly sands.
					SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCH ZONE ON PLASTICITY CHART)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)			ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)			MH	Inorganic silts of high plasticity, silty soils, elastic silts.
	CLAYS (LIMITS PLOT ABOVE "A" LINE & HATCH ZONE ON PLASTICITY CHART)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)			CH	Inorganic clays of high plasticity, fat clays, silty and sandy clays of high plasticity.

NOTE: Coarse-grained soils with between 5% & 12% passing the No. 200 sieve and fine-grained soils with limits plotting in the hatched zone on the plasticity chart to have dual symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Boulders	Above 300mm (12in.)
Cobbles	300mm to 75mm (12in. to 3in.)
Gravel	75mm (3in.) to No. 4 sieve
Coarse gravel	75mm to 19mm (3in. to 3/4in.)
Fine gravel	19mm (3/4in.) to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

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Terminology Used on Boring Logs to Describe the Relative Density or Relative Consistency of Soils

The terminology used on the boring logs to describe the relative density or relative consistency of soils relative to the standard penetration resistance is presented below. The standard penetration resistance (N value) in blows per foot is determined according to the ASTM D 1586 test method using 2 inch outside diameter (1 3/8 inch inside diameter) soil sampling tools.

1. Terms describing the relative density of coarse grained sand and gravel soils

N	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

2. Terms describing the relative consistency of fine grained clay and silt soils

N	Relative Consistency
0 - 2	Very soft
3 - 4	Soft
5 - 8	Medium Stiff
9 - 15	Stiff
16 - 30	Very Stiff
>30	Hard

Test Drilling Equipment & Procedures

Description of Subsurface Exploration Methods

Auger Boring Drilling through overburden soils is performed with 7" O.D., 3.25" I.D. hollow stem auger or 4.5" solid stem continuous flight auger. Carbide insert teeth are normally used on bits so they can penetrate soft rock or very strongly cemented soils. Generally, a CME-55 or CME-75 truck-mounted drill rig is used to advance the auger.

Refusal to drilling indicates the auger was unable to penetrate the materials. Further drilling would require extraordinary methods. Grab samples or auger cuttings may be taken as necessary. Standard penetration tests or 2.42" diameter ring samples are taken in conjunction with the auger borings as needed, with the sampling interval and type being indicated on the boring logs.

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D 1586 test procedure. In many cases, 2" O.D., 1 3/8" I.D. samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140-pound, 30-inch free fall drop hammer required to advance the samplers in 6-inch increments. These values are expressed in blows per 6 inches or per 12 inches on the boring logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587), pitcher samplers, Denison samplers or continuous CME samplers. Where samples of rock are required, they are obtained by NQ diamond core drilling (ASTM D2113). When necessary for testing, larger bulk samples are taken from auger cuttings.

Boring Records Drilling operations are directed by our field person who examines soil recovery and prepares the boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487).

APPENDIX B

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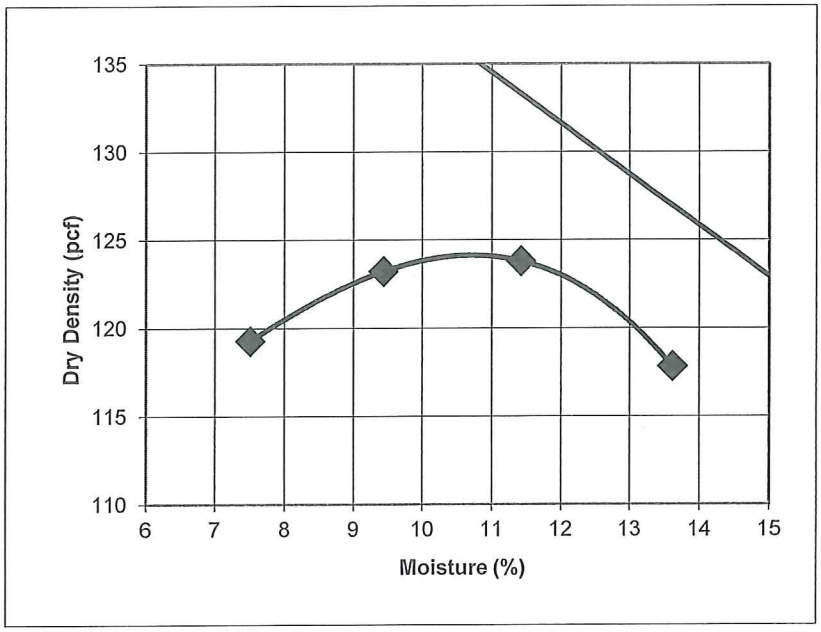
Project	Chlorine Contact Basin	**Job No.**	14-0429
Location	Corona de Tucson		
Material	Soil		
Sample Source	Boring 1 at 0 to 20 feet blend of soils		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)

Maximum dry density	124.1 pcf
Optimum moisture	10.7 %



SIEVE SIZE	PERCENT PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	97
3/4 in / 19 mm	92
1/2 in / 12.5 mm	87
3/8 in / 9.5 mm	83
1/4 in / 6.4 mm	78
#4, 4.75mm	74
#8, 2.36mm	65
#10, 2.00mm	63
#16, 1.18mm	55
#30, 0.60mm	46
#40, .425mm	42
#50, .300mm	38
#100, .150mm	30
#200, .075mm	22.5

LL	25
PI	13
USCS	SC

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Project	Chlorine Contact Basin	**Job No.**	14-0429
Location	Corona de Tucson		
Material	Soil		
Sample Source	Boring 1 at 5 and Boring 2 at 5 (combined)		

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	100
3/4 in / 19 mm	97
1/2 in / 12.5 mm	91
3/8 in / 9.5 mm	88
1/4 in / 6.4 mm	85
#4, 4.75mm	82
#8, 2.36mm	74
#10, 2.00mm	72
#16, 1.18mm	63
#30, 0.60mm	51
#40, .425mm	43
#50, .300mm	37
#100, .150mm	25
#200, .075mm	17.5

Liquid Limit (LL)	NV
Plasticity Index (PI)	NP
USCS Soil Classification	SM

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Project	Chlorine Contact Basin	**Job No.**	14-0429
Location	Corona de Tucson		
Material	Soil		
Sample Source	Boring 1 at 10 and Boring 2 at 10 (combined)		

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	97
3/4 in / 19 mm	86
1/2 in / 12.5 mm	81
3/8 in / 9.5 mm	77
1/4 in / 6.4 mm	71
#4, 4.75mm	68
#8, 2.36mm	58
#10, 2.00mm	56
#16, 1.18mm	47
#30, 0.60mm	38
#40, .425mm	32
#50, .300mm	28
#100, .150mm	19
#200, .075mm	13.1

Liquid Limit (LL)	NV
Plasticity Index (PI)	NP
USCS Soil Classification	SM

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Project	Chlorine Contact Basin	**Job No.**	14-0429
Location	Corona de Tucson		
Material	Soil		
Sample Source	Boring 1 at 15 and Boring 2 at 15 (combined)		

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	100
3/4 in / 19 mm	99
1/2 in / 12.5 mm	98
3/8 in / 9.5 mm	97
1/4 in / 6.4 mm	95
#4, 4.75mm	94
#8, 2.36mm	90
#10, 2.00mm	89
#16, 1.18mm	82
#30, 0.60mm	73
#40, .425mm	66
#50, .300mm	61
#100, .150mm	50
#200, .075mm	36.2

Liquid Limit (LL)	24
Plasticity Index (PI)	8
USCS Soil Classification	SC

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Project	Chlorine Contact Basin	**Job No.**	14-0429
Location	Corona de Tucson WRF		
Material	Soil		
Sample Source	Boring 1 at 25 and Boring 2 at 30 (combined)		

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	100
3/4 in / 19 mm	100
1/2 in / 12.5 mm	98
3/8 in / 9.5 mm	97
1/4 in / 6.4 mm	96
#4, 4.75mm	94
#8, 2.36mm	89
#10, 2.00mm	88
#16, 1.18mm	81
#30, 0.60mm	71
#40, .425mm	64
#50, .300mm	58
#100, .150mm	47
#200, .075mm	36.8

Liquid Limit (LL)	37
Plasticity Index (PI)	24
USCS Soil Classification	SC

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Project	Chlorine Contact Basin	**Job No.**	14-0429
Location	Corona de Tucson WRF		
Material	Soil		
Sample Source	Boring 1 at 40 and Boring 2 at 40 (combined)		

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	100
3/4 in / 19 mm	100
1/2 in / 12.5 mm	100
3/8 in / 9.5 mm	99
1/4 in / 6.4 mm	99
#4, 4.75mm	99
#8, 2.36mm	98
#10, 2.00mm	97
#16, 1.18mm	95
#30, 0.60mm	92
#40, .425mm	88
#50, .300mm	85
#100, .150mm	77
#200, .075mm	63.8

Liquid Limit (LL)	28
Plasticity Index (PI)	4
USCS Soil Classification	ML

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Project	Chlorine Contact Basin	**Job No.**	14-0429
Location	Corona de Tucson		
Material	Soil		
Sample Source	Boring 2 at 50 feet		

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6 in / 152mm	100
4 in / 100mm	100
3 in / 75mm	100
2 in / 50mm	100
1 1/2 in / 37.5mm	100
1 1/4 in / 32 mm	100
1 in / 25 mm	100
3/4 in / 19 mm	99
1/2 in / 12.5 mm	97
3/8 in / 9.5 mm	97
1/4 in / 6.4 mm	94
#4, 4.75mm	93
#8, 2.36mm	89
#10, 2.00mm	88
#16, 1.18mm	83
#30, 0.60mm	75
#40, .425mm	69
#50, .300mm	65
#100, .150mm	53
#200, .075mm	39.2

Liquid Limit (LL)	24
Plasticity Index (PI)	10
USCS Soil Classification	SC

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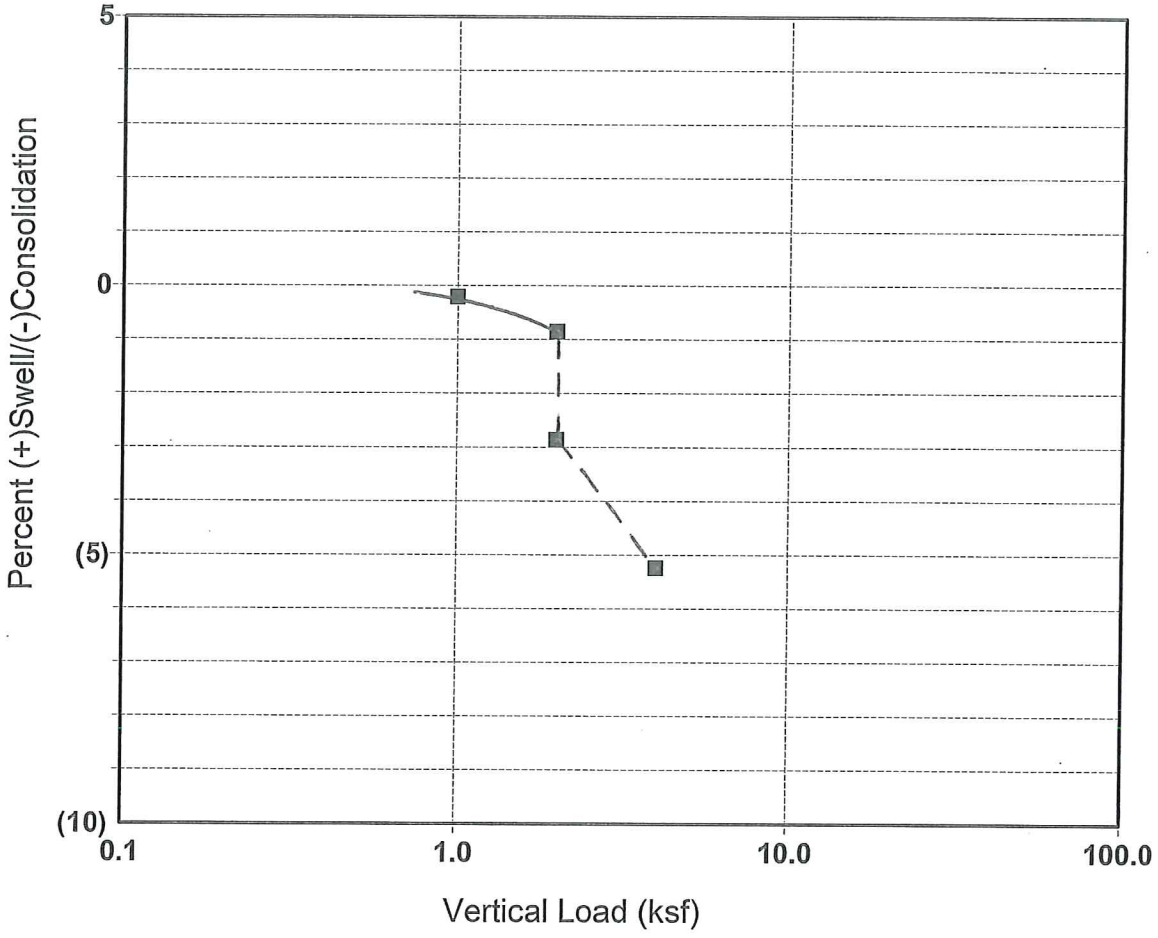
Project: Chlorine Contact Basin
Location Corona de Tucson WRF
Job No. 14-0429
Sample Boring 1 at 15 feet

Insitu Dry Density	106.8 pcf
Insitu Moisture	5.8 %



Curve Explanation In-situ ——————
Saturated ----------

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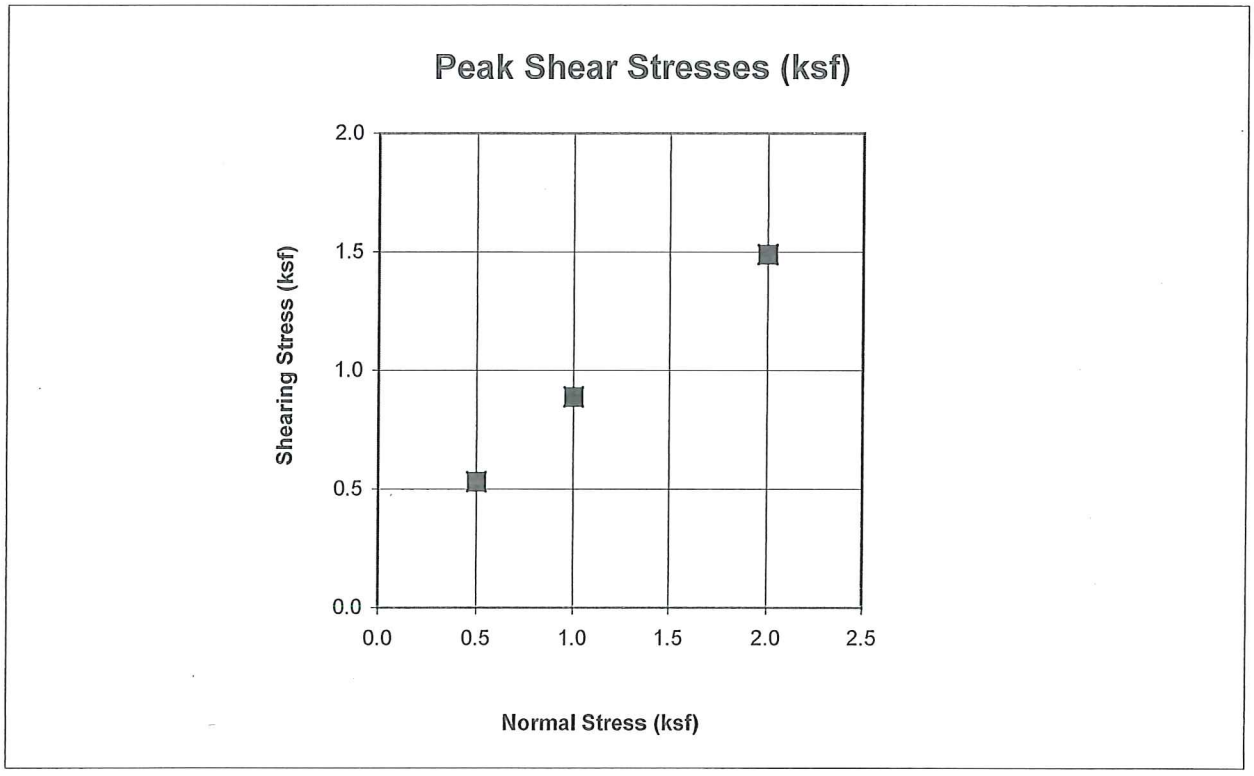
PROJECT:	Chlorine Contact Basin	**JOB NO:** 14-0429
LOCATION:	Corona de Tucson WRF	
MATERIAL:	Native	
SAMPLE SOURCE:	Boring 1 at 0 to 20 feet (remolded)	
SAMPLE PREPARATION:	Minus Number 4 material remolded to dry density of 117.9 pcf at 7.7% moisture.	
TEST CONDITIONS	Submerged in water	

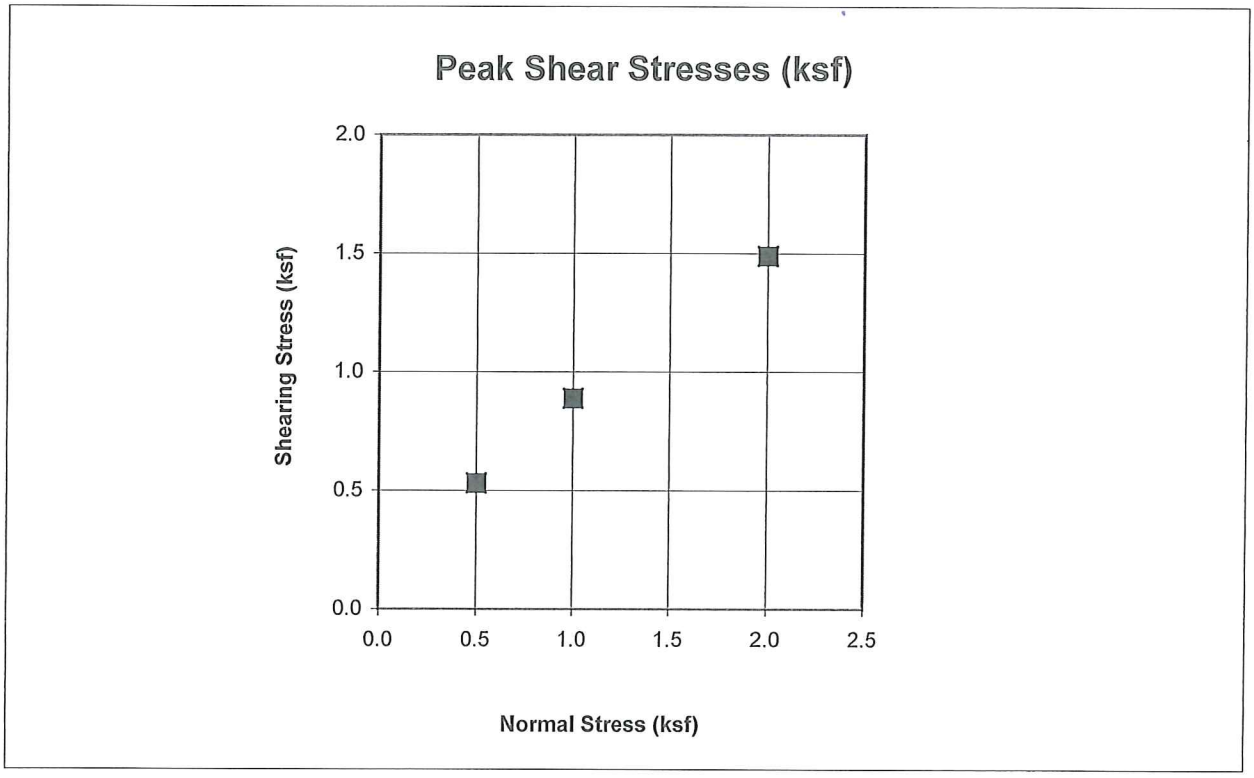
DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS



ConformaTECH

PROJECT:	Chlorine Contact Basin	**JOB NO:** 14-0429
LOCATION:	Corona de Tucson WRF	
MATERIAL:	Native	
SAMPLE SOURCE:	Boring 1 at 20 feet	
SAMPLE PREPARATION:	Minus Number 4 material remolded to dry density of 110.0 pcf at 8% moisture.	
TEST CONDITIONS	Submerged in water	

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS



PROJECT:	14-0429, Chlorine Contact Basin	**JOB NO:**	4-119-000069
LOCATION:	Corona de Tucson, WRF	**WORK ORDER NO:**	56
MATERIAL:	Native Soil	**LAB NO:**	204
SAMPLE SOURCE:	B1 @ 50'	**SAMPLE DATE:**	01/06/15
PREPARATION:	Remolded with the Harvard Compactor 112.0 pcf at 8.0% moisture	**WATER CONTENT:**	8.00%

IDENTIFICATION AND CLASSIFICATION OF DISPERSIVE CLAY SOILS BY THE PINHOLE TEST(ASTM D4647-06)

HEAD	FLOW RATE			COLOR	FALLING
	(mls.)	(sec.)	(ml/sec)		PARTICLES
2"	10	13	0.77	Completely clear	NONE
	25	33	0.76	Completely clear	NONE
	25	33	0.76	Completely clear	NONE
	50	66	0.76	Completely clear	NONE
7"	25	23	1.09	Completely clear	NONE
	25	23	1.09	Completely clear	NONE
	50	49	1.02	Completely clear	NONE
	100	99	1.01	Completely clear	NONE
15"	50	35	1.43	Barely visible	FEW
	50	35	1.43	Barely visible	FEW
	100	70	1.43	Barely visible	FEW
	100	70	1.43	Barely visible	FEW
40"	50	23	2.17	Dark	HEAVY
	50	23	2.17	Dark	HEAVY
	100	46	2.17	Dark	HEAVY
	100	45	2.22	Dark	HEAVY

CLASSIFICATION: ND1

NOTES: Nondispersive

The flow rate is less than 3.0 mL/s

Diameter of hole is not measurably larger than the needle punch

Client provided remold instructions

REVIEWED BY _____

Client: Conforma Tech
Project: Soil Samples01
Work Order: 14L0738
Lab Sample ID: 14L0738-01

Client Sample ID: B1 at 0' to 10'
Collection Date/Time: 12/23/2014 1000
Matrix: Soil
Order Name: Chlorine Contact Basin 14-0429

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Anions by Ion Chromatography-E300								
Chloride	40	10		mg/Kg	1	01/06/2015 1140	01/06/2015 1548	AC
Sulfate	51	50		mg/Kg	1	01/06/2015 1140	01/06/2015 1548	AC

Client: Conforma Tech
Project: Soil Samples01
Work Order: 14L0738
Lab Sample ID: 14L0738-02

Client Sample ID: B1 at 10' to 20'
Collection Date/Time: 12/23/2014 1030
Matrix: Soil
Order Name: Chlorine Contact Basin 14-0429

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Anions by Ion Chromatography-E300								
Chloride	33	10		mg/Kg	1	01/06/2015 1140	01/06/2015 1607	AC
Sulfate	ND	50		mg/Kg	1	01/06/2015 1140	01/06/2015 1607	AC

LABORATORY TESTING PROCEDURES

Consolidation Tests Testing apparatus of the "floating-ring" type are employed for the one-dimensional consolidation tests. They are designed to receive one inch high 2.5 inch O.D. brass liner rings with soil specimens as secured in the field. Procedures for the tests generally are those outlined in ASTM D2435. Loads are applied in several increments to the upper surface of the test specimen and the resulting deformations are recorded. Generally, the applied loads are such that each new increment is equal to the total previously applied loading. Porous stones are placed in contact with the top and bottom of the specimens to permit the free addition or expulsion of water. For partially saturated soils, the tests are normally performed at in situ moisture conditions until consolidation is complete under the applied stresses. The samples are then submerged to show the effect of moisture increase and the test is continued to the final stress level.

Expansion Tests The same type of consolidometer apparatus described above is used in expansion testing. Samples contained in brass liner rings are placed in the consolidometers, subjected to appropriate surcharge loads and submerged. The loads are maintained until the test indicates the completion of "primary swell".