To: The Preserve at San Juan, LLC
c/o J.P, Weber Group
2697 N. Vista Glen Road
Orange, CA 92867

October 23, 2014

Project No. 12-054
Permit No. PA130026

Attention: Mr. Jeff Weber

Subject: Response to County Review Comments dated September, 2014, regarding the proposed Onsite Waste Water Treatment System, "The Preserve at San Juan" County of Orange, California

References: TSI, 2014a, Summary of Percolation Testing and Evaluation Leach Field Potential, Tentative Tract Maps 17269 and 17270, "The Preserve at San Juan", Counties of Orange and Riverside, California, Project No. 13-054, Dated January 20, 2014.

---------, 2014b, Response to County Review Comments from e-mail dated July 15, 2014, regarding the proposed Onsite Waste Water Treatment System, "The Preserve at San Juan" County of Orange, California, Project No. 13-054, report dated August 12, 2014.

---------, 2013, Draft EIR-Level Geotechnical Assessment, Tentative Tract Maps 17269 and 17270, The Preserve at San Juan, Counties of Orange and Riverside, California, Project No. 12-054, revision dated September 19, 2013.

Terrestrial Solutions Inc. (TSI) has reviewed the comments provided by the County of Orange from the Planning Department and Geotechnical Reviewer. The comments were provided via e-mail, dated September 2014. Some of the comments were repeated from previous comments provided and responded to in the referenced TSI (2014b) report. In addition input from County representatives was provided in a meeting on October 21, 2014. Each geotechnical-related comment is responded to herein. For convenience each review comment is reiterated prior to the response.

Planning Department Review Comments:

29) *In lieu of the proposed drainage beds (mini leach fields) an additional storage tank for emergency overflow/extra capacity will be required as part of the proposed OWTS. In*

addition, the proposed OWTS will require a structural setback from the slopes and buildings. Please provide an updated standard excavation size required (length, width and depth) for installation of the septic tanks, pump tanks/boxes, biofilters and emergency overflow/extra capacity storage tank on a single lot at the subject site. The excavation description should include any appropriate temporary excavation recommendations required for system installation. Provide plot plan indicating the typical OWTS excavation size and currently proposed typical location at the subject site

<u>Response to Comment:</u> In meetings on October 9 and 21, 2014, with County Planning and public works personnel, it was tentatively agreed that as an emergency contingency there would be additional overflow storage capacity built into the reuse water pump station. According to Figure 1 (PACE Advanced Water Engineering), a proposed 1,500 gallon emergency storage tank will be added to the 300-gallon reuse water pump station. Therefore, the dispersal field or mini-leach fields would no longer be necessary.

The OWTS is currently proposed to consist of a 1,500 gallon septic treatment system, biofilters, attached 300-gallon reuse water pump station and 1,500 gallon emergency storage system, and subsurface irrigation system. Reclaimed water will be emitted from this system via the subsurface irrigation system at a controlled rate (320 gallons per day, supplemented with freshwater to meet the 320 gallon per day demand). Excess water will be discharged into the emergency storage tank. The subsurface irrigation system consists of a gridded series of lines, spaced horizontally 18-inches apart, with discharge holes also spaced 18-inches apart in the treatment area. This grid will be cover roughly 13,100 square feet, essentially dispersing the 320 gallons of greywater over the 13,100 square-foot treatment area per day. The gridded series of subsurface irrigation lines will be located near the surface with a minimum cover of 2 inches proposed.

TSI recommends that certain OWTS components (1,500 gallon septic tank, biofilters, and reuse water pump station/emergency storage tank) be setback a minimum of 5 feet from structures, property lines, and the top of descending slopes (See Figure A and Figure 1-PACE). These components do not emit water into the surrounding soils. Additionally, the bottom of these components should be located a minimum of 1:1 (horizontal:vertical) projection from the bottom of adjacent footings (See Figure A). The tops of the temporary backcuts for installation of the components should also be located no closer than 5 feet from existing structures and the top of slope. The intent of these setbacks is to allow for the installation and future maintenance of the components without negatively impacting adjacent structures or slopes during excavation and construction activities. Unsupported temporary slopes should be excavated in accordance with the regulations of the State of California, Division of Occupational Safety and Health, and County guidelines. It is anticipated that the OWTS components will be installed in engineered fill. For temporary cuts within fill, vertical cuts up to 4 feet can be made. Temporary excavations deeper than 4 feet should have a sloped portion no steeper than 1:1 (horizontal:vertical) unless temporary shoring is used (Figure A).

The OWTS components should be installed in accordance with the manufacturer's recommendations. Backfill surrounding the OWTS components should be compacted to a minimum of 90 percent of the maximum dry density (ASTM D1557).

The subsurface irrigation system should be located no closer than 5 feet from structures. The bedrock and fill onsite is expected to be non-expansive.

30) *Provide additional comment/discussion on short and long term impact of the proposed OWTS effluent dispersal emitters on slope stability (gross and surficial). Will the slopes (locally or globally) become oversaturated due to the proposed effluent dispersal? How will slope oversaturation be monitored? How will oversaturation of slope soils from climate oscillations impact the effluent dispersal? How will the wetting-drying cycle of slope soils from effluent dispersal, irrigation and climate oscillations impact slope stability? Provide additional recommendations as necessary. Include additional information (e.g. slope stability analysis, laboratory data, cross-sections, case studies, etc.) to support your conclusions/recommendations.*

Response to Comment: As mentioned in the response to Comment No. 29, the proposed OWTS system includes a network of subsurface irrigation hoses that have emitters spaced approximately 18" linearly apart. Approximately 320 gallons of water (reclaimed water supplemented with freshwater as necessary) will be emitted per day over an area roughly 13,100 square feet in size (or an average equivalent of 0.04 inches of water per day or 14.6 inches per year). These areas will be HOA maintained fill slope areas. It is our understanding that the 320-gallon per day volume was the minimum water requirement needed to support the proposed landscaping scheme in the rainy season. An above ground sprinkler system will provide supplemental irrigation needs and will be controlled automatically using a weather sensitive controller.

Owing to both the controlled manner and large area in which the reclaimed water will be discharged, saturation of the engineered fill slope areas is not expected to occur due to a properly functioning OWTS. Saturation of the surficial soils is likely to be caused by climatic conditions and not the OWTS.

The project site is underlain by granitic bedrock with a thin veneer of soils that have originated from this bedrock. The soil consists of a silty sand to sand with angular sand grains. When the bedrock is broken down during the grading process, it will consist of similar materials. The native soils are considered very permeable as illustrated by abundant percolation testing that was conducted on the site (TSI, 2014a) and engineered fill soils are expected to be permeable as well. Shear strengths of onsite materials was conducted by Pacific Soils Engineering, Inc., and was presented in TSI (2013).

TSI conducted surficial stability analysis (infinite slope with seepage parallel to slope) on an engineered 2:1 fill slope assuming saturated depths of 5 and 7.5 feet (greater than the typical 4-foot maximum depth considered). Shear strengths and the density on engineered fill soils was estimated based on the previous laboratory testing conducted by Pacific Soils Engineering, Inc. (PSE). The laboratory data developed by PSE was included in the previous prepared EIR document (TSI 2013) and has been appended herein as well. The results of the analyses are presented on Plates E-1 and E-2 indicate that the surficial stability of engineered fill slopes have factors of safety in excess of 1.5 (minimum factor of safety required by the County).

It is TSI's opinion that the minor amount of additional soil moisture that could be produced by the drip system during the winter months will not significantly impact either surficial and/or gross stability of the fill slopes where they will be placed. In addition, there will be beneficial effects of an engineered and managed water delivery system include promoting year round, deep seated, root growth. The drip systems will not be placed on cut slopes.

31) *A State of California Registered Civil Engineer or Geotechnical Engineer is required to sign/stamp the submitted report.*

Response to Comment: Acknowledged, This response report is cosigned by a Geotechnical Engineer, whom also reviewed the previously prepared report (August 12, 2014). The responses provided herein cover the same topics and issues discussed in this previous response report which are superseded by this response report.

32) *Provide site specific laboratory data to support statement from submitted report (Page 4) that site soils are very low to non-expansive. Include Plot Plan to indicate the location of samples tested.*

Response to Comment: Geology reports are attached as Appendix F to the EIR and contain descriptions and laboratory data regarding the material present at the site. The proposed OWTS will disperse the reclaimed water onto the slopes that are adjacent to the individual lots. In all cases these will be fill slopes. Fill soils will be constructed with soils that are anticipated to consist of sand and silty sand. (decomposed granite), that are expected to be permeable and have favorable high shear strengths. Three expansion index tests were conducted at the site for EIR purposes. Two of the tests yielded a 0 expansion index (EI), and one other had a 2 EI (see appended laboratory test results). the attached Plates 1, 2A and 2B show the location of the trenches where these samples were collected. Two trenches were in the northern tract, and one trench was in the southern tract. As normally required, additional testing will be conducted during later phases of the project.

33) *Provide site specific geotechnical recommendations for construction of proposed Subsurface Drainage Bed within Zone "B" as indicated on Figure 1. Include recommendations for remedial grading/subgrade preparation (if necessary), compaction criteria (for drainage bed material and backfill material) and construction on/adjacent*

slopes (e.g. setback requirements). Please include a cross-section view/detail of the proposed subsurface drainage bed that includes your construction recommendations.

<u>Response to Comment:</u> The Drainage Bed is no longer proposed as an emergency backup for the proposed OWTS system.

34) *Provide site specific geotechnical recommendations for construction of the proposed OWTS (e.g. septic tanks, pump tanks, Puraflo Biofilters, etc.). Recommendations should address the temporary excavations required for installation of the system, construction on or adjacent slopes (e.g. setback requirements), remedial grading/subgrade preparation, leveling pad stone/gravel compaction criteria, tank/structure backfill requirements and Puraflo Biofilter backfill/site restoration.*

<u>Response to Comment:</u> Construction of the OWTS system components should be per the manufacturer recommendations. Temporary excavations and setbacks were discussed in the response to comment Number 29. From a geotechnical viewpoint there are no backfill requirements that are specific to the proposed system. Normal backfill requirements such as compacting backfill materials to a minimum of 90 percent of the relative compaction apply for this in-ground system. Based on review of information provided by the various manufacturers, the soil cover above the emitters and the distribution hoses is a minimum of 2 inches and a maximum depth of 8 inches. TSI concurs with these recommendations as they are consistent with the zone of disturbance typically assumed to occur during the landscape installation process. Main distribution hoses (not emitter hoses) deeper than approximately 6 inches in depth should be backfilled with moisture conditioned, hand compacted soil (90% relative compaction). It is not advised to use mechanical compaction equipment so as to avoid crushing of the distribution hoses. Light hand compaction above emitter hoses is also advisable where deeper than 6 inches in depth.

60) *Reconsider secondary "mini" leach fields located at toe of manufactured slopes (may affect slope stability); use pit or leach lines*

<u>Response to Comment:</u> The Drainage Bed (mini leach field) is no longer proposed as an emergency backup for the proposed OWTS system.

61) *Provide minimum setbacks for bio-filter installation from top of manufactured slopes, include surface drainage adjacent to bio-filters*

<u>Response to Comment</u>: Setbacks were discussed in the response to comment Number 29. Surface drainage should be per County of Orange guidelines.

62) *Provide typical drawing with minimum setbacks from foundations and slopes*

Response to Comment: Setbacks were discussed in the response to comment Number 29. Figures 1 (PACE) and A illustrates the required and recommended setbacks.

64) *Introducing secondary effluent drip-system into manufactured slopes (during wet periods) could super-saturate these slopes and lead to surficial stability problems; also maintenance of slopes exposed to desiccation, the pipe clogging, etc. are issues to address.*

Response to Comment: Saturation of slopes and surficial slope stability issues were discussed in the response to comment Number 30. Because of a controlled and consistent dosing of water to the slope and the granular nature of the soils, desiccation is not considered a significant issue. The emitters are specially made to be clog resistant, including an herbicide which prevents plant roots from clogging them.

83) *Provide a site plan to show the locations and layouts of the proposed Anua Puraflo Peat Fiber Biofilter OWTS (a proprietary product) in the project site.*

Response to Comment: See attached PACE Figure 1.

84) *Identify the setback distances from each OWTS unit to the residential units, fuel mod, WQ Basin, and drainage course in the site plan.*

Response to Comment: See Figure A for required and recommended setbacks. Other requested setbacks are provided within documents provided by others.

85) *Provide a narrative to discuss the following concerns:*

a. The operation life for the entire system. Who is responsible to replace the whole system?

b. The system consists of three major components: septic tank, peat filtration system, and sub-surface irrigation system. Who is responsible for each component?

c. When the soil gets saturated and the smart controller shuts down the sub-surface irrigation system. Where the effluent will go?

d. There are pumps located in septic tank and irrigation tank. If the pumps fails, how to treat the emergency overflow?

e. Confirm the effluent would not impact the slope stability, residential units, WQ Basins, and drainage course.

Response to Comment item e: See response to comment No. 30 for slope stability issues.

Terrestrial Solutions Inc. appreciates the opportunity to present this report. Should you have any questions, please contact the undersigned at (949) 201-3388.

CERTIFIED ENGINEERING GEOLOGIST DONALD A. TERRES No. CEG 1362 Exp. 1-31-15 STATE OF CALIFORNIA

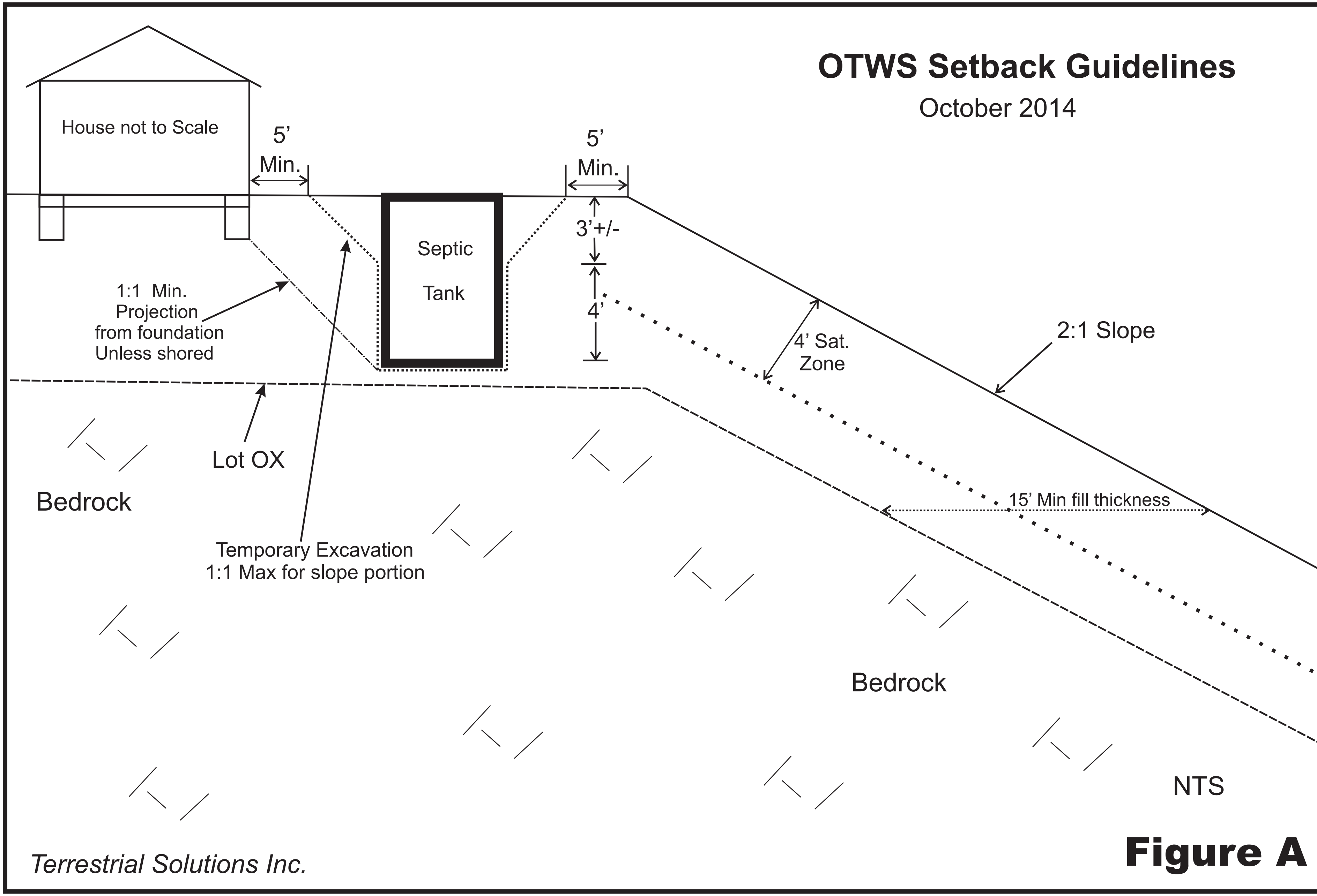
REGISTERED PROFESSIONAL ENGINEER JOHN J. DONOVAN No. 2790 EXP. 6-30-15 GEOTECHNICAL STATE OF CALIFORNIA

Don Terres
President, Engineering Geologist
CEG 1362

John Donovan / RGE 2790
Reg. Exp. 6-30-15
Geotechnical Engineer

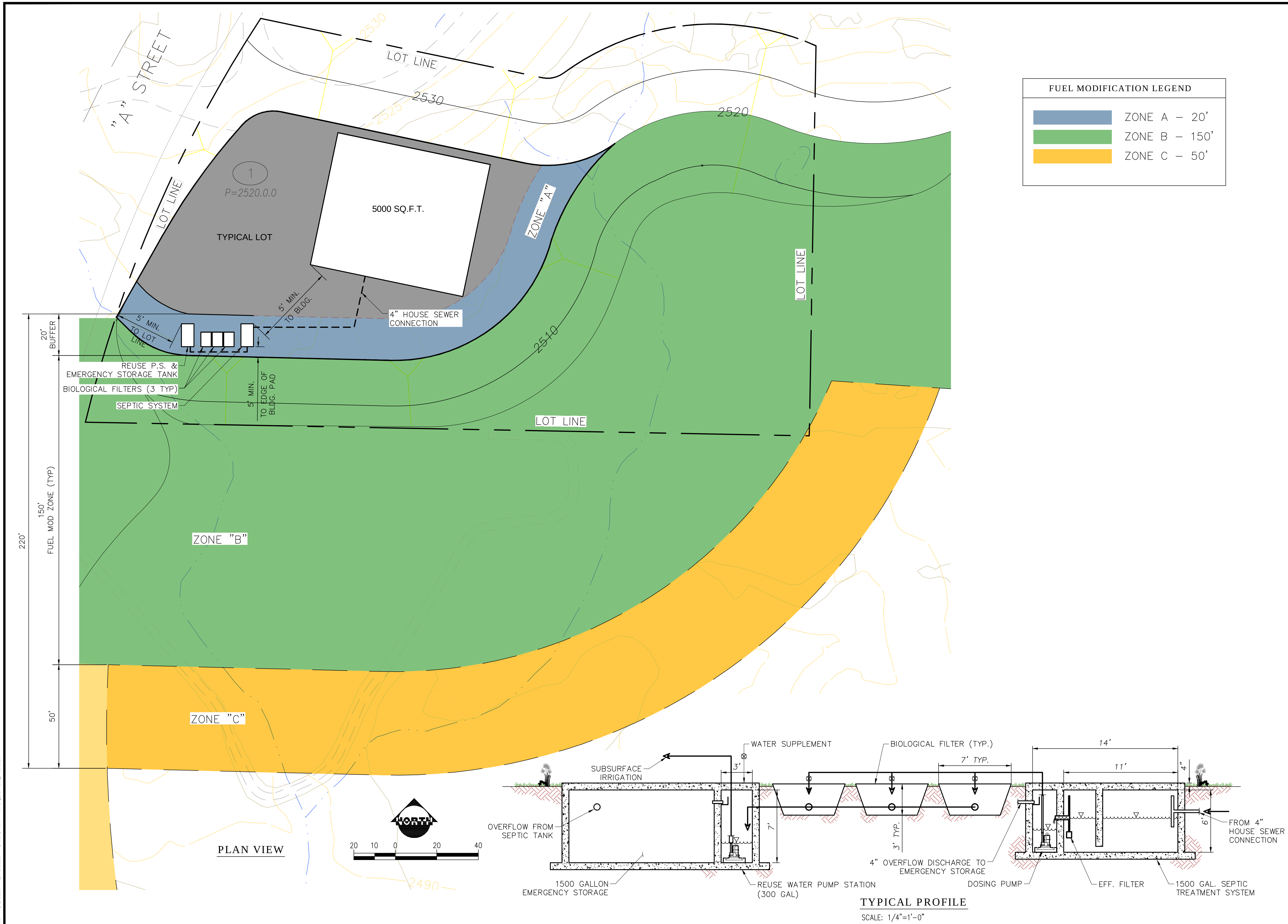
Attachments:

OWTS Description from PACE, dated June, 20, 2014 (Pages 1 through 7, & 254). (Full package – digital version only)
Figure 1 (PACE)
Figure A (Proposed Setbacks)
Excerpts from EIR document (TSI 2013) (Laboratory test results by Pacific Soils Engineering, Inc., and Plates 1, 2A, and 2B)
Figures E-1 and E-2 (Surficial Slope Stability Analyses)
County of Orange On-site Sewage Guidelines, 2010



Terrestrial Solutions Inc.

Figure A



NO	BY	DATE	REVISIONS	DATE	APP.

PREPARED BY DUONG T. DO, PROJECT ENGINEER
R.C.E. NO. --- #62802 EXP. 06/3/16
DRAWN D.S. | DESIGNED | CHECKED | SCALE | DATE

TITLE: ONSITE WASTEWATER TREATMENT SYSTEM TYPICAL LAYOUT

JOB: THE PRESERVE AT SAN JUAN, ORANGE COUNTY, CA

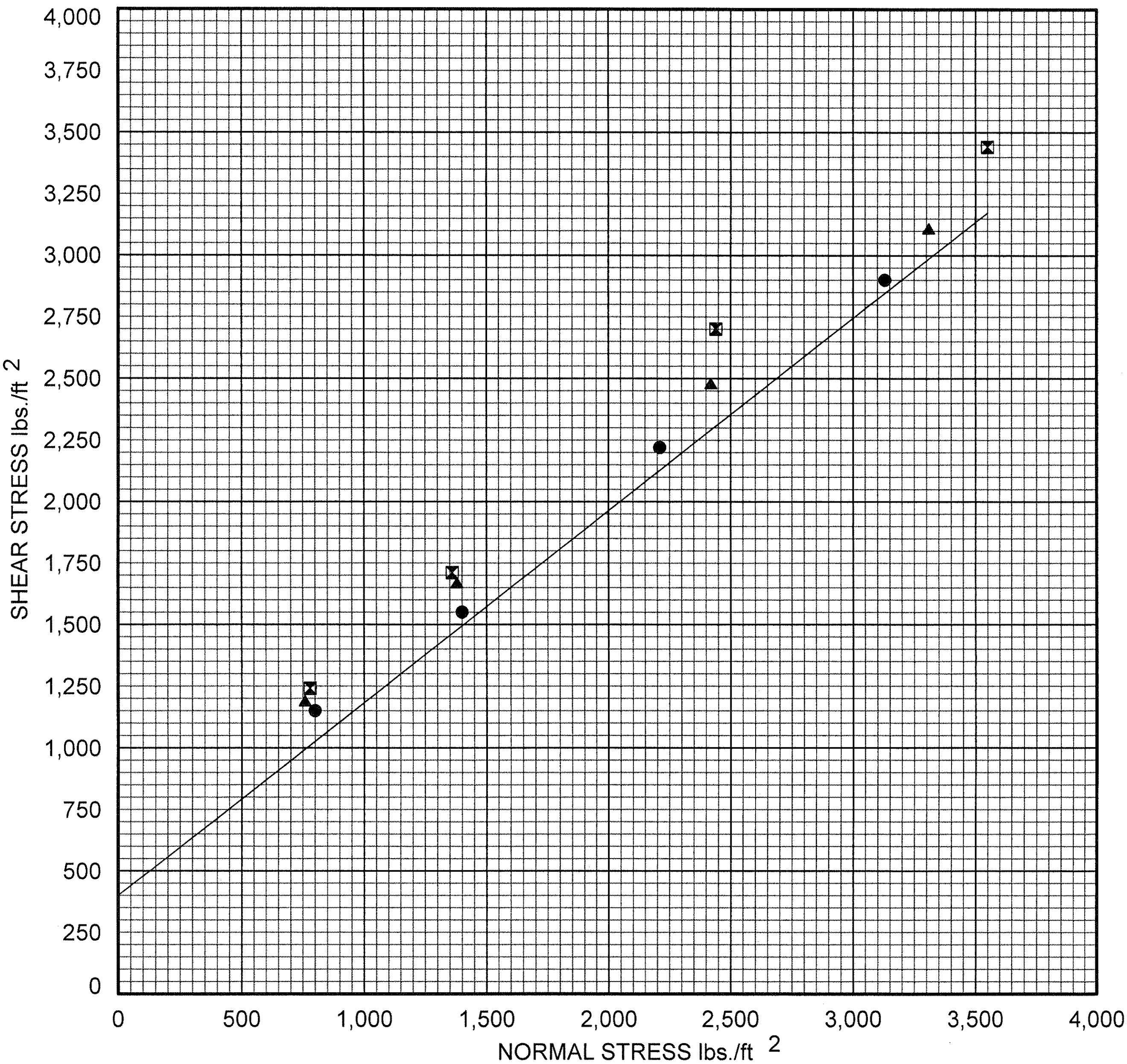
PACE Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

FIGURE 1 OF xx SHEETS
JOB NO. 9302-E

TABLE C-1
SUMMARY OF LABORATORY TEST DATA
W.O. 500654

BORING	DEPTH (FEET)	SOIL DESCRIPTION	GROUP SYMBOL	MAXIMUM DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	DIRECT SHEAR	PLUS NO.4 SEIVE (plus 4.76mm) (%)	SAND (4.76mm-0.075mm) (%)	SILT (0.075mm-0.005mm) (%)	CLAY (minus 0.005mm) (%)	EXPANSION INDEX UBC 18-2	OTHER TESTS REMARKS
TP-13	3	Granodiorite Bedrock (Kgr)		132.9	7.7	SEE PLATE C-1	0	64	22	14	2	Sulfate Content <0.001 (% by wt); pH=7.1; Resistivity=9,100 ohm cm
TP-23	3	Granodiorite Bedrock (Kgr)		127.5	9.7	SEE PLATE C-1	0	86	9	5	0	Sulfate Content <0.001 (% by wt); pH=6.6; Resistivity=10,600 ohm cm
TP-4	6	Granodiorite Bedrock (Kgr)		120.6	11.5	SEE PLATE C-1	0	86	10	4	0	Sulfate Content <0.001 (% by wt); pH=6.8; Resistivity=8,550 ohm cm

DIRECT SHEAR TEST
Remolded at 90% Relative Compaction - Peak Strength



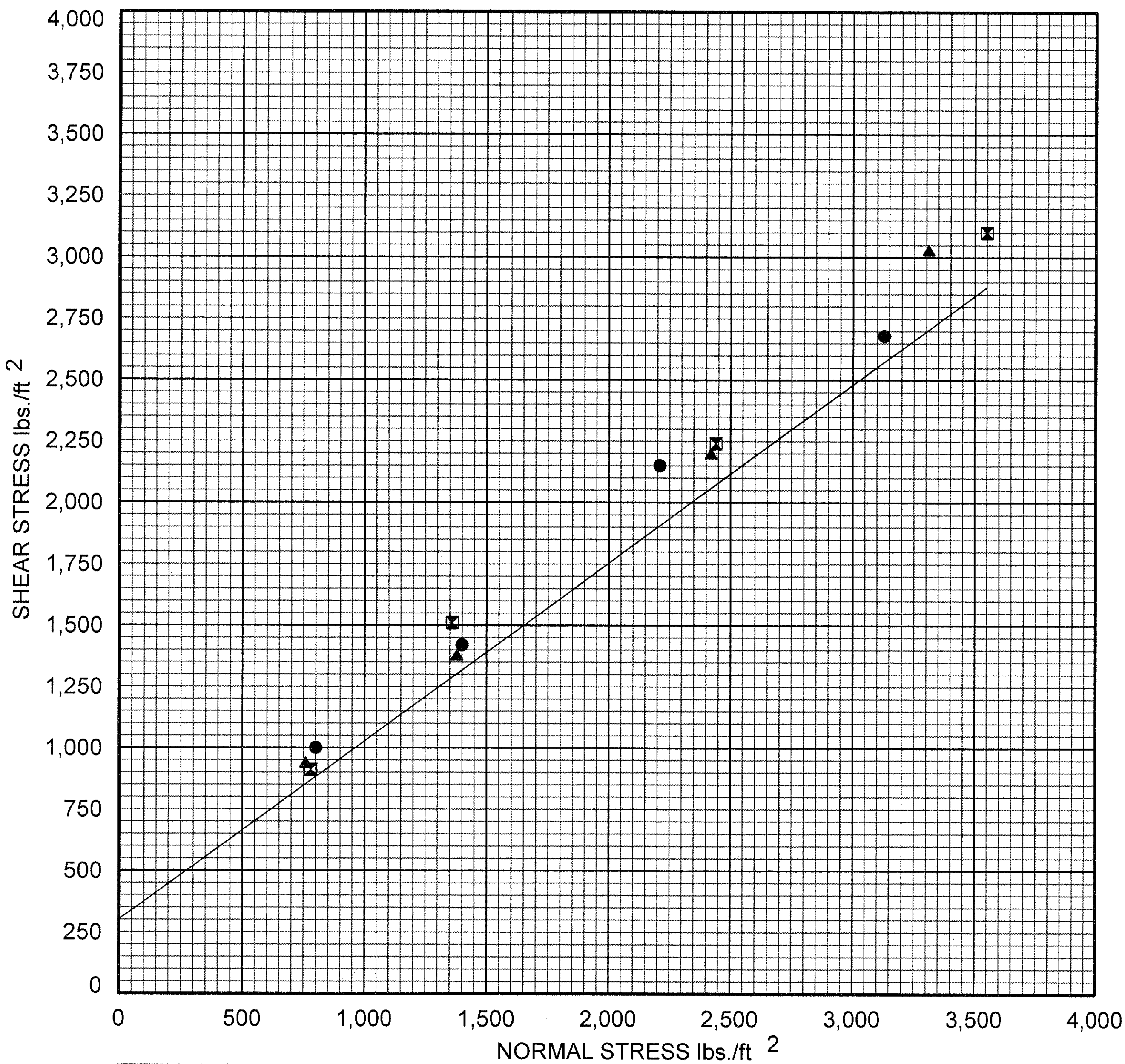
TYPICAL NAME: Remolded Bedrock (Kgr)	COHESION 400 psf.
GROUP SYMBOL:	FRICTION ANGLE 38 degrees

symbol	boring	depth	symbol	boring	depth	symbol	boring	depth	symbol	boring	depth
●	TP-13	3.0	⊗			◆			✳		
⊠	TP-23	3.0	⊕			◇			◘		
▲	TP-4	6.0	□			×			◪		
★			⊗			✖			⊟		
✕			◕			◘			◫		
✿			☆								
○			✪								
△			■								

PACIFIC SOILS ENGINEERING, INC.

W.O. 500654 PLATE C-1

DIRECT SHEAR TEST
Remolded at 90% Relative Compaction - Residual Strength



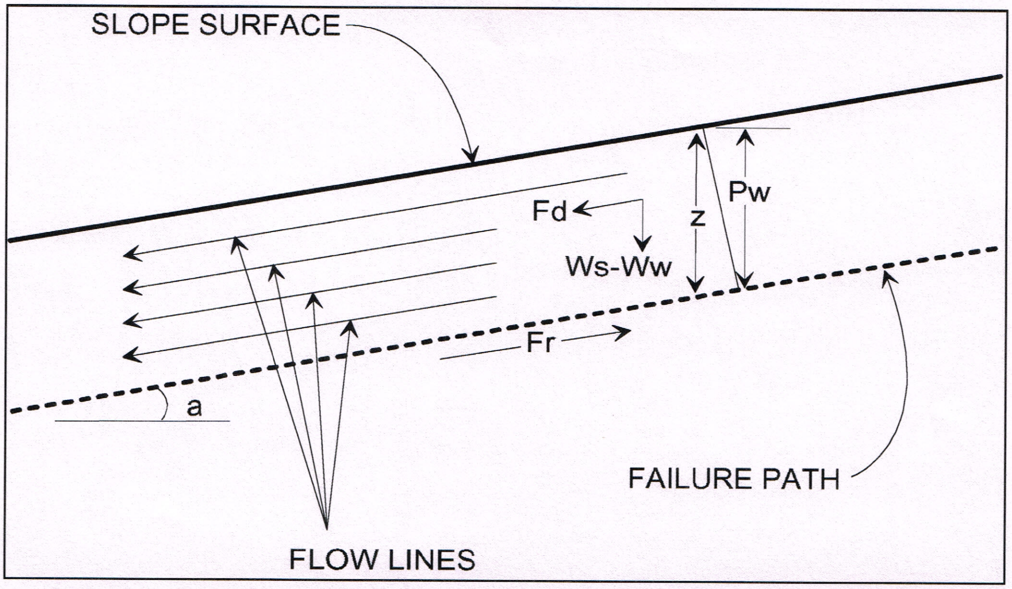
TYPICAL NAME: Remolded Bedrock (Kgr)	COHESION 300 psf.
GROUP SYMBOL:	FRICTION ANGLE 36 degrees

symbol	boring	depth	symbol	boring	depth	symbol	boring	depth	symbol	boring	depth
●	TP-13	3.1	⊗			◆			✳		
⧗	TP-23	3.1	⊕			◇			◘		
▲	TP-4	6.1	□			×			▣		
★			⊛			✖			⊟		
✕			◕			▣			▥		
✿			☆								
○			✣								
△			■								

PACIFIC SOILS ENGINEERING, INC.

W.O. 500654 PLATE C-2

SURFICIAL STABILITY ANALYSIS



Assume: (1) Saturation To Slope Surface
(2) Sufficient Permeability To Establish Water Flow

Pw = Water Pressure Head=(z)(cos^2(a))
Ws = Saturated Soil Unit Weight
Ww = Unit Weight of Water (62.4 lb/cu.ft.)
u = Pore Water Pressure=(Ww)(z)(cos^2(a))
z = Layer Thickness
a = Angle of Slope
phi = Angle of Friction
c = Cohesion
Fd = (0.5)(z)(Ws)(sin(2a))
Fr = (z)(Ws-Ww)(cos^2(a))(tan(phi)) + c
Factor of Safety (FS) = Fr/Fd

2:1 COMPACTED FILL SLOPE

Given:

Ws (pcf)	z (ft)	a (degrees)	a (radians)	phi (degrees)	phi (radians)	c (psf)
142	5	26.6	0.464258	36	0.628319	300

Calculations:

Pw	u	Fd	Fr	**FS**
4.00	249.45	284.26	531.19	**1.87**

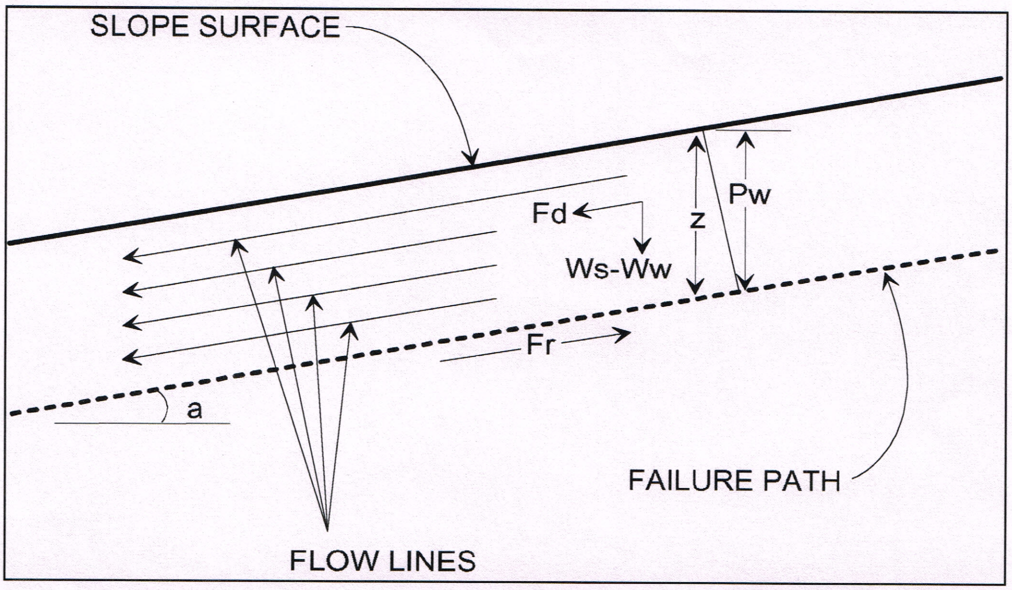
Special Cases:

Saturated Sand: FS = (Ww/Ws)(tan(phi')/tan(a))
FS = 0.302878

Moist Clay FS = (c/Ws*z)(1/(cos^2(a)*tan(a))
FS = 1.055373

PLATE E-1

SURFICIAL STABILITY ANALYSIS



Assume: (1) Saturation To Slope Surface
(2) Sufficient Permeability To Establish Water Flow

Pw = Water Pressure Head=(z)(cos^2(a))
Ws = Saturated Soil Unit Weight
Ww = Unit Weight of Water (62.4 lb/cu.ft.)
u = Pore Water Pressure=(Ww)(z)(cos^2(a))
z = Layer Thickness
a = Angle of Slope
phi = Angle of Friction
c = Cohesion
Fd = (0.5)(z)(Ws)(sin(2a))
Fr = (z)(Ws-Ww)(cos^2(a))(tan(phi)) + c
Factor of Safety (FS) = Fr/Fd

2:1 COMPACTED FILL SLOPE

Given:

Ws	z	a		phi		c
(pcf)	(ft)	(degrees)	(radians)	(degrees)	(radians)	(psf)
142	7.5	26.6	0.464258	36	0.628319	300

Calculations:

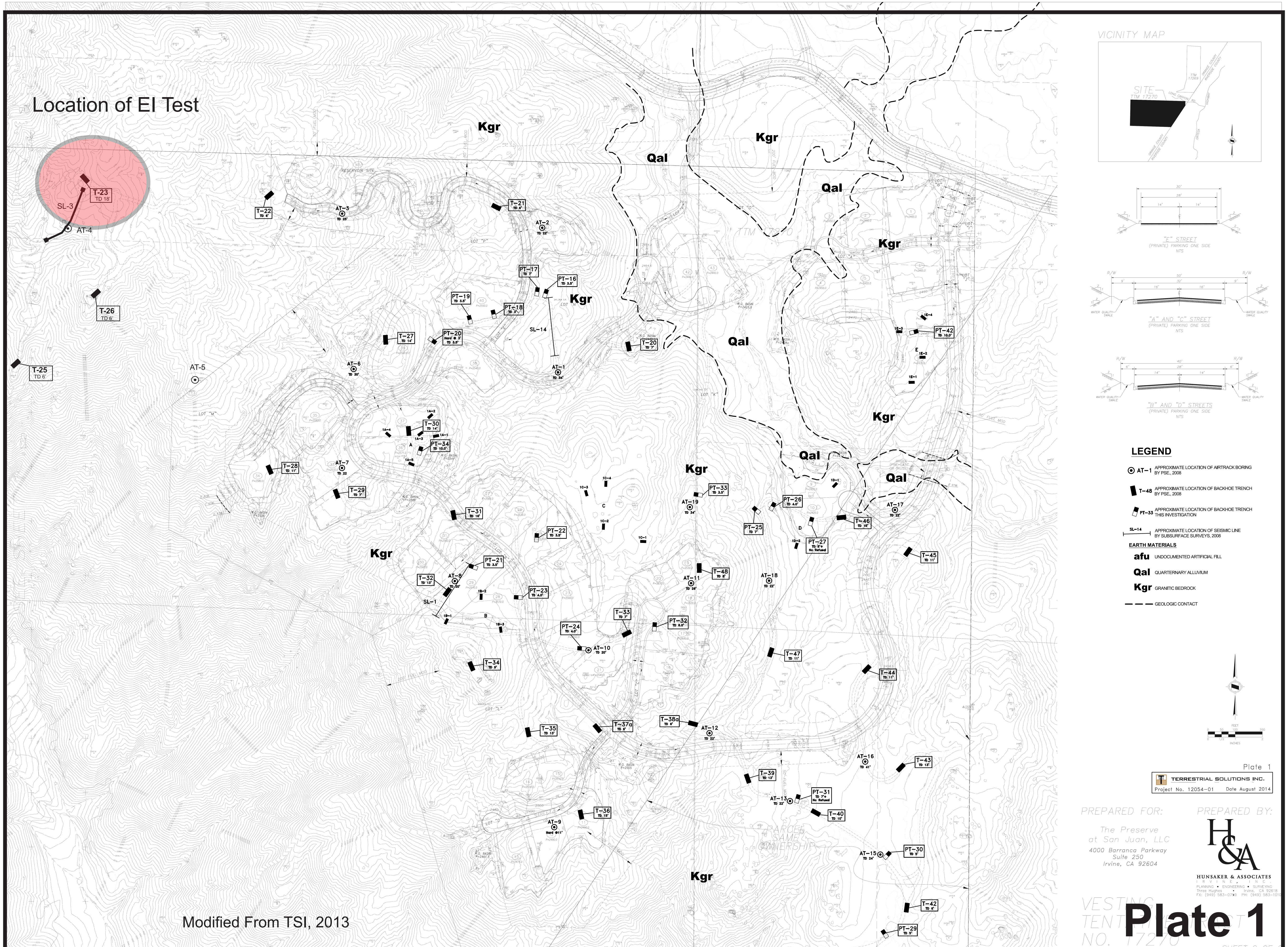
Pw	u	Fd	Fr	**FS**
6.00	374.17	426.39	646.78	**1.52**

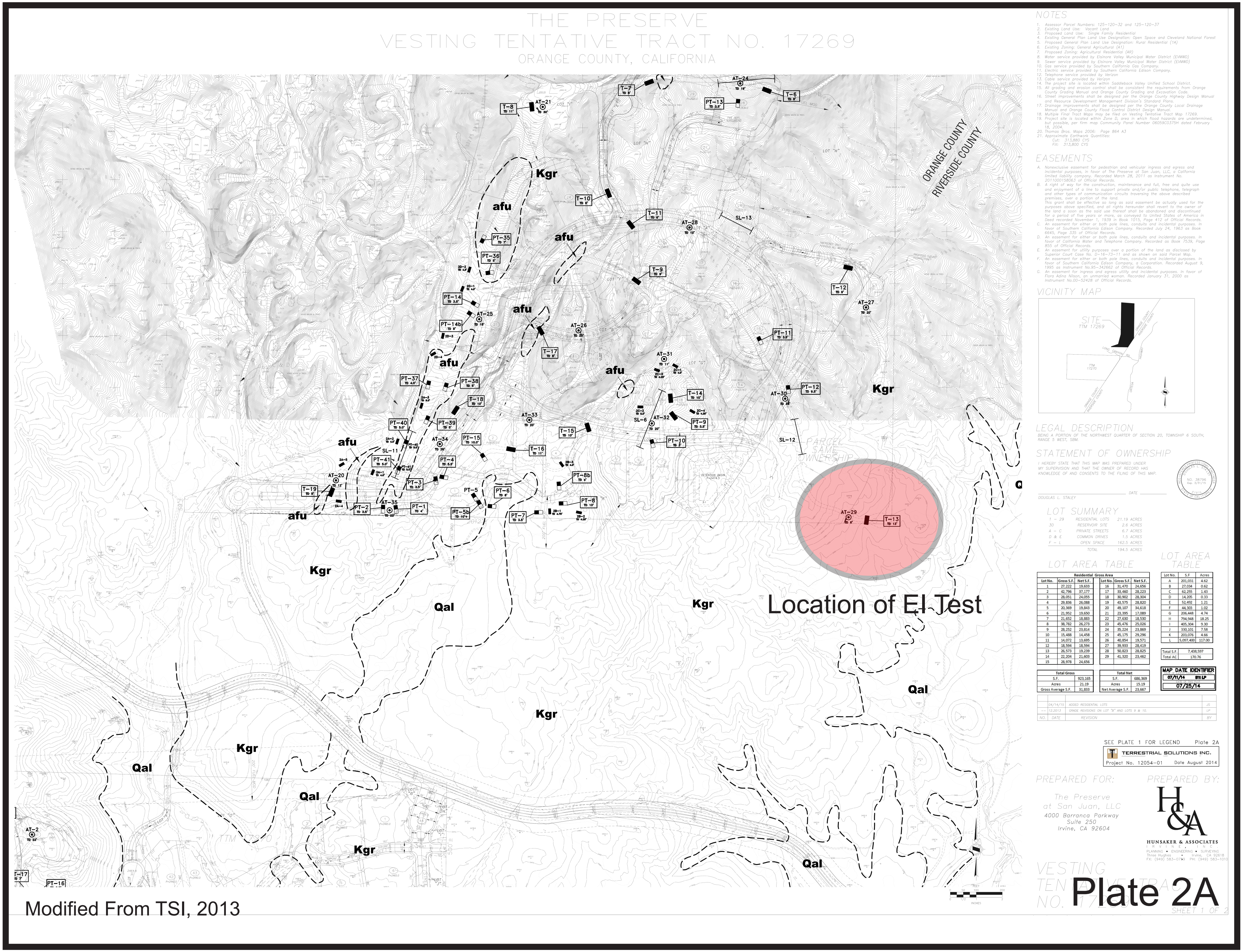
Special Cases:

Saturated Sand: FS = (Ww/Ws)(tan(phi')/tan(a))
FS = 0.302878

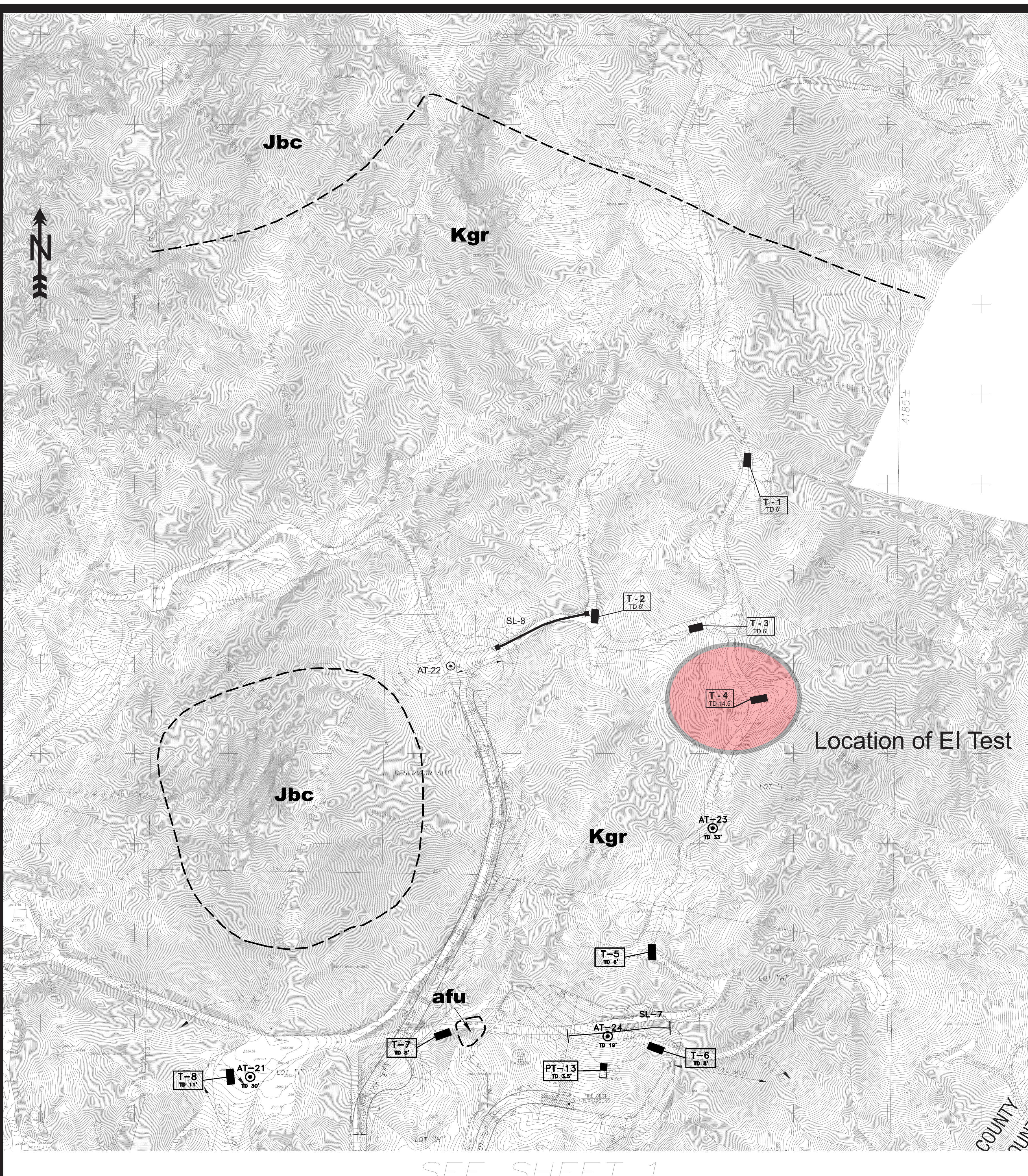
Moist Clay FS = (c/Ws*z)(1/(cos^2(a)*tan(a))
FS = 0.703582

PLATE E-2


Location of EI Test
T-23
TD 18'
SL-3
AT-4
T-22
T-26
TD 6'
T-25
TD 6'
AT-5
AT-3
T-21
AT-2
Kgr
Qal
Kgr
Qal
Kgr
Qal
Kgr
Qal
Qal
Kgr
Kgr
Kgr
Kgr
PT-17
PT-16
PT-19
PT-18
SL-14
T-27
PT-20
T-20
AT-6
AT-1
PT-42
T-30
PT-34
T-28
AT-7
T-29
T-31
PT-33
AT-19
PT-26
PT-25
PT-27
T-46
AT-17
T-45
PT-22
PT-21
T-32
AT-8
SL-1
PT-23
T-48
AT-11
AT-18
T-33
PT-32
PT-24
AT-10
T-34
T-47
T-44
T-35
T-37a
T-38a
AT-12
AT-16
T-43
T-39
PT-31
AT-13
T-40
T-36
AT-9
AT-15
PT-30
T-42
PT-29
Modified From TSI, 2013
VICINITY MAP
SITE
"E" STREET
"A" AND "C" STREET
"B" AND "D" STREETS
LEGEND
AT-1 APPROXIMATE LOCATION OF AIRTRACK BORING BY PSE., 2008
T-48 APPROXIMATE LOCATION OF BACKHOE TRENCH BY PSE., 2008
PT-33 APPROXIMATE LOCATION OF BACKHOE TRENCH THIS INVESTIGATION
SL-14 APPROXIMATE LOCATION OF SEISMIC LINE BY SUBSURFACE SURVEYS, 2008
EARTH MATERIALS
afu UNDOCUMENTED ARTIFICIAL FILL
Qal QUARTERNARY ALLUVIUM
Kgr GRANITIC BEDROCK
GEOLOGIC CONTACT
Plate 1
TERRESTRIAL SOLUTIONS INC.
Project No. 12054-01 Date August 2014
PREPARED FOR:
The Preserve at San Juan, LLC
4000 Barranca Parkway Suite 250 Irvine, CA 92604
PREPARED BY:
H&A
HUNSAKER & ASSOCIATES
Plate 1



THE PRESERVE
VESTING TENTATIVE TRACT NO. 17269
ORANGE COUNTY, CALIFORNIA
NOTES
EASEMENTS
VICINITY MAP
LEGAL DESCRIPTION
STATEMENT OF OWNERSHIP
LOT SUMMARY
LOT AREA TABLE
ORANGE COUNTY
RIVERSIDE COUNTY
Kgr
afu
Qal
AT-29
T-13
Location of EI Test
SEE PLATE 1 FOR LEGEND
Plate 2A
TERRESTRIAL SOLUTIONS INC.
Project No. 12054-01
Date August 2014
PREPARED FOR:
The Preserve
at San Juan, LLC
4000 Barranca Parkway
Suite 250
Irvine, CA 92604
PREPARED BY:
HUNSAKER & ASSOCIATES
Plate 2A
Modified From TSI, 2013



Modified From TSI, 2013

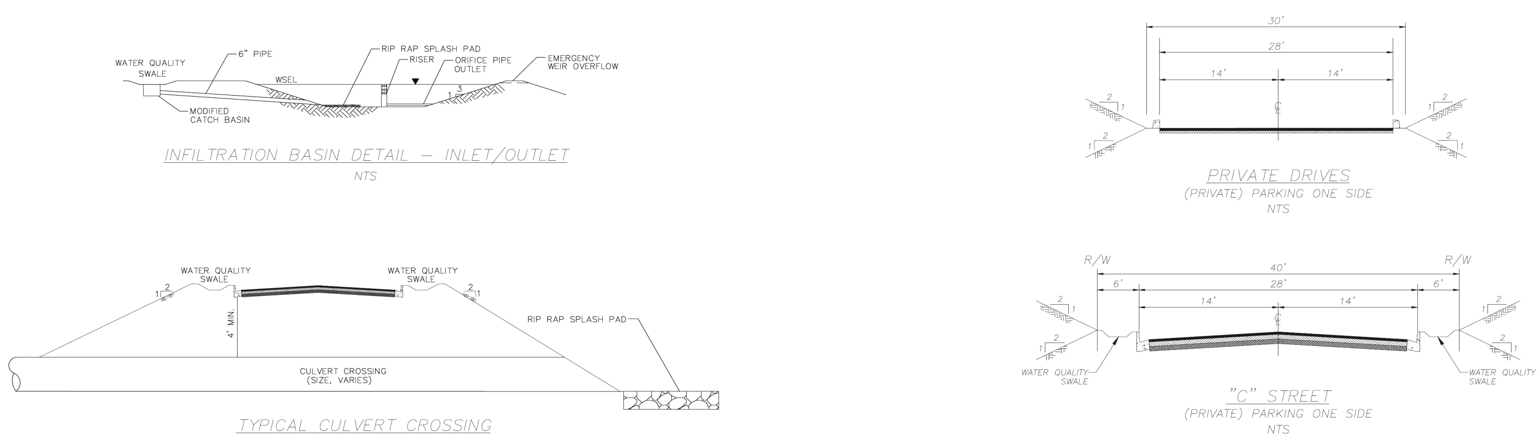


Plate 2B