City of Sedona Community Development Department
Engineering Services
102 Roadrunner Drive Sedona, AZ 86336
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To Whom It May Concern:

The City of Sedona, Arizona is issuing **Addendum # 1** to the plans and specifications as originally issued at the time of solicitation for bids for the **WWRP A+ Upgrades Project.** For any bid to be considered responsible and responsive, receipt of this addendum must be acknowledged.

As specified in the Instructions to Bidders this Addendum upon issuance has become a part of the Contract Documents.

This Addendum contains 41 pages including this page, 0 changed bid sheets, and 0 plan sheets. Any changed bid sheets shall be used in lieu of the originally issued bid sheets in order to submit a responsive bid.

This Addendum changes the following:

1. **Drawing 10-C-06, detail E:** capacity of existing channel should be **200 cfs**
2. **Drawing 10-C-03, keynote 11:** reference should be to Drawing 10-C-06.
3. **Specification 02742 Section 2.01D:** delete item no. 3
4. **Specification 09960:** Clarifier coating is required as noted on the drawings. Sauereisen Sewer Guard 210X is acceptable as an alternate to Sewer Shield. Either system shall be applied in accordance with specification 09960, and manufacturer's requirements and in addition, shall meet these minimum criteria:
    a. Surface prep: sand blast to expose aggregate (80 grit)
    b. Apply in two (2) coats, 125 mil thickness total.
5. **Drawing 70-S-01:** Add note to Roof Plan "A" as follows: Construct roof opening for relief hood per Typical details A631 and S520 (attached)
6. **Special Condition C (pg. 45):** The project area of disturbance is greater than 1 acre, therefor the Contractor shall obtain a Notice of Intent (NOI) from Arizona Department of Environmental Quality. The approved NOI must be submitted to the City prior to Start of Construction.

This Addendum clarifies the following:

1. **Specification 02742:** In accordance with MAG Specification 710, the asphalt binder shall be performance grade asphalt conforming to the requirements of MAG Specification 711 for PG 70-10.
2. **Specification 02772** applies to fuel tank curbing and entrance pads shown on the drawings.
3. **Specification 07220, Section 2.01.A.:** If the base layer R-value is slightly less, it is acceptable as long as the criteria in this specification is met for the overall insulation system.
4. **Specification 11353C, Section 2.02.B:** The wetted parts may be coated ASTM A 36 Steel unless otherwise noted within the specific sections (i.e. hardware, etc.). Coating and preparation must be per the painting specification.

5. **Specification 11353C, Section 2.03.H.3.j.1a:** Matching with a 35 inch raceway size is acceptable, provided the manufacturer still recommends this size today for this design.

This Addendum adds the following:

1. **The attached Geotechnical Report shall become part of the Contract Documents**
2. **The attached Pre-Bid sign in sheet**
3. **The attached Typical Detail A631**
4. **The attached Typical Detail S520**

ACKNOWLEDGEMENT

I have received addendum # 1 for the **WWRP A+ Upgrades Project** as described above, and acknowledge it as part of the Contract Documents for the project.

______________________________ ______________________

Signature **Date**

____

Print Business Name

Addendum # 1 issued by J. Andy Dickey, PE, Assistant Community Development Director/City Engineer, City of Sedona

______________________________ 10/7/2014

J. Andy Dickey, PE Assistant Community Development Director/City Engineer

Date

SPEEDIE AND ASSOCIATES
Geotechnical ▪ Environmental ▪ Materials Engineers

www.speedie.net

REPORT ON GEOTECHNICAL INVESTIGATION

Registered Professional Engineer (Civil)
CERTIFICATE NO.
14388
GREGG ALAN CREASER
Date Signed 9/30/13
ARIZONA, U.S.A.
Expires 06/30/14

DESIGNATION: Sedona WWTP – New Clarifier and Building Improvements

LOCATION: N of Highway 89A, 8mi SW of downtown Sedona, Arizona

CLIENT: Carollo Engineers

PROJECT NO: 130984SF

REVISED DATE: September 30, 2013

3331 East Wood Street ▪ Phoenix, AZ 85040 ▪ Phone (602) 997-6391 ▪ Fax (602) 943-5508
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14388
GREGG ALAN
CREASER
Date Signed 9/30/13
Expires 06/30/14

1.0 INTRODUCTION

This report presents the results of a subsoil investigation carried out at the site of the proposed new clarifier and building improvements at the Sedona Waste Water Treatment Plant located north of US 89A approximately 8 miles southwest of downtown Sedona, Arizona.

Preliminary information calls for the construction of a new Digester Basin, a new Secondary Clarifier, and a small electrical building at the existing wastewater treatment facility. Both the Digester Basin and Clarifier will be cast in place concrete tanks/vaults with estimated bottom elevations shown below. Structural loads are expected to be light to moderate and no special considerations regarding settlement tolerances are known at this time.

This report is written assuming the following.

Structure	Estimated Bottom Elevation	Existing Ground Elevation
Clarifier Tank	4030 Tank/ 4025 Drain Piping	4041-4045
Digester Tank	4033	4053
Blower Canopy	At Grade	4049
Note: All elevations are estimated from 1999 CH2M Hill site grading plan.		

2.0 GENERAL SITE AND SOIL CONDITIONS

2.1 Site Conditions

The site is located within the existing waste water treatment facility. The existing Clarifier appears to have been constructed below the existing ground with the exterior grade built up around the tank several feet. The existing Digester Basin also appears to be cut into the existing ground. The north end of the treatment facility is protected from sheet flow by a drainage ditch that intersects flow, directing it to the west.

2.2 Seismic Design Parameters

The project area is located in a seismic zone that is considered to have low historical seismicity. Liquefaction is not considered a concern as groundwater exceeds 15 meters below ground surface.

Although borings were not advanced to 100 feet, based on the nature of the subsoils encountered in the borings and geology in the area, Site Class Definition, Class C may be used for design of the structures. In addition, the following seismic parameters may be used for design (based on 2008 USGS maps adopted by 2012 IBC):

Table 2.2.1 Seismic Parameters

MCE[1] spectral response acceleration for 0.2 second period, S_S:	0.319g
MCE[1] spectral response acceleration for 1.0 second period, S_1:	0.093g
Site coefficient, Fa:	1.2
Site coefficient, Fv:	1.7
MCE[1] spectral response acceleration adjusted for site class, S_{MS}:	0.383g
MCE[1] spectral response acceleration adjusted for site class, S_{M1}:	0.158g
5% Damped spectral response acceleration, $S_{DS:}$	0.255g
5% Damped spectral response acceleration, $S_{D1:}$	0.106g
NOTE 1: MCE = maximum considered earthquake	

2.3 General Subsurface Conditions

The subsoil conditions comprise predominantly of sandy lean clay, clayey sand, and silty sand underlain by weathered bedrock to depths of 7 to 21 feet below existing grade. Subordinate amounts of gravel were also noted throughout the profile. The very dense clayey sand and gravel layer below the surface alluvial soils is likely highly weathered conglomerate bedrock. The standard penetration resistance test (SPT) values range from 7 to 20 blows per foot in the upper 4 to 5 feet increasing to 40 to 50+ blows per foot at depth. Where cored (B-7), this bedrock exhibits a RQD of 32 to 68 below 20 feet deep. The rock exhibited unit weights on the order of 144 to 154 pcf with unconfined compressive strengths between 2390 and 2540 psi. No groundwater was encountered during this investigation. Based on visual and tactile observation, the soils were in a ‘dry to moist’ state at the time of investigation.

Laboratory testing indicates in-situ dry densities of the upper soils on the order of 79 to 106 pcf and water contents on the order of **11 to 26 percent** at the time of investigation. Liquid limits range from 31 to 41 percent with Plasticity Indices on the order of 9 to 17. The upper clayey soils exhibit volume increase (swell) due to wetting of approximately 1.3 percent when compacted to moisture and density levels normally expected during construction. Undisturbed samples displayed moderate compression due to loading and significant additional compression due to inundation under a maximum confining load of 3,200 psf.

3.0 ANALYSIS AND RECOMMENDATIONS

3.1 Analysis

Analysis of the field and laboratory data indicates that subsoils at the site are generally favorable for the support of the proposed structures on shallow foundations and slab-on-grade. Some special site preparation will be required with respect to the existing structures (if any are to be removed) and related elements, and underground utilities.

The Clarifier and Digester Basin depths are expected to be 18 to 20 feet below grade. These will likely encounter weathered to medium hard bedrock which will provide excellent bearing conditions. However, in order to excavate to the proposed elevations will require "hard dig" rock excavation operations. Blasting operations, if allowed, will require seismographs set up at the nearest structures to monitor ground vibrations. Maximum peak particle velocities should not exceed 2.0 inches per second as recorded at the nearest existing structure. Maximum peak particle velocities at new structures should not exceed 0.1 inches per second for fresh concrete (< 24 hours old) and 0.8 inches per second for concrete between 24 and 48 hours old. It should be noted that the Digester Basin will likely be moved to an area directly east of the current location. Soil borings were not drilled in this immediate area as the location shifted after the initial investigation. It is not anticipated that the depth to rock will change significantly from where drilled. The small size and relatively flat area of the blower canopy area suggests these foundations will bear on native soils.

Laboratory and field testing indicates that the upper soils are of relatively low and somewhat variable density and are susceptible to various degrees of additional (hydro) compression when subjected to inundation. This could cause excessive settlement resulting in cracking problems. However, as noted above, the proposed tanks will be cut into the underlying bedrock eliminating any special requirements for remedial foundation work. The native soils in the blower canopy area are sufficient for direct support of that lightweight structure without the need to over-excavate and re-compact the bearing soils. Attention should still be paid to provide proper drainage to limit the potential for surface water infiltration of underground tank wall backfill soils.

Groundwater is not expected to be a factor in the design or construction of shallow foundations and underground utilities. While none was noted during this investigation, it is possible to encounter seasonal perched water at soil-bedrock interface during wet weather periods. The potential for the drainage channel to contribute to the perched water table was not evaluated as part of this study. It would appear to be located far enough away from the proposed digester location to have little impact assuming there are no direct conduits leading to this area.

While groundwater was not encountered and will not pose a problem for construction, overly wet subgrade may be an issue. Several samples indicated relatively high moisture contents. Depending on the time of year for construction and previous rainfall activity there is an increased risk to encounter moist unstable soils. The construction plans should assume that soft wet soil will be encountered beneath the existing pavement and possibly in the yard area. Should the contractor not have time to allow for the soils to dry should wet conditions be encountered, alternative options for stabilizing any soft wet subgrade could include mixing the soil with either a chemical lime slurry or dry cement.

For standard shallow foundations bearing on soil to perform as expected, attention must be paid to provide proper drainage to limit the potential for water infiltration of deeper soils. It is assumed that the landscape plan will use mostly low water use or "green" desert type plants (xeriscape). It is preferred to keep irrigated plants at least 5 feet away from structures with irrigation schedules set and maintained to run intermittingly. **Unpaved planter areas should be sloped at least 5 percent for a distance of at least 10 feet away from the building.** Sidewalks should not be placed (or planters graded) that could create a "pond" adjacent to the building. Roof drainage should also be directed away from the building in paved scuppers. Pre-cast loose splash blocks should not be used as they can be dislodged and/or eroded. Roof drains should not be allowed to discharge into planters adjacent to the structure. It is preferred that they be directed to discharge to pavement, retention basins or discharge points located at least 10 feet away from the building.

For exterior slabs-on-grade, frequent jointing is recommended to control cracking and reduce tripping hazards should differential movement occur. It is also recommended to pin the landing slab to the building floor/stem wall. This will reduce the potential for the exterior slab lifting and blocking the operation of out-swinging doors. Pinning typically consists of 24-inch long No. 4 reinforcing steel dowels placed at 12-inch centers.

3.2 Site Preparation

The entire area to be occupied by the proposed construction should be stripped of all vegetation, debris, rubble and obviously loose surface soils. The existing structures (if there are any to be removed) and foundation elements should be removed in their entirety along with soil disturbed by this activity. Carefully remove all concrete and other elements as well as any deleterious materials that may be encountered. For the proposed depths of the tanks, all surface soils will likely be removed.

It is not known whether existing underground services will be removed. If any utility is located within 5 feet of any proposed shallow foundation, relocation and/or abandonment of the utility should be provided. They should either be removed and replaced with engineered fill or abandoned in-place.

In the case of manholes (drywells) and pipelines, it may be possible to abandon them in-place. The tops of manholes should be removed and filled with a weak (>500 psi) cementitious grout. Pipelines larger than 6 inches should be capped and filled with grout.

For the shallow (near surface) spread footing option, subsoils should be over-excavated at least 2 feet below proposed footing bottom elevation, or existing grade, whichever is deeper, extending at least 5 feet beyond the footing edges within all footing areas. A representative of the Geotechnical Engineer should examine the subgrade once sub-excavation is complete and prior to backfilling to ensure exposure of native soils and removal of deleterious materials. Fill placement and quality should be as defined in the "Fill and Backfill" section of this report.

Prior to placing any engineered fill, the exposed grade should be scarified to a depth of 8 inches, moisture conditioned to optimum (±2 percent) and compacted to at least 95 percent of maximum dry density as determined by ASTM D-698. Pavement areas should be scarified, moisture conditioned and compacted in a similar manner.

3.3 Excavation And Temporary Cut Slopes

Care should be taken during excavation not to endanger nearby existing structures, roadways, utilities, etc. Depending on proximity, existing structures (including utilities) may require shoring, bracing or underpinning to provide structural stability and protect personnel working in the excavation.

All excavations must comply with current governmental regulations including the current OSHA Excavation and Trench Safety Standards. Preliminary indications are that the upper fine-grained soils would be classified as Type C. Side slopes for open-cut excavation should be cut back at 1½:1 (horizontal to vertical). Deeper excavation may encounter weathered bedrock classified as Type A with side slopes open-cut to ¾:1. Deeper cuts into the medium hard rock may be considered “stable rock” with vertical cuts allowed. The slopes should be protected from erosion due to run-off or long term surcharge at the slope crest. Construction equipment, building materials, excavated soil and vehicular traffic should not be allowed within 10 feet or one-third the slope height, whichever is greater, from the top of slope. All cut slopes should be observed by the Soils Engineer or contractor’s qualified person during excavation. Adjustments to the recommended slopes may be necessary due to wet zones, loose strata and other conditions not observed in the borings. Localized shoring may also be required. Shotcrete or soil stabilizer on the slope face may be useful in preventing erosion due to run-off and/or drying of the slope. Shotcrete protection is recommended for slopes that will remain open for extended periods of time (more than a week). Provision should be made for drainage (such as weep holes) to mitigate potential build-up of hydrostatic pressure below the shotcrete. If seepage from the slopes is encountered during construction, Speedie should be notified so that these recommendations can be reviewed. Vertical rock cuts will require scaling to remove loose rock to minimize rock fall hazards.

3.4 Soil Corrosion

Laboratory testing of the native soil concluded a pH of 7.4, a laboratory minimum resistivity of 760 ohm-cm, and Chloride concentrations on the order of 21 ppm. These results indicate a severe degree of corrosivity to direct buried metal. Accordingly, suitable pipe wall thickness and corrosion protection should be selected per the lifetime requirements of the project. Sulfate concentrations were on the order of 9 ppm. This indicates a negligible degree of sulfate attack. Subsurface concrete should use Type I or II cement, which is readily available and used in the area.

3.5 Foundation Design

The following allowable bearing capacities are available for design.

Table 3.5.1 Foundation Design

Structure	Foundation Type	Bearing Strata	Bearing Depth (feet)	Allowable Bearing Capacity
Minor Structures and Equipment Pads	Spread Footing or Structural Slab	Medium Dense Native Soil	1.5^(1)^	1,500 psf k_s = 125 pci
Blower Building	Spread Footing or Structural Slab	Dense Native Soils	2.0^(2)^	3,000 psf
Other Surface Buildings	Spread Footings/Mats	4.0 Min. Feet of Engineered Fill	2.0^(3)^	3,000 psf k_s = 200 pci
Deep Structures/ Clarifier Tanks	Spread Footing Structural Slab	Weathered Bedrock	1.0^(4)^	8,000 psf k_s = 250 pci

Notes:

1. For screen walls, shade structures not connected to large structures. Bearing depth refers to depth below **lowest finished exterior grade** within 5 feet of the structure. Bearing on undisturbed native soils or properly compacted fill.
2. Spread footings bearing on dense native soils. Depth refers to depth below **lowest finished exterior grade** within 5 feet of the structure.
3. For other miscellaneous structures bearing at-grade on at least 4 feet of engineered fill. Minimum 4.0 feet of over-excavation required, plus 8" scarification prior to the placement of fill is required to ensure removal of any loose surface soils. Depth of removal may be reduced if very dense native soils or decomposed bedrock are exposed.
4. Bearing depth refers to depth below bottom of vessel floor (assumed to greater than 15 feet below existing grade). Bearing on slightly weathered bedrock. In any area where suitable bedrock is not exposed, remove unsuitable material and replace with concrete with f′c greater than 500 psi.

These bearing capacities refer to the total of all loads, dead and live, and are net pressures. They may be increased one-third for wind, seismic or other loads of short duration. All footing excavations should be level and cleaned of all loose or disturbed materials. Positive drainage away from the proposed structures must be maintained at all times.

Continuous masonry wall footings and isolated rectangular footings should be designed with minimum widths of 16 and 24 inches respectively, regardless of the resultant bearing pressure. Lightly loaded interior partitions (less than 800 plf) may be supported on reinforced thickened slab sections (minimum 12 inches of bearing width).

Estimated settlements for spread footing bearing on soil under design loads are on the order of ½ to ¾-inch, virtually all of which will occur during construction. Settlement of footings bearing on rock will be nil. Post-construction differential settlements will be negligible, under existing and compacted moisture contents. Post-construction differential settlements will be on the order of one-half the total, under existing and compacted moisture contents. Additional localized settlements of the same magnitude (or greater if deeper soils are saturated) could occur if native supporting soils were to experience a significant increase in moisture content. **Positive drainage away from structures, and controlled routing of roof runoff should be provided and maintained to prevent ponding adjacent to perimeter walls.** Planters requiring heavy watering should be avoided adjacent to structures. Care should be taken in design and construction to insure that storm water sheet flow is directed away from all foundations.

Continuous footings and stem walls should be reinforced to distribute stresses arising from small differential movements, and long walls should be provided with control joints to accommodate these movements. Reinforcement and control joints are suggested to allow slight movement and prevent minor floor slab cracking.

3.6 Lateral Pressures

The following equivalent fluid lateral pressure values may be utilized for the proposed construction. These are ultimate values for soils.

Active Pressures	
Unrestrained Walls	35 pcf
At-Rest Pressures	
Restrained Walls	60 pcf

Passive Pressures (on soils)	
Continuous Footings	300 pcf
Spread Footings or Drilled Piers	350 pcf
Coefficient of Friction (w/ passive pressure)	0.35
Coefficient of Friction (w/out passive pressure)	0.45
Coefficient of Friction (bearing on rock)	0.60

All backfill must be compacted to not less than 95 percent (ASTM D-698) to mobilize these passive values at low strain. Expansive soils should not be used as retaining wall backfill, except as a surface seal to limit infiltration of storm/irrigation water. The expansive pressures could greatly increase active pressures. **The exposed rock cut must be cleaned of all loose debris by high pressure air or water to take advantage of the higher coefficient of friction.** In locations where the downhill slope at the toe of the retaining walls is greater than 3:1, do not rely on passive pressure in front of the wall for stability.

3.7 Fill and Backfill

Native soils with a soil classification ‘SM’ and ‘SC’ with the gradation presented below are considered suitable for use in engineered pad fill and tank wall backfill, provided they can be properly compacted and screened of any oversized material greater than 3 inches. The bedrock materials will likely require crushing and/or screening to the minus 3 inch size (or smaller) for use as structural fill and wall backfill. Soils with a classification of ‘ML’ and ‘CL’ should **not** be used as structural fill or wall backfill. **The use of free-draining backfill against below grade walls is also not recommended.** The increased potential for water infiltration creating perched water zones on the bedrock would have a negative impact on foundations and increase pressure behind walls. If due to tight access requires a backfill that does not require compaction, a controlled low strength flowable backfill (MAG 728) is recommended.

Specification	Common	Engineered Fill Below Foundations[2]
Passing 3″/75mm	100%	100%
Passing #200/.075mm	≤60%	15-45%
Liquid Limit	<40%	<35%
Plasticity Index	<18%	<15%
Swell[1]	<1.5	<1.5

Notes:

1. Swell potential when compacted to 95 percent of maximum dry density (ASTM D-698) at a moisture content of 2 percent below optimum, confined under a 100 psf surcharge, and inundated.
2. Cinder based products may be used below foundations provided they meet the required specifications.

The silty fine sand soils may be sensitive to excessive moisture content and will become unstable at elevated moisture content. Accordingly, it may be necessary to compact soils on the dry side of optimum, especially in asphalt pavement areas. The reduced moisture content under slabs-on-grade should only be used upon approval of the engineer in the field.

Imported common borrow fill for use in site grading should be examined by a Soils Engineer to ensure that it is of low swell potential and free of organic or otherwise deleterious material. In general, the fill should have 100 percent passing the 3-inch sieve and not more than 60 percent passing the 200 sieve. For the fine fraction (passing the 40 sieve), the liquid limit and plasticity index should not exceed 40 percent and 18 percent, respectively. It should exhibit less than 1.5 percent swell potential when compacted to 95 percent of maximum dry density (ASTM D-698) at a moisture content of 2 percent below optimum, confined under a 100 psf surcharge, and inundated.

Fill should be placed on subgrade which has been properly prepared and approved by a Soils Engineer. Fill must be wetted and thoroughly mixed to achieve optimum moisture content, ±2 percent (optimum to +3 percent for underslab fill). Granular fill (ASTM Classification GW, GP, SW, SP) can be placed on the dry side of optimum at the discretion of the geotechnical engineer on record.

Fill should be placed in horizontal lifts of 8-inch thickness (or as dictated by compaction equipment) and compacted to the percent of maximum dry density per ASTM D-698 as set forth below. Frozen material shall not be placed, nor shall fill be placed upon frozen grade.

A.	Building Areas		
	1.	Fills > 5 feet below finished grade and/or footing bottom (Full depth to finished grade)	97
	2.	Fills < 5 feet below finished grade	95
	3.	Below slabs-on-grade (non-expansive soils)	95
	4.	Below slabs-on-grade (expansive soils)	Not Recommended
B.	Pavement Subgrade or Fill		95
C.	Utility Trench Backfill		
	1.	More than 2.0' below finish subgrade	95
	2.	Within 2.0' of finish subgrade (non-granular)	95
	3.	Within 2.0' of finish subgrade (granular)	100
D.	Aggregate Base Course		
	1.	Below floor slabs	95
	2.	Below asphalt paving	100
E.	Landscape Areas		90

3.8 Utilities Installation

Excavation operations may be difficult due to very dense, rocklike soils and/or bedrock conditions in some areas, especially deeper cuts. It should be noted that the fact that a boring was advanced to a particular depth should not lead to the assumption that it is necessarily excavatable by conventional means. **Very dense and/or rocky conditions will require more aggressive rock removal techniques**. The contractor should be responsible for determining what equipment will be required to make excavations.

Trench walls may not stand near-vertical for the periods of time required to install utilities. Trenches penetrating looser sandy deposits may experience sloughing of side walls and necessitating cutting back of side slopes and/or shoring. Adequate precautions must be taken to protect workmen in accordance with all current governmental regulations.

Backfill of trenches above bedding zones may be carried out with native excavated material provided over-sized materials (+6 inches) are removed. This material should be moisture-conditioned, placed in 8-inch lifts and mechanically compacted. Water settling is not recommended. Compaction requirements are summarized in the "Fill and Backfill" section of this report.

3.9 Slabs-On-Grade

To facilitate fine grading operations and aid in concrete curing, a 4-inch thick layer of granular material conforming to the gradation for aggregate base (A.B.) as per M.A.G. Specification Section 702 should be utilized beneath the slab. Dried subgrade soils **must** be re-moistened prior to placing the aggregate base if allowed to dry out, especially if fine-grained soils are used in the top 12-inches of the pad.

For the support of industrial slabs-on-grade, a Modulus of Subgrade Reaction, k, of 100 pci may be used for slabs supported on common non-expansive borrow. This may be increased to 200 pci for slabs supported on 12 inches of granular fill or cement/lime stabilized soil (+ 4 inches of aggregate base or 2 inches of washed ¾-inch rock).

The native soils are capable of storing a significant amount of moisture, which could increase the natural vapor drive through the slab. Accordingly, if moisture sensitive flooring and/or adhesive are planned, the use of a vapor barrier or low permeability concrete should be considered. Vapor barriers should be a minimum 15-mil thick polyolefin (or equivalent), which meets ASTM E 1745 Class A specifications. Vapor barriers do increase the potential for slab curling and water entrapment under the slab. Accordingly, if a vapor barrier is used, additional precautions such as low slump concrete, frequent jointing and proper curing will be required to reduce curling potential and detailed to prevent the entrapment of outside water sources.

3.10 Asphalt/Concrete Pavement

If earthwork in paved areas is carried out to finish subgrade elevation as set forth herein, the subgrade will provide adequate support for pavements. The location designation is for reference only. The designer/owner should choose the appropriate sections to meet the anticipated traffic volume and life expectancy. The section capacity is reported as daily ESALs, Equivalent 18 kip Single Axle Loads. Typical heavy trucks impart 1.0 to 2.5 ESALs per truck depending on load. It takes approximately 1200 passenger cars to impart 1 ESAL.

Pavement Design Parameters:

Assume:	One 18 kip Equivalent Single Axle Load (ESAL)/Truck
Life:	20 years
Subgrade Soil Profile:	
% Passing #200 sieve:	47
Plasticity Index:	15%
k:	100 pci (assumed)
R value:	30 (per ADOT tables)
M_R:	10,600 (per AASHTO design)

Table 3.10.1 Pavement Sections

Area	**Daily 18-kip ESALs**		**Flexible**		**Rigid**
	AC	**PCCP**	**AC (0.39)**	**ABC (0.12)**	**PCCP**
Auto Parking	2	7	2.0”	6.0”	5.0”
Main Drives, Truck Parking & Fire Lanes	7	18	3.0”	6.0”	6.0”
	15	43	3.0”	8.0”	7.0”

Notes:

1. Designs are based on AASHTO design equations and ADOT correlated R-values.
2. The PCCP thickness is increased to provide better load transfer, and reduce potential for joint and edge failures. Design PCCP per ACI 330R-87.
3. Full depth asphalt or increased asphalt thickness can be increased by adding 1.0-inch asphalt for each 3 inches of base course replaced.

These designs assume that all subgrades are prepared in accordance with the recommendations contained in the "Site Preparation" and "Fill and Backfill" sections of this report, and paving operations carried out in a proper manner. If pavement subgrade preparation is not carried out immediately prior to paving, the entire area should be proof-rolled at that time with a heavy pneumatic-tired roller to identify locally unstable areas for repair.

Pavement base course material should be aggregate base per M.A.G. Section 702 Specifications. Asphalt concrete materials and mix design should conform to M.A.G. 710. It is recommended that a ½-inch or ¾-inch mix designation be used for the pavements. While a ¾-inch mix may have a somewhat rougher texture, it offers more stability and resistance to scuffing, particularly in truck turning areas. Pavement installation should be carried out under applicable portions of M.A.G. Section 321 and municipality standards. The asphalt supplier should be informed of the pavement use and be required to provide a mix that will provide stability and be aesthetically acceptable. Some of the newer M.A.G. mixes are very coarse and could cause placing and finish problems. A mix design should be submitted for review to determine if it will be acceptable for the intended use.

Portland Cement Concrete Pavement must have a minimum 28-day flexural strength 550 psi (compressive strength of approximately 3,700 psi). It may be cast directly on the prepared subgrade with proper compaction (reduced) and the elevated moisture content as recommended in the report. Lacking an aggregate base course, attention must be paid to using low slump concrete and proper curing, especially on the thinner sections. No reinforcing is necessary. Joint design and spacing should be in accordance with ACI recommendations. Construction joints should contain dowels or be tongue-and-grooved to provide load transfer. Tie bars are recommended on the joints adjacent to unsupported edges. Maximum joint spacing in feet should not exceed 2 to 3 times the thickness in inches. Joint sealing with a quality silicone sealer is recommended to prevent water from entering the subgrade allowing pumping and loss of support.

Proper subgrade preparation and joint sealing will reduce (but not eliminate) the potential for slab movements (thus cracking) on the expansive native soils. Frequent jointing will reduce uncontrolled cracking and increase the efficiency of aggregate interlock joint transfer.

4.0 GENERAL

The scope of this investigation and report includes only regional published considerations for seismic activity and ground fissures resulting from subsidence due to groundwater withdrawal, not any site specific studies. The scope does not include any considerations of hazardous releases or toxic contamination of any type.

Our analysis of data and the recommendations presented herein are based on the assumption that soil conditions do not vary significantly from those found at specific sample locations. Our work has been performed in accordance with generally accepted engineering principles and practice; this warranty is in lieu of all other warranties expressed or implied.

We recommend that a representative of the Soils Engineer observe and test the earthwork and foundation portions of this project to ensure compliance to project specifications and the field applicability of subsurface conditions which are the basis of the recommendations presented in this report. If any significant changes are made in the scope of work or type of construction that was assumed in this report, we must review such revised conditions to confirm our findings if the conclusions and recommendations presented herein are to apply.

Respectfully submitted,
SPEEDIE & ASSOCIATES, INC.

Registered Geologist
Certificate No
50535
CLAY WARD
SPENCER
Date Signed 9/30/13
Arizona U.S.A.
Expires 03/31/16

Clay W. Spencer, R.G.

Registered Professional Engineer (Civil)
Certificate No
14388
GREGG ALAN
CREASER
Date Signed 9/30/13
Arizona, U.S.A.
Expires 06/30/14

Gregg A. Creaser. P.E.

APPENDIX

FIELD AND LABORATORY INVESTIGATION

SOIL BORING LOCATION PLAN

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SHEAR TEST DIAGRAM

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CORROSIVE TEST DATA

ROCK CORE COMPRESSIVE STRENGTH

FIELD AND LABORATORY INVESTIGATION

On August 1, 2013, soil test borings were drilled at the approximate locations shown on the attached Soil Boring Location Plan. All exploration work was carried out under the full-time supervision of our staff engineer, who recorded subsurface conditions and obtained samples for laboratory testing. The soil borings were advanced with a truck-mounted CME-75 drill rig utilizing 7-inch diameter hollow stem flight augers. On September 17, 2013, an additional boring (B-7) was performed to provide additional information regarding the bedrock and obtain samples for unconfined compressive strength tests. NQ wireline coring equipment and diamond impregnated core bits were used to obtain undisturbed samples of the rock. Detailed information regarding the borings and samples obtained can be found on an individual Log of Test Boring prepared for each drilling location. The ground surface elevations presented on the logs are estimates only, taken from the available topographic survey.

Laboratory testing consisted of moisture content, dry density, grain-size distribution and plasticity (Atterberg Limits) tests for classification and pavement design parameters and unconfined compressive strength of rock cores. Remolded swell tests were performed on samples compacted to densities and moisture contents expected during construction. Compression tests were performed on a selected ring sample in order to estimate settlements and determine effects of inundation. Compression tests were also performed on a selected rock core samples. All field and laboratory data is presented in this appendix.

⊕ - APPROXIMATE SOIL BORING LOCATIONS

IMAGE COURTESY OF: GOOGLE MAPS

SOIL BORING LOCATION PLAN

DR: TSW CHK: REV: TSW DATE: 09/30/2013 PROJECT NO. 130984SF

SEDONA WWTP - NEW CLARIFIER & BLDG IMPROVEMENTS
HIGHWAY 89A - APPROX. 8 MILES SW OF DOWTOWN SEDONA
SEDONA, ARIZONA

SPEEDIE AND ASSOCIATES
GEOTECHNICAL/ENVIRONMENTAL/MATERIALS ENGINEERS
3331 E. WOOD ST. PHOENIX, ARIZONA 85040 (602) 997-6391

SOIL LEGEND

SAMPLE DESIGNATION	DESCRIPTION	
AS	**Auger Sample**	A grab sample taken directly from auger flights.
BS	**Large Bulk Sample**	A grab sample taken from auger spoils or from bucket of backhoe.
S	**Spoon Sample**	Standard Penetration Test (ASTM D-1586) Driving a 2.0 inch outside diameter split spoon sampler into undisturbed soil for three successive 6-inch increments by means of a 140 lb. weight free falling through a distance of 30 inches. The cumulative number of blows for the final 12 inches of penetration is the Standard Penetration Resistance.
RS	**Ring Sample**	Driving a 3.0 inch outside diameter spoon equipped with a series of 2.42-inch inside diameter, 1-inch long brass rings, into undisturbed soil for one 12-inch increment by the same means of the Spoon Sample. The blows required for the 12 inches of penetration are recorded.
LS	**Liner Sample**	Standard Penetration Test driving a 2.0-inch outside diameter split spoon equipped with two 3-inch long, 3/8-inch inside diameter brass liners, separated by a 1-inch long spacer, into undisturbed soil by the same means of the Spoon Sample.
ST	**Shelby Tube**	A 3.0-inch outside diameter thin-walled tube continuously pushed into the undisturbed soil by a rapid motion, without impact or twisting (ASTM D-1587).
--	**Continuous Penetration Resistance**	Driving a 2.0-inch outside diameter "Bullnose Penetrometer" continuously into undisturbed soil by the same means of the spoon sample. The blows for each successive 12-inch increment are recorded.

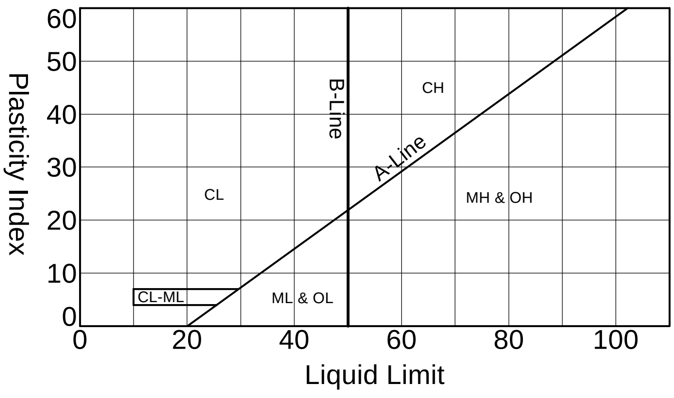
CONSISTENCY			RELATIVE DENSITY	
Clays & Silts	Blows/Foot	Strength (tons/sq ft)	Sands & Gravels	Blows/Foot
Very Soft	0 - 2	0 - 0.25	Very Loose	0 - 4
Soft	2 - 4	0.25 - 0.5	Loose	5 - 10
Firm	5 - 8	0.5 - 1.0	Medium Dense	11 - 30
Stiff	9 - 15	1 - 2	Dense	31 - 50
Very Stiff	16 - 30	2 - 4	Very Dense	> 50
Hard	> 30	> 4		

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

NOTE: DUAL OR MODIFIED SYMBOLS MAY BE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS OR TO PROVIDE A BETTER GRAPHICAL PRESENTATION OF THE SOIL

MATERIAL SIZE	PARTICLE SIZE			
	Lower Limit		Upper Limit	
	mm	Sieve Size ◆	mm	Sieve Size ◆
SANDS				
Fine	0.075	#200	0.42	#40
Medium	0.420	#40	2.00	#10
Coarse	2.000	#10	4.75	#4
GRAVELS				
Fine	4.75	#4	19	0.75" ×
Coarse	19	0.75" ×	75	3" ×
COBBLES	75	3" ×	300	12" ×
BOULDERS	300	12" ×	900	36" ×

◆U.S. Standard ×Clear Square Openings



ROCK TERMINOLOGY

SCALE OF RELATIVE HARDNESS	
Term	Field Identification
Extremely Soft	Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.
Very Soft	Crumbles under firm blows with point of a geology pick. Can be peeled by a pocketknife. Scratched with fingernail.
Soft	Can be peeled by a pocketknife with difficulty. Cannot be scratched with fingernail. Shallow indention made by firm blow of a geology pick.
Medium Hard	Can be scratched by knife or pick. Specimen can be fractured with a single firm blow of hammer/geology pick.
Hard	Can be scratched with knife or pick only with difficulty. Several hard hammer blows required to fracture specimen.
Very Hard	Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.

STRATIFICATION TERMS	
Term	Characteristics
Laminations	Thin beds (<½ inch)
Fissile	Tendency to break along laminations.
Parting	Tendency to break parallel to bedding, any scale.
Foliation	Non-depositional, e.g., segregation and layering of minerals in metamorphic rocks.

ROCK TERMINOLOGY

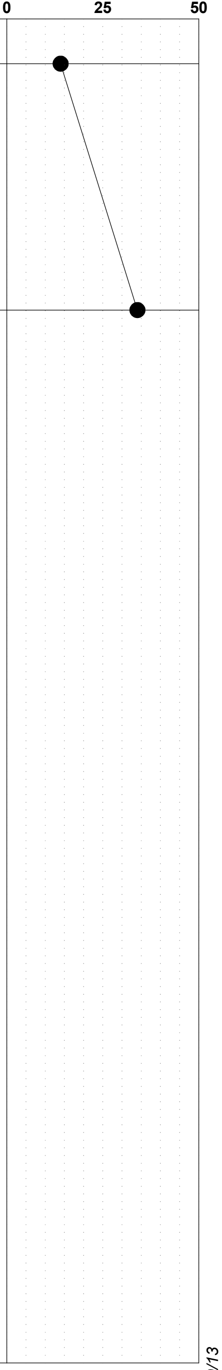
SCALE OF RELATIVE ROCK WEATHERING	
Term	Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric. Decomposition extends up to 1 inch into rock.
Moderately Weathered	Rock mass is decomposed 50% or less. Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Predominantly Decomposed	Rock mass is more than 50% decomposed. Rock can be excavated with a geologists pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock fabric may be evident. May be reduced to soil with hand pressure.

JOINT AND BEDDING/FOLIATION SPACING TERMS		
Spacing	Joint Spacing Terms	Bedding/Foliation Spacing Terms
<2 in.	Very Close	Very Thin (Laminated)
2 in. to 1 ft.	Close	Thin
1 ft. to 3 ft.	Moderately Close	Medium
3 ft. to 10 ft.	Wide	Thick
>10 ft.	Very Wide	Very Thick (Massive)

Rig Type: **CME-75**
Boring Type: **Hollow Stem Auger**
Surface Elevation: **4044.0**

Depth (feet)	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)
0	Stiff Brown <u>SANDY LEAN CLAY</u> (CL-Dry) with Trace Gravel	RS-1	1.0	11.6	82.3
5.0	Dense Brown <u>CLAYEY SAND</u> (SC-Dry) with Some Gravel	S-2	6.5	NT	NT
7.0	Auger Refusal on Bedrock				

Penetration Resistance Blows per Foot



Boring Date: **8-1-13**
Field Engineer/Technician: **B. Amos**
Driller: **J. Hurt**
Contractor: **Enviro-Drill, Inc.**

Water Level

Depth	Hour	Date
Free Water was Not Encountered		

▽
▼

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-1**

Sedona WWTP - New Clarifier and Bldg Impv

89A 8mi SW of Sedona

Sedona, Arizona

Project No.: **130984SF**

Rig Type: **CME-75**
Boring Type: **Hollow Stem Auger**
Surface Elevation: **4043.0**

Depth (feet)	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot (0 25 50)
0	Very Dense Brown CLAYEY SAND (SC-Dry) with Some Gravel and Occasional Cobble					
		RS-1	2.8	17.3	100.8	50/9" ●
5	Little Gravel	S-2	5.3	NT	NT	50/3" ●
7.0	Auger Refusal on Bedrock					
10						
15						
20						
25						
30						

Boring Date: **8-1-13**
Field Engineer/Technician: **B. Amos**
Driller: **J. Hurt**
Contractor: **Enviro-Drill, Inc.**

Water Level

Depth	Hour	Date
Free Water was Not Encountered		

▽ ▼

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-2**

Sedona WWTP - New Clarifier and Bldg Impv

89A 8mi SW of Sedona

Sedona, Arizona

Project No.: **130984SF**

Rig Type: **CME-75**
Boring Type: **Hollow Stem Auger**
Surface Elevation: **4050.0**

Depth (feet)	Visual Classification		Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot (0 25 50)
0	Medium Dense Brown <u>CLAYEY SAND</u> (SC-Dry to Moist) with Some Gravel and Occasional Cobble						
		4.0					
5	Very Dense Brown <u>SILTY SAND</u> (SM-Dry) with Some Gravel, 1-5% Cobble		RS-1	5.8	26.8	79.1	50/9" ●
		8.0					
	Auger Refusal on Bedrock						
10							
15							
20							
25							
30							

Boring Date: **8-1-13**
Field Engineer/Technician: **B. Amos**
Driller: **J. Hurt**
Contractor: **Enviro-Drill, Inc.**

Water Level

Depth	Hour	Date	
Free Water was Not Encountered			▽
			▼

NT = Not Tested

SPEEDIE
AND ASSOCIATES

Log of Test Boring Number: **B-3**

Sedona WWTP - New Clarifier and Bldg Impv

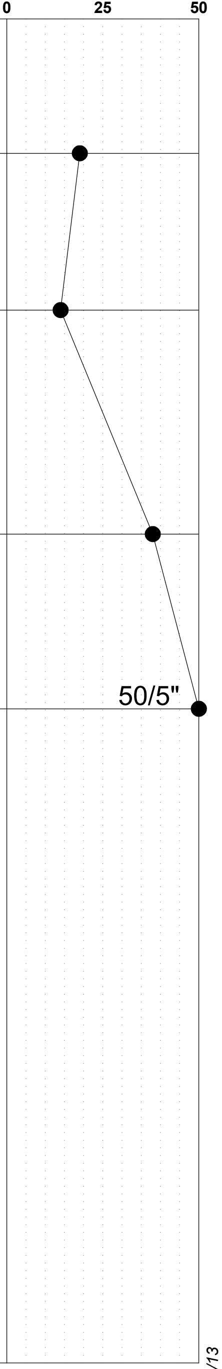
89A 8mi SW of Sedona

Sedona, Arizona

Project No.: **130984SF**

Rig Type: **CME-75**
Boring Type: **Hollow Stem Auger**
Surface Elevation: **4053.0**

Depth (feet)	Visual Classification	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
0	Medium Dense Brown <u>CLAYEY SAND</u> (SC-Dry) with Gravel and 1-5% Cobble					
		RS-1	3.0	13.7	105.7	
5	No Cobble					
		S-2	6.5	NT	NT	
10	Dense Brown <u>CLAYEY SAND</u> (SC-Dry) with Little Gravel					
		S-3	11.5	NT	NT	
15	Very Dense Brown <u>CLAYEY SAND with GRAVEL</u> (SC-Dry)	S-4	15.4	NT	NT	50/5"
16.0	Auger Refusal on Bedrock					
20						
25						
30						



Boring Date: **8-1-13**
Field Engineer/Technician: **B. Amos**
Driller: **J. Hurt**
Contractor: **Enviro-Drill, Inc.**

Water Level

Depth	Hour	Date
Free Water was Not Encountered		

▽
▼

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-4**

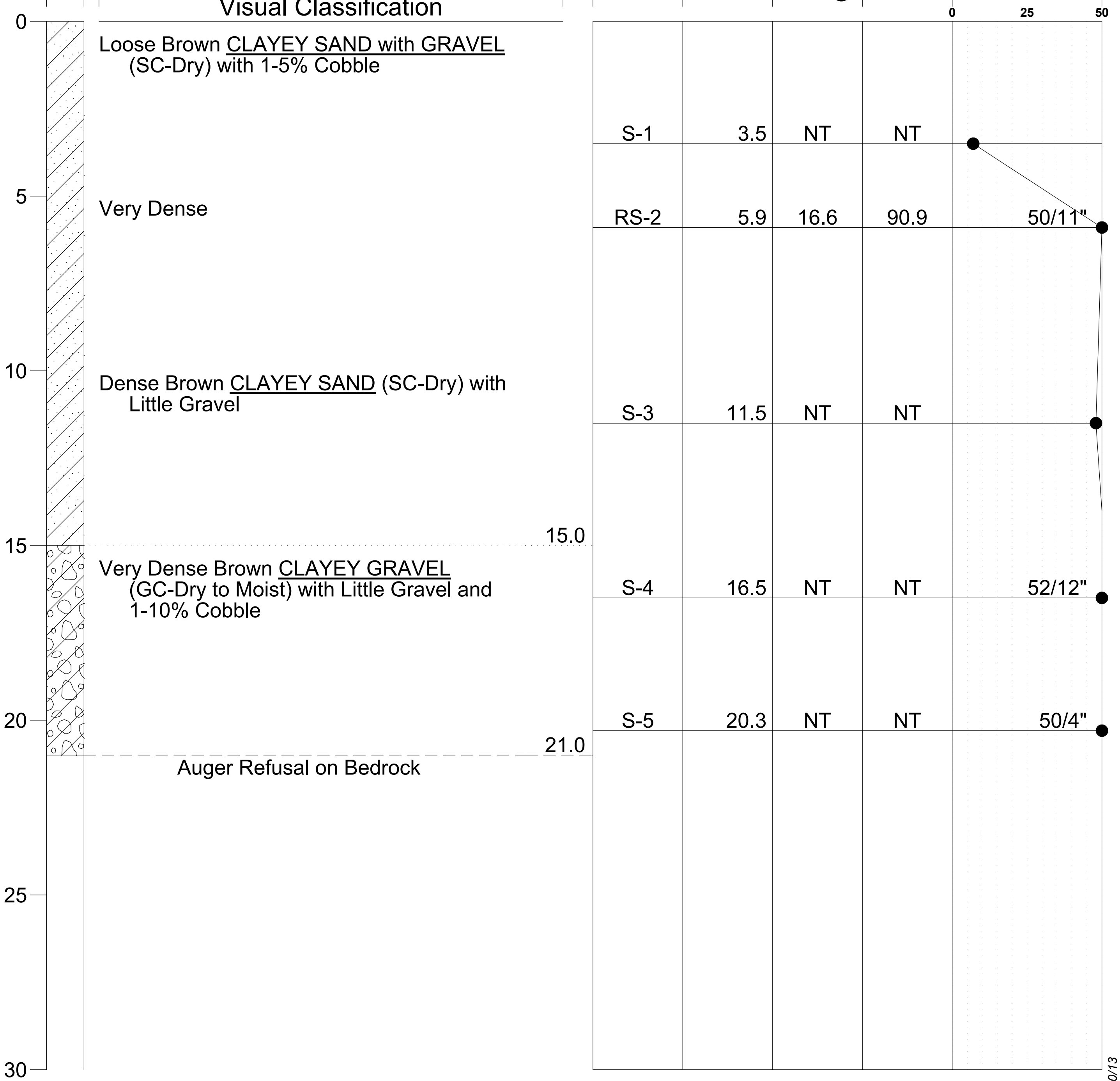
Sedona WWTP - New Clarifier and Bldg Impv

89A 8mi SW of Sedona

Sedona, Arizona

Project No.: **130984SF**

Rig Type: **CME-75**
Boring Type: **Hollow Stem Auger**
Surface Elevation: **4053.0**



Visual Classification

Depth (feet)	Visual Classification
0	Loose Brown CLAYEY SAND with GRAVEL (SC-Dry) with 1-5% Cobble
5	Very Dense
10	Dense Brown CLAYEY SAND (SC-Dry) with Little Gravel
15.0	Very Dense Brown CLAYEY GRAVEL (GC-Dry to Moist) with Little Gravel and 1-10% Cobble
21.0	Auger Refusal on Bedrock

Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
S-1	3.5	NT	NT	
RS-2	5.9	16.6	90.9	50/11"
S-3	11.5	NT	NT	
S-4	16.5	NT	NT	52/12"
S-5	20.3	NT	NT	50/4"

Boring Date: **8-1-13**
Field Engineer/Technician: **B. Amos**
Driller: **J. Hurt**
Contractor: **Enviro-Drill, Inc.**

Water Level

Depth	Hour	Date
Free Water was Not Encountered		

▽
▼

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-5**

Sedona WWTP - New Clarifier and Bldg Impv

89A 8mi SW of Sedona

Sedona, Arizona

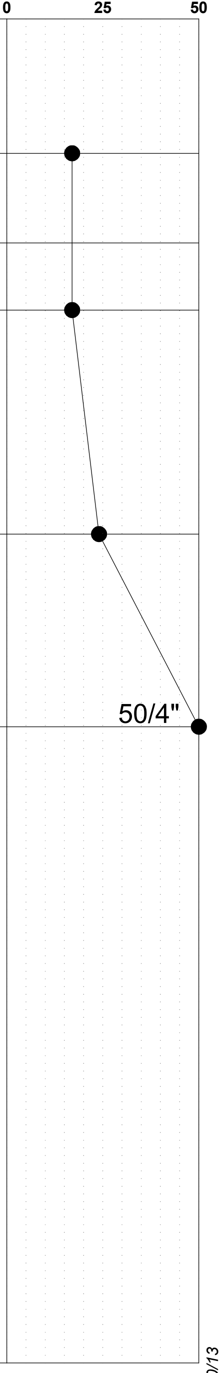
Project No.: **130984SF**

Rig Type: **CME-75**
Boring Type: **Hollow Stem Auger**
Surface Elevation: **4053.0**

Visual Classification

Depth (feet)	Visual Classification
0	Probable Fill to 10 Feet:
	Medium Dense Brown <u>CLAYEY SAND</u> (SC-Dry to Moist) with Some Gravel and Occasional Cobble
5	No Cobble
15	Very Dense Light Brown <u>CLAYEY SAND</u> (SC-Dry) with Little Gravel
16.0	Auger Refusal on Bedrock

Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
RS-1	3.0	16.3	106.8	
BS-2	5.0	NT	NT	
S-3	6.5	NT	NT	
S-4	11.5	NT	NT	
S-5	15.8	NT	NT	50/4"



Boring Date: **8-1-13**
Field Engineer/Technician: **B. Amos**
Driller: **J. Hurt**
Contractor: **Enviro-Drill, Inc.**

Water Level

Depth	Hour	Date
Free Water was Not Encountered		

▽
▼

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-6**

Sedona WWTP - New Clarifier and Bldg Impv

89A 8mi SW of Sedona

Sedona, Arizona

Project No.: **130984SF**

GEOTECHNICAL SERVICES
EXPLORATION LOG

PROJECT NO.: 130984SF
DATE: 9-17-13
GEOL/TECH: A. Griffiths
PROJECT NAME: Sedona WWTP - New Clarifier and Bldg Impv
DRILLER: B. Anderson
LOCATION: 89A 8mi SW of Sedona
CONTRACTOR: Geomechanics SW
BORING NO.: B-7
STATION: N/A
RIG TYPE: CME-75
ELEVATION: 4043.0

DEPTH IN FEET	NX CORING DATA %RECOVERY	NX CORING DATA %RQD	PENETRATION RESISTANCE BLOWS/12"	DRILLING DATA NOTES	DRILLING DATA AVERAGE RATE (Min/Ft)	VISUAL CLASSIFICATION & REMARKS
						Dense Brown CLAYEY SAND (SC-Moist) with Trace to Little Gravel
						From 4' to 4.5': with 0-10% Cobble
5						
5.8			73			Dense Pinkish Brown GRAVELLY SAND (SW-Dry to Moist) (Weathered Conglomerate)
10			50			
12.5						CONGLOMERATE Pinkish Brown Slightly Weathered; Medium Hard; Sandstone Matrix is Fine Grained; Clasts are Medium to Coarse Sand and Fine to Coarse Gravel; Sub-Angular to Sub-Rounded; Poorly Sorted; Very Close Joints; Very Close Fractures; Approximately 25-35% Clasts
15						
				Good Circulation		
	56	32		Circulation Plugging Off at 17.5'	4.4	
20						
	100	68		Moderate Circulation	4.5	
24.7						End of Boring
25						

	Depth	Hour	Date
▽	*Free Water was Not Encountered*		
▼			

SPEEDIE
AND ASSOCIATES

TABULATION OF TEST DATA

SOIL BORING or TEST PIT NUMBER	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE INTERVAL (ft)	NATURAL WATER CONTENT (Percent of Dry Weight)	IN-PLACE DRY DENSITY (Pounds Per Cubic Foot)	PARTICLE SIZE DISTRIBUTION (Percent Finer)					ATTERBERG LIMITS			UNIFIED SOIL CLASSIFICATION	SPECIMEN DESCRIPTION
						#200 SIEVE	#40 SIEVE	#10 SIEVE	#4 SIEVE	3" SIEVE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
B-1	RS-1	RING	0.0 - 1.0	11.6	82.3	68	90	95	97	100	34	18	16	CL	SANDY LEAN CLAY
B-2	RS-1	RING	2.0 - 2.8	17.3	100.8	NT	NT	NT	NT	NT	NT	NT	NT		
B-3	RS-1	RING	5.0 - 5.8	26.8	79.1	25	53	79	92	100	41	32	9	SM	SILTY SAND
B-4	RS-1	RING	2.0 - 3.0	13.7	105.7	44	66	74	81	100	35	18	17	SC	CLAYEY SAND with GRAVEL
B-5	RS-2	RING	5.0 - 5.9	16.6	90.9	44	65	73	82	100	36	23	13	SC	CLAYEY SAND with GRAVEL
B-6	BS-2	BULK	0.0 - 5.0	NT	NT	30	44	59	70	100	31	17	14	SC	CLAYEY SAND with GRAVEL
B-6	RS-1	RING	2.0 - 3.0	16.3	106.8	NT	NT	NT	NT	NT	NT	NT	NT		

Sieve analysis results do not include material greater than 3". Refer to the actual boring logs for the possibility of cobble and boulder sized materials.

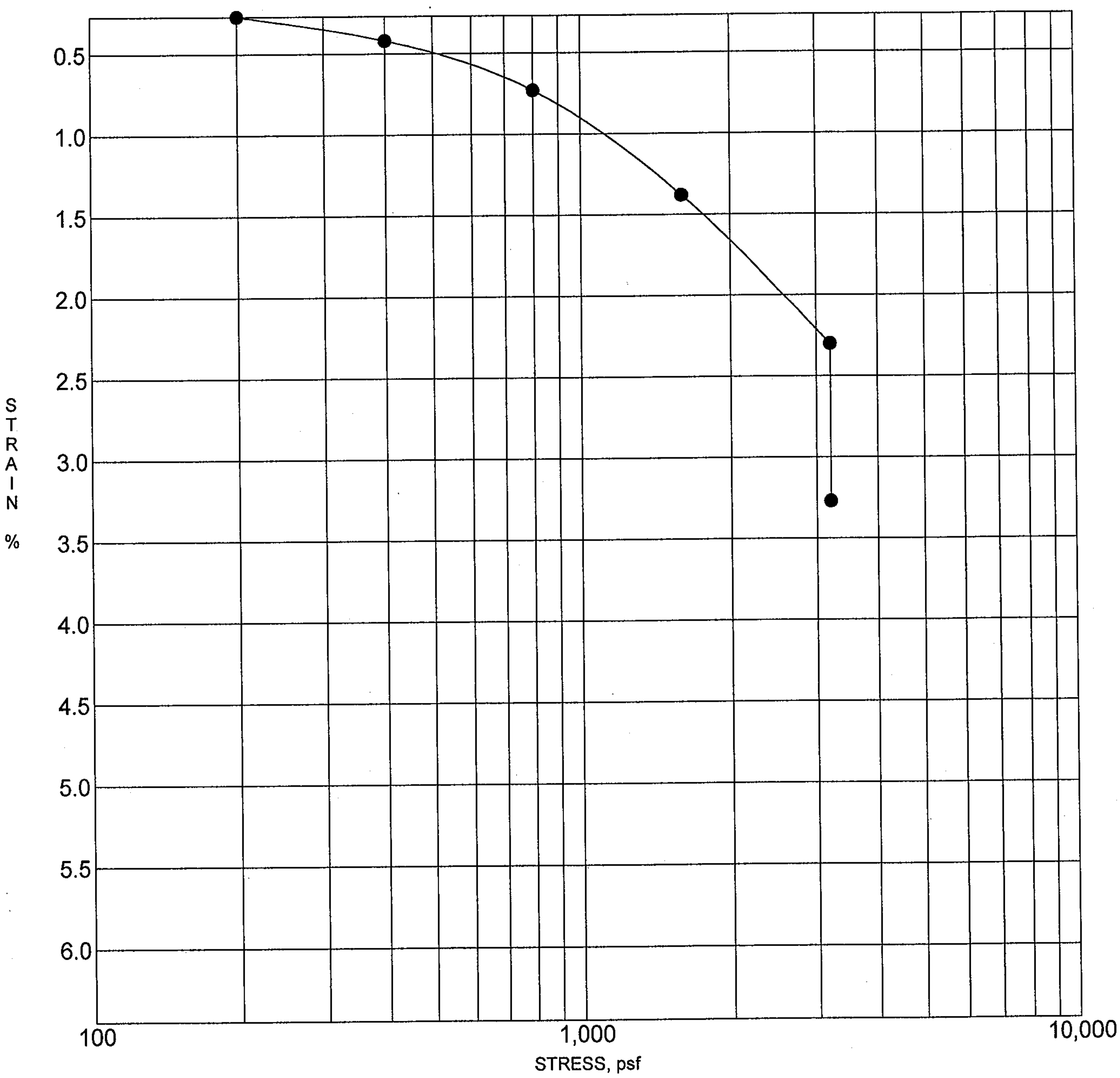
NT=Not Tested

Sedona WWTP - New Clarifier and Bldg Imov
89A 8mi SW of Sedona
Sedona, Arizona
Project No. 130984SF

SPEEDIE AND ASSOCIATES

CONSOLIDATION TEST

PROJECT: Sedona WWTP - New Clarifier and Bldg Impv			**PROJECT NO.:** 130984SF
LOCATION: 89A 8mi SW of Sedona			**DATE:** 8/1/13
BORING NO.: B-6	**SAMPLE NO.:** RS-1	**SAMPLE DEPTH:** 2 to 3	**LABORATORY NO.:**
LIQUID LIMIT:	**PLASTIC LIMIT:**		**PLASTICITY INDEX:**
CLASSIFICATION:	**ASTM SOIL DESCRIPTION:**		



Sample inundated at end of test at 3200 psf

SPEEDIE AND ASSOCIATES

CONSOLIDATION TEST

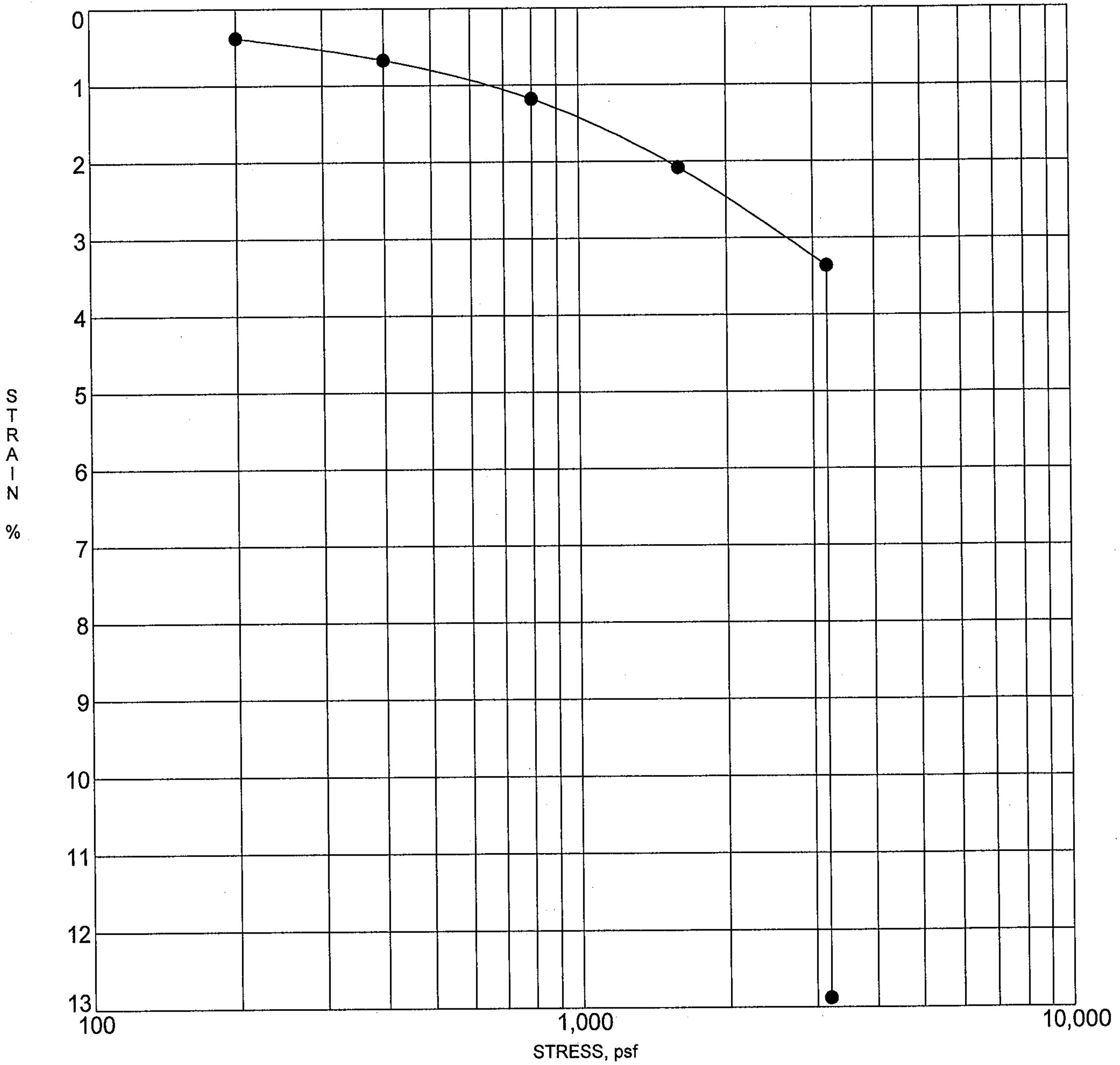
PROJECT: Sedona WWTP - New Clarifier and Bldg Impv **PROJECT NO.:** 130984SF

LOCATION: 89A 8mi SW of Sedona **DATE:** 8/1/13

BORING NO.: B-1 **SAMPLE NO.:** RS-1 **SAMPLE DEPTH:** 0 to 1 **LABORATORY NO.:**

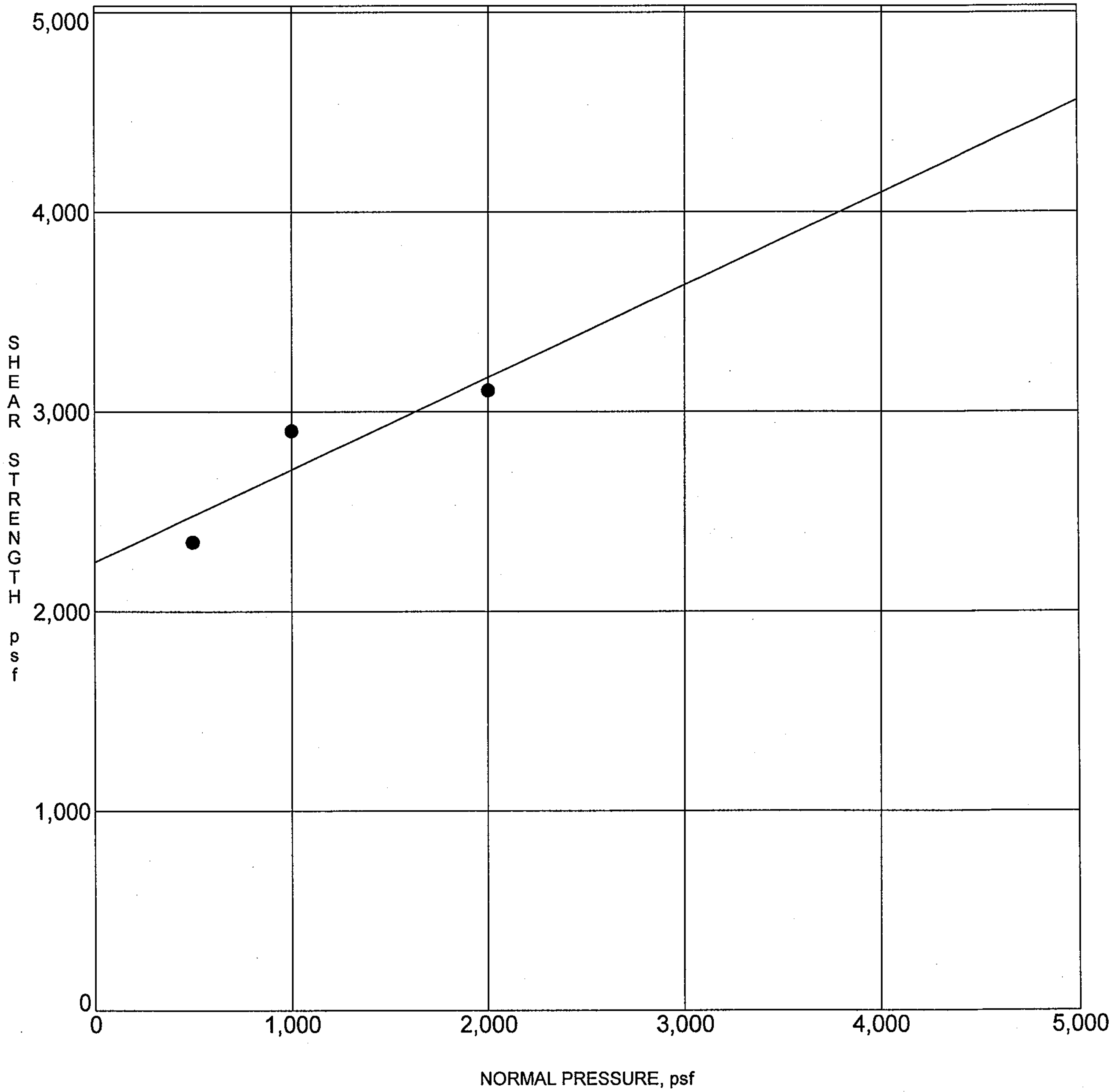
LIQUID LIMIT: 34 **PLASTIC LIMIT:** 18 **PLASTICITY INDEX:** 16

CLASSIFICATION: CL **ASTM SOIL DESCRIPTION:** SANDY LEAN CLAY



Sample inundated at end of test at 3200 psf

SHEAR TEST DIAGRAM



	Specimen Identification		Cohesion, psf	Friction Angle	DD	MC%
●	**B-4**	**2.0**	**2247.0**	**25.0**	**106.8**	**14.5**

PROJECT **Sedona WWTP - New Clarifier and Bldg Impv - 89A**
8mi SW of Sedona

JOB NO. **130984SF**
DATE **8/1/13**

SPEEDIE AND ASSOCIATES

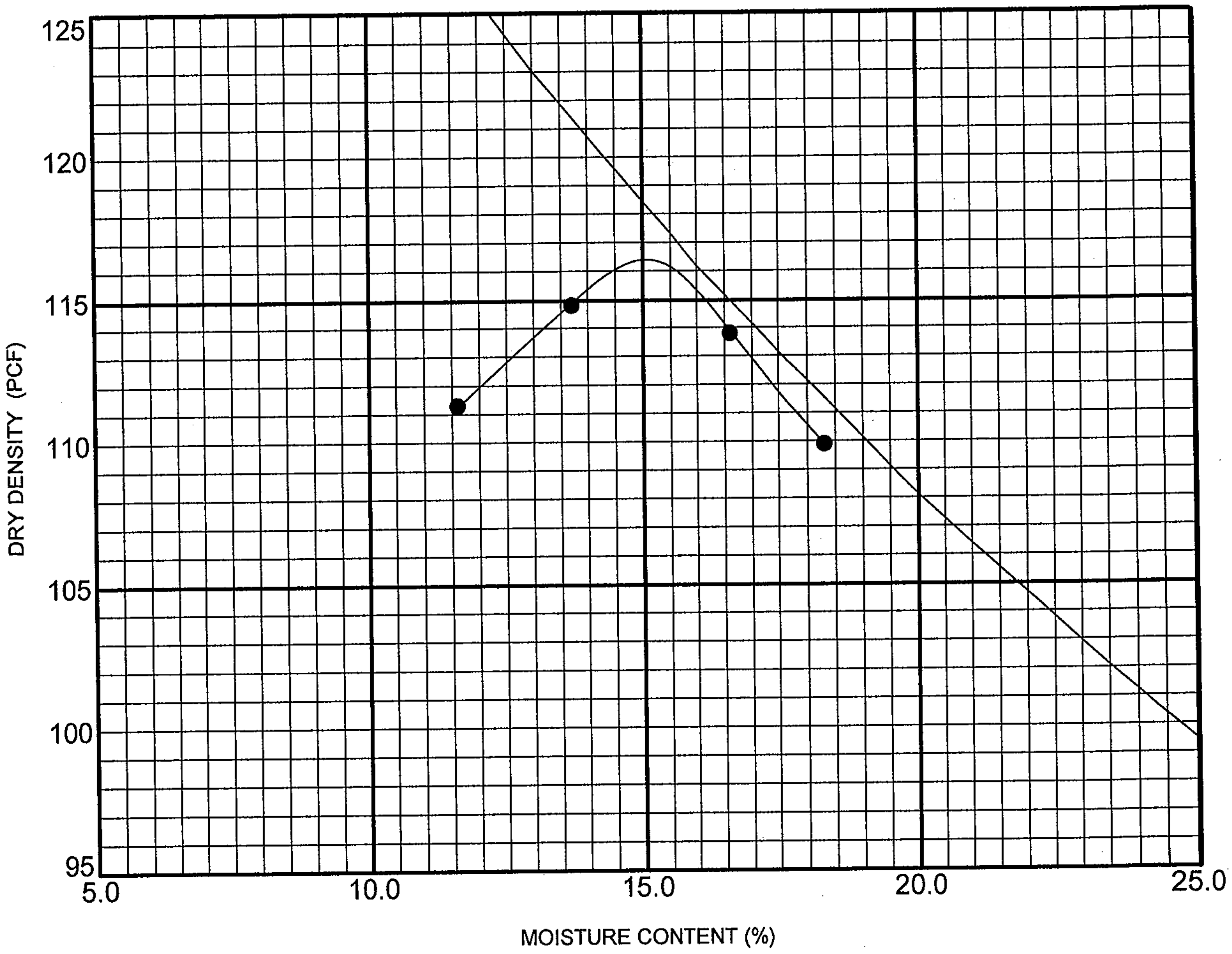
GEOTECH DIRECT SHEAR 130984SF.GPJ 8/22/13

MOISTURE-DENSITY RELATIONS

PROJECT: Sedona WWTP - New Clarifier and Bldg Impv
PROJECT NO.: 130984SF
LOCATION: 89A 8mi SW of Sedona
DATE: 8/1/13
BORING NO.: B-6 SAMPLE NO.: BS-2 SAMPLE DEPTH: 0 to 5
LABORATORY NO.:
METHOD OF COMPACTION: D698A
LIQUID LIMIT: 31 PLASTIC LIMIT: 17 PLASTICITY INDEX: 14
CLASSIFICATION: SC ASTM SOIL DESCRIPTION: CLAYEY SAND with GRAVEL

MAXIMUM DRY DENSITY: 116.3 PCF

OPTIMUM MOISTURE CONTENT: 15.1%



GEOTECH PROCTOR 130984SF.GPJ 8/12/13

SPEEDIE AND ASSOCIATES

SWELL TEST DATA

BORING or TEST PIT No.	SAMPLE DEPTH, ft	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	REMOLDED DRY DENSITY (pcf)	INITIAL MOISTURE CONTENT (%)	PERCENT COMPACTION	FINAL MOISTURE CONTENT (%)	CONFINING LOAD (psf)	TOTAL SWELL (%)
B-6, BS-2	5.0	116.3	15.1	110.8	13.1	95.2	18.4	100	1.3

Sheet 1 of 1

Sedona WWTP - New Clarifier and Bldg Impv
89A 8mi SW of Sedona
Sedona, Arizona
Project No. 130984SF

SPEEDIE AND ASSOCIATES

CORROSIVE TEST DATA

SOIL BORING or TEST PIT NUMBER	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE INTERVAL (ft)	PERCENT FINER #200 SIEVE	pH	RESISTIVITY (Ohm-Centimeters)	PPM SULFATE (SO4)	PPM CHLORIDE (CL)	SULFIDE (+ or -)	REDOX (millivolts)	UNIFIED SOIL CLASSIFICATION	SPECIMEN DESCRIPTION
B-6	BS-2	BULK	0.0 - 5.0	30	7.4	760	9	21	NT	NT	SC	CLAYEY SAND with GRAVEL

Sheet 1 of 1

Sedona WWTP - New Clarifier and Bldg Imprv
89A 8mi SW of Sedona
Sedona, Arizona
Project No. 130984SF

SPEEDIE AND ASSOCIATES

SPEEDIE AND ASSOCIATES
Geotechnical ▪ Environmental ▪ Materials Engineers
4025 E. HUNTINGTON DR., STE.140, FLAGSTAFF, AZ 86004 ■ O: 928-526-6681 F: 928-526-6685

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT:	Sedona WWTP	PROJECT NUMBER:	130984SF
LOCATION:		LAB NUMBER:	Various
CLIENT:	Carollo	SOURCE:	Beavertail Conglomerate

TYPE OF SAMPLE:	Rock Core	DATE SAMPLED:	9/17/2013
NO. OF SAMPLES:	2	DATE SUBMITTED:	9/17/2013
SAMPLE LOCATION:	B-7	DATE TESTED:	9/26/2013
REMARKS:			

SAMPLE NUMBER:	B-7	B-7		
CORE LOCATION:	15'	24'		
DATE TESTED:	09/26/2013	09/26/2013		
SAMPLE DIAMETER (in.)	2.40	2.40		
SAMPLE LENGTH (in.)	4.80	4.80		
CAPPED LENGTH (in.)	4.85	4.90		
SPECIMEN AREA (sq.in.)	4.51	4.52		
TIME OF TEST	12:25	12:28		
LAB TECH ID	CWS	CWS		
MOISTURE CONDITION	Dry	Dry		
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular		
TOTAL LOAD (lb.)	11,450	10,790		
TYPE OF FRACTURE	Shear	Cone/Split		
COMPRESSIVE STRENGTH (psi)	2539	2387		
LENGTH TO DIAMETER CORRECTION	1.00	1.00		
CORRECTED COMPRESSIVE STRENGTH (psi)	2539	2387		
SPECIFIC GRAVITY OF SAMPLE	2.31	2.47		
UNIT WEIGHT (pcf)	144.1	154.1		

DATE REQUESTED:	09/13/2013	REQUESTED BY:	Client
DATE SAMPLED:	09/17/2013	SAMPLED BY:	AMG
DATE OBTAINED:	09/17/2013	SUBMITTED BY:	AMG
DATE MOLDED:		REVIEWED BY:	CWS

SIGN IN SHEET

WWRP A+ Upgrades Project -
Pre-Bid Conference 09/30/14 - Official Copy

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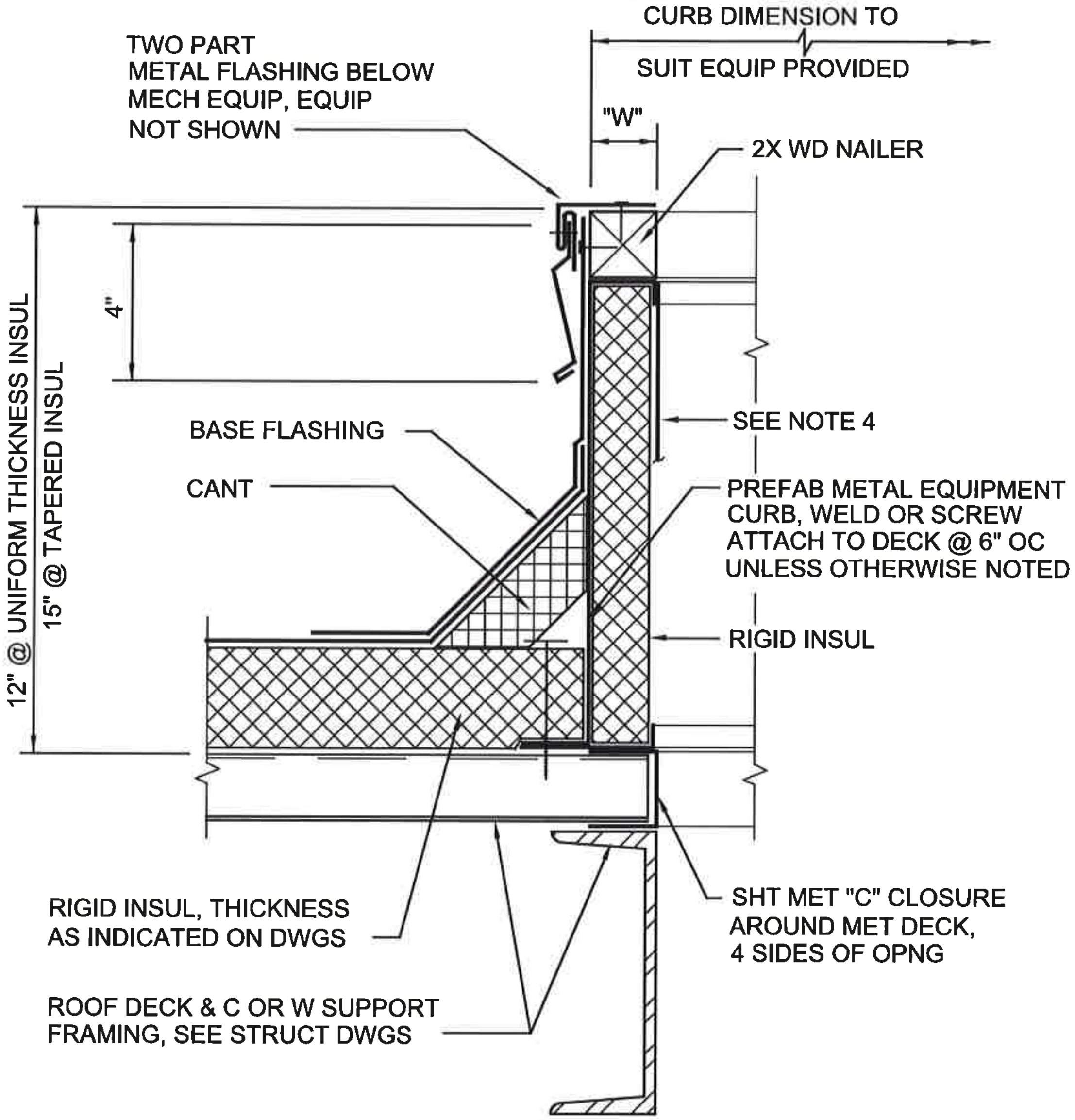


NOTES:

1. "W" DIMENSION SHALL BE AS REQD BY EQUIP SUPPORTED. CURB MFR TO VERIFY "W" PRIOR TO FABRICATION.
2. SLOPE SIDES OF CURB TO COMPENSATE FOR ROOF SLOPE, PROVIDING LEVEL TOP ON WHICH TO MOUNT EQUIP, UNLESS OTHERWISE NOTED.
3. CURB IS SHOWN @ EDGE OF DECK OPNG, CURB MAY BE LARGER THAN DECK OPNG OR DECK OPNG MAY NOT EXIST. SEE ROOF PLAN.
4. WHERE A PLATFORM IS INDICATED OR REQD FOR SLED MTD EQUIP, PROVIDE A 3/4" PLYWOOD TOP WITH 20 GA GALV CAP FLASHING, WELDED WATERTIGHT. FSTN EQUIP TO PLATFORM W/ LAG BOLTS THROUGH RUBBER WASHERS.
5. WHERE CURB IS EXPOSED TO VIEW FROM BELOW, CURB MFR SHALL PROVIDE AN INTERIOR METAL LINER, MATCHING MATERIAL OF CURB, TO CONCEAL INSUL.

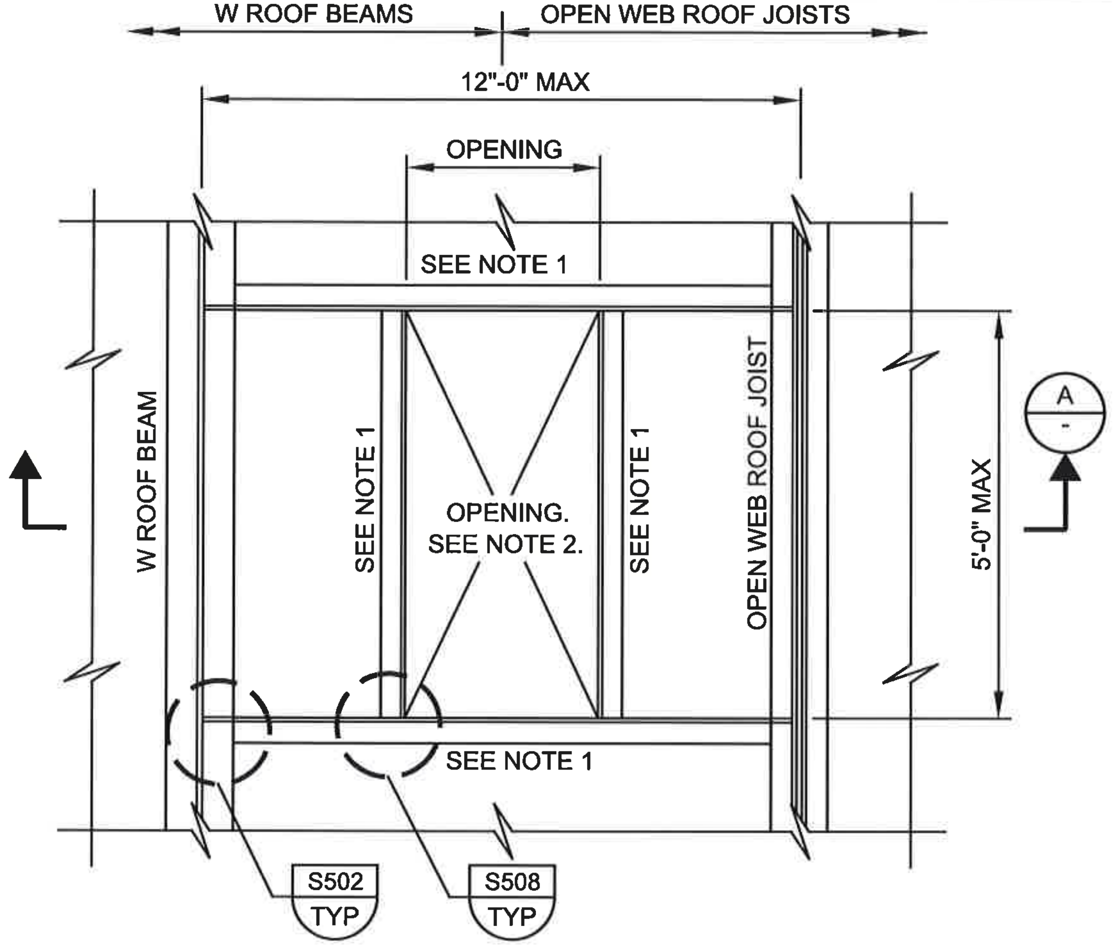
A631

TYP

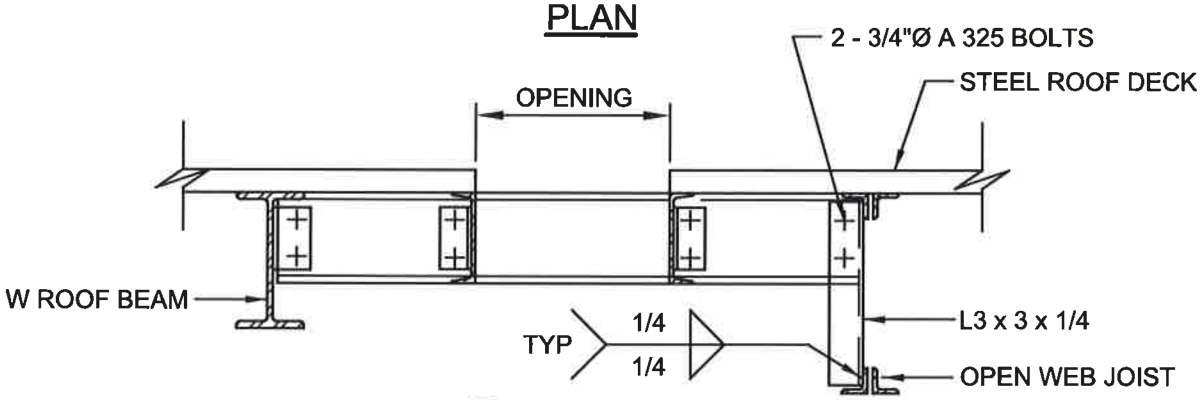
EQUIPMENT CURB @ BUILT-UP ROOFING

10/25/13

carollo



PLAN



A
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SECTION

NOTES:

1. SEE ROOF FRAMING PLAN FOR BEAM SIZE. (C8x10)
2. PROVIDE OPENING SIZE TO SUIT EQUIPMENT PROVIDED.

S520
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N

FRAMED ROOF OPENING ASSEMBLY

08/31/09