PRELIMINARY DRAINAGE REPORT

Legacy International Center

City of San Diego, CA
February 3, 2017
PTS # 332401

Morris Cerullo Legacy Center Foundation, LLC.
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1. INTRODUCTION

This drainage report has been prepared in support of a Vesting Tentative Map Entitlement submittal for the Legacy International Center (the Project), which is located in the City of San Diego, California. The purpose of this report is to determine the hydrologic impact, if any, to the existing storm drain facilities or natural drainage, and to provide peak 100-year discharge values for the project.

The drainage analysis presented herein reflects a Tentative Map level-of-effort, which includes peak 100-year storm event hydrologic analyses using preliminary grades. Hydraulic analyses for inlets, pipe sizes and inverts, and HGL's will be provided during final engineering. Therefore, the purpose of this report submittal is to acquire from the City of San Diego: 1) concept approval of the proposed storm drain layout, 2) approval of the methodology used in the evaluation of the project storm drain system hydrology, and 3) identification of critical path drainage issues that need to be addressed during final engineering.

The project is located to the south of Interstate 8 and to the west of of Interstate 163, and is bounded on the north by Hotel Circle Street, on the east by existing hotel facilities and steep slopes, on the south by steep slopes and canyons, and on the west by existing hotel facilities. The vicinity map is shown in Figure 1. The total project area is 18.13 acres, of which approximately 13 acres are to be disturbed during redevelopment.

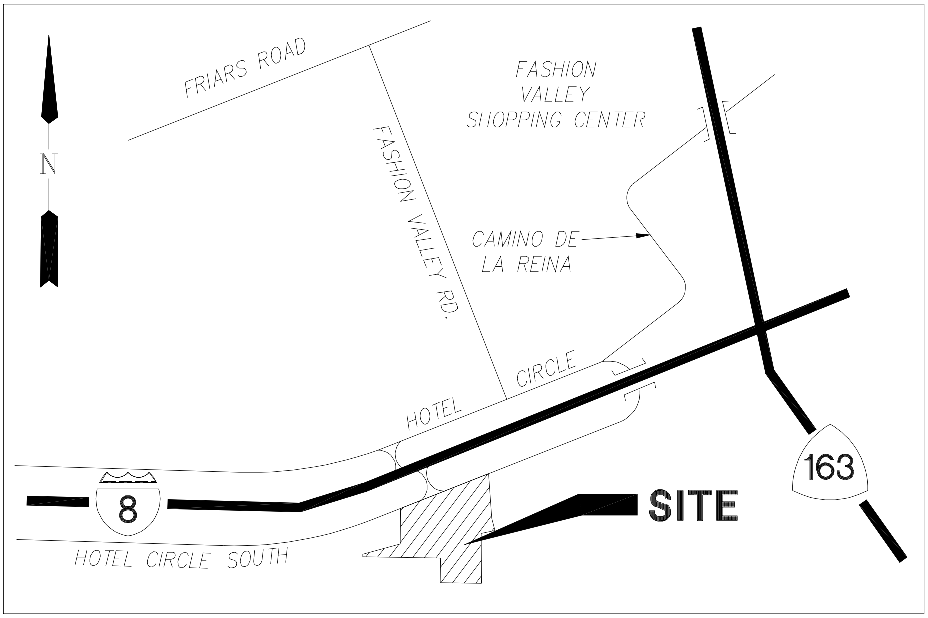

Figure 1: Project Vicinity Map

The project proposes to redevelop Lot 1 of San Diego County Recorder Map No. 3347. Currently, this site consists of a hotel complex. Redevelopment of the site will involve demolition of existing onsite hotel facilities and fill of the site. Existing onsite storm drain is to be upsized and rerouted to facilitate site redevelopment and improve drainage patterns. A blend of multi-story commercial buildings is to be constructed including all associated landscaping, hardscaping, and utilities. Project includes construction of a mixed-use development with religious, lodging, administrative, recreational, and commercial uses.

From a regional drainage perspective, the project's storm drain system will connect to an existing storm drain conveying flows under Interstate 8 and into the San Diego River. No hydraulic analysis of existing storm drain systems could be found. FEMA shaded Zone AE and Zone X areas exist along the northern boundary of the project site. Project redevelopment will require floodproofing of the buildings for which the lowest basement elevation is lower than the flood zone water surface elevation of 28.9 feet (NGVD 29) plus the applicable freeboard. The base flood elevation varies throughout the length of the site, so base flood elevations for the westerly buildings are slightly lower than the base flood elevations along the easterly portion of the site. As the project is a non-residential project, floodproofing per FEMA requirements as outlined in Technical Bulletin 6-93 is an alternative to raising the lowest floor elevation above the floodplain elevation. Floodproofing was selected by the architect as a means to comply with the City's flood ordinance for potentially some of the buildings onsite. Per Section 143.0146(c)(8), for non-residential construction, floodproofing per FEMA requirements is an alternative to complying with 143.0146(c)(6). Any floodproofing, if required, will be handled by the architect during final engineering. Refer to Appendix 1 for FEMA floodplain mapping and vertical datum conversion for the water surface elevation. Refer to Exhibit C in Appendix 4 for a site plan exhibit showing the FEMA floodplain inundation limits and base flood elevations.

Treatment of storm water prior to discharging into the downstream systems will be facilitated by biofiltration area(s) or other similar BMPs. In depth water quality investigations are completed in a Storm Water Quality Management Plan published under a separate cover.

2. EXISTING AND PROPOSED DRAINAGE PATTERNS

2.1 Existing Drainage Patterns

Offsite canyons with steep slopes border the southern and eastern edges of the project site and convey runoff from areas around the rim of the canyon towards the Project. Offsite flows conveyed towards the southeastern edge of the project are either conveyed underground in an 42-inch/45-inch storm drain or above ground into Hotel Circle Street by surface features.

Onsite, under existing conditions the site generally sheetflows into one of two storm drain systems conveying flows beneath Interstate 8 and into the San Diego River. Surface drainage improvements convey building and parking lot runoff either into onsite storm drain inlets or into Hotel Circle Street where it is conveyed to storm drain inlets via the public curb and gutter system. Currently, the site is occupied by undeveloped steep slopes, hotel buildings surrounded by pavement, and all the associated hardscaping, landscaping, and utilities. See Exhibit A in Appendix 4 for an existing conditions drainage map.

2.2 Proposed Drainage Patterns and Storm Drain Improvements

Redevelopment will disturb approximately 13 acres of the project site. Proposed development will not alter ultimate discharge points of onsite and offsite runoff. Flows generated south and east of the Project site will primarily be collected in inlets, prior to entering the developed area and will be conveyed through the site below ground to the existing storm drains beneath Interstate 8. Generally, proposed onsite drainage patterns will mimic existing drainage patterns. Some local re-direction of runoff occurs adding flows to the proposed 60-inch storm drain, however all flows converge in the storm drain system on the north side of Interstate 8 and ultimately discharge into the San Diego River.

A 60-inch RCP storm drain system will replace the existing 42-inch/45-inch system. A preliminany hydraulic analysis of the existing 42-inch pipe at the upsteam headwall indicates the capacity of the line is approximately 130 cfs according to assumed inlet control conditions. The offsite runoff from the hydrologic analysis at this location yields 243 cfs; thus approximately 113 cfs would overtop the headwall and surface drain on to the project site. The intent is to fully capture all offsite flows, conveying them underground through the site. Therefore the 42-inch portion of the existing storm drain will be upsized to a 60-inch line. A new headwall is also to be installed at the upstream end of the 60-inch storm drain. Further hydraulic analysis of this storm drain will be conducted during final engineering.

The existing 45-inch storm drain conveying flows beneath Hotel Circle will remain, as the existing pipe is below the 100-year floodplain and upsizing this pipe would not increase capacity. As shown on Exhibit B, the connection from the proposed 60-inch storm drain to the existing 45-inch storm drain will occur at the clean out near the easterly project entrance just south of Hotel Circle South. The FEMA 100-year floodline is near the same elevation as the cleanout. Therefore, because the storm drain line is already inundated during the 100-year flood, any flow above the capacity of the 45-inch pipe underneath Hotel Circle South would flow out the most downstream inlet openings into Hotel Circle South. Note that pipe surcharge out of inlets occurs in both the existing condition and proposed condition due to the current undersized pipe system underneath Interstate 8 and the existing flooding situation of the San Diego River. Proposed site drainage patterns were modified during the design process so that the flows into the 45-inch storm drain outlet are roughly the same as existing conditions and therefore impacts do not need to be addressed, as there are minimal impacts to downstream systems.

A 24-inch/30-inch RCP storm drain system is proposed to connect to the existing 30-inch storm drain beneath Hotel Circle near the northwest corner of the site. Contributing southwest offsite flows will be captured in inlets and conveyed beneath the project site in the 24-inch/30-inch storm drain. Brow ditches will be constructed along tops of retaining walls to safely convey offsite flows to storm drain inlets. See Exhibit B in Appendix 4 for proposed drainage conditions.

Within the project site, the site grading will direct onsite flows into storm drain inlets or collection areas. These onsite flows will be conveyed to and treated before discharging to the proposed public storm drain lines.

3. HYDROLOGY CRITERIA, METHODOLOGY, AND RESULTS

3.1 Hydrology Criteria

Table 1 summarizes the key hydrology assumptions and criteria used for the hydrologic modeling.

Table 1: Hydrology Criteria

Existing and Proposed Hydrology:	100-year storm frequency
Soil Type:	Hydrologic Soil Group D
Runoff coefficients:	Based on land use in sub-drainage area, from C=0.45 to 0.95. See Rational Method output.
Rainfall intensity:	Based on the City of San Diego Intensity Frequency Duration Curves presented in the 1984 City of San Diego Drainage Design Manual.

3.2 Hydrology Methodology

Hydrology calculations were completed for existing and proposed conditions accounting for all areas draining to the onsite storm drain systems. Drainage areas were defined from existing and proposed topographic maps of the area. Hydrologic analysis was completed utilizing the Rational Method, outlined in the 1984 City of San Diego Drainage Design Manual. The goal of the Rational Method analysis was to determine the peak 100-year flow rates for the storm drain pipes by developing a node link model of the contributing drainage area and applying the intensity-duration-frequency (IDF) curve to the areas. See Appendix 1 for the City of San Diego IDF curve.

The Civil-D computer program was used to obtain peak flow rates for the offsite and onsite drainage areas in existing and proposed conditions. Site drainage was broken down into 3 systems; 1) area draining to the 45-inch pipe beneath Hotel Circle (System 100), 2) area draining to the 30-inch pipe beneath Hotel Circle (System 400), and 3) area draining into Hotel Circle (System 500). City of San Diego Drainage Design Manual runoff coefficients, based on land use, were assigned for each drainage sub-basin within CivilD.

3.3 Hydrology Results

Redevelopment of the project site slightly increased the 100-year runoff from the site. Flows to System 100 decreased by approximately 1.4 cfs to 276.8 cfs, due to the slight reduction in imperviousness. Proposed System 400 flows increased by approximately 2 cfs to 50.5 cfs, due to removal of contributing area in proposed conditions. Proposed flows to System 500 decreased by approximately 2.2 cfs in existing conditions to 4.2 cfs in proposed conditions, due to a decrease in contributing area. The overall difference in flows between existing and proposed conditions is less than 0.5%, and therefore can be considered negligible. In order to be conservative, most of the proposed project area was assigned a runoff coefficient of 0.85.

For results of the analysis, see Exhibit A for the existing conditions hydrology map and Exhibit B for the proposed conditions hydrology map in Appendix 4. Refer to the appendices for the hydrology calculations. Table 2 summarizes the hydrology results and compares existing and proposed conditions.

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		Existing Conditions			Proposed Conditions				
System Number	**Discharge Location**	**Total Area (acres)**	**Composite Runoff Coefficient**	**100-Year Runoff (ft^3/s)**	**Total Area (acres)**	**Composite Runoff Coefficient**	**100-Year Runoff (ft^3/s)**	**Difference of Contrib. Area (acres)**	**% Difference of Existing Runoff (%)**
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400	30-inch Pipe	24.3	0.63	48.5	23.9	0.68	50.5	-0.4	4.1%
500	Hotel Circle	2.0	0.89	6.4	1.0	0.95	4.2	-1.1	-34.4%
	Total	**170.6**	**N/A**	**330.3**	**169.2**	**N/A**	**328.1**	**-1.5**	**-0.7%**

4. CONCLUSION

This drainage report supports the Tentative Map Entitlement for the proposed Legacy International Center redevelopment. This report was prepared to ensure that project development would not adversely affect existing drainage patterns. Hydrology calculations indicate that redevelopment will result in a slight overall increase in flows from the site, but by a negligible amount. Small onsite re-direction of flows does not alter general drainage patterns as both onsite storm drain systems ultimately discharge to the same location. As such, the project redevelopment should not have an adverse affect on local or global drainage patterns. Floodproofing requirements of the buildings for which the lowest floor elevation is less than two feet above the base flood elevation will be addressed by the architect during final engineering.

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Supporting Documentation

(IDF Curve, Runoff Coefficients, FEMA Firmette, Inlet Control Nomograph)

APPENDIX 2

Existing Conditions 100-year Rational Method Computer Output

APPENDIX 3

Proposed Conditions 100-year Rational Method Computer Output

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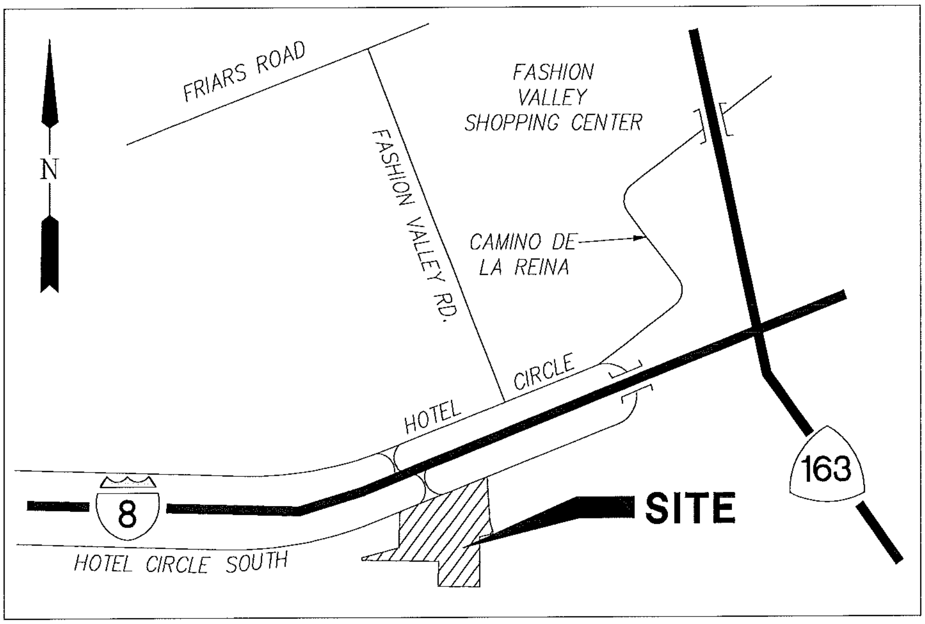

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Supporting Documentation

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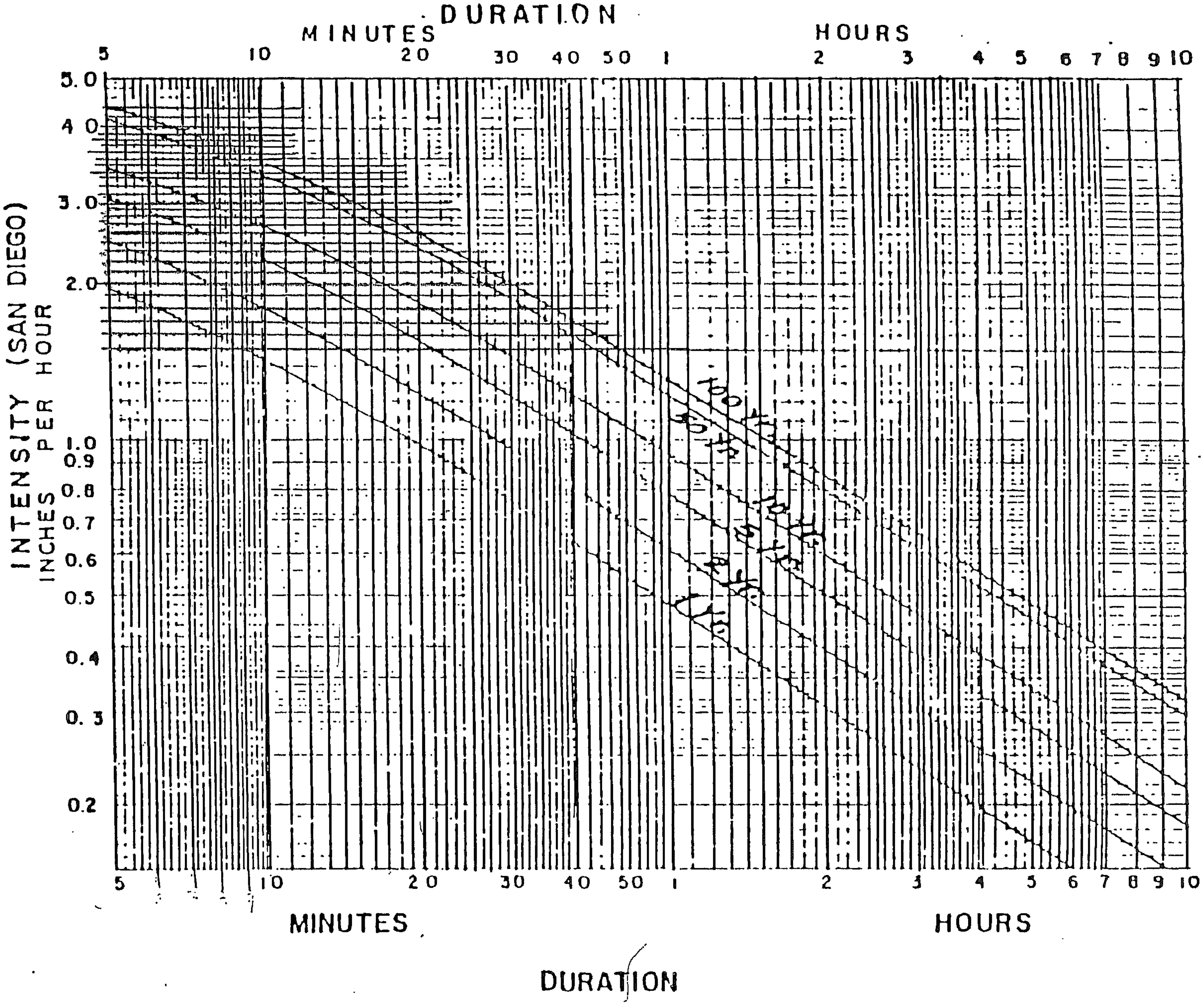
ELEV.	FACTOR
0–1500	1.00
1500–3000	1.25
3000–4000	1.42
4000–5000	1.60
5000–6000	1.70
DESERT	1.25

To obtain correct intensity, multiply intensity on chart by factor for design elevation.



RAINFALL
INTENSITY – DURATION – FREQUEN
CURVES
for
COUNTY OF SAN DIEGO

APPENDIX

TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

Land Use	Coefficient, C Soil Type (1)
Residential:	D
Single Family	.55
Multi-Units	.70
Mobile Homes	.65
Rural (lots greater than 1/2 acre)	.45
Commercial (2) 80% Impervious	.85
Industrial (2) 90% Impervious	.95

NOTES:

(1) Type D soil to be used for all areas.

(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in no case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%

Tabulated imperviousness = 80%

Revised C = $\frac{50}{80}$ x 0.85 = 0.53

Composite Runoff Coefficient

3948.00
5/21/2014

Proposed Condition: System 100

	From Node	To Node	Area [ac]	C [ ]	CA [ac]
1	100	105	0.58	0.95	0.55
2	105	110	24.87	0.85	21.14
3	110	115	4.75	0.45	2.14
4	120	125	0.55	0.45	0.25
5	130	125	3.33	0.85	2.83
6	135	125	4.78	0.85	4.06
7	125	115	5.09	0.45	2.29
8	140	115	4.60	0.85	3.91
9	145	115	4.12	0.55	2.27
10	115	150	18.26	0.45	8.22
11	155	160	0.45	0.95	0.43
12	160	165	17.42	0.85	14.81
13	165	170	5.13	0.45	2.31
14	175	170	1.16	0.55	0.64
15	180	170	5.69	0.55	3.13
16	170	185	9.85	0.45	4.43
17	190	185	1.16	0.55	0.64
18	185	150	6.46	0.45	2.91
19	150	195	6.48	0.45	2.92
20	205	200	0.96	0.45	0.43
21	210	200	3.26	0.45	1.47
22	201	140	0.38	0.45	0.17
23	220	225	0.32	0.55	0.18
24	225	230	4.19	0.55	2.30
25	230	235	2.53	0.45	1.14
26	103	104	0.30	0.45	0.14
27	202	204	0.23	0.45	0.10
28	107	108	0.17	0.85	0.14
29	108	109	0.53	0.85	0.45
30	101	102	0.13	0.45	0.06
31	102	109.5	0.66	0.45	0.30
32	109.5	112	0.75	0.85	0.64
33	114	113	0.65	0.85	0.55
34	113.5	113.5	0.09	0.85	0.08
35	257	260	0.29	0.45	0.13
36	260	262	0.74	0.45	0.33
37	262	117	1.15	0.45	0.52
38	117	118	1.08	0.45	0.49
39	121	122	0.08	0.85	0.07
40	122	124	0.35	0.85	0.30
41	123	124	0.45	0.85	0.38
42	131	132	0.11	0.85	0.09
43	136	136	0.28	0.95	0.27
44	127	128	0.06	0.85	0.05
45	128	129	0.70	0.85	0.60
46	142	143	0.13	0.45	0.06

ΣA= 145.30 [ac] ΣCA= 91.28 [ac]

Composite Runoff Coefficient => ΣCA/ΣA= **0.63**

P:\3948\ENGR\REPORTS\DRAIN-TM\HYDRO\Composite Runoff Coefficient Calcs.xls

Composite Runoff Coefficient

3948.00
5/21/2014

Proposed Condition: System 400

	From Node	To Node	Area [ac]	C [ ]	CA [ac]
1	400	405	0.42	0.55	0.23
2	405	410	3.04	0.55	1.67
3	405	410	0.97	0.55	0.53
4	401	404	0.83	0.55	0.46
5	402	403	0.18	0.45	0.08
6	403	439	1.66	0.45	0.75
7	439	404	0.00	0.45	0.00
8	406	407	0.10	0.85	0.09
9	407	408	0.75	0.85	0.64
10	409	412	0.37	0.85	0.31
11	411	412	1.10	0.85	0.94
12	414	416	0.10	0.85	0.09
13	413	416	0.58	0.85	0.49
14	417	418	0.28	0.85	0.24
15	421	422	0.09	0.85	0.08
16	422	428	0.40	0.85	0.34
17	420	440	1.73	0.85	1.47
18	423	424	0.13	0.95	0.12
19	424	426	0.30	0.95	0.29
20	446	428	0.27	0.55	0.15
21	431	432	0.27	0.45	0.12
22	432	433	0.27	0.85	0.23
23	434	434	0.16	0.45	0.07
24	427	434	0.45	0.45	0.20
25	440	445	0.45	0.55	0.25
26	445	450	2.20	0.55	1.21
27	450	455	0.75	0.45	0.34
28	457	455	1.65	0.45	0.74
29	455	437	0.33	0.95	0.31
30	460	437	2.63	0.85	2.24
31	465	470	0.13	0.95	0.12
32	470	475	0.67	0.95	0.64
33	475	437	1.10	0.95	1.05

ΣA= 24.36 [ac]   ΣCA= 16.47 [ac]

Composite Runoff Coefficient => ΣCA/ΣA= **0.68**

P:\3948\ENGR\REPORTS\DRAIN-TM\HYDRO\Composite Runoff Coefficient Calcs.xls

Composite Runoff Coefficient

3948.00
5/21/2014

Proposed Condition: System 500

	From Node	To Node	Area [ac]	C [ ]	CA [ac]
1	500	505	0.17	0.95	0.16
2	505	510	0.48	0.95	0.46
3	510	520	0.30	0.95	0.29

ΣA= 0.95 [ac] ΣCA= 0.90 [ac]

Composite Runoff Coefficient => ΣCA/ΣA= **0.95**

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PROJECT Morris Cerullo
SUBJECT FEMA elev conversion
PAGE : 1 OF 1 JOB NO. : 3948.00
DRAWN BY : BJP DATE : 6/26/13
CHECKED BY : DATE :

Maximum FEMA elevation contour for project site:

31 Ft -(From FEMA Map # 06073C1618 G)
-(Elevation in NAVD 88)

Project Survey data in NGVD 29 ∴ Conversion Required

for project Area datum shift = 0.640 meter
↳ per Vert-con

$0.640\text{ meter} \times \frac{3.28\text{ feet}}{1\text{ meter}} = 2.1\text{ ft}$

Adjusted FEMA Elevation for project site:

$\text{NGVD } 29_{eL} = \text{NAVD } 88_{eL} - 2.1\text{ ft}$

$= 31\text{ ft} - 2.1\text{ ft}$

$\underline{\text{NGVD}_{el} = 28.9\text{ ft}}$

Proposed minimum Garage FF elev = 25.0 ft NGVD29
Flood proofing of buildings is required.

ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1618G

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1618 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1618	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1618G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

LATLONG.net

Add Place

Latest Places

Country List

Address → Lat Long

Lat Long → Address

Lat Long → DMS

Lat Long → UTM

Convert Lat and Long to DMS

Type the lat and long values to convert into **degrees minutes seconds**.

Latitude

32.760068

DMS value of Lat:

32° 45' 36.2448" N

Longitude

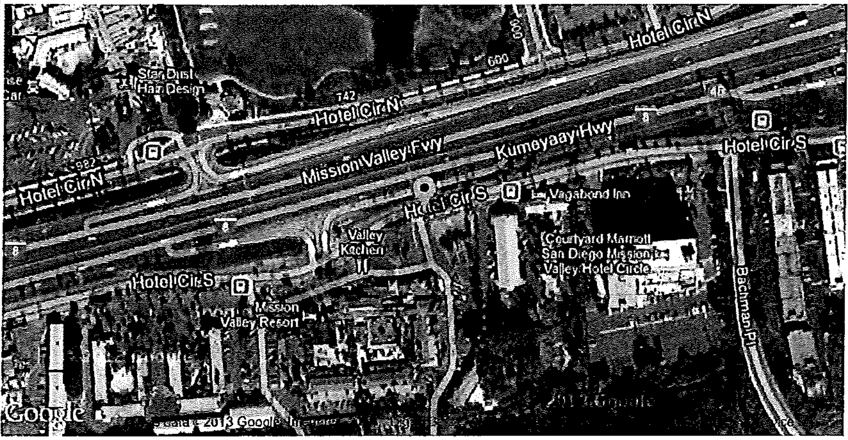
-117.170117

DMS value of Long:

117° 10' 12.4212" W

Convert to DMS

Location of point on map



0

Like

0

Lat long to DMS

On this page you can convert decimal degrees to DMS values.

The directions abbreviations ;

- S: South
- W: West
- E: East
- N: North

What is DMS?

DMS is the abbreviation of *Degrees Minutes Seconds*.

Meanings of Signs

° degrees, ' minutes, " seconds.

Tips

- You can press ENTER to calculate DMS in the lat long input box.
- If you click into the DMS lat and DMS long input box, it will auto select the value.

Questions concerning the VERTCON process may be mailed to NGS

Latitude: 32.760068

Longitude: 117.170117

NGVD 29 height:

Datum shift (NAVD 88 minus NGVD 29): 0.640 meter

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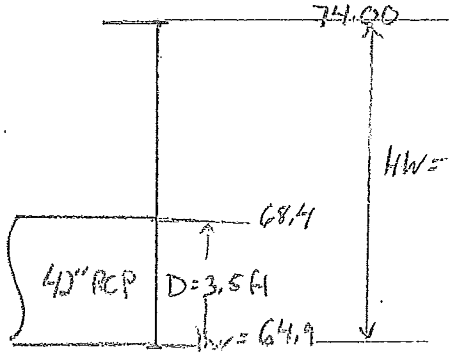
PROJECT Morris Cerullo
SUBJECT 42" capacity
PAGE : 1 OF 2 JOB NO. : 3948.6
DRAWN BY : BSP DATE : 6/28/13
CHECKED BY : DATE :

42"-inch Storm Drain preliminary analysis

Existing Condition

from topo: crest elevation contour = 74.00
from DWG no. 16423-D 42" invert = 64.90



Maximum HW = 74.00 - 64.90
= 9.1

- Assume pipe under inlet control

$\frac{HW_{max}}{D_{42}} = \frac{9.1}{3.5} = 2.6$

@ headwall

from Chart 1B Nomograph; Q ≈ 130 cfs

from existing hydrologic model; Q_{100} = 243 cfs

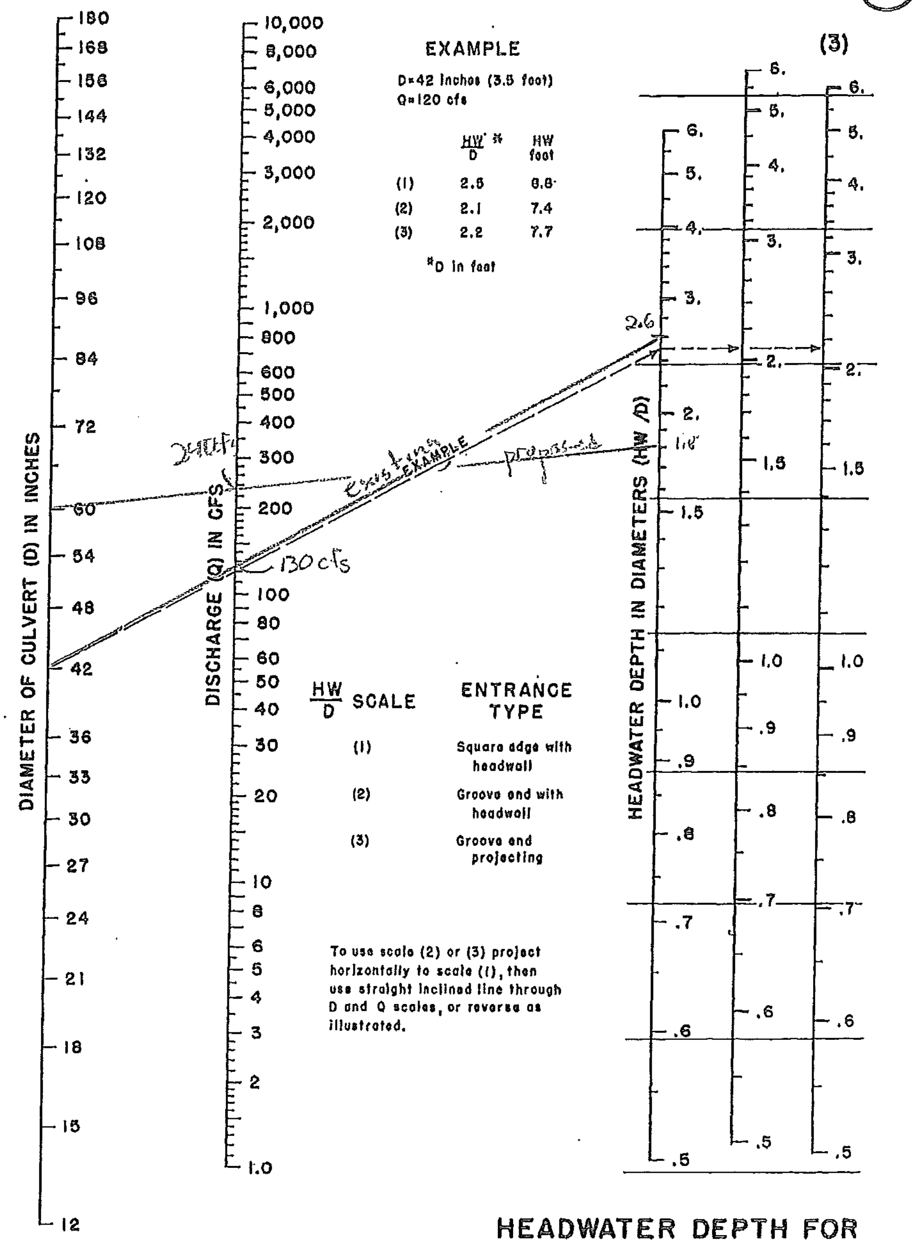
* existing Q_{100} exceeds 42-inch capacity ∴ Requires upsizing

Proposed Condition

for 60-inch RCP $\frac{HW}{D} = \frac{9.1}{5.0} = 1.8$

from Chart 1B Nomograph; Q ≈ 240 cfs

CHART 1B



EXAMPLE

D=42 inches (3.5 feet)
Q=120 cfs

	$\frac{HW}{D}$*	HW feet
(1)	2.5	8.8
(2)	2.1	7.4
(3)	2.2	7.7

*D in feet

$\frac{HW}{D}$ SCALE	ENTRANCE TYPE
(1)	Square edge with headwall
(2)	Groove end with headwall
(3)	Groove end projecting

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER SCALES 2&3
REVISED MAY 1964

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

APPENDIX 2

Existing Conditions 100-year Rational Method Computer Output

```
             San Diego County Rational Hydrology Program

 CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

 Rational method hydrology  program based on
 San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 12/04/06
------------------------------------------------------------------------
3236 MISSION VALLEY INN
EXISTING CONDITIONS - 100 YEAR STORM
SYSTEM 100
NOVEMBER 10, 2006
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      105.000
**** INITIAL AREA EVALUATION ****
_______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  374.620(Ft.)
Highest elevation =  301.000(Ft.)
Lowest elevation =  300.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.12 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 374.620^.5)/( 0.267^(1/3)]=   8.12
Rainfall intensity (I) =      3.640(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      2.006(CFS)
Total initial stream area =        0.580(Ac.)
```

```
Flow(q) thru subarea =     72.897(CFS)
Depth of flow =   0.774(Ft.), Average velocity =  20.707(Ft/s)
Channel flow top width =    6.096(Ft.)
Flow Velocity =   20.71(Ft/s)
Travel time  =    0.54 min.
Time of concentration =   13.63 min.
Critical depth =     1.797(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.013(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      6.440(CFS) for    4.750(Ac.)
Total runoff =     73.116(CFS)      Total area =      30.20(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      115.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.200(Ac.)
Runoff from this stream =     73.116(CFS)
Time of concentration =   13.63 min.
Rainfall intensity =     3.013(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      125.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  176.000(Ft.)
Highest elevation =  294.000(Ft.)
Lowest elevation =  246.000(Ft.)
Elevation difference =   48.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.16 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 176.000^.5)/(27.273^(1/3)]=   5.16
Rainfall intensity (I) =      4.334(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      1.073(CFS)
Total initial stream area =       0.550(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      125.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
```

```
Total runoff =      40.261(CFS)       Total area =       13.75(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      115.000
**** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      13.750(Ac.)
Runoff from this stream =      40.261(CFS)
Time of concentration =    6.06 min.
Rainfall intensity =     4.065(In/Hr)
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)       (min)                  (In/Hr)


1        73.116     13.63                3.013
2        40.261      6.06                4.065
Qmax(1) =
          1.000 *    1.000 *    73.116) +
          0.741 *    1.000 *    40.261) + =     102.959
Qmax(2) =
          1.000 *    0.445 *    73.116) +
          1.000 *    1.000 *    40.261) + =      72.776

Total of 2 streams to confluence:
Flow rates before confluence point:
      73.116      40.261
Maximum flow rates at confluence using above data:
      102.959       72.776
Area of streams before confluence:
       30.200        13.750
Results of confluence:
Total flow rate =     102.959(CFS)
Time of concentration =    13.627 min.
Effective stream area after confluence =     43.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      140.000 to Point/Station      115.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                          ]
Time of concentration =    13.63 min.
Rainfall intensity =      3.013(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      11.781(CFS) for    4.600(Ac.)
Total runoff =    114.740(CFS)      Total area =       48.55(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      155.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  264.000(Ft.)
Highest elevation =  280.000(Ft.)
Lowest elevation =  278.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.81 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 264.000^.5)/(   0.758^(1/3)]=   4.81
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      1.876(CFS)
Total initial stream area =        0.450(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      165.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   278.000(Ft.)
End of street segment elevation =   270.000(Ft.)
Length of street segment  =  1019.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  48.000(Ft.)
Distance from crown to crossfall grade break  =  47.999(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   0.001(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     38.193(CFS)
Depth of flow =   0.647(Ft.), Average velocity =   3.315(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  24.000(Ft.)
Flow velocity =   3.32(Ft/s)
Travel time =    5.12 min.     TC =   10.12  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
```

```
Total runoff =     61.417(CFS)      Total area =       24.16(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                   ]
Time of concentration =    10.41 min.
Rainfall intensity =      3.326(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =     10.408(CFS) for    5.690(Ac.)
Total runoff =     71.825(CFS)      Total area =       29.85(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      185.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   170.000(Ft.)
Downstream point elevation =   132.000(Ft.)
Channel length thru subarea  =   617.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     83.676(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =   10.000(Ft.)
Flow(q) thru subarea =     83.676(CFS)
Depth of flow =    1.092(Ft.), Average velocity =  14.785(Ft/s)
Channel flow top width =    7.367(Ft.)
Flow Velocity =   14.78(Ft/s)
Travel time  =    0.70 min.
Time of concentration =   11.10 min.
Critical depth =      1.938(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.249(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     14.401(CFS) for    9.850(Ac.)
Total runoff =     86.226(CFS)      Total area =       39.70(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      190.000 to Point/Station      185.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
1      145.488     14.92               2.911
2       97.513     11.88               3.170
Qmax(1) =
          1.000 *    1.000 *   145.488) +
          0.918 *    1.000 *    97.513) + =     235.041
Qmax(2) =
          1.000 *    0.796 *   145.488) +
          1.000 *    1.000 *    97.513) + =     213.360

Total of 2 streams to confluence:
Flow rates before confluence point:
     145.488      97.513
Maximum flow rates at confluence using above data:
      235.041      213.360
Area of streams before confluence:
       70.930       47.320
Results of confluence:
Total flow rate =    235.041(CFS)
Time of concentration =    14.918 min.
Effective stream area after confluence =    118.250(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      195.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =    86.000(Ft.)
Downstream point elevation =    66.000(Ft.)
Channel length thru subarea  =   441.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    241.481(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =   10.000(Ft.)
Flow(q) thru subarea =    241.481(CFS)
Depth of flow =   1.982(Ft.), Average velocity =  17.501(Ft/s)
Channel flow top width =   10.926(Ft.)
Flow Velocity =   17.50(Ft/s)
Travel time  =    0.42 min.
Time of concentration =   15.34 min.
Critical depth =      3.250(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.880(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      8.398(CFS) for    6.480(Ac.)
Total runoff =    243.439(CFS)      Total area =      124.73(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      195.000 to Point/Station      200.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Normal flow depth in pipe =   45.09(In.)
Flow top width inside pipe =   46.34(In.)
Critical Depth =   52.41(In.)
Pipe flow velocity =     16.55(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    15.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      215.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    128.950(Ac.)
Runoff from this stream =    248.891(CFS)
Time of concentration =  15.57 min.
Rainfall intensity =     2.863(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      225.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                 ]
Initial subarea flow distance  =  227.000(Ft.)
Highest elevation =  254.000(Ft.)
Lowest elevation =  240.000(Ft.)
Elevation difference =   14.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.13 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 227.000^.5)/( 6.167^(1/3)]=   8.13
Rainfall intensity (I) =      3.637(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =       0.640(CFS)
Total initial stream area =        0.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      230.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   240.000(Ft.)
End of street segment elevation =   208.000(Ft.)
Length of street segment  =   293.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  48.000(Ft.)
Distance from crown to crossfall grade break  =  47.999(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      235.000 to Point/Station      240.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

________________________________________________________________________
Upstream point/station elevation =    94.000(Ft.)
Downstream point/station elevation =    78.000(Ft.)
Pipe length  =   116.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.376(CFS)
Nearest computed pipe diameter  =    12.00(In.)
Calculated individual pipe flow  =    12.376(CFS)
Normal flow depth in pipe =    9.21(In.)
Flow top width inside pipe =   10.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.15(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      242.000 to Point/Station      240.000
**** SUBAREA FLOW ADDITION ****

________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     9.83 min.
Rainfall intensity =      3.395(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.825(CFS) for    0.540(Ac.)
Total runoff =     13.201(CFS)      Total area =        7.45(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      243.000 to Point/Station      240.000
**** SUBAREA FLOW ADDITION ****

________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Time of concentration =     9.83 min.
Rainfall intensity =      3.395(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.731(CFS) for    0.600(Ac.)
Total runoff =     14.932(CFS)      Total area =        8.05(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      215.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

________________________________________________________________________
Upstream point/station elevation =    78.000(Ft.)
```

```
No. of pipes = 1  Required pipe flow  =   261.593(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   261.593(CFS)
Normal flow depth in pipe =   33.75(In.)
Flow top width inside pipe =   33.37(In.)
Critical depth could not be calculated.
Pipe flow velocity =     31.54(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    15.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      245.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                      ]
Time of concentration =    15.72 min.
Rainfall intensity =      2.852(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.503(CFS) for    0.620(Ac.)
Total runoff =    263.096(CFS)      Total area =      137.62(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      255.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
Upstream point/station elevation =     48.000(Ft.)
Downstream point/station elevation =     36.000(Ft.)
Pipe length  =     92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   263.096(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   263.096(CFS)
Normal flow depth in pipe =   28.45(In.)
Flow top width inside pipe =   34.65(In.)
Critical depth could not be calculated.
Pipe flow velocity =     40.57(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    15.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      255.000
**** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    137.620(Ac.)
Runoff from this stream =    263.096(CFS)
Time of concentration =   15.76 min.
Rainfall intensity =     2.849(In/Hr)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 **** IMPROVED CHANNEL TRAVEL TIME ****

______________________________________________________________________
Upstream point elevation =    72.000(Ft.)
Downstream point elevation =    68.800(Ft.)
Channel length thru subarea  =    69.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =  40.000
Slope or 'Z' of right channel bank =  40.000
Estimated mean flow rate at midpoint of channel =      2.060(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =   10.000(Ft.)
Flow(q) thru subarea =      2.060(CFS)
Depth of flow =   0.093(Ft.), Average velocity =   3.273(Ft/s)
Channel flow top width =   10.474(Ft.)
Flow Velocity =    3.27(Ft/s)
Travel time  =    0.35 min.
Time of concentration =    5.85 min.
Critical depth =      0.143(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Rainfall intensity =      4.121(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.401(CFS) for    0.400(Ac.)
Total runoff =      3.076(CFS)      Total area =        1.27(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      270.000 to Point/Station      265.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     5.85 min.
Rainfall intensity =      4.121(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.817(CFS) for    0.980(Ac.)
Total runoff =      4.893(CFS)      Total area =        2.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      265.000 to Point/Station      280.000
**** IMPROVED CHANNEL TRAVEL TIME ****

______________________________________________________________________
Upstream point elevation =    68.800(Ft.)
Downstream point elevation =    61.000(Ft.)
Channel length thru subarea  =   295.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =  40.000
Slope or 'Z' of right channel bank =  40.000
Estimated mean flow rate at midpoint of channel =      5.991(CFS)
```

```
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                       ]
Rainfall intensity =      3.713(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.041(CFS) for    0.330(Ac.)
Total runoff =     10.918(CFS)      Total area =        4.60(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      290.000 to Point/Station      255.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     7.69 min.
Rainfall intensity =      3.713(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.771(CFS) for    1.060(Ac.)
Total runoff =     12.689(CFS)      Total area =        5.66(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      290.000 to Point/Station      255.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.660(Ac.)
Runoff from this stream =     12.689(CFS)
Time of concentration =    7.69 min.
Rainfall intensity =     3.713(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)      (min)                  (In/Hr)


1      263.096     15.76                 2.849
2       12.689      7.69                 3.713
Qmax(1) =
         1.000 *    1.000 *   263.096) +
         0.767 *    1.000 *    12.689) + =     272.834
Qmax(2) =
         1.000 *    0.488 *   263.096) +
         1.000 *    1.000 *    12.689) + =     141.112

Total of 2 streams to confluence:
Flow rates before confluence point:
     263.096      12.689
Maximum flow rates at confluence using above data:
      272.834      141.112
```

```
Time of concentration (TC) =    16.26 min.
End of computations, total study area =         144.340 (Ac.)
```

```
              San Diego County Rational Hydrology Program

 CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

 Rational method hydrology  program based on
 San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 12/04/06
------------------------------------------------------------------------
3236.10 MISSION VALLEY INN
EXISTING CONDITIONS - 100 YEAR STORM
SYSTEM 400
NOVEMBER 13, 2006
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      405.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Initial subarea flow distance  =  204.000(Ft.)
Highest elevation =  278.000(Ft.)
Lowest elevation =  272.000(Ft.)
Elevation difference =    6.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     9.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 204.000^.5)/( 2.941^(1/3)]=    9.87
Rainfall intensity (I) =      3.390(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.783(CFS)
Total initial stream area =       0.420(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      455.000 to Point/Station      437.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.020(Ac.)
Runoff from this stream =     15.155(CFS)
Time of concentration =   15.03 min.
Rainfall intensity =     2.903(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      465.000 to Point/Station      470.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =   95.000(Ft.)
Highest elevation =   29.000(Ft.)
Lowest elevation =   28.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.26 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  95.000^.5)/(   0.526^(1/3)]=   3.26
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.542(CFS)
Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      470.000 to Point/Station      475.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =    28.500(Ft.)
End of street segment elevation =    25.200(Ft.)
Length of street segment  =   191.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  23.000(Ft.)
Distance from crown to crossfall grade break  =  21.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.250(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      1.376(CFS)
Depth of flow =   0.181(Ft.), Average velocity =   2.030(Ft/s)
```

```
Flow velocity =   4.68(Ft/s)
Travel time =    2.28 min.     TC =   13.08  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Rainfall intensity =      3.059(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      3.702(CFS) for    2.200(Ac.)
Total runoff =      4.514(CFS)      Total area =        2.65(Ac.)
Street flow at end of street =      4.514(CFS)
Half street flow at end of street =      4.514(CFS)
Depth of flow =   0.299(Ft.), Average velocity =   5.180(Ft/s)
Flow width (from curb towards crown)=   8.630(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      450.000 to Point/Station      455.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   206.000(Ft.)
Downstream point elevation =    40.000(Ft.)
Channel length thru subarea  =   612.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      5.153(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =   10.000(Ft.)
Flow(q) thru subarea =      5.153(CFS)
Depth of flow =   0.152(Ft.), Average velocity =  10.258(Ft/s)
Channel flow top width =    3.608(Ft.)
Flow Velocity =   10.26(Ft/s)
Travel time  =   0.99 min.
Time of concentration =  14.07 min.
Critical depth =      0.410(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.977(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.005(CFS) for    0.750(Ac.)
Total runoff =      5.518(CFS)      Total area =        3.40(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      457.000 to Point/Station      455.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.994(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.458(CFS) for    0.340(Ac.)
Total runoff =     11.403(CFS)      Total area =        7.49(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      435.000 to Point/Station      430.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    13.86 min.
Rainfall intensity =      2.994(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.212(CFS) for    0.900(Ac.)
Total runoff =     12.616(CFS)      Total area =        8.39(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      430.000 to Point/Station      437.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =    25.600(Ft.)
Downstream point elevation =    20.500(Ft.)
Channel length thru subarea  =   295.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  30.000
Slope or 'Z' of right channel bank =  30.000
Estimated mean flow rate at midpoint of channel =     16.195(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     16.195(CFS)
Depth of flow =   0.238(Ft.), Average velocity =   3.967(Ft/s)
Channel flow top width =   24.289(Ft.)
Flow Velocity =    3.97(Ft/s)
Travel time  =   1.24 min.
Time of concentration =   15.10 min.
Critical depth =      0.316(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Rainfall intensity =      2.897(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =     11.723(CFS) for    4.760(Ac.)
Total runoff =     24.339(CFS)      Total area =       13.15(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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```
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   5.323(Ft.)
Flow velocity =   2.03(Ft/s)
Travel time =    1.57 min.      TC =    6.57  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Rainfall intensity =      3.940(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.497(CFS) for    0.400(Ac.)
Total runoff =      2.039(CFS)      Total area =       0.53(Ac.)
Street flow at end of street =      2.039(CFS)
Half street flow at end of street =      1.020(CFS)
Depth of flow =   0.201(Ft.), Average velocity =   2.214(Ft/s)
Flow width (from curb towards crown)=   6.364(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      480.000 to Point/Station      475.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Time of concentration =     6.57 min.
Rainfall intensity =      3.940(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      5.761(CFS) for    1.720(Ac.)
Total runoff =      7.800(CFS)      Total area =       2.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      475.000 to Point/Station      437.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =     25.200(Ft.)
End of street segment elevation =     22.300(Ft.)
Length of street segment  =   469.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  23.000(Ft.)
Distance from crown to crossfall grade break  =  21.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.250(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      9.308(CFS)
```

```
Area of streams before confluence:
       13.150        8.020        3.120
Results of confluence:
Total flow rate =     48.469(CFS)
Time of concentration =    15.101 min.
Effective stream area after confluence =     24.290(Ac.)
End of computations, total study area =          24.290 (Ac.)
```

```
              San Diego County Rational Hydrology Program

 CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

 Rational method hydrology  program based on
 San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 12/04/06
------------------------------------------------------------------------
3136.10 MISSION VALLEY INN
EXISTING CONDITIONS - 100 YEAR STORM
SYSTEM 500
NOVEMBER 14, 2006
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      505.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
Initial subarea flow distance  =  230.000(Ft.)
Highest elevation =   31.000(Ft.)
Lowest elevation =   26.900(Ft.)
Elevation difference =    4.100(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.63 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 230.000^.5)/( 1.783^(1/3)]=   5.63
Rainfall intensity (I) =      4.185(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      1.423(CFS)
Total initial stream area =        0.400(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      520.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =    26.300(Ft.)
End of street segment elevation =    24.000(Ft.)
Length of street segment  =   290.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  23.000(Ft.)
Distance from crown to crossfall grade break  =  21.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.250(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.938(CFS)
Depth of flow =   0.378(Ft.), Average velocity =   2.511(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.198(Ft.)
Flow velocity =   2.51(Ft/s)
Travel time =    1.93 min.     TC =   10.99  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.261(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.929(CFS) for    0.300(Ac.)
Total runoff =      6.389(CFS)      Total area =       2.01(Ac.)
Street flow at end of street =      6.389(CFS)
Half street flow at end of street =      6.389(CFS)
Depth of flow =   0.387(Ft.), Average velocity =   2.556(Ft/s)
Flow width (from curb towards crown)=  15.632(Ft.)
End of computations, total study area =          2.010 (Ac.)
```

APPENDIX 3

Proposed Conditions 100-year Rational Method Computer Output

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              San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 02/02/17
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3948 LIC
PROPOSED CONDITIONS
SYSTEM 100
FILE: S100P100
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 *********   Hydrology Study Control Information **********

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Program License Serial Number 4049

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Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


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Process from Point/Station      100.000 to Point/Station      105.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =  374.600(Ft.)
Highest elevation =  301.000(Ft.)
Lowest elevation =  300.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.12 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 374.600^.5)/( 0.267^(1/3)]=   8.12
Rainfall intensity (I) =      3.640(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      2.006(CFS)
Total initial stream area =        0.580(Ac.)


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Process from Point/Station      105.000 to Point/Station      110.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   300.000(Ft.)
End of street segment elevation =   280.000(Ft.)
Length of street segment  =  1317.550(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  48.000(Ft.)
Distance from crown to crossfall grade break  =  47.999(Ft.)
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Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   0.001(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      45.010(CFS)
Depth of flow =   0.618(Ft.), Average velocity =   4.421(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.562(Ft.)
Flow velocity =    4.42(Ft/s)
Travel time =    4.97 min.      TC =   13.08  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                      ]
Rainfall intensity =      3.059(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =     64.670(CFS) for   24.870(Ac.)
Total runoff =     66.676(CFS)  Total area =        25.45(Ac.)
Street flow at end of street =     66.676(CFS)
Half street flow at end of street =     33.338(CFS)
Depth of flow =   0.694(Ft.), Average velocity =   4.794(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.07(Ft.)
Flow width (from curb towards crown)=  26.344(Ft.)


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Process from Point/Station      110.000 to Point/Station      115.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   280.000(Ft.)
Downstream point elevation =   162.000(Ft.)
Channel length thru subarea  =   676.000(Ft.)
Channel base width       =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      72.898(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel   =   10.000(Ft.)
Flow(q) thru subarea =     72.898(CFS)
Depth of flow =   0.774(Ft.), Average velocity =  20.707(Ft/s)
Channel flow top width =    6.096(Ft.)
Flow Velocity =   20.71(Ft/s)
Travel time  =    0.54 min.
Time of concentration =   13.63 min.
Critical depth =      1.797(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.013(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      6.440(CFS) for    4.750(Ac.)
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Total runoff =      73.116(CFS)   Total area =        30.20(Ac.)


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Process from Point/Station      110.000 to Point/Station      115.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.200(Ac.)
Runoff from this stream =     73.116(CFS)
Time of concentration =   13.63 min.
Rainfall intensity =     3.013(In/Hr)


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Process from Point/Station      120.000 to Point/Station      125.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  176.000(Ft.)
Highest elevation =  294.000(Ft.)
Lowest elevation =  246.000(Ft.)
Elevation difference =   48.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      5.16 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 176.000^.5)/(27.273^(1/3)]=    5.16
Rainfall intensity (I) =      4.334(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =        1.073(CFS)
Total initial stream area =          0.550(Ac.)


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Process from Point/Station      130.000 to Point/Station      125.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                          ]
Time of concentration =     5.16 min.
Rainfall intensity =       4.334(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      12.268(CFS) for    3.330(Ac.)
Total runoff =     13.341(CFS)   Total area =         3.88(Ac.)


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Process from Point/Station      135.000 to Point/Station      125.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                          ]
Time of concentration =     5.16 min.
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Rainfall intensity =      4.334(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      17.610(CFS) for     4.780(Ac.)
Total runoff =     30.951(CFS)   Total area =         8.66(Ac.)


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Process from Point/Station      125.000 to Point/Station      115.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   246.000(Ft.)
Downstream point elevation =   162.000(Ft.)
Channel length thru subarea  =   791.000(Ft.)
Channel base width       =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      40.046(CFS)
Manning's 'N'      = 0.020
Maximum depth of channel   =   10.000(Ft.)
Flow(q) thru subarea =     40.046(CFS)
Depth of flow =   0.641(Ft.), Average velocity =  14.591(Ft/s)
Channel flow top width =     5.564(Ft.)
Flow Velocity =    14.59(Ft/s)
Travel time  =    0.90 min.
Time of concentration =     6.06 min.
Critical depth =       1.320(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      4.065(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       9.310(CFS) for    5.090(Ac.)
Total runoff =     40.261(CFS)   Total area =        13.75(Ac.)


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Process from Point/Station      125.000 to Point/Station      115.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =     13.750(Ac.)
Runoff from this stream =     40.261(CFS)
Time of concentration =    6.06 min.
Rainfall intensity =     4.065(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       73.116      13.63               3.013
2       40.261       6.06               4.065
Qmax(1) =
         1.000 *    1.000 *    73.116) +
         0.741 *    1.000 *    40.261) + =     102.960
Qmax(2) =
         1.000 *    0.445 *    73.116) +
         1.000 *    1.000 *    40.261) + =      72.777

Total of 2 streams to confluence:
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Flow rates before confluence point:
      73.116      40.261
Maximum flow rates at confluence using above data:
      102.960       72.777
Area of streams before confluence:
       30.200       13.750
Results of confluence:
Total flow rate =    102.960(CFS)
Time of concentration =    13.627 min.
Effective stream area after confluence =     43.950(Ac.)


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Process from Point/Station      140.000 to Point/Station      115.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                     ]
Time of concentration =    13.63 min.
Rainfall intensity =      3.013(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =     11.781(CFS) for    4.600(Ac.)
Total runoff =    114.741(CFS)  Total area =       48.55(Ac.)


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Process from Point/Station      145.000 to Point/Station      115.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                  ]
Time of concentration =    13.63 min.
Rainfall intensity =      3.013(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      6.828(CFS) for    4.120(Ac.)
Total runoff =    121.568(CFS)  Total area =       52.67(Ac.)


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Process from Point/Station      115.000 to Point/Station      150.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   162.000(Ft.)
Downstream point elevation =    86.000(Ft.)
Channel length thru subarea  =  1298.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    142.641(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =   10.000(Ft.)
Flow(q) thru subarea =    142.641(CFS)
Depth of flow =   1.445(Ft.), Average velocity =  16.755(Ft/s)
Channel flow top width =    8.781(Ft.)
Flow Velocity =   16.75(Ft/s)
Travel time  =    1.29 min.
Time of concentration =   14.92 min.
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Critical depth =      2.516(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.911(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     23.921(CFS) for   18.260(Ac.)
Total runoff =    145.489(CFS)  Total area =       70.93(Ac.)


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Process from Point/Station      115.000 to Point/Station      150.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     70.930(Ac.)
Runoff from this stream =     145.489(CFS)
Time of concentration =   14.92 min.
Rainfall intensity =     2.911(In/Hr)


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Process from Point/Station      155.000 to Point/Station      160.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                     ]
Initial subarea flow distance  =  264.000(Ft.)
Highest elevation =  280.000(Ft.)
Lowest elevation =  278.000(Ft.)
Elevation difference =     2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      4.81 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 264.000^.5)/( 0.758^(1/3)]=   4.81
Rainfall intensity (I) =       4.459(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       1.906(CFS)
Total initial stream area =        0.450(Ac.)


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Process from Point/Station      160.000 to Point/Station      165.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   278.000(Ft.)
End of street segment elevation =   270.000(Ft.)
Length of street segment  =  1019.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  48.000(Ft.)
Distance from crown to crossfall grade break  =  47.999(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   0.001(Ft.)
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Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     38.799(CFS)
Depth of flow =   0.649(Ft.), Average velocity =   3.328(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  24.142(Ft.)
Flow velocity =    3.33(Ft/s)
Travel time =    5.10 min.       TC =    9.91  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                      ]
Rainfall intensity =      3.385(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =     50.115(CFS) for   17.420(Ac.)
Total runoff =     52.021(CFS)  Total area =       17.87(Ac.)
Street flow at end of street =     52.021(CFS)
Half street flow at end of street =      26.011(CFS)
Depth of flow =   0.712(Ft.), Average velocity =   3.482(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.80(Ft.)
Flow width (from curb towards crown)=  27.257(Ft.)


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Process from Point/Station      165.000 to Point/Station      170.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =    270.000(Ft.)
Downstream point elevation =   170.000(Ft.)
Channel length thru subarea  =   382.000(Ft.)
Channel base width       =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     59.488(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel   =   10.000(Ft.)
Flow(q) thru subarea =     59.488(CFS)
Depth of flow =   0.622(Ft.), Average velocity =  22.539(Ft/s)
Channel flow top width =    5.488(Ft.)
Flow Velocity =   22.54(Ft/s)
Travel time  =    0.28 min.
Time of concentration =   10.20 min.
Critical depth =      1.625(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.350(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      7.734(CFS) for    5.130(Ac.)
Total runoff =     59.756(CFS)  Total area =       23.00(Ac.)


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Process from Point/Station      175.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    10.20 min.
Rainfall intensity =      3.350(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      2.138(CFS) for    1.160(Ac.)
Total runoff =     61.893(CFS)  Total area =       24.16(Ac.)


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Process from Point/Station      180.000 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    10.20 min.
Rainfall intensity =      3.350(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =     10.485(CFS) for    5.690(Ac.)
Total runoff =     72.378(CFS)  Total area =       29.85(Ac.)


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Process from Point/Station      170.000 to Point/Station      185.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   170.000(Ft.)
Downstream point elevation =    132.000(Ft.)
Channel length thru subarea  =   617.000(Ft.)
Channel base width       =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     84.320(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel   =   10.000(Ft.)
Flow(q) thru subarea =     84.320(CFS)
Depth of flow =   1.096(Ft.), Average velocity =  14.816(Ft/s)
Channel flow top width =    7.384(Ft.)
Flow Velocity =   14.82(Ft/s)
Travel time  =    0.69 min.
Time of concentration =   10.89 min.
Critical depth =      1.938(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.271(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     14.501(CFS) for    9.850(Ac.)
Total runoff =     86.879(CFS)  Total area =       39.70(Ac.)


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Process from Point/Station      190.000 to Point/Station      185.000
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**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =     10.89 min.
Rainfall intensity =      3.271(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       2.087(CFS) for    1.160(Ac.)
Total runoff =     88.966(CFS)  Total area =       40.86(Ac.)


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Process from Point/Station      185.000 to Point/Station      150.000
**** IMPROVED CHANNEL TRAVEL TIME ****

______________________________________________________________________
Upstream point elevation =   132.000(Ft.)
Downstream point elevation =    86.000(Ft.)
Channel length thru subarea  =   723.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     95.999(CFS)
Manning's 'N'     = 0.020
Maximum depth of channel  =   10.000(Ft.)
Flow(q) thru subarea =     95.999(CFS)
Depth of flow =   1.161(Ft.), Average velocity =  15.531(Ft/s)
Channel flow top width =    7.645(Ft.)
Flow Velocity =   15.53(Ft/s)
Travel time  =    0.78 min.
Time of concentration =   11.67 min.
Critical depth =       2.063(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.191(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       9.275(CFS) for    6.460(Ac.)
Total runoff =     98.242(CFS)  Total area =       47.32(Ac.)


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Process from Point/Station      185.000 to Point/Station      150.000
**** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     47.320(Ac.)
Runoff from this stream =     98.242(CFS)
Time of concentration =   11.67 min.
Rainfall intensity =     3.191(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      145.489     14.92                 2.911
2       98.242     11.67                 3.191
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Qmax(1) =
          1.000 *    1.000 *   145.489) +
          0.912 *    1.000 *    98.242) + =     235.122
Qmax(2) =
          1.000 *    0.782 *   145.489) +
          1.000 *    1.000 *    98.242) + =     212.028

Total of 2 streams to confluence:
Flow rates before confluence point:
    145.489      98.242
Maximum flow rates at confluence using above data:
    235.122      212.028
Area of streams before confluence:
     70.930       47.320
Results of confluence:
Total flow rate =    235.122(CFS)
Time of concentration =    14.918 min.
Effective stream area after confluence =    118.250(Ac.)


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Process from Point/Station      150.000 to Point/Station      195.000
**** IMPROVED CHANNEL TRAVEL TIME ****

______________________________________________________________________
Upstream point elevation =    86.000(Ft.)
Downstream point elevation =    72.400(Ft.)
Channel length thru subarea  =   441.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    241.565(CFS)
Manning's 'N'     = 0.020
Maximum depth of channel  =   10.000(Ft.)
Flow(q) thru subarea =    241.565(CFS)
Depth of flow =   2.170(Ft.), Average velocity =  15.169(Ft/s)
Channel flow top width =   11.679(Ft.)
Flow Velocity =   15.17(Ft/s)
Travel time  =    0.48 min.
Time of concentration =   15.40 min.
Critical depth =       3.250(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.875(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       8.384(CFS) for    6.480(Ac.)
Total runoff =    243.507(CFS)  Total area =      124.73(Ac.)


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Process from Point/Station      195.000 to Point/Station      200.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
Upstream point/station elevation =     72.400(Ft.)
Downstream point/station elevation =     62.000(Ft.)
Pipe length  =   143.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   243.507(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   243.507(CFS)
Normal flow depth in pipe =   31.08(In.)
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Flow top width inside pipe =   36.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     31.90(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    15.48 min.


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Process from Point/Station      205.000 to Point/Station      200.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    15.48 min.
Rainfall intensity =      2.870(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.240(CFS) for    0.960(Ac.)
Total runoff =    244.746(CFS)  Total area =      125.69(Ac.)


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Process from Point/Station      210.000 to Point/Station      200.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    15.48 min.
Rainfall intensity =      2.870(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      4.210(CFS) for    3.260(Ac.)
Total runoff =    248.957(CFS)  Total area =      128.95(Ac.)


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Process from Point/Station      200.000 to Point/Station      139.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     68.000(Ft.)
Downstream point/station elevation =     67.000(Ft.)
Pipe length  =     50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    248.957(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   248.957(CFS)
Normal flow depth in pipe =   44.06(In.)
Flow top width inside pipe =   34.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.10(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    15.52 min.


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Process from Point/Station      201.000 to Point/Station      139.500
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    15.52 min.
Rainfall intensity =      2.867(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.490(CFS) for    0.380(Ac.)
Total runoff =    249.447(CFS)  Total area =      129.33(Ac.)


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Process from Point/Station      139.500 to Point/Station      139.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     67.000(Ft.)
Downstream point/station elevation =     65.500(Ft.)
Pipe length  =    150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    249.447(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   249.447(CFS)
Normal flow depth in pipe =   47.06(In.)
Flow top width inside pipe =   49.35(In.)
Critical Depth =   53.02(In.)
Pipe flow velocity =     15.10(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    15.69 min.


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Process from Point/Station      139.500 to Point/Station      139.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     129.330(Ac.)
Runoff from this stream =     249.447(CFS)
Time of concentration =    15.69 min.
Rainfall intensity =     2.855(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      220.000 to Point/Station      225.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Initial subarea flow distance  =  227.000(Ft.)
Highest elevation =  254.000(Ft.)
Lowest elevation =  240.000(Ft.)
Elevation difference =   14.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.13 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 227.000^.5)/( 6.167^(1/3)]=   8.13
Rainfall intensity (I) =      3.637(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.640(CFS)
Total initial stream area =       0.320(Ac.)
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Process from Point/Station      225.000 to Point/Station      230.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    240.000(Ft.)
End of street segment elevation =    208.000(Ft.)
Length of street segment  =   293.000(Ft.)
Height of curb above gutter flowline  =     8.0(In.)
Width of half street (curb to crown)  =  48.000(Ft.)
Distance from crown to crossfall grade break  =  47.999(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   0.001(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      4.831(CFS)
Depth of flow =   0.303(Ft.), Average velocity =   5.219(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.803(Ft.)
Flow velocity =   5.22(Ft/s)
Travel time =    0.94 min.      TC =    9.07  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                         ]
Rainfall intensity =       3.496(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       8.056(CFS) for    4.190(Ac.)
Total runoff =       8.696(CFS)  Total area =        4.51(Ac.)
Street flow at end of street =       8.696(CFS)
Half street flow at end of street =      4.348(CFS)
Depth of flow =   0.336(Ft.), Average velocity =   6.072(Ft/s)
Flow width (from curb towards crown)=   8.461(Ft.)


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Process from Point/Station      230.000 to Point/Station      235.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   208.000(Ft.)
Downstream point elevation =    94.000(Ft.)
Channel length thru subarea  =   502.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     11.039(CFS)
Manning's 'N'     = 0.020
Maximum depth of channel  =   10.000(Ft.)
Flow(q) thru subarea =     11.039(CFS)
Depth of flow =   0.250(Ft.), Average velocity =  12.610(Ft/s)
Channel flow top width =    4.000(Ft.)
Flow Velocity =   12.61(Ft/s)
Travel time  =    0.66 min.
Time of concentration =    9.73 min.
Critical depth =      0.645(Ft.)
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 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       3.407(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       3.726(CFS) for    2.430(Ac.)
Total runoff =      12.422(CFS)  Total area =        6.94(Ac.)


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Process from Point/Station      235.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     94.000(Ft.)
Downstream point/station elevation =     62.000(Ft.)
Pipe length  =    200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     12.422(CFS)
Nearest computed pipe diameter   =     12.00(In.)
Calculated individual pipe flow  =     12.422(CFS)
Normal flow depth in pipe =     8.67(In.)
Flow top width inside pipe =    10.74(In.)
Critical depth could not be calculated.
Pipe flow velocity =      20.45(Ft/s)
Travel time through pipe =     0.16 min.
Time of concentration (TC) =      9.90 min.


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Process from Point/Station      104.100 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =      9.90 min.
Rainfall intensity =       3.387(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       0.533(CFS) for    0.350(Ac.)
Total runoff =      12.955(CFS)  Total area =        7.29(Ac.)


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Process from Point/Station      104.000 to Point/Station      104.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     71.000(Ft.)
Downstream point/station elevation =     65.000(Ft.)
Pipe length  =    120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     12.955(CFS)
Nearest computed pipe diameter   =     15.00(In.)
Calculated individual pipe flow  =     12.955(CFS)
Normal flow depth in pipe =    11.09(In.)
Flow top width inside pipe =    13.17(In.)
Critical depth could not be calculated.
Pipe flow velocity =      13.31(Ft/s)
Travel time through pipe =     0.15 min.
Time of concentration (TC) =     10.05 min.
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Process from Point/Station      104.000 to Point/Station      104.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area =      7.290(Ac.)
Runoff from this stream =     12.955(CFS)
Time of concentration =   10.05 min.
Rainfall intensity =     3.369(In/Hr)


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Process from Point/Station      103.100 to Point/Station      103.500
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  150.000(Ft.)
Highest elevation =  115.000(Ft.)
Lowest elevation =   60.000(Ft.)
Elevation difference =   55.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.31 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 150.000^.5)/(  36.667^(1/3)]=   4.31
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.751(CFS)
Total initial stream area =        0.380(Ac.)


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Process from Point/Station      103.200 to Point/Station      103.500
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =      5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       0.988(CFS) for    0.500(Ac.)
Total runoff =      1.738(CFS)  Total area =        0.88(Ac.)


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Process from Point/Station      103.500 to Point/Station      104.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =      62.000(Ft.)
Downstream point/station elevation =      60.000(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      1.738(CFS)
Nearest computed pipe diameter  =      12.00(In.)
Calculated individual pipe flow  =      1.738(CFS)
Normal flow depth in pipe =     6.47(In.)
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Flow top width inside pipe =   11.96(In.)
Critical Depth =     6.72(In.)
Pipe flow velocity =       4.03(Ft/s)
Travel time through pipe =    1.12 min.
Time of concentration (TC) =     6.12 min.


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Process from Point/Station      103.500 to Point/Station      104.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.880(Ac.)
Runoff from this stream =      1.738(CFS)
Time of concentration =    6.12 min.
Rainfall intensity =     4.050(In/Hr)


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Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  114.100(Ft.)
Highest elevation =  210.000(Ft.)
Lowest elevation =  180.000(Ft.)
Elevation difference =   30.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.20 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 114.100^.5)/(  26.293^(1/3)]=   4.20
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.257(CFS)
Total initial stream area =        0.130(Ac.)


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Process from Point/Station      102.000 to Point/Station      102.500
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   180.000(Ft.)
Downstream point elevation =     66.000(Ft.)
Channel length thru subarea  =   280.000(Ft.)
Channel base width      =   0.530(Ft.)
Slope or 'Z' of left channel bank =    1.000
Slope or 'Z' of right channel bank =    1.000
Estimated mean flow rate at midpoint of channel =       0.780(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel   =    0.100(Ft.)
Flow(q) thru subarea =      0.780(CFS)
Depth of flow =   0.104(Ft.), Average velocity =  11.840(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    0.730(Ft.)
Flow Velocity =    11.84(Ft/s)
Travel time  =    0.39 min.
Time of concentration =     5.39 min.
Critical depth =      0.344(Ft.)
```

```
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      4.256(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.015(CFS) for    0.530(Ac.)
Total runoff =      1.272(CFS)  Total area =        0.66(Ac.)


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Process from Point/Station      102.500 to Point/Station      104.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     68.000(Ft.)
Downstream point/station elevation =     66.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.272(CFS)
Nearest computed pipe diameter  =       9.00(In.)
Calculated individual pipe flow  =     1.272(CFS)
Normal flow depth in pipe =    4.08(In.)
Flow top width inside pipe =    8.96(In.)
Critical Depth =    6.24(In.)
Pipe flow velocity =      6.54(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     5.55 min.


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Process from Point/Station      102.500 to Point/Station      104.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.660(Ac.)
Runoff from this stream =      1.272(CFS)
Time of concentration =    5.55 min.
Rainfall intensity =     4.209(In/Hr)
Summary of stream data:

Stream   Flow rate     TC            Rainfall Intensity
 No.       (CFS)      (min)                 (In/Hr)


1       12.955     10.05                  3.369
2        1.738      6.12                  4.050
3        1.272      5.55                  4.209
Qmax(1) =
           1.000 *    1.000 *    12.955) +
           0.832 *    1.000 *     1.738) +
           0.800 *    1.000 *     1.272) + =      15.419
Qmax(2) =
           1.000 *    0.609 *    12.955) +
           1.000 *    1.000 *     1.738) +
           0.962 *    1.000 *     1.272) + =      10.851
Qmax(3) =
           1.000 *    0.552 *    12.955) +
           1.000 *    0.907 *     1.738) +
           1.000 *    1.000 *     1.272) + =      10.001

Total of 3 streams to confluence:
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```
Flow rates before confluence point:
      12.955        1.738        1.272
Maximum flow rates at confluence using above data:
       15.419       10.851        10.001
Area of streams before confluence:
        7.290        0.880        0.660
Results of confluence:
Total flow rate =     15.419(CFS)
Time of concentration =     10.046 min.
Effective stream area after confluence =      8.830(Ac.)


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Process from Point/Station      104.500 to Point/Station      139.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     66.000(Ft.)
Downstream point/station elevation =     65.500(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     15.419(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =     15.419(CFS)
Normal flow depth in pipe =    18.94(In.)
Flow top width inside pipe =    19.58(In.)
Critical Depth =    16.99(In.)
Pipe flow velocity =      5.80(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    10.33 min.


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Process from Point/Station      104.500 to Point/Station      139.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.830(Ac.)
Runoff from this stream =     15.419(CFS)
Time of concentration =    10.33 min.
Rainfall intensity =     3.334(In/Hr)
Summary of stream data:

Stream   Flow rate     TC            Rainfall Intensity
 No.       (CFS)      (min)                 (In/Hr)


1      249.447     15.69                  2.855
2       15.419     10.33                  3.334
Qmax(1) =
           1.000 *    1.000 *   249.447) +
           0.856 *    1.000 *    15.419) + =     262.648
Qmax(2) =
           1.000 *    0.659 *   249.447) +
           1.000 *    1.000 *    15.419) + =     179.741

Total of 2 main streams to confluence:
Flow rates before confluence point:
     249.447       15.419
Maximum flow rates at confluence using above data:
      262.648       179.741
Area of streams before confluence:
      129.330        8.830
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Results of confluence:
Total flow rate =    262.648(CFS)
Time of concentration =    15.686 min.
Effective stream area after confluence  =    138.160(Ac.)


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Process from Point/Station      139.000 to Point/Station      138.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     65.000(Ft.)
Downstream point/station elevation =     40.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   262.648(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   262.648(CFS)
Normal flow depth in pipe =   35.77(In.)
Flow top width inside pipe =   36.35(In.)
Critical depth could not be calculated.
Pipe flow velocity =     27.90(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    15.99 min.


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Process from Point/Station      139.000 to Point/Station      138.800
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =    138.160(Ac.)
Runoff from this stream =    262.648(CFS)
Time of concentration =   15.99 min.
Rainfall intensity =     2.834(In/Hr)


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Process from Point/Station      257.000 to Point/Station      260.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  137.000(Ft.)
Highest elevation =  218.000(Ft.)
Lowest elevation =  160.000(Ft.)
Elevation difference =   58.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      3.93 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 137.000^.5)/(  42.336^(1/3)]=   3.93
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.573(CFS)
Total initial stream area =        0.290(Ac.)


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Process from Point/Station      260.000 to Point/Station      262.000
**** IMPROVED CHANNEL TRAVEL TIME ****
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```
Upstream point elevation =    160.000(Ft.)
Downstream point elevation =     69.000(Ft.)
Channel length thru subarea  =    230.000(Ft.)
Channel base width       =     3.000(Ft.)
Slope or 'Z' of left channel bank =  10.000
Slope or 'Z' of right channel bank =  10.000
Estimated mean flow rate at midpoint of channel =        1.304(CFS)
Manning's 'N'     = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =       1.304(CFS)
Depth of flow =    0.058(Ft.), Average velocity =    6.312(Ft/s)
Channel flow top width =     4.155(Ft.)
Flow Velocity =     6.31(Ft/s)
Travel time  =     0.61 min.
Time of concentration =      5.61 min.
Critical depth =       0.151(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       4.191(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       1.396(CFS) for     0.740(Ac.)
Total runoff =       1.968(CFS)  Total area =        1.03(Ac.)


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Process from Point/Station      262.000 to Point/Station      117.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =     69.000(Ft.)
Downstream point elevation =     60.000(Ft.)
Channel length thru subarea  =    311.000(Ft.)
Channel base width       =     0.000(Ft.)
Slope or 'Z' of left channel bank =   1.250
Slope or 'Z' of right channel bank =   1.250
Estimated mean flow rate at midpoint of channel =        3.067(CFS)
Manning's 'N'     = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =       3.067(CFS)
Depth of flow =    0.614(Ft.), Average velocity =    6.505(Ft/s)
Channel flow top width =     1.535(Ft.)
Flow Velocity =     6.50(Ft/s)
Travel time  =     0.80 min.
Time of concentration =      6.40 min.
Critical depth =       0.820(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       3.979(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       2.059(CFS) for     1.150(Ac.)
Total runoff =       4.027(CFS)  Total area =        2.18(Ac.)


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Process from Point/Station      117.000 to Point/Station      118.000
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**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =    60.000(Ft.)
Downstream point elevation =    46.000(Ft.)
Channel length thru subarea  =   121.800(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =   1.250
Slope or 'Z' of right channel bank =   1.250
Estimated mean flow rate at midpoint of channel =       5.025(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.025(CFS)
Depth of flow =   0.571(Ft.), Average velocity =  12.344(Ft/s)
Channel flow top width =    1.427(Ft.)
Flow Velocity =   12.34(Ft/s)
Travel time  =    0.16 min.
Time of concentration =    6.57 min.
Critical depth =       1.000(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.940(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.915(CFS) for    1.080(Ac.)
Total runoff =       5.942(CFS)  Total area =        3.26(Ac.)


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Process from Point/Station      118.000 to Point/Station      138.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    39.000(Ft.)
Downstream point/station elevation =    38.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.942(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =      5.942(CFS)
Normal flow depth in pipe =   11.34(In.)
Flow top width inside pipe =   12.88(In.)
Critical Depth =   11.82(In.)
Pipe flow velocity =       5.97(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     6.85 min.


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Process from Point/Station      118.000 to Point/Station      138.800
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.260(Ac.)
Runoff from this stream =       5.942(CFS)
Time of concentration =     6.85 min.
Rainfall intensity =     3.878(In/Hr)
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)
```

```
1      262.648     15.99                 2.834
2        5.942      6.85                 3.878
Qmax(1) =
         1.000 *     1.000 *    262.648) +
         0.731 *     1.000 *      5.942) + =     266.990
Qmax(2) =
         1.000 *     0.428 *    262.648) +
         1.000 *     1.000 *      5.942) + =     118.455

Total of 2 streams to confluence:
Flow rates before confluence point:
    262.648      5.942
Maximum flow rates at confluence using above data:
     266.990      118.455
Area of streams before confluence:
     138.160        3.260
Results of confluence:
Total flow rate =     266.990(CFS)
Time of concentration =    15.985 min.
Effective stream area after confluence =     141.420(Ac.)


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Process from Point/Station      138.800 to Point/Station      138.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    39.400(Ft.)
Downstream point/station elevation =    39.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    266.990(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =    266.990(CFS)
Normal flow depth in pipe =   52.03(In.)
Flow top width inside pipe =   47.78(In.)
Critical Depth =   54.58(In.)
Pipe flow velocity =      13.97(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    16.04 min.


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Process from Point/Station      138.800 to Point/Station      138.700
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     141.420(Ac.)
Runoff from this stream =     266.990(CFS)
Time of concentration =    16.04 min.
Rainfall intensity =     2.829(In/Hr)


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Process from Point/Station      121.000 to Point/Station      122.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                          ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =    62.000(Ft.)
Lowest elevation =    60.000(Ft.)
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Elevation difference =     2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      3.57 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 100.000^.5)/(   2.000^(1/3)]=   3.57
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.634(CFS)
Total initial stream area =       0.170(Ac.)


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Process from Point/Station      122.000 to Point/Station      123.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     60.000(Ft.)
Downstream point/station elevation =     40.000(Ft.)
Pipe length  =    350.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.634(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.634(CFS)
Normal flow depth in pipe =     2.91(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    4.85(In.)
Pipe flow velocity =       6.74(Ft/s)
Travel time through pipe =    0.87 min.
Time of concentration (TC) =     5.87 min.


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Process from Point/Station      122.500 to Point/Station      123.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Time of concentration =     5.87 min.
Rainfall intensity =      4.117(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      2.660(CFS) for     0.760(Ac.)
Total runoff =      3.294(CFS)  Total area =       0.93(Ac.)


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Process from Point/Station      123.000 to Point/Station      123.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Time of concentration =     5.87 min.
Rainfall intensity =      4.117(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.015(CFS) for     0.290(Ac.)
Total runoff =      4.309(CFS)  Total area =       1.22(Ac.)


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Process from Point/Station      123.000 to Point/Station      138.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     41.000(Ft.)
Downstream point/station elevation =     39.000(Ft.)
Pipe length  =     70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.309(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.309(CFS)
Normal flow depth in pipe =     7.51(In.)
Flow top width inside pipe =    11.61(In.)
Critical Depth =    10.47(In.)
Pipe flow velocity =       8.34(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     6.01 min.


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Process from Point/Station      123.000 to Point/Station      138.700
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =       1.220(Ac.)
Runoff from this stream =      4.309(CFS)
Time of concentration =      6.01 min.
Rainfall intensity =      4.079(In/Hr)
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                  (In/Hr)


1      266.990     16.04                 2.829
2        4.309      6.01                 4.079
Qmax(1) =
             1.000 *     1.000 *   266.990) +
             0.694 *     1.000 *     4.309) + =      269.978
Qmax(2) =
             1.000 *     0.374 *   266.990) +
             1.000 *     1.000 *     4.309) + =      104.246

Total of 2 streams to confluence:
Flow rates before confluence point:
     266.990       4.309
Maximum flow rates at confluence using above data:
       269.978       104.246
Area of streams before confluence:
       141.420         1.220
Results of confluence:
Total flow rate =     269.978(CFS)
Time of concentration =     16.045 min.
Effective stream area after confluence =      142.640(Ac.)


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Process from Point/Station      138.700 to Point/Station      138.600
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     39.000(Ft.)
Downstream point/station elevation =     38.000(Ft.)
Pipe length  =     50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   269.978(CFS)
Nearest computed pipe diameter  =     54.00(In.)
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Calculated individual pipe flow  =   269.978(CFS)
Normal flow depth in pipe =   42.94(In.)
Flow top width inside pipe =   43.59(In.)
Critical depth could not be calculated.
Pipe flow velocity =      19.93(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    16.09 min.


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Process from Point/Station      138.700 to Point/Station      138.600
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     142.640(Ac.)
Runoff from this stream =    269.978(CFS)
Time of concentration =   16.09 min.
Rainfall intensity =     2.827(In/Hr)


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Process from Point/Station      127.000 to Point/Station      128.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Initial subarea flow distance  =  200.000(Ft.)
Highest elevation =   41.000(Ft.)
Lowest elevation =   38.000(Ft.)
Elevation difference =     3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.56 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 200.000^.5)/( 1.500^(1/3)]=   5.56
Rainfall intensity (I) =      4.205(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      1.430(CFS)
Total initial stream area =        0.400(Ac.)


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Process from Point/Station      128.000 to Point/Station      138.600
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    39.000(Ft.)
Downstream point/station elevation =    38.000(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.430(CFS)
Nearest computed pipe diameter   =      9.00(In.)
Calculated individual pipe flow  =      1.430(CFS)
Normal flow depth in pipe =    4.75(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =     6.61(In.)
Pipe flow velocity =       6.05(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     5.67 min.


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Process from Point/Station      128.000 to Point/Station      138.600
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**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.400(Ac.)
Runoff from this stream =       1.430(CFS)
Time of concentration =    5.67 min.
Rainfall intensity =     4.173(In/Hr)
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1      269.978     16.09                 2.827
2        1.430      5.67                 4.173
Qmax(1) =
           1.000 *     1.000 *   269.978) +
           0.677 *     1.000 *     1.430) + =     270.947
Qmax(2) =
           1.000 *     0.352 *   269.978) +
           1.000 *     1.000 *     1.430) + =      96.581

Total of 2 streams to confluence:
Flow rates before confluence point:
     269.978       1.430
Maximum flow rates at confluence using above data:
      270.947       96.581
Area of streams before confluence:
      142.640        0.400
Results of confluence:
Total flow rate =    270.947(CFS)
Time of concentration =     16.087 min.
Effective stream area after confluence =     143.040(Ac.)


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Process from Point/Station      138.600 to Point/Station      138.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    38.000(Ft.)
Downstream point/station elevation =    27.000(Ft.)
Pipe length  =    350.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   270.947(CFS)
Nearest computed pipe diameter   =     48.00(In.)
Calculated individual pipe flow  =   270.947(CFS)
Normal flow depth in pipe =   43.13(In.)
Flow top width inside pipe =   29.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =      22.80(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =    16.34 min.


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Process from Point/Station      138.600 to Point/Station      138.300
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     143.040(Ac.)
Runoff from this stream =    270.947(CFS)
Time of concentration =   16.34 min.
Rainfall intensity =     2.809(In/Hr)
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Process from Point/Station      131.000 to Point/Station      132.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Initial subarea flow distance  =    60.000(Ft.)
Highest elevation =   42.000(Ft.)
Lowest elevation =   41.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.94 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*(  60.000^.5)/(   1.667^(1/3)]=    2.94
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.560(CFS)
Total initial stream area =       0.150(Ac.)


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Process from Point/Station      132.000 to Point/Station      133.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =     42.000(Ft.)
End of street segment elevation =     27.000(Ft.)
Length of street segment  =   420.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  15.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.200
Slope from grade break to crown (v/hz)  =    0.200
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =    0.000
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.667(CFS)
Depth of flow =   0.182(Ft.), Average velocity =   4.384(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   2.492(Ft.)
Flow velocity =   4.38(Ft/s)
Travel time =    1.60 min.     TC =    6.60  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Note: user entry of impervious value, Ap = 0.600
Rainfall intensity =      3.934(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.637
Subarea runoff =      2.834(CFS) for    1.130(Ac.)
Total runoff =      3.394(CFS)  Total area =       1.28(Ac.)
Street flow at end of street =      3.394(CFS)
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Half street flow at end of street =      1.697(CFS)
Depth of flow =   0.203(Ft.), Average velocity =   4.737(Ft/s)
Flow width (from curb towards crown)=   2.598(Ft.)


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Process from Point/Station      133.000 to Point/Station      138.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    28.000(Ft.)
Downstream point/station elevation =    27.000(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.394(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.394(CFS)
Normal flow depth in pipe =    6.71(In.)
Flow top width inside pipe =   11.91(In.)
Critical Depth =    9.46(In.)
Pipe flow velocity =       7.50(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     6.69 min.


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Process from Point/Station      133.000 to Point/Station      138.300
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.280(Ac.)
Runoff from this stream =      3.394(CFS)
Time of concentration =     6.69 min.
Rainfall intensity =     3.914(In/Hr)
Summary of stream data:

Stream   Flow rate      TC             Rainfall Intensity
 No.       (CFS)       (min)                   (In/Hr)


1      270.947     16.34                 2.809
2        3.394      6.69                 3.914
Qmax(1) =
          1.000 *    1.000 *   270.947) +
          0.718 *    1.000 *     3.394) + =     273.382
Qmax(2) =
          1.000 *    0.409 *   270.947) +
          1.000 *    1.000 *     3.394) + =     114.236

Total of 2 streams to confluence:
Flow rates before confluence point:
    270.947      3.394
Maximum flow rates at confluence using above data:
     273.382      114.236
Area of streams before confluence:
      143.040        1.280
Results of confluence:
Total flow rate =     273.382(CFS)
Time of concentration =     16.343 min.
Effective stream area after confluence =    144.320(Ac.)


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Process from Point/Station      138.300 to Point/Station      138.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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```
Upstream point/station elevation =     26.000(Ft.)
Downstream point/station elevation =     25.000(Ft.)
Pipe length  =     50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   273.382(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   273.382(CFS)
Normal flow depth in pipe =   43.45(In.)
Flow top width inside pipe =   42.82(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.93(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    16.38 min.
End of computations, total study area =         144.320 (Ac.)
```

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             San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study       Date: 02/03/17
------------------------------------------------------------------------
3948 LIC
PROPOSED CONDITIONS
SYSTEM 400
FILE: S400P100
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********
------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


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Process from Point/Station      400.000 to Point/Station      405.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Initial subarea flow distance  =  204.000(Ft.)
Highest elevation =  278.000(Ft.)
Lowest elevation =  272.000(Ft.)
Elevation difference =    6.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      9.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 204.000^.5)/( 2.941^(1/3)]=   9.87
Rainfall intensity (I) =      3.390(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.783(CFS)
Total initial stream area =        0.420(Ac.)


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Process from Point/Station      405.000 to Point/Station      410.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   272.000(Ft.)
End of street segment elevation =   212.000(Ft.)
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Length of street segment  =   872.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.063
Slope from grade break to crown (v/hz)  =   0.200
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0170
 Manning's N from gutter to grade break =  0.0170
 Manning's N from grade break to crown =  0.0170
Estimated mean flow rate at midpoint of street =      3.617(CFS)
Depth of flow =   0.315(Ft.), Average velocity =   6.988(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   2.740(Ft.)
Flow velocity =   6.99(Ft/s)
Travel time =    2.08 min.      TC =   11.95  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Rainfall intensity =      3.163(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      5.289(CFS) for    3.040(Ac.)
Total runoff =      6.072(CFS)  Total area =        3.46(Ac.)
Street flow at end of street =      6.072(CFS)
Half street flow at end of street =      6.072(CFS)
Depth of flow =   0.393(Ft.), Average velocity =   8.113(Ft/s)
Flow width (from curb towards crown)=   3.133(Ft.)


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Process from Point/Station      410.000 to Point/Station      431.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   212.000(Ft.)
Downstream point elevation =    66.000(Ft.)
Channel length thru subarea  =   362.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      6.326(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =   1.000(Ft.)
Flow(q) thru subarea =      6.326(CFS)
Depth of flow =   0.156(Ft.), Average velocity =  12.886(Ft/s)
Channel flow top width =    3.311(Ft.)
Flow Velocity =   12.89(Ft/s)
Travel time  =    0.47 min.
Time of concentration =   12.42 min.
Critical depth =      0.488(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.119(In/Hr) for a   100.0 year storm
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```
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.407(CFS) for    0.290(Ac.)
Total runoff =      6.479(CFS)  Total area =        3.75(Ac.)


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Process from Point/Station      431.300 to Point/Station      431.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    12.42 min.
Rainfall intensity =      3.119(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.446(CFS) for    1.030(Ac.)
Total runoff =      7.924(CFS)  Total area =        4.78(Ac.)


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Process from Point/Station      431.000 to Point/Station      432.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =    60.000(Ft.)
Downstream point elevation =    58.000(Ft.)
Channel length thru subarea  =   100.000(Ft.)
Channel base width       =    50.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      8.223(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel   =    5.000(Ft.)
Flow(q) thru subarea =      8.223(CFS)
Depth of flow =   0.069(Ft.), Average velocity =   2.362(Ft/s)
Channel flow top width =   50.278(Ft.)
Flow Velocity =    2.36(Ft/s)
Travel time  =    0.71 min.
Time of concentration =   13.12 min.
Critical depth =      0.094(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.056(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.495(CFS) for    0.360(Ac.)
Total runoff =      8.419(CFS)  Total area =        5.14(Ac.)


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Process from Point/Station      432.000 to Point/Station      432.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    45.000(Ft.)
Downstream point/station elevation =    40.000(Ft.)
Pipe length  =   50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.419(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     8.419(CFS)
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Normal flow depth in pipe =    7.73(In.)
Flow top width inside pipe =   11.49(In.)
Critical depth could not be calculated.
Pipe flow velocity =      15.73(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    13.18 min.


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Process from Point/Station      432.000 to Point/Station      432.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.140(Ac.)
Runoff from this stream =      8.419(CFS)
Time of concentration =   13.18 min.
Rainfall intensity =     3.051(In/Hr)


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Process from Point/Station      402.000 to Point/Station      403.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  157.000(Ft.)
Highest elevation =  190.000(Ft.)
Lowest elevation =  160.000(Ft.)
Elevation difference =   30.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.48 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 157.000^.5)/(19.108^(1/3)]=   5.48
Rainfall intensity (I) =      4.228(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.342(CFS)
Total initial stream area =       0.180(Ac.)


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Process from Point/Station      403.000 to Point/Station      404.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Covered channel
Upstream point elevation =   160.000(Ft.)
Downstream point elevation =    48.000(Ft.)
Channel length thru subarea  =   300.000(Ft.)
Channel base width       =    1.660(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      2.369(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel   =    0.100(Ft.)
Flow(q) thru subarea =      2.369(CFS)
Pressure flow condition in covered channel:
Wetted perimeter =     3.80(Ft.)  Flow area =     0.18(Sq.Ft)
Hydraulic grade line required at box inlet =  14146.235(Ft.)
Friction loss =  14244.169(Ft.)
Minor Friction loss =     14.065(Ft.)   K-Factor =  5.000
Flow Velocity =   13.46(Ft/s)
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Travel time  =     0.37 min.
Time of concentration =     5.86 min.
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      4.120(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      3.949(CFS) for    2.130(Ac.)
Total runoff =      4.291(CFS)  Total area =        2.31(Ac.)


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Process from Point/Station      404.000 to Point/Station      432.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     42.000(Ft.)
Downstream point/station elevation =     39.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =      4.291(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.291(CFS)
Normal flow depth in pipe =     6.85(In.)
Flow top width inside pipe =    11.88(In.)
Critical Depth =   10.45(In.)
Pipe flow velocity =      9.26(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     5.96 min.


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Process from Point/Station      404.000 to Point/Station      432.500
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.310(Ac.)
Runoff from this stream =      4.291(CFS)
Time of concentration =     5.96 min.
Rainfall intensity =     4.091(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)


1         8.419      13.18                 3.051
2         4.291       5.96                 4.091
Qmax(1) =
           1.000 *    1.000 *     8.419) +
           0.746 *    1.000 *     4.291) + =      11.620
Qmax(2) =
           1.000 *    0.453 *     8.419) +
           1.000 *    1.000 *     4.291) + =       8.102

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.419       4.291
Maximum flow rates at confluence using above data:
      11.620       8.102
Area of streams before confluence:
       5.140       2.310
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Results of confluence:
Total flow rate =     11.620(CFS)
Time of concentration =     13.176 min.
Effective stream area after confluence =      7.450(Ac.)


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Process from Point/Station      432.500 to Point/Station      435.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     40.000(Ft.)
Downstream point/station elevation =     26.000(Ft.)
Pipe length  =    180.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     11.620(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     11.620(CFS)
Normal flow depth in pipe =     9.64(In.)
Flow top width inside pipe =    14.37(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.94(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     13.39 min.


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Process from Point/Station      432.500 to Point/Station      435.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.450(Ac.)
Runoff from this stream =      11.620(CFS)
Time of concentration =    13.39 min.
Rainfall intensity =     3.033(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      433.000 to Point/Station      433.100
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                          ]
Initial subarea flow distance  =    70.000(Ft.)
Highest elevation =    42.000(Ft.)
Lowest elevation =    41.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      4.21 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*(  70.000^.5)/(   0.714^(1/3)]=    4.21
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      1.045(CFS)
Total initial stream area =        0.280(Ac.)


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Process from Point/Station      433.100 to Point/Station      433.200
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**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =    40.000(Ft.)
Downstream point elevation =    38.000(Ft.)
Channel length thru subarea  =   220.000(Ft.)
Channel base width      =   60.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =      2.071(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      2.071(CFS)
Depth of flow =   0.034(Ft.), Average velocity =   1.000(Ft/s)
Channel flow top width =   60.000(Ft.)
Flow Velocity =     1.00(Ft/s)
Travel time  =    3.67 min.
Time of concentration =    8.67 min.
Critical depth =      0.033(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                      ]
Rainfall intensity =       3.554(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.662(CFS) for    0.550(Ac.)
Total runoff =      2.706(CFS)  Total area =        0.83(Ac.)


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Process from Point/Station      433.200 to Point/Station      434.600
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    37.000(Ft.)
Downstream point/station elevation =    30.000(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      2.706(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =      2.706(CFS)
Normal flow depth in pipe =     6.52(In.)
Flow top width inside pipe =     8.05(In.)
Critical Depth =     8.47(In.)
Pipe flow velocity =        7.90(Ft/s)
Travel time through pipe =     0.42 min.
Time of concentration (TC) =      9.09 min.


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Process from Point/Station      433.200 to Point/Station      434.600
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.830(Ac.)
Runoff from this stream =       2.706(CFS)
Time of concentration =     9.09 min.
Rainfall intensity =     3.493(In/Hr)


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Process from Point/Station      434.000 to Point/Station      434.100
**** INITIAL AREA EVALUATION ****
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                      ]
Initial subarea flow distance  =   50.000(Ft.)
Highest elevation =    50.000(Ft.)
Lowest elevation =    49.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.53 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 50.000^.5)/( 2.000^(1/3)]=   2.53
Rainfall intensity (I) =      5.962(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      1.571(CFS)
Total initial stream area =        0.310(Ac.)


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Process from Point/Station      434.100 to Point/Station      434.500
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    39.000(Ft.)
End of street segment elevation =    32.000(Ft.)
Length of street segment  =   340.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  15.000(Ft.)
Distance from crown to crossfall grade break  =   7.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.787(CFS)
Depth of flow =   0.304(Ft.), Average velocity =   3.052(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.869(Ft.)
Flow velocity =   3.05(Ft/s)
Travel time =    1.86 min.     TC =    4.38  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                      ]
Rainfall intensity =      4.637(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.892(CFS) for    0.480(Ac.)
Total runoff =      3.463(CFS)  Total area =        0.79(Ac.)
Street flow at end of street =      3.463(CFS)
Half street flow at end of street =      3.463(CFS)
Depth of flow =   0.322(Ft.), Average velocity =   3.204(Ft/s)
Flow width (from curb towards crown)=   9.767(Ft.)


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Process from Point/Station      434.300 to Point/Station      434.500
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**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =     4.38 min.
Rainfall intensity =     4.637(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.813(CFS) for     0.460(Ac.)
Total runoff =       5.276(CFS)  Total area =        1.25(Ac.)


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Process from Point/Station      434.500 to Point/Station      434.600
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     30.000(Ft.)
Downstream point/station elevation =     29.000(Ft.)
Pipe length   =     50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      5.276(CFS)
Nearest computed pipe diameter   =     15.00(In.)
Calculated individual pipe flow   =      5.276(CFS)
Normal flow depth in pipe =     8.18(In.)
Flow top width inside pipe =    14.94(In.)
Critical Depth =    11.17(In.)
Pipe flow velocity =        7.71(Ft/s)
Travel time through pipe =     0.11 min.
Time of concentration (TC) =      4.49 min.


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Process from Point/Station      434.500 to Point/Station      434.600
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.250(Ac.)
Runoff from this stream =        5.276(CFS)
Time of concentration =     4.49 min.
Rainfall intensity =     4.589(In/Hr)
Summary of stream data:

Stream    Flow rate       TC              Rainfall Intensity
 No.        (CFS)        (min)                   (In/Hr)


1        2.706       9.09                   3.493
2        5.276       4.49                   4.589
Qmax(1) =
           1.000 *    1.000 *     2.706) +
           0.761 *    1.000 *     5.276) + =        6.722
Qmax(2) =
           1.000 *    0.494 *     2.706) +
           1.000 *    1.000 *     5.276) + =        6.613

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.706        5.276
Maximum flow rates at confluence using above data:
        6.722         6.613
Area of streams before confluence:
        0.830         1.250
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Results of confluence:
Total flow rate =       6.722(CFS)
Time of concentration =      9.088 min.
Effective stream area after confluence =       2.080(Ac.)


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Process from Point/Station      434.600 to Point/Station      435.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     30.000(Ft.)
Downstream point/station elevation =     26.000(Ft.)
Pipe length   =    250.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      6.722(CFS)
Nearest computed pipe diameter   =     15.00(In.)
Calculated individual pipe flow   =      6.722(CFS)
Normal flow depth in pipe =    10.36(In.)
Flow top width inside pipe =    13.87(In.)
Critical Depth =    12.50(In.)
Pipe flow velocity =        7.43(Ft/s)
Travel time through pipe =     0.56 min.
Time of concentration (TC) =      9.65 min.


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Process from Point/Station      434.600 to Point/Station      435.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.080(Ac.)
Runoff from this stream =        6.722(CFS)
Time of concentration =     9.65 min.
Rainfall intensity =     3.418(In/Hr)
Summary of stream data:

Stream    Flow rate       TC              Rainfall Intensity
 No.        (CFS)        (min)                   (In/Hr)


1       11.620      13.39                   3.033
2        6.722       9.65                   3.418
Qmax(1) =
           1.000 *    1.000 *    11.620) +
           0.887 *    1.000 *     6.722) + =       17.584
Qmax(2) =
           1.000 *    0.721 *    11.620) +
           1.000 *    1.000 *     6.722) + =       15.094

Total of 2 main streams to confluence:
Flow rates before confluence point:
      11.620        6.722
Maximum flow rates at confluence using above data:
       17.584        15.094
Area of streams before confluence:
        7.450         2.080


Results of confluence:
Total flow rate =      17.584(CFS)
Time of concentration =     13.391 min.
Effective stream area after confluence  =      9.530(Ac.)
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Process from Point/Station      435.000 to Point/Station      437.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     26.000(Ft.)
Downstream point/station elevation =     25.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.584(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =     17.584(CFS)
Normal flow depth in pipe =   15.91(In.)
Flow top width inside pipe =   22.69(In.)
Critical Depth =   18.13(In.)
Pipe flow velocity =      7.96(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    13.60 min.


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Process from Point/Station      435.000 to Point/Station      437.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      9.530(Ac.)
Runoff from this stream =     17.584(CFS)
Time of concentration =   13.60 min.
Rainfall intensity =     3.015(In/Hr)


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Process from Point/Station      436.000 to Point/Station      436.100
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                     ]
Initial subarea flow distance  =    60.000(Ft.)
Highest elevation =    50.000(Ft.)
Lowest elevation =   49.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.76 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  60.000^.5)/(   1.667^(1/3)]=   1.76
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      3.252(CFS)
Total initial stream area =        0.780(Ac.)


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Process from Point/Station      436.100 to Point/Station      436.200
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =    30.000(Ft.)
Downstream point elevation =    28.000(Ft.)
Channel length thru subarea  =   175.000(Ft.)
Channel base width       =   40.000(Ft.)
Slope or 'Z' of left channel bank = 100.000
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Slope or 'Z' of right channel bank = 100.000
Estimated mean flow rate at midpoint of channel =      4.003(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     4.003(CFS)
Depth of flow =   0.059(Ft.), Average velocity =   1.480(Ft/s)
Channel flow top width =   51.788(Ft.)
Flow Velocity =    1.48(Ft/s)
Travel time  =    1.97 min.
Time of concentration =    6.97 min.
Critical depth =     0.064(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                     ]
Rainfall intensity =      3.852(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.179(CFS) for    0.360(Ac.)
Total runoff =      4.431(CFS)  Total area =       1.14(Ac.)


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Process from Point/Station      436.200 to Point/Station      437.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    27.000(Ft.)
Downstream point/station elevation =    26.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.431(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.431(CFS)
Normal flow depth in pipe =    9.98(In.)
Flow top width inside pipe =   14.15(In.)
Critical Depth =   10.23(In.)
Pipe flow velocity =      5.11(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =     7.40 min.


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Process from Point/Station      436.200 to Point/Station      437.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.140(Ac.)
Runoff from this stream =     4.431(CFS)
Time of concentration =    7.40 min.
Rainfall intensity =     3.768(In/Hr)
Summary of stream data:

Stream   Flow rate      TC             Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       17.584     13.60                3.015
2        4.431      7.40                3.768
Qmax(1) =
          1.000 *    1.000 *    17.584) +
          0.800 *    1.000 *     4.431) + =      21.130
Qmax(2) =
          1.000 *    0.544 *    17.584) +
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          1.000 *    1.000 *     4.431) + =      13.993

Total of 2 streams to confluence:
Flow rates before confluence point:
      17.584       4.431
Maximum flow rates at confluence using above data:
       21.130       13.993
Area of streams before confluence:
        9.530       1.140
Results of confluence:
Total flow rate =      21.130(CFS)
Time of concentration =    13.600 min.
Effective stream area after confluence =     10.670(Ac.)


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Process from Point/Station      437.000 to Point/Station      439.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    25.000(Ft.)
Downstream point/station elevation =    23.000(Ft.)
Pipe length  =    120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.130(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    21.130(CFS)
Normal flow depth in pipe =    17.91(In.)
Flow top width inside pipe =   14.89(In.)
Critical Depth =    19.47(In.)
Pipe flow velocity =        9.67(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    13.81 min.


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Process from Point/Station      439.000 to Point/Station      439.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Note: user entry of impervious value, Ap = 0.350
Time of concentration =    13.81 min.
Rainfall intensity =      2.998(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.500
Subarea runoff =      0.480(CFS) for    0.320(Ac.)
Total runoff =     21.610(CFS)  Total area =       10.99(Ac.)


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Process from Point/Station      439.000 to Point/Station      444.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    24.500(Ft.)
Downstream point/station elevation =    23.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.610(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    21.610(CFS)
Normal flow depth in pipe =    15.05(In.)
Flow top width inside pipe =   18.93(In.)
Critical Depth =    19.57(In.)
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Pipe flow velocity =      11.72(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    13.89 min.


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Process from Point/Station      439.000 to Point/Station      444.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      10.990(Ac.)
Runoff from this stream =     21.610(CFS)
Time of concentration =   13.89 min.
Rainfall intensity =      2.991(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      442.100 to Point/Station      442.200
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   50.000(Ft.)
Lowest elevation =   49.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      4.50 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 100.000^.5)/(   1.000^(1/3)]=   4.50
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.970(CFS)
Total initial stream area =       0.260(Ac.)


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Process from Point/Station      442.200 to Point/Station      442.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     30.000(Ft.)
Downstream point/station elevation =    26.000(Ft.)
Pipe length  =    400.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.970(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.970(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =    8.95(In.)
Critical Depth =    5.42(In.)
Pipe flow velocity =       3.89(Ft/s)
Travel time through pipe =    1.71 min.
Time of concentration (TC) =     6.71 min.


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Process from Point/Station      442.500 to Point/Station      442.500
**** SUBAREA FLOW ADDITION ****
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =      6.71 min.
Rainfall intensity =      3.908(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      6.710(CFS) for    2.020(Ac.)
Total runoff =      7.680(CFS)  Total area =        2.28(Ac.)


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Process from Point/Station      442.500 to Point/Station      442.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    25.000(Ft.)
Downstream point/station elevation =    23.000(Ft.)
Pipe length  =   370.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.680(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.680(CFS)
Normal flow depth in pipe =   14.67(In.)
Flow top width inside pipe =   13.98(In.)
Critical Depth =   12.88(In.)
Pipe flow velocity =      4.98(Ft/s)
Travel time through pipe =    1.24 min.
Time of concentration (TC) =     7.95 min.


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Process from Point/Station      442.500 to Point/Station      442.700
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.280(Ac.)
Runoff from this stream =      7.680(CFS)
Time of concentration =    7.95 min.
Rainfall intensity =     3.668(In/Hr)


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Process from Point/Station      438.000 to Point/Station      438.100
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Initial subarea flow distance  =  130.000(Ft.)
Highest elevation =   31.000(Ft.)
Lowest elevation =   29.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.44 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 130.000^.5)/(   1.538^(1/3)]=   4.44
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.261(CFS)
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Total initial stream area =        0.070(Ac.)


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Process from Point/Station      438.100 to Point/Station      438.200
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =     29.000(Ft.)
End of street segment elevation =     25.000(Ft.)
Length of street segment  =   170.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =   0.500(Ft.)
Slope from gutter to grade break (v/hz) =  -0.010
Slope from grade break to crown (v/hz)  =  -0.010
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   1.000
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      0.316(CFS)
Depth of flow =   0.049(Ft.), Average velocity =   1.290(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  40.000(Ft.)
Flow velocity =   1.29(Ft/s)
Travel time =    2.20 min.     TC =    7.20  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Rainfall intensity =      3.807(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.359(CFS) for    0.420(Ac.)
Total runoff =      1.620(CFS)  Total area =        0.49(Ac.)
Street flow at end of street =      1.620(CFS)
Half street flow at end of street =      0.810(CFS)
Depth of flow =   0.091(Ft.), Average velocity =   1.942(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  40.000(Ft.)


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Process from Point/Station      438.200 to Point/Station      442.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    24.000(Ft.)
Downstream point/station elevation =    23.500(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     1.620(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.620(CFS)
Normal flow depth in pipe =    6.18(In.)
Flow top width inside pipe =   11.99(In.)
Critical Depth =    6.48(In.)
Pipe flow velocity =      3.98(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     7.41 min.
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Process from Point/Station      438.200 to Point/Station      442.700
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.490(Ac.)
Runoff from this stream =       1.620(CFS)
Time of concentration =    7.41 min.
Rainfall intensity =     3.766(In/Hr)
Summary of stream data:

Stream    Flow rate      TC             Rainfall Intensity
 No.        (CFS)       (min)                  (In/Hr)


1        7.680      7.95                 3.668
2        1.620      7.41                 3.766
Qmax(1) =
           1.000 *    1.000 *     7.680) +
           0.974 *    1.000 *     1.620) + =       9.258
Qmax(2) =
           1.000 *    0.931 *     7.680) +
           1.000 *    1.000 *     1.620) + =       8.773

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.680       1.620
Maximum flow rates at confluence using above data:
        9.258       8.773
Area of streams before confluence:
        2.280        0.490
Results of confluence:
Total flow rate =      9.258(CFS)
Time of concentration =     7.951 min.
Effective stream area after confluence =      2.770(Ac.)


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Process from Point/Station      442.700 to Point/Station      444.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    23.500(Ft.)
Downstream point/station elevation =    22.500(Ft.)
Pipe length   =    110.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.258(CFS)
Nearest computed pipe diameter   =     18.00(In.)
Calculated individual pipe flow   =     9.258(CFS)
Normal flow depth in pipe =   13.66(In.)
Flow top width inside pipe =   15.39(In.)
Critical Depth =    14.10(In.)
Pipe flow velocity =       6.43(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     8.24 min.


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Process from Point/Station      442.700 to Point/Station      444.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
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Stream flow area =      2.770(Ac.)
Runoff from this stream =      9.258(CFS)
Time of concentration =    8.24 min.
Rainfall intensity =     3.621(In/Hr)
Summary of stream data:

Stream   Flow rate       TC             Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)


1       21.610     13.89                  2.991
2        9.258      8.24                  3.621
Qmax(1) =
          1.000 *    1.000 *    21.610) +
          0.826 *    1.000 *     9.258) + =      29.258
Qmax(2) =
          1.000 *    0.593 *    21.610) +
          1.000 *    1.000 *     9.258) + =      22.068

Total of 2 main streams to confluence:
Flow rates before confluence point:
     21.610       9.258
Maximum flow rates at confluence using above data:
      29.258      22.068
Area of streams before confluence:
       10.990        2.770


Results of confluence:
Total flow rate =     29.258(CFS)
Time of concentration =     13.893 min.
Effective stream area after confluence  =     13.760(Ac.)


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Process from Point/Station      444.000 to Point/Station      476.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    23.500(Ft.)
Downstream point/station elevation =    23.000(Ft.)
Pipe length   =     50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.258(CFS)
Nearest computed pipe diameter   =     27.00(In.)
Calculated individual pipe flow   =    29.258(CFS)
Normal flow depth in pipe =   20.91(In.)
Flow top width inside pipe =   22.57(In.)
Critical Depth =   22.51(In.)
Pipe flow velocity =      8.86(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    13.99 min.


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Process from Point/Station      444.000 to Point/Station      476.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     13.760(Ac.)
Runoff from this stream =     29.258(CFS)
Time of concentration =   13.99 min.
Rainfall intensity =     2.984(In/Hr)
Program is now starting with Main Stream No. 2
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Process from Point/Station      440.000 to Point/Station      445.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Initial subarea flow distance  =  279.000(Ft.)
Highest elevation =  266.000(Ft.)
Lowest elevation =  256.000(Ft.)
Elevation difference =   10.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     10.81 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 279.000^.5)/( 3.584^(1/3)]=  10.81
Rainfall intensity (I) =      3.281(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =       0.812(CFS)
Total initial stream area =         0.450(Ac.)


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Process from Point/Station      445.000 to Point/Station      450.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   256.000(Ft.)
End of street segment elevation =   206.000(Ft.)
Length of street segment  =   639.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.063
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0170
 Manning's N from gutter to grade break =  0.0170
 Manning's N from grade break to crown =  0.0170
Estimated mean flow rate at midpoint of street =      2.797(CFS)
Depth of flow =   0.264(Ft.), Average velocity =   4.681(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.862(Ft.)
Flow velocity =    4.68(Ft/s)
Travel time =     2.28 min.      TC =   13.08  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Rainfall intensity =      3.059(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       3.702(CFS) for    2.200(Ac.)
Total runoff =      4.514(CFS)  Total area =         2.65(Ac.)
Street flow at end of street =      4.514(CFS)
Half street flow at end of street =       4.514(CFS)
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Depth of flow =   0.299(Ft.), Average velocity =   5.180(Ft/s)
Flow width (from curb towards crown)=   8.630(Ft.)


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Process from Point/Station      450.000 to Point/Station      455.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   206.000(Ft.)
Downstream point elevation =    45.000(Ft.)
Channel length thru subarea  =    580.000(Ft.)
Channel base width        =    2.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =       6.583(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel   =    2.000(Ft.)
Flow(q) thru subarea =      6.583(CFS)
Depth of flow =    0.191(Ft.), Average velocity =  15.701(Ft/s)
Channel flow top width =    2.383(Ft.)
Flow Velocity =   15.70(Ft/s)
Travel time  =    0.62 min.
Time of concentration =   13.70 min.
Critical depth =      0.625(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.007(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      3.288(CFS) for    2.430(Ac.)
Total runoff =      7.802(CFS)  Total area =         5.08(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      453.000 to Point/Station      455.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    13.70 min.
Rainfall intensity =      3.007(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       0.311(CFS) for    0.230(Ac.)
Total runoff =      8.114(CFS)  Total area =         5.31(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      455.000 to Point/Station      456.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Covered channel
Upstream point elevation =    40.000(Ft.)
Downstream point elevation =    20.000(Ft.)
Channel length thru subarea  =    392.000(Ft.)
Channel base width        =    1.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
```

```
Estimated mean flow rate at midpoint of channel =      8.320(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    0.100(Ft.)
Flow(q) thru subarea =      8.320(CFS)
Pressure flow condition in covered channel:
Wetted perimeter =    2.48(Ft.)  Flow area =    0.11(Sq.Ft)
Hydraulic grade line required at box inlet = 515150.439(Ft.)
Friction loss = 515170.439(Ft.)
Minor Friction loss =      0.000(Ft.)    K-Factor =  0.000
Flow Velocity =   75.64(Ft/s)
Travel time  =    0.09 min.
Time of concentration =   13.78 min.
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                      ]
Rainfall intensity =      3.000(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.770(CFS) for    0.270(Ac.)
Total runoff =      8.883(CFS)  Total area =        5.58(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      460.000 to Point/Station      456.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                      ]
Time of concentration =    13.78 min.
Rainfall intensity =      3.000(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      6.911(CFS) for    2.710(Ac.)
Total runoff =     15.794(CFS)  Total area =        8.29(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      460.000 to Point/Station      456.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area =      8.290(Ac.)
Runoff from this stream =     15.794(CFS)
Time of concentration =   13.78 min.
Rainfall intensity =     3.000(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      465.000 to Point/Station      470.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                      ]
Initial subarea flow distance  =   95.000(Ft.)
Highest elevation =   29.000(Ft.)
Lowest elevation =   28.500(Ft.)
```

```
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      3.26 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  95.000^.5)/( 0.526^(1/3)]=   3.26
Rainfall intensity (I) =      5.284(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.653(CFS)
Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      470.000 to Point/Station      475.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =     28.500(Ft.)
End of street segment elevation =     25.200(Ft.)
Length of street segment  =   191.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  23.000(Ft.)
Distance from crown to crossfall grade break  =  21.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.250(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =       1.983(CFS)
Depth of flow =   0.200(Ft.), Average velocity =   2.200(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.285(Ft.)
Flow velocity =   2.20(Ft/s)
Travel time =    1.45 min.     TC =    4.71  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                      ]
Rainfall intensity =      4.500(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.266(CFS) for    0.530(Ac.)
Total runoff =      2.918(CFS)  Total area =        0.66(Ac.)
Street flow at end of street =      2.918(CFS)
Half street flow at end of street =      1.459(CFS)
Depth of flow =   0.223(Ft.), Average velocity =   2.404(Ft/s)
Flow width (from curb towards crown)=   7.426(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      475.000 to Point/Station      456.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =     25.200(Ft.)
End of street segment elevation =     22.300(Ft.)
Length of street segment  =   469.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  23.000(Ft.)
Distance from crown to crossfall grade break  =  21.500(Ft.)
```

```
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.250(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.195(CFS)
Depth of flow =   0.377(Ft.), Average velocity =   2.212(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.144(Ft.)
Flow velocity =   2.21(Ft/s)
Travel time =    3.53 min.     TC =    8.24  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.620(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.542(CFS) for    1.030(Ac.)
Total runoff =      6.460(CFS)  Total area =        1.69(Ac.)
Street flow at end of street =      6.460(CFS)
Half street flow at end of street =      6.460(CFS)
Depth of flow =   0.404(Ft.), Average velocity =   2.334(Ft/s)
Flow width (from curb towards crown)=  16.470(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      475.100 to Point/Station      456.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Note: user entry of impervious value, Ap = 0.350
Time of concentration =     8.24 min.
Rainfall intensity =      3.620(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.500
Subarea runoff =      0.272(CFS) for    0.150(Ac.)
Total runoff =      6.732(CFS)  Total area =        1.84(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      475.100 to Point/Station      456.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.840(Ac.)
Runoff from this stream =      6.732(CFS)
Time of concentration =    8.24 min.
Rainfall intensity =     3.620(In/Hr)
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)
```

```
1       15.794     13.78                3.000
2        6.732      8.24                3.620
Qmax(1) =
           1.000 *    1.000 *    15.794) +
           0.829 *    1.000 *     6.732) + =      21.373
Qmax(2) =
           1.000 *    0.598 *    15.794) +
           1.000 *    1.000 *     6.732) + =      16.175

Total of 2 streams to confluence:
Flow rates before confluence point:
      15.794       6.732
Maximum flow rates at confluence using above data:
       21.373      16.175
Area of streams before confluence:
        8.290        1.840
Results of confluence:
Total flow rate =      21.373(CFS)
Time of concentration =    13.783 min.
Effective stream area after confluence =     10.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      456.000 to Point/Station      476.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    23.000(Ft.)
Downstream point/station elevation =    22.500(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.373(CFS)
Nearest computed pipe diameter   =    24.00(In.)
Calculated individual pipe flow  =    21.373(CFS)
Normal flow depth in pipe =   15.25(In.)
Flow top width inside pipe =   23.11(In.)
Critical Depth =   19.86(In.)
Pipe flow velocity =      10.15(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    13.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      456.000 to Point/Station      476.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      10.130(Ac.)
Runoff from this stream =      21.373(CFS)
Time of concentration =    13.83 min.
Rainfall intensity =     2.996(In/Hr)
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1       29.258     13.99                2.984
2       21.373     13.83                2.996
Qmax(1) =
           1.000 *    1.000 *    29.258) +
           0.996 *    1.000 *    21.373) + =      50.542
Qmax(2) =
```

```
          1.000 *    0.989 *    29.258) +
          1.000 *    1.000 *    21.373) + =      50.308

Total of 2 main streams to confluence:
Flow rates before confluence point:
      29.258      21.373
Maximum flow rates at confluence using above data:
       50.542       50.308
Area of streams before confluence:
       13.760       10.130


Results of confluence:
Total flow rate =     50.542(CFS)
Time of concentration =    13.987 min.
Effective stream area after confluence  =     23.890(Ac.)
End of computations, total study area =         23.890 (Ac.)
```

```
                 San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 05/21/14
------------------------------------------------------------------------
3948 LIC
PROPOSED CONDITIONS
SYSTEM 500
FILE: S500P100
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      505.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                      ]
Initial subarea flow distance  =     77.000(Ft.)
Highest elevation =   28.500(Ft.)
Lowest elevation =   26.900(Ft.)
Elevation difference =    1.600(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.86 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  77.000^.5)/( 2.078^(1/3)]=   1.86
Rainfall intensity (I) =       6.962(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      1.124(CFS)
Total initial stream area =        0.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      505.000 to Point/Station      510.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =     26.900(Ft.)
End of street segment elevation =     26.300(Ft.)
```

```
Length of street segment  =   265.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  23.000(Ft.)
Distance from crown to crossfall grade break  =  21.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.250(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =       2.712(CFS)
Depth of flow =   0.360(Ft.), Average velocity =   1.291(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.302(Ft.)
Flow velocity =    1.29(Ft/s)
Travel time =    3.42 min.      TC =    5.28  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                      ]
Rainfall intensity =       4.293(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.958(CFS) for    0.480(Ac.)
Total runoff =      3.082(CFS)  Total area =        0.65(Ac.)
Street flow at end of street =       3.082(CFS)
Half street flow at end of street =       3.082(CFS)
Depth of flow =   0.375(Ft.), Average velocity =   1.332(Ft/s)
Flow width (from curb towards crown)=  15.028(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      520.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =     26.300(Ft.)
End of street segment elevation =     24.000(Ft.)
Length of street segment  =   289.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  23.000(Ft.)
Distance from crown to crossfall grade break  =  21.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.250(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =       3.793(CFS)
Depth of flow =   0.329(Ft.), Average velocity =   2.252(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.763(Ft.)
Flow velocity =    2.25(Ft/s)
Travel time =    2.14 min.      TC =    7.42  min.
 Adding area flow to street
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                   ]
Rainfall intensity =     3.764(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.073(CFS) for    0.300(Ac.)
Total runoff =      4.155(CFS)  Total area =       0.95(Ac.)
Street flow at end of street =      4.155(CFS)
Half street flow at end of street =      4.155(CFS)
Depth of flow =   0.339(Ft.), Average velocity =   2.303(Ft/s)
Flow width (from curb towards crown)=  13.224(Ft.)
End of computations, total study area =          0.950 (Ac.)
```

APPENDIX 4

Exhibits

0 50 100 200 300
GRAPHICAL SCALE

SCALE: 1"=100'
JOB #: 3948.00
CREATED: 06/28/13

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Environmental | Engineering | Survey
701 B Street, Suite 800 San Diego, CA 92101
619.235.6471 Tel 619.234.0349 Fax

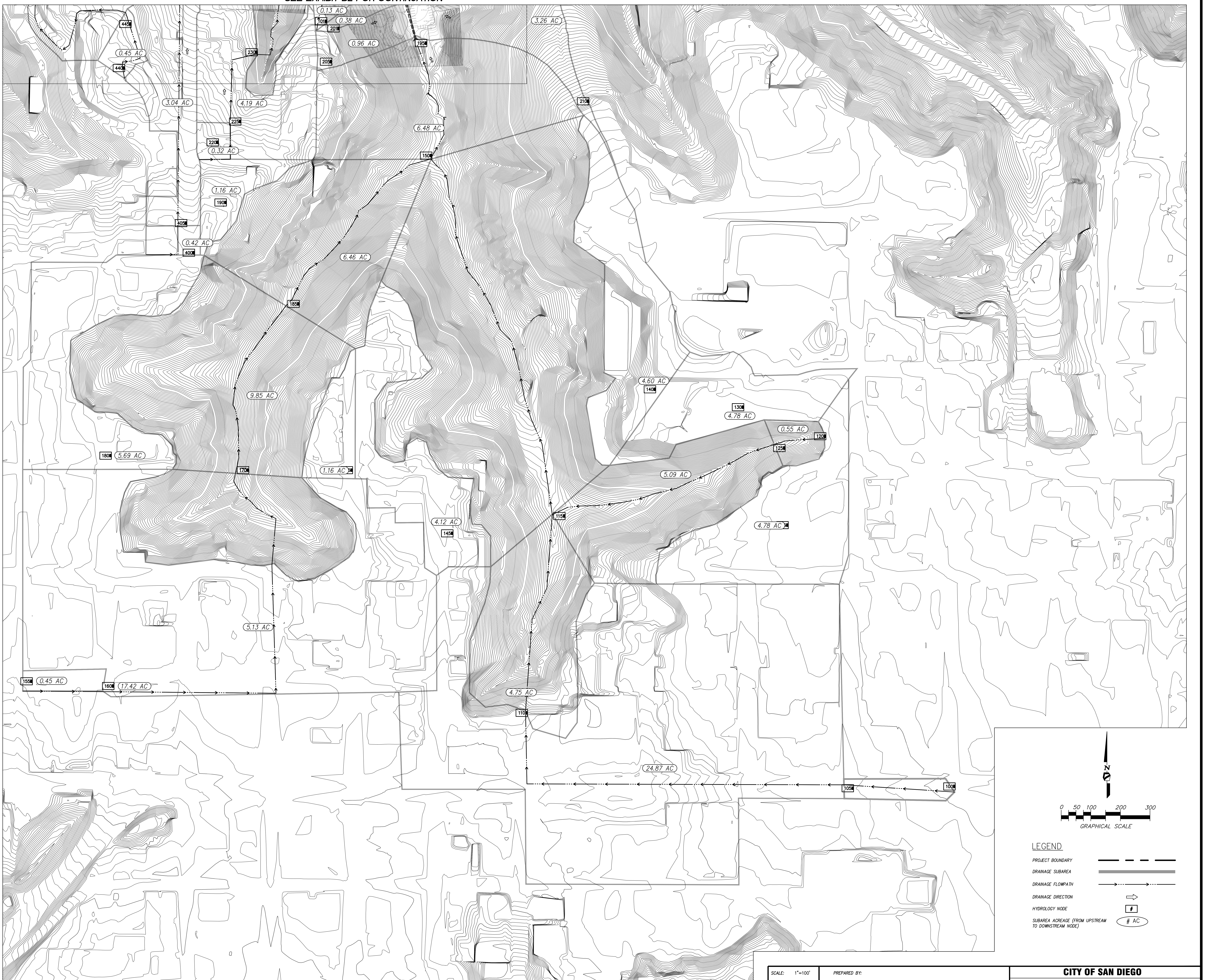
CITY OF SAN DIEGO

LEGACY INTERNATIONAL CENTER

DRAINAGE MAP
EXISTING CONDITIONS
EXHIBIT A

P:\3948\ENGR\REPORTS\DRAIN-TM\EXH\Exhibit A.dwg 6/19/2013 11:03:43 AM

SEE EXHIBIT B2 FOR CONTINUATION



SCALE: 1"=100'

JOB #: 3948.60

CREATED: 2/3/17

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey

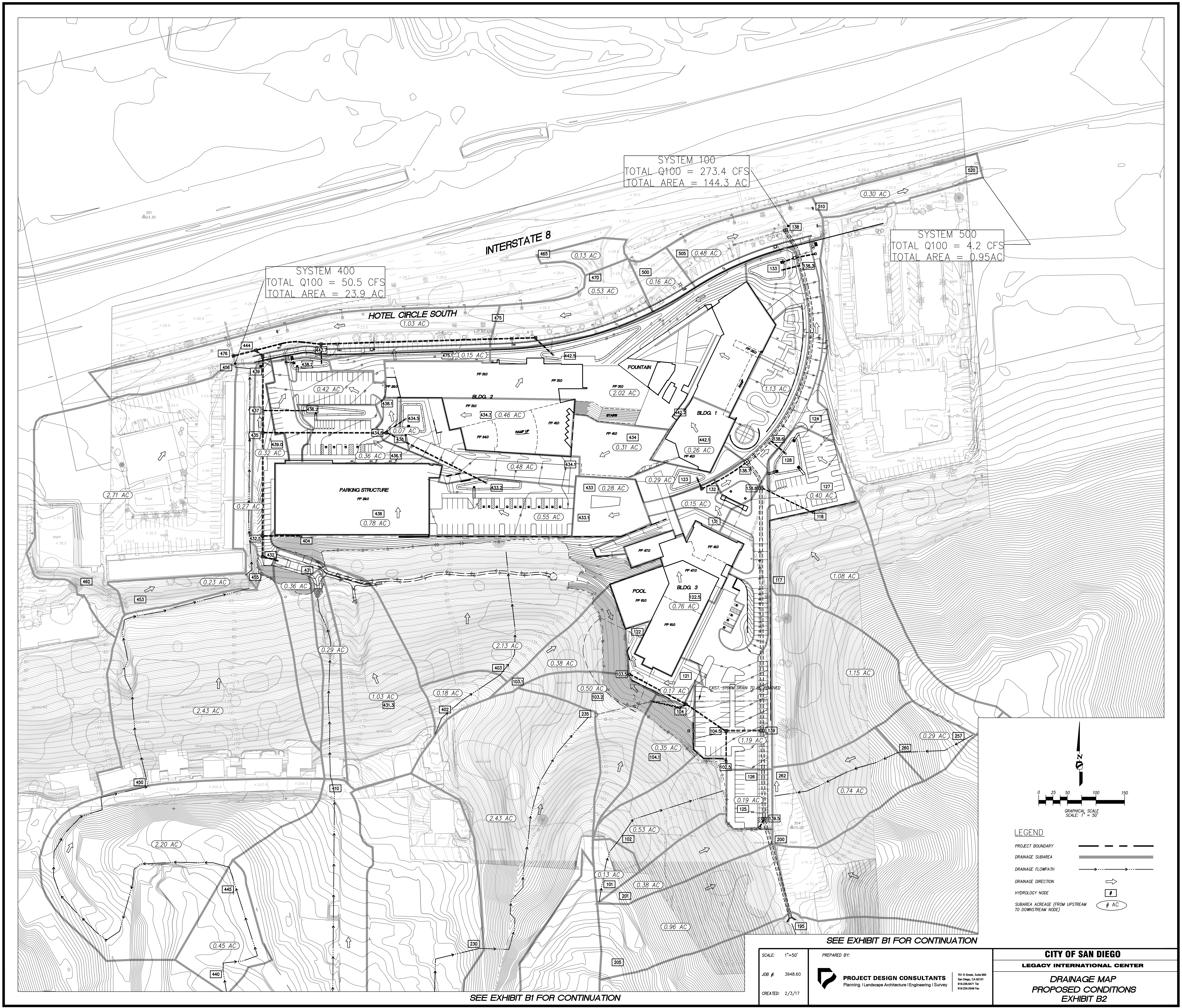
701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

CITY OF SAN DIEGO

LEGACY INTERNATIONAL CENTER

DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B1

P:\3948.60\Engr\Reports\Drainage\EXH\3948.60 Proposed Drainage_Exh A.dwg 2/3/2017 11:00:16 AM



SEE EXHIBIT B1 FOR CONTINUATION

SEE EXHIBIT B1 FOR CONTINUATION

SCALE: 1"=50'

JOB #: 3948.60

CREATED: 2/3/17

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey

701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

CITY OF SAN DIEGO

LEGACY INTERNATIONAL CENTER

DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B2

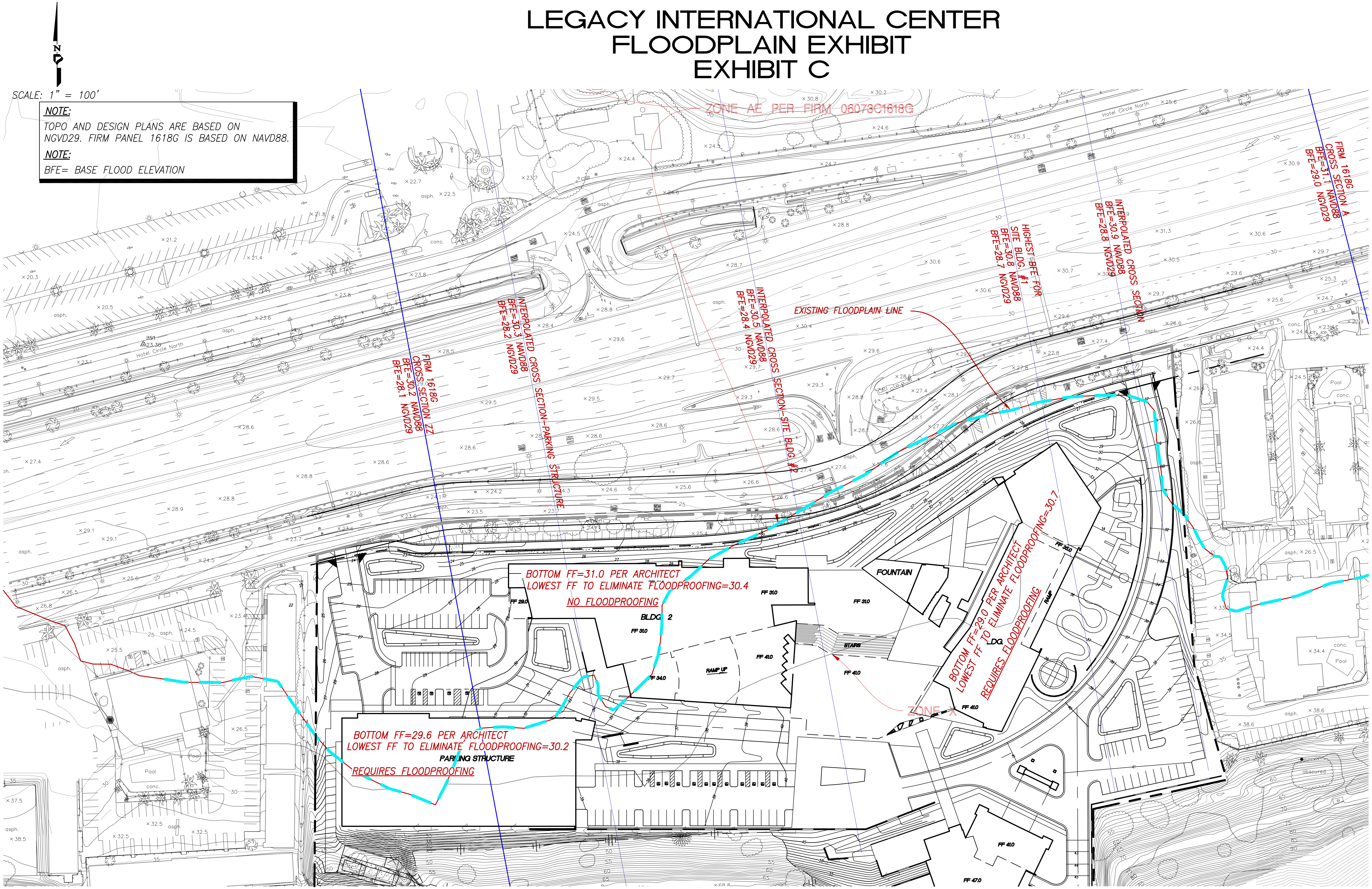
P:\3948.60\Engr\Reports\Drainage\EXH\3948.60 Proposed Drainage_Exh B.dwg 2/3/2017 10:58:55 AM

LEGACY INTERNATIONAL CENTER
FLOODPLAIN EXHIBIT
EXHIBIT C

SCALE: 1" = 100'

NOTE:
TOPO AND DESIGN PLANS ARE BASED ON NGVD29. FIRM PANEL 1618G IS BASED ON NAVD88.

NOTE:
BFE= BASE FLOOD ELEVATION



P:\3948.60\Engr\Reports\Drainage\EXH\Exhibit C.dwg 11/21/2016 6:19:38 PM

Project Name: Legacy International Center

CITY OF SAN DIEGO

PRIORITY DEVELOPMENT PROJECT (PDP)
STORM WATER QUALITY MANAGEMENT PLAN (SWQMP)
FOR
Legacy International Center

Vesting TM#/Planned Development Permit# 332401

INSERT PROJECT DRAWING NUMBERS______

ENGINEER OF WORK:

REGISTERED PROFESSIONAL ENGINEER
DEBBY SUE REECE
No. C56148
EXP. 12-31-18
CIVIL
STATE OF CALIFORNIA

Debby Reece, PE
RCE 56148, REGISTRATION EXPIRES 12/31/16

PREPARED FOR:

Morris Cerullo Legacy Center Foundation, LLC.
3545 Aero Court
San Diego, CA 92123
858-277-0626

PREPARED BY:
L. Pizarro & C. Bell

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey

701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

DATE OF SWQMP:
February 3, 2017

Job No. 3948.60

Approved by: City of San Diego Date

Project Name: Legacy International Center

TABLE OF CONTENTS

Project Name: Legacy International Center

ACRONYMS

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

CERTIFICATION PAGE

Project Name: Legacy International Center
Permit Application Number: TM PTS # 332401

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

____
Debby Reece, PE, RCE 56148, Registration Expires 12/31/18

Debby Reece
Print Name

Project Design Consultants
Company

____
Date

DEBBY SUE REECE
No. C56148
EXP. 12-31-18

Project Name: Legacy International Center

SUBMITTAL RECORD

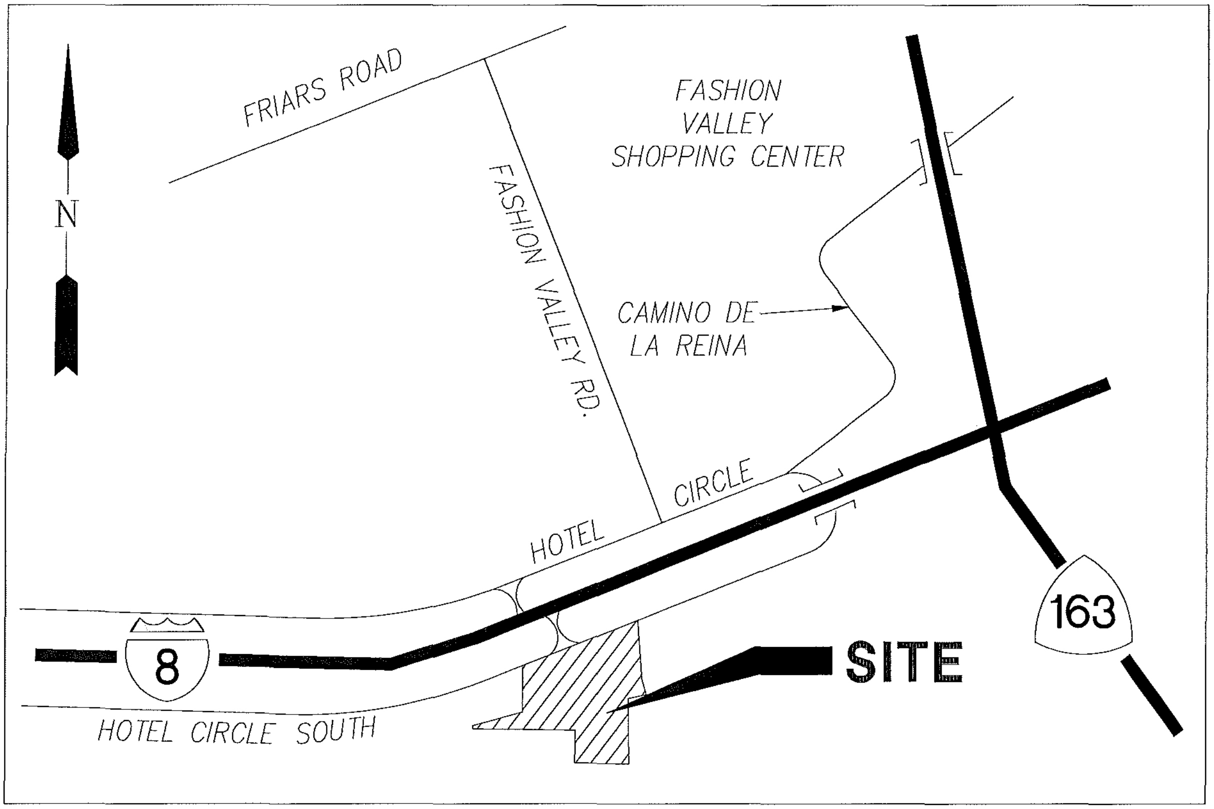
Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments.

Submittal Number	Date	Project Status	Summary of Changes
1	9/30/16	☒ Preliminary Design / Planning / CEQA ☐ Final Design	Updating report to City SWQMP Template
2	2/3/2017	☒ Preliminary Design / Planning / CEQA ☐ Final Design	Response to comments (adjust sizing factors)
3		☐ Preliminary Design / Planning / CEQA ☐ Final Design	
4		☐ Preliminary Design / Planning / CEQA ☐ Final Design	

Project Name: Legacy International Center

PROJECT VICINITY MAP

Project Name: Legacy International Center
TM PTS#: 332401



Project Name: Legacy International Center

THE CITY OF SAN DIEGO

City of San Diego
Development Services
1222 First Ave., MD-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
February 2016

Project Address: Click here to enter project address.	Project Number *(for the City Use Only)*: Click here to enter project number

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1], which is administrated by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with construction activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ● Yes; SWPPP required, skip questions 2-4 ○ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity that results in ground disturbance and contact with storm water runoff?

   ○ Yes; WPCP required, skip questions 3-4 ● No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (projects such as pipeline/utility replacement)

   ○ Yes; WPCP required, skip questions 4 ● No; next question

4. Does the project only include the following Permit types listed below?
   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include one of the following activities and associated curb/sidewalk repair: water services, sewer lateral, storm drain lateral, or dry utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes; no document required

Check one of the boxes to the right, and continue to PART B:

☒ If you checked "Yes" for question 1,
a SWPPP is REQUIRED. Continue to PART B

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3,
a WPCP is REQUIRED. If the project processes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all question 1-3, and checked "Yes" for question 4
PART B **does not apply and no document is required. Continue to Section 2.**

More information on the City's construction BMP requirements as well as CGP requirements can be found at:
www.sandiego.gov/stormwater/regulations/swguide/constructing.shtml

Project Name: Legacy International Center

PART B: Determine Construction Site Priority.

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk. Determination approach of the Stat e Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**
   a. Projects located in the ASBS watershed. A map of the ASBS watershed can he found here *<placeholder for ASBS map link>*

2. ☒ **High Priority**
   a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.
   b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ **Medium Priority**
   a. Projects 1 acre or more but not subject to an ASBS or high priority designation.
   b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☐ **Low Priority**
   a. Projects not subject to ASBS, high or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water
BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water? ○ Yes ● No

2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces? ○ Yes ● No

3. Does the project fall under routine maintenance? Examples include, but are not limited to:
   roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair). ○ Yes ● No

Project Name: Legacy International Center

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."
If "no" was checked for all questions in Part D, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:

   - Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;
   - Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;
   - Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?

   ○ Yes; PDP exempt requirements apply ● No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

   ○ Yes; PDP exempt requirements apply ● No; PDP not exempt. PDP requirements apply.

PART E: Determine if Project is a Priority Development Project (PDP). Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".
If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Project".

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ○ Yes ● No
2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ● Yes ○ No
3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ● Yes ○ No
4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ● Yes ○ No

5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).**	● Yes ○ No
6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	● Yes ○ No
7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging- directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands).	● Yes ○ No
8. **New development or redevelopment projects of a retail gasoline outlet that creates and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic of 100 or more vehicles per day.	○ Yes ● No
9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.	○ Yes ● No
10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces.	○ Yes ● No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO STORM WATER REQUIREMENTS**.	☐
2. The project is a **STANDARD PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires hydromodification management.	☒

Name of Owner or Agent *(Please Print)*: Click here to enter name.	Title: Click here to enter title
Signature:	Date: Insert Date

Applicability of Permanent, Post-Construction Storm Water BMP Requirements

(Storm Water Intake Form for all Development Permit Applications)

Form I-1

Project Identification

Project Name: **Legacy International Center (LIC)**

Permit Application Number: **TM PTS # 332401**

Date: 2/3/17

Determination of Requirements

The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop". Refer to Part 1 of Storm Water Standards sections and/or separate forms referenced in each step below.

Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes	Go to Step 2.
	☐ No	Stop. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) in its entirety for guidance, AND complete Storm Water Requirements Applicability Checklist.	☐ Standard Project	Stop. Standard Project requirements apply.
	☒ PDP	PDP requirements apply, including PDP SWQMP. Go to Step 3.
	☐ PDP Exempt	Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below.

Form I-1

[Step 2 Continued from Page 1] Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		
Step 3: Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☐Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	☒No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (*not required if prior lawful approval does not apply*):		
Step 4: Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☐Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	☒No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply: LIC is exempt from hydromodification requirements because the project discharges into channels that are concreted-lined or significantly hardened downstream to an exempt river reach, the San Diego River.		
Step 5: Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☐Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	☒N/A	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply:		

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Legacy International Center
Project Address	Hotel Circle South, Mission Valley, San Diego, CA 92108
Assessor's Parcel Number(s) (APN(s))	444-060-10 & 11
Permit Application Number	**TM PTS # 332401**
Project Watershed	Select One: ☐San Dieguito ☐Penasquitos ☐Mission Bay ☒San Diego River ☐San Diego Bay ☐Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	907.11 Mission San Diego
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	18.1 Acres (788,436 Square Feet)
Area to be Disturbed by the Project (Project Area)	13.0 Acres (566,280 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	8.7 Acres (379,843 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	1.8 Acres (77,101 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	7 % Decrease

Project Name: Legacy International Center

Form I-3B

Description of Existing Site Condition

Current Status of the Site (select all that apply):
☒ Existing development
☐ Previously graded but not built out
☐ Demolition completed without new construction
☐ Agricultural or other non-impervious use
☐ Vacant, undeveloped/natural

Description / Additional Information:

The site is presently developed as a hotel and fitness club.

Existing Land Cover Includes (select all that apply):
☒ Vegetative Cover
☒ Non-Vegetated Pervious Areas
☒ Impervious Areas

Description / Additional Information:

The site is predominantly paved parking lots with various buildings and some landscaping dispersed throughout.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):
☐ NRCS Type A
☐ NRCS Type B
☐ NRCS Type C
☒ NRCS Type D

Approximate Depth to Groundwater (GW):
☐ GW Depth < 5 feet
☒ 5 feet < GW Depth < 10 feet
☒ 10 feet < GW Depth < 20 feet
☒ GW Depth > 20 feet

The depth to groundwater varies significantly throughout the site.

Existing Natural Hydrologic Features (select all that apply):
☐ Watercourses
☐ Seeps
☐ Springs
☐ Wetlands
☒ None

Description / Additional Information:

Form I-3B

Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

1. *Whether existing drainage conveyance is natural or urban;*
2. *If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site;*
3. *Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels;*
4. *Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.*

Description/ Additional Information:

1) Existing drainage conveyance is urban.
2) Offsite canyons with steep slopes border the southern and eastern edges of the project site and convey runoff from areas around the rim of the canyon towards the project. The offsite flows conveyed towards the southeastern edge of the project are conveyed underground towards a 42-inch reinforced concrete pipe (RCP) storm drain which transitions into a 45-inch RCP line at Hotel Circle South. The offsite flows are also conveyed above ground into Hotel Circle via existing surface improvements.
3) Under existing conditions, there are two underground storm drain systems that convey onsite and offsite runoff to the existing storm drain in Hotel Circle South.
4) In existing conditions, the project runoff discharges into existing storm drain pipe systems (one 30-inch RCP, the other 45-inch RCP) in Hotel Circle South, which discharge to the north underneath the Interstate 8 (I-8) and empty into a concrete channel. The concrete channel flows to the west and underneath Hotel Circle North via a box culvert. The runoff then enters a private triple box culvert and drains along the perimeter to the northwest corner of the Presidio View Apartments development, where it connects to an existing box culvert located in the Town and Country property and ultimately outlets into the San Diego River.

Note a Preliminary Drainage Report was previously prepared by Project Design Consultants dated November 2014 that was approved per the previous site plan. Subsequent to the approval of the Drainage Study, an alternative site plan was created that has overall less environmental impacts than the previously approved site plan. Drainage Report Addendum #1 was prepared for the previous preliminary drainage study and can be found in Attachment 5.

Project Name: Legacy International Center

Form I-3B
Description of Proposed Site Development
Project Description / Proposed Land Use and/or Activities: The project proposes an international museum, a resort hotel with 127 units, restaurants, resort themed retail, a performing arts center, an operations office space, and a training center.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): The project includes the following impervious features: buildings, parking lots, walkways, hardscape and courtyards.
List/describe proposed pervious features of the project (e.g., landscape areas): The project includes the following pervious features: landscaped areas and trees placed throughout the development.
Does the project include grading and changes to site topography? ☒ Yes ☐ No Description / Additional Information:

Form I-3B

Description of Proposed Site Drainage Patterns

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☒ Yes
☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Describe proposed site drainage patterns:

In proposed conditions, a 60-inch RCP storm drain system will replace the existing 42-inch (upstream) and 45-inch (downstream) storm drain system located along the eastern side of the project site. There will be a headwall installed in the upstream end of the 60-inch RCP. The 60-inch will continue downstream and will connect to the existing 45-inch RCP located beneath Hotel Circle South via a clean out. The location of this connection is at the northeasterly project entrance. The 60-inch RCP will collect some onsite drainage from proposed storm drain lines that will intercept runoff from various inlets or biofiltration basins. The 60-inch RCP will act as a bypass system collecting offsite drainage from the canyons around the southern and southeastern perimeter of the project.

A proposed 24-inch RCP storm drain system will tie into the existing 30-inch storm drain beneath Hotel Circle South by a clean out. This connection is near the northwest corner of the site. The 24-inch storm drain system will run along the western side of the project site. A proposed 18-inch RCP will collect onsite flows that drain towards biofiltration basins and will then convey runoff to the 24-inch RCP. On the upstream end of the 24-inch RCP, there will be a headwall which will collect in a brow ditch the contributing offsite runoff from the canyons that slope towards the southern perimeter of the project boundary.

Eventually all project runoff will discharge towards the San Diego River to mimic existing conditions.

Form I-3B

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

☒ On-site storm drain inlets
☒ Interior floor drains and elevator shaft sump pumps
☒ Interior parking garages
☒ Need for future indoor & structural pest control
☒ Landscape/Outdoor Pesticide Use
☒ Pools, spas, ponds, decorative fountains, and other water features
☒ Food service
☒ Refuse areas
☐ Industrial processes
☐ Outdoor storage of equipment or materials
☐ Vehicle and Equipment Cleaning
☐ Vehicle/Equipment Repair and Maintenance
☐ Fuel Dispensing Areas
☐ Loading Docks
☒ Fire Sprinkler Test Water
☒ Miscellaneous Drain or Wash Water
☒ Plazas, sidewalks, and parking lots
☐ Large Trash Generating Facilities
☐ Animal Facilities
☐ Plant Nurseries and Garden Centers
☐ Automotive-related Uses

Description / Additional Information:

Form I-3B

Identification and Narrative of Receiving Water

Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)

The project site runoff will be conveyed to towards the northeast corner of the site (to a 45-inch RCP) and towards the northwest corner of the site (to a 30-inch RCP) where runoff will converge in the storm drain system located on the north side of the Interstate 8 and will eventually drain into the San Diego River. The San Diego River drains to the Pacific Ocean south of Mission Bay.

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations.

Beneficial Uses for Inland Surface Waters (San Diego River):

AGR - Agricultural Supply: Includes use of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

IND - Industrial Services Supply: Includes use of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

REC1 - Contact Recreation: Includes use of water for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs.

REC2 - Non-Contact Recreation: Includes use of water for recreation involving proximity to water, but not normally involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

BIOL - Preservation of Biological Habitats of Special Significance: Includes uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

WARM - Warm Freshwater Habitat: Includes uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

WILD - Wildlife Habitat: Includes uses of water that support terrestrial ecosystems including but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife, (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife and food sources.

RARE - Rare, Threatened, or Endangered Species: Includes uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species

Beneficial Uses for Groundwater:

Form I-3B

AGR - Agricultural Supply: Includes use of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

IND - Industrial Services Supply: Includes use of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

PROC - Industrial Process Supply: Includes uses of water for industrial activities that depend primarily on water quality.

Source: San Diego Regional Water Quality Control Board, Water Quality Control Plan for the San Diego Basin, Chapter 2, Table 2-3, Beneficial Uses of Coastal Surface Waters and Table 2-5 Beneficial Uses of Ground Waters (2011 update).

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations.

There is not an ASBS receiving water downstream of LIC.

Provide distance from project outfall location to impaired or sensitive receiving waters.

The project outfall is about 0.23 miles from the closest impaired receiving water, the San Diego River.

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands

The project will be discharging into an ESA.

Identification of Receiving Water Pollutants of Concern

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

The project is not directly tributary to a 303(d) impaired water body. The closest impaired water body is the Lower San Diego River.

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
Lower San Diego River	Bacteria (enterococcus and fecal coliform, low dissolved oxygen, manganese, nutrients (nitrogen and phosphorus), total dissolved solids, and toxicity.	Indicator bacteria

Identification of Project Site Pollutants*

*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)

Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see BMP Design Manual (Part 1 of Storm Water Standards) Appendix B.6):

Project Name: Legacy International Center

Form I-3B

Pollutant	Not Applicable to the Project Site	Expected from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment		x	
Nutrients		X	X
Heavy Metals		X	X
Organic Compounds		X	X
Trash & Debris		X	X
Oxygen Demanding Substances		X	
Oil & Grease	x		
Bacteria & Viruses		X	X
Pesticides	x		

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

○ Yes, hydromodification management flow control structural BMPs required.

○ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

○ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

● No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):
The project is exempt from meeting the hydromodification management requirements because it discharges to an underground storm drain system that empties directly to the San Diego River. This exemption is included in the Final WQIP for the watershed.

Critical Coarse Sediment Yield Areas*
***This Section only required if hydromodification management requirements apply**

Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint?

○ Yes

● No, No critical coarse sediment yield areas to be protected based on WMAA maps

Discussion / Additional Information:

N/A to the project since exempt from hydromodification requirements.

Project Name: Legacy International Center

Form I-3B
Flow Control for Post-Project Runoff* ***This Section only required if hydromodification management requirements apply**
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.
Has a geomorphic assessment been performed for the receiving channel(s)? ☐ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes, the result is the low flow threshold is 0.1Q2 ☐ Yes, the result is the low flow threshold is 0.3Q2 ☐ Yes, the result is the low flow threshold is 0.5Q2 If a geomorphic assessment has been performed, provide title, date, and preparer: Discussion / Additional Information: (optional)

Form I-3B
Other Site Requirements and Constraints
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

Source Control BMP Checklist for All Development Projects (Standard Projects and Priority Development Projects)			Form I-4
Project Identification			
Project Name: Legacy International Center			
Permit Application Number: **TM PTS # 332401**			
Source Control BMPs			
All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the Model BMP Design Manual for information to implement source control BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the Model BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.			
Source Control Requirement	**Applied?**		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented:			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented:			

Form I-4			
Source Control Requirement	**Applied?**		
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-5 not implemented:			
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☒ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☒ Yes	☐ No	☐ N/A
Interior parking garages	☒ Yes	☐ No	☐ N/A
Need for future indoor & structural pest control	☒ Yes	☐ No	☐ N/A
Landscape/Outdoor Pesticide Use	☒ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☒ Yes	☐ No	☐ N/A
Food service	☒ Yes	☐ No	☐ N/A
Refuse Areas	☒ Yes	☐ No	☐ N/A
Industrial processes	☐ Yes	☐ No	☒ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☒ N/A
Fuel Dispensing Areas	☐ Yes	☐ No	☒ N/A
Loading Docks	☐ Yes	☐ No	☒ N/A
Fire Sprinkler Test Water	☒ Yes	☐ No	☐ N/A
Miscellaneous Drain or Wash Water	☒ Yes	☐ No	☐ N/A
Plazas, sidewalks, and parking lots	☒ Yes	☐ No	☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes	☐ No	☒ N/A
SC-6B: Animal Facilities	☐ Yes	☐ No	☒ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes	☐ No	☒ N/A
SC-6D: Automotive-related Uses	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.			

Site Design BMP Checklist for All Development Projects (Standard Projects and Priority Development Projects)	**Form I-5**

Project Identification
Project Name: Legacy International Center
Permit Application Number: **TM PTS # 332401**
Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

A site map with implemented site design BMPs must be included at the end of this checklist.

Site Design Requirement		Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features		☒Yes	☐ No	☐ N/A
Discussion / justification if SD-1 not implemented:				
1-1	Are existing natural drainage pathways and hydrologic features mapped on the site map?	☒Yes	☐ No	☐ N/A
1-2	Are street trees implemented? If yes, are they shown on the site map?	☒Yes	☐ No	☐ N/A
1-3	Implemented street trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐Yes	☐ No	☒ N/A
1-4	Is street tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐Yes	☐ No	☒ N/A
SD-2 Have natural areas, soils and vegetation been conserved?		☒Yes	☐ No	☐ N/A
Discussion / justification if SD-2 not implemented:				
SD-3 Minimize Impervious Area		☒Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented:				
SD-4 Minimize Soil Compaction		☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented:				
SD-5 Impervious Area Dispersion		☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-5 not implemented:				

Form I-5				
Site Design Requirement		**Applied?**		
SD-6 Runoff Collection		☒Yes	☐ No	☒ N/A
Discussion / justification if SD-6 not implemented:				
6a-1	Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map?	☐Yes	☐ No	☒ N/A
6a-2	Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E?	☐Yes	☐ No	☒ N/A
6b-1	Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site map?	☐Yes	☐ No	☒ N/A
6b-2	Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E?	☐Yes	☐ No	☒ N/A
SD-7 Landscaping with Native or Drought Tolerant Species		☒Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented:				
SD-8 Harvesting and Using Precipitation		☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-8 not implemented:				
8-1	Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☒ N/A
8-2	Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☒ N/A
Insert Site Map with all site design BMPs identified:				
Refer to Attachment 1A for site design BMP notes on the BMP map.				

Summary of PDP Structural BMPs	Form I-6 (PDPs)
Project Identification	
Project Name: Legacy International Center	
Permit Application Number: **TM PTS # 332401**	
PDP Structural BMPs	

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The site will implement six lined biofiltration and two unlined bioretention basins to manage pollutant control requirements. These basins are distributed fairly uniformly throughout the site to limit the accumulation of pollutants in the storm water prior to treatment. In the due diligence report prepared by the geotechnical engineer it was found that high groundwater tables and possible historical contamination due to a demolished gas station would preclude infiltration near the front of the site while steep slopes and liquefaction susceptible soils make infiltration near the back of the site unsafe. As the irrigation demand did not justify harvest and use BMPs, lined biofiltration basins were selected as the pollutant control strategy except in DMA 7 and DMA 9 where it was determined that partial infiltration was feasible. These BMPs will be unlined to allow for partial infiltration. Refer to Attachment 4 for cross section details for the BMPs. Over the course of the site design there were upwards of 15 basins, some small and some large and ultimately these were whittled down to the most efficient largest basins where runoff could be conveniently routed. Towards the end of this process, BMP#5 was combined with BMP#4 and therefore there is no longer a BMP#5. ***Two of the basins are non-standard and have been sized utilizing the alternative minimum sizing factor. The sizing spreadsheets are based on the January 2016 version of the Stormwater Standards, with supplemental volume retention sizing spreadsheets for BMPs 7, 8, and 9 based on the November 2016 Stormwater Standards supplemental guidance. They all meet pollutants control and volume retention requirements for these DMAs. In addition, a number of BMPs have been oversized, namely BMP 2 which is almost 700 sf larger than the 3% necessary.***

Project Name: Legacy International Center

Form I-6

Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #1

Construction Plan Sheet No. TBD

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

Project Name: Legacy International Center

Form I-6

Structural BMP Summary Information

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #2

Construction Plan Sheet No. TBD

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

Project Name: Legacy International Center

Form I-6

Structural BMP Summary Information

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #3

Construction Plan Sheet No. TBD

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

Form I-6

Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #4

Construction Plan Sheet No. TBD

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

Project Name: Legacy International Center

Form I-6

Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #5

Construction Plan Sheet No. TBD

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

Project Name: Legacy International Center

Form I-6

Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #6

Construction Plan Sheet No. TBD

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

Form I-6

Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #7

Construction Plan Sheet No.TBD

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☒ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

Project Name: Legacy International Center

Form I-6

Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #8

Construction Plan Sheet No. TBD

Type of structural BMP:
☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:
☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

Project Name: Legacy International Center

Form I-6

Structural BMP Summary Information

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration BMP #9

Construction Plan Sheet No. TBD

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☒ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	LIC Development Management
Who will maintain this BMP into perpetuity?	LIC Development Management
What is the funding mechanism for maintenance?	Future patrons of LIC

City of San Diego
Development Services
1222 First Ave., MD-302
San Diego, CA 92101
(619) 446-5000

Permenant BMP Construction

Self Certification Form

FORM
DS-563
January 2016

Date Prepared: Click here to enter text.

Project No.: Click here to enter text.

Project Applicant: Click here to enter text.

Phone: Click here to enter text.

Project Address: Click here to enter text.

Project Engineer: Click here to enter text.

Phone: Click here to enter text.

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and structural BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: ______________________________

Date of Signature: _Insert Date__

Printed Name: Click here to enter text.

Title: Click here to enter text.

Phone No. Click here to enter text.

Engineer's

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Project Name: Legacy International Center

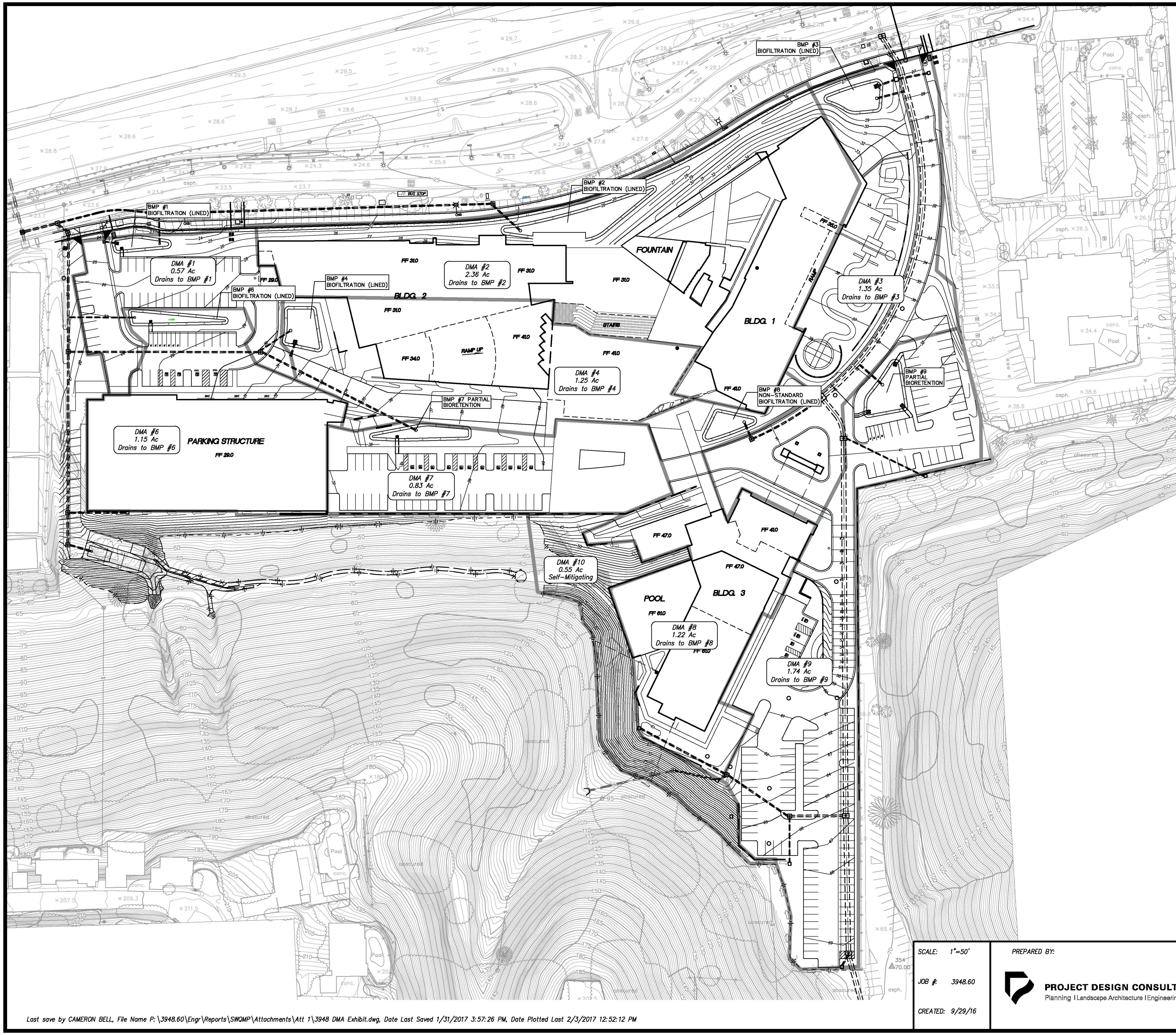
Indicate which Items are Included:

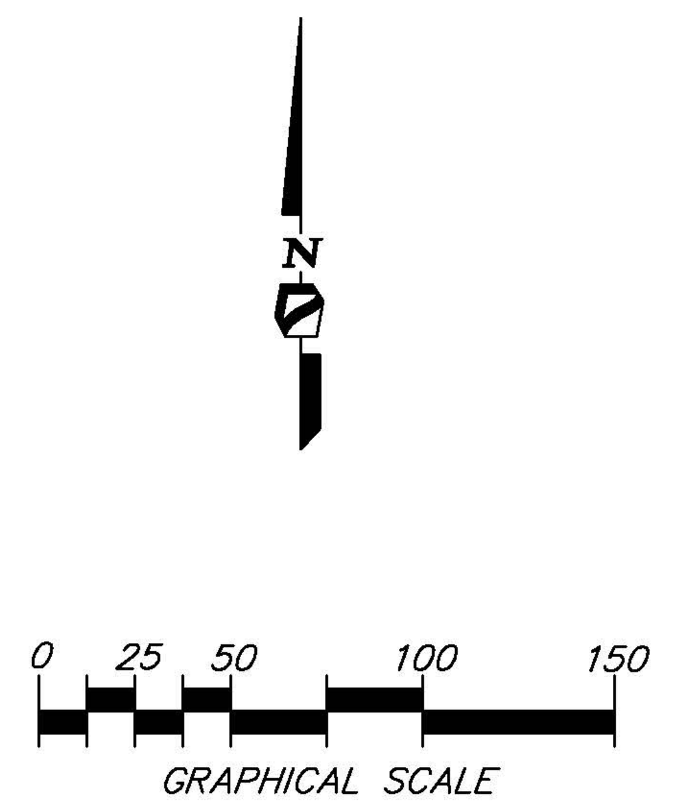
Attachment Sequence	**Contents**	**Checklist**
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☒ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☒ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Worksheet C.4-1, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒ To be included later, see comment below*. ☐ Not included because the entire project will use harvest and use BMPs *Not included as geotechnical consultant is currently conducting infiltration testing. The site is however, expected to be classified as a non-infiltration site due to high groundwater at the low end of the site, existing contaminated soils from a demolished and now non-existent gasoline station, and liquefaction and hillslope failure risk from existing compacted fill along the upslope areas of the site.
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☒ Included

Project Name: Legacy International Center

ATTACHMENT 1a-1b

DMA Exhibit





DMA SUMMARY

DMA #	DMA TYPE	DRAINAGE AREA (Ac)
1	Drains to BMP 1	0.66
2	Drains to BMP 2	2.36
3	Drains to BMP 3	1.35
4	Drains to BMP 4	1.25
6	Drains to BMP 6	1.15
7	Drains to BMP 7	0.83
8	Drains to BMP 8	1.22
9	Drains to BMP 9	1.74
10	Self-Mitigating	0.55

BMP NOTES:

1. THE TREATMENT BMPS SELECTED FOR THIS PROJECT ARE EIGHT LINED BIOFILTRATION BASINS. THE BMPS ARE PRIVATE AND WILL BE PRIVATELY MAINTAINED.

2. GROUNDWATER AT +15.5 to +20.5 FEET ABOVE MEAN SEA LEVEL, CORRESPONDING TO 8 to 20.5 FEET BELOW EXISTING GRADE

3. SITE DESIGN BMPS INCLUDE:
   - MINIMIZATION OF IMPERVIOUS FOOTPRINT
   - IMPERVIOUS DISPERSION
   - RUNOFF COLLECTION

4. SOURCE CONTROL BMPs FOR PROJECT INCLUDE:
   - INTEGRATED PEST MANAGEMENT PRINCIPLES
   - EFFICIENT LANDSCAPE AND IRRIGATION DESIGN
   - STORMWATER EDUCATION
   - BUILDING MANAGEMENT PRACTICES (MANAGEMENT OF FIRE SPRINKLER SYSTEM DISCHARGES, AIR CONDITIONING CONDENSATE DISCHARGES, AND THE USE OF NON-TOXIC ROOFING MATERIALS.)

5. PROJECT DISCHARGES TO SAN DIEGO RIVER, A HYDROMODIFICATION EXEMPT RIVER REACH.

6. THE NRCS SOIL SURVEY CLASSIFIES THE SITE SOILS AS HYDROLOGIC SOIL GROUP 'D'

SCALE: 1"=50'
JOB #: 3948.60
CREATED: 9/29/16

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey
701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

CITY OF SAN DIEGO

LEGACY INTERNATIONAL CENTER

Attachment 1a
DMA Exhibit

Last save by CAMERON BELL, File Name P:\3948.60\Engr\Reports\SWQMP\Attachments\Att 1\3948 DMA Exhibit.dwg, Date Last Saved 1/31/2017 3:57:26 PM, Date Plotted Last 2/3/2017 12:52:12 PM

Project Name: Legacy International Center

Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☐ Critical coarse sediment yield areas to be protected
☒ Existing topography and impervious areas
☒ Existing and proposed site drainage network and connections to drainage offsite
☐ Proposed demolition
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☐ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
☒ Structural BMPs (identify location, type of BMP, and size/detail)

Project Name: Legacy International Center

ATTACHMENT 1c

Harvest & Use Feasibility

<table>
<tr><th colspan="2">Harvest and Use Feasibility Checklist</th><th>Form I-7</th></tr>
<tr><td colspan="3">1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?
☒ Toilet and urinal flushing
☒ Landscape irrigation
☐ Other:______________</td></tr>
<tr><td colspan="3">2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.
[Provide a summary of calculations here]
Landscape Irrigation:
77101 SF of landscaping = 1.77 Ac.
Total Demand: 347 cf + 2450 cf = 2797
Assume Moderate Water Use:
1470 g/ac/36 hours x 1.77 Ac. = 2602 gallons x (1 CF/7.48 gallons) = 347 CF
Greywater reuse:
1256 Fixture Units x 1 EDU / 20 F.U. x 280 gallons sewage/day x 1 CF/7.48 gallons = 2,350 CF
(fixture unit values base upon City of San Diego water and sewer fee information bulletin)</td></tr>
<tr><td colspan="3">3. Calculate the DCV using worksheet B-2.1.
DCV = 15,439 (cubic feet)</td></tr>
<tr><td>3a. Is the 36 hour demand greater than or equal to the DCV?
☐ Yes / ☒ No ⇨
⇩</td><td>3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV?
☐ Yes / ☒ No ⇨
⇩
0.25DCV = 3860 CF</td><td>3c. Is the 36 hour demand less than 0.25DCV?
☒ Yes
⇩</td></tr>
<tr><td>Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.</td><td>Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.</td><td>Harvest and use is considered to be infeasible.</td></tr>
<tr><td colspan="3">Is harvest and use feasible based on further evaluation?
☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☒ No, select alternate BMPs.</td></tr>
</table>

Project Name: Legacy International Center

ATTACHMENT 1d

Infiltration Feasibility

BMP-1

Categorization of Infiltration Feasibility Condition — Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-1 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-1 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-1 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-1

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:
The results of percolation testing in Boring BMP-1 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:
The results of percolation testing in Boring BMP-1 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

BMP-1

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-1 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-1 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Categorization of Infiltration Feasibility Condition			Form I-8
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: See results of percolation test for Boring BMP-2 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D). These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-2 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-2 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
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<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-2

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:
The results of percolation testing in Boring BMP-2 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:
The results of percolation testing in Boring BMP-2 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-2 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-2 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Categorization of Infiltration Feasibility Condition			Form I-8
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling. Notwithstanding, the results of other percolation tests in the low lying area adjacent of Hotel Circle South (Borings BMP-1, BMP-2 and BMP-4/6) indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D). These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-3 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-1 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

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Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower. Likewise, a potentially hydrocarbon contaminated soil and groundwater condition is believed to have existed (or may still exist) at the northeast corner of the site where a Chevron gas station formerly existed (San Diego Department of Health ID No. H21151-004). Numerous documents prepared by both Stantec and SECOR (2001 through 2005) have identified petroleum hydrocarbon contaminated materials in this area. After a limited site cleanup following a Corrective Action Plan approved by the DEH, a No-Further-Action notice (Case Closure) was issued by the DEH (November 29, 2010) which was contingent on actual land use at that time. However, purposeful infiltration of storm water into an area of potentially contaminated conditions that have a shallow groundwater table is not recommended.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

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Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling.

See response to Criteria No.1.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling.

See response to Criteria No.1.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>☒</td></tr>
<tr><td colspan="4">Provide basis:
The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling.
See response to Criteria No.1.
Likewise, a potentially hydrocarbon contaminated soil and groundwater condition is believed to have existed (or may still exist) at the northeast corner of the site where a Chevron gas station formerly existed (San Diego Department of Health ID No. H21151-004). Numerous documents prepared by both Stantec and SECOR (2001 through 2005) have identified petroleum hydrocarbon contaminated materials in this area. After a limited site cleanup following a Corrective Action Plan approved by the DEH, a No-Further-Action notice (Case Closure) was issued by the DEH (November 29, 2010) which was contingent on actual land use at that time. However, purposeful infiltration of storm water into an area of potentially contaminated conditions that have a shallow groundwater table is not recommended.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>☒</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling.
See response to Criteria No.1.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td>If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2</td><td colspan="2"></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-4

Categorization of Infiltration Feasibility Condition — Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-4/6 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-4 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-4/6 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

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Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

BMP-4

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-6

Categorization of Infiltration Feasibility Condition	**Form I-8**

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-4/6 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-6 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-4/6 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

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Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: The results of percolation testing in Boring BMP-6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The results of percolation testing in Boring BMP-6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

BMP-6

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Criteria	Screening Question	Yes	No
7	Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X
Provide basis: The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration. If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-7

Categorization of Infiltration Feasibility Condition			Form I-8
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-7 which indicated less than 0.5 inches per hour infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to very poor. In this respect, the subsurface materials in the immediate area of BMP-7 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-7 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

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Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-7

<table>
<tr><th colspan="4">Form I-8 Page 3 of 4</th></tr>
<tr><td colspan="4">Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>5</td><td>Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-7 indicated a calculated infiltration rate of 0.268 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.134 inch per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>6</td><td>Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-7 indicated a calculated infiltration rate of 0.268 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.134 inch per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
</table>

Form I-8 Page 4 of 4			
Criteria	Screening Question	Yes	No
7	Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: The results of percolation testing in Boring BMP-7 indicated a calculated infiltration rate of 0.268 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.134 inch per hour. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: The results of percolation testing in Boring BMP-7 indicated a calculated infiltration rate of 0.268 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.134 inch per hour. However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration. If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Categorization of Infiltration Feasibility Condition	Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-8 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-8 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-8 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) buried structures (i.e., basement retaining walls, foundations and floor slabs).

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Form I-8 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-8

<table>
<tr><th colspan="4">Form I-8 Page 3 of 4</th></tr>
<tr><td colspan="4">Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>5</td><td>Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-8 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>6</td><td>Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-8 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) buried structures (i.e., basement retaining walls, foundations and floor slabs).

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
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<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-8 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-8 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-9

Categorization of Infiltration Feasibility Condition — Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-9 which indicated less than 0.5 inches per hour infiltration rate due to the presence alluvial soils consisting of clayey SAND (SC) and lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to very poor. In this respect, the subsurface materials in the immediate area of BMP-9 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-9 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Form I-8 Page 2 of 4

Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-9

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	

Provide basis:

The results of percolation testing in Boring BMP-9 indicated a calculated infiltration rate of 0.047 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.023 inch per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

The results of percolation testing in Boring BMP-9 indicated a calculated infiltration rate of 0.047 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.023 inch per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-9 indicated a calculated infiltration rate of 0.047 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.023 inch per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
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<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-9 indicated a calculated infiltration rate of 0.047 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.023 inch per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td>If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td colspan="2"></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Project Name: Legacy International Center

ATTACHMENT 1e

BMP Worksheets/Calculations

porosity, hydraulic head, and the proximity to the groundwater. Surface drainage and maintenance will largely determine the site's infiltration rate and the amount of water that will infiltrate for any given storm. The percolation rate will depend locally on the soil layering and will primarily be controlled by the finer grained soil layers.

4.2 PERCOLATION TESTING

As previously discussed in Section 3, seven (7) percolation tests were performed at or directly adjacent to proposed BMP locations. The proposed BMP basins and corresponding elevations are shown on Figure 4, BMP Locations with Basin Elevations. The percolation tests were performed in general accordance with the procedures set forth in California Test 750, "Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole". The tests were performed in drilled holes advanced to depths between 5 and 10 feet below existing site grades. The measured percolation rates have been converted to an adjusted infiltration rate based on borehole geometry using the Porchet Method (Ritzema, 1994) and are presented in Table 2.

Table 2

Summary of Adjusted Infiltration Rates

Boring	Tested Depth from Ground Surface (feet)	Adjusted Infiltration Rate (inch/hour)	Soil Description
BMP-1	3 - 6	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-2	6 - 10	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-3*	-	-	Alluvium - Sandy Lean CLAY (CL)
BMP-4	1 - 5	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-5	Location Omitted from Project		
BMP-6	1 - 5	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-7	1 - 5	0.268	Deposits - Sandy Lean CLAY (CL)
BMP-8	3 - 8	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-9	3 - 8	0.047	Alluvium - Clayey SAND with Gravel (SC) to Sandy Lean CLAY (CL)

*Percolation testing was not completed due to hydrocarbon contamination.

ATTACHMENT 1B: Worksheet B.2-1: DCV

85th percentile 24-hr storm depth from Figure B.1.= 0.53 in

DMA ID	BMP ID	BMP Drainage Area (ac)	Impervious Area (ac)	Amended Soils (ac) (C=0.1)	% Impervious	Composite C[1]	Tree Credit Volume (cf)	Rain Barrels Credit Volume (cf)	Design Capture Volume (DCV) (CF)
1	Biofiltration #1	0.66	0.47	0.19	71.21%	0.67	0	0	850
2	Biofiltration #2	2.36	1.89	0.47	80.08%	0.74	0	0	3363
3	Biofiltration #3	1.29	0.78	0.51	60.47%	0.58	0	0	1449
4	Biofiltration #4	1.25	1.16	0.09	92.80%	0.84	0	0	2026
			0						
6	Biofiltration #6	1.15	1.01	0.14	87.83%	0.80	0	0	1776
7	Biofiltration #7	0.83	0.72	0.11	86.75%	0.79	0	0	1268
8	Biofiltration #8	1.28	1.22	0.06	95.31%	0.86	0	0	2124
9	Biofiltration #9	1.74	1.54	0.2	88.51%	0.81	0	0	2705
10	Self-Mitigating	0.47	0	0.47	0.00%	0.10	0	0	90

Notes:

1) Equation for composite C factor = (0.9*Impervious Area + C*Pervious Area)/Total Area per BMP Design Manual.
C factors are from Table B.1-1 of Jan 2016 City BMP Design Manual.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

BMP: **Biofiltration #1**

	Simple Sizing Method for Biofiltration BMPs	**Worksheet B-5.1**	
1	Remaining DCV after implementing retention BMPs	850.4	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	0	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]		inches
7	Assumed surface area of the biofiltration BMP	**760**	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	114.0	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	736.4	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing of the aggregate is not over the entire bottom surface area	6	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	12	inches
19	Total Depth Treated [Line 17 + Line 18]	42	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1104.5	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**315.6**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	552.3	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**552.3**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	28749.6	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.67	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.030	
27	Minimum BMP Footprint (Line 24 x Line 25 x minimum sizing factor)	578	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**655**	sq-ft
Check for Volume Reduction [**Not applicable for No Infiltration Condition**]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.13**	unitless
30	Minimum required fraction of DCV retained for partial infiltration	**0.325**	unitless
31	Is the retained DCV ≥ 0.325? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**N/A**	unitless
	Check Footprint Provided >= Footprint Required	**OK**	

Notes:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23).

2. The DCV fraction of 0.325 is based on a 40% average annual percent capture and a 36-hour drawdown time.

3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

BMP: Biofiltration Area #2

	Simple Sizing Method for Biofiltration BMPs	**Worksheet B-5.1**	
1	Remaining DCV after implementing retention BMPs	3363.0	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	0	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP	**3000**	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	450.0	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	2913.0	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing of the aggregate is not over the entire bottom surface area	3	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	16.8	inches
19	Total Depth Treated [Line 17 + Line 18]	46.8	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	4369.5	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**1120.4**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	2184.7	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**1560.5**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	102801.6	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.74	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.030	
27	Minimum BMP Footprint (Line 24 x Line 25 x minimum sizing factor)	2284	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**3000**	sq-ft
Check for Volume Reduction **[Not applicable for No Infiltration Condition]**			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.13**	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	**0.325**	unitless
31	Is the retained DCV ≥ 0.325? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**N/A**	unitless
	Check Footprint Provided >= Footprint Required	**OK**	

Notes:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its

2. The DCV fraction of 0.325 is based on a 40% average annual percent capture and a 36-hour drawdown time.

3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

BMP: **Biofiltration #3**

	Simple Sizing Method for Biofiltration BMPs	**Worksheet B-5.1**	
1	Remaining DCV after implementing retention BMPs	1448.7	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	0	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP	**1420**	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	213.0	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	1235.7	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing of the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	20.4	inches
19	Total Depth Treated [Line 17 + Line 18]	50.4	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1853.5	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**441.3**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	926.8	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**545.2**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	56192.4	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.67	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.030	
27	Minimum BMP Footprint (Line 24 x Line 25 x minimum sizing factor)	1129	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**1420**	sq-ft
Check for Volume Reduction [**Not applicable for No Infiltration Condition**]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.15**	unitless
30	Minimum required fraction of DCV retained for partial infiltration	**0.325**	unitless
31	Is the retained DCV ≥ 0.325? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**N/A**	unitless
	Check Footprint Provided >= Footprint Required	**OK**	

Notes:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23).
2. The DCV fraction of 0.325 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

BMP: **Biofiltration #4**

Simple Sizing Method for Biofiltration BMPs		**Worksheet B-5.1**	
1	Remaining DCV after implementing retention BMPs	2025.9	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	0	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP	**1490**	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	223.5	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	1802.4	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing of the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	20.4	inches
19	Total Depth Treated [Line 17 + Line 18]	50.4	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	2703.6	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**643.7**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	1351.8	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**795.2**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	54450	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.84	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.030	
27	Minimum BMP Footprint (Line 24 x Line 25 x minimum sizing factor)	1376	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**1490**	sq-ft
Check for Volume Reduction [**Not applicable for No Infiltration Condition**]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.11**	unitless
30	Minimum required fraction of DCV retained for partial infiltration	**0.325**	unitless
31	Is the retained DCV ≥ 0.325? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**N/A**	unitless
	Check Footprint Provided >= Footprint Required	**OK**	

Notes:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23).

2. The DCV fraction of 0.325 is based on a 40% average annual percent capture and a 36-hour drawdown time.

3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

BMP: **Biofiltration #6**

	Simple Sizing Method for Biofiltration BMPs	**Worksheet B-5.1**	
1	Remaining DCV after implementing retention BMPs	1775.8	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	0	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP	**970**	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	145.5	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	1630.3	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing of the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	20.4	inches
19	Total Depth Treated [Line 17 + Line 18]	50.4	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	2445.4	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**582.2**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	1222.7	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**719.2**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	50094	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.80	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.030	
27	Minimum BMP Footprint (Line 24 x Line 25 x minimum sizing factor)	1206	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**970**	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.08**	unitless
30	Minimum required fraction of DCV retained for partial infiltration	**0.325**	unitless
31	Is the retained DCV ≥ 0.325? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**N/A**	unitless
	Check Footprint Provided >= Footprint Required	**OK**	

Notes:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23).
2. The DCV fraction of 0.325 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

BMP: **Biofiltration #7**

	Simple Sizing Method for Biofiltration BMPs	**Worksheet B-5.1**	
1	Remaining DCV after implementing retention BMPs	1267.9	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.13	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	0	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP	**1190**	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	178.5	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	1089.4	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing of the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	20.4	inches
19	Total Depth Treated [Line 17 + Line 18]	50.4	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1634.0	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**389.1**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	817.0	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**480.6**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	36154.8	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.79	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.030	
27	Minimum BMP Footprint (Line 24 x Line 25 x minimum sizing factor)	861	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**1190**	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.49**	unitless
30	Minimum required fraction of DCV retained for partial infiltration	**0.22**	unitless
31	Is the retained DCV ≥ 0.325? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**YES**	unitless
	Check Footprint Provided >= Footprint Required	**OK**	

Notes:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23).
2. The DCV fraction of 0.325 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

The City *of*
SAN DIEGO

	Project Name	LIC
	BMP ID	7

Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	36154.8	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.79	
3	85th percentile 24-hour rainfall depth	0.53	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	1262	cu. ft.
BMP Parameters			
5	Footprint of the BMP	1190	sq. ft.
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	18	inches
7	Media retained pore space [50% of (FC-WP)]	0.05	in/in
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Porosity of aggregate storage	0.4	in/in
Volume Retention Requirement			
10	Measured infiltration rate in the DMA	0.268	in/hr.
11	Factor of safety	2	
12	Reliable infiltration rate, for biofiltration BMP sizing [Line 10/ Line 11] Note: This worksheet is not applicable if Line 12 < 0.01 in/hr.	0.134	in/hr.
13	Average annual volume reduction target (Figure B.5-2) When Line 12 ≥ 0.01 in/hr. = Minimum (40, 166.9 x Line 12 +6.62)	29.0	%
14	Fraction of DCV to be retained (Figure B.5-3) 0.0000013 x Line 13^3 - 0.000057 x Line 13^2 + 0.0086 x Line 13 - 0.014	0.219	
15	Target volume retention [Line 14 x Line 4]	276	cu. ft.
Evapotranspiration: Average Annual Volume Retention			
16	Effective evapotranspiration depth [Line 6 x Line 7]	0.9	inches
17	Retained Pore Volume [(Line 16 x Line 5)/12]	89	cu. ft.
18	Fraction of DCV retained in pore spaces [Line 17/Line 4]	0.07	
19	Evapotranspiration average annual capture [ET nomographs in Figure B.5-5]	5.2	%
Infiltration: Average Annual Volume Retention			
20	Drawdown for infiltration storage [(Line 8 x Line 9)/Line 12]	9	hours
21	Equivalent DCV fraction from evapotranspiration (use Line 19 and Line 20 in Figure B.4-1; Refer to Appendix B.4.2.2)	0.01	
22	Infiltration volume storage [(Line 5 x Line 8 x Line 9)/12]	119	cu. ft.
23	Infiltration Storage Fraction of DCV [Line 22/Line 4]	0.09	
24	Total Equivalent Fraction of DCV [Line 21 + Line 23]	0.10	
25	Biofiltration BMP average annual capture [use Line 24 and 20 in Figure B.4-1]	53.92	%
Volume retention required from site design and other BMPs			
26	Fraction of DCV retained (Figure B.5-3) 0.0000013 x Line 25^3 - 0.000057 x Line 25^2 + 0.0086 x Line 25 - 0.014	0.488	
27	Remaining target DCV retention [(Line 14 – Line 26) x Line 4] Note: If Line 27 is equal to or smaller than 0 then the BMP meets the volume retention performance standard. If Line 27 is greater than 0, the applicant must implement site design and/or other BMPs within the DMA that will retain DCV equivalent to or greater than Line 27 to meet the volume retention performance standard	-339	cu. ft.

Volume Retention Performance Standard is Met

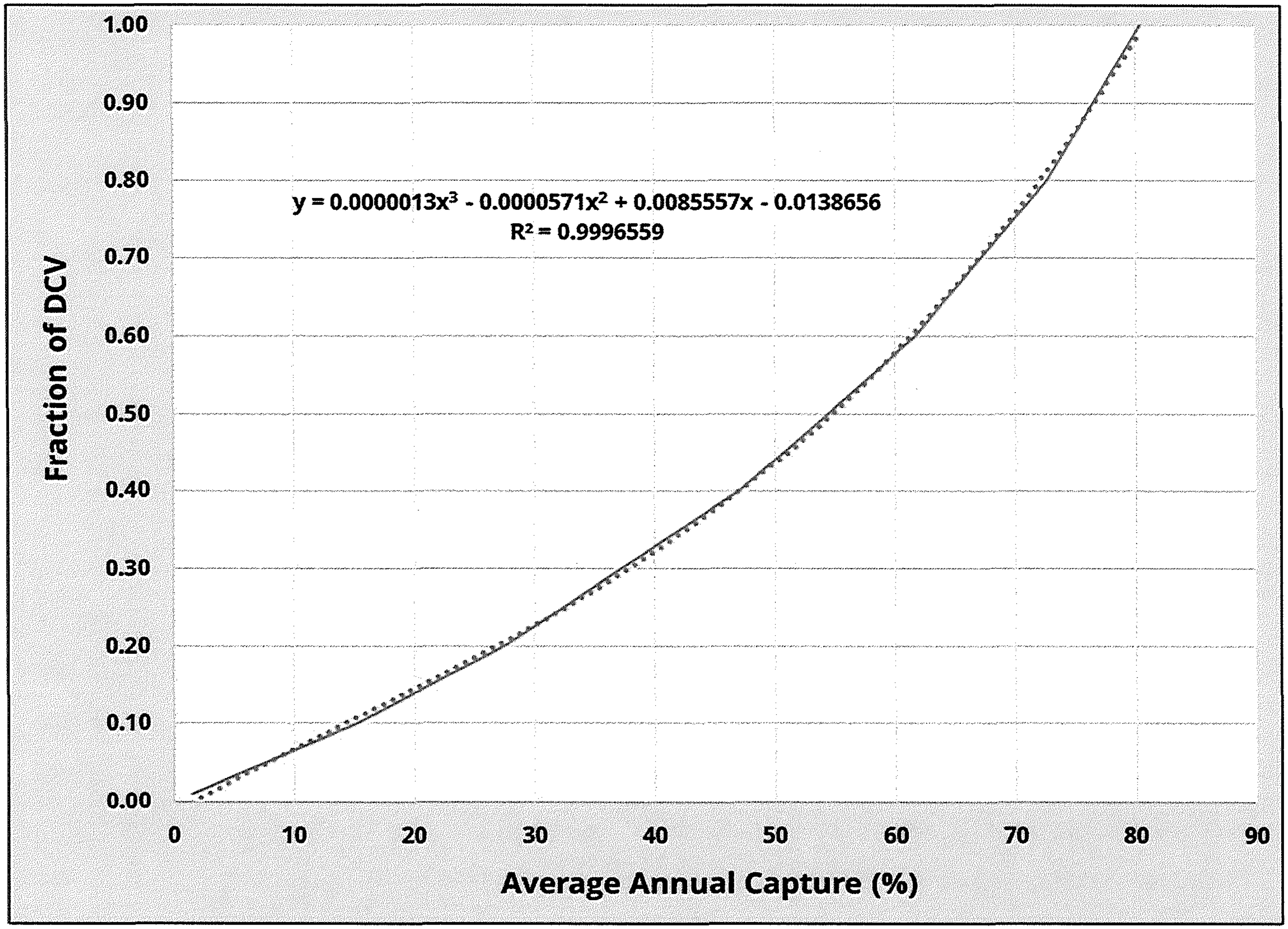


Figure B.5-3. Fraction of DCV versus Average Annual Capture

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs
BMP: **Biofiltration #8**

Simple Sizing Method for Biofiltration BMPs		**Worksheet B-5.1**	
1	Remaining DCV after implementing retention BMPs	2124.0	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	0	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP	**980**	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	147.0	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	1977.0	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing of the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	20.4	inches
19	Total Depth Treated [Line 17 + Line 18]	50.4	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	2965.5	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**706.1**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	1482.7	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**872.2**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	55756.8	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.86	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.012	
27	Minimum BMP Footprint (Line 24 x Line 25 x minimum sizing factor)	577	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**980**	sq-ft
Check for Volume Reduction **[Adjusted for No Infiltration Condition]**			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.15**	unitless
30	Minimum required fraction of DCV retained for no infiltration	**0.060**	unitless
31	Is the retained DCV ≥ REQD? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**YES**	unitless
	Check Footprint Provided >= Footprint Required	**OK**	

Notes:
1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23).
2. The DCV fraction of 0.325 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

The City of SAN DIEGO	**Project Name**	LIC	
	BMP ID	8	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	55756.8	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.86	
3	85th percentile 24-hour rainfall depth	0.53	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2118	cu. ft.
BMP Parameters			
5	Footprint of the BMP	980	sq. ft.
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	18	inches
7	Media retained pore space [50% of (FC-WP)]	0.05	in/in
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Porosity of aggregate storage	0.4	in/in
Volume Retention Requirement			
10	Measured infiltration rate in the DMA	0	in/hr.
11	Factor of safety	2	
12	Reliable infiltration rate, for biofiltration BMP sizing [Line 10/ Line 11] Note: This worksheet is not applicable if Line 12 < 0.01 in/hr.	0	in/hr.
13	Average annual volume reduction target (Figure B.5-2) When Line 12 ≥ 0.01 in/hr. = Minimum (40, 166.9 x Line 12 +6.62)	6.6	%
14	Fraction of DCV to be retained (Figure B.5-3) 0.0000013 x Line 13^3 - 0.000057 x Line 13^2 + 0.0086 x Line 13 - 0.014	0.041	
15	Target volume retention [Line 14 x Line 4]	87	cu. ft.
Evapotranspiration: Average Annual Volume Retention			
16	Effective evapotranspiration depth [Line 6 x Line 7]	0.9	inches
17	Retained Pore Volume [(Line 16 x Line 5)/12]	74	cu. ft.
18	Fraction of DCV retained in pore spaces [Line 17/Line 4]	0.03	
19	Evapotranspiration average annual capture [ET nomographs in Figure B.5-5]	2.4	%
Infiltration: Average Annual Volume Retention			
20	Drawdown for infiltration storage [(Line 8 x Line 9)/Line 12]	0	hours
21	Equivalent DCV fraction from evapotranspiration (use Line 19 and Line 20 in Figure B.4-1; Refer to Appendix B.4.2.2)	0.01	
22	Infiltration volume storage [(Line 5 x Line 8 x Line 9)/12]	98	cu. ft.
23	Infiltration Storage Fraction of DCV [Line 22/Line 4]	0.05	
24	Total Equivalent Fraction of DCV [Line 21 + Line 23]	0.06	
25	Biofiltration BMP average annual capture [use Line 24 and 20 in Figure B.4-1]	20.42	%
Volume retention required from site design and other BMPs			
26	Fraction of DCV retained (Figure B.5-3) 0.0000013 x Line 25^3 - 0.000057 x Line 25^2 + 0.0086 x Line 25 - 0.014	0.149	
27	Remaining target DCV retention [(Line 14 – Line 26) x Line 4] Note: If Line 27 is equal to or smaller than 0 then the BMP meets the volume retention performance standard. If Line 27 is greater than 0, the applicant must implement site design and/or other BMPs within the DMA that will retain DCV equivalent to or greater than Line 27 to meet the volume retention performance standard	-229	cu. ft.
Volume Retention Performance Standard is Met			

Worksheet B.5-2: Calculation of Alternative Minimum Footprint Sizing Factor

Alternative Minimum Footprint Sizing Factor		Worksheet B.5-2 (Page 1 of 2)	
1	Area draining to the BMP	1.28	acre
2	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.86	
3	Load to Clog (See Table B.5-3 for guidance; Lc)	2	lb/sq-ft
4	Allowable Period to Accumulate Clogging Load (T_L)	10	years

Volume Weighted EMC Calculation

Land Use	Fraction of Total DCV	TSS EMC (mg/L)	Product
Single Family Residential		123	0
Commercial	0.28	128	35
Industrial		125	0
Education (Municipal)		132	0
Transportation		78	0
Multi-family Residential		40	0
Roof Runoff	0.72	14	10
Low Traffic Areas		50	0
Open Space		216	0
Other, specify:			0
Other, specify:			0
Other, specify:			0

5	Volume Weighted EMC (sum of all products)	45	mg/L

BMP Parameters

6	If pretreatment measures are included in the design, apply an adjustment of 25% 1 [Line 5 x (1-0.25)]	45	mg/L
7	Average Annual Precipitation	10	inches
8	Calculate the Average Annual Runoff (Line 1 x Line 7 x 43,560/12) x Line2	41277	cu-ft/yr
9	Calculate the Average Annual TSS Load (Line 8 x 62.4 x Line 6)/10^6	116	lb/yr
10	Calculate the BMP Footprint Needed (Line 9 x Line 4)/Line 3	580	sq-ft
11	Calculate the Alternative Minimum Footprint Sizing Factor [Line 10/ (Line 1 x 43560 x Line 2)]	0.012	

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

BMP: **Biofiltration #9**

	Simple Sizing Method for Biofiltration BMPs	**Worksheet B-5.1**	
1	Remaining DCV after implementing retention BMPs	2705.0	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.02	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	0	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	inches
7	Assumed surface area of the biofiltration BMP	**1600**	sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	240.0	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	2465.0	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	12	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing of the aggregate is not over the entire bottom surface area	29	inches
14	Freely drained pore space	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	27.2	inches
19	Total Depth Treated [Line 17 + Line 18]	57.2	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	3697.5	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	**775.7**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	1848.8	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	**815.6**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	75794.4	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.81	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.026	
27	Minimum BMP Footprint (Line 24 x Line 25 x minimum sizing factor)	1592	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**1600**	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.09**	unitless
30	Minimum required fraction of DCV retained for partial infiltration	**0.08**	unitless
31	Is the retained DCV ≥ REQD? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	**YES**	unitless
	Check Footprint Provided >= Footprint Required	**OK**	

Notes:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23).

2. The DCV fraction of 0.325 is based on a 40% average annual percent capture and a 36-hour drawdown time.

3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

The City of SAN DIEGO

Project Name LIC

BMP ID 9

Sizing Method for Volume Retention Criteria

Worksheet B.5-2

1	Area draining to the BMP	75794.4	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.808	
3	85th percentile 24-hour rainfall depth	0.53	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2705	cu. ft.
BMP Parameters			
5	Footprint of the BMP	1600	sq. ft.
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	18	inches
7	Media retained pore space [50% of (FC-WP)]	0.05	in/in
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	4	inches
9	Porosity of aggregate storage	0.4	in/in
Volume Retention Requirement			
10	Measured infiltration rate in the DMA	0.047	in/hr.
11	Factor of safety	2	
12	Reliable infiltration rate, for biofiltration BMP sizing [Line 10/ Line 11] Note: This worksheet is not applicable if Line 12 < 0.01 in/hr.	0.0235	in/hr.
13	Average annual volume reduction target (Figure B.5-2) When Line 12 ≥ 0.01 in/hr. = Minimum (40, 166.9 x Line 12 +6.62)	10.5	%
14	Fraction of DCV to be retained (Figure B.5-3) 0.0000013 x Line 13^3 - 0.000057 x Line 13^2 + 0.0086 x Line 13 - 0.014	0.072	
15	Target volume retention [Line 14 x Line 4]	195	cu. ft.
Evapotranspiration: Average Annual Volume Retention			
16	Effective evapotranspiration depth [Line 6 x Line 7]	0.9	inches
17	Retained Pore Volume [(Line 16 x Line 5)/12]	120	cu. ft.
18	Fraction of DCV retained in pore spaces [Line 17/Line 4]	0.04	
19	Evapotranspiration average annual capture [ET nomographs in Figure B.5-5]	3.1	%
Infiltration: Average Annual Volume Retention			
20	Drawdown for infiltration storage [(Line 8 x Line 9)/Line 12]	68	hours
21	Equivalent DCV fraction from evapotranspiration (use Line 19 and Line 20 in Figure B.4-1; Refer to Appendix B.4.2.2)	0.03	
22	Infiltration volume storage [(Line 5 x Line 8 x Line 9)/12]	213	cu. ft.
23	Infiltration Storage Fraction of DCV [Line 22/Line 4]	0.08	
24	Total Equivalent Fraction of DCV [Line 21 + Line 23]	0.11	
25	Biofiltration BMP average annual capture [use Line 24 and 20 in Figure B.4-1]	12.56	%
Volume retention required from site design and other BMPs			
26	Fraction of DCV retained (Figure B.5-3) 0.0000013 x Line 25^3 - 0.000057 x Line 25^2 + 0.0086 x Line 25 - 0.014	0.088	
27	Remaining target DCV retention [(Line 14 – Line 26) x Line 4] Note: If Line 27 is equal to or smaller than 0 then the BMP meets the volume retention performance standard. If Line 27 is greater than 0, the applicant must implement site design and/or other BMPs within the DMA that will retain DCV equivalent to or greater than Line 27 to meet the volume retention performance standard	-43	cu. ft.

Volume Retention Performance Standard is Met

Worksheet B.5-2: Calculation of Alternative Minimum Footprint Sizing Factor

Alternative Minimum Footprint Sizing Factor	Worksheet B.5-2 (Page 1 of 2)		
1	Area draining to the BMP	1.74	acre
2	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.81	
3	Load to Clog (See Table B.5-3 for guidance; Lc)	2	lb/sq-ft
4	Allowable Period to Accumulate Clogging Load (T_L)	10	years

Volume Weighted EMC Calculation

Land Use	Fraction of Total DCV	TSS EMC (mg/L)	Product
Single Family Residential		123	0
Commercial	1.00	128	128
Industrial		125	0
Education (Municipal)		132	0
Transportation		78	0
Multi-family Residential		40	0
Roof Runoff		14	0
Low Traffic Areas		50	0
Open Space		216	0
Other, specify:			0
Other, specify:			0
Other, specify:			0

5	Volume Weighted EMC (sum of all products)	128	mg/L

BMP Parameters

6	If pretreatment measures are included in the design, apply an adjustment of 25% 1 [Line 5 x (1-0.25)]	96	mg/L
7	Average Annual Precipitation	10	inches
8	Calculate the Average Annual Runoff (Line 7 x 43,560/12) x Line2	52569	cu-ft/yr
9	Calculate the Average Annual TSS Load (Line 8 x 62.4 x Line 6)/10^6	315	lb/yr
10	Calculate the BMP Footprint Needed (Line 9 x Line 4)/Line 3	1575	sq-ft
11	Calculate the Alternative Minimum Footprint Sizing Factor [Line 10/ (Line 1 x 43560 x Line 2)]	0.026	

Project Name: Legacy International Center

ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☒ **As shown in the FEMA FIRM panel located in this Attachment, the outlet location is below the San Diego River floodplain elevation, and therefore qualifies as a direct discharge to the San Diego River which is an exempt water body. No other hydromodification information is required because the outfall qualifies for the hydromodification exemption.**

Project Name: Legacy International Center

Indicate which Items are Included:

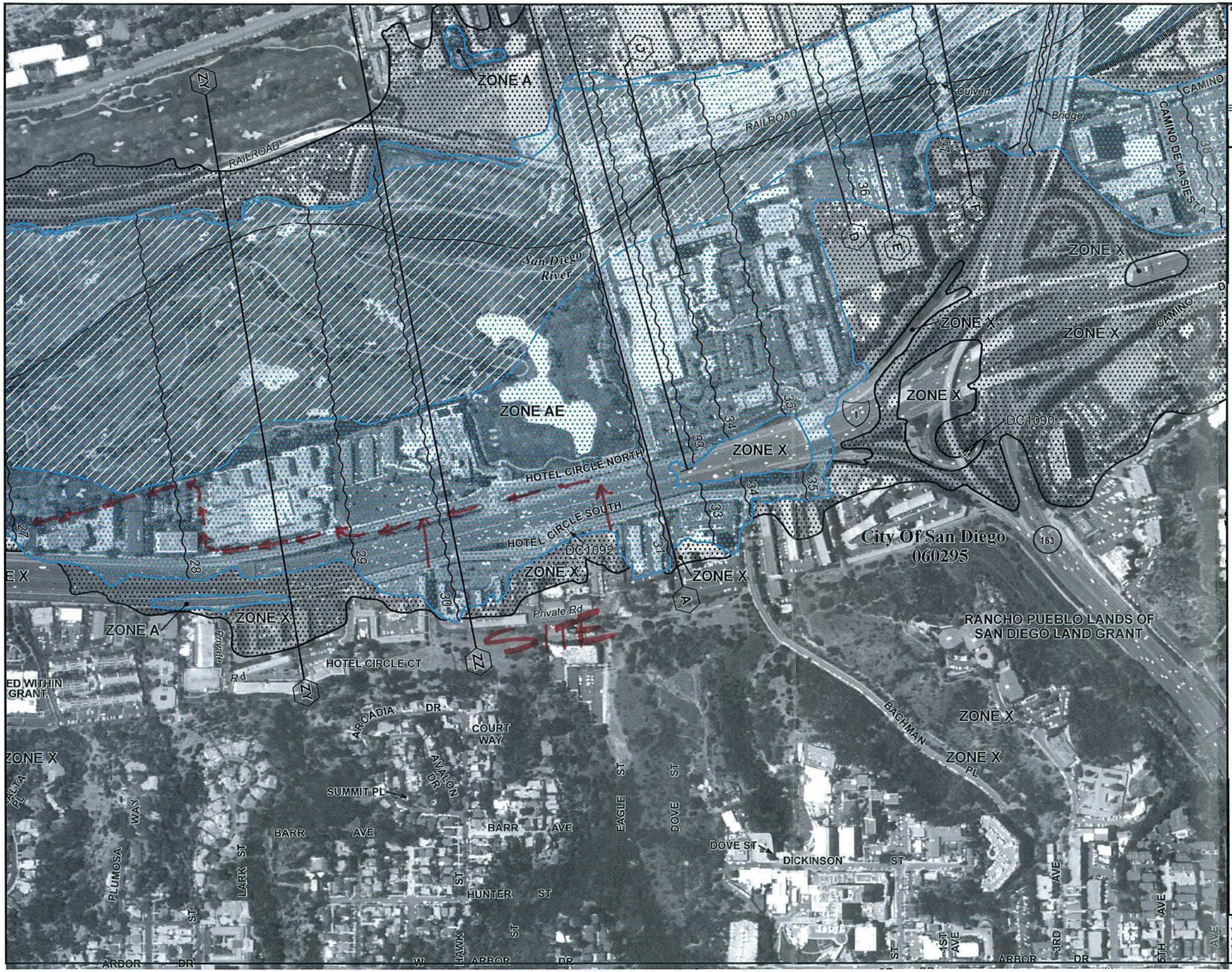
Attachment Sequence	**Contents**	**Checklist**
Attachment 2a	Hydromodification Management Exhibit (Required)	☐ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☐ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☐ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☐ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☐ Not required because BMPs will drain in less than 96 hours

Project Name: Legacy International Center

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☐ Underlying hydrologic soil group
☐ Approximate depth to groundwater
☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☐ Critical coarse sediment yield areas to be protected
☐ Existing topography
☐ Existing and proposed site drainage network and connections to drainage offsite
☐ Proposed grading
☐ Proposed impervious features
☐ Proposed design features and surface treatments used to minimize imperviousness
☐ Point(s) of Compliance (POC) for Hydromodification Management
☐ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☐ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)



ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 1618G

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1618 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1618	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

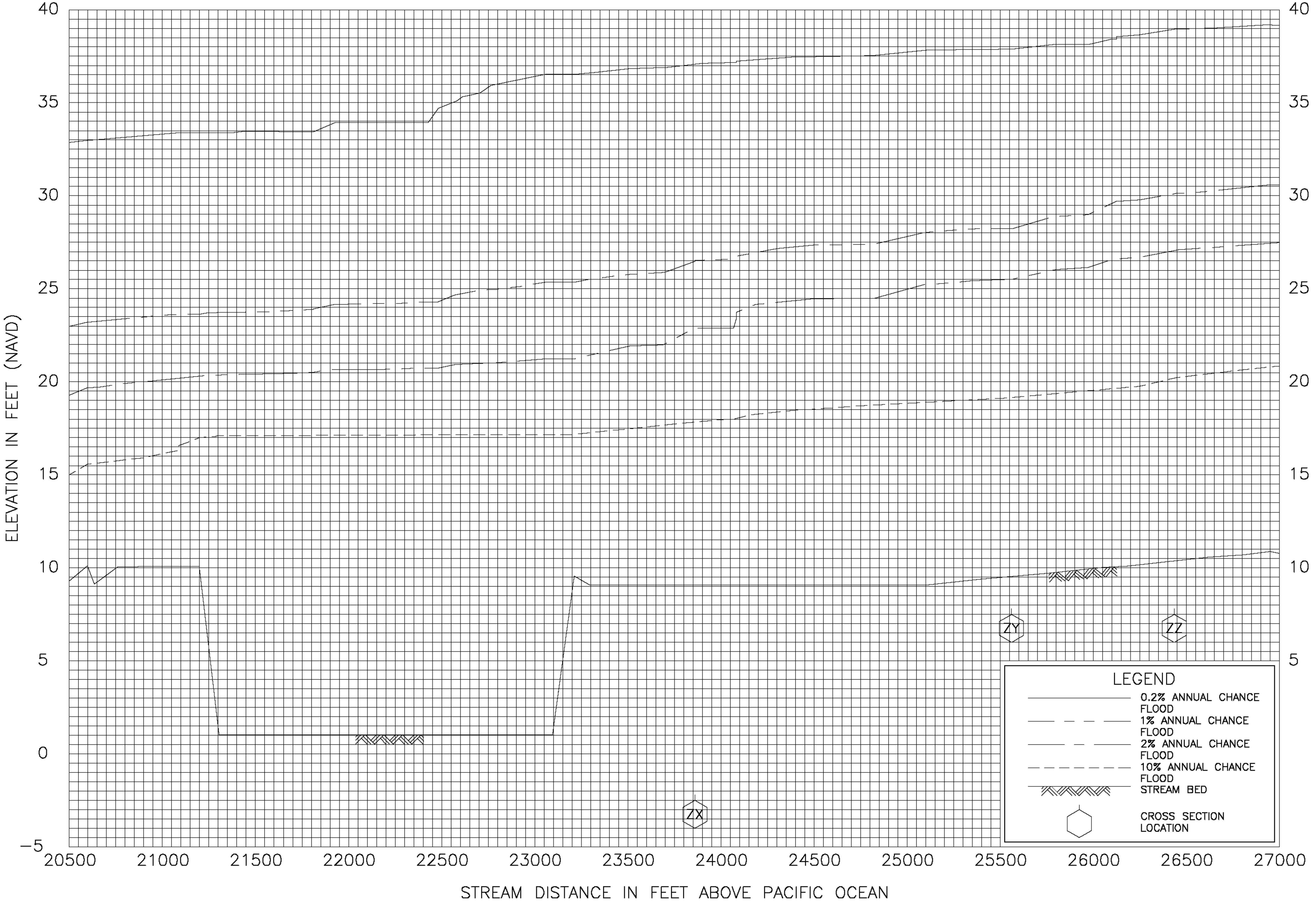
MAP NUMBER
06073C1618G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

HYDROMODIFICATION
EXEMPTION
(STABILIZED CONVEYANCE)

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



FLOOD PROFILES

SAN DIEGO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA

(AND INCORPORATED AREAS)

Project Name: Legacy International Center

ATTACHMENT 3

STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

Project Name: Legacy International Center

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒ Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Draft Maintenance Agreement (when applicable)	☐ Included ☐ Not Applicable

Project Name: Legacy International Center

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:
  - ☐ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual
- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

- ☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
- ☐ How to access the structural BMP(s) to inspect and perform maintenance
- ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☐ When applicable, frequency of bioretention soil media replacement
- ☐ Recommended equipment to perform maintenance
- ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- ☐ Vicinity map
- ☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- ☐ BMP and HMP location and dimensions
- ☐ BMP and HMP specifications/cross section/model
- ☐ Maintenance recommendations and frequency
- ☐ LID features such as (permeable paver and LS location, dim, SF).

THE CITY OF SAN DIEGO
RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO
AND WHEN RECORDED MAIL TO:

Click or tap here to enter text.
Click or tap here to enter text.
Click or tap here to enter text.

(THIS SPACE IS FOR THE RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSOR'S PARCEL NUMBER:	PROJECT NUMBER:
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

This agreement is made by and between the City of San Diego, a municipal corporation [City] and Click or tap here to enter text.

the owner or duly authorized representative of the owner [Property Owner] of property located at:

Click or tap here to enter text.

(Property Address)

and more particularly described as: Click or tap here to enter text.

(Legal Description of Property)

in the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): Click or tap here to enter text.

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): Click or tap here to enter text.

Continued on Page 2

Project Name: Legacy International Center

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s):Click or tap here to enter text..
2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's WQTR and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s)Click or tap here to enter text..
3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibits(s):Click or tap here to enter text.

(Owner Signature)

Click or tap here to enter text.
(Print Name and Title)

Click or tap here to enter text.
(Company/Organization Name)

Click or tap to enter a date.
(Date)

THE CITY OF SAN DIEGO

APPROVED:

(City Control engineer Signature

(Print Name)

(Date)

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDMENTS PER CIVIL CODE SEC. 1180 ET.SEQ

Project Name: Legacy International Center

ATTACHMENT 4

COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

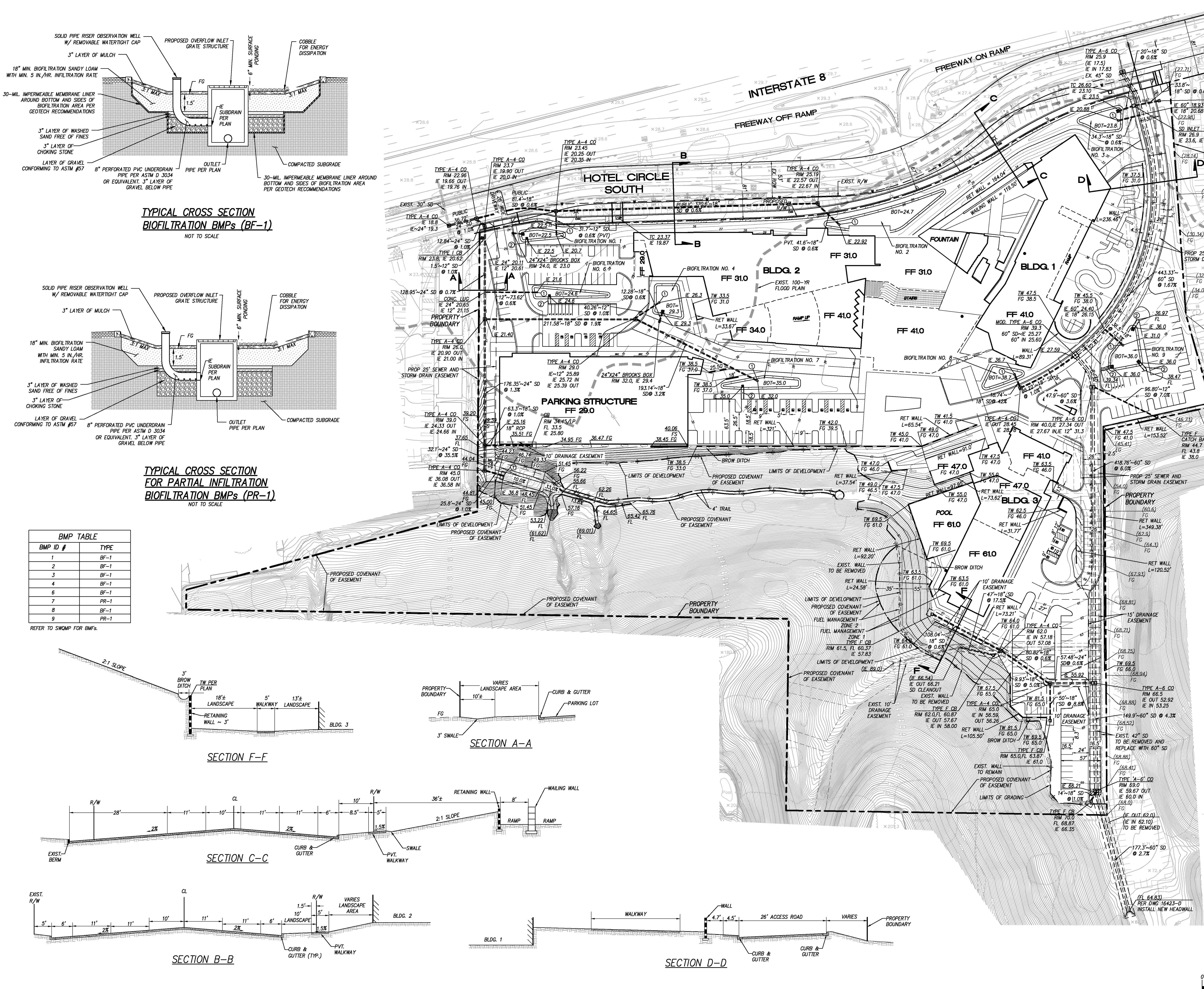
This is the cover sheet for Attachment 4.

Project Name: Legacy International Center

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

☐ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
☐ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☐ Details and specifications for construction of structural BMP(s)
☐ Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
☐ How to access the structural BMP(s) to inspect and perform maintenance
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐ Recommended equipment to perform maintenance
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☐ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☐ All BMPs must be fully dimensioned on the plans
☐ When propritery BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Broucher photocopies are not allowed.



TYPICAL CROSS SECTION BIOFILTRATION BMPs (BF-1)

NOT TO SCALE

TYPICAL CROSS SECTION FOR PARTIAL INFILTRATION BIOFILTRATION BMPs (PR-1)

NOT TO SCALE

BMP TABLE	
BMP ID #	TYPE
1	BF-1
2	BF-1
3	BF-1
4	BF-1
6	BF-1
7	PR-1
8	BF-1
9	PR-1

REFER TO SWQMP FOR BMFs.

SECTION F-F

SECTION A-A

SECTION C-C

SECTION B-B

SECTION D-D

NOTES:

1. NO PORTION OF ANY PROPOSED BELOW-GRADE PARKING GARAGE WILL BE ALLOWED BENEATH ANY RESIDENTIAL BUILDING IN THE SPECIAL FLOOD HAZARD AREA.
2. PROJECT SHALL ADHERE TO FEMA'S TECHNICAL BULLETIN 6-93 FOR FLOOD PROOFING DESIGNS FOR THE BELOW-GRADE PARKING GARAGE INCLUDING A FREE-BOARD LEVEL OF SAFETY. A REGISTERED CIVIL ENGINEER OR ARCHITECT WILL CERTIFY PRIOR TO OCCUPANCY THAT THOSE REQUIREMENTS HAVE BEEN MET.
3. THE ENTRANCE TO ANY BELOW GRADE GARAGE MUST BE EITHER ABOVE THE BASE FLOOD ELEVATION OR IF BELOW THE BASE FLOOD ELEVATION, A HIGH-STRENGHT FLOOD SHIELD THAT CAN WITHSTAND THE HIGH HYDROSTATIC PRESSURE BE INSTALLED SO THAT THE FLOODWATERS WILL NOT ENTER THE DRY-PROOFED GARAGE.
4. SUBJECT TO INUNDATION ALL AREAS LOWER THAN 30.8 FT MSL (NVGD29), WHICH IS THE BASE FLOOD ELEVATION PLUS 2 FEET. REFER TO THE DRAINAGE STUDY FOR FURTHER INFORMATION.
5. THE PROPERTY OWNER SHALL ENTER INTO AN AGREEMENT TO INDEMNIFY, PROTECT, AND HOLD HARMLESS THE CITY, ITS OFFICIALS AND EMPLOYEES FROM ANY AND ALL CLAIMS, DEMANDS, CAUSES OR ACTIONS, LIABILITY OR LOSS BECAUSE OF, OR ARISING OUT OF FLOOD WATERS.
6. FILL PLACED IN THE SPECIAL FLOOD HAZARD AREA FOR THE PURPOSE OF CREATING A BUILDING PAD MUST BE COMPACTED TO 95% OF THE MAXIMUM DENSITY OBTAINABLE WITH THE STANDARD PROCTOR TEST FILL METHOD ISSUED BY THE AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM STANDARD D-698). GRANULAR FILL SLOPES MUST HAVE ADEQUATE PROTECTION FOR A MINIMUM FLOOD WATER VELOCITY OF FIVE FEET PER SECOND.

LEGEND

①	RISER/AREA DRAIN
②	CURB OUTLET, TYPE 'A' D-25
⇨	BROW DITCH, L=1260 LF
▨	RIPRAP, SDD-104

carrierjohnson + CULTURE
architecture + environments + brand strategy + graphics
1301 third avenue, san diego ca 92101
phone 619.239.2353 fax 619.239.6227

PROJECT DESIGN CONSULTANTS
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Legacy International Center
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San Diego, CA. 92108

12-09-2016 2ND SUBMITTAL
09-30-2016 1ST SUBMITTAL
ISSUES:

REGISTERED PROFESSIONAL ENGINEER
GREGORY M. SHIELDS
No. 42951
Exp. 03-31-18
CIVIL
STATE OF CALIFORNIA

PROJECT NO:
3948.60
FILENAME:
P:\3948.60\ENGR\DWG_PLANS\TM\3948.60 TM SHEET 4.DWG
DRAWN BY: CHECKED BY:
PLOT DATE:
TITLE:

GRADING AND STORM DRAIN

DRAWING NO:

4 of 33

C-4

File Name P:\3948.60\Engr\DWG_Plans\TM\3948.60 TM Sheet 4.dwg, Date Plotted Last 2/3/2017 9:01:02 AM

Project Name: Legacy International Center

ATTACHMENT 5
DRAINAGE REPORT

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

Project Name: Legacy International Center

ATTACHMENT 6

GEOTECHNICAL AND GROUNDWATER INVESTIGATION REPORT

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

Included in the CD:

Leighton Geotech Report dated 4/13/16

Leighton Infiltration Study dated 11/17/16

Leighton Infiltration Study Addendum #1 dated 1/19/17

EXCERPT FROM INFILTRATION STUDY (Full report on CD)

porosity, hydraulic head, and the proximity to the groundwater. Surface drainage and maintenance will largely determine the site's infiltration rate and the amount of water that will infiltrate for any given storm. The percolation rate will depend locally on the soil layering and will primarily be controlled by the finer grained soil layers.

4.2 PERCOLATION TESTING

As previously discussed in Section 3, seven (7) percolation tests were performed at or directly adjacent to proposed BMP locations. The proposed BMP basins and corresponding elevations are shown on Figure 4, BMP Locations with Basin Elevations. The percolation tests were performed in general accordance with the procedures set forth in California Test 750, "Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole". The tests were performed in drilled holes advanced to depths between 5 and 10 feet below existing site grades. The measured percolation rates have been converted to an adjusted infiltration rate based on borehole geometry using the Porchet Method (Ritzema, 1994) and are presented in Table 2.

Table 2
Summary of Adjusted Infiltration Rates

Boring	Tested Depth from Ground Surface (feet)	Adjusted Infiltration Rate (inch/hour)	Soil Description
BMP-1	3 - 6	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-2	6 - 10	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-3*	-	-	Alluvium - Sandy Lean CLAY (CL)
BMP-4	1 - 5	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-5	Location Omitted from Project		
BMP-6	1 - 5	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-7	1 - 5	0.268	Deposits - Sandy Lean CLAY (CL)
BMP-8	3 - 8	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-9	3 - 8	0.047	Alluvium - Clayey SAND with Gravel (SC) to Sandy Lean CLAY (CL)

*Percolation testing was not completed due to hydrocarbon contamination.

KLEINFELDER
Bright People. Right Solutions.

November 17, 2016
Kleinfelder Project No. 20163965.001A

Mr. Jim Reed, PE, RA, Leed®AP, RPA
Carrier Johnson + Culture
1301 Third Avenue
San Diego, California 92101

SUBJECT: Storm Water Infiltration Study
Legacy International Center
Mission Valley Campus
875 Hotel Circle South
San Diego, California

Dear Mr. Reed:

Kleinfelder is pleased to present the results of our storm water infiltration study of the proposed Legacy International Center, located at 875 Hotel Circle South, Mission Valley, San Diego, California.

We appreciate this opportunity to be of professional service on this project, and we look forward to being of continued service to you and the Carrier Johnson + Culture design team. If you have any questions about our report or require additional information, please contact us at 619.831.4600.

Very truly yours,

KLEINFELDER

Trampus Grindstaff
Project Engineer

Moi Arzamendi, GE 2275
Senior Geotechnical Engineer

Reviewed by:

Kevin Crennan
Kevin M. Crennan, GE 2511
Senior Geotechnical Engineer

STORM WATER INFILTRATION STUDY
LEGACY INTERNATIONAL CENTER
MISSION VALLEY CAMPUS
875 HOTEL CIRCLE SOUTH
SAN DIEGO, CALIFORNIA

NOVEMBER 17, 2016

KLEINFELDER
Bright People. Right Solutions.

A Report Prepared for:

Mr. Jim Reed, PE, RA, Leed®AP, RPA
Carrier Johnson + Culture
1301 Third Avenue
San Diego, California 92101

STORM WATER INFILTRATION STUDY
LEGACY INTERNATIONAL CENTER
MISSION VALLEY CAMPUS
875 HOTEL CIRCLE SOUTH
SAN DIEGO, CALIFORNIA

Prepared by:

Trampus Grindstaff
Project Engineer

Moi Arzamendi, GE 2275
Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
MOI ARZAMENDI
No. GE 2275
Exp: 6-30-17
GEOTECHNICAL
STATE OF CALIFORNIA

Reviewed by:

Kevin Crennan

Kevin M. Crennan, GE 2511
Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
KEVIN M. CRENNAN
No. 2511
EXP. 12/31/17
GEOTECHNICAL
STATE OF CALIFORNIA

KLEINFELDER
550 West C Street, Suite 1200
San Diego, California 92101
Phone: 619.831.4600
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November 17, 2016
Kleinfelder Project No. 20170795.001A

TABLE OF CONTENTS

1 INTRODUCTION

This report presents the results of our storm water Best Management Practices (BMP) evaluation for the proposed Legacy International Center, located at 875 Hotel Circle South, Mission Valley, San Diego, California. This report addresses the eight currently proposed storm water infiltration BMP basin areas. The project site location is presented in Figure 1, Site Vicinity Map.

2 BACKGROUND AND SITE CONDITIONS

Kleinfelder previously performed a design level geotechnical investigation at the site and the results are presented in our April 13, 2016 report titled "Geotechnical Investigation, Legacy International Center, Mission Valley Campus, 875 Hotel Circle South, San Diego, California". The previous study was performed in order to evaluate the site conditions and provide geotechnical recommendations for the proposed construction of site improvements, including four buildings associated with faith-based training, retail, commercial, recreational, administrative and hostelry.

Our previous geotechnical field investigation did not directly address specific guidelines for storm water infiltration set forth in the 2016 City of San Diego BMP Design Manual for Permanent Site Design, Storm Water Treatment and Hydromodificatoin Management (BMP Design Manual) for final design. Based on our understanding of the project and review of various civil design plans provided by Project Design Consultants for the site, proposed improvements for the project include eight (8) new BMP basins throughout the site as shown in Figure 3, Site Plan and Geologic Map, and Figure 4, BMP Locations with Basin Elevations.

The site currently has several existing facilities currently operating and one large vacant building at the most southern portion of the site. The site is located at the existing Mission Valley Resort Hotel (operating), which is located throughout most of the northern portion of the site. A liquor store and bar/restaurant are located adjacent to a portion of the hotel and a Frogs Gym (nonoperational) is located on the southeastern side of the site and behind the hotel.

Based on this proposed redevelopment for the site, the guidelines for storm water infiltration from the BMP Design Manual must be implemented in the overall final project. Existing site elevations will be altered at each BMP location, most will be regraded and the basin will be constructed below current elevations, however, some areas of the site will receive fill material to raise existing grade. The existing site and proposed finish grade elevations for each of the new BMP locations are listed in Table 1 (Existing Site and Proposed Basin Elevations) below along with the planned bottom elevation of the infiltration basin. Elevations are presented in terms of Mean Sea Level (MSL).

Table 1

Existing Site and Proposed Basin Elevations

Basin ID	Tested Depth Range from Ground Surface (ft)	Existing and Proposed Elevations			Proposed Grading
		Existing Elevation (feet, MSL)	Proposed Top of BMP Basin Elevation (feet, MSL)	Proposed Bottom of BMP Basin Elevation (feet, MSL)	
BMP-1	3 - 6	23.0	22.8	19.5	Cut
BMP-2	6 - 10	28.0	24.5	21.5	Cut
BMP-3*	Not Tested	28.0	25.5	22.5	Cut
BMP-4**	1 - 5	25.3	29.0	26.0	Fill
BMP-5	Location Omitted from Project				
BMP-6**	1 - 5	24.4	24.0	21.0	Cut
BMP-7	1 - 5	29.0	37.5	34.5	Fill
BMP-8	3 - 8	38.0	38.5	35.0	Cut
BMP-9	3 - 8	35.0	36.0	33.0	Cut

*Percolation testing was not completed due to site contamination.

**Percolation tests were completed at one location directly between BMP-4 and BMP-6 proposed locations.

3 SUBSURFACE CONDITIONS

3.1 EXPLORATIONS

Our knowledge of the site conditions has been developed from current and previous field explorations, a review of published geologic maps of the area, historical information, and our experience in the site vicinity.

Our subsurface field exploration was performed on November 8 and 9, 2016 and consisted of drilling and sampling seven (7) hollow stem auger borings (BMP-Borings). All of the boring locations were performed to evaluate infiltration for future basin areas. Prior to commencement of the fieldwork, geophysical techniques were used at the boring locations to identify potential conflicts with subsurface structures. The boring locations were also cleared for buried utilities through Underground Service Alert (USA). A Kleinfelder staff engineer supervised the field operations and logged the explorations.

The soil borings were completed using a truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers. Selected bulk samples were retrieved, placed in plastic bags, and transported to our laboratory for further examination and testing. The drill rig was operated by Pacific Drilling of San Diego, California. The total depths of the borings were between approximately 5 to 10 feet below the existing ground surface. The approximate locations of the borings are shown on Figure 2, Site Plan and Geologic Map.

The borehole percolation tests were performed in general accordance with California Test 749, “Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole”. The tests were performed in drilled holes advanced to various depths below existing site elevations based on the proposed BMP design elevations as noted in Table 1. To prepare each hole for testing, the bottom approximate 2-inches of the hole was filled with pea gravel and then a perforated PVC pipe (OD 3¼-inches) was centered through the tested depth. The PVC pipe was fully encapsulated with a high permittivity woven geotextile sock for its entire length. The test holes were presoaked overnight, and the tests performed the following day. Testing generally consisted of filling the holes with water and monitoring the rate at which the water surface dropped until stabilized percolation rates were obtained. Percolation field test data and conversions for infiltration rates using the Porchet Method (Ritzema, 1994) are presented in Appendix B. These rates are further discussed in Section 4.

Soil descriptions used on the logs result from field observations, as well as from laboratory test data. Stratification lines on the logs represent the approximate boundary between soil and/or rock types, and the actual transition may vary and can be gradual. Appendix A presents a description of the field exploration program, exploration logs, and a legend of terms and symbols used on the logs. The Kleinfelder boring logs are also presented in Appendix A. Pertinent geotechnical data collected from previous site investigations are included in Appendix D of this report.

3.2 LABORATORY TESTING

Geotechnical laboratory testing was performed on selected bulk samples to substantiate field classifications and to provide engineering parameters for geotechnical design. Testing performed consisted of wash analyses (percent passing no. 200 sieve) and Atterberg Limits and the results are presented on the boring logs in Appendix A. Previously completed site investigation lab results are also included in Appendix D.

3.3 SITE GEOLOGY

The project site is comprised of two distinct geologic areas. The area on the northern portion of the site ranges in elevation from approximately +23 to +40 feet MSL, and is considered a portion of the southern edge of the Mission Valley floodplain. This area is underlain by shallow fill soils, stream deposited alluvium, slope wash (colluvium) and alluvial fan deposits. These materials were deposited into an ancient Pleistocene channel/floodplain cut by the San Diego River. The bedrock material below the alluvial deposits consists of the Eocene age Stadium Conglomerate.

The southern portion of the site, steps up in elevation from approximately +40 to +70 feet MSL into a large north-draining side canyon off of the southern slope of Mission Valley. The southern slopes range up to 190 feet in height and have gradients of approximately 2H:1V. This lower portion of the southern side drainage area is underlain by relatively deep fill that was placed to create a pad for the existing structures and associated parking lot. The fill was placed over alluvial deposits which occupied the bottom areas of the drainage and Eocene-age Stadium Conglomerate which form the canyon walls and underlies the alluvium. Colluvial deposits accumulated along the lower portions of the southern slopes, resting on top of the Stadium Conglomerate and alluvium. The upper portions of the slope are underlain by another Eocene age unit known as the Mission Valley Formation. The Mission Valley Formation is not anticipated to occur on any portion of the project site. The areal extent of these geologic units is depicted on Figure 2.

3.4 GROUNDWATER

Groundwater was not observed within any of our boring excavations for the current infiltration study. The borehole depths (less than 10 feet) were based on the proposed BMP design. Our previous site investigation indicates groundwater depths range between approximately 8 to 20½ feet, which corresponds to elevations ranging between approximately +15½ to +20½ feet MSL. A previous investigation by Geocon Incorporated (2013) included 11 borings and encountered groundwater in nine (9) borings ranging in depth between approximately 8 to 33½ feet. The anticipated maximum groundwater elevation throughout the lower northern portion of the project site is anticipated to be on the order of +22 feet MSL.

Fluctuations of the groundwater level, localized zones of perched water, and variations in soil moisture content should be anticipated during and following the rainy season. Irrigation of landscaped areas on and adjacent to the site can also cause a fluctuation of local groundwater levels and perched water conditions can develop.

A more complete description of the geologic site and groundwater conditions is presented in our previous geotechnical investigation report for the project (Kleinfelder, 2016).

4 STORM WATER INFILTRATION

4.1 GENERAL CONSIDERATIONS

Based on the results of our field exploration, laboratory testing and engineering analyses conducted during this study, it is our professional opinion that partial infiltration is feasible for two (2) select BMP basin areas of the project site. However, the majority of the site is not suitable for storm water infiltration based on the field percolation test results during this study. We identified the following key geotechnical considerations during our study:

- Static groundwater elevations at the northern portion of the project site along Hotel Circle South will be within approximately 10 feet of proposed basin BMP bottom elevations. Percolation test results within this area of the site indicate no infiltration.
- Potential adverse impacts to new foundations, floor slabs and basement walls with proposed BMP design based on the proximity of basins and where new fill material will be placed to elevate existing site grades.
- Potential hydrocarbon contaminated soils identified at the northeast corner of the site will require additional studies and possibly mitigation measures. The lateral extent of potential contamination is not known at this time. Percolation testing could not be completed at the proposed BMP-3 basin location within this area of the site.

The following opinions, conclusions, and recommendations are based on the properties of the materials encountered in the borings, the results of the laboratory-testing program, and our engineering analyses performed. Our recommendations regarding the geotechnical aspects of the design and construction of storm water BMP basins are presented in the following sections. If the design grades are substantially different than what was assumed in our analyses or the proposed improvement configuration changes, our recommendations may have to be modified accordingly.

We have evaluated the site in conformance with the February 2016 Model BMP Design Manual for Permanent Site Design, San Diego Region, Storm Water Treatment and Hydromodification Management (BMP Design Manual). For the purpose of this report, infiltration is defined as the flow of water through the ground surface and percolation is defined as the downward flow of water through the subsurface soil layers. Infiltration may be controlled primarily by factors such as the type and porosity of the surface filtering media, maintenance of these media, surface slope, surface vegetation, and intensity, duration, and type of precipitation. Percolation may be controlled primarily by the soil types and properties such as grain size and density, soil layering, porosity, hydraulic head, and the proximity to the groundwater. Surface drainage and maintenance will largely determine the site's infiltration rate and the amount of water that will infiltrate for any given storm. The percolation rate will depend locally on the soil layering and will primarily be controlled by the finer grained soil layers.

4.2 PERCOLATION TESTING

As previously discussed in Section 3, seven (7) percolation tests were performed at or directly adjacent to proposed BMP locations. The proposed BMP basins and corresponding elevations are shown on Figure 4, BMP Locations with Basin Elevations. The percolation tests were performed in general accordance with the procedures set forth in California Test 750, "Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole". The tests were performed in drilled holes advanced to depths between 5 and 10 feet below existing site grades. The measured percolation rates have been converted to an adjusted infiltration rate based on borehole geometry using the Porchet Method (Ritzema, 1994) and are presented in Table 2.

Table 2
Summary of Adjusted Infiltration Rates

Boring	Tested Depth from Ground Surface (feet)	Adjusted Infiltration Rate (inch/hour)	Soil Description
BMP-1	3 - 6	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-2	6 - 10	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-3*	-	-	Alluvium - Sandy Lean CLAY (CL)
BMP-4	1 - 5	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-5	Location Omitted from Project		
BMP-6	1 - 5	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-7	1 - 5	0.268	Deposits - Sandy Lean CLAY (CL)
BMP-8	3 - 8	0.000	Alluvium - Sandy Lean CLAY (CL)
BMP-9	3 - 8	0.047	Alluvium - Clayey SAND with Gravel (SC) to Sandy Lean CLAY (CL)

*Percolation testing was not completed due to hydrocarbon contamination.

Note that relatively clean water was used to perform the test above. However, surface runoff water from the site would likely contain silt, clay, oil and/or other materials that would eventually decrease the infiltration rates. The provided infiltration rates in Table 2 do not include reduction factors for long term performance.

Based on visual soil classification and laboratory testing of the six soil samples collected during our field exploration at the percolation test locations, subsurface materials mostly consist of layers of sandy lean clays within the depths of the test. Testing performed consisted of wash analyses (percent passing no. 200 sieve) and Atterberg Limits and the results are presented on the boring logs in Appendix A. Previously completed site investigation lab results are also included in Appendix D. The majority of the tested soils within the depths of the percolation tests performed indicated sandy lean clay if low plasticity and fines contents on the order of 50 to 75 percent.

As noted in Table 1, the percolation test at the northeast corner of the site (location BMP-3) could not be completed due to the presence of potentially contaminated soils. All field work at this location was ceased during the field investigation due to a strong hydrocarbon odor, with photoionization detector (PID) readings reaching nearly 500 ppm. A soil/vapor survey is currently being performed in this area. A site map from the Stantec (2010) report for the Former Chevron Station Number 90158 with previously completed sample locations is presented in Appendix E for reference.

4.3 MITIGATION MEASURES

The following bullets present typical considerations (geotechnical and others) for implementation of infiltration systems, along with site specific conditions in *italics*.

- Building sites located adjacent to or within landslide hazard areas or hillside grading areas. *This site is not located near landslide hazard areas.*
- Sites with initial seasonal high groundwater elevation within 10 feet of the invert of a proposed basin. *Portions of the site are within 10 feet of high a groundwater table based on our explorations and review of existing data for the site vicinity.*
- Site soils with a moderate or high potential for liquefaction. *Portions of the site have a high potential for liquefaction*.
- Site soils with a moderate or high expansion potential. *The majority of observed soils within the percolation test areas appear to have a low to medium expansion potential.*

- Sloping sites. *The proposed campus expansion area is gently sloping within the proposed BMP basin areas*. There are no significant descending slopes.
- Sites with soil and/or groundwater contamination. *According to the California State Water Resources Control Board Geo Tracker Database, the closest site cleanup is located at the northeast corner of the site, within the area of proposed basin location BMP-3. The underground storage tank (UST) Case Number is H21151-004 for the Chevron Station No. 9-0158 located at 925 (formerly 755) Hotel Circle, San Diego, California. This is the area of the site where BMP-3 is proposed and the field work was not completed due to potential soil contamination.*
- Future use of the site and foundation set-backs (e.g., softening of the near surface soils caused by the infiltration water systems). *One of the proposed BMP basin areas (BMP-8) will be directly adjacent to a subterranean building wall and foundation.*

4.4 DATA EVALUATION

The results of the field testing program provide design infiltration rates based on correction factors contained within Tables D.5-1 and D.5-2 of the BMP Design Manual, as summarized below.

Table 3

Suitability Assessment Related Considerations for Infiltration Facility Safety Factors*

Consideration	High Concern (3 Points)	Medium Concern (2 Points)	Low Concern (1 Point)
Assessment methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates Use of well permeameter or borehole methods without accompanying continuous boring log Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log Direct measurement infiltration area with localized infiltration measurement methods (e.g., infiltrometer) Moderate spatial resolution	Direct measurement with localized (double-ring infiltrometer and borehole) infiltration testing methods at relatively high resolution or Use of extensive test pit infiltration measurement methods (Extensive refers to large excavation, filling with water and monitoring drawdown – ideally 30 to 100 square feet)

Table 3 (continued)

Suitability Assessment Related Considerations for Infiltration Facility Safety Factors*

Consideration	High Concern (3 Points)	Medium Concern (2 Points)	Low Concern (1 Point)
Texture Class	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site soil variability	Highly variable soils indicated from site assessment, or unknown variability	Soil borings/test pits indicate moderately homogeneous soils	Soil borings/test pits indicate relatively homogeneous soils
Depth to groundwater/ impervious layer	<5 ft below facility bottom	5-15 ft below facility bottom	>15 below facility bottom

*As presented in Table D.5-1 in Appendix D on page D-16 of BMP Design Manual

Table 4

Design Related Considerations for Infiltration Facility Safety Factors*

Consideration	High Concern (3 Points)	Medium Concern (2 Points)	Low Concern (1 Point)
Level of pretreatment/ expected influent sediment loads	Limited pretreatment from gross solids removal devices only, such as hydrodynamic separators, racks and screens AND tributary area includes landscaped areas, steep slopes, high traffic areas, or any other areas expected to produce high sediment, trash, or debris loads.	Good pretreatment with BMPs that mitigate coarse sediments such as vegetated swales AND influent sediment loads from the tributary area are expected to be moderate (e.g., low traffic, mild slopes, disconnected impervious areas, etc.).	Excellent pretreatment with BMPs that mitigate fine sediments such as bioretention or media filtration OR sedimentation or facility only treats runoff from relatively clean surfaces, such as rooftops/non-sanded road surfaces.
Redundancy / resiliency	No “backup” system is provided; the system design does not allow infiltration rates to be restored relatively easily with maintenance.	The system has a backup pathway for treated water to discharge if clogging occurs <u>or</u> infiltration rates can be restored via maintenance.	The system has a backup pathway for treated water to discharge if clogging occurs and infiltration rates can be relatively easily restored via maintenance.
Compaction during construction	Construction of facility on a compacted site or elevated probability of unintended/ indirect compaction.	Medium probability of unintended/ indirect compaction.	Equipment traffic is effectively restricted from infiltration areas during construction and there is low probability of unintended/ indirect compaction.

*As presented in Table D.5-2 in Appendix D on page D-17 of BMP Design Manual

4.5 DESIGN INFILTRATION RATES

Based on our evaluation of the percolation test data, the soils encountered just below the proposed bottom elevation of BMP basins in the boreholes exhibit short-term, adjusted infiltration rates between 0.0 and 0.5 inches/hr. Based on raw, non-factored, field percolation rates, proposed BMP basin locations at the site, approximate depth to static groundwater, and proximity of BMP basins to new structures, we have separated the BMP data into three (3) basin groups for design purposes, as follows:

- Group 1 – Locations BMP-1, BMP-2, BMP-4/6, and BMP-8 (no effective percolation)
- Group 2 – Location BMP-7
- Group 3 – Location BMP-9

The long term design infiltration rate was calculated by using the following correction factors based on Worksheet D.5-1 of the BMP Design Manual. Design infiltration rates have been estimated for BMP-7 and BMP-9 (Tables 5 and 6, respectively).

Table 5

Factor of Safety and Design Infiltration Rates for BMP-7

Factor Category		**Factor Description**	**Assigned Weight (w)**	**Factor Value (v)**	**Product (p) p = w x v**
A	Suitability Assessment	Soil assessment methods	0.25	2	0.5
		Predominant soil texture	0.25	3	0.75
		Site soil variability	0.25	2	0.5
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor, $S_A = \sum p$			2.25
B	Design	Level of pretreatment/ expected sediment loads	0.5	1	0.5
		Redundancy	0.25	2	0.5
		Compaction during construction	0.25	2	0.5
		Design Safety Factor, $S_B = \sum p$			1.5
Combined Safety Factor, $S_{total} = S_A \times S_B$					2.25 x 1.5 = 3.375
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					0.268
Design Infiltration Rate, inch/hr, $K_{design} = K_{observed} / S_{total}$					**0.079**

Table 6

Factor of Safety and Design Infiltration Rates for BMP-9

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.5
		Predominant soil texture	0.25	3	0.75
		Site soil variability	0.25	2	0.5
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \sum p$			2.0
B	Design	Level of pretreatment/ expected sediment loads	0.5	1	0.5
		Compaction during construction	0.25	2	0.5
		Design Safety Factor, $S_B = \sum p$	0.25	2	0.5
		Design Safety Factor, $S_B = \sum p$			1.5
Combined Safety Factor, $S_{total} = S_A \times S_B$				1.5 x 2.0 = 3.0	
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)				0.047	
Design Infiltration Rate, inch/hr, $K_{design} = K_{observed} / S_{total}$				**0.016**	

Based on the testing performed and the correction factors presented above, we recommend a Combined Safety Factors of 3.4 and 3.0 for locations BMP-7 and BMP-9, respectively. All other BMP test locations at the site have a zero (0.00 in/hr) rate of infiltration, or could not be tested due potential contaminated soil.

Based on this very low rate, or zero (0.00) rate, which is well below the recommended minimum of 0.5 inches/hr, and the completed Geotechnical and Groundwater Investigation Requirement worksheet C.4-1 contained in the BMP Design Manual, the site is classified as a feasibility screening category of both “Partial Infiltration” and “No Infiltration”. The completed C.4-1 worksheets for each BMP location proposed at the site are included in Appendix C of this report.

Based on the field percolation testing, geotechnical observations, laboratory data, and completion of the BMP Manual Worksheets, it is our opinion that the majority of the project site is not suitable for infiltration, however, two (2) of the eight (8) BMP locations are capable of partial infiltration. The resulting Design Infiltration Rate for the BMP areas tested are provided in the Group categories as follows:

- Group 1 – **NO Infiltration** (Locations BMP-1, BMP-2, BMP-4/6, and BMP-8)
- Group 2 – **PARTIAL Infiltration, Design Rate of 0.08 inches/hr** (Location BMP-7)
- Group 3 – **PARTIAL Infiltration, Design Rate of 0.02 inches/hr** (Location BMP-9)

Based on the design infiltration rates above, BMP locations within Group 1 of the site should be constructed with impermeable liners. However, it's our understanding that impermeable liners below BMP basins are no longer allowed by the City. Therefor to mitigate the potential for retained storm water to travel through permeable bedding and backfill within the adjacent storm drain and other utility trenches within 5 feet of a basin within Group 1 locations at the site, we recommend that trench plugs or cutoffs be placed in the existing or proposed trenches. Trench plugs may consist of cement slurry or concrete and should extend through the bedding material.

5 LIMITATIONS

This report has been prepared for the exclusive use of Carrier Johnson + Culture and their consultants for specific application to the subject project. The findings, conclusions and recommendations presented in this report were prepared in accordance with generally accepted geotechnical engineering practice. No warranty, express or implied, is made.

The scope of services was limited to the field exploration program described in this report. It should be recognized that definition and evaluation of subsurface conditions are difficult. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies. The conclusions presented herein are based on field explorations, laboratory testing, engineering analyses and professional judgement.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues addressed in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, laboratory tests, and our understanding of the proposed construction. It is possible that soil or groundwater conditions could vary between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Kleinfelder is notified immediately so that we may reevaluate the recommendations of this report. If the scope of the proposed construction, or locations of the improvements, changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid until the changes are reviewed, and the conclusions of this report are modified or approved in writing, by Kleinfelder.

Our geotechnical scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

6 REFERENCES

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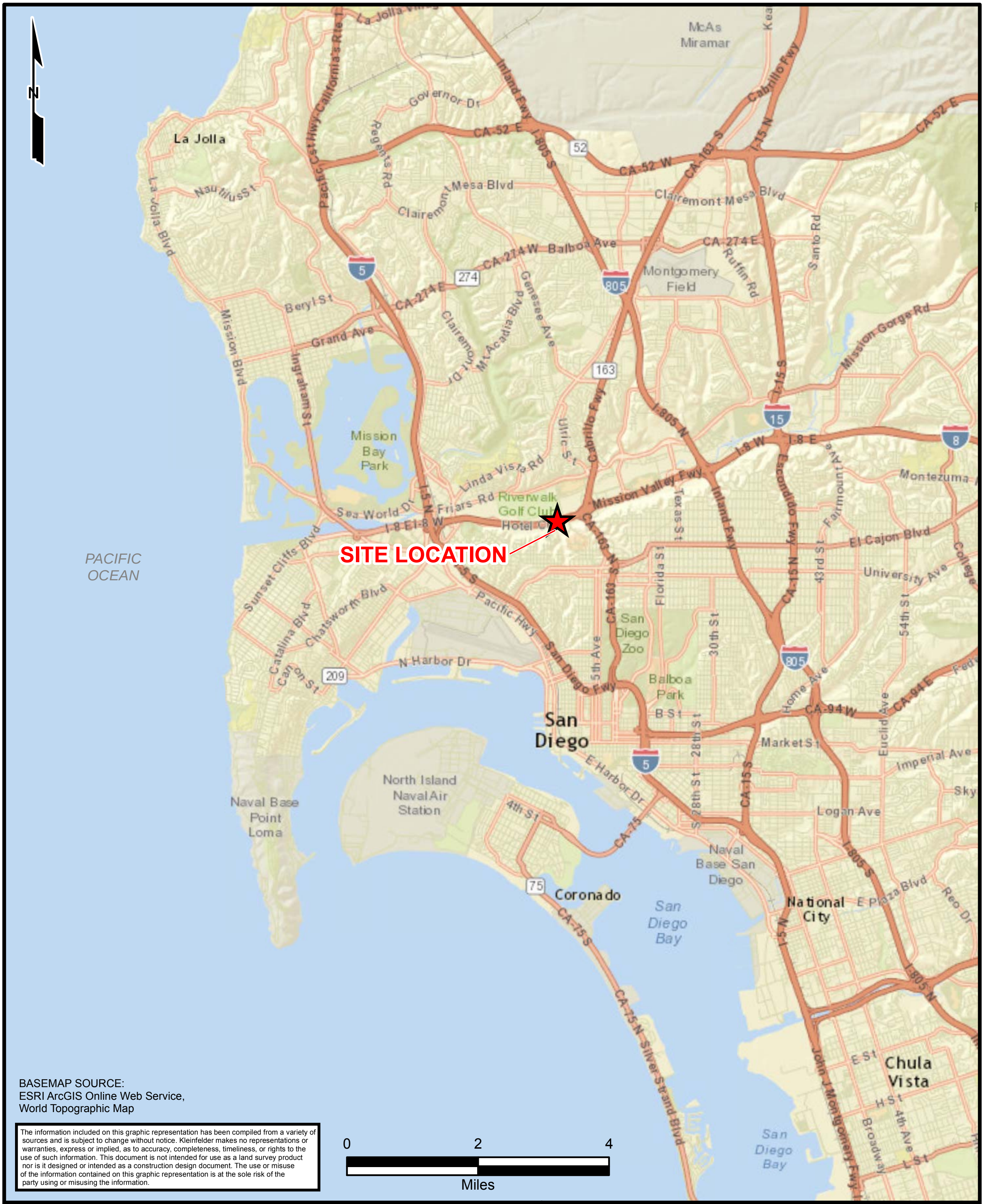
FIGURES



BASEMAP SOURCE:
ESRI ArcGIS Online Web Service,
World Topographic Map

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FILE NAME:	20163965_Vic.mxd

SITE VICINITY MAP

LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
1

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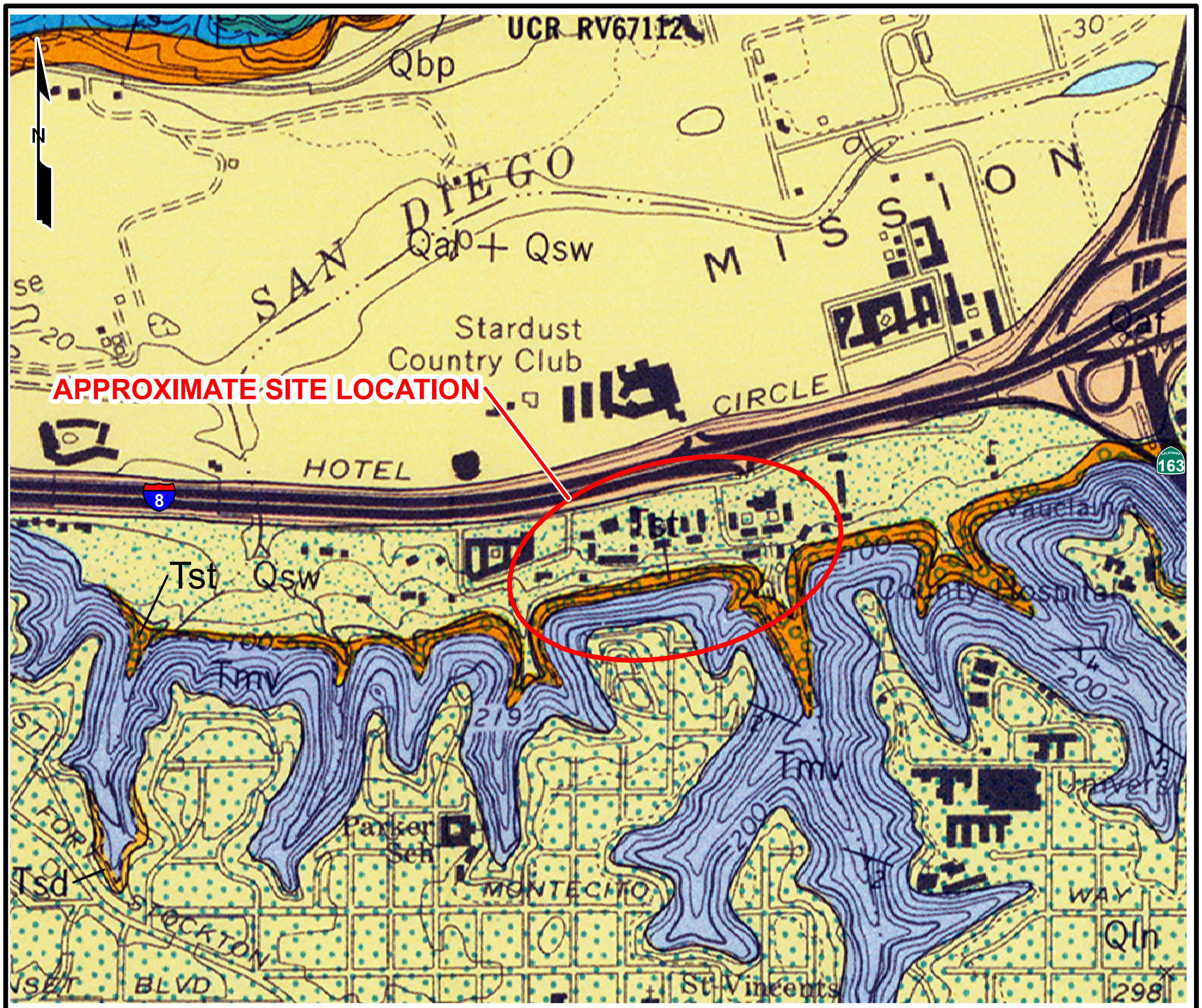

LEGEND

Qal - ALLUVIUM

Qsw - WASH DEPOSITS

Qln - LINDAVISTA FORMATION

Tmv - MISSION VALLEY FORMATION

Tst - STADIUM FORMATION

Tsd - SAN DIEGO FORMATION

SOURCE:
GEOLOGY OF THE LA JOLLA
QUADRANGLE, KENNEDY 1975..

0 500 1,000 2,000
Feet

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20163965_Geo.mxd

REGIONAL GEOLOGIC MAP

LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE

2

J:_clients\Legacy_Intl\20163965\MXD\20163965_Geo.mxd

LEGEND

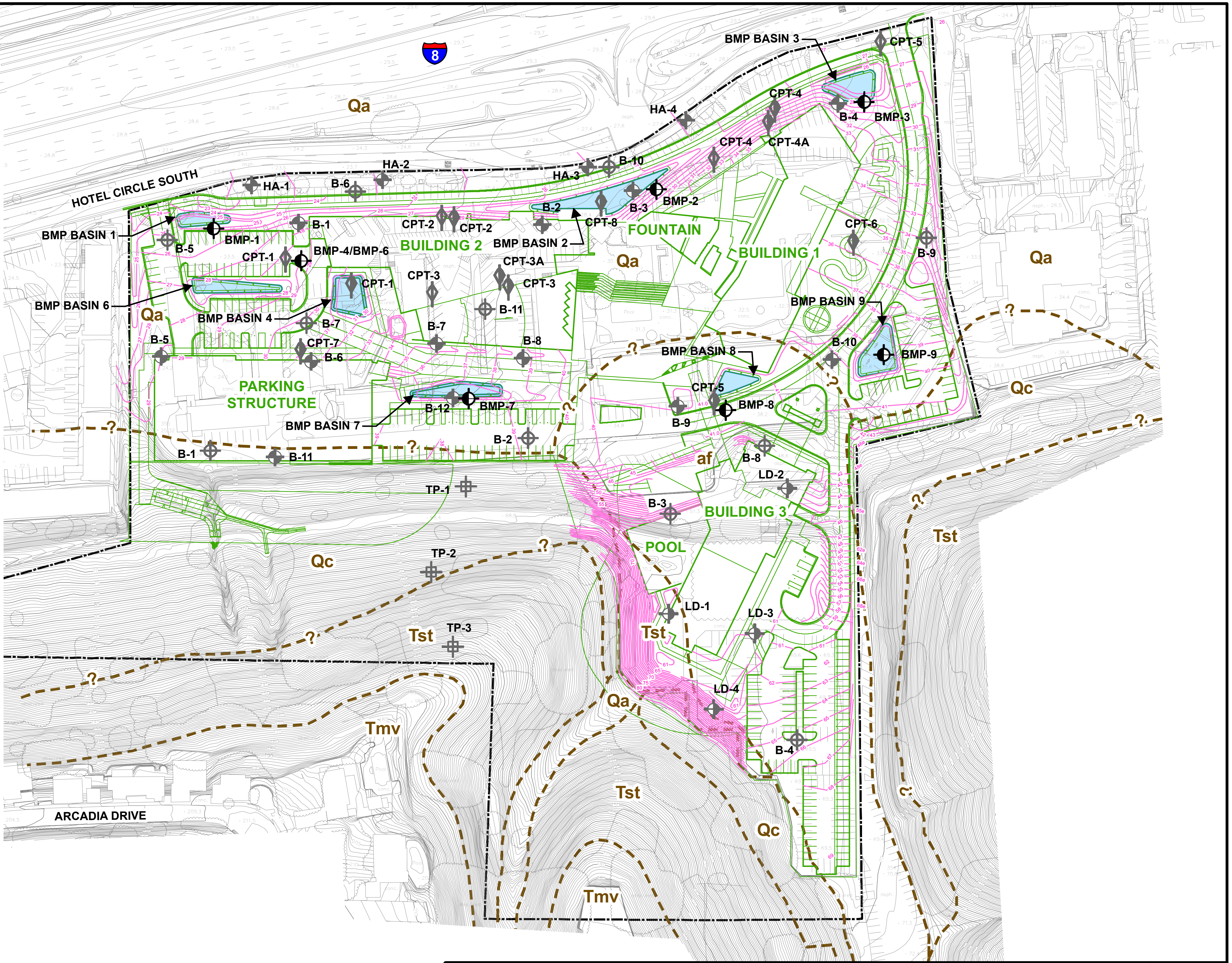
af	ARTIFICIAL FILL
Qa	ALLUVIAL DEPOSITS
Qc	COLLUVIAL DEPOSITS
Tst	STADIUM CONGLOMERATE
Tmv	MISSION VALLEY FORMATION
? - - -	APPROXIMATE LOCATION OF GEOLOGICAL CONTACT, QUERIED WHERE UNCERTAIN
🟩	PROPOSED IMPROVEMENTS
☐	APPROXIMATE PROJECT LIMITS
🟦	PROPOSED BMP BASIN
—	PROPOSED TOPO

KLEINFELDER EXPLORATIONS, 2016

BMP-9 ⌖	APPROXIMATE LOCATION OF BMP BORING
HA-4 ⌖	APPROXIMATE LOCATION OF HAND AUGER BORING
B-12 ⌖	APPROXIMATE LOCATION OF AUGER BORING
LD-4 ⌖	APPROXIMATE LOCATION OF LARGE DIAMETER BORING
CPT-8 ◆	APPROXIMATE LOCATION OF CONE PENETROMETER TEST

GEOCON EXPLORATIONS, 2013

B-11 ⌖	APPROXIMATE LOCATION OF AUGER BORING
TP-3 ⌖	APPROXIMATE LOCATION OF TEST PIT
CPT-5 ◆	APPROXIMATE LOCATION OF CONE PENETROMETER TEST



0 65 130 260
Feet

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Path: J:_clients\Legacy_Intl\20163965\MXD\20163965_SiteGeo2.mxd

NOTES:
- Elevation contours in feet.

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SITE PLAN AND GEOLOGIC MAP

LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
3

EE: EXISTING ELEVATION
SE: ELEVATION AT BASIN SURFACE
BG: ELEVATION AT BOTTOM OF GRAVEL

SCALE: 1"=30'

JOB #: 3948.60

CREATED: 10/31/16

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey

701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

CITY OF SAN DIEGO

LEGACY INTERNATIONAL CENTER

BMP LOCATIONS WITH BASIN ELEVATIONS

FIGURE
4

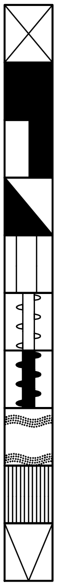
Last save by RAUL RODRIGUEZ, File Name P:\3948.60\Engr\Exhibits\INFILTRATION TEST LOCATIONS\3948 Inf Test Locations.dwg, Date Last Saved 10/31/2016 4:10:35 PM, Date Plotted Last 10/31/2016 4:19:44 PM

APPENDIX A

FIELD EXPLORATIONS

PLOTTED: 11/17/2016 07:23 AM BY: mpalmer

SAMPLE/SAMPLER TYPE GRAPHICS



BULK / GRAB / BAG SAMPLE

MODIFIED CALIFORNIA SAMPLER
(2 or 2-1/2 in. (50.8 or 63.5 mm.) outer diameter)

CALIFORNIA SAMPLER
(3 in. (76.2 mm.) outer diameter)

STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

SHELBY TUBE SAMPLER

HOLLOW STEM AUGER

SOLID STEM AUGER

WASH BORING

NQ CORE SAMPLE
(1.874 in. (47.6 mm.) core diameter)

TEXAS CONE PENETRATION

GROUND WATER GRAPHICS

- ▽ WATER LEVEL (level where first observed)
- ▼ WATER LEVEL (level after exploration completion)
- ▼ WATER LEVEL (additional levels after exploration)
- ≈ OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu≥4 and 1≤Cc≤3		**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu<4 and/ or 1>Cc>3		**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu≥4 and 1≤Cc≤3		**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu<4 and/ or 1>Cc>3		**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES			**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
					GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
					GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu≥6 and 1≤Cc≤3		**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu<6 and/ or 1>Cc>3		**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu≥6 and 1≤Cc≤3		**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu<6 and/ or 1>Cc>3		**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES			**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
					SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
					SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)		**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

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PROJECT NO.: 20163965	GRAPHICS KEY	FIGURE
DRAWN BY: MAP		
CHECKED BY: SHR	Legacy International Center San Diego, California	A-1
DATE: 11/17/2016		
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gINT FILE: Klf_gint_master_2016
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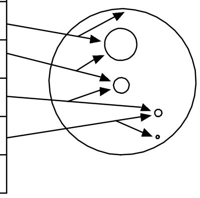
GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

Term of Use	AMOUNT	
	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MUNSELL COLOR

NAME	ABBR	NAME	ABBR
Red	R	Blue	B
Yellow Red	YR	Purple Blue	PB
Yellow	Y	Purple	P
Green Yellow	GY	Red Purple	RP
Green	G	Black	N
Blue Green	BG		

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure.
Moderately	Crumbles or breaks with considerable finger pressure.
Strongly	Will not crumble or break with finger pressure.

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N_{60} (# blows / ft)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium	4 - 8	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	>8000	Thumbnail will not indent soil.

FROM TERZAGHI AND PECK, 1948; LAMBE AND WHITMAN, 1969; FHWA, 2002; AND ASTM D2488

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

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SOIL DESCRIPTION KEY

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FIGURE

A-2

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gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2016.GLB [GEO-LEGEND 2 (SOIL DESC KEY) REV 072616]

BORING LOG BMP-1

Date Begin - End: 11/08/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Jeff & Miguel
Drilling Equipment: Diedrich D-50
Drilling Method: Hollow Stem Auger
Exploration Diameter: 8 in. O.D.

Approximate Ground Surface Elevation (ft.): 23
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		■	**ASPHALT**: 4 inches												
20		▨	**Alluvial Deposits (Qa):** **Lean CLAY (CL)**: fine-grained sand, medium plasticity, black (10YR 2/1), moist												
	5	▨		S-1	☒			CL			100	67	42	24	

The boring was terminated at approximately 6 ft. below ground surface. The boring was backfilled with soil and betonite chips on November 08, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

Approximate Elevation (feet)	Depth (feet)
15	
	10
10	
	15
5	
	20
0	
	25
-5	
	30
-10	

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PROJECT NO.: 20163965
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BORING LOG BMP-1

Legacy International Center
San Diego, California

FIGURE
A-3

PAGE: 1 of 1

PLOTTED: 11/17/2016 07:25 AM BY: mpalmer

Date Begin - End:	11/08/2016	**Drilling Company:**	Pacific Drilling	**BORING LOG BMP-2**
Logged By:	S. Tena	**Drill Crew:**	Jeff & Miguel	
Hor.-Vert. Datum:	MSL	**Drilling Equipment:**	Diedrich D-50	
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger	
Weather:	Sunny	**Exploration Diameter:**	8 in. O.D.	

Approximate Ground Surface Elevation (ft.): 28
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)=Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		■	**ASPHALT**: 4 inches												
		▨	**Alluvial Deposits (Qa):** **Clayey SAND (SC)**: low plasticity, grayish brown (10YR 5/2), moist												
25															
		▨	**Lean CLAY with Sand (CL)**: low to medium plasticity, dark yellowish brown (10YR 4/4), moist												
	5														
20															
				S-1	☒			CL			100	52	34	17	
	10														
15															
	15														
10															
	20														
5															
	25														
0															
	30														
-5															

The boring was terminated at approximately 10 ft. below ground surface. The boring was backfilled with soil and betonite chips on November 08, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

gINT FILE: Klf_gint_master_2016
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PROJECT NO.:	20163965	BORING LOG BMP-2	FIGURE
DRAWN BY:	MAP		A-4
CHECKED BY:	SHR	Legacy International Center San Diego, California	
DATE:	11/17/2016		
REVISED:	-		PAGE: 1 of 1

PLOTTED: 11/17/2016 07:25 AM BY: mpalmer

BORING LOG BMP-3

Date Begin - End: 11/08/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Jeff & Miguel
Drilling Equipment: Diedrich D-50
Drilling Method: Hollow Stem Auger
Exploration Diameter: 8 in. O.D.

FIELD EXPLORATION

Approximate Ground Surface Elevation (ft.): 28
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		■	**ASPHALT**: 4 inches												
		⁘	**Artificial Fill (af):** **Silty SAND with Gravel (SM)**: medium-grained sand, up to 3" cobble, light gray (10YR 7/2), moist												PID=86.9 ppm
25		▨	**Alluvial Deposits (Qa):** **Lean CLAY with Sand (CL)**: fine to medium-grained sand, 1" to 2" gravel, low plasticity, very dark gray (5Y 3/1), moist, strong hydrocarbon odor												PID=485.6 ppm
	5														
20															
	10														
15															
	15														
10															
	20														
5															
	25														
0															
	30														
-5															

LABORATORY RESULTS

The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with soil and betonite chips on November 08, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

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DATE: 11/17/2016
REVISED: -

BORING LOG BMP-3

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San Diego, California

FIGURE
A-5

PAGE: 1 of 1

gINT FILE: Klf_gint_master_2016
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BORING LOG BMP-4/6

Date Begin - End: 11/08/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Jeff & Miguel
Drilling Equipment: Diedrich D-50
Drilling Method: Hollow Stem Auger
Exploration Diameter: 8 in. O.D.

Approximate Ground Surface Elevation (ft.): 25
Surface Condition: Asphalt

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		■	**ASPHALT**: 4 inches												
		▨	**Alluvial Deposits (Qa):** **Lean CLAY (CL)**: fine-grained sand, medium plasticity, black (10YR 2/1), moist	S-1	☒			CL			100	63	33	16	
20	5														
15	10														
10	15														
5	20														
0	25														
-5	30														

The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with soil and betonite chips on November 08, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

KLEINFELDER
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PROJECT NO.: 20163965
DRAWN BY: MAP
CHECKED BY: SHR
DATE: 11/17/2016
REVISED: -

BORING LOG BMP-4/6

Legacy International Center
San Diego, California

FIGURE
A-6

PAGE: 1 of 1

BORING LOG BMP-7

Date Begin - End: 11/08/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Jeff & Miguel
Drilling Equipment: Diedrich D-50
Drilling Method: Hollow Stem Auger
Exploration Diameter: 8 in. O.D.

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 29 Surface Condition: Asphalt Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		■	**ASPHALT**: 4 inches												
		▨	**Alluvial Deposits (Qa):** **Lean CLAY with Sand (CL)**: fine-grained sand, 1" to 1.5" gravel, medium plasticity, dark brown (7.5YR 3/3), moist												
25		▨		S-1	☒			CL			100	73	37	21	
	5														
20															
	10														
15															
	15														
10															
	20														
5															
	25														
0															
	30														
-5															

The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with soil and betonite chips on November 08, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

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BORING LOG BMP-7

Legacy International Center
San Diego, California

FIGURE
A-7

PAGE: 1 of 1

PLOTTED: 11/17/2016 07:25 AM BY: mpalmer

BORING LOG BMP-8

Date Begin - End: 11/08/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Jeff & Miguel
Drilling Equipment: Diedrich D-50
Drilling Method: Hollow Stem Auger
Exploration Diameter: 8 in. O.D.

Approximate Ground Surface Elevation (ft.): 38
Surface Condition: Asphalt

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: 3 inches												
			AGGREGATE BASE: 3 inches												
35			**Artificial Fill (af):** **Lean CLAY with Sand (CL)**: low to medium plasticity, dark brown (7.5YR 3/3), moist												Drill rig chatter from 3 to 4 feet
	5		**Alluvial Deposits (Qa):** **Sandy Lean CLAY with Gravel (CL)**: 1" to 3" gravel, low to medium plasticity, dark grayish brown (10YR 4/2), moist												Large cobble at 5 feet
			Sandy Lean CLAY (CL): dark grayish brown (10YR 4/2), moist	S-1	☒			CL			100	54	38	21	
30															
	10														
25															
	15														
20															
	20														
15															
	25														
10															
	30														
5															

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with soil and betonite chips on November 08, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

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REVISED: -

BORING LOG BMP-8

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San Diego, California

FIGURE
A-8

PAGE: 1 of 1

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BORING LOG BMP-9

Date Begin - End:	11/08/2016	**Drilling Company:**	Pacific Drilling
Logged By:	S. Tena	**Drill Crew:**	Jeff & Miguel
Hor.-Vert. Datum:	MSL	**Drilling Equipment:**	Diedrich D-50
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger
Weather:	Sunny	**Exploration Diameter:**	8 in. O.D.

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 35 Surface Condition: Asphalt Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: 3 inches												
			AGGREGATE BASE: 3 inches												
			Alluvial Deposits (Qa): **Lean CLAY with Sand (CL)**: fine to medium-grained sand, low to medium plasticity, yellowish brown (10YR 4/4), moist												
30	5		**Sandy Lean CLAY with Gravel (CL) to Clayey SAND (SC)**: cobble up to 6", low to medium plasticity, dark yellowish brown (10YR 4/6), moist	S-1	☒			SC			100	36	30	14	
25	10														
20	15														
15	20														
10	25														
5	30														

The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with soil and betonite chips on November 08, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

gINT FILE: Klf_gint_master_2016
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

KLEINFELDER
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PROJECT NO.:	20163965	BORING LOG BMP-9	FIGURE
DRAWN BY:	MAP		A-9
CHECKED BY:	SHR	Legacy International Center San Diego, California	
DATE:	11/17/2016		
REVISED:	-		PAGE: 1 of 1

APPENDIX A
FIELD EXPLORATIONS

Prior to our subsurface explorations, Kleinfelder notified Underground Service Alert (USA) and also coordinated the design team to utilize a private utility locator to evaluate conflicts between proposed boring locations and existing utilities.

The geotechnical test exploration program consisted of excavating and logging seven (7) hollow-stem auger (HSA) borings (BMP-Borings). The HSA soil borings were advanced by Pacific Drilling of San Diego, California using a Diedrich D-50 drill rig. The drill rig was equipped with 8-inch hollow stem auger. The borings were advanced to depths up to approximately 10 feet below ground surface. Drilling occurred on November 8, 2016. Figure 2 presents the approximate boring locations.

The American Society of Testing and Materials (ASTM) chart for soil classification and a Boring Log Legend are presented as Figure A-1 and A-2, respectively. The logs of borings are presented as Figures A-3 through A-9. The Logs of Borings describe the earth materials encountered, samples obtained, and show field and laboratory tests performed. The borings were logged by our geologist using the ASTM classification system. The boundaries between soil types shown on the logs are approximate and the transition between different soil layers may be gradual. Bulk samples of representative earth materials were obtained from the borings. Upon completion, the borings were backfilled with soil cuttings, bentonite chips and capped with asphalt patch (in paved areas) when the drilling and percolation testing was completed.

Bulk samples of select earth materials were also obtained from the exploratory excavations. These samples were bagged, sealed, and transported to the laboratory for testing.

APPENDIX B

PERCOLATION TEST RESULTS AND ADJUSTED INFILTRATION RATES

Percolation Test Data Sheet

Project:	Legacy International Center San Diego, California	Tested By:	Scott Rugg
		Date:	11/9/2016
Project No:	20163965.001A	Checked By:	Moi Arzamendi

Borehole ID:	**BMP-1**	
Depth of Borehole:	6	feet
Diameter of Borehole:	8	inches
USCS Soil Classification:	CL	
Reference Elevation:	0	ft

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to water (feet)	Final Depth to Water (feet)	Change in Water Level (feet)	Percolation Rate (min./in.)
1	9:36	10:06	30	3.00	3.01	0.01	250.00
2	10:06	10:36	30	3.01	3.03	0.02	125.00
3	10:36	11:06	30	2.99	2.99	0	NA
4	11:06	11:36	30	2.99	2.99	0	NA
5	11:36	12:06	30	2.99	2.99	0	NA
6	12:06	12:36	30	2.99	2.99	0	NA
7	12:36	1:06	30	2.99	2.99	0	NA
8	1:06	1:36	30	2.99	3.00	0.01	250.00
9	1:36	2:06	30	3.00	3.00	0	NA
10	2:06	2:36	30	3.00	3.00	0	NA
11	2:36	3:06	30	3.00	3.00	0	NA
12	3:06	3:36	30	3.00	3.00	0	**NA**

Adjusted Percolation Rate

Reference:
Department of Transportation, California Test 749, 1986
"Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole"

$$C=n\left[1-\left(\frac{O}{D}\right)^2\right]+\left(\frac{I}{D}\right)^2 \text{ (Correction Factor)}$$

$$K=0.27+\frac{8.70}{D} \text{ (Conversion Factor)}$$

$$P=\frac{K*R}{C} \ (Equivalent\ unlined\ 12-inch\ diameter\ percolation\ rate)$$

D = Diameter of percolation test hole (inches)
I = Inside diameter of perforated pipe (inches)
O = Outside diameter of perforated pipe (inches)
n = Estimated porosity of annular zone (n = 1 if no material used)
R = Average percolation rate (min/inch) for equivalent 12-inch diameter hole based on last reading

Input		
D	8.00	inches
I	3.00	inches
O	3.25	inches
n	1.00	-
R	**NA**	min/inch
	0.00	inch/hour

Output		
C	0.98	-
K	1.36	-
P	**NA**	min/inch
	0.00	inch/hour

Porchet Method Conversion

- to convert percolation rate to tested infiltration rate

Reference:
H.P. Ritzema, 1994, "Drainage Principles and Applications", International Institute for Land Reclamation and Improvement, Publication 16, 2nd revised edition, Wageningen, The Netherlands

$$I_t=\frac{\Delta H\ 60\ r}{\Delta t\ (r+2Havg)}$$

Ho = Original height of water column in hole (inches)
Hf = Final height of water column in hole (inches)
ΔH = Change in head over the time interval (inches)
Havg = Average head over the time interval (inches)
Δt = Time interval (minutes)
r = Effective radius of test hole (inches)
It = Tested infiltration rate (inch/hour)

Conversion Parameters (for 8 inch hole)		
Ho	36.00	inches
Hf	36.00	inches
ΔH	0.00	inches
Havg	36.00	inches
Δt	30.00	minutes
r	4.00	inches
It	**0.00**	in/hr

Percolation Test Data Sheet

Project: Legacy International Center
San Diego, California
Project No: 20163965.001A

Tested By: Scott Rugg
Date: 11/9/2016
Checked By: Moi Arzamendi

Borehole ID: **BMP-2**
Depth of Borehole: 10 feet
Diameter of Borehole: 8 inches
USCS Soil Classification: CL
Reference Elevation: 0 ft

Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Depth to water (feet)**	**Final Depth to Water (feet)**	**Change in Water Level (feet)**	**Percolation Rate (min./in.)**
1	9:40	10:10	30	6.01	6.15	0.14	17.86
2	10:10	10:40	30	6.01	6.08	0.07	35.71
3	10:40	11:10	30	6.02	6.05	0.03	83.33
4	11:10	11:40	30	6.02	6.04	0.02	125.00
5	11:40	12:10	30	6.00	6.02	0.02	125.00
6	12:10	12:40	30	6.02	6.02	0	NA
7	12:40	1:10	30	6.02	6.02	0	NA
8	1:10	1:40	30	6.02	6.03	0.01	250.00
9	1:40	2:10	30	6.01	6.01	0	NA
10	2:10	2:40	30	6.01	6.01	0	NA
11	2:40	3:10	30	6.01	6.02	0.01	250.00
12	3:10	3:40	30	6.02	6.02	0	**NA**

Adjusted Percolation Rate

Reference:
Department of Transportation, California Test 749, 1986
"Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole"

$$C=n\left[1-\left(\frac{O}{D}\right)^2\right]+\left(\frac{I}{D}\right)^2 \text{ (Correction Factor)}$$

$$K = 0.27 + \frac{8.70}{D} \text{(Conversion Factor)}$$

$$P = \frac{K * R}{C}\ (Equivalent\ unlined\ 12 - inch\ diameter\ percolation\ rate)$$

D = Diameter of percolation test hole (inches)
I = Inside diameter of perforated pipe (inches)
O = Outside diameter of perforated pipe (inches)
n = Estimated porosity of annular zone (n = 1 if no material used)
R = Average percolation rate (min/inch) for equivalent 12-inch diameter hole based on last reading

Input		
D =	8.00	inches
I =	3.00	inches
O =	3.25	inches
n =	1.00	-
R =	**NA**	min/inch
	0.00	inch/hour

Output		
C =	0.98	-
K =	1.36	-
P =	**NA**	min/inch
	0.00	inch/hour

Porchet Method Conversion

- to convert percolation rate to tested infiltration rate

Reference:
H.P. Ritzema, 1994, "Drainage Principles and Applications", International Institute for Land Reclamation and Improvement, Publication 16, 2nd revised edition, Wageningen, The Netherlands

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r + 2Havg)}$$

Ho = Original height of water column in hole (inches)
Hf = Final height of water column in hole (inches)
ΔH = Change in head over the time interval (inches)
Havg = Average head over the time interval (inches)
Δt = Time interval (minutes)
r = Effective radius of test hole (inches)
It = Tested infiltration rate (inch/hour)

Conversion Parameters (for 8 inch hole)		
Ho	47.76	inches
Hf	47.76	inches
ΔH	0.00	inches
Havg	47.76	inches
Δt	30.00	minutes
r	4.00	inches
It	**0.000**	in/hr

Percolation Test Data Sheet

Project: Legacy International Center
San Diego, California
Project No: 20163965.001A

Tested By: Scott Rugg
Date: 11/9/2016
Checked By: Moi Arzamendi

Borehole ID: **BMP-4/6**
Depth of Borehole: 5 feet
Diameter of Borehole: 8 inches
USCS Soil Classification: CL
Reference Elevation: 0 ft

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to water (feet)	Final Depth to Water (feet)	Change in Water Level (feet)	Percolation Rate (min./in.)
1	9:38	10:08	30	1.00	1.00	0	NA
2	10:08	10:38	30	1.00	1.00	0	NA
3	10:38	11:08	30	1.00	1.00	0	NA
4	11:08	11:38	30	1.00	1.00	0	NA
5	11:38	12:08	30	1.00	1.00	0	NA
6	12:08	12:38	30	1.00	1.00	0	NA
7	12:38	1:08	30	1.00	1.00	0	NA
8	1:08	1:38	30	1.00	1.01	0.01	250.00
9	1:38	2:08	30	1.01	1.01	0	NA
10	2:08	2:38	30	1.01	1.01	0	NA
11	2:38	3:08	30	1.01	1.01	0	NA
12	3:08	3:38	30	1.01	1.01	0	**NA**

Adjusted Percolation Rate

Reference:
Department of Transportation, California Test 749, 1986
"Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole"

$$C=n\left[1-\left(\frac{O}{D}\right)^2\right]+\left(\frac{I}{D}\right)^2 \text{ (Correction Factor)}$$

$$K = 0.27 + \frac{8.70}{D} \text{ (Conversion Factor)}$$

$$P = \frac{K * R}{C} \; (Equivalent\ unlined\ 12 - inch\ diameter\ percolation\ rate)$$

D = Diameter of percolation test hole (inches)
I = Inside diameter of perforated pipe (inches)
O = Outside diameter of perforated pipe (inches)
n = Estimated porosity of annular zone (n = 1 if no material used)
R = Average percolation rate (min/inch) for equivalent 12-inch diameter hole based on last reading

Input		
D =	8.00	inches
I =	3.00	inches
O =	3.25	inches
n =	1.00	-
R =	**NA**	min/inch
	0.00	inch/hour

Output		
C =	0.98	-
K =	1.36	-
P =	**NA**	min/inch
	0.00	inch/hour

Porchet Method Conversion

- to convert percolation rate to tested infiltration rate

Reference:
H.P. Ritzema, 1994, "Drainage Principles and Applications", International Institute for Land Reclamation and Improvement, Publication 16, 2nd revised edition, Wageningen, The Netherlands

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r + 2Havg)}$$

Ho = Original height of water column in hole (inches)
Hf = Final height of water column in hole (inches)
ΔH = Change in head over the time interval (inches)
Havg = Average head over the time interval (inches)
Δt = Time interval (minutes)
r = Effective radius of test hole (inches)
It = Tested infiltration rate (inch/hour)

Conversion Parameters (for 8 inch hole)		
Ho	47.88	inches
Hf	47.88	inches
ΔH	0.00	inches
Havg	47.88	inches
Δt	30.00	minutes
r	4.00	inches
It	**0.000**	in/hr

Percolation Test Data Sheet

Project: Legacy International Center
San Diego, California
Project No: 20163965.001A

Tested By: Scott Rugg
Date: 11/9/2016
Checked By: Moi Arzamendi

Borehole ID: **BMP-7**
Depth of Borehole: 5 feet
Diameter of Borehole: 8 inches
USCS Soil Classification: CL
Reference Elevation: 0 ft

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to water (feet)	Final Depth to Water (feet)	Change in Water Level (feet)	Percolation Rate (min./in.)
1	9:34	10:04	30	1.00	1.45	0.45	5.56
2	10:04	10:34	30	1.01	1.35	0.34	7.35
3	10:34	11:04	30	1.00	1.37	0.37	6.76
4	11:04	11:34	30	1.00	1.35	0.35	7.14
5	11:34	12:04	30	1.01	1.35	0.34	7.35
6	12:04	12:34	30	1.00	1.35	0.35	7.14
7	12:34	1:04	30	1.00	1.33	0.33	7.58
8	1:04	1:34	30	0.99	1.32	0.33	7.58
9	1:34	2:04	30	1.01	1.29	0.28	8.93
10	2:04	2:34	30	1.00	1.28	0.28	8.93
11	2:34	3:04	30	1.00	1.27	0.27	9.26
12	3:04	3:34	30	1.00	1.27	0.27	**9.26**

Adjusted Percolation Rate

Reference:
Department of Transportation, California Test 749, 1986
"Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole"

$$C=n\left[1-\left(\frac{O}{D}\right)^2\right]+\left(\frac{I}{D}\right)^2 \text{ (Correction Factor)}$$

$$K = 0.27 + \frac{8.70}{D} \text{ (Conversion Factor)}$$

$$P = \frac{K * R}{C}\ (Equivalent\ unlined\ 12 - inch\ diameter\ percolation\ rate)$$

D = Diameter of percolation test hole (inches)
I = Inside diameter of perforated pipe (inches)
O = Outside diameter of perforated pipe (inches)
n = Estimated porosity of annular zone (n = 1 if no material used)
R = Average percolation rate (min/inch) for equivalent 12-inch diameter hole based on last reading

Input		
D =	8.00	inches
I =	3.00	inches
O =	3.25	inches
n =	1.00	-
R =	**9.26**	min/inch
	6.48	inch/hour

Output		
C =	0.98	-
K =	1.36	-
P =	**12.88**	min/inch
	4.66	inch/hour

Porchet Method Conversion

- to convert percolation rate to tested infiltration rate

Reference:
H.P. Ritzema, 1994, "Drainage Principles and Applications", International Institute for Land Reclamation and Improvement, Publication 16, 2nd revised edition, Wageningen, The Netherlands

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r + 2Havg)}$$

Ho = Original height of water column in hole (inches)
Hf = Final height of water column in hole (inches)
ΔH = Change in head over the time interval (inches)
Havg = Average head over the time interval (inches)
Δt = Time interval (minutes)
r = Effective radius of test hole (inches)
It = Tested infiltration rate (inch/hour)

Conversion Parameters (for 8 inch hole)		
Ho	48.00	inches
Hf	44.76	inches
ΔH	3.24	inches
Havg	46.38	inches
Δt	30.00	minutes
r	4.00	inches
It	**0.268**	in/hr

Percolation Test Data Sheet

Project:	Legacy International Center		Tested By:	Scott Rugg
	San Diego, California		Date:	11/9/2016
Project No:	20163965.001A		Checked By:	Moi Arzamendi

Borehole ID:	**BMP-8**	
Depth of Borehole:	8	feet
Diameter of Borehole:	8	inches
USCS Soil Classification:	CL	
Reference Elevation:	0	ft

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to water (feet)	Final Depth to Water (feet)	Change in Water Level (feet)	Percolation Rate (min./in.)
1	9:32	10:02	30	3.00	3.01	0.01	250.00
2	10:02	10:32	30	3.01	3.03	0.02	125.00
3	10:32	11:02	30	3.01	3.02	0.01	250.00
4	11:02	11:32	30	3.02	3.04	0.02	125.00
5	11:32	12:02	30	3.00	3.01	0.01	250.00
6	12:04	12:32	28	3.01	3.02	0.01	233.33
7	12:32	1:02	30	3.02	3.03	0.01	250.00
8	1:04	1:32	28	3.00	3.01	0.01	233.33
9	1:32	2:02	30	3.01	3.01	0	NA
10	2:04	2:32	28	3.01	3.02	0.01	233.33
11	2:32	3:02	30	3.02	3.02	0	NA
12	3:04	3:32	30	3.02	3.02	0	**NA**

Adjusted Percolation Rate

Reference:
Department of Transportation, California Test 749, 1986
"Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole"

$$C=n\left[1-(\tfrac{O}{D})^2\right]+(\tfrac{I}{D})^2 \text{ (Correction Factor)}$$

$$K = 0.27 + \frac{8.70}{D} \text{ (Conversion Factor)}$$

$$P = \frac{K * R}{C}\ (Equivalent\ unlined\ 12-inch\ diameter\ percolation\ rate)$$

D = Diameter of percolation test hole (inches)
I = Inside diameter of perforated pipe (inches)
O = Outside diameter of perforated pipe (inches)
n = Estimated porosity of annular zone (n = 1 if no material used)
R = Average percolation rate (min/inch) for equivalent 12-inch diameter hole based on last reading

Input		
D =	8.00	inches
I =	3.00	inches
O =	3.25	inches
n =	1.00	-
R =	**NA**	min/inch
	0.00	inch/hour

Output		
C =	0.98	-
K =	1.36	-
P =	**NA**	min/inch
	0.00	inch/hour

Porchet Method Conversion

- to convert percolation rate to tested infiltration rate

Reference:
H.P. Ritzema, 1994, "Drainage Principles and Applications", International Institute for Land Reclamation and Improvement, Publication 16, 2nd revised edition, Wageningen, The Netherlands

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r + 2Havg)}$$

Ho = Original height of water column in hole (inches)
Hf = Final height of water column in hole (inches)
ΔH = Change in head over the time interval (inches)
Havg = Average head over the time interval (inches)
Δt = Time interval (minutes)
r = Effective radius of test hole (inches)
It = Tested infiltration rate (inch/hour)

Conversion Parameters (for 8 inch hole)		
Ho	59.76	inches
Hf	59.76	inches
ΔH	0.00	inches
Havg	59.76	inches
Δt	30.00	minutes
r	4.00	inches
It	**0.000**	in/hr

Percolation Test Data Sheet

Project: Legacy International Center
San Diego, California
Project No: 20163965.001A

Tested By: Scott Rugg
Date: 11/9/2016
Checked By: Moi Arzamendi

Borehole ID: **BMP-9**
Depth of Borehole: 8 feet
Diameter of Borehole: 8 inches
USCS Soil Classification: SC
Reference Elevation: 0 ft

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to water (feet)	Final Depth to Water (feet)	Change in Water Level (feet)	Percolation Rate (min./in.)
1	9:30	10:00	30	3.01	3.30	0.29	8.62
2	10:00	10:30	30	3.01	3.25	0.24	10.42
3	10:30	11:00	30	2.99	3.21	0.22	11.36
4	11:00	11:30	30	3.02	3.24	0.22	11.36
5	11:30	12:00	30	3.00	3.21	0.21	11.90
6	12:00	12:30	28	3.01	3.23	0.22	10.61
7	12:30	1:00	30	2.98	3.14	0.16	15.63
8	1:00	1:30	28	3.00	3.19	0.19	12.28
9	1:30	2:00	30	2.99	3.13	0.14	17.86
10	2:00	2:30	28	2.99	3.12	0.13	17.95
11	2:30	3:00	30	3.00	3.09	0.09	27.78
12	3:00	3:30	30	3.01	3.07	0.06	**41.67**

Adjusted Percolation Rate

Reference:
Department of Transportation, California Test 749, 1986
"Method for Determining the Percolation Rate of Soils Using a 12-Inch-Diameter-Test Hole"

$$C=n\left[1-\left(\frac{O}{D}\right)^2\right]+\left(\frac{I}{D}\right)^2 \text{ (Correction Factor)}$$

$$K=0.27+\frac{8.70}{D} \text{ (Conversion Factor)}$$

$$P=\frac{K*R}{C}\ (Equivalent\ unlined\ 12-inch\ diameter\ percolation\ rate)$$

D = Diameter of percolation test hole (inches)
I = Inside diameter of perforated pipe (inches)
O = Outside diameter of perforated pipe (inches)
n = Estimated porosity of annular zone (n = 1 if no material used)
R = Average percolation rate (min/inch) for equivalent 12-inch diameter hole based on last reading

Input		
D =	8.00	inches
I =	3.00	inches
O =	3.25	inches
n =	1.00	-
R =	**41.67**	min/inch
	1.44	inch/hour

Output		
C =	0.98	-
K =	1.36	-
P =	**57.98**	min/inch
	1.03	inch/hour

Porchet Method Conversion

- to convert percolation rate to tested infiltration rate

Reference:
H.P. Ritzema, 1994, "Drainage Principles and Applications", International Institute for Land Reclamation and Improvement, Publication 16, 2nd revised edition, Wageningen, The Netherlands

$$I_t=\frac{\Delta H\ 60\ r}{\Delta t\ (r+2Havg)}$$

Ho = Original height of water column in hole (inches)
Hf = Final height of water column in hole (inches)
ΔH = Change in head over the time interval (inches)
Havg = Average head over the time interval (inches)
Δt = Time interval (minutes)
r = Effective radius of test hole (inches)
It = Tested infiltration rate (inch/hour)

Conversion Parameters (for 8 inch hole)		
Ho	59.88	inches
Hf	59.16	inches
ΔH	0.72	inches
Havg	59.52	inches
Δt	30.00	minutes
r	4.00	inches
It	**0.047**	in/hr

APPENDIX C

INFILTRATION BMP WORKSHEETS

BMP-1

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition</th><th colspan="2">Form I-8</th></tr>
<tr><td colspan="4">Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>1</td><td>Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
See results of percolation test for Boring BMP-1 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).
These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-1 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>2</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-1 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
</table>

Form I-8 Page 2 of 4

Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-1

<table>
<tr><th colspan="4">Form I-8 Page 3 of 4</th></tr>
<tr><td colspan="4">Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>5</td><td>Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-1 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>6</td><td>Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-1 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
</table>

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-1 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-1 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-2

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition</th><th colspan="2">Form I-8</th></tr>
<tr><td colspan="4">Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>1</td><td>Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
See results of percolation test for Boring BMP-2 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).
These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-2 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>2</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-2 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
</table>

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-2

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: The results of percolation testing in Boring BMP-2 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The results of percolation testing in Boring BMP-2 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

BMP-2

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-2 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-2 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-3

Categorization of Infiltration Feasibility Condition	Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling.

Notwithstanding, the results of other percolation tests in the low lying area adjacent of Hotel Circle South (Borings BMP-1, BMP-2 and BMP-4/6) indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-3 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-1 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower. Likewise, a potentially hydrocarbon contaminated soil and groundwater condition is believed to have existed (or may still exist) at the northeast corner of the site where a Chevron gas station formerly existed (San Diego Department of Health ID No. H21151-004). Numerous documents prepared by both Stantec and SECOR (2001 through 2005) have identified petroleum hydrocarbon contaminated materials in this area. After a limited site cleanup following a Corrective Action Plan approved by the DEH, a No-Further-Action notice (Case Closure) was issued by the DEH (November 29, 2010) which was contingent on actual land use at that time. However, purposeful infiltration of storm water into an area of potentially contaminated conditions that have a shallow groundwater table is not recommended.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: The results of percolation testing in Boring BMP-3 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The results of percolation testing in Boring BMP-3 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

BMP-3

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-3 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
Likewise, a potentially hydrocarbon contaminated soil and groundwater condition is believed to have existed (or may still exist) at the northeast corner of the site where a Chevron gas station formerly existed (San Diego Department of Health ID No. H21151-004). Numerous documents prepared by both Stantec and SECOR (2001 through 2005) have identified petroleum hydrocarbon contaminated materials in this area. After a limited site cleanup following a Corrective Action Plan approved by the DEH, a No-Further-Action notice (Case Closure) was issued by the DEH (November 29, 2010) which was contingent on actual land use at that time. However, purposeful infiltration of storm water into an area of potentially contaminated conditions that have a shallow groundwater table is not recommended.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-3 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Categorization of Infiltration Feasibility Condition	Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-4/6 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-4 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-4/6 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Form I-8 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-4

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Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

BMP-4

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-6

Categorization of Infiltration Feasibility Condition			**Form I-8**
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: See results of percolation test for Boring BMP-4/6 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D). These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-6 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-4/6 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Form I-8 Page 2 of 4

Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

The results of percolation testing in Boring BMP-6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

The results of percolation testing in Boring BMP-6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

BMP-6

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-4/6 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-7

Categorization of Infiltration Feasibility Condition	**Form I-8**

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-7 which indicated less than 0.5 inches per hour infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to very poor. In this respect, the subsurface materials in the immediate area of BMP-7 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-7 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: The results of percolation testing in Boring BMP-7 indicated a positive infiltration rate below 0.5 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: The results of percolation testing in Boring BMP-7 indicated a positive infiltration rate below 0.5 inches per hour. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

BMP-7

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-7 indicated a positive infiltration rate below 0.5 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-7 indicated a positive infiltration rate below 0.5 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Categorization of Infiltration Feasibility Condition		**Form I-8**	
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: See results of percolation test for Boring BMP-8 which indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D). These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-8 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-8 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) buried structures (i.e., basement retaining walls, foundations and floor slabs). Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-8

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

The results of percolation testing in Boring BMP-8 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

The results of percolation testing in Boring BMP-8 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) buried structures (i.e., basement retaining walls, foundations and floor slabs).

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

BMP-8

Form I-8 Page 4 of 4

Criteria	Screening Question	Yes	No
7	Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		X
Provide basis: The results of percolation testing in Boring BMP-8 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: The results of percolation testing in Boring BMP-8 indicated an infiltration rate of zero (0). In this respect, these materials are likely to have an "estimated reliable infiltration rate less than 0.01 inches per hour. However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights. This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration. If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-9

Categorization of Infiltration Feasibility Condition	**Form I-8**

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See results of percolation test for Boring BMP-9 which indicated less than 0.5 inches per hour infiltration rate due to the presence alluvial soils consisting of clayey SAND (SC) and lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to very poor. In this respect, the subsurface materials in the immediate area of BMP-9 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-9 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

BMP-9

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

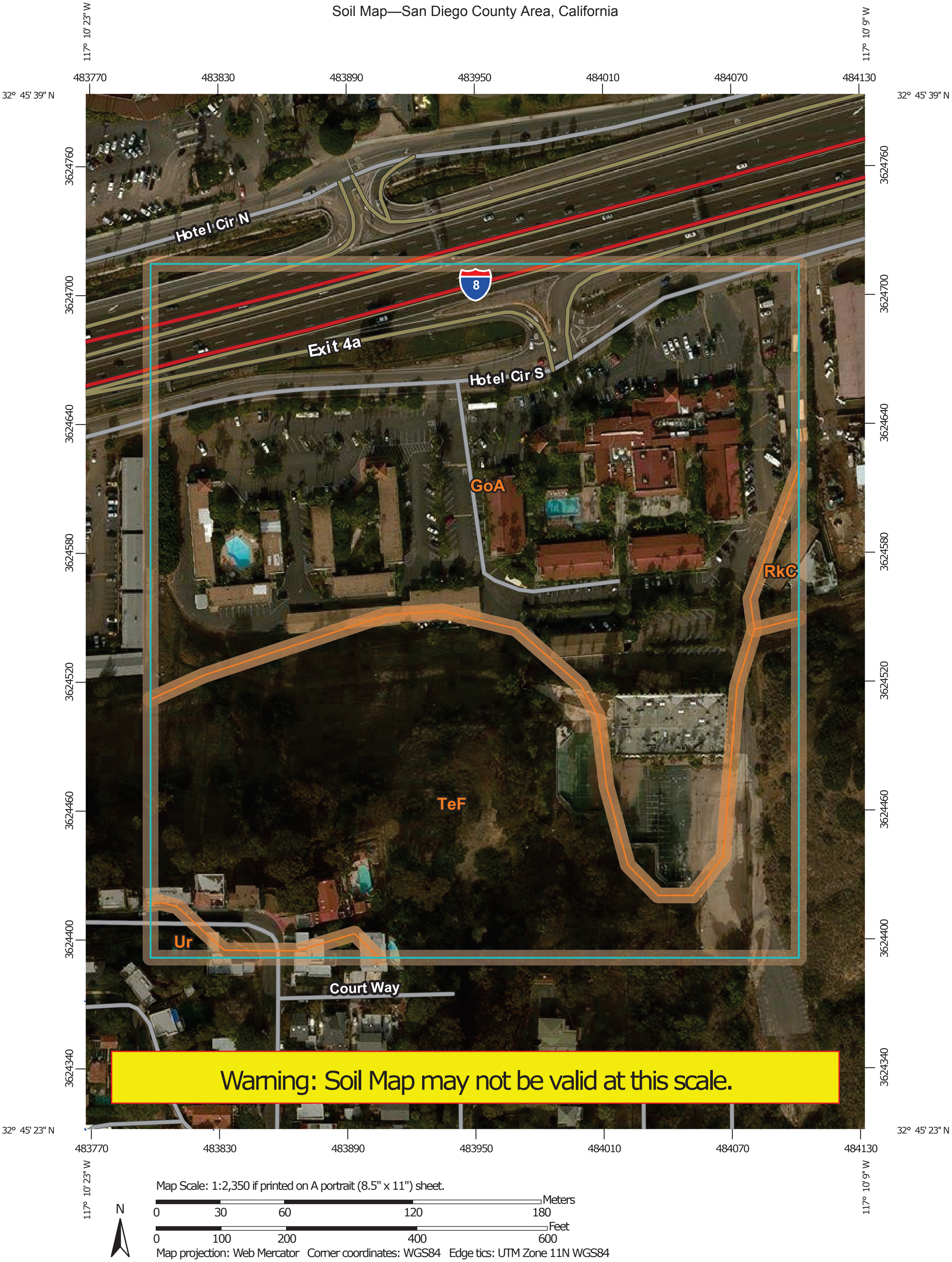
BMP-9

<table>
<tr><th colspan="4">Form I-8 Page 3 of 4</th></tr>
<tr><td colspan="4">Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>5</td><td>Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-9 indicated a positive infiltration rate below 0.5 inches per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>6</td><td>Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-9 indicated a positive infiltration rate below 0.5 inches per hour.
Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
</table>

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-9 indicated a positive infiltration rate below 0.5 inches per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-9 indicated a positive infiltration rate below 0.5 inches per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Soil Map—San Diego County Area, California



Warning: Soil Map may not be valid at this scale.

Map Scale: 1:2,350 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 9, Sep 17, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

San Diego County Area, California (CA638)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
GoA	Grangeville fine sandy loam, 0 to 2 percent slopes	14.7	60.4%
RkC	Reiff fine sandy loam, 5 to 9 percent slopes	0.2	1.0%
TeF	Terrace escarpments	9.1	37.6%
Ur	Urban land	0.2	1.0%
Totals for Area of Interest		**24.3**	**100.0%**

APPENDIX D
PREVIOUS RELEVANT GEOTECHNICAL INFORMATION (APRIL 13, 2016)

LEGEND

RL-6 APPROXIMATE LOCATION OF REFRACTION MICROTREMOR (ReMi) LINE

🟥 PROPOSED STRUCTURE

APPROXIMATE PROJECT LIMITS

KLEINFELDER EXPLORATIONS, 2016

HA-4 APPROXIMATE LOCATION OF HAND AUGER BORING

B-12 APPROXIMATE LOCATION OF AUGER BORING

LD-4 APPROXIMATE LOCATION OF LARGE DIAMETER BORING

CPT-8 APPROXIMATE LOCATION OF CONE PENETROMETER TEST

GEOCON EXPLORATIONS, 2013

B-11 APPROXIMATE LOCATION OF AUGER BORING

TP-3 APPROXIMATE LOCATION OF TEST PIT

CPT-5 APPROXIMATE LOCATION OF CONE PENETROMETER TEST

Path: J:_clients\Legacy_Intl\20163965\MXD\20163965_Exploration.mxd

0 50 100 200

Feet

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Imagery, NAIP 2014

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PROJECT NO. 20163965
DRAWN: 4/4/2016
DRAWN BY: LM/JP
CHECKED BY: TG
FILE NAME: 20163965_Exploration.mxd

AERIAL PHOTOGRAPH WITH PROPOSED IMPROVEMENTS

LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
2

LEGEND

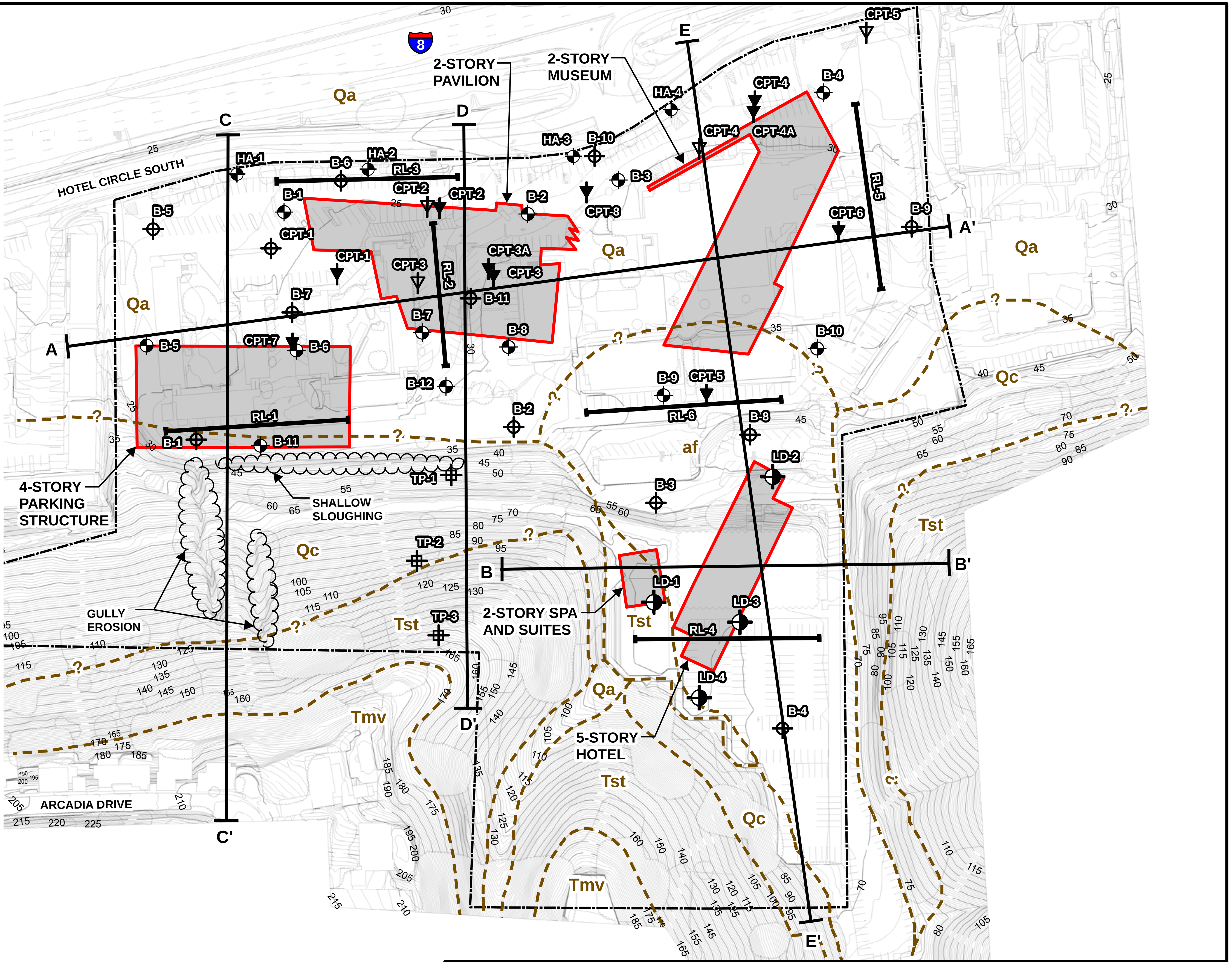
af	ARTIFICIAL FILL
Qa	ALLUVIAL DEPOSITS
Qc	COLLUVIAL DEPOSITS
Tst	STADIUM CONGLOMERATE
Tmv	MISSION VALLEY FORMATION
? - - -	APPROXIMATE LOCATION OF GEOLOGICAL CONTACT, QUERIED WHERE UNCERTAIN
E ├─┤ E'	APPROXIMATE LOCATION OF CROSS-SECTION
RL-6	APPROXIMATE LOCATION OF REFRACTION MICROTREMOR (ReMi) LINE
🟥	PROPOSED STRUCTURE
⬚	APPROXIMATE PROJECT LIMITS

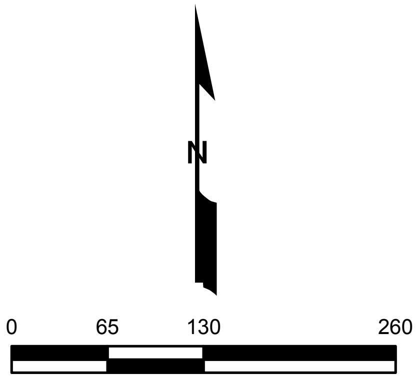
KLEINFELDER EXPLORATIONS, 2016

HA-4 ⊕	APPROXIMATE LOCATION OF HAND AUGER BORING
B-12 ⊕	APPROXIMATE LOCATION OF AUGER BORING
LD-4 ⊕	APPROXIMATE LOCATION OF LARGE DIAMETER BORING
CPT-8 ▼	APPROXIMATE LOCATION OF CONE PENETROMETER TEST

GEOCON EXPLORATIONS, 2013

B-11 ⊕	APPROXIMATE LOCATION OF AUGER BORING
TP-3 ⊞	APPROXIMATE LOCATION OF TEST PIT
CPT-5 ▽	APPROXIMATE LOCATION OF CONE PENETROMETER TEST





0 65 130 260

Feet

Path: J:_clients\Legacy_Intl\20163965\MXD\20163965_SiteGeo.mxd

NOTES:
- Elevation contours in feet.

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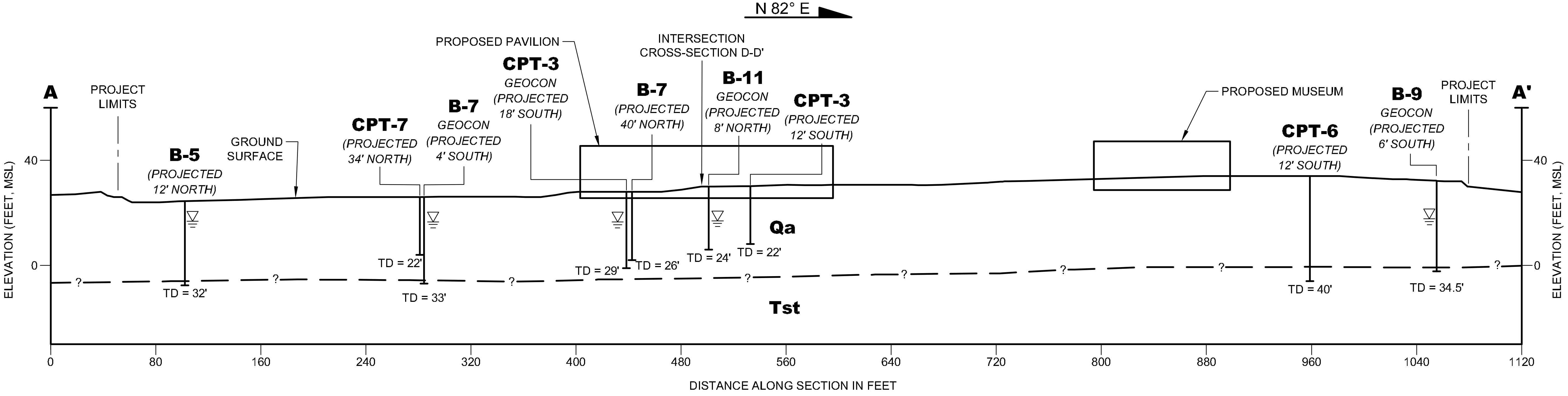
CHECKED BY:	TG
FILE NAME:	20163965_SiteGeo.mxd

SITE PLAN AND GEOLOGIC MAP

LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
3

PLOTTED: 04 Apr 2016, 11:51am, jpatay LAYOUT: A-A' CAD FILE: J:_clients\Legacy_Intl\20163965\MXD\



LEGEND

Qa	ALLUVIAL DEPOSITS
Tst	STADIUM CONGLOMERATE
—?—	APPROXIMATE LOCATION OF GEOLOGIC CONTACT, QUERIED WHERE UNCERTAIN
B-9 TD = 34'	APPROXIMATE LOCATION OF BORING, CPT, OR TEST PIT, SHOWING PROJECTION AND TOTAL DEPTH IN FEET
▽	GROUNDWATER ENCOUNTERED AT TIME OF DRILLING

NOTE:
ARTIFICIAL FILL OF LESS THAN 3 FEET IN DEPTH OCCURS IN ISOLATED AREAS AT SURFACE. NOT SHOWN.

40 20 0 40
APPROXIMATE VERTICAL SCALE (feet)

80 40 0 80
APPROXIMATE HORIZONTAL SCALE (feet)

2X VERTICAL EXAGGERATION

ATTACHED IMAGES:
ATTACHED XREFS:

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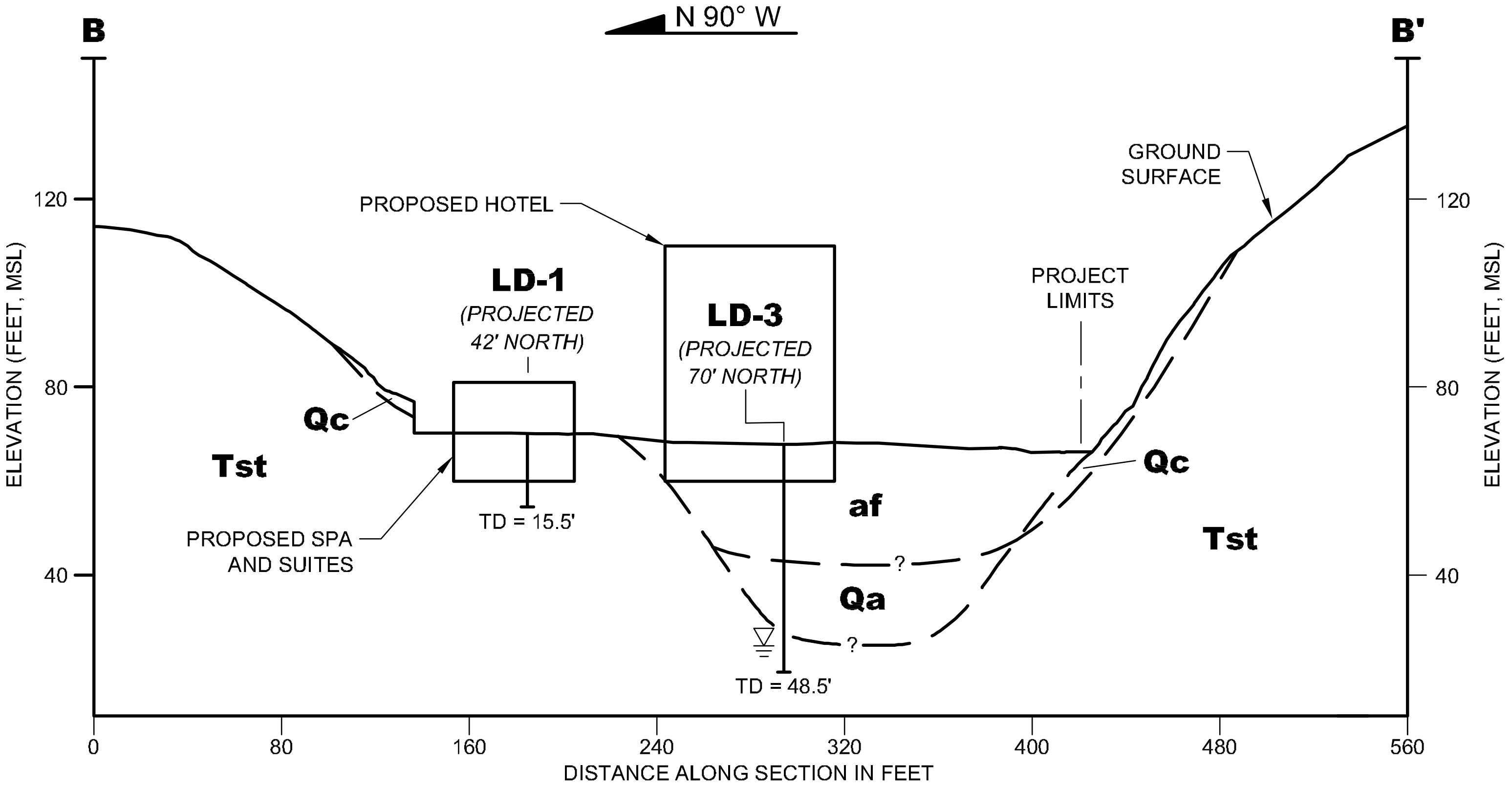
CHECKED BY:	SR/TG
FILE NAME:	20163965_Sections.dwg

GEOLOGIC CROSS-SECTION A-A'

LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
6



LEGEND

af	ARTIFICIAL FILL
Qa	ALLUVIAL DEPOSITS
Qc	COLLUVIAL DEPOSITS
Tst	STADIUM CONGLOMERATE
—?—	APPROXIMATE LOCATION OF GEOLOGIC CONTACT, QUERIED WHERE UNCERTAIN
B-9 ⊥ TD = 34'	APPROXIMATE LOCATION OF BORING, CPT, OR TEST PIT SHOWING PROJECTION AND TOTAL DEPTH IN FEET
▽	GROUNDWATER ENCOUNTERED AT TIME OF DRILLING

40 20 0 40
APPROXIMATE VERTICAL SCALE (feet)

80 40 0 80
APPROXIMATE HORIZONTAL SCALE (feet)
2X VERTICAL EXAGGERATION

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PROJECT NO.	20163965
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CHECKED BY:	SR/TG
FILE NAME:	20163965_Sections.dwg

GEOLOGIC CROSS-SECTION B-B'

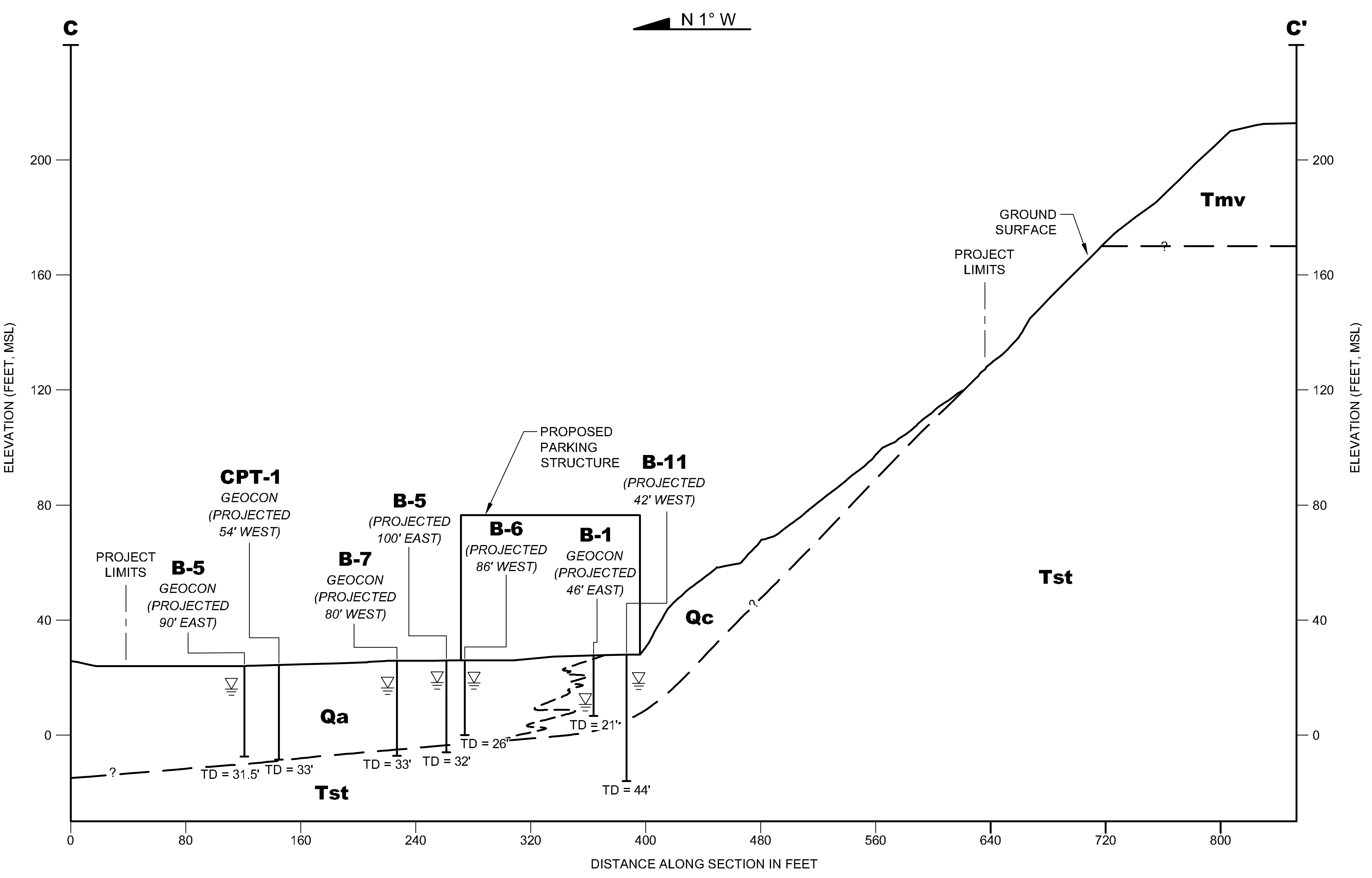
LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
7

PLOTTED: 04 Apr 2016, 11:52am, jpatay
LAYOUT: B-B'
CAD FILE: J:_clients\Legacy_Intl\20163965\MXD\
ATTACHED IMAGES:
ATTACHED XREFS:

PLOTTED: 04 Apr 2016, 11:53am, jpatay

CAD FILE: J:_clients\Legacy_Intl\20163965\MXD\ LAYOUT: C-C'



LEGEND

Qc	COLLUVIAL DEPOSITS
Qa	ALLUVIAL DEPOSITS
Tst	STADIUM CONGLOMERATE
Tmv	MISSION VALLEY FORMATION
—?—	APPROXIMATE LOCATION OF GEOLOGIC CONTACT, QUERIED WHERE UNCERTAIN
B-9 ⊥ TD = 34'	APPROXIMATE LOCATION OF BORING, CPT, OR TEST PIT SHOWING PROJECTION AND TOTAL DEPTH IN FEET
▽	GROUNDWATER ENCOUNTERED AT TIME OF DRILLING

40 20 0 40
APPROXIMATE VERTICAL SCALE (feet)

80 40 0 80
APPROXIMATE HORIZONTAL SCALE (feet)
2X VERTICAL EXAGGERATION

ATTACHED IMAGES:
ATTACHED XREFS:

NOTE:
ARTIFICIAL FILL OF LESS THAN 3 FEET IN DEPTH OCCURS IN ISOLATED AREAS NORTH OF STATION 400. NOT SHOWN.

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FILE NAME:
20163965_Sections.dwg

GEOLOGIC CROSS-SECTION C-C'

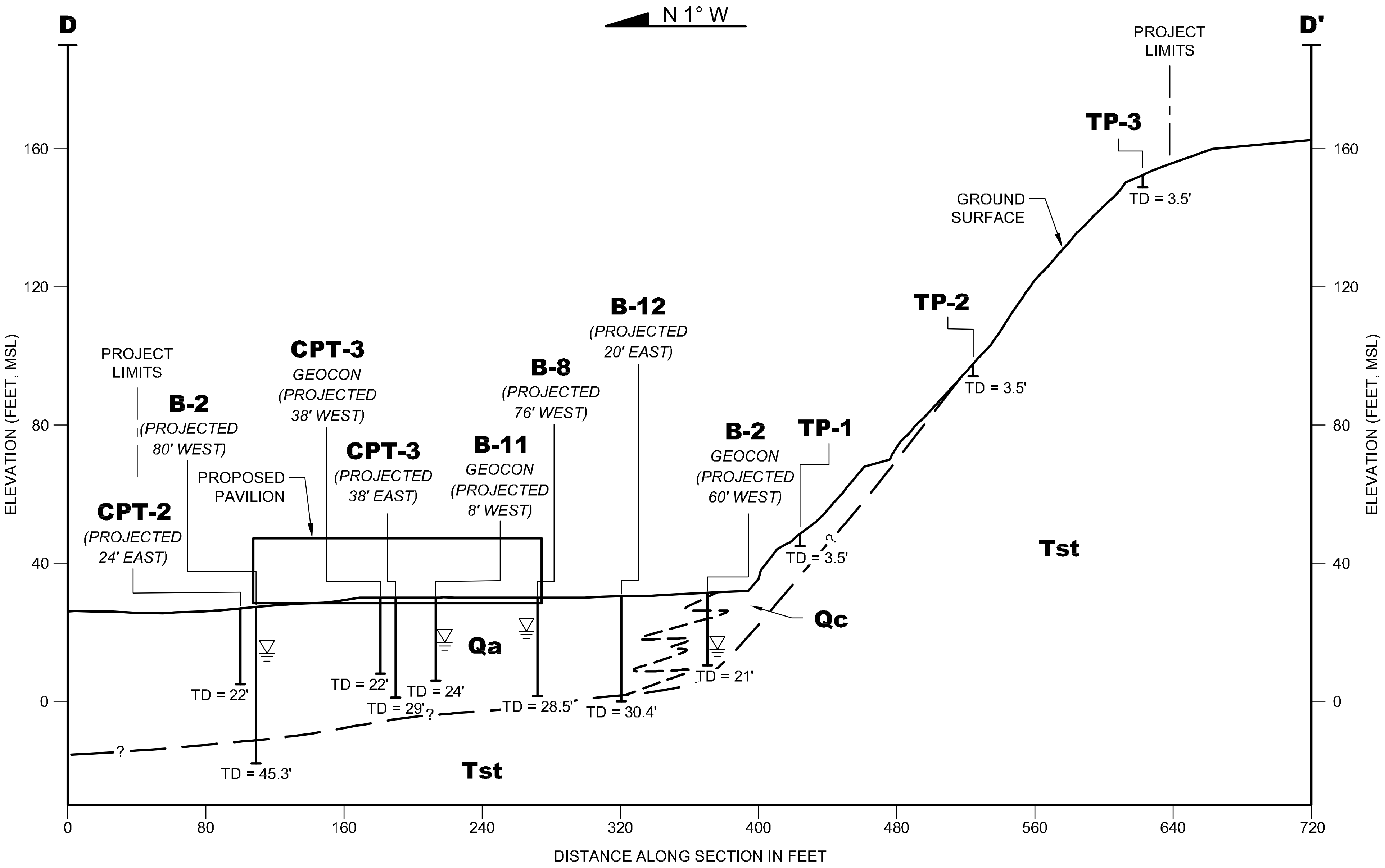
LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
8

PLOTTED: 04 Apr 2016, 12:14pm, jpatay LAYOUT: D-D'

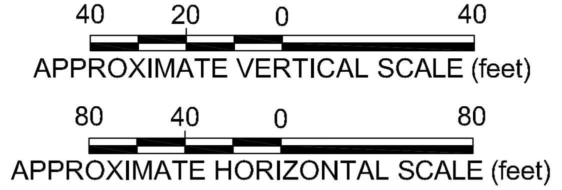
CAD FILE: J:_clients\Legacy_Intl\20163965\MXD\

ATTACHED IMAGES:
ATTACHED XREFS:



LEGEND

Qa	ALLUVIAL DEPOSITS
Qc	COLLUVIAL DEPOSITS
Tst	STADIUM CONGLOMERATE
?—	APPROXIMATE LOCATION OF GEOLOGIC CONTACT, QUERIED WHERE UNCERTAIN
B-9 TD = 34'	APPROXIMATE LOCATION OF BORING, CPT, OR TEST PIT SHOWING PROJECTION AND TOTAL DEPTH IN FEET
▽	GROUNDWATER ENCOUNTERED AT TIME OF DRILLING



APPROXIMATE VERTICAL SCALE (feet)

APPROXIMATE HORIZONTAL SCALE (feet)

2X VERTICAL EXAGGERATION

NOTE:
ARTIFICIAL FILL OF LESS THAN 3 FEET IN DEPTH OCCURS IN ISOLATED AREAS NORTH OF STATION 400. NOT SHOWN.

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FILE NAME: 20163965_Sections.dwg	

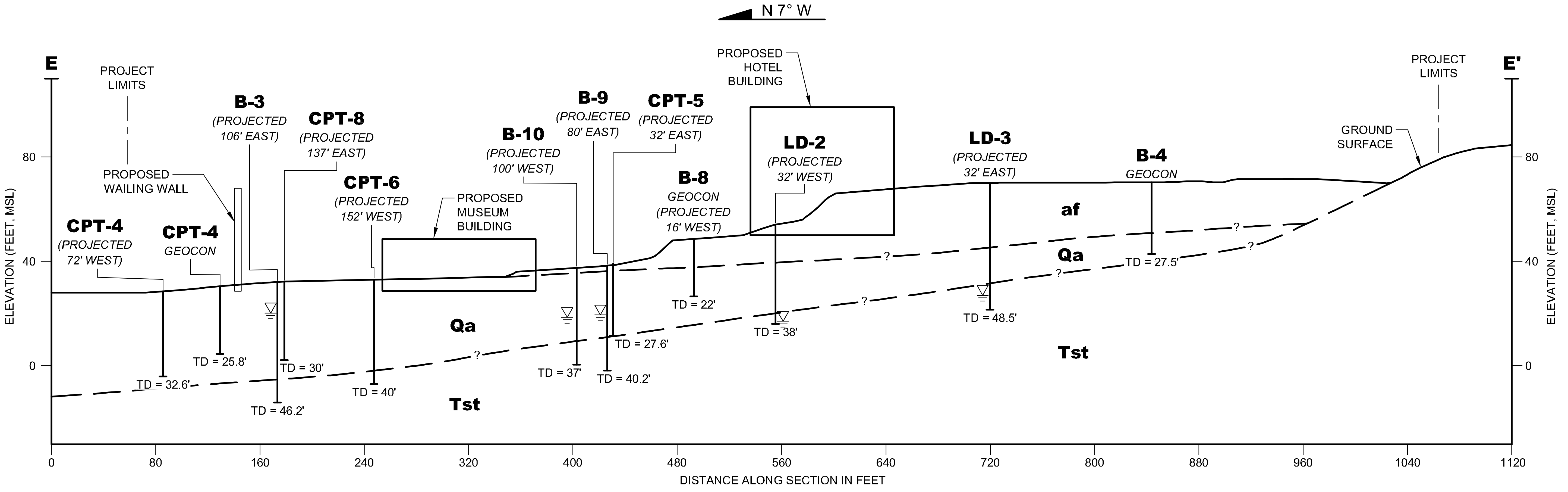
GEOLOGIC CROSS-SECTION D-D'

LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
9

PLOTTED: 04 Apr 2016, 11:54am, jpatay LAYOUT: E-E' CAD FILE: J:_clients\Legacy_Intl\20163965\MXD\

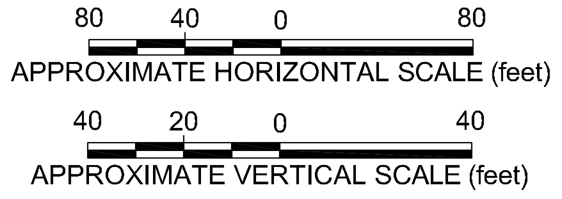
ATTACHED IMAGES:
ATTACHED XREFS:



LEGEND

af	ARTIFICIAL FILL
Qa	ALLUVIAL DEPOSITS
Tst	STADIUM CONGLOMERATE
—?—	APPROXIMATE LOCATION OF GEOLOGIC CONTACT, QUERIED WHERE UNCERTAIN
B-9 ⊥ TD = 34'	APPROXIMATE LOCATION OF BORING, CPT, OR TEST PIT SHOWING PROJECTION AND TOTAL DEPTH IN FEET
▽	GROUNDWATER ENCOUNTERED AT TIME OF DRILLING

NOTE:
ARTIFICIAL FILL OF LESS THAN 3 FEET IN DEPTH OCCURS IN ISOLATED AREAS NORTH OF STATION 340. NOT SHOWN.



APPROXIMATE HORIZONTAL SCALE (feet)

APPROXIMATE VERTICAL SCALE (feet)

2X VERTICAL EXAGGERATION

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PROJECT NO.	20163965
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FILE NAME:	20163965_Sections.dwg

GEOLOGIC CROSS-SECTION E-E'

LEGACY INTERNATIONAL CENTER
SAN DIEGO, CALIFORNIA

FIGURE
10

APPENDIX B
PREVIOUS RELEVANT GEOTECHNICAL INFORMATION

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PRELIMINARY GEOTECHNICAL INVESTIGATION

MORRIS CERULLO
WORLD OUTREACH LEGACY PAVILION
SAN DIEGO, CALIFORNIA

PREPARED FOR

CARIBOU INDUSTRIES
% PROJECT DESIGN CONSULTANTS
SAN DIEGO, CALIFORNIA

MARCH 6, 2013
PROJECT NO. 07817-52-02

APPENDIX A

FIELD INVESTIGATION

We performed a previous field investigation in 2004 and 2007 including 11 borings and 5 cone penetration test soundings (CPTs) and 3 test pits. The approximate locations of the exploratory borings, test pits and CPTs are shown on the Geologic Map, Figure 2.

Test pits were excavated using a jackhammer and shovel on the southern slope area. Borings were drilled to depths ranging from 21 feet to 34½ feet below existing grade using a truck-mounted, high-torque, CME 75 drill rig equipped with 8-inch-diameter, hollow-stem augers or a Mayhew 1000 rotary wash rig. Relatively undisturbed samples were obtained by driving a 3-inch-diameter, split-tube sampler 12 inches into the undisturbed soil mass with blows from a hammer weighing 140 pounds, dropped from a height of 30 inches. The sampler was equipped with 1-inch-by-2½-inch brass sampler rings to facilitate removal and testing of the soil. Bulk samples were also obtained from drill cuttings and the test pits. The five CPTs were advanced to approximately depths between 12 and 45 feet.

The soil conditions encountered in the borings were visually examined, classified, and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). Logs of the borings and test pits are presented on Figures A-1 through A-14. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The logs of CPT sounding are enclosed within this appendix.

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 1

ELEV. (MSL.) **27.5** DATE COMPLETED **07-12-2004**

EQUIPMENT **CME 75 HIGH-TORQUE** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					3 inches **ASPHALT**			
2	B1-1 ⊠			CL	**SLOPEWASH** Stiff to very stiff, moist, brown, Silty CLAY; with fine to medium sand and fine to coarse gravel -Grades to clayey sand			
4 6	B1-2 ■			SC	Medium dense to dense, moist, brown, Silty to Clayey, fine to coarse SAND; some fine to coarse gravel	54	115.5	9.9
8 10	B1-3 ■			SM	Medium dense, moist to wet, dark brown to black, fine to medium SAND; some silt	39	105.3	16.4
12 14				SC	Medium dense to dense, moist to wet, yellowish to orange-brown, Clayey, fine to medium SAND; some fine to coarse gravel			
16 18	B1-4 ■		▼	SC	Very dense, wet, brown to reddish-brown, mottled, Silty to Clayey, fine to coarse SAND; some gravel	89/9"		11.2
20	B1-5 ■				-Cobble fragment in tip of sampler	50/6"	106.1	20.6

BORING TERMINATED AT 21 FEET (Refusal)
Groundwater encountered at 17 feet
Backfilled with approximately 7.5 cu. ft. of bentonite grout

Figure A-1,
Log of Boring B 1, Page 1 of 1

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 2

ELEV. (MSL.) **32** DATE COMPLETED **07-12-2004**

EQUIPMENT **CME 75 HIGH-TORQUE** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					3 inches **ASPHALT** 4 inches **BASE**			
2 4				CL	**SLOPEWASH** Medium stiff to stiff, moist, brown, Silty CLAY; trace sand			
	B2-1				-Increase in silt, sand, and fine gravel	31	114.1	14.9
6				CL	Very stiff, moist, dark brown, fine Sandy SILT and CLAY; trace to some gravel			
8 10 12	B2-2			SC/GC	Dense, moist to wet, brown, Clayey, fine to medium SAND and fine to coarse GRAVEL	57	111.8	9.5
14 16			▼	SM/GM	Dense to very dense, wet, brown to reddish-brown, Silty, fine to coarse SAND and GRAVEL; trace clay; mottled -No recovery; cobble in tip of sampler	78		
18 20	B2-3			SM	Dense to very dense, wet, grayish-to orange-brown, fine to medium SAND; intermittent silty gravel/cobble beds	90/8"	108.7	15.6

BORING TERMINATED AT 21 FEET (Refusal)
Groundwater encountered at 16.3 feet
Backfilled with approximately 7.5 cu. ft. of bentonite grout

Figure A-2,
Log of Boring B 2, Page 1 of 1

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▧ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◣ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 3

ELEV. (MSL.) 52 DATE COMPLETED 07-12-2004

EQUIPMENT CME 75 HIGH-TORQUE BY: G. HORNER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					3.5 inches **ASPHALT**			
					UNDOCUMENTED FILL Loose to medium dense, moist, brown, Silty to Clayey, fine to medium SAND; some fine to medium gravel			
2								
				SC				
4								
	B3-1				Medium dense, damp to moist, pale orange to grayish brown, fine to coarse SAND; trace fine to coarse gravel; some clay within upper 3 feet	21	105.3	4.4
6								
	B3-2							
8								
10								
	B3-3					38	109.0	4.2
				SW	-Increase in coarse sand; intermittent layers of fine sand and silt			
12								
14								
	B3-4							
	B3-5					36	113.9	5.2
16								
					SLOPEWASH			
18					Very stiff, moist, brown, Sandy CLAY; trace fine subrounded gravel			
				CL				
					Dense, damp to moist, pale yellowish brown, Silty, fine SAND and subrounded GRAVEL			
20								
						50/4"		
				SM/GM				
22								
					Dense to very dense, damp to wet, pale yellowish-brown to orange-brown to tan, Silty, fine to medium SAND; interbedded with moist, clayey layers; trace fine to medium gravel			
24								
	B3-6					50/2"		
26	B3-7							
				SM				
28								

Figure A-3,
Log of Boring B 3, Page 1 of 2

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 3

ELEV. (MSL.) 52 DATE COMPLETED 07-12-2004

EQUIPMENT CME 75 HIGH-TORQUE BY: G. HORNER

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B3-8	■				92/10"	99.1	18.2
					Dense to very dense, wet, tan to orange brown, GRAVEL and COBBLE in a Silty to Clayey, fine to medium SAND matrix			
32				GC				
			▼					
34						50/4"		

BORING TERMINATED AT 34.5 FEET (Refusal)
Groundwater encountered at 33.5 feet
Backfilled with approximately 12 cu. ft. of bentonite grout

**Figure A-3,
Log of Boring B 3, Page 2 of 2**

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

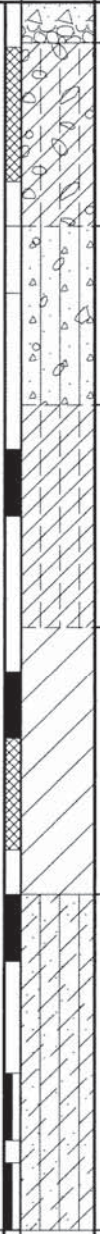
GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 4

ELEV. (MSL.) **69** DATE COMPLETED **07-12-2004**

EQUIPMENT **CME 75 HIGH-TORQUE** BY: **G. HORNER**



DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0			5 inches **CONCRETE**; 4 inches **BASE**			
2 4	B4-1	CL	**UNDOCUMENTED FILL** Stiff, moist, dark brownish gray to black, Silty CLAY with fine to coarse gravel; trace sand; organic odor			
6 8		ML	Moist, grayish brown, fine Sandy SILT with gravel and cobble; some clay -No recovery; cobble in tip of sampler	74		
10 12	B4-2	CL	Stiff to very stiff, damp to moist, dark brownish gray to black, Silty CLAY; some fine to coarse gravel	41	101.5	17.2
14 16 18	B4-3 B4-4	CL/CH	Very stiff to hard, damp to moist, dark grayish to reddish brown, CLAY; trace sand, silt and gravel	50	114.2	12.9
20 22 24 26	B4-5 B4-6 B4-7	SC	**SLOPEWASH** Very dense, damp, light orange-brown to tan, fine SAND; with silt, clay and fine to coarse gravel -Gravel layer at approximately 24 feet -Medium dense -Very dense	75 26 67	116.7	12.3

BORING TERMINATED AT 27.5 FEET (Refusal)
No groundwater encountered
Backfilled with approximately 9.5 cu. ft. of bentonite grout

Figure A-4,
Log of Boring B 4, Page 1 of 1

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

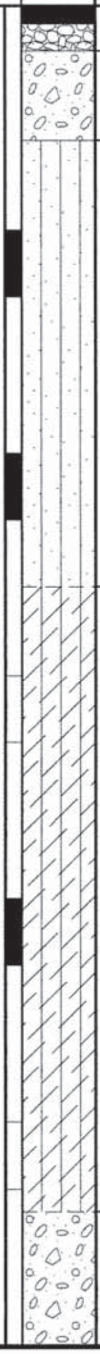
GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 5

ELEV. (MSL.) **23** DATE COMPLETED **07-15-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**



DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				4 inches **ASPHALT**			
				8 inches **BASE**			
2			GM	**UNDOCUMENTED FILL** GRAVEL/COBBLE layer 1 to 3 feet			
4				**ALLUVIUM** Very soft to soft, wet, brownish gray, fine Sandy SILT; some clay, mica flakes, slight organic odor			
6	B5-1				2	94.2	29.9
8		▼	ML				
10	B5-2			-Grayish brown; trace clay	5	98.1	27.2
12							
14				Soft to medium stiff, wet, brownish-gray to gray, Clayey SILT to Silty CLAY; trace fine sand and mica flakes			
16					6		
18			CL				
20	B5-3				5	107.2	20.3
22				-Soft; some coarse sand and medium to coarse, subangular to subrounded gravel			
24					4		
26				-No recovery			
28				GRAVEL/COBBLE at 27 feet			
			GC	-No sample attempted due to gravel/cobble			

Figure A-5,
Log of Boring B 5, Page 1 of 2

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◩ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 5

ELEV. (MSL.) **23** DATE COMPLETED **07-15-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30		░						
					BORING TERMINATED AT 31.5 FEET Groundwater encountered at 8 feet Backfilled with approximately 11 cu. ft. of bentonite grout			

Figure A-5,
Log of Boring B 5, Page 2 of 2

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 6

ELEV. (MSL.) **25** DATE COMPLETED **07-15-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				4 inches **ASPHALT** 7 inches **BASE** **UNDOCUMENTED FILL**			
2			GM	GRAVEL/COBBLE layer 1 to 3 feet			
4				**ALLUVIUM** Soft, moist to wet, brownish to dark gray, SILT; some clay, trace medium gravel, fine sand and mica flakes; strong organic odor			
6	B6-1		ML		5		
8				Soft, wet, brownish gray to grayish brown, Silty to Sandy CLAY; slight organic odor; trace fine roots			
10		▼			4		
12			CL				
14							
16	B6-2			-Trace fine sand; coarse rounded gravel fragment in sampler	4	87.8	34.6
18				Soft, wet, brown, Silty, fine SAND; abundant mica flakes; some fine to medium gravel			
20	B6-3				5		
22			SM				
24							
26	B6-4		CL/GC	Very stiff to hard, moist, grayish-to orange-brown, Sandy CLAY -Gravel and cobble at 26 feet	55/11"	110.3	17.0

BORING TERMINATED AT 27 FEET (Refusal)
Groundwater encountered at 10 feet
Backfilled with approximately 9.5 cu. ft. of bentonite grout

Figure A-6,
Log of Boring B 6, Page 1 of 1

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 7

ELEV. (MSL.) **25.5** DATE COMPLETED **07-15-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				4 inches **ASPHALT**			
				2 inches **BASE**			
2			GM	**UNDOCUMENTED FILL** GRAVEL/COBBLE			
4			ML	**ALLUVIUM** Soft, moist, grayish-brown, Sandy to Clayey SILT; some fine to medium gravel			
6				-No recovery			
				-Minimal recovery	4		
8							
		▼	CH	Stiff, moist, gray and reddish brown, CLAY; trace fine to coarse gravel/cobble, mottled			
10	B7-1				17		
12							
14			CL	Very stiff, wet, brown to reddish-brown, Sandy CLAY; trace fine to medium gravel			
					37		
16				-Minimal recovery -Grades more clayey			
18				-Gravel/cobble layer 18 to 19 feet			
20	B7-2		SM	Medium dense, saturated, brown, fine to coarse SAND, with silt and clay and some fine to medium gravel	19		
22							
24			SC	Dense to very dense, moist to wet, grayish-to orange-brown, Clayey SAND; some medium to coarse gravel/cobble			
				-Sample disturbed due to cobble fragment in sampler	62/9"		
26							
28							

Figure A-7,
Log of Boring B 7, Page 1 of 2

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 7

ELEV. (MSL.) **25.5** DATE COMPLETED **07-15-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B7-3				Dense to very dense, wet, reddish to yellowish brown, Clayey, medium to coarse SAND and GRAVEL/COBBLE	92/9"		12.9
32				SC/GC		50/2"		
					BORING TERMINATED AT 33 FEET (Refusal) Groundwater encountered at 9.5 feet Backfilled with approximately 11.5 cu. ft. of bentonite grout			

Figure A-7,
Log of Boring B 7, Page 2 of 2

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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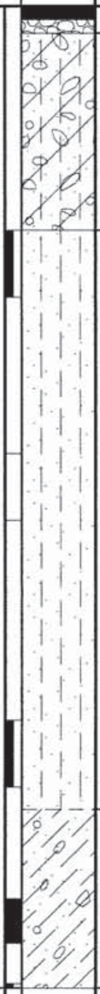
PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 8

ELEV. (MSL.) **49** DATE COMPLETED **07-16-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**



DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				3 inches **ASPHALT** 3 inches **BASE**			
2			SC/GC	**UNDOCUMENTED FILL** Medium dense to dense, moist, light brown, Silty to Clayey, fine to coarse SAND and GRAVEL/COBBLE			
4							
6	B8-1			**SLOPEWASH** Loose to medium dense, moist, brown, Silty, fine to medium SAND; some clay and fine to coarse angular to subrounded gravel, trace organics (stems)	9		
8							
10					24		
12			SM	-Minimal recovery; cobble in tip of sampler; increase in silt and clay			
14				-Gravel/cobble layer 13 to 14 feet			
16				-Gravel/cobble layer 15 to 16 feet			
	B8-2				13		
18				Dense to very dense, moist, brown, Clayey, fine to coarse SAND and GRAVEL; trace silt and organics (stems)			
20	B8-3		SC/GC		80		
22					50/1"		

BORING TERMINATED AT 22 FEET (Refusal)
No groundwater encountered
Backfilled with approximately 7.5 cu. ft. of bentonite grout

Figure A-8,
Log of Boring B 8, Page 1 of 1

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◣ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 9

ELEV. (MSL.) **32** DATE COMPLETED **07-19-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				4 inches **ASPHALT** 4 inches **BASE**			
2				**ALLUVIUM** Loose, wet, brown, Silty, fine to medium SAND; some clay; trace roots, and fine to medium, subangular to subrounded gravel -Gravel/cobble at 1 foot			
4							
			SM		6		
6							
8							
				Loose to medium dense, wet to saturated, Silty to Clayey, fine to medium SAND; some fine to coarse gravel			
10					10		
				-Minimal recovery			
12							
			SC				
14		▼		Gravel/cobble from 14 to 17 feet			
16							
				SLOPEWASH Very stiff, moist to wet, grayish-brown and tan to orange-brown, Sandy CLAY; some coarse sand and fine to coarse gravel/cobble			
18					32		
20					18		
22			CL	-Increase in medium to coarse sand			
24				-Gravel/cobble from 23.5 to 24 feet			
				-Grades to clayey sand			
26							
	B9-1				12	111.2	18.1
28				Loose to medium dense, saturated, brown, Clayey, fine to medium SAND; some silt and fine to medium gravel			
			SC				

Figure A-9,
Log of Boring B 9, Page 1 of 2

07817-22-01 (OLD 07345-52-01).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 9

ELEV. (MSL.) **32** DATE COMPLETED **07-19-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B9-2				Loose, saturated, dark brown to orange-brown, Silty, fine to medium SAND; some clay and fine to medium gravel	6		
32				SM	-Gravel/cobble from 32 to 34.5 feet			
34								
					BORING TERMINATED AT 34.5 FEET (Refusal) Groundwater encountered at 14.5 feet Backfilled with approximately 12 cu. ft. of bentonite grout			

Figure A-9,
Log of Boring B 9, Page 2 of 2

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▧ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◣ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 10

ELEV. (MSL.) **28** DATE COMPLETED **07-19-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				4 inches **ASPHALT** 1 foot **BASE**			
2				**ALLUVIUM** Medium stiff to stiff, moist to wet, dark brown, Sandy to Clayey SILT; some fine to coarse gravel			
4							
6	B10-1		ML		12	107.4	18.0
8							
10				Medium dense, moist, light grayish-brown and tan to light orange-brown, Clayey, fine to medium SAND; trace silt and fine to coarse gravel			
	B10-2	▼			16		
12							
			SC				
14				-Gravel/cobble at 14 feet			
	B10-3				55	108.2	17.2
16				Dense, wet, light yellowish-and reddish-brown, Clayey, medium to coarse SAND and GRAVEL/COBBLE			
18			SC/GC				
				Dense, moist, grayish-to yellowish-brown, Clayey SAND, some silt, trace fine to coarse gravel			
20	B10-4				34		
22			SC				
24							
	B10-5				65	104.0	24.2
26				Soft to firm, saturated, dark brown to orange-brown, Sandy to Clayey SILT and GRAVEL/COBBLE			
28			ML/GM				

BORING TERMINATED AT 28.5 FEET (Refusal)
Groundwater encountered at 10.5 feet
Backfilled with approximately 10 cu. ft. of bentonite grout

Figure A-10,
Log of Boring B 10, Page 1 of 1

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

BORING B 11

ELEV. (MSL.) **30.5** DATE COMPLETED **07-19-2004**

EQUIPMENT **MAYHEW 1000 ROTARY WASH** BY: **G. HORNER**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					3 inches **ASPHALT** 3 inches **BASE**			
2				GC	**UNDOCUMENTED FILL** Light brown, Silty to Sandy CLAY and GRAVEL/COBBLE -Gravel/cobble from 1 to 4 feet			
4 6 8				CL	**ALLUVIUM** Light brown, Sandy CLAY; some gravel/cobble			
10 12 14			▼	SC	Brown, Clayey, fine to medium SAND			
16				CL	Light brown, Sandy CLAY			
18				SC	Brown, Silty to Clayey, fine to medium SAND; some gravel/cobble			
				CL	Light brown, Sandy CLAY; some silt and gravel/cobble			
20 22				SC/GC	Brown, Silty to Clayey, fine to medium SAND and GRAVEL/COBBLE			
	B11-1				-Gravel/cobble fragments in sampler	90		
24					BORING TERMINATED AT 24 FEET Groundwater encountered at 13 feet Backfilled with approximately 8.5 cu. ft. of bentonite grout			

07817-22-01 (OLD 07345-52-01).GPJ

Figure A-11,
Log of Boring B 11, Page 1 of 1

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 07817-22-01

TEST PIT TP 1

ELEV. (MSL.) **48'** DATE COMPLETED **04-10-2007**

EQUIPMENT **JACK HAMMER (35 lb.)** BY: **B.W.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	TP1-1			SM	**STADIUM CONGLOMERATE** Medium dense, dry, brown, Silty, fine SAND with trace clay and gravel; pinhole pores			
	TP1-2			SM	Medium dense, damp, brown, Silty, fine SAND; trace clay and approx. 10% to 15% of gravel			
2								
	TP1-3							
					TEST PIT TERMINATED AT 3½ FEET No groundwater encountered			

Figure A-12,
Log of Test Pit TP 1, Page 1 of 1

07817-22-01.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07817-22-01

TEST PIT TP 2

ELEV. (MSL.) **100'** DATE COMPLETED **04-10-2007**

EQUIPMENT **JACK HAMMER (35 lb.)** BY: **B.W.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**STADIUM CONGLOMERATE** Firm to very stiff, dry, brown, Silty CLAY; approx. 25% of gravel up to 3", trace sand; heavily burrowed in shallow depth			
2		▨						
	TP2-1	☒ ▨						
					TEST PIT TERMINATED AT 3½ FEET No groundwater encountered			

Figure A-13,
Log of Test Pit TP 2, Page 1 of 1

07817-22-01.GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07817-22-01

TEST PIT TP 3

ELEV. (MSL.) **152'** DATE COMPLETED **04-10-2007**

EQUIPMENT **JACK HAMMER (35 lb.)** BY: **B.W.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/GC	**STADIUM CONGLOMERATE** Firm to very stiff, dry, brown, Silty CLAY and GRAVEL/COBBLE up to 12", trace sand; heavily burrowed in shallow depth			
2								
	TP3-1 ▨							
					TEST PIT TERMINATED AT 3½ FEET No groundwater encountered			

Figure A-14,
Log of Test Pit TP 3, Page 1 of 1

07817-22-01.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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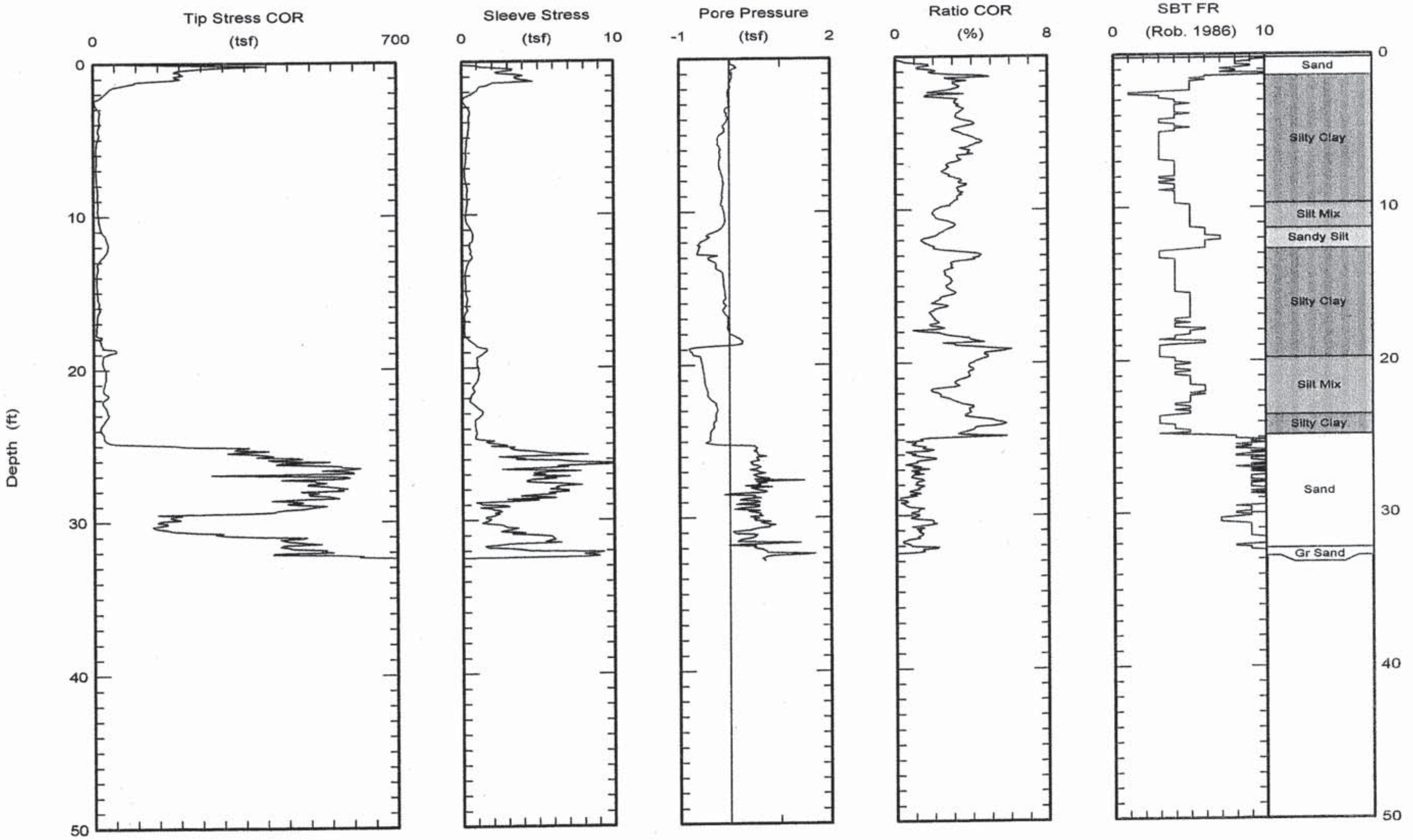
GEOCON

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 12/Jul/2004
Test ID: CPT-1
Project: SanDiego

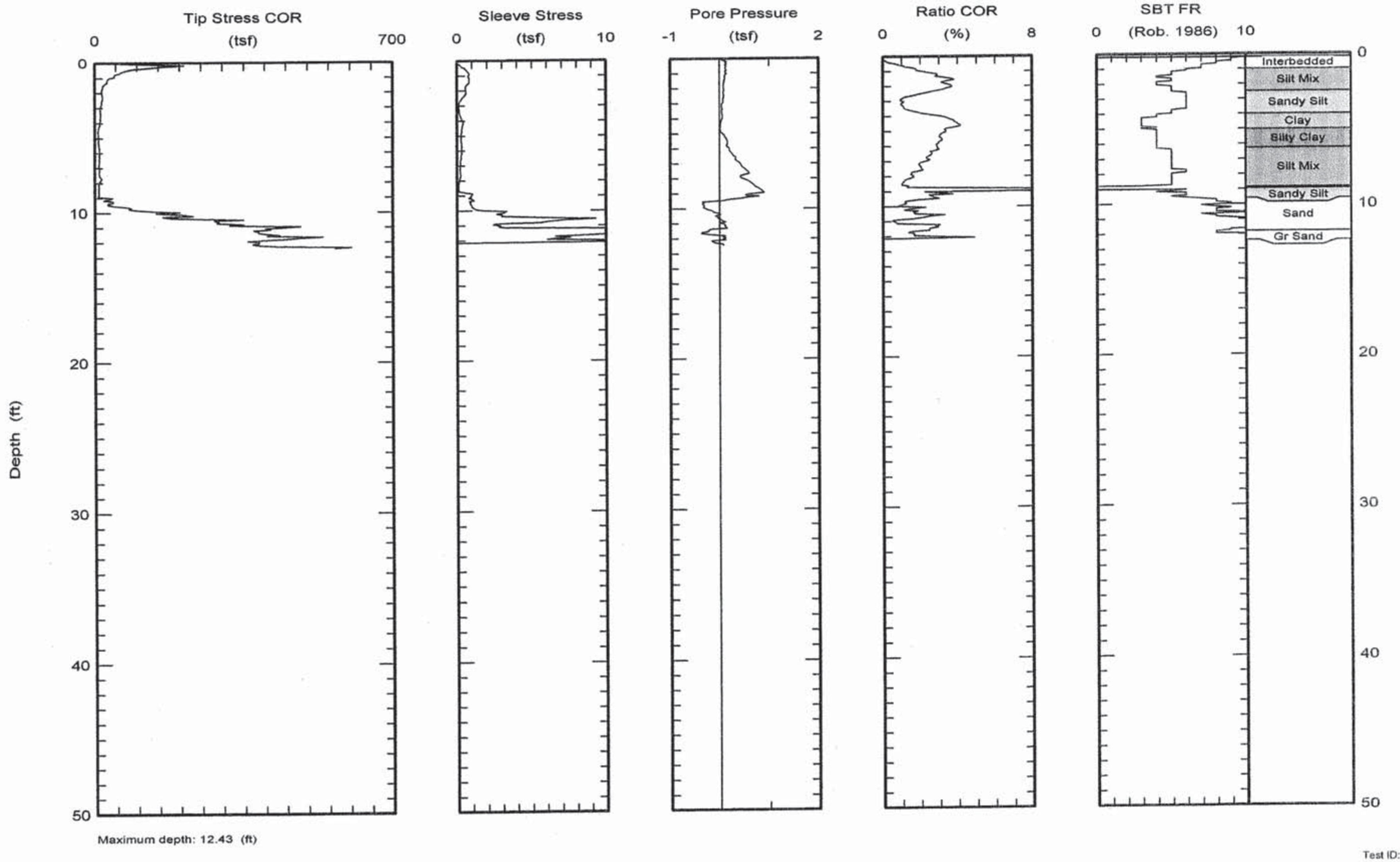
Client: Geocon Cons.
Job Site: Mission Valley Inn Redev



Maximum depth: 32.83 (ft)

Test ID: CPT-1
File: C12L0401C.ECP

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Jul/2004 Test ID: CPT-2 Project: SanDiego
	Client: Geocon Cons. Job Site: Mission Valley Inn Redev	



Maximum depth: 12.43 (ft)

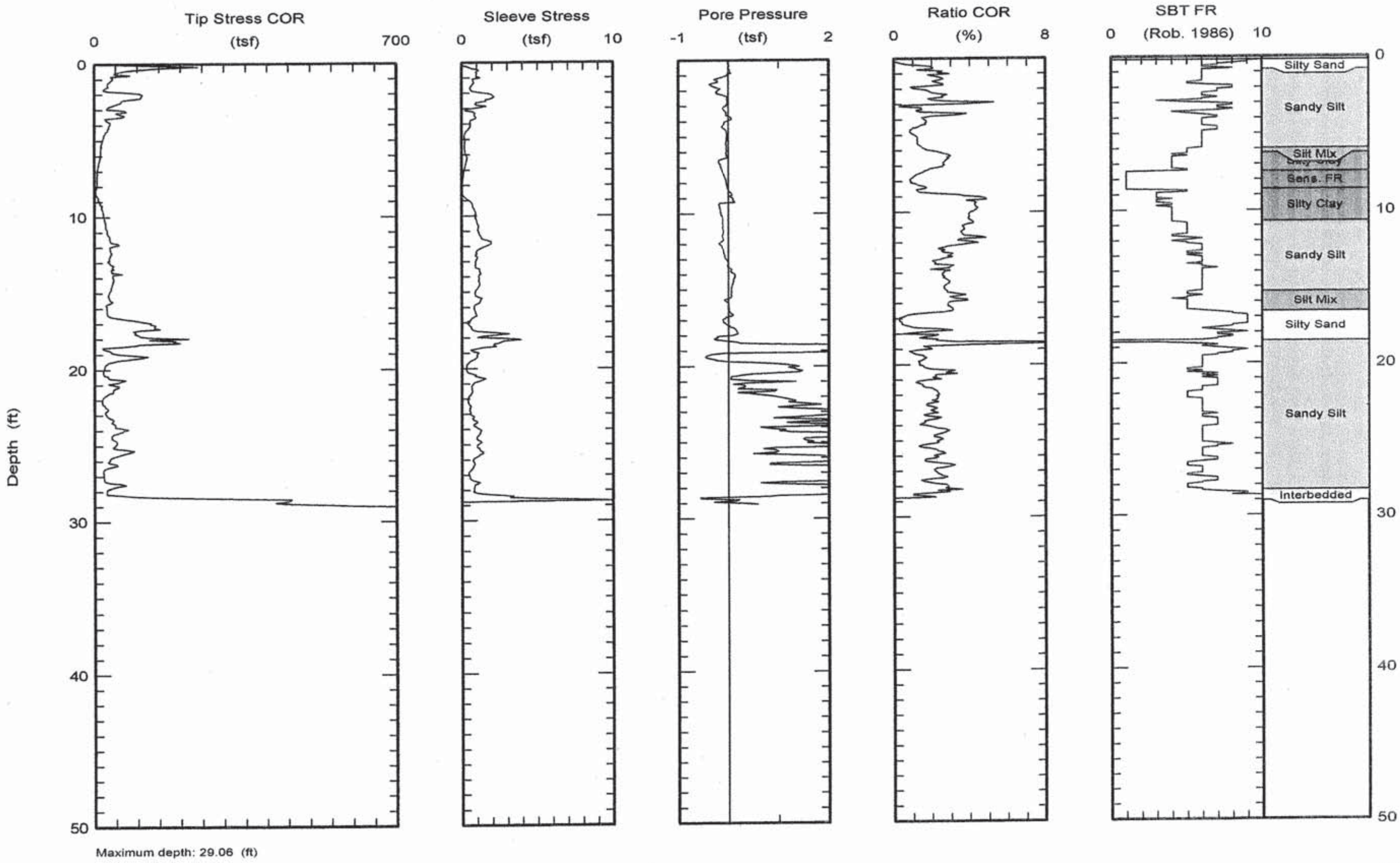
Test ID: CPT-2
File: C12L0403C.ECP

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 12/Jul/2004
Test ID: CPT-3
Project: SanDiego

Client: Geocon Cons.
Job Site: Mission Valley Inn Redev



Maximum depth: 29.06 (ft)

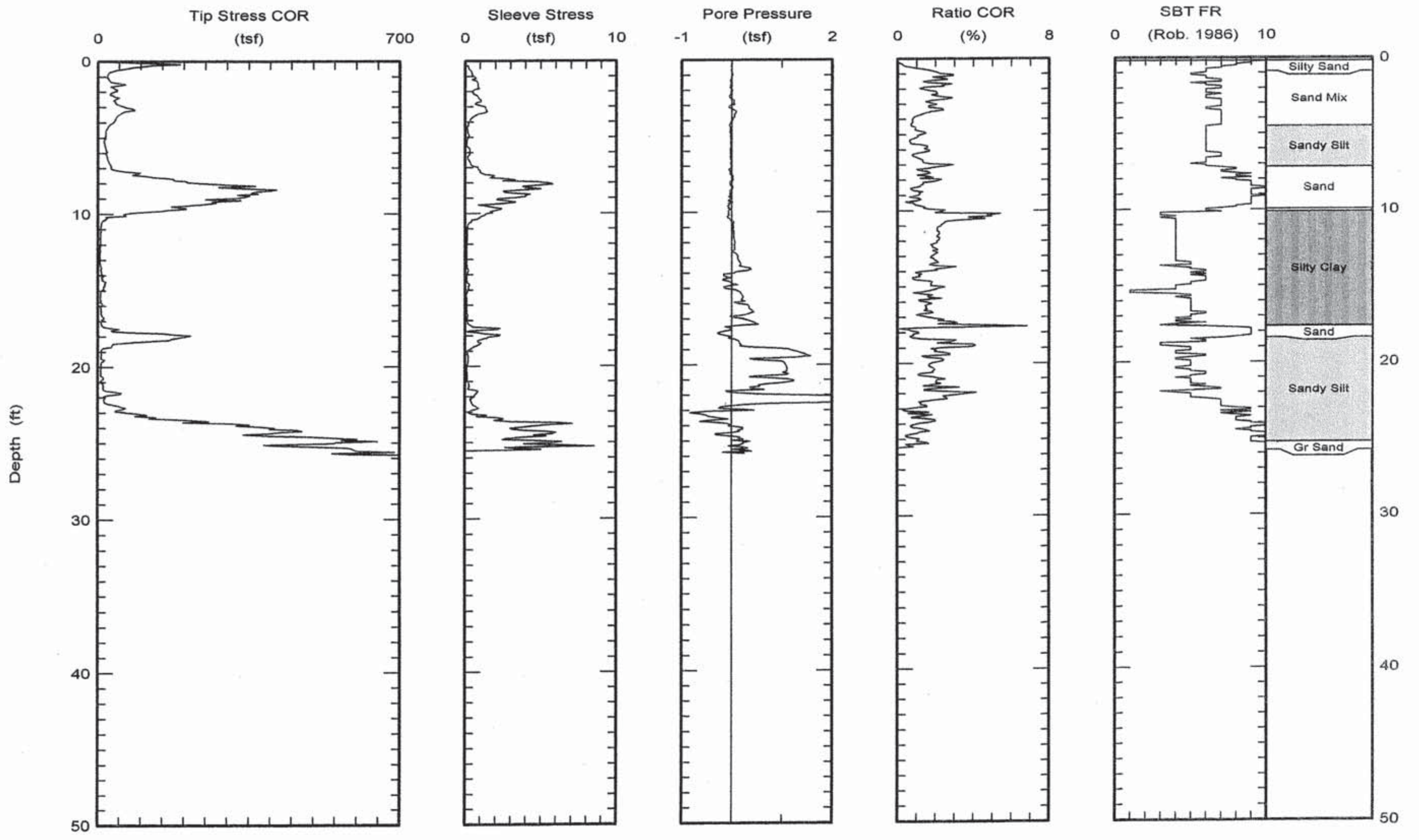
Test ID: CPT-3
File: C12L0402C.ECP

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 12/Jul/2004
Test ID: CPT-4
Project: SanDiego

Client: Geocon Cons.
Job Site: Mission Valley Inn Redev



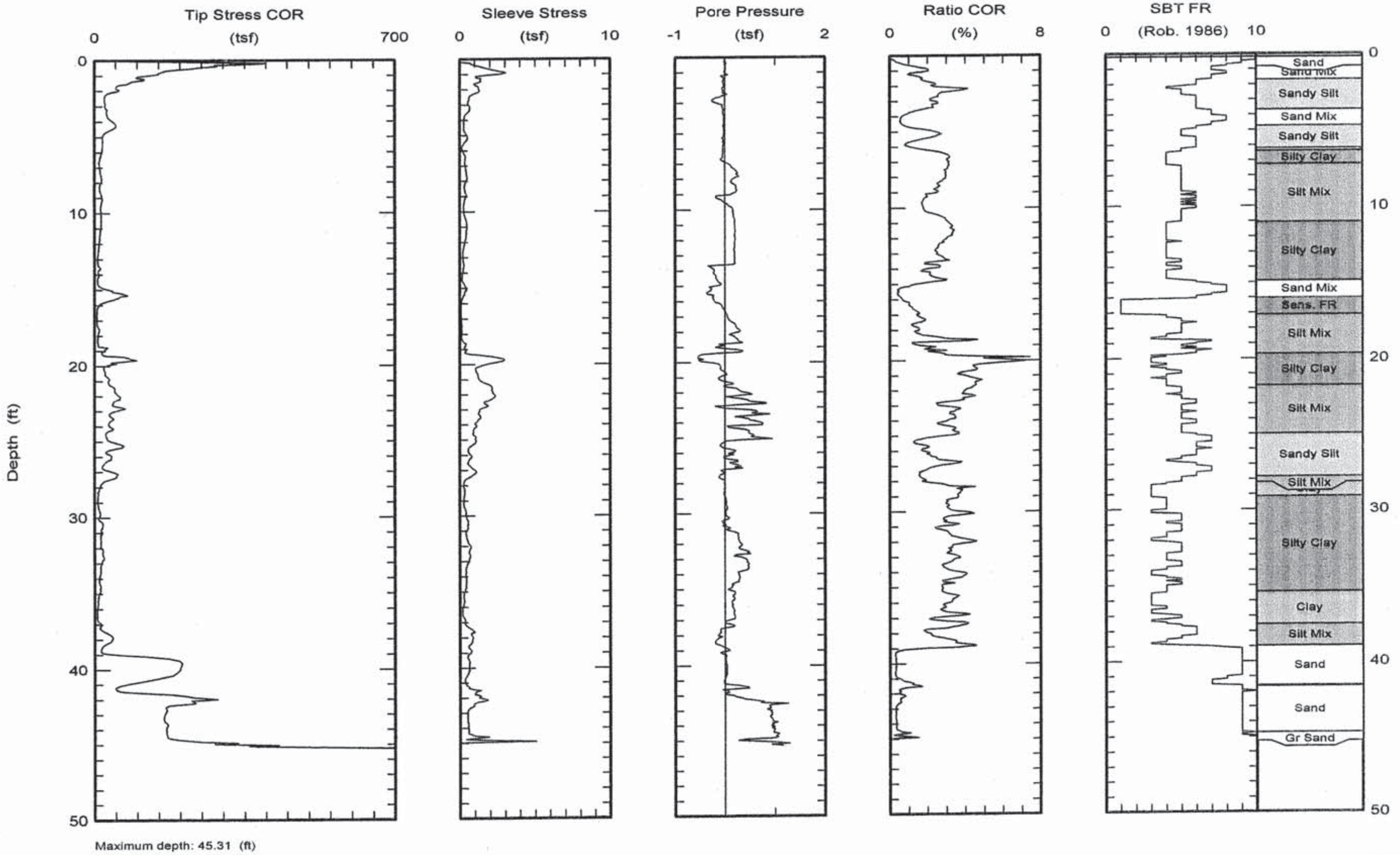
Maximum depth: 25.83 (ft)

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 12/Jul/2004
Test ID: CPT-5
Project: SanDiego

Client: Geocon Cons.
Job Site: Mission Valley Inn Redev



Maximum depth: 45.31 (ft)

Test ID: CPT-5
File: C12L0405C.ECP

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in general accordance with the test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected ring samples for their in-place dry density, moisture content, shear strength, and consolidation characteristics. Samples were tested to evaluate compaction, gradation characteristics, Atterberg Limits, expansion, and soluble sulfate content, pH and resistivity, and resistance value (R-Value).

The results of our laboratory tests are presented in the following tables and graphs. The in-place dry density and moisture content results are presented on the exploratory boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
(ASTM D 1557)

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry weight)
B1-1	Dark brown, Clayey SAND, trace gravel	129.2	9.8
B3-7	Yellowish brown, Silty/Clayey SAND, trace gravel	132.6	8.6
B4-4	Dark brown, CLAY/Clayey SAND, trace gravel	130.0	9.1
TP1-3/2-1/3-1*	Dark brown, Silty CLAY with gravel, trace sand	122.4	11.3

*Combined sample

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
(ASTM D 4829)

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification	2010 CBC Classification
	Before Test	After Test				
B1-1	8.8	18.3	111.2	24	Low	Expansive
B3-2	7.6	15.0	119.6	0	Very Low	Non-expansive
B3-4	7.8	15.1	118.2	0	Very Low	Non-expansive

TABLE B-III
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
(ASTM D 3080)

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B3-8	99.1	18.2	100	39
B9-1	111.2	18.1	150	39
TP1-3/2-1/3-1*	109.5	11.7	180	27

*Combined sample compacted to 90 percent of maximum dry density.

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
(CALIFORNIA TEST NO. 417)

Sample No.	Water Soluble Sulfate Content (%)	Sulfate Rating*
B2-1	0.040	Not Applicable (S0)
B7-1	0.019	Not Applicable (S0)
B8-2	0.026	Not Applicable (S0)
B10-2	0.040	Not Applicable (S0)

*Reference: California Building Code Table 19-A-4.

TABLE B-V
SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (PH) AND RESISTIVITY TEST RESULTS
(CALIFORNIA TEST NO. 643)

Sample No.	pH	Minimum Resistivity (ohm-centimeters)
B2-1	6.6	470
B7-1	7.1	870

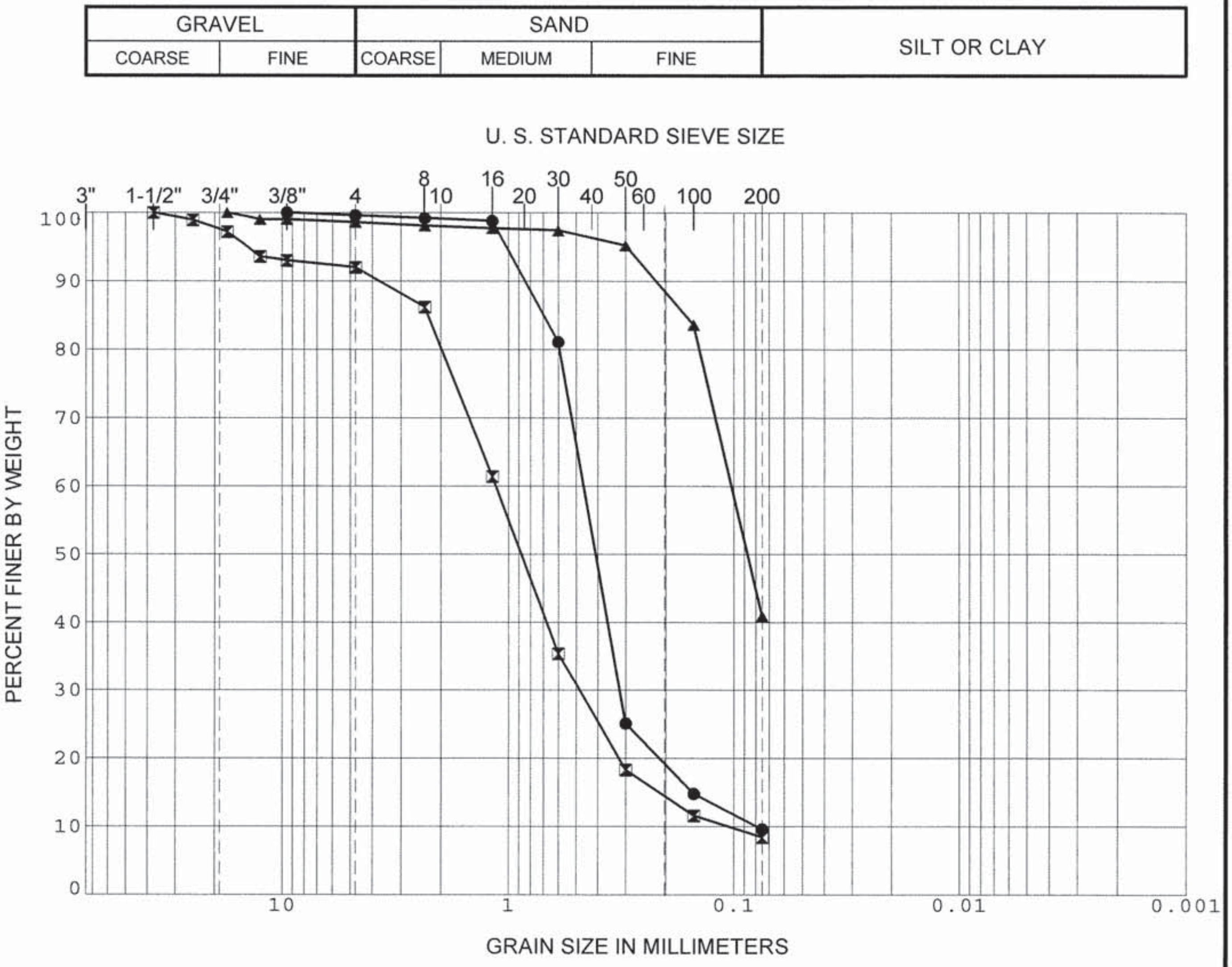
TABLE B-VI
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
(ASTM D 4318)

Sample No.	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index
B7-2	26	14	12
B8-3	29	13	16

TABLE B-VII
SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
(ASTM D 2844)

Sample No.	R-Value
B1-1	<5
B3-2	13
B3-4	70
B4-1	20

PROJECT NO. 07817-22-01 (OLD 07345-52-01)



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B1-3	10.0	SM/SP				
⧗	B3-4	14.0	SW				
▲	B6-3	20.0	SM				

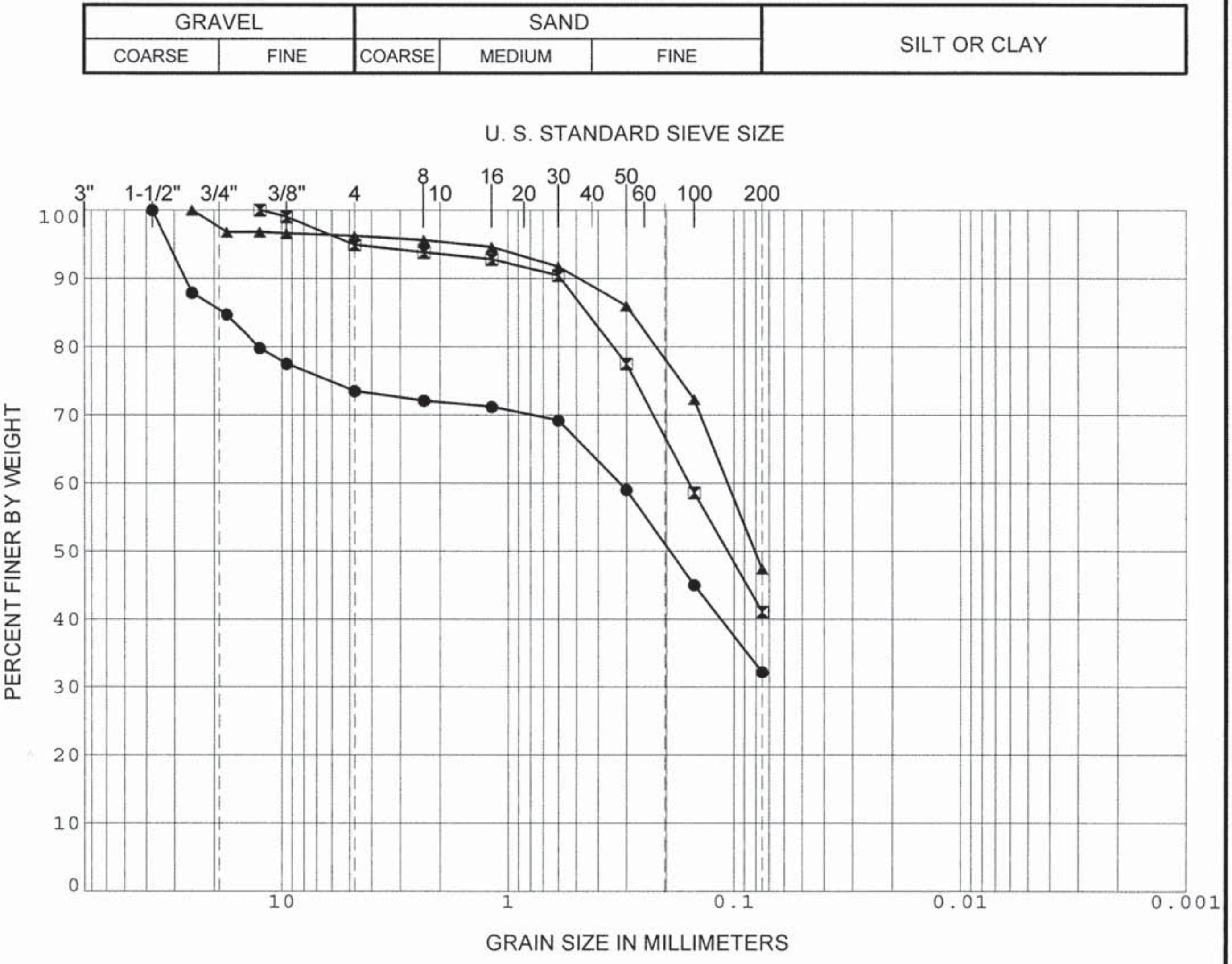
GRADATION CURVE

MISSION VALLEY MULTI-USE

SAN DIEGO, CALIFORNIA

Figure B-1

GEOCON



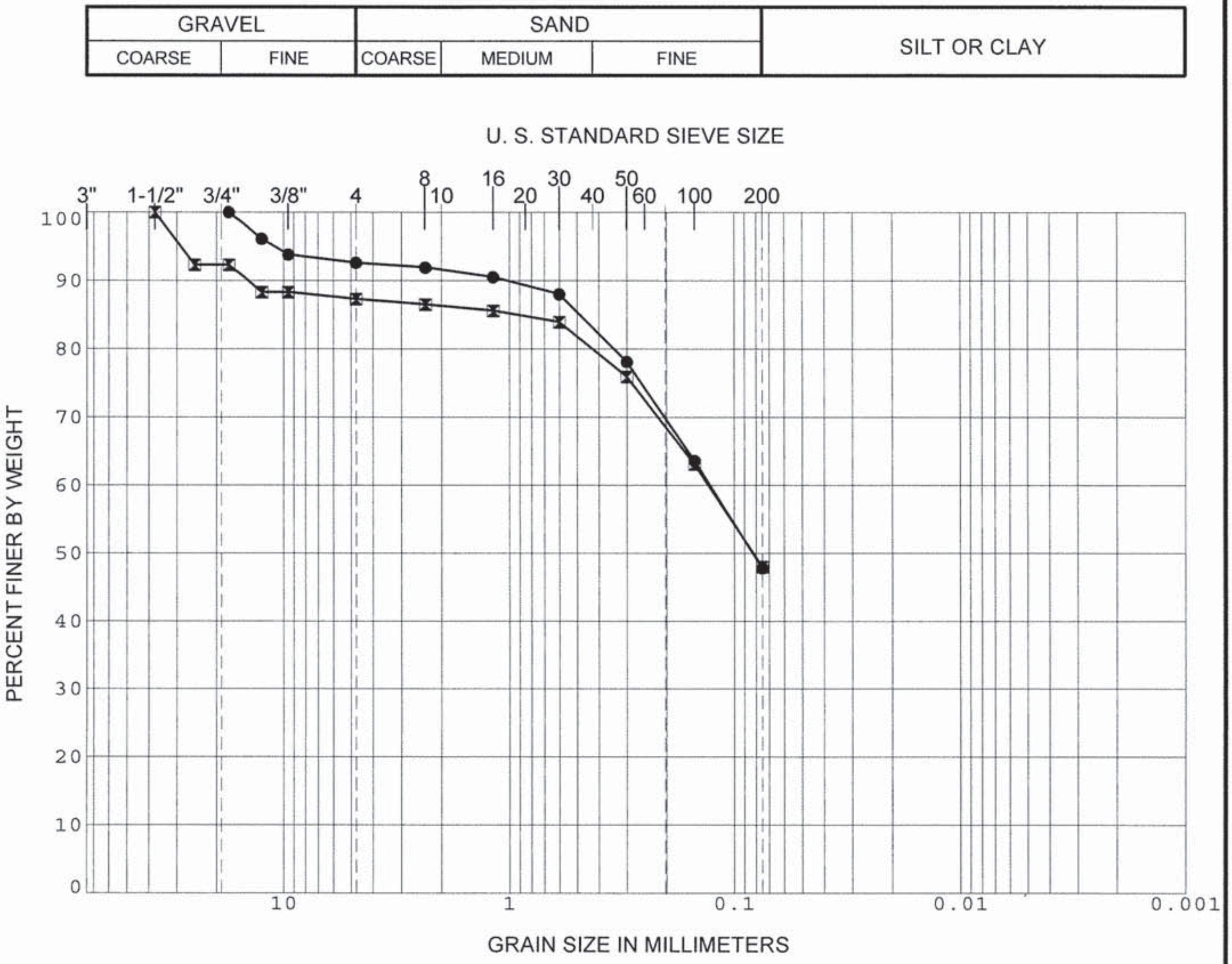
	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B8-1	5.0	SM				
⧗	B8-2	16.0	SM				
▲	B9-2	30.0	SM				

GRADATION CURVE

MISSION VALLEY MULTI-USE

SAN DIEGO, CALIFORNIA

Figure B-2



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B10-2	10.0	SC				
⧗	B10-4	20.0	SC				

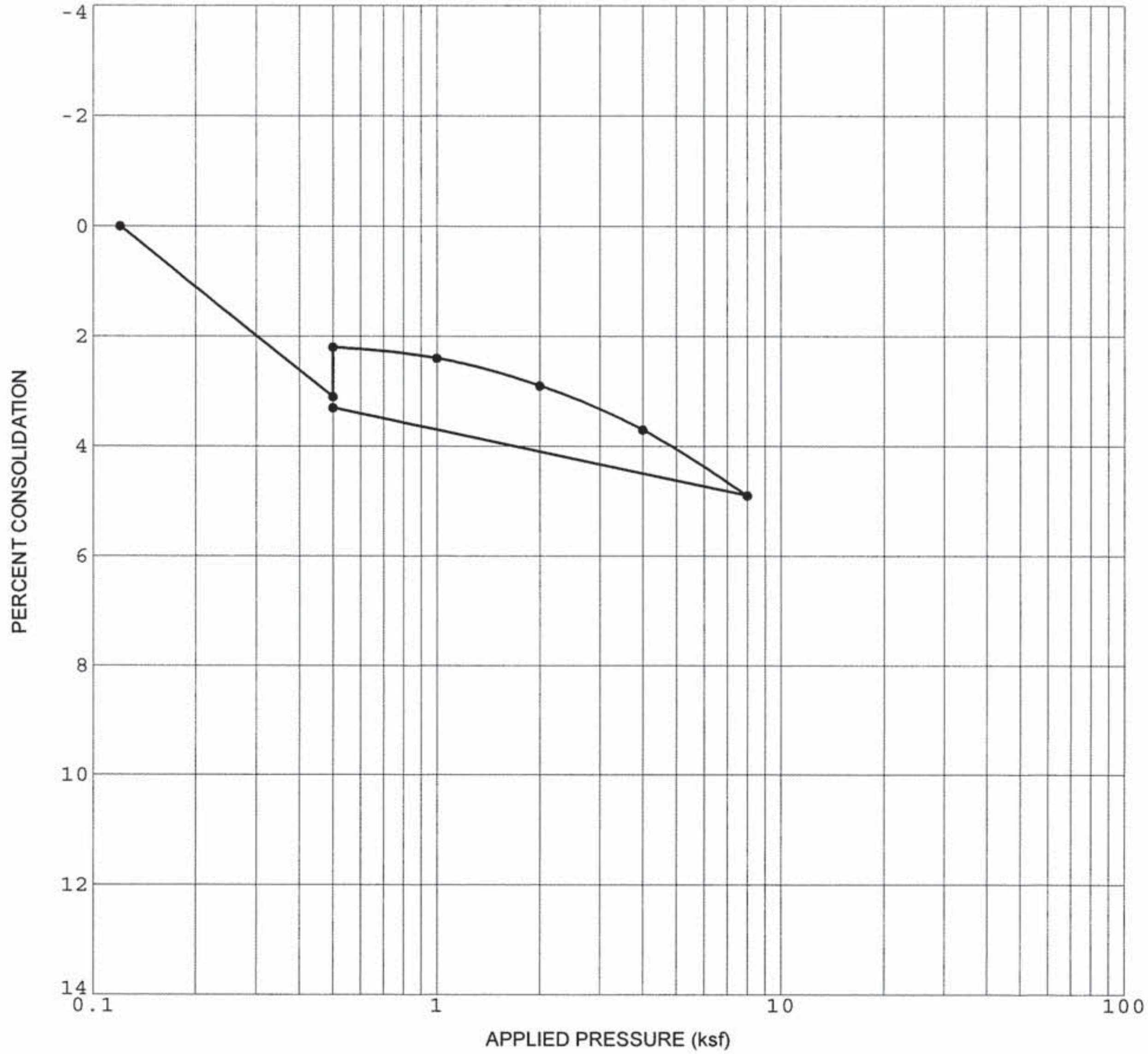
GRADATION CURVE

MISSION VALLEY MULTI-USE

SAN DIEGO, CALIFORNIA

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

SAMPLE NO. B2-1



Initial Dry Density (pcf)	114.1		**Initial Saturation (%)**	87.2
Initial Water Content (%)	14.9		**Sample Saturated at (ksf)**	.5

CONSOLIDATION CURVE

MISSION VALLEY MULTI-USE

SAN DIEGO, CALIFORNIA

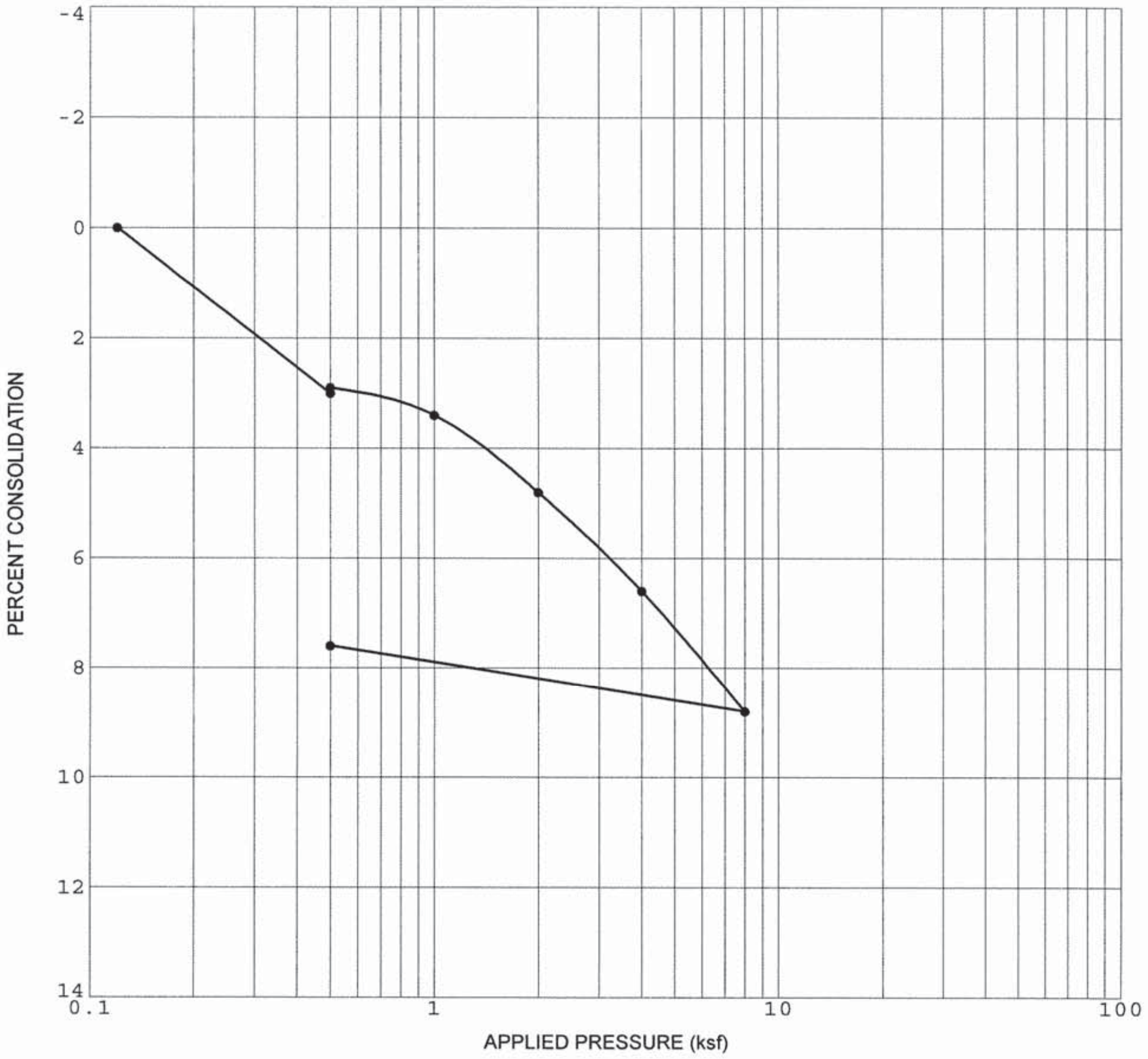
07817-22-01 (OLD 07345-52-01).GPJ

Figure B-4

GEOCON

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

SAMPLE NO. B5-2



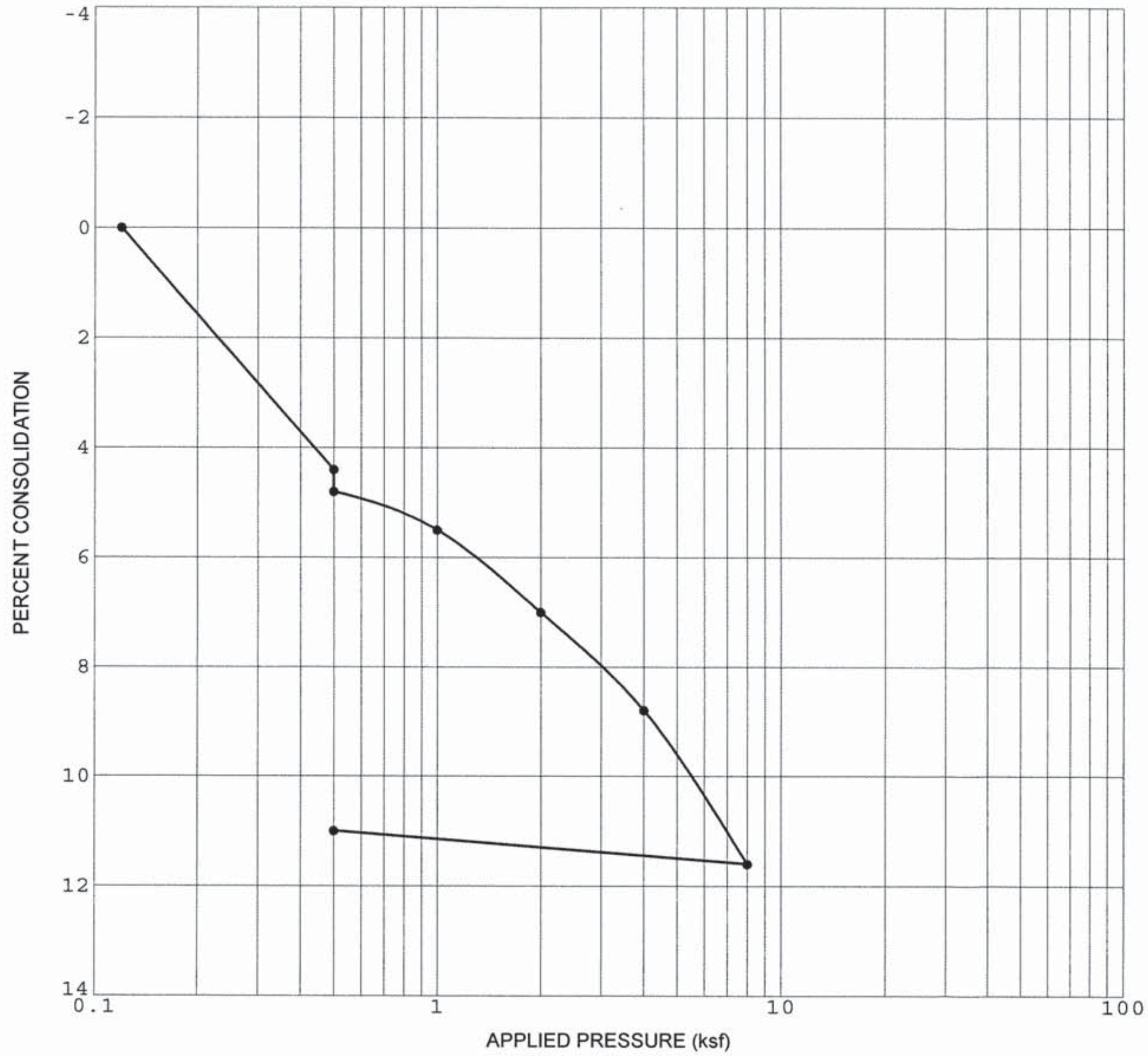
Initial Dry Density (pcf)	98.1		**Initial Saturation (%)**	100+
Initial Water Content (%)	27.2		**Sample Saturated at (ksf)**	.5

CONSOLIDATION CURVE

MISSION VALLEY MULTI-USE

SAN DIEGO, CALIFORNIA

SAMPLE NO. B5-3



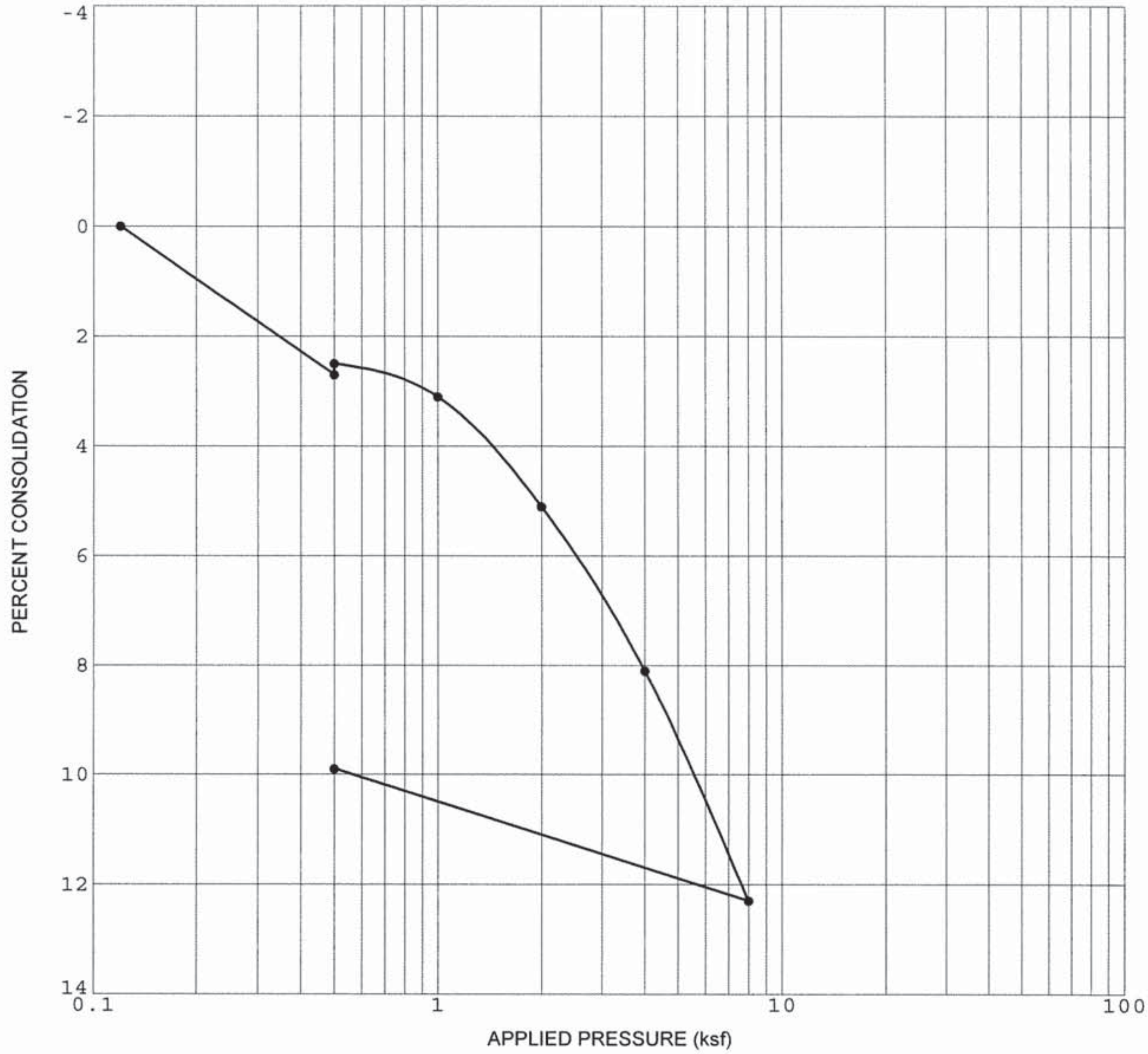
Initial Dry Density (pcf)	107.2		**Initial Saturation (%)**	98.4
Initial Water Content (%)	20.3		**Sample Saturated at (ksf)**	.5

CONSOLIDATION CURVE

MISSION VALLEY MULTI-USE

SAN DIEGO, CALIFORNIA

SAMPLE NO. B6-2



Initial Dry Density (pcf)	87.8
Initial Water Content (%)	34.6

Initial Saturation (%)	100+
Sample Saturated at (ksf)	.5

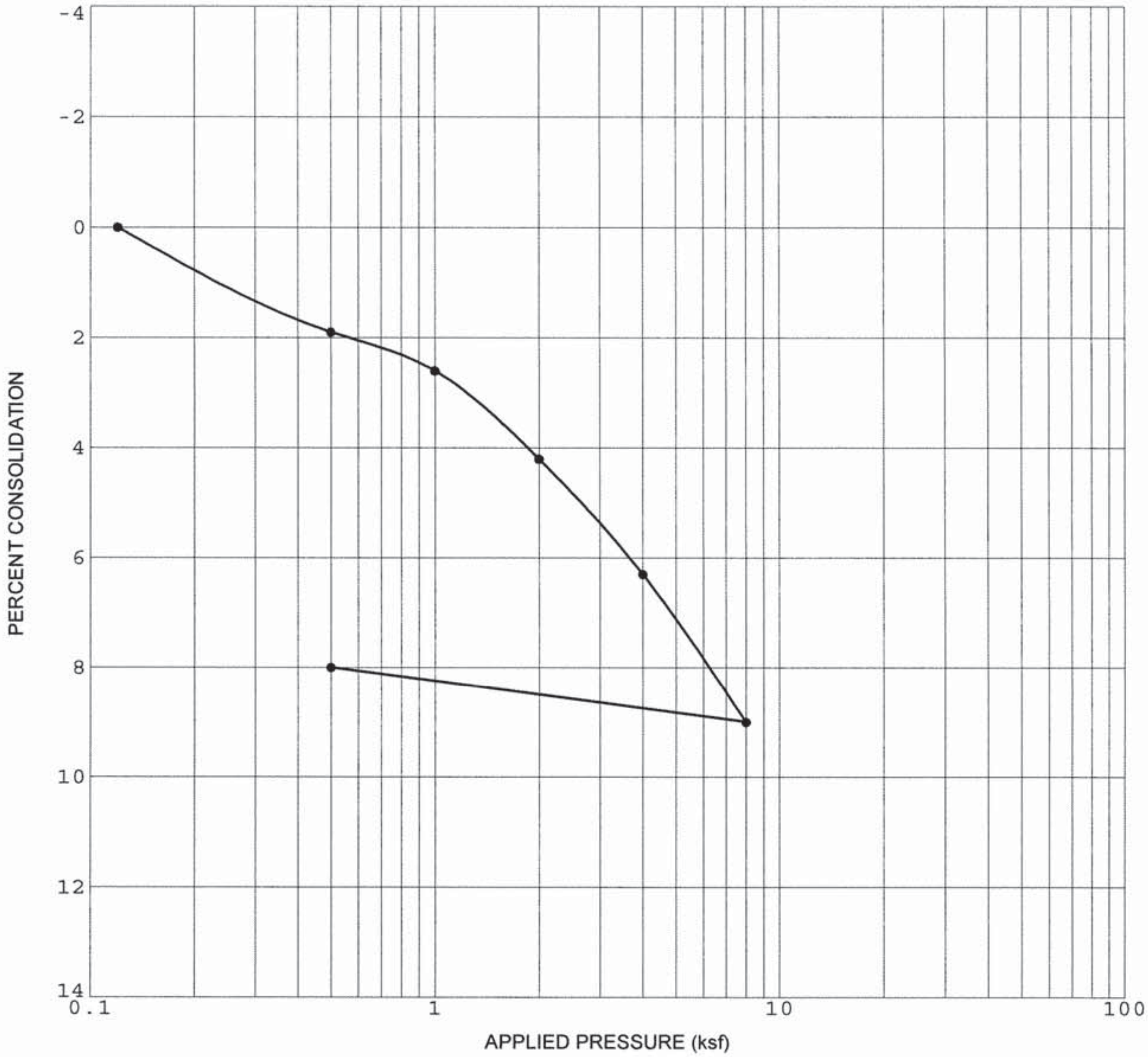
CONSOLIDATION CURVE

MISSION VALLEY MULTI-USE

SAN DIEGO, CALIFORNIA

PROJECT NO. 07817-22-01 (OLD 07345-52-01)

SAMPLE NO. B10-1



Initial Dry Density (pcf)	107.4	**Initial Saturation (%)**	87.7
Initial Water Content (%)	18.0	**Sample Saturated at (ksf)**	.5

CONSOLIDATION CURVE

MISSION VALLEY MULTI-USE

SAN DIEGO, CALIFORNIA

APPENDIX C
BOREHOLE LOGS

APPENDIX C
BOREHOLE LOGS

The geotechnical borehole explorations for the project consisted of the drilling and logging four hand auger borings; twelve hollow-stem auger (HSA) borings; and four large diameter borings. Our field engineer used a hand auger tool to advance borings to depths up to 2 feet below ground surface. The HSA borings were advanced by Pacific Drilling of San Diego, California using a Unimog drill rig which was equipped with 7-inch diameter hollow stem augers. The HSA borings were advanced to depths up to approximately 46 feet below ground surface. The large diameter borings were advance by Western and Pacific Drilling of San Diego, California using Earth Drill Bucket Rig equipped with 24 inches rotary bucket auger or Watson 2500 drill rig equipped with 24 inches auger. Drilling occurred from February 16, 2016 through March 2, 2016. Figures 2 and 3 present the approximate locations of the boreholes.

A Unified Soil Classification System (USCS) chart, graphics key and borehole log legends are presented in Appendix C as Figure C-1 and C-2. The borehole logs are presented as Figures C-3 through C-22.

The borehole logs describe the earth materials encountered, samples obtained, and show field and laboratory tests performed. The logs also show the general location, borehole number, drilling date, and the names of the logger and drilling subcontractor. The boreholes were logged by our field engineer from Kleinfelder. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Bulk and intact samples of representative earth materials were obtained from the boreholes. The boreholes were backfilled after the total depth was attained.

In-place soil samples were obtained at the test boring locations using a Standard Penetration (SPT) or California-type Sampler driven a total of 18-inches (or until practical refusal) into the undisturbed soil at the bottom of the boring. The soil sampled by the SPT (2-inch O.D., 1.5 inches I.D.) or California-type sampler (3-inch O.D., 2.4 inches I.D.) was returned to our laboratory for testing. The samplers and associated rods (threaded) were driven using a 140-pound automatic hammer falling 30 inches. The total number of hammer blows required to drive the SPT sampler the final 12 inches is termed the blow count (or N-value) and is recorded on the Logs of Borings along with the blow count for each 6-inch interval. The blow count values on the boring logs are presented as field values and have not been corrected for the effects such as overburden pressure, sampler size, hammer efficiency, etc. This is the typical way to present information on the borehole logs and the mentioned corrections are performed for analysis purposes.

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SAMPLE/SAMPLER TYPE GRAPHICS

- ☒ BAG SAMPLE
- ☒ BULK SAMPLE
- ◧ CALIFORNIA SAMPLER (3 in. (76.2 mm.) outer diameter)
- ▥ SHELBY TUBE SAMPLER
- ◩ STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- ▽ WATER LEVEL (level where first observed)
- ▼ WATER LEVEL (level after exploration completion)
- ▼ WATER LEVEL (additional levels after exploration)
- ≋ OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu≥4 and 1≤Cc≤3	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu<4 and/ or 1>Cc>3	**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu≥4 and 1≤Cc≤3	**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu<4 and/ or 1>Cc>3	**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu≥6 and 1≤Cc≤3	**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu<6 and/ or 1>Cc>3	**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu≥6 and 1≤Cc≤3	**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu<6 and/ or 1>Cc>3	**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

KLEINFELDER
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PROJECT NO.:	20163965
DRAWN BY:	MAP
CHECKED BY:	SHR & MA
DATE:	3/25/2016
REVISED:	-

GRAPHICS KEY

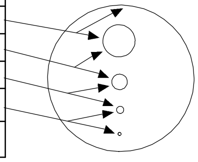
Legacy International Center
San Diego, California

FIGURE

C-1

GRAIN SIZE

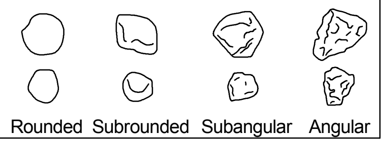
DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3 in. (19 - 76.2 mm.)	3/4 -3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



Munsell Color

NAME	ABBR
Red	R
Yellow Red	YR
Yellow	Y
Green Yellow	GY
Green	G
Blue Green	BG
Blue	B
Purple Blue	PB
Purple	P
Red Purple	RP
Black	N

ANGULARITY

DESCRIPTION	CRITERIA	
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces	
Subangular	Particles are similar to angular description but have rounded edges	
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges	
Rounded	Particles have smoothly curved sides and no edges	

Particles Present

Amount	Percentage
trace	<5
few	5-10
little	15-25
some	30-45
and	50
mostly	50-100

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

NOTE: AFTER TERZAGHI AND PECK, 1948

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (q_u)(psf)	CRITERIA
Very Soft	< 1000	Thumb will penetrate soil more than 1 in. (25 mm.)
Soft	1000 - 2000	Thumb will penetrate soil about 1 in. (25 mm.)
Firm	2000 - 4000	Thumb will indent soil about 1/4-in. (6 mm.)
Hard	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail
Very Hard	> 8000	Thumbnail will not indent soil

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

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PROJECT NO.:	20163965	SOIL DESCRIPTION KEY	FIGURE
DRAWN BY:	MAP		
CHECKED BY:	SHR & MA	Legacy International Center San Diego, California	C-2
DATE:	3/25/2016		
REVISED:	-		

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BORING LOG B-1

Date Begin - End: 2/25/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny
Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.
Hammer Type - Drop: 140 lb. Auto - 30 in.

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 25 Surface Condition: Asphalt Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: 4 inches thick												
			Alluvial Deposits (Qa): **Lean CLAY (CL)**: fine-grained sand, subrounded gravel (1"), medium to high plasticity, black (10YR 2/1), moist, micaceous	S1											**pH=** 8.7 **Resistivity=** 960 ohm-cm **Sulfates=** 190 ppm **Chlorides=** 90 ppm **R-Value=** 11 **Expansion Index=** 33
20	5		- stiff below 5 feet	S2		BC=3 4 4 PP=1.0	4"								
∇															
			becomes **Silty SAND (SM)**												
15	10			S3			12"	SM	22.6	109.3	98	35	NP	NP	
			SILT (ML): very dark gray (5Y 3/1), wet, very soft, possible estuarine material												
10	15			S4		BC=2 2 3 PP=0	18"								
			becomes **Lean CLAY (CL):** dark olive gray (5Y 3/2), medium stiff, micaceous below 20 feet												
5	20			S5		BC=4 5 5 PP=0.5	18"	CL	31.9	91.1	100	92			
			Clayey SAND (SC): fine to coarse-grained sand, subrounded gravel (1"), dark brown (10YR 3/3), wet, dense, rock fragment at tip of sampler												
0	25			S6		BC=10 11 14	4"								
			- gravel/cobble content increases at 27 feet												Rig chatter from 27 to 30 feet due to cobbles and gravel
-5	30														

The boring was terminated at approximately 30 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 25, 2016.

GROUNDWATER LEVEL INFORMATION:
∇ Groundwater was observed at approximately 7.8 ft. below ground surface during drilling.

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PROJECT NO.: 20163965
DRAWN BY: MAP
CHECKED BY: SHR & MA
DATE: 3/25/2016
REVISED: -

BORING LOG B-1

Legacy International Center
San Diego, California

FIGURE
C-3

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BORING LOG B-2

Date Begin - End: 2/24/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny
Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.
Hammer Type - Drop: 140 lb. Auto - 30 in.

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 29 Surface Condition: Asphalt Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		■	**ASPHALT**: 4 inches thick												
25		▨	**Alluvial Deposits (Qa):** **Lean CLAY with Sand (CL)**: fine-grained sand, medium plasticity, very dark brown (10YR 2/2), moist, micaceous	S1	☒										
	5	▨	**Clayey SAND (SC)**: fine to medium-grained sand, very dark grayish brown (10YR 3/2), moist, loose, micaceous	S2	◣	BC=2 3 2 PP=0.5	11"								
20		▨	**Sandy Lean CLAY (CL) to Clayey SAND (SC)**: fine to medium-grained sand, medium to high plasticity, dark brown (10YR 3/3), moist, very stiff, micaceous												
	10	▨		S3	◨	BC=6 9 14 PP=2.0	12"	SC	14.9	118.0	100	37	32	16	
15	▽	▨													Lense of gravel at 13 feet
	15	▨	- dark yellowish brown (10YR 4/4) below 15 feet - rock at tip of sampler	S4	◣	BC=3 10 8 PP=3.0	18"								
10		▨													
	20	▨		S5	▥		15"	SC	25.5	99.5	100	30	27	11	**Consolidation:** C_c=10.5% C_r=1%
5		▨	**Lean CLAY with Sand (CL) to Clayey SAND (SC)**: fine to medium-grained sand, subangular gravel (<1"), medium plasticity, dark yellowish brown (10YR 3/4), wet, stiff, micaceous												
	25	▨		S6	◨	BC=5 7 8 PP=1.5	14"	SC	17.8	115.0	100	44			
0		▨	**Clayey SAND (SC)**: fine to medium-grained sand, subangular gravel (1"), dark yellowish brown (10YR 4/4), wet, very dense												
	30	▨	- gravel zone from 31 to 32.5 feet	S7	◣	BC=17 18 50/3"	6"								
-5		▨	**Well-graded SAND (SW)**: fine to coarse-grained sand, yellowish brown (10YR 5/6), wet, very dense												

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BORING LOG B-2

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FIGURE
C-4

PAGE: 1 of 2

Date Begin - End: 2/24/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

BORING LOG B-2

Approximate Ground Surface Elevation (ft.): 29
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Well-graded SAND (SW): fine to coarse-grained sand, yellowish brown (10YR 5/6), wet, very dense - trace of Clayey SAND (SC) at tip of sampler	S8	◣	BC=3 21 20	18"								Rig chatter at 35 feet
-10															
	40		**Stadium Conglomerate (Tst):** **CONGLOMERATE**: fine to medium-grained sand, gravel (<1.5"), brownish yellow (10YR 6/8), wet, very dense, high gravel and cobble content based on rig action												Drill rig chatter at 39.5 feet due to gravel and cobbles
					▬	BC=50/2"	NR								Drill rig chatter from 41 to 45 feet
-15															
	45			S9	◣	BC=50/3"	3"								
-20															
	50														
-25															
	55														
-30															
	60														
-35															
	65														
-40															

The boring was terminated at approximately 45.3 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 24, 2016.

GROUNDWATER LEVEL INFORMATION:
⊻ Groundwater was observed at approximately 13.5 ft. below ground surface during drilling.

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BORING LOG B-2

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FIGURE
C-4

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BORING LOG B-3

Date Begin - End: 2/26/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 30
Surface Condition: Asphalt

		FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		ASPHALT: 4 inches thick												
		Alluvial Deposits (Qa): **Clayey SAND (SC)**: fine to medium-grained sand, subrounded gravel (1"), very dark grayish brown (10YR 3/2), moist	S1	☒										
25	5	- dark brown (10YR 3/3), loose, micaceous, presence of roots below 5 feet	S2	◣	BC=3 3 3	9"								
20	10		S3	▥		24"	SC	22.2	103.1	98	40	25	9	
▽														
15	15	- dark yellowish brown (10YR 4/4), wet below 15 feet	S4	▮	BC=2 2 5	18"	SC	18.9	90.6	79	29			
														Rig chatter from 18 to 20 feet due to gravel and cobbles
10	20	**Lean CLAY with Sand (CL) to Clayey SAND (SC)**: fine-grained sand, medium plasticity, dark yellowish brown (10YR 4/6), wet, stiff, micaceous	S5	◣	BC=3 5 5 PP=1.0	10"								
5	25	- very soft below 25 feet	S6	▮	BC=5 5 6 PP=0	12"	SC	20.7	110.6	100	44	27	12	**Consolidation:** C_C=7.8% C_r=01%
		Well-graded SAND with Silt (SW-SM): fine to coarse-grained sand, subrounded gravel (1"), olive brown (2.5Y 4/4), wet, medium dense, micaceous, with intermittent gravel layer												
0	30	- possible fluvial material below 31 feet	S7	◣	BC=6 6 9	9"								Intermittent gravel layers, drill rig chatter from 30 to 35 feet
		- becomes fine to coarse-grained sand, subrounded gravel (1"), light olive brown (2.5Y 5/6), dense below 33 feet												

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BORING LOG B-3

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FIGURE
C-5

Date Begin - End: 2/26/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

BORING LOG B-3

Approximate Ground Surface Elevation (ft.): 30
Surface Condition: Asphalt

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Well-graded SAND with Silt (SW-SM): fine to coarse-grained sand, subrounded gravel (1"), olive brown (2.5Y 4/4), wet, medium dense, micaceous, with intermittent gravel layer	S8	■	BC=25 28	9"								Intermittent gravel, drill rig chatter from 36 to 40 feet Rig chatter from 38 to 45 feet due to cobbles and gravel
-10	40		**<u>Stadium Conglomerate (Tst):</u>** **CONGLOMERATE**: fine to coarse-grained sand, light olive brown (2.5Y 5/4), wet, micaceous, high gravel and cobble content based on rig action, rock fragment at tip of sampler	S9	◣	BC=47 50/4"	6"								
-15	45		**Clayey SANDSTONE**: fine to coarse-grained sand, some gravel (<2.5"), brownish yellow (10YR 6/8), wet	S10 S11	■ ◣	BC=50/5" BC=35 50/4"	2"								
-20	50														
-25	55														
-30	60														
-35	65														

The boring was terminated at approximately 46.3 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 26, 2016.

<u>GROUNDWATER LEVEL INFORMATION:</u>
▽ Groundwater was observed at approximately 11.9 ft. below ground surface during drilling.

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BORING LOG B-3

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FIGURE
C-5

BORING LOG B-4

Date Begin - End:	2/26/2016	**Drilling Company:**	Pacific Drilling
Logged By:	S. Tena	**Drill Crew:**	Gordy & Raymond
Hor.-Vert. Datum:	MSL	**Drilling Equipment:**	UNIMOG MARL 5
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger
Weather:	Sunny	**Exploration Diameter:**	7 in. O.D.

Approximate Ground Surface Elevation (ft.): 28
Surface Condition: Asphalt

FIELD EXPLORATION								LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: 5 inches thick												
25			**Alluvial Deposits (Qa):** **Lean CLAY with Sand (CL)**: fine to medium-grained sand, subangular gravel (2"), medium plasticity, very dark gray (5YR 3/1), moist, micaceous, strong hydrocarbon odor												
	5														
20															
	10														
15															
	15														
10															
	20														
5															
	25														
0															
	30														
-5															

The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with soil cuttings on February 26, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

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BORING LOG B-4

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FIGURE

C-6

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Date Begin - End: 2/25/2016
Drilling Company: Pacific Drilling
BORING LOG B-5

Logged By: S. Tena
Drill Crew: Gordy & Raymond

Hor.-Vert. Datum: MSL
Drilling Equipment: UNIMOG MARL 5
Hammer Type - Drop: 140 lb. Auto - 30 in.

Plunge: -90 degrees
Drilling Method: Hollow Stem Auger

Weather: Sunny
Exploration Diameter: 7 in. O.D.

Approximate Ground Surface Elevation (ft.): 25
Surface Condition: Asphalt

		FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		ASPHALT: 4 inches thick												
		Alluvial Deposits (Qa): **Lean CLAY (CL)**: fine-grained sand, subrounded to subangular gravel (1"), medium plasticity, black (2.5Y 2.5/1), moist	S1											Rig chatter due to rock at 1 foot
20	5	- stiff below 5 feet	S2		BC=2 3 1 PP=1.0	12"								
	▽	- very dark brown (2.5/2), very soft, micaceous below 6 feet	S3		PP=0		CL	23.5	91.8	100	59	28	10	
15	10	- medium to high plasticity, dark brown (7.5YR 3/2), wet, stiff below 10 feet	S4		BC=4 9 10 PP=1.0	5"								
		Silty SAND (SM): fine to coarse-grained sand, brown (7.5YR 4/4), wet, dense, micaceous												
10	15		S5		BC=7 11 12	14"	SM	15.1	117.2	98	16			
		Clayey SAND with Gravel (SC): fine to coarse-grained sand, subangular gravel (<1.5"), brown (7.5YR 4/4), wet, very dense, high gravel content based on rig action												
5	20		S6		BC=50/6"	6"								Rig chatter due to gravel and cobbles from 21 to 30 feet
0	25	- rock fragments, rock at tip of sampler	S7		BC=50/6"	6"								
-5	30	**Stadium Conglomerate (Tst):** **CONGLOMERATE**: brownish yellow (10YR 6/8), high gravel content based on rig action, rock (4") at tip of sampler	S8		BC=50/4"	3"								Rig chatter from 30 to 32 feet due to gravel and cobbles No advancement at 32 feet

The boring was terminated due to practical auger refusal (↑) at ~32 ft. and was backfilled with bentonite grout and patched with asphalt on February 25, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 7.7 ft. below ground surface during drilling.

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BORING LOG B-5

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FIGURE
C-7

PAGE: 1 of 1

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BORING LOG B-6

Date Begin - End: 2/22/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 26
Surface Condition: Asphalt

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: 4 inches thick												
25			**Alluvial Deposits (Qa):** **Lean CLAY (CL)**: medium to high plasticity, dark brown (10YR 3/3), moist	S1											Drill rig chatter due to cobbles at 2 feet
20	5					BC=11 7 8	NR								
∇			**Lean CLAY with Sand (CL)**: hard	S2		BC=8 10 13 PP=1.0 PP=4.0	12"	CL	19.6	108.9	100	65	31	15	**Direct Shear:** c'= 647 psf ϕ'= 33.4°
15	10		- wet, stiff below 10 feet	S3		BC=3 4 6 PP=1.5	18"								
			Clayey SAND with Gravel (SC): fine to coarse-grained sand, subangular gravel (<2"), dark yellowish brown (10YR 4/6), wet, very dense												Drill rig chatter due to cobbles from 13.5 to 26 feet
10	15			S4		BC=35 33 26	12"								
5	20		- increase in clay below 20 feet	S5		BC=12 15 37	14"								
			- becomes yellowish brown (10YR 5/6) below 23 feet												
0	25			S6		BC=50/6"	6"								No advancement at 26 feet due to rock
-5	30														

The boring was terminated because of practical auger refusal (↑) at approximately 26 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 22, 2016.

GROUNDWATER LEVEL INFORMATION:
∇ Groundwater was observed at approximately 7.4 ft. below ground surface during drilling.

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BORING LOG B-6

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FIGURE
C-8

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Date Begin - End: 2/23/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.

BORING LOG B-7

Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 28
Surface Condition: Asphalt

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
	0	■	**ASPHALT**: 5 inches thick												
		▨	**Alluvial Deposits (Qa):** **Clayey SAND (SC)**: fine-grained sand, very dark brown (10YR 2/2), moist	S1	☒										
25															
	5				■	BC=8 9 12	NR								
		▨	**Lean CLAY with Sand (CL)**: fine-grained sand, medium to high plasticity, very dark brown (10YR 2/2), moist, hard, rock at tip of sampler	S2	◩	BC=6 19 50/5" PP=4.5	10"								
20															
	10	▨	**Sandy Lean CLAY with Gravel (CL)**: fine-grained sand, subangular gravel (2"), medium to high plasticity, grayish brown (2.5Y 5/2), moist, very stiff, micaceous - possible rock at tip of sampler	S3	■	BC=11 50/2" PP=2.0	5"								Drill rig chatter from 10 to 15 feet
▽															
15															
	15				◩	BC=12 12 23	NR								
		▒	**Silty SAND with Gravel (SM)**: fine to coarse-grained sand, subangular gravel (<1.5"), light olive brown (2.5Y 5/6), wet, very dense, micaceous												Drill rig chatter due to gravel and cobbles from 17 to 27 feet
10															
	20			S4	◩	BC=33 31 16	9"								
5															
			- contains pockets of Clayey SAND (SC), light olive brown (2.5Y 5/4), micaceous below 23.5 feet												
	25			S5	◩	BC=50/4"	4"								
0															
	30														
-5															

The boring was terminated at approximately 27 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 23, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 11.5 ft. below ground surface during drilling.

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BORING LOG B-7

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FIGURE
C-9

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BORING LOG B-8

Date Begin - End: 2/24/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny
Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.
Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 30
Surface Condition: Asphalt

		FIELD EXPLORATION				LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
30	0	**ASPHALT**: 4 inches thick											
		Alluvial Deposits (Qa): **Lean CLAY (CL)**: fine to medium-grained sand, medium plasticity, dark yellowish brown (10YR 3/6), moist	S1										
25	5	**Clayey SAND (SC)**: fine to medium-grained sand, brown (10YR 5/3), moist, dense	S2	BC=6 10 13	12"	SC	15.8	111.9	100	49	34	18	**Direct Shear:** c'= 160 psf ϕ'= 43.4°
		Sandy Lean CLAY with Gravel (CL): fine to coarse-grained sand, medium to high plasticity, yellowish brown (10YR 5/6), moist, stiff											Drill rig chatter due to gravel and cobbles from 7 to 10 feet
▽ 20	10		S3	BC=5 12 10 PP=2.0	9"								
		Silty SAND with Gravel (SM): fine to coarse-grained sand, subangular gravel (1"), yellowish brown (10YR 5/4), wet, dense											
15	15		S4	BC=8 14 16	6"								Drill rig chatter due to gravel and cobbles from 15 to 20 feet
10	20	**Silty SAND (SM)**: fine-grained sand, light olive brown (2.5Y 5/4), wet, medium dense, micaceous											
			S5	BC=4 6 8	18"								
5	25	**Silty SAND with Gravel (SM)**: fine to coarse-grained sand, pockets of clay, light olive brown (2.5Y 5/4), wet, very dense	S6	BC=5 50/6"	8"								Hard drilling due to cobbles from 25 to 28.5 feet
				BC=50/0"	NR								No advancement at 28.5 feet
0	30	The boring was terminated because of practical auger refusal (↑) at approximately 28.5 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 24, 2016.											

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 9.7 ft. below ground surface during drilling.

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BORING LOG B-8

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FIGURE
C-10

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BORING LOG B-9

Date Begin - End: 2/23/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 36
Surface Condition: Asphalt

FIELD EXPLORATION								LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: 5 inches thick												
35			**Artificial Fill (af):** **Lean CLAY with Sand (CL)**: fine-grained sand, medium plasticity, dark brown (7.5YR 3/3), moist	S1	☒										
			Alluvial Deposits (Qa): **Sandy Lean CLAY (CL)**: fine to medium-grained sand, medium to high plasticity, dark yellowish brown (10YR 4/6), moist, hard												Drill rig chatter due to rock from 4 to 5 feet
30	5			S2	◣	BC=12 7 10 PP=4.0	18"								
			Clayey SAND with Gravel (SC): fine to medium-grained sand, subangular gravel (<2"), brown (7.5YR 4/4), moist, very dense												Drill rig chatter from 8 to 10 feet
25	10		- rock fragment at tip of sampler	S3	▮	BC=39 50/6"	8"	SC	10.3	100.9	73	24	34	19	
			Silty SAND (SM): fine to medium-grained sand, subangular gravel (<1"), strong brown (7.5YR 4/6), moist, dense, presence of rock fragments												
20	15			S4	◣	BC=15 14 9	12"								
			Clayey SAND with Gravel (SC): fine to coarse-grained sand, subangular gravel (1/2"), strong brown (7.5YR 4/6), moist, very dense, rock at bottom of sampler and in sample												
15	20			S5	▮	BC=50/5"	5"								Drill rig chatter from 20 to 25 feet due to cobbles
▽															
10	25		**Clayey SAND (SC)**: fine-grained sand, light olive brown (2.5Y 5/6, wet, medium dense, micaceous	S6	◣	BC=4 4 8	18"								
			Sandy SILT (ML): fine-grained sand, low plasticity, gray (2.5Y 6/1), wet, stiff, micaceous, mottled with iron oxide stains												
5	30				▮	BC=21 13 14	NR								
			Stadium Conglomerate (Tst): **CONGLOMERATE**: fine-grained sand, medium plasticity, dark gray (2.5Y 4/1), wet, stiff, micaceous, high gravel and cobble content based on rig action	S7A S7B	◣	BC=4 4 22 PP=1.5 PP=1.0	18"								Drill rig chatter from 32 to 40 feet due to cobbles

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BORING LOG B-9

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FIGURE
C-11

PAGE: 1 of 2

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BORING LOG B-9

Date Begin - End: 2/23/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny
Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.
Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 36
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
0			**Stadium Conglomerate (Tst):** **CONGLOMERATE**: fine-grained sand, medium plasticity, dark gray (2.5Y 4/1), wet, stiff, micaceous, high gravel and cobble content based on rig action												
	40					BC=50/2"	NR								Sampler bouncing on cobble
-5															
	45														
-10															
	50														
-15															
	55														
-20															
	60														
-25															
	65														
-30															

The boring was terminated at approximately 40.2 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 23, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 22.5 ft. below ground surface during drilling.

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BORING LOG B-9

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FIGURE
C-11

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BORING LOG B-10

Date Begin - End: 2/22/2016 - 2/23/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny
Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.
Hammer Type - Drop: 140 lb. Auto - 30 in.

FIELD EXPLORATION								LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 36 Surface Condition: Asphalt Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		■	**ASPHALT**: 4 inches thick												
35		▨	**<u>Alluvial Deposits (Qa):</u>** **Lean CLAY with Sand (CL) to Sandy Lean CLAY (CL)**: low to medium plasticity, dark yellowish brown (10YR 4/4), moist	S1	☒										Cobble at 0.5 feet **pH=** 8.9 **Resistivity=** 770 ohm-cm **Sulfates=** 180 ppm **Chlorides=** 60 ppm **R-Value=** 10 **Expansion Index=** 44
30	5	▨	- fine to medium-grained sand, medium plasticity, dark brown (10YR 3/3), traces of manganese oxide stains below 5 feet	S2	■	BC=11 12 14 PP=4.5	18"	CL			100	52	34	19	**Direct Shear:** c'= 1243 psf ϕ'= 35.2°
		▨	**Clayey SAND (SC)**: fine to medium-grained sand, dark yellowish brown (10YR 4/6), moist, very dense												
25	10	▨	- rock fragments at tip of sampler	S3	◣	BC=20 41 28	9"								
		▨	**Clayey SAND with Gravel (SC)**: fine to coarse-grained sand, brown (7.5YR 4/4), moist, very dense, micaceous, rock fragments												Drill rig chatter due to cobbles and gravel from 13 to 15 feet
20	15	▨		S4	■	BC=32 50/6"	8"								Drill rig chatter due to gravel from 16 to 20 feet
	∇ ▼	▨													
15	20	▨	**Silty SAND with Gravel (SM)**: fine to coarse-grained sand, subangular gravel (<1.5"), yellowish brown (10YR 5/6), wet, very dense	S5	◣	BC=13 14 29	9"								Drill rig chatter from 21 to 24 feet
10	25	▨			◣	BC=50/6"	NR								Sampler bouncing, probably due to cobbles
		▨	**Well-graded SAND with Silt (SW-SM)**: fine to coarse-grained sand, dark grayish brown (10YR 4/2), wet, very dense, micaceous												
5	30	▨		S6	◣	BC=14 20 24	18"	CL	15.7	112.9					

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BORING LOG B-10

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San Diego, California

FIGURE
C-12

Date Begin - End: 2/22/2016 - 2/23/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 36
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
0			**Silty SAND (SM)**: fine to coarse-grained sand, grayish brown (10YR 5/2), wet, very dense	S7A S7B	◣	BC=15 16 50/4"	16"								No advancement at 37 feet
		↑	**Stadium Conglomerate (Tst):** **CONGLOMERATE**: fine to coarse-grained sand, subangular gravel (1"), yellowish brown (10YR 5/6), wet, rock fragments in sampler												
	40														
-5			The boring was terminated because of practical auger refusal (↑) at approximately 37 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 23, 2016.												
	45														
-10															
	50														
-15															
	55														
-20															
	60														
-25															
	65														
-30															

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 17.6 ft. below ground surface during drilling.
▼ Groundwater was observed at approximately 18.9 ft. below ground surface at the end of drilling.

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BORING LOG B-10

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FIGURE
C-12

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Date Begin - End: 2/19/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

BORING LOG B-11

Approximate Ground Surface Elevation (ft.): 28
Surface Condition: Asphalt

FIELD EXPLORATION								LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: 4 inches thick												
25			**Slope Wash Deposits (Qsw):** **Lean CLAY with Sand (CL)**: fine to medium-grained sand, medium plasticity, brown (7.5YR 4/4), moist	S1											Drill rig chatter due to cobbles at 1 foot
	5					BC=10 13 17	NR								Drill rig chatter due to cobbles at 5 feet
20			**Silty SAND (SM)**: fine to medium-grained sand, dark brown (7.5YR 3/4), moist, medium dense, micaceous	S2		BC=7 7 6	15"								
∇	10		- fine to coarse-grained sand, cobbles (3"), brown (7.5YR 4/4), wet below 10 feet	S3		BC=10 7 9	12"								
15			- increase in coarse-grained sand content, subrounded to subangular gravel (2") below 11.5 feet	S4		BC=4 5 5	14"								
	15		**Poorly graded SAND with Gravel (SP)**: medium-grained sand, brownish yellow (10YR 6/6), wet, dense	S5		BC=10 15 16		SP	20.1	106.5	100	4.5	NP	NP	Drill rig chatter due to cobbles and gravel from 15 to 26 feet
			Well-graded SAND with Gravel (SW): fine to coarse-grained subangular sand, yellowish brown (10YR 5/6), wet, dense	S6											
10			**Clayey SAND with Gravel (SC)**: fine to medium-grained sand, yellowish brown (10YR 5/6), wet, very dense, rock fragments (1.5") described as gravel												
	20			S7		BC=50/6"	4"								
5			- subrounded gravel (1") below 22 feet	S8		BC=50/5"	5"								
	25		- medium dense below 25 feet	S9A		BC=22 8 8	9"								
			SILT (ML): low plasticity, olive yellow (2.5Y 6/8) with very dark grayish brown (2.5Y 3/2), wet, very stiff, high angle fractures	S9B		PP=4.5									
0			**Stadium Conglomerate (Tst):** **CONGLOMERATE**: high gravel and cobble content based on rig action												Hard drilling due to cobbles and gravel from 27 to 35 feet
	30		- attempted sample, sampler bouncing on rock												Rock at 30 feet
-5															

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BORING LOG B-11

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FIGURE
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Date Begin - End: 2/19/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny
Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.
Hammer Type - Drop: 140 lb. Auto - 30 in.

BORING LOG B-11

Approximate Ground Surface Elevation (ft.): 28
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
-10			**Stadium Conglomerate (Tst):** **CONGLOMERATE**: high gravel and cobble content based on rig action - attempted sample, sampler bouncing on rock												Drill rig chatter from 35 to 40 feet
	40		- light olive brown (2.5Y 5/4), moist, Matrix: Clayey SAND, fine-grained sand below 40 feet	S10	◣	BC=50/3"	3"								
-15			- olive yellow (2.5Y 6/8), very dense, fine to medium-grained sand, micaceous, iron oxide stains below 41.5 feet			BC=30 50/3"									

45

The boring was terminated at approximately 43.8 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 19, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 10 ft. below ground surface during drilling.

-20
50
-25
55
-30
60
-35
65
-40

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BORING LOG B-11

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FIGURE
C-13

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BORING LOG B-12

Date Begin - End: 2/19/2016 - 2/22/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny
Drilling Company: Pacific Drilling
Drill Crew: Gordy & Raymond
Drilling Equipment: UNIMOG MARL 5
Drilling Method: Hollow Stem Auger
Exploration Diameter: 7 in. O.D.
Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 30
Surface Condition: Asphalt

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			ASPHALT: 4 inches thick												
			Alluvial Deposits (Qa): **Lean CLAY with Sand (CL) to Clayey SAND (SC)**: fine to medium-grained sand, medium plasticity, dark brown (7.5YR 3/3), moist	S1	☒										**pH=** 8.5 **Resistivity=** 830 ohm-cm **Sulfates=** 530 ppm **Chlorides=** 50 ppm **R-Value=** 15 **Expansion Index=** 5
25	5		- subangular gravel (<0.5"), very stiff below 5 feet	S2	■	BC=14 24 27 PP=4.5	18"	SC	8.0	119.6		30	34	19	
			Lean CLAY (CL): fine to medium-grained sand, dark brown (7.5YR 3/2), moist, very stiff												
20	10			S3	◣	BC=4 6 9 PP=2.5 PP=3.5	18"								
	▽ ▽														
			Clayey SAND (SC): fine-grained sand, dark brown (7.5YR 3/3), wet, micaceous												
15	15			S4	■	BC=8 8 11		SC	17.9	110.4	95	34	30	12	
10	20		**Well-graded SAND with Silt and Gravel (SW-SM)**: fine to coarse-grained sand, brownish yellow (10YR 6/6), wet, very dense, possible rock at tip of sampler	S5	◣	BC=5 12 50/4"	12"								Rig chatter due to cobbles and gravel from 22 to 30 feet
5	25														
0	30		- rock fragments at 30 feet	S6	◣	BC=50/5"	4"								

The boring was terminated at approximately 30.4 ft. below ground surface. The boring was backfilled with bentonite grout and patched with asphalt on February 22, 2016.

GROUNDWATER LEVEL INFORMATION:
▽ Groundwater was observed at approximately 12.2 ft. below ground surface during drilling.
▽ Groundwater was observed at approximately 11.7 ft. below ground surface during drilling.

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BORING LOG B-12

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FIGURE
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Date Begin - End: 2/17/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company:
Drill Crew:
Drilling Equipment: Shovel
Drilling Method: Hand Auger
Exploration Diameter: 9 in. O.D.

BORING LOG HA-1

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 23 Surface Condition: Grass Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			GRASS / TOPSOIL: 4 inches thick												
			Alluvial Deposits (Qa): **Clayey SAND (SC)**: fine to medium-grained sand, very dark grayish brown (10YR 3/2), moist, micaceous	S1	☒										**R-Value=** 27 Combined with Sample HA-2 S1 @ 0.5'-2'

The hand exploration was terminated at approximately 2 ft. below ground surface. The hand exploration was backfilled with soil cuttings on February 17, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

Approximate Elevation (feet)	Depth (feet)
20	
	5
15	
	10
10	

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BORING LOG HA-1

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FIGURE
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Date Begin - End: 2/17/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company:
Drill Crew:
Drilling Equipment: Shovel
Drilling Method: Hand Auger
Exploration Diameter: 9 in. O.D.

BORING LOG HA-2

Approximate Ground Surface Elevation (ft.): 24
Surface Condition: Grass

		FIELD EXPLORATION						LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			GRASS / TOPSOIL: 5 inches thick												
		▨	**Alluvial Deposits (Qa):** **Clayey SAND (SC)**: fine to medium-grained sand, very dark grayish brown (10YR 3/2), micaceous	S1	☒										**R-Value=** 27 Combined with Sample HA-1 S1 @ 0.5'-2'
20															
	5														
15															
	10														
10															

The hand exploration was terminated at approximately 2 ft. below ground surface. The hand exploration was backfilled with soil cuttings on February 17, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

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BORING LOG HA-2

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FIGURE
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BORING LOG HA-3

Date Begin - End: 2/17/2016
Logged By: S. Tena
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny

Drilling Company:
Drill Crew:
Drilling Equipment: Shovel
Drilling Method: Hand Auger
Exploration Diameter: 9 in. O.D.

Approximate Ground Surface Elevation (ft.): 27
Surface Condition: Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			GRASS / TOPSOIL: 5 inches thick												
			Alluvial Deposits (Qa): **Clayey SAND (SC)**: fine to medium-grained sand, dark grayish brown (2.5Y 4/2), micaceous	S1	☒										**R-Value=** 27 Combined with Sample HA-4 S1 @ 0.5'-2'
25															
	5														
20															
	10														
15															

The hand exploration was terminated at approximately 2 ft. below ground surface. The hand exploration was backfilled with soil cuttings on February 17, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

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BORING LOG HA-3

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FIGURE
C-17

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Date Begin - End:	2/17/2016	**Drilling Company:**		**BORING LOG HA-4**
Logged By:	S. Tena	**Drill Crew:**		
Hor.-Vert. Datum:	MSL	**Drilling Equipment:**	Shovel	
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger	
Weather:	Sunny	**Exploration Diameter:**	9 in. O.D.	

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 28 Surface Condition: Grass Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			GRASS / TOPSOIL: 5 inches thick												
			Alluvial Deposits (Qa): **Clayey SAND (SC)**: fine to medium-grained sand, dark olive brown (2.5Y 3/3), micaceous	S1	☒										**R-Value=** 27 Combined with Sample HA-3 S1 @ 0.5'-2'
25															
	5														
20															
	10														
15															

The hand exploration was terminated at approximately 2 ft. below ground surface. The hand exploration was backfilled with soil cuttings on February 17, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

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BORING LOG LD-1

Date Begin - End:	3/03/2016	**Drilling Company:**	Western
Logged By:	S. Rugg	**Drill Crew:**	Kirk & Bob
Hor.-Vert. Datum:	MSL	**Drilling Equipment:**	Watson 2500
Plunge:	-90 degrees	**Drilling Method:**	Auger
Weather:	Fog	**Exploration Diameter:**	24 in. O.D.

Approximate Ground Surface Elevation (ft.): 70
Surface Condition: Concrete

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	LABORATORY RESULTS USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			CONCRETE: 3 inches thick												
			Stadium Conglomerate (Tst): **CONGLOMERATE**: medium-grained sand, well-graded to poorly-graded gravel and cobbles up to 11", with clay and sand (GW-GC to GP-GC), olive yellow (2.5Y 6/6), moist, very dense												
65	5		- 14" boulder at 5 feet	S1	☒										
			- fines are mostly silt with some clay, brownish yellow (10YR 6/6) below 6 feet												
			- 13" boulder at 9 feet												
60	10			S2	☒										
				S3	☒			GP-GC	7.2		35	7.5			**pH=** 9.1 **Resistivity=** 1400 ohm-cm **Sulfates=** 74 ppm **Chlorides=** 21 ppm **R-Value=** 20 **Expansion Index=** 22
			- 15" boulder at 14 feet												
55	15			S4	☒										
50	20														
45	25														
40	30														

The boring was terminated at approximately 15.5 ft. below ground surface. The boring was backfilled with interval layers of bentonite to surface on March 03, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20163965 DRAWN BY: MAP CHECKED BY: SHR & MA DATE: 3/25/2016 REVISED: -	BORING LOG LD-1 Legacy International Center San Diego, California	FIGURE C-19 PAGE: 1 of 1

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Date Begin - End: 2/16/2016
Logged By: S. Rugg
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny, warm

Drilling Company: Pacific Drilling
Drill Crew: Dave & Salvador
Drilling Equipment: Earth Drill Bucket Rig
Drilling Method: Rotary Bucket Auger
Exploration Diameter: 24 in. O.D.

BORING LOG LD-2

Approximate Ground Surface Elevation (ft.): 49
Surface Condition: Asphalt

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			FIELD EXPLORATION					LABORATORY RESULTS							
			ASPHALT: 3 inches thick												
			AGGREGATE BASE: 5 inches thick	S1	☒										
45	5		**Artificial Fill (af):** **Silty SAND with Gravel (SM)**: fine to coarse-grained sand, fine to coarse-grained gravel, cobble up to 12", well-rounded cobble=10%, yellowish brown (10YR 5/6), moist												
40	10		**Clayey SAND with Gravel (SC)**: fine to medium-grained sand, fine to coarse-grained gravel, well-rounded cobble up to 8", medium plasticity, yellowish brown (10YR 5/6), moist - 15" boulder at 7 feet - roots at 8 feet												Difficult drilling on boulder at 9 feet
			Sandy SILT with Gravel (ML) to Clayey SAND (SC): fine-grained sand, fine to medium-grained gravel, medium plasticity, very dark grayish brown (10YR 3/2), moist	S2	☒			SC	8.0		84	44	32	16	
35	15		**Alluvial Deposits (Qa):** **Sandy SILT (ML)**: fine-grained sand, fine-grained gravel, low plasticity, brown (10YR 4/3), moist, contains roots - carbonate at 16 feet	S3	☒										
30	20		**Clayey SAND with Gravel (SC)**: fine to medium-grained sand, fine to coarse-grained gravel, cobble up to 11", medium plasticity, dark yellowish brown (10YR 4/4), moist	S4	☒			SC	4.1		68	20	30	16	Boulder at 20.5 feet, estimated +18", very difficult drilling from 20.5 to 27.5 feet
25	25		- cobble size decreases, up to 4" below 22.5 feet	S5	☒										
			- cobble up to 6", olive yellow (2.5Y 4/4) below 26.5 feet	S6	☒										
20	30		- cobble up to 8", yellow (2.5Y 7/8) below 29 feet - fine to coarse-grained sand, cobble up to 4", dark brown (10YR 3/3) below 29.5 feet	S7	☒										
15			**Sandy Lean CLAY with Gravel (CL)**: fine to medium-grained sand, fine to coarse-grained gravel, cobble up to 8", medium plasticity, yellowish brown (10YR 5/4), wet	S8	☒										

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BORING LOG LD-2

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FIGURE
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Date Begin - End:	2/16/2016	**Drilling Company:**	Pacific Drilling
Logged By:	S. Rugg	**Drill Crew:**	Dave & Salvador
Hor.-Vert. Datum:	MSL	**Drilling Equipment:**	Earth Drill Bucket Rig
Plunge:	-90 degrees	**Drilling Method:**	Rotary Bucket Auger
Weather:	Sunny, warm	**Exploration Diameter:**	24 in. O.D.

BORING LOG LD-2

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 49 Surface Condition: Asphalt Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
⊻		○ ○ ○	**Stadium Conglomerate (Tst):** **CONGLOMERATE**: fine to medium-grained sand, fine to coarse-grained gravel, cobble up to 8", medium plasticity, light olive brown (2.5Y 5/4), wet												13 inch boulder at 36 feet
10	40														
5	45														
0	50														
-5	55														
-10	60														
-15	65														
-20															

The boring was terminated at approximately 38 ft. below ground surface. The boring was backfilled with interval layers of bentonite to surface on February 16, 2016.

GROUNDWATER LEVEL INFORMATION:

⊻ Groundwater was observed at approximately 37 ft. below ground surface during drilling.

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BORING LOG LD-2

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FIGURE

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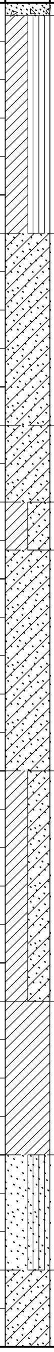
BORING LOG LD-3

Date Begin - End: 2/22/2016 - 3/02/2016
Logged By: S. Rugg
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny, fog
Drilling Company: Pacific Drilling / Western
Drill Crew: Dave & Salvador / Kirk & Bob
Drilling Equipment: Earth Drill Bucket Rig / Watson 2500
Drilling Method: Rotary Bucket Auger / Auger
Exploration Diameter: 24 in. O.D.



Approximate Ground Surface Elevation (ft.): 70
Surface Condition: Concrete

		FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		CONCRETE PAVEMENT with #7 Rebar: 4 inches thick												
		Artificial Fill (af): **Silty CLAY with Sand (CL-ML)**: fine to medium-grained sand, fine to coarse-grained gravel, medium plasticity, olive brown (2.5Y 4/3), moist	S1	☒										
65	5	- some cobble up to 8" and concrete debris at 5 feet												
		Clayey SAND with Gravel (SC) to Clayey GRAVEL with Sand (GC): fine to medium-grained sand, fine to coarse-grained gravel, cobble up to 8", medium plasticity, dark yellowish brown (10YR 3/4), moist	S2	☒										**pH=** 8.3 **Resistivity=** 520 ohm-cm **Sulfates=** 750 ppm **Chlorides=** 200 ppm
60	10	- yellowish brown (10YR 5/4) below 10 feet	S3	☒			GC	4.1		37	12			
		Clayey SAND (SC): fine to medium-grained sand, fine to coarse-grained gravel, medium plasticity, yellowish brown (10YR 5/4), moist												
		Sandy Lean CLAY with Gravel (CL) to Clayey SAND with Gravel (SC): fine to coarse-grained sand, fine to medium-grained gravel, medium plasticity, greenish black (10Y 2.5/1), moist, concrete debris at 13 feet	S4	☒			SC	10.5		75	39	36	20	
55	15	**Clayey SAND with Gravel (SC)**: fine to coarse-grained sand, fine to coarse-grained gravel, medium plasticity, dark greenish gray (10Y 3/1), moist, few wood debris - abundant carbonate at 17 feet - light olive brown (2.5Y 5/4) below 17 feet - 12" boulder, rootlets, brick debris at 19 feet												
50	20	**Sandy Lean CLAY with Gravel (CL) to Clayey SAND with Gravel (SC)**: fine-grained sand, cobble up to 8", medium plasticity, dark yellowish brown (10YR 4/4), moist	S5	☒			SC	11.7		73	43			Boring terminated at 20 feet. Rig broke down. Hole backfilled with loose cuttings. Remobilized to site on 3/2/2016 and drilled out previous backfill from Bucket Rig attempt on 2/22/2016 with Watson 2500 rig and completed hole.
45	25													
		Alluvial Deposits (Qa): **Sandy Lean CLAY with Gravel (CL)**: yellowish brown (10YR 5/6)	S6	☒										
40	30	**Poorly graded SAND with Silt and Gravel (SP-SM) to Well-Graded GRAVEL with Silt and Sand (GW-GM)**: medium-grained sand, cobbles up to 5", medium plasticity, brownish yellow (10YR 6/8), moist	S7	☒			GW-GM	3.3		34	5.8			Heavy drill rig chatter from 30 to 39 feet due to nested cobbles

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FIGURE
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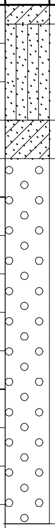
BORING LOG LD-3

Date Begin - End: 2/22/2016 - 3/02/2016
Logged By: S. Rugg
Hor.-Vert. Datum: MSL
Plunge: -90 degrees
Weather: Sunny, fog

Drilling Company: Pacific Drilling / Western
Drill Crew: Dave & Salvador / Kirk & Bob
Drilling Equipment: Earth Drill Bucket Rig / Watson 2500
Drilling Method: Rotary Bucket Auger / Auger
Exploration Diameter: 24 in. O.D.



			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Approximate Ground Surface Elevation (ft.): 70 Surface Condition: Concrete Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Clayey SAND with Gravel (SC): medium-grained sand, cobbles up to 8", medium plasticity, dark yellowish brown (10YR 4/6), moist	S8	☒										
			Silty SAND with Gravel (SM): medium-grained sand, cobbles up to 6", one 12" boulder, yellowish brown (10YR 5/6)												
30	40		**Clayey SAND with Gravel (SC)**: medium-grained sand, cobble up to 8", dark yellowish brown (10YR 4/6)												
∇			**Stadium Conglomerate (Tst):** **CONGLOMERATE**: medium-grained sand, cobble up to 4", well-graded sand, gravel and cobble, brownish yellow (10YR 6/6) - medium-grained sand, gravel up to 3", strong brown (7.5YR 5/8), wet below 43 feet - cobble up to 5", yellow (10YR 7/6) below 44.5 feet	S9	☒			SW-SM	16.4		90	9.2			Perched groundwater from 43 to 44.5 feet
25	45			S10	☒										
															Hole collapsing at 48.5 feet
20	50														
15	55														
10	60														
5	65														

The boring was terminated at approximately 48.5 ft. below ground surface. The boring was backfilled with interval layers of bentonite to surface on March 02, 2016.

GROUNDWATER LEVEL INFORMATION:
∇ Perched groundwater was observed at approximately 43 ft. below ground surface during drilling.

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BORING LOG LD-3

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FIGURE
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BORING LOG LD-4

Date Begin - End:	3/02/2016	**Drilling Company:**	Western
Logged By:	S. Rugg	**Drill Crew:**	Kirk & Bob
Hor.-Vert. Datum:	MSL	**Drilling Equipment:**	Watson 2500
Plunge:	-90 degrees	**Drilling Method:**	Auger
Weather:	Sunny	**Exploration Diameter:**	24 in. O.D.

Approximate Ground Surface Elevation (ft.): 70
Surface Condition: Concrete

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		CONCRETE PAVEMENT: 3 inches thick												
		Artificial Fill (af): **Clayey SAND with Gravel (SC)**: fine to medium-grained sand, cobble up to 7", one boulder at 13", medium plasticity, light olive brown (2.5Y 5/6), moist												
65	5		S1	☒										**pH=** 8.9 **Resistivity=** 560 ohm-cm **Sulfates=** 170 ppm **Chlorides=** 290 ppm
		Alluvial Deposits (Qa): **Clayey SAND with Gravel (SC)**: fine to medium-grained sand, cobble up to 8", medium plasticity, dark yellowish brown (10YR 4/6), moist												
60	10		S2	☒			SC	4.3		54	22			
		Stadium Conglomerate (Tst): **CONGLOMERATE**: fine to medium-grained sand, cobble up to 6", some clay, medium plasticity, dark brown (10YR 3/3), moist - cobble up to 10", dark yellowish brown (10YR 4/4) and poorly-graded SAND below 13.5 feet	S3	☒			SP-SC	3.5		54	12			
55	15	- cobble up to 6", one boulder at 13", well-graded gravel and cobble, brownish yellow (10YR 5/6) below 16.5 feet	S4	☒										
50	20	- cobble up to 6", strong brown (7.5YR 5/8) below 20 feet	S5	☒										
		- yellowish brown (10YR 5/8) below 23 feet - 15" boulder at 24 feet - brownish yellow (10YR 6/6) below 24 feet - 6" silty sandstone lense, light gray (10YR 7/1) at 25 feet												
45	25		S6	☒										
40	30													

The boring was terminated at approximately 26 ft. below ground surface. The boring was backfilled with interval layers of bentonite to surface on March 02, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

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BORING LOG LD-4

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FIGURE
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APPENDIX D
CONE PENETRATION TESTS

APPENDIX D
CONE PENETRATION TESTS

Cone penetrometer test (CPT) soundings were advanced by Gregg In-situ, Inc. personnel on February 11, 2016 through February 12, 2016 at ten locations under the supervision of a Kleinfelder engineer. The CPTs extended to depths of approximately 11 to 40 feet. The CPTs utilized a 25-ton truck capacity electronic cone with a tip area of 15 cm^2 and a 225 cm^2 sleeve area. The CPT soundings consisted of pushing the conical tipped rod into the soil at a constant rate of two centimeters per second. Resistance along the shaft of the rod, as well as resistance on the conical tip, was measured continuously.

Each CPT location was backfilled with hydrated bentonite chips and finished flush with the surrounding surface grade with asphalt patch or soil. The graphical data plots for each location are presented in this Appendix.

Soil descriptions on the CPT sounding are inferred based on correlations to CPT measurements. Direct observations of soil conditions encountered are not made with the CPT, and it is not always possible to clearly identify the soil type solely based on the CPT measurements. Where CPT interpretations were required for our analyses, Kleinfelder reviewed the results of the CPT sounding against our laboratory and test boreholes. Inference of the soil classifications from the CPT soundings by other parties should be made with caution, and should be cross checked with soil borehole data and available corresponding laboratory test data.

Cone Penetration Testing Procedure (CPT)

Gregg Drilling carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*.

The cone takes measurements of tip resistance (q_c), sleeve resistance (f_s), and penetration pore water pressure (u_2). Measurements are taken at either 2.5 or 5 cm intervals during penetration to provide a nearly continuous profile. CPT data reduction and basic interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored electronically for further analysis and reference. All CPT soundings are performed in accordance with revised ASTM standards (D 5778-12).

The 5mm thick porous plastic filter element is located directly behind the cone tip in the u_2 location. A new saturated filter element is used on each sounding to measure both penetration pore pressures as well as measurements during a dissipation test (*PPDT*). Prior to each test, the filter element is fully saturated with oil under vacuum pressure to improve accuracy.

When the sounding is completed, the test hole is backfilled according to client specifications. If grouting is used, the procedure generally consists of pushing a hollow tremie pipe with a "knock out" plug to the termination depth of the CPT hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

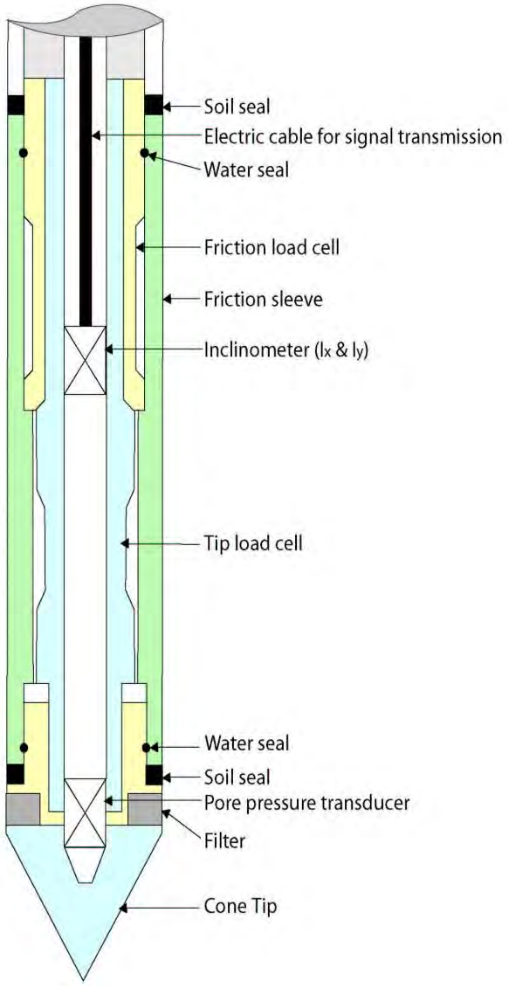


Figure CPT

Gregg 15cm^2 Standard Cone Specifications

Dimensions	
Cone base area	15 cm^2
Sleeve surface area	225 cm^2
Cone net area ratio	0.80
Specifications	
Cone load cell	
Full scale range	180 kN (20 tons)
Overload capacity	150%
Full scale tip stress	120 MPa (1,200 tsf)
Repeatability	120 kPa (1.2 tsf)
Sleeve load cell	
Full scale range	31 kN (3.5 tons)
Overload capacity	150%
Full scale sleeve stress	1,400 kPa (15 tsf)
Repeatability	1.4 kPa (0.015 tsf)
Pore pressure transducer	
Full scale range	7,000 kPa (1,000 psi)
Overload capacity	150%
Repeatability	7 kPa (1 psi)

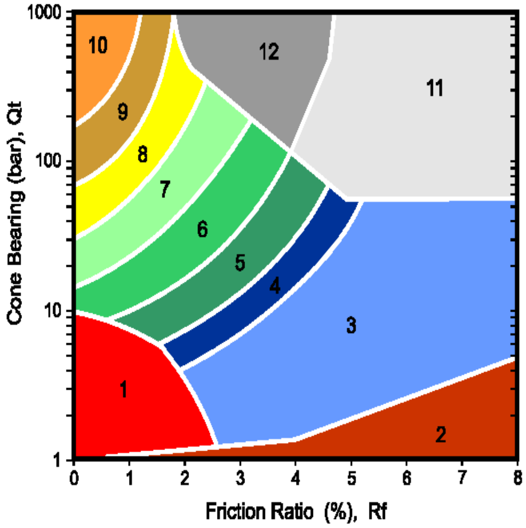
Note: The repeatability during field use will depend somewhat on ground conditions, abrasion, maintenance and zero load stability.

Cone Penetration Test Data & Interpretation

The Cone Penetration Test (CPT) data collected are presented in graphical and electronic form in the report. The plots include interpreted Soil Behavior Type (SBT) based on the charts described by Robertson (1990). Typical plots display SBT based on the non-normalized charts of Robertson et al (1986). For CPT soundings deeper than 30m, we recommend the use of the normalized charts of Robertson (1990) which can be displayed as SBTn, upon request. The report also includes spreadsheet output of computer calculations of basic interpretation in terms of SBT and SBTn and various geotechnical parameters using current published correlations based on the comprehensive review by Lunne, Robertson and Powell (1997), as well as recent updates by Professor Robertson (Guide to Cone Penetration Testing, 2015). The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg Drilling & Testing Inc. does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software. Some interpretation methods require input of the groundwater level to calculate vertical effective stress. An estimate of the in-situ groundwater level has been made based on field observations and/or CPT results, but should be verified by the user.

A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Note that it is not always possible to clearly identify a soil type based solely on q_t, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the correct soil behavior type.



ZONE		SBT
1		🟥 Sensitive, fine grained
2		🟫 Organic materials
3		🟦 Clay
4		🟦 Silty clay to clay
5		🟩 Clayey silt to silty clay
6		🟩 Sandy silt to clayey silt
7		🟨 Silty sand to sandy silt
8		🟨 Sand to silty sand
9		🟫 Sand
10		🟧 Gravely sand to sand
11		⬜ Very stiff fine grained*
12		⬛ Sand to clayey sand*

*over consolidated or cemented

Figure SBT (After Robertson et al., 1986) – Note: Colors may vary slightly compared to plots

Cone Penetration Test (CPT) Interpretation

Gregg uses a proprietary CPT interpretation and plotting software. The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1 Units for display (Imperial or metric) (atm. pressure, p_a = 0.96 tsf or 0.1 MPa)
2 Depth interval to average results (ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3 Elevation of ground surface (ft or m)
4 Depth to water table, z_w (ft or m) – input required
5 Net area ratio for cone, a (default to 0.80)
6 Relative Density constant, C_{Dr} (default to 350)
7 Young's modulus number for sands, α (default to 5)
8 Small strain shear modulus number
    a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
    b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9 Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10 Over Consolidation ratio number, k_{ocr} (default to 0.3)
11 Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1 Depth, z, (m) – CPT data is collected in meters
2 Depth (ft)
3 Cone resistance, q_c (tsf or MPa)
4 Sleeve resistance, f_s (tsf or MPa)
5 Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6 Other – any additional data
7 Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1-a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \sigma z$
12	In-situ pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1} = (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with I_c)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT (Lunne et al., 1997 and table below)

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT (Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n Lunne et al. (1997)

4 SBT_n Index, I_c $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, n = 0.5 (clean sand)
When $I_c > 3.30$, n = 1.0 (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} based on Normalized SBT_n (Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft Lunne et al. (1997)

$$\frac{(q_t/p_a)}{N_{60}} = 8.5\left(1-\frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft $(N_1)_{60} = N_{60}\,C_{N,}$
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, ϕ', (degrees) $\tan\phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right)+0.29\right]$

Only SBT_n 5, 6, 7 & 8 *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s $E_s = \alpha\,q_t$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go
a. $G_o = S_G\,(q_t\ \sigma'_{vo}\ pa)^{1/3}$ *For SBT_n 5, 6, 7*
b. $G_o = C_G\,q_t$ *For SBT_n 1, 2, 3& 4*
Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR $OCR = k_{ocr}\,Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

The following updated and simplified SBT descriptions have been used in the software:

SBT Zones		**SBT$_n$ Zones**	
1	sensitive fine grained	1	sensitive fine grained
2	organic soil	2	organic soil
3	clay	3	clay
4	clay & silty clay	4	clay & silty clay
5	clay & silty clay		
6	sandy silt & clayey silt		

7	silty sand & sandy silt	5	silty sand & sandy silt
8	sand & silty sand	6	sand & silty sand
9	sand		
10	sand	7	sand
11	very dense/stiff soil*	8	very dense/stiff soil*
12	very dense/stiff soil*	9	very dense/stiff soil*

*heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print ‘clays & silty clays’)

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	3x 10^{-8}	1x 10^{-8}
2	3x 10^{-7}	1x 10^{-7}
3	1x 10^{-9}	3x 10^{-10}
4	3x 10^{-8}	1x 10^{-8}
5	3x 10^{-6}	1x 10^{-6}
6	3x 10^{-4}	1x 10^{-4}
7	3x 10^{-2}	1x 10^{-2}
8	3x 10^{-6}	1x 10^{-6}
9	1x 10^{-8}	3x 10^{-9}

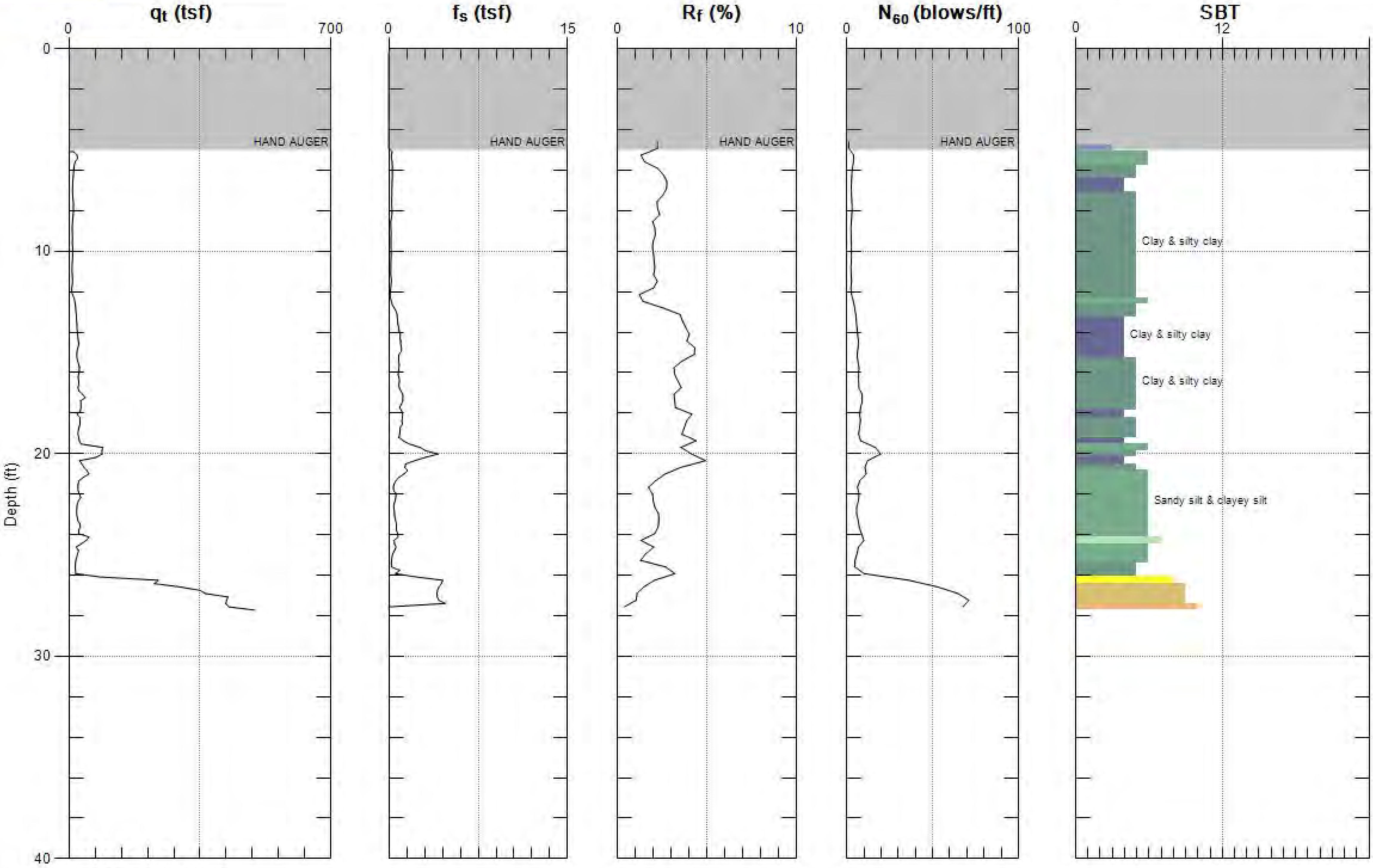
Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-1

Engineer: T.GRINDSTAFF
Date: 2/11/2016 03:13



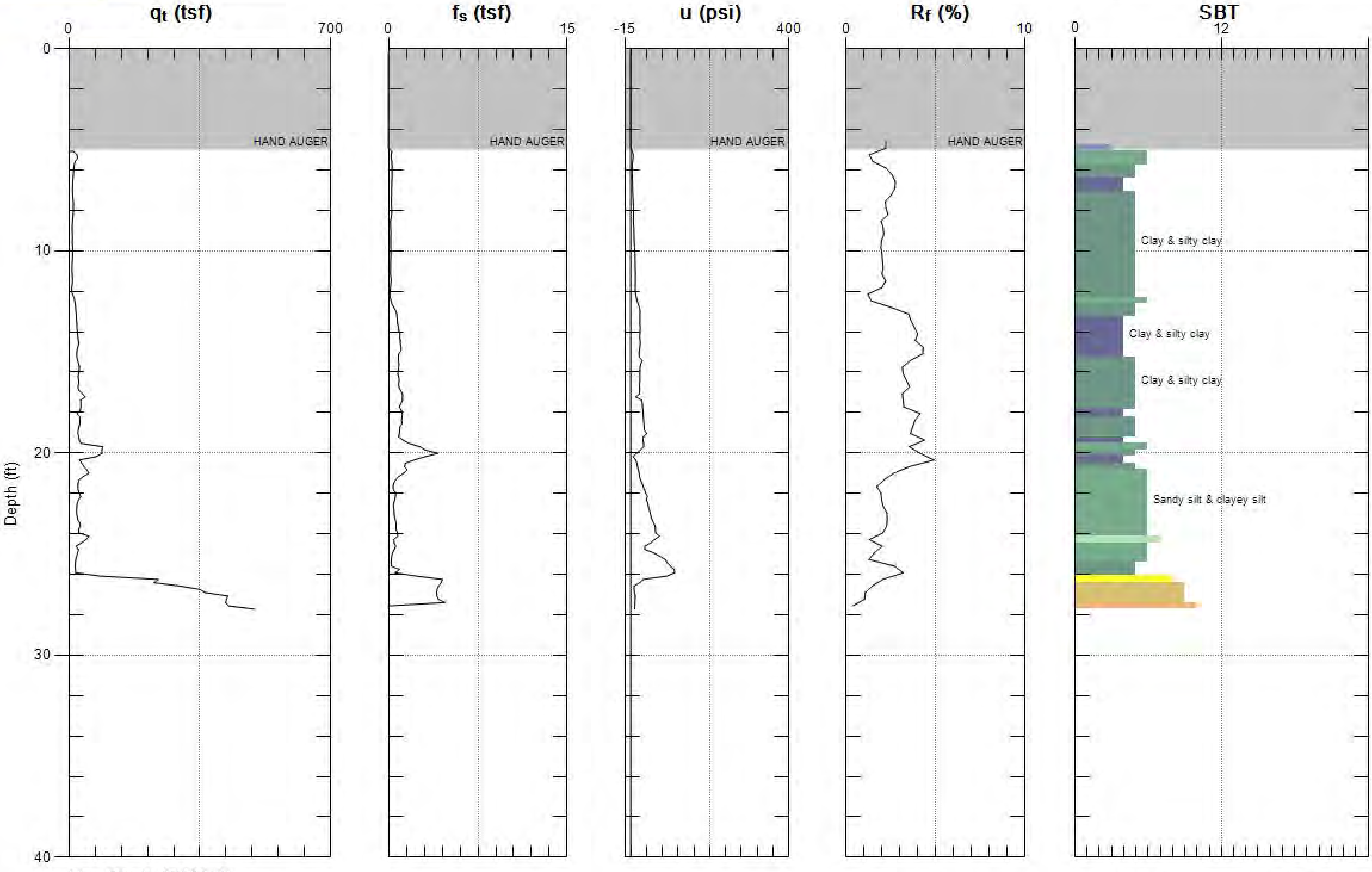
Max. Depth: 27.723 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

KLEINFELDER

Site: LEGACY INTL. CNTR.
Sounding: CPT-1

Engineer: T.GRINDSTAFF
Date: 2/11/2016 03:13



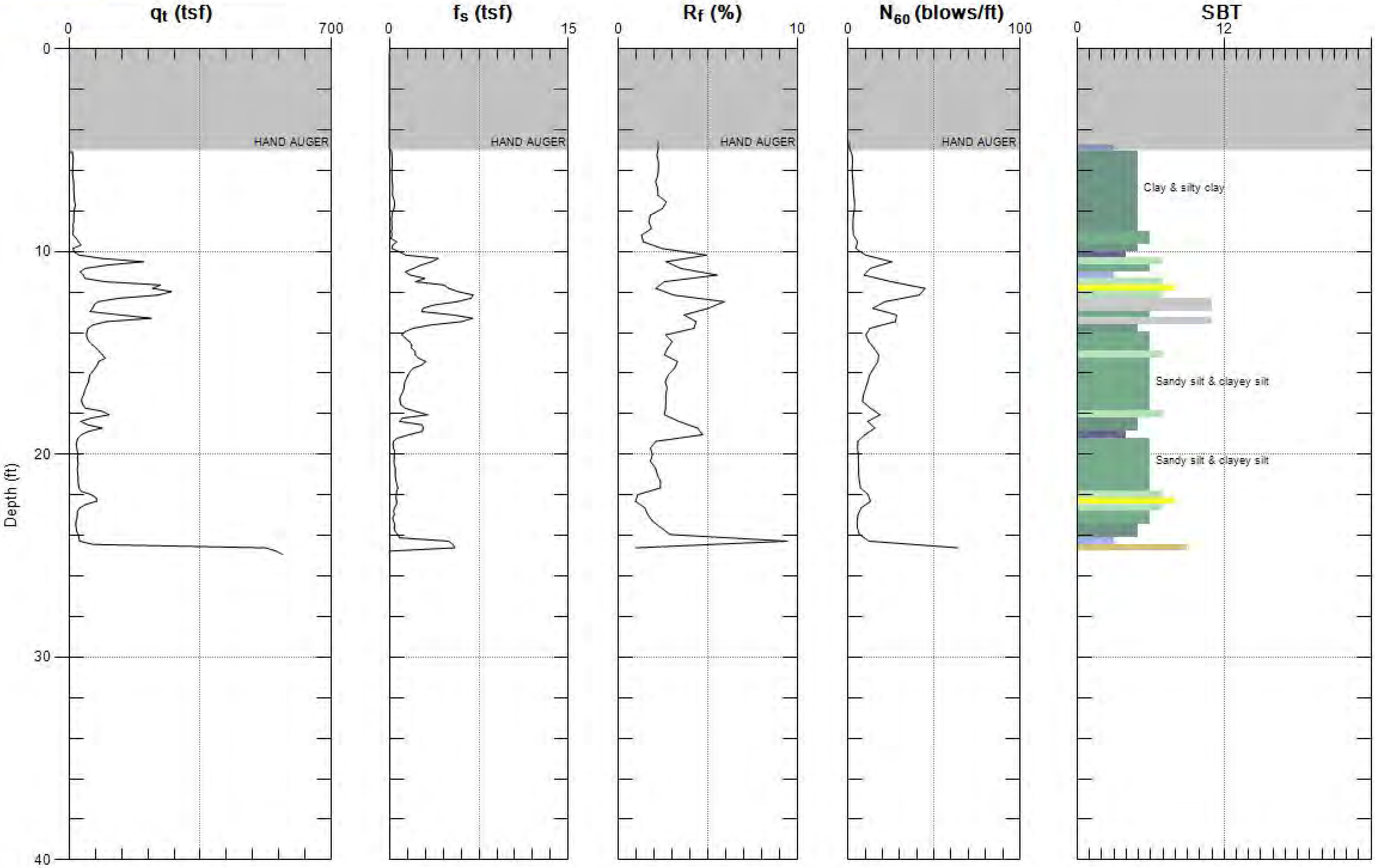
Max. Depth: 27.723 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-2

Engineer: T.GRINDSTAFF
Date: 2/11/2016 02:10



Max. Depth: 24.934 (ft)
Avg. Interval: 0.328 (ft)

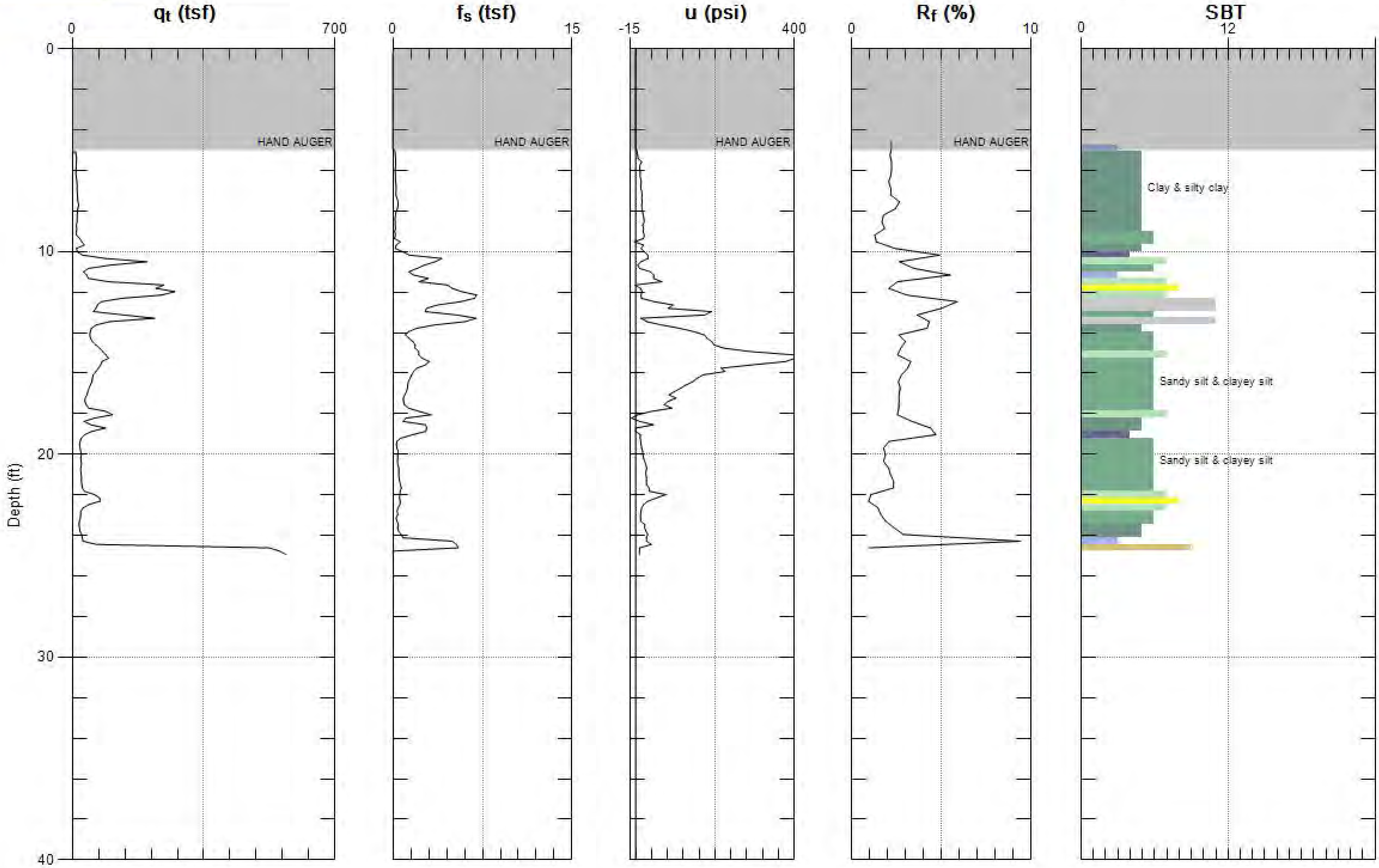
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: LEGACY INTL. CNTR.
Sounding: CPT-2

Engineer: T.GRINDSTAFF
Date: 2/11/2016 02:10



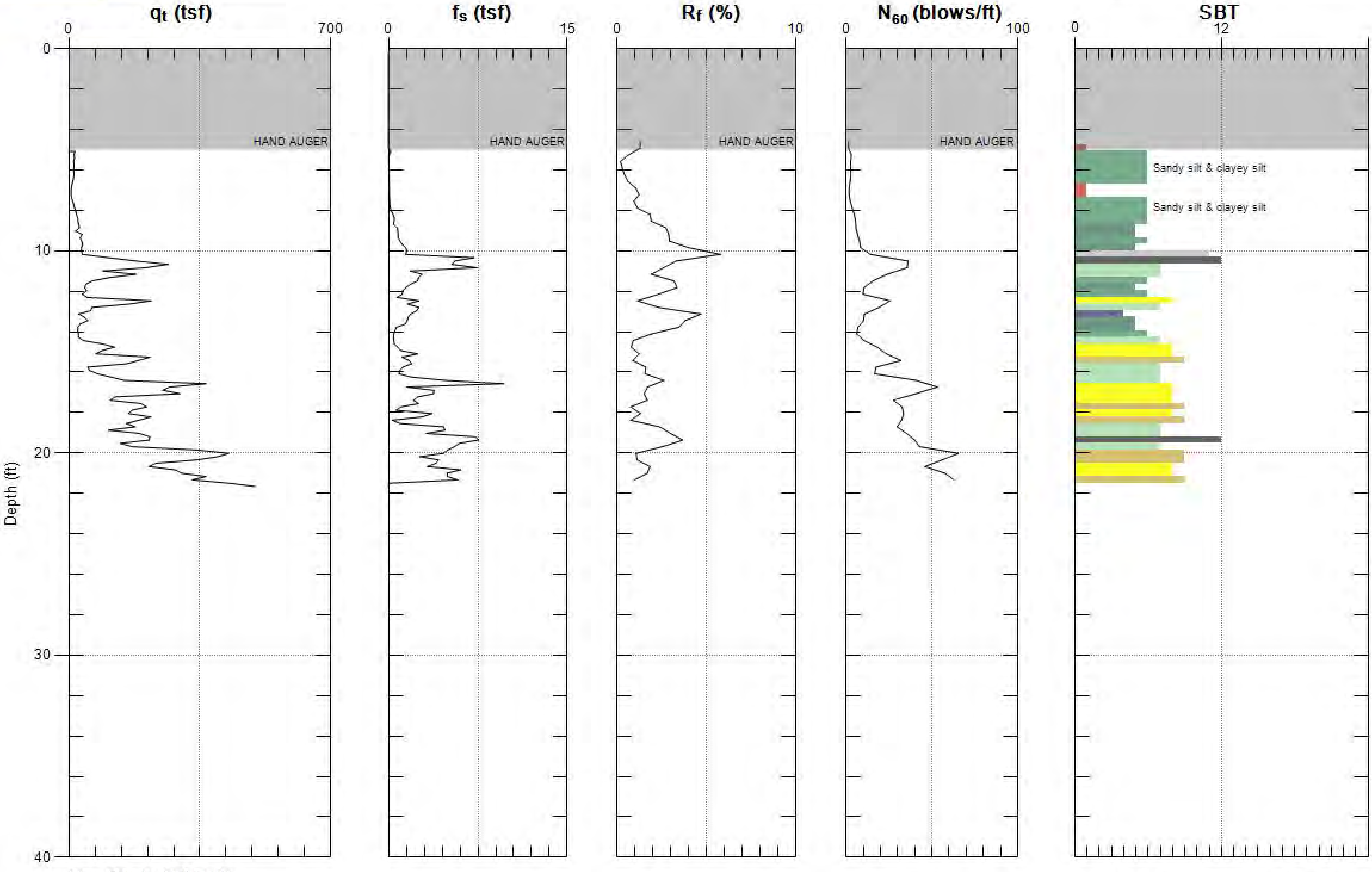
Max. Depth: 24.934 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-3a

Engineer: T.GRINDSTAFF
Date: 2/12/2016 10:42



Max. Depth: 21.654 (ft)
Avg. Interval: 0.328 (ft)

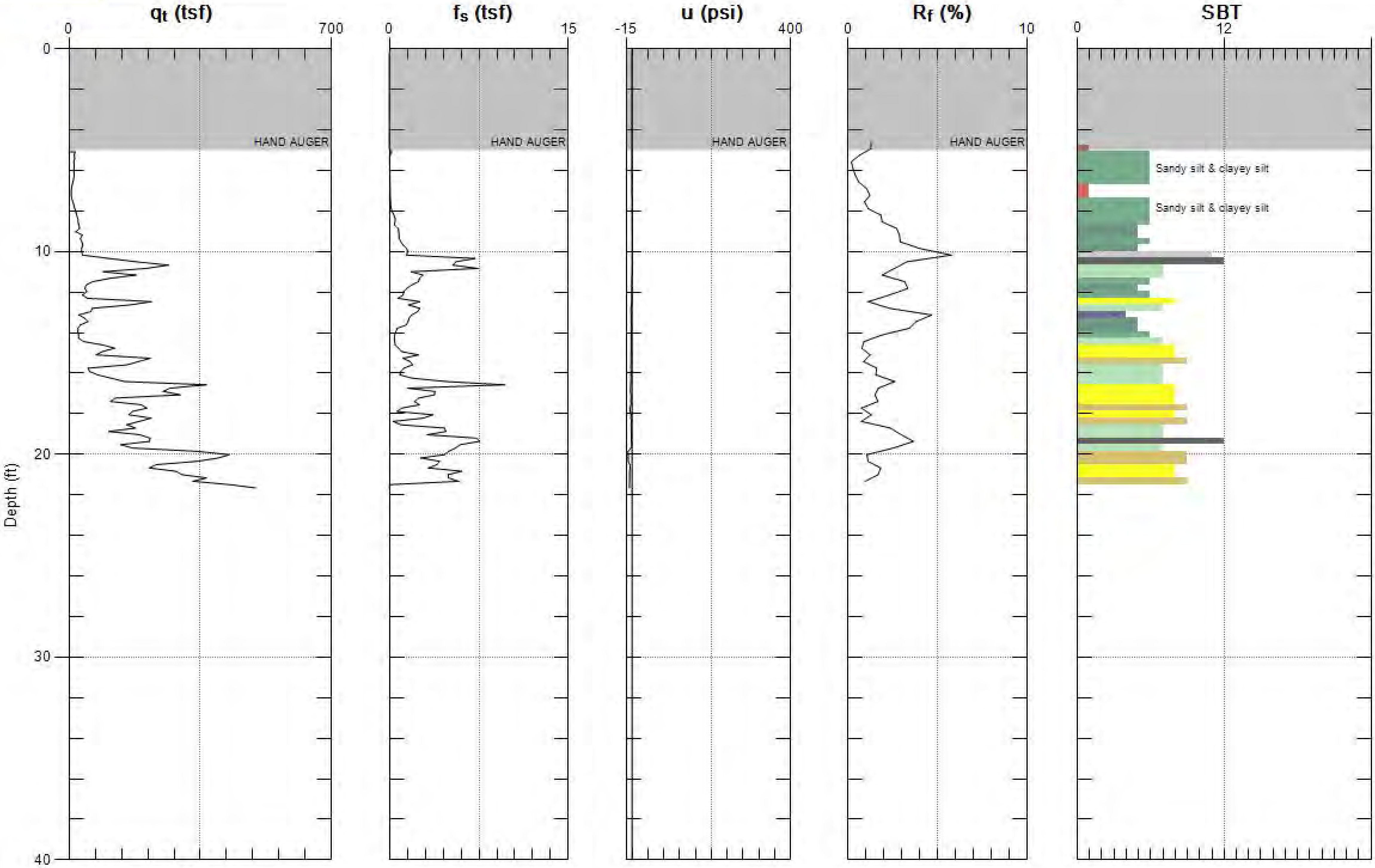
SBT: Soil Behavior Type (Robertson 1990)

Site: LEGACY INTL. CNTR.

Sounding: CPT-3a

Engineer: T.GRINDSTAFF

Date: 2/12/2016 10:42



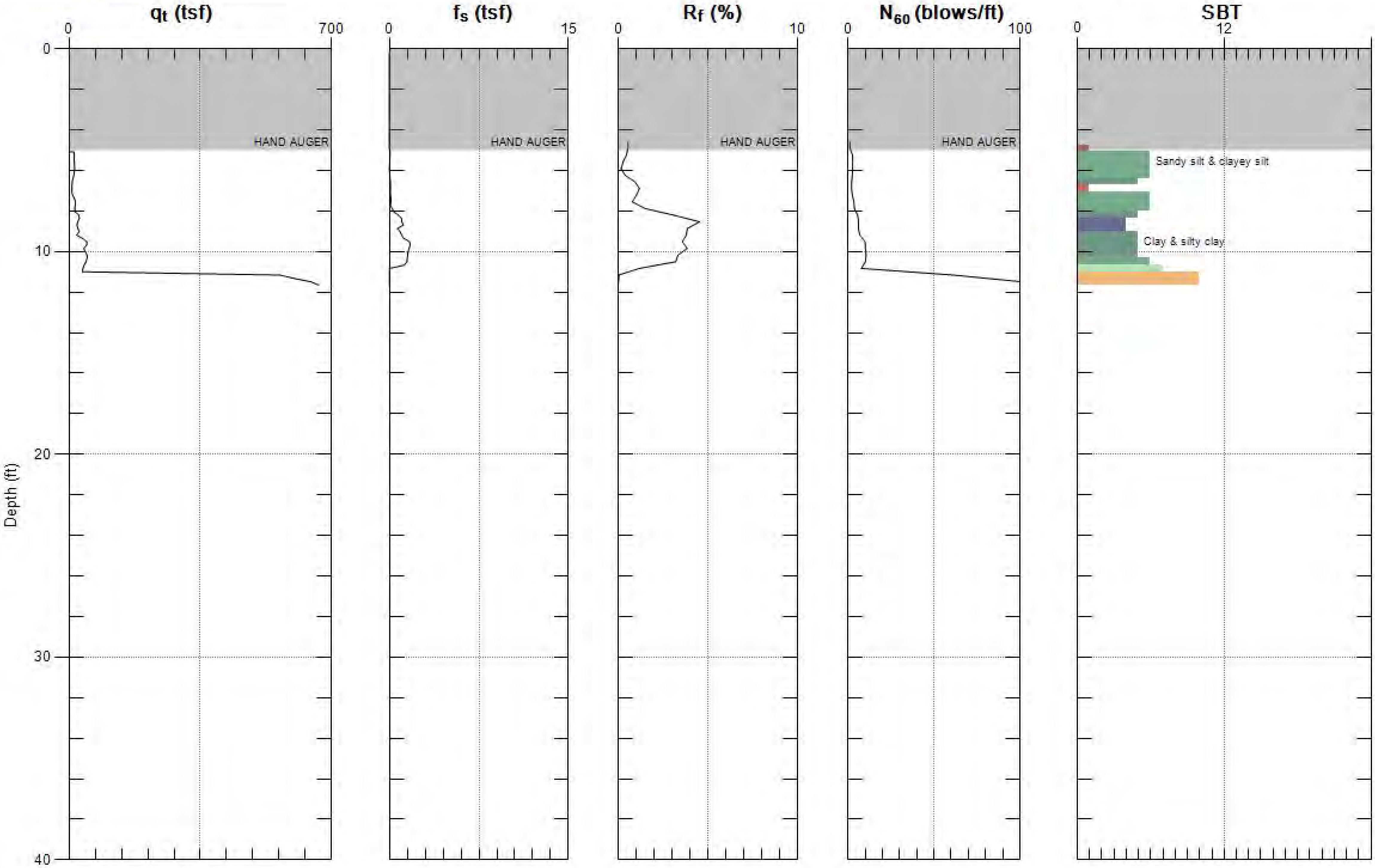
Max. Depth: 21.654 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-3

Engineer: T.GRINDSTAFF
Date: 2/12/2016 10:12



Max. Depth: 11.647 (ft)
Avg. Interval: 0.328 (ft)

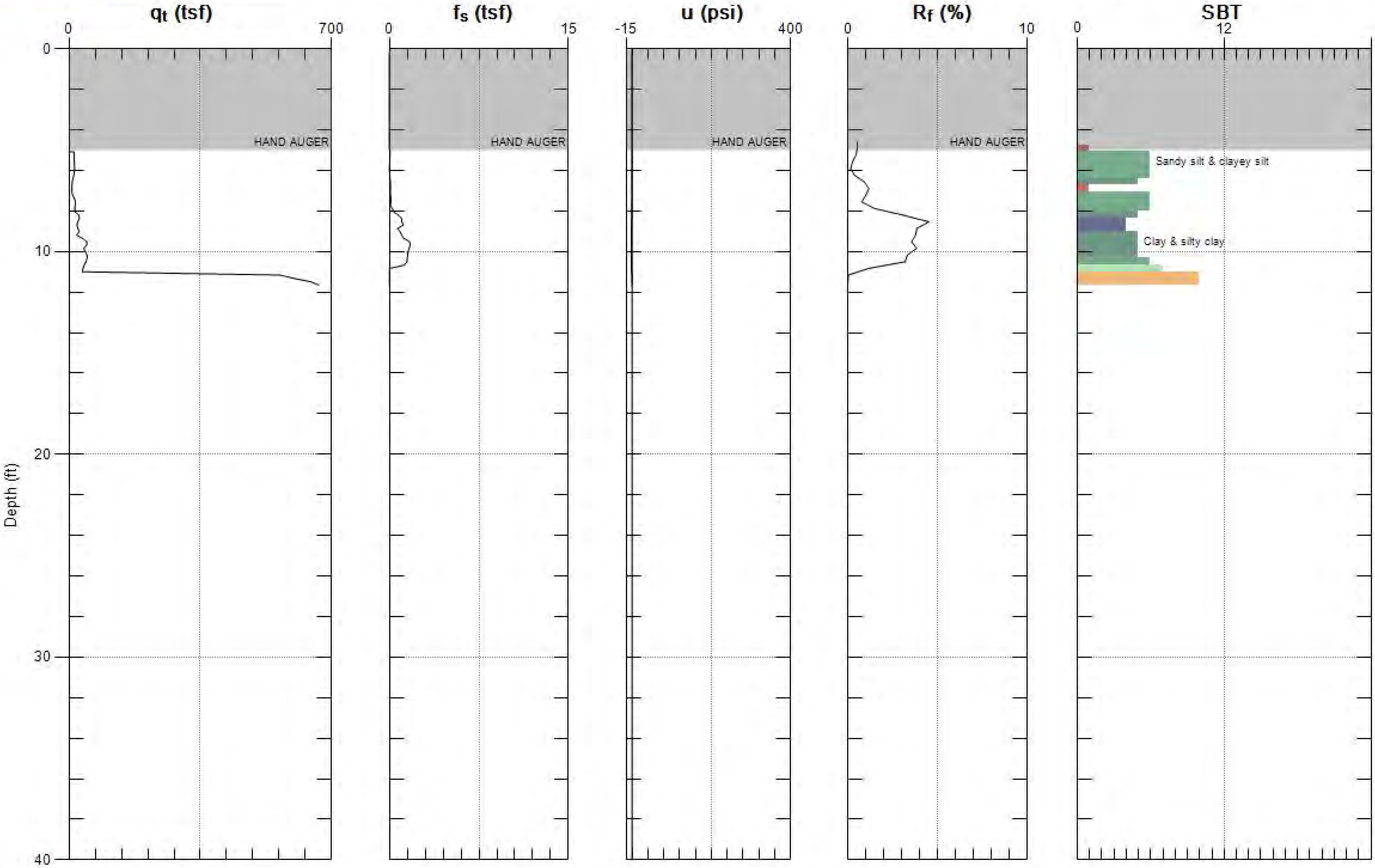
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: LEGACY INTL. CNTR.
Sounding: CPT-3

Engineer: T.GRINDSTAFF
Date: 2/12/2016 10:12



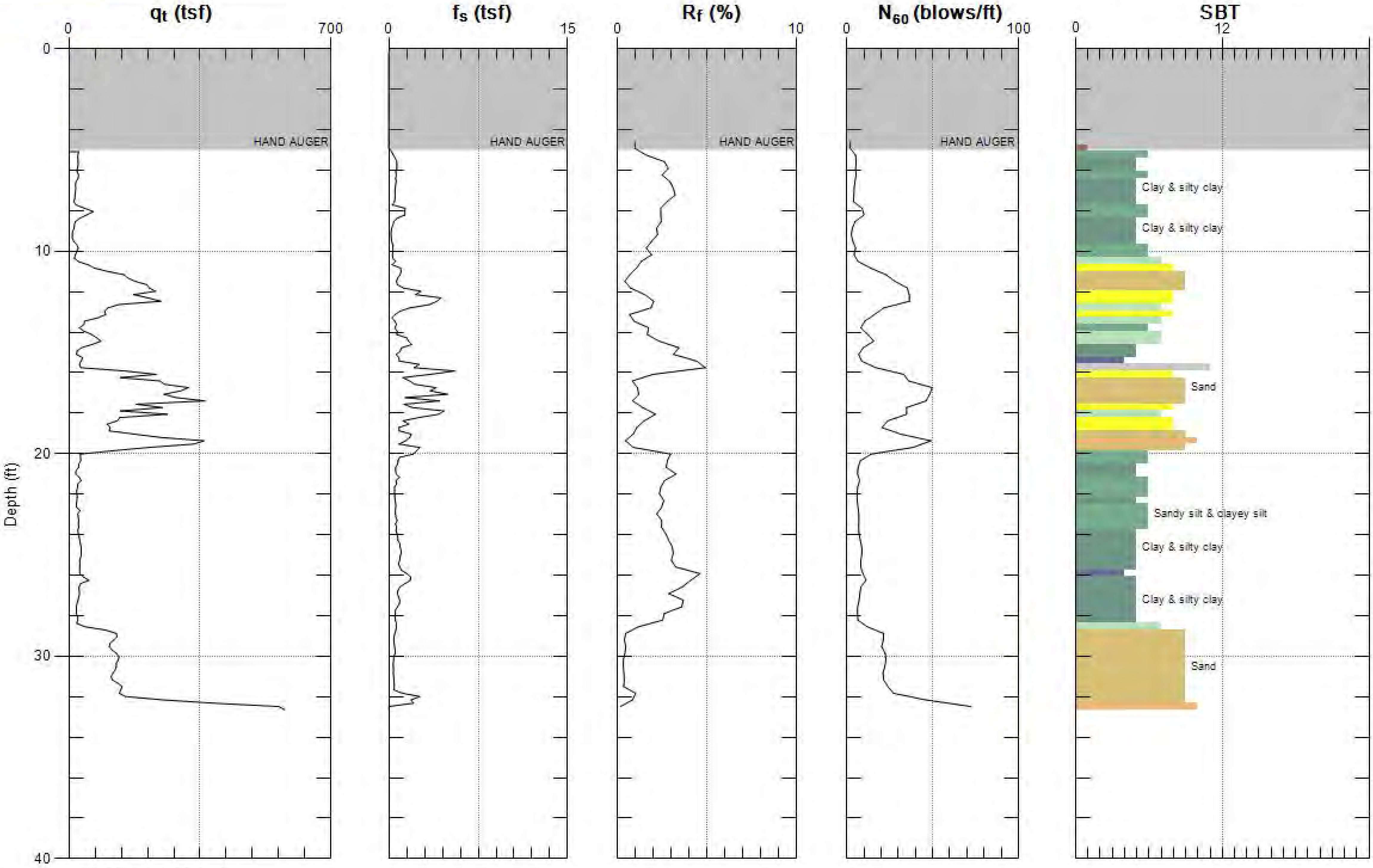
Max. Depth: 11.647 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-4a

Engineer: T.GRINDSTAFF
Date: 2/12/2016 08:15



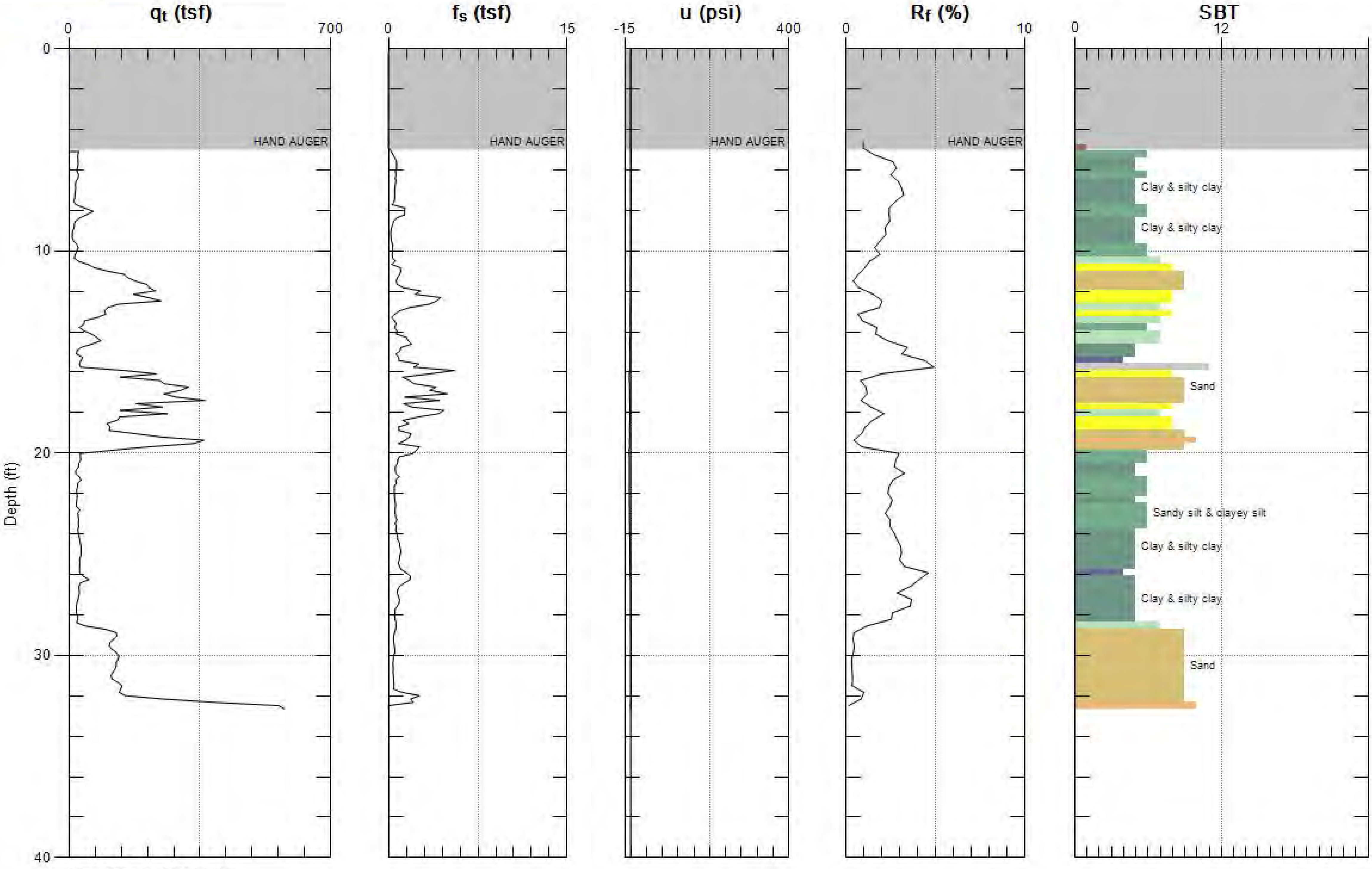
Max. Depth: 32.644 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

KLEINFELDER

Site: LEGACY INTL. CNTR.
Sounding: CPT-4a

Engineer: T.GRINDSTAFF
Date: 2/12/2016 08:15



Max. Depth: 32.644 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

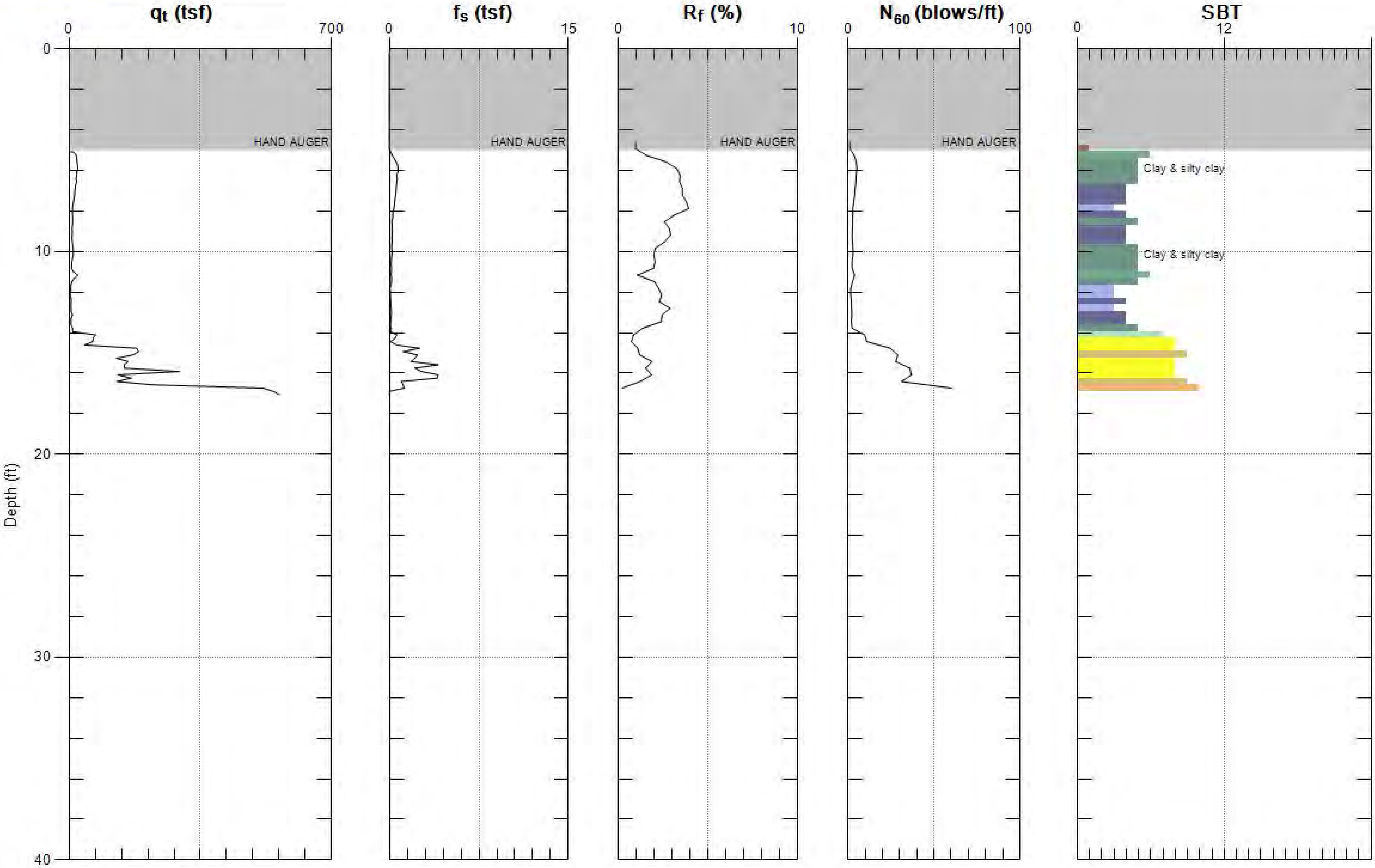
GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.

Engineer: T.GRINDSTAFF

Sounding: CPT-4

Date: 2/12/2016 07:43



Max. Depth: 17.060 (ft)
Avg. Interval: 0.328 (ft)

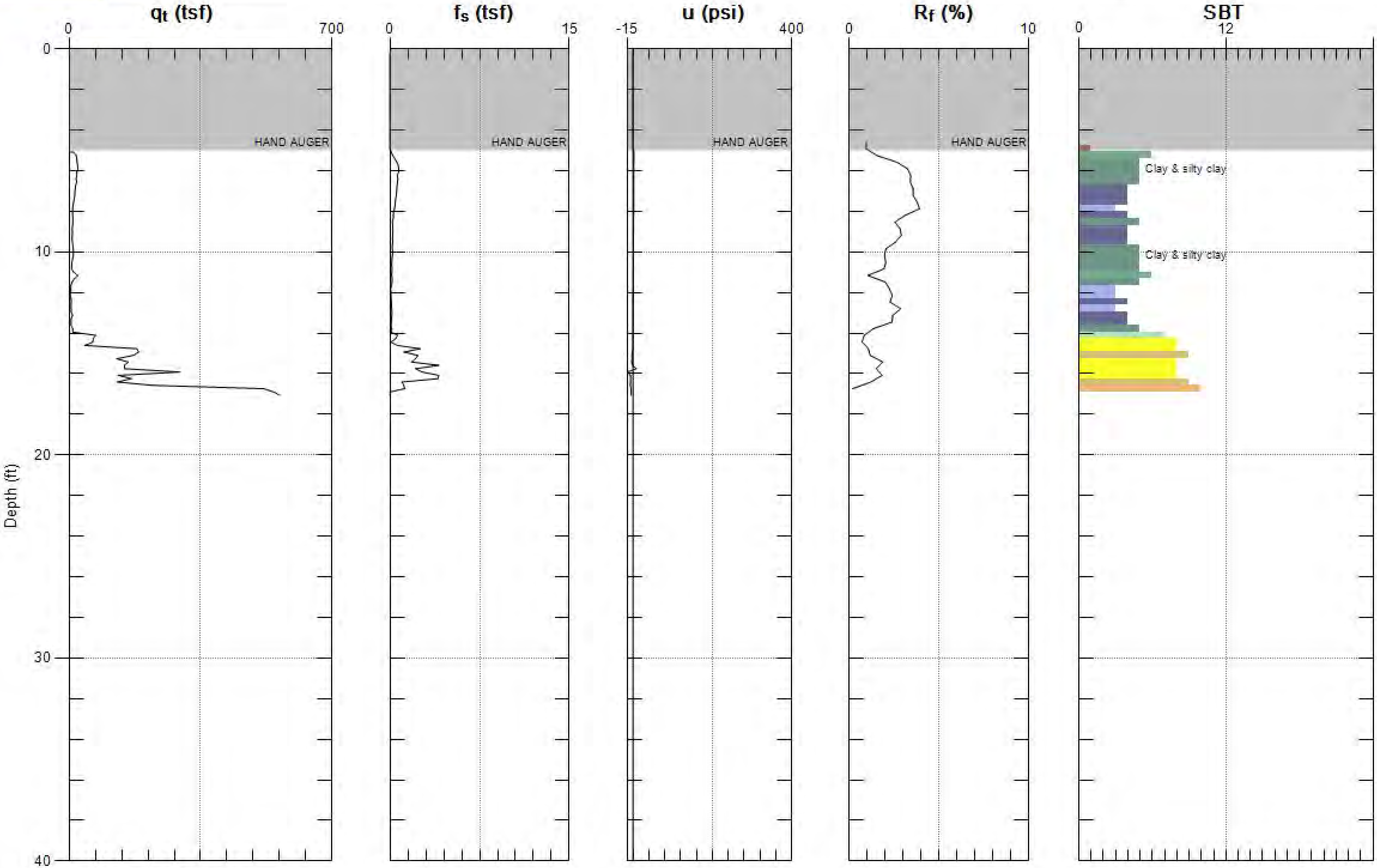
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: LEGACY INTL. CNTR.
Sounding: CPT-4

Engineer: T.GRINDSTAFF
Date: 2/12/2016 07:43



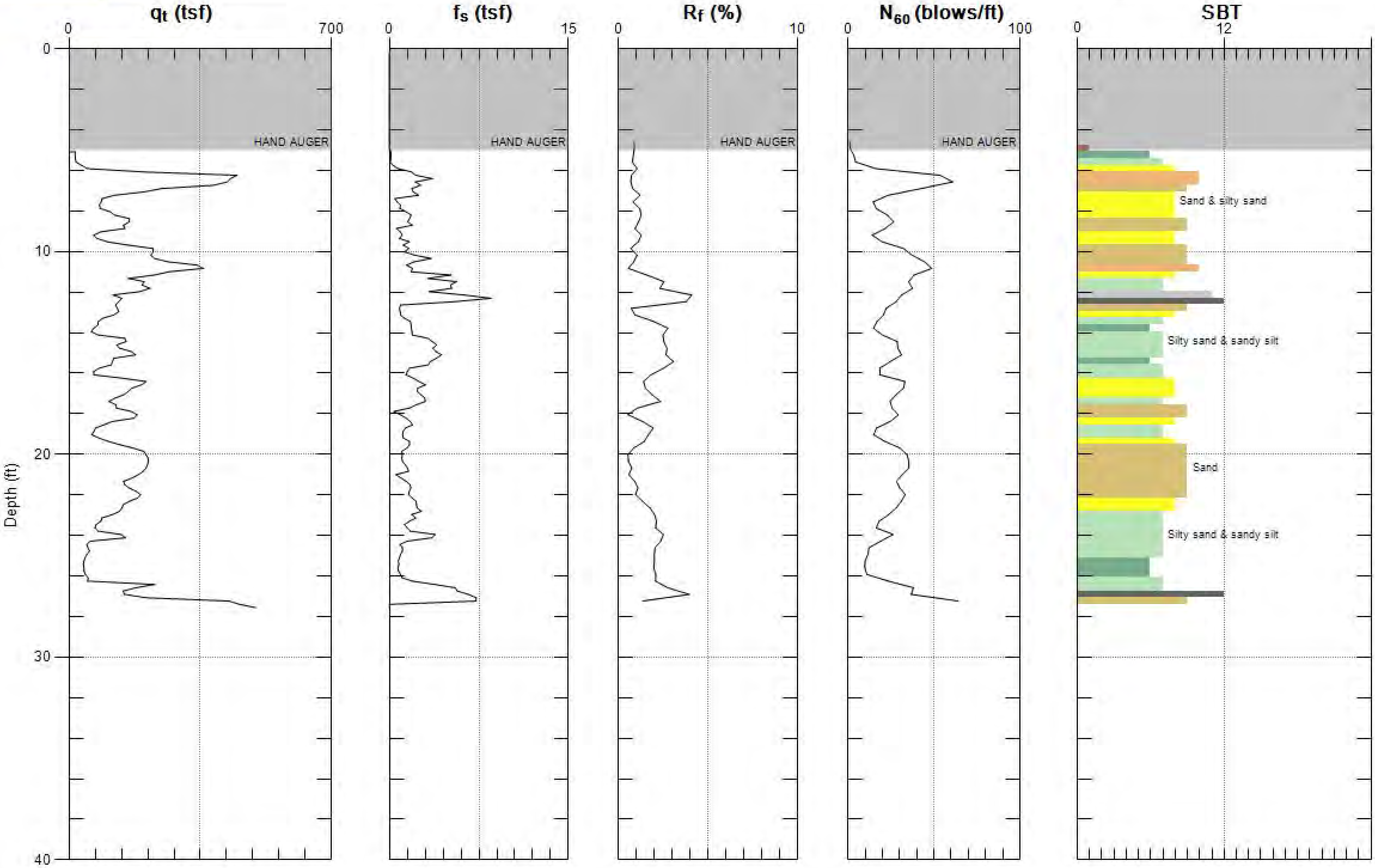
Max. Depth: 17.060 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-5

Engineer: T.GRINDSTAFF
Date: 2/12/2016 09:25



Max. Depth: 27.559 (ft)
Avg. Interval: 0.328 (ft)

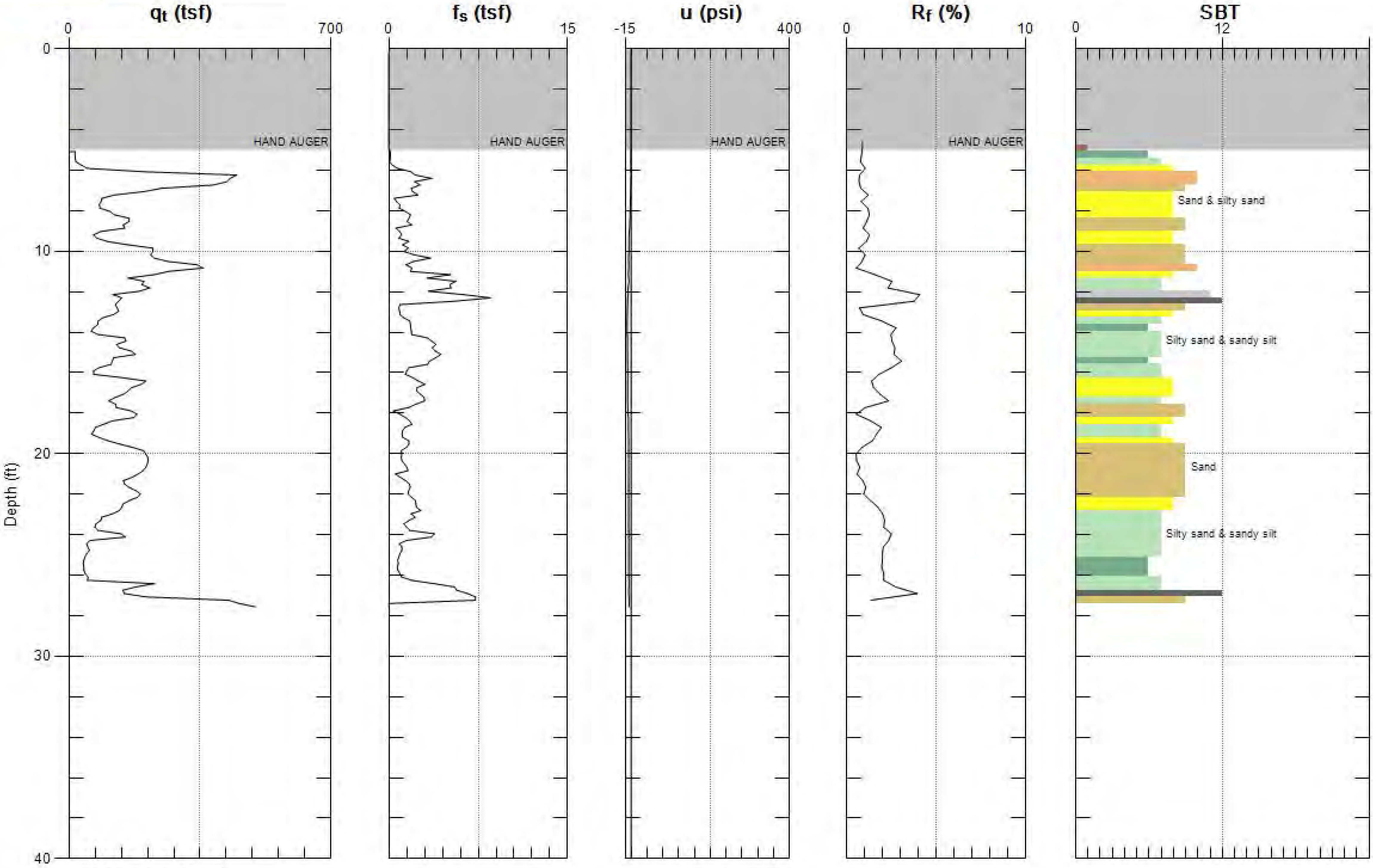
SBT: Soil Behavior Type (Robertson 1990)

GREGG

KLEINFELDER

Site: LEGACY INTL. CNTR.
Sounding: CPT-5

Engineer: T.GRINDSTAFF
Date: 2/12/2016 09:25



Max. Depth: 27.559 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

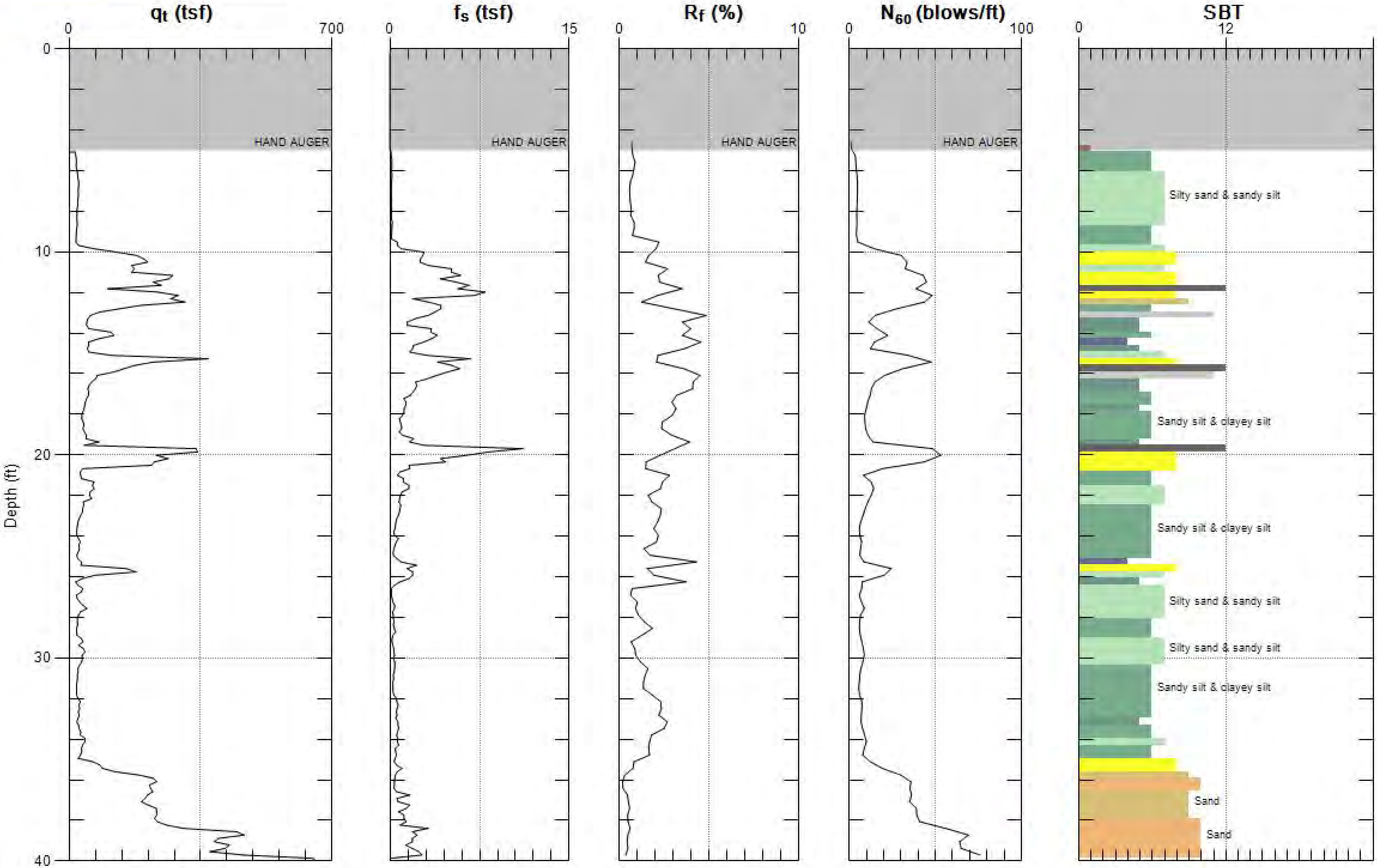
GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.

Engineer: T.GRINDSTAFF

Sounding: CPT-6

Date: 2/12/2016 11:39



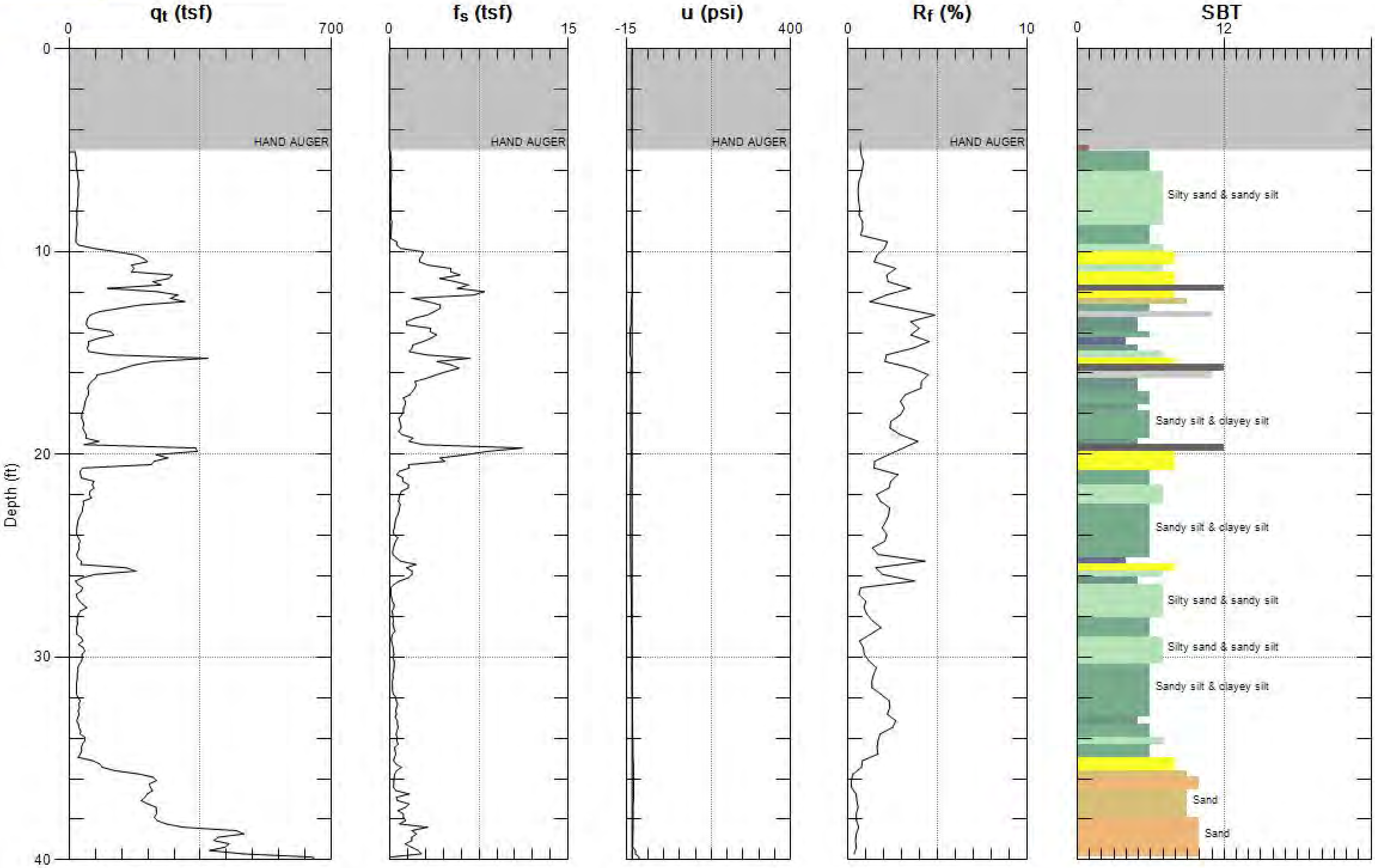
Max. Depth: 40.026 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-6

Engineer: T.GRINDSTAFF
Date: 2/12/2016 11:39



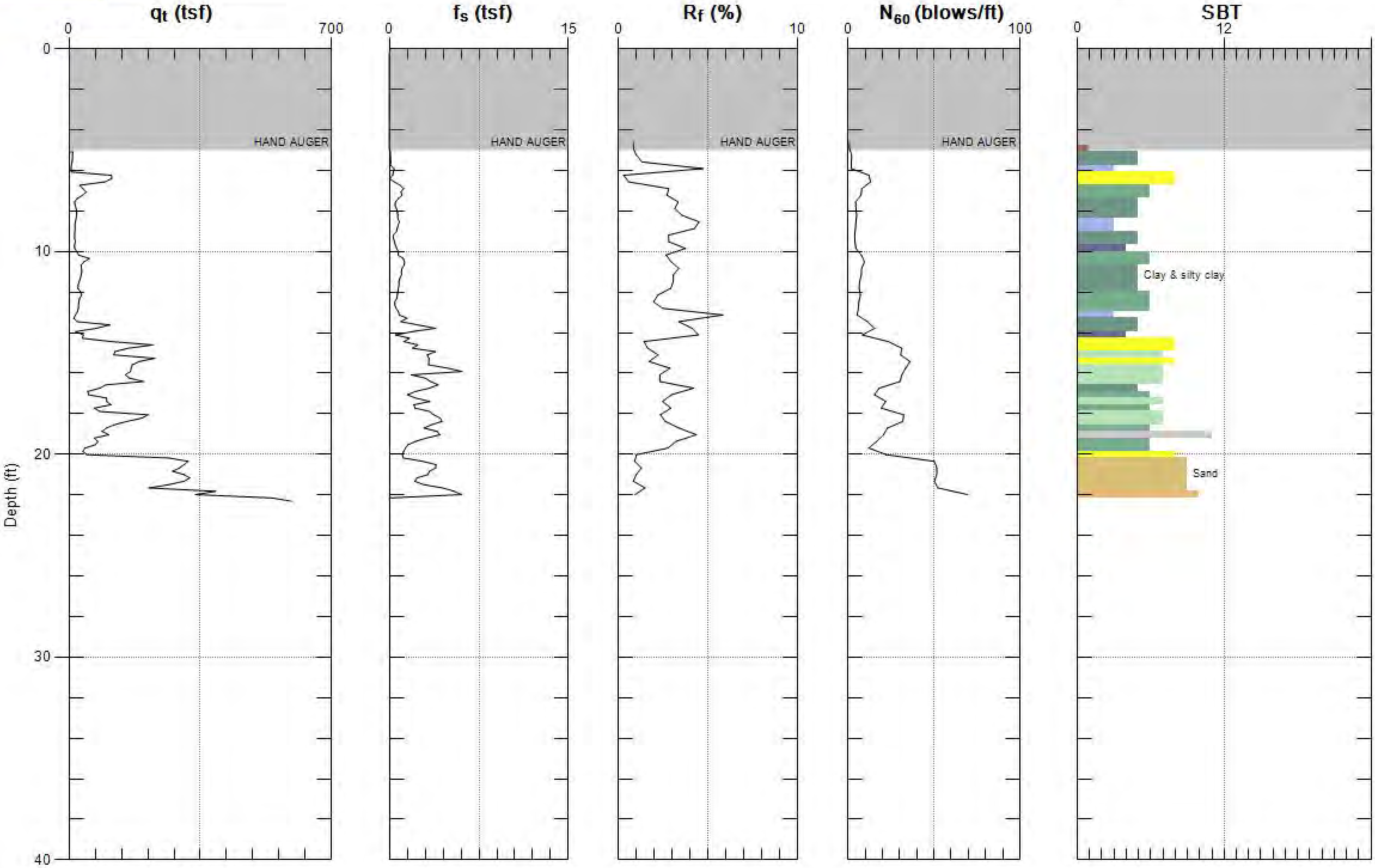
Max. Depth: 40.026 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

KLEINFELDER

Site: LEGACY INTL. CNTR.
Sounding: CPT-7

Engineer: T.GRINDSTAFF
Date: 2/12/2016 01:14



Max. Depth: 22.310 (ft)
Avg. Interval: 0.328 (ft)

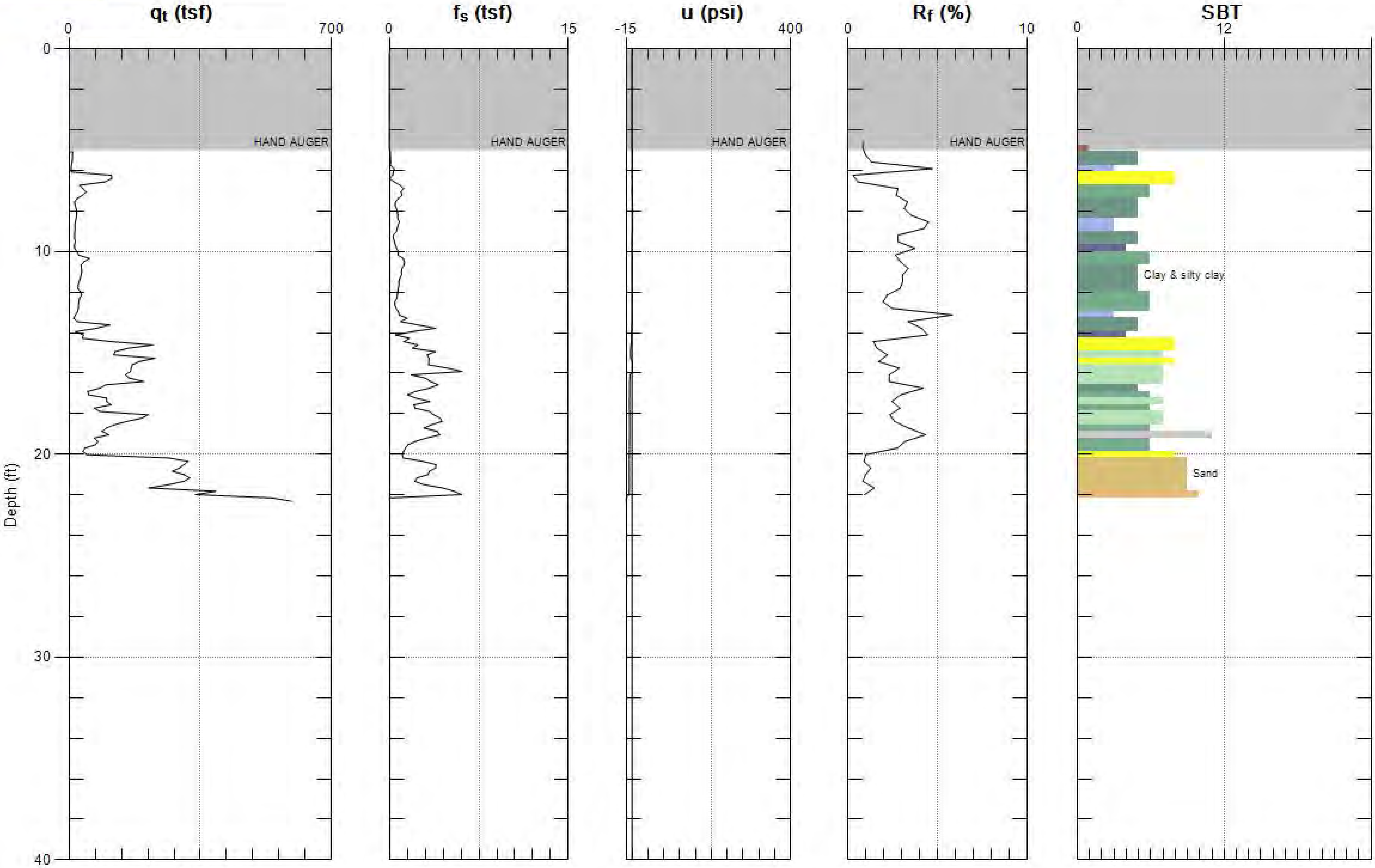
SBT: Soil Behavior Type (Robertson 1990)

Site: LEGACY INTL. CNTR.

Engineer: T.GRINDSTAFF

Sounding: CPT-7

Date: 2/12/2016 01:14



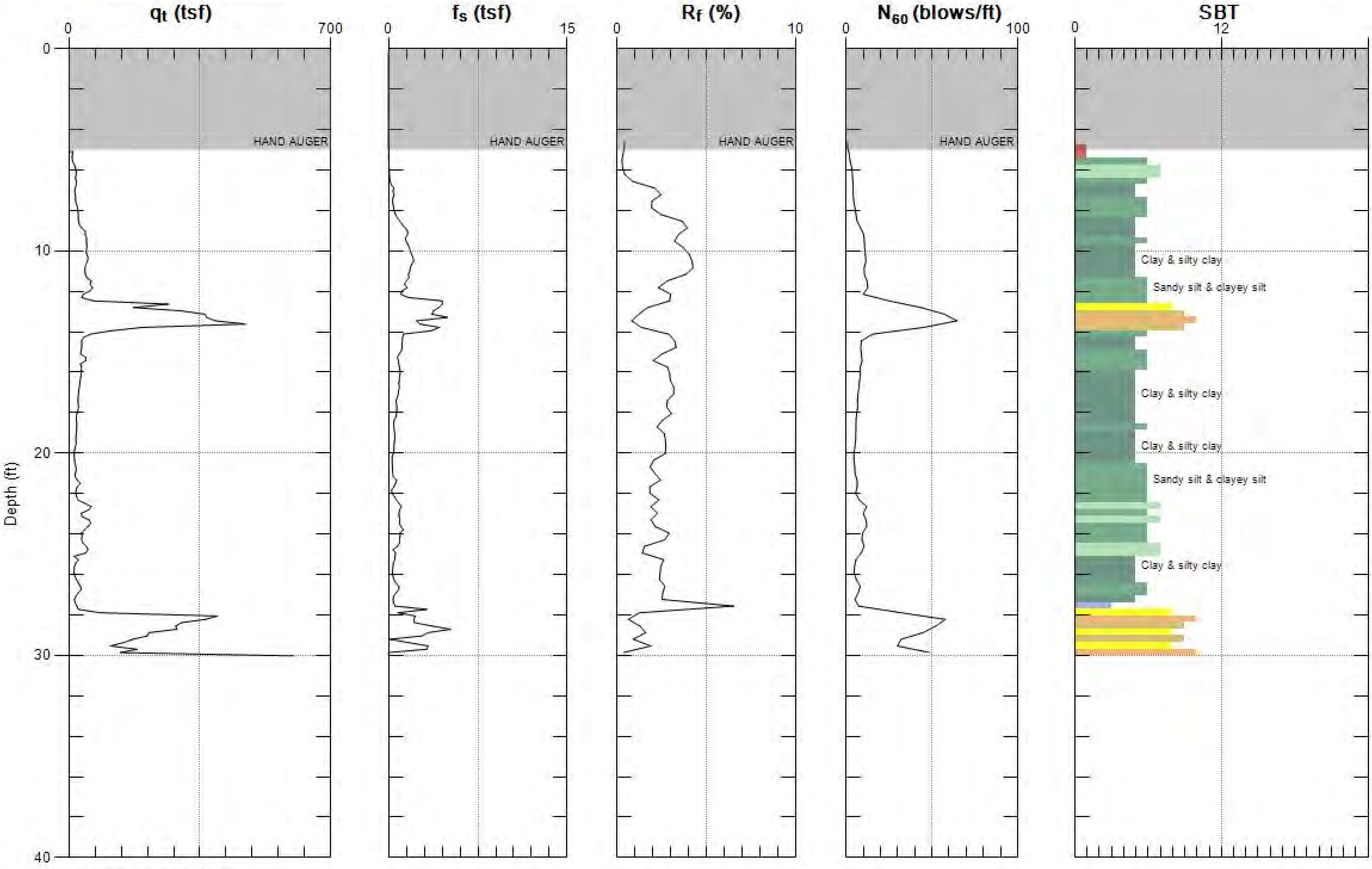
Max. Depth: 22.310 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-8

Engineer: T.GRINDSTAFF
Date: 2/12/2016 02:08



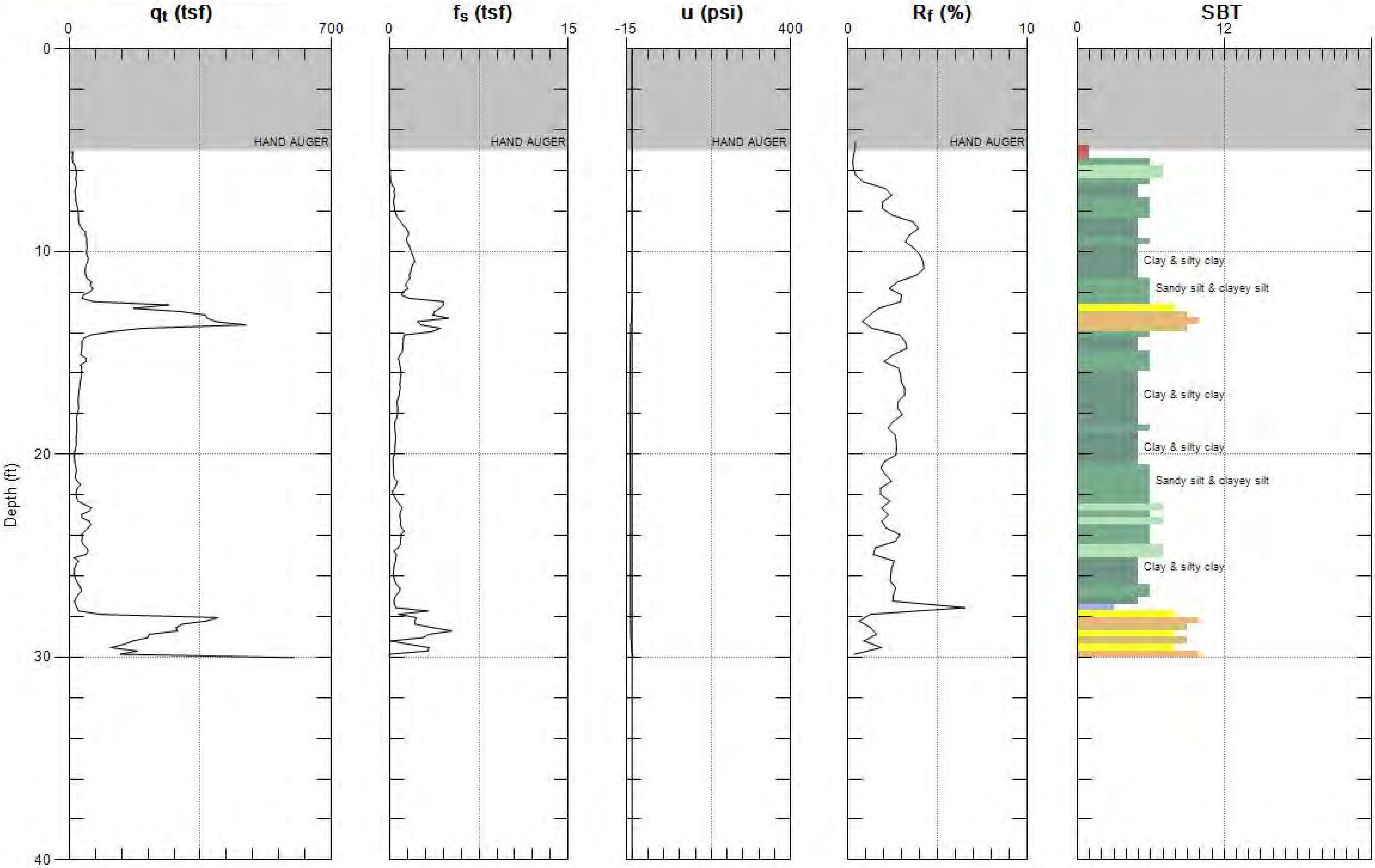
Max. Depth: 30.020 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG **KLEINFELDER**

Site: LEGACY INTL. CNTR.
Sounding: CPT-8

Engineer: T.GRINDSTAFF
Date: 2/12/2016 02:08



Max. Depth: 30.020 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

APPENDIX F
LABORATORY TEST RESULTS

APPENDIX F
LABORATORY TEST RESULTS

Laboratory tests were performed on selected bulk and drive samples borehole explorations to estimate engineering characteristics of the various earth materials encountered. Testing was performed in accordance with ASTM Standards for Soil Testing and are presented in herein.

MOISTURE CONTENT AND DRY UNIT WEIGHT

Natural moisture content and dry unit weight tests were performed on selected drive samples collected from the boreholes in accordance with ASTM D 2216 and D2937, respectively.

SIEVE AND #200 WASH ANALYSIS

Sieve and #200 wash analyses were performed on representative samples of the materials encountered at the site to evaluate the gradation characteristics of the soil and to aid in classification. The tests were performed in general accordance with ASTM Test Method D 422.

ATTERBERG LIMITS

Atterberg limit tests were performed on selected soil samples to evaluate the plasticity characteristics (liquid limit, plastic limit, and plasticity index) of the soil and to aid in its classification. The test was performed in general accordance with ASTM Test Method D4318.

DIRECT SHEAR TEST

Direct shear strength tests were performed on representative soil samples. The test procedures were in general accordance with the ASTM D3080.

CONSOLIDATION TEST

Consolidation testing was performed on two relatively undisturbed samples in accordance with ASTM Standard Test Method D-2435. Results of the tests are summarized in the corresponding results summary tables and specific test result forms presented herein.

EXPANSION INDEX

Expansion index tests were performed on representative soil samples. The test procedures were in general accordance with the ASTM D4829.

R-VALUE

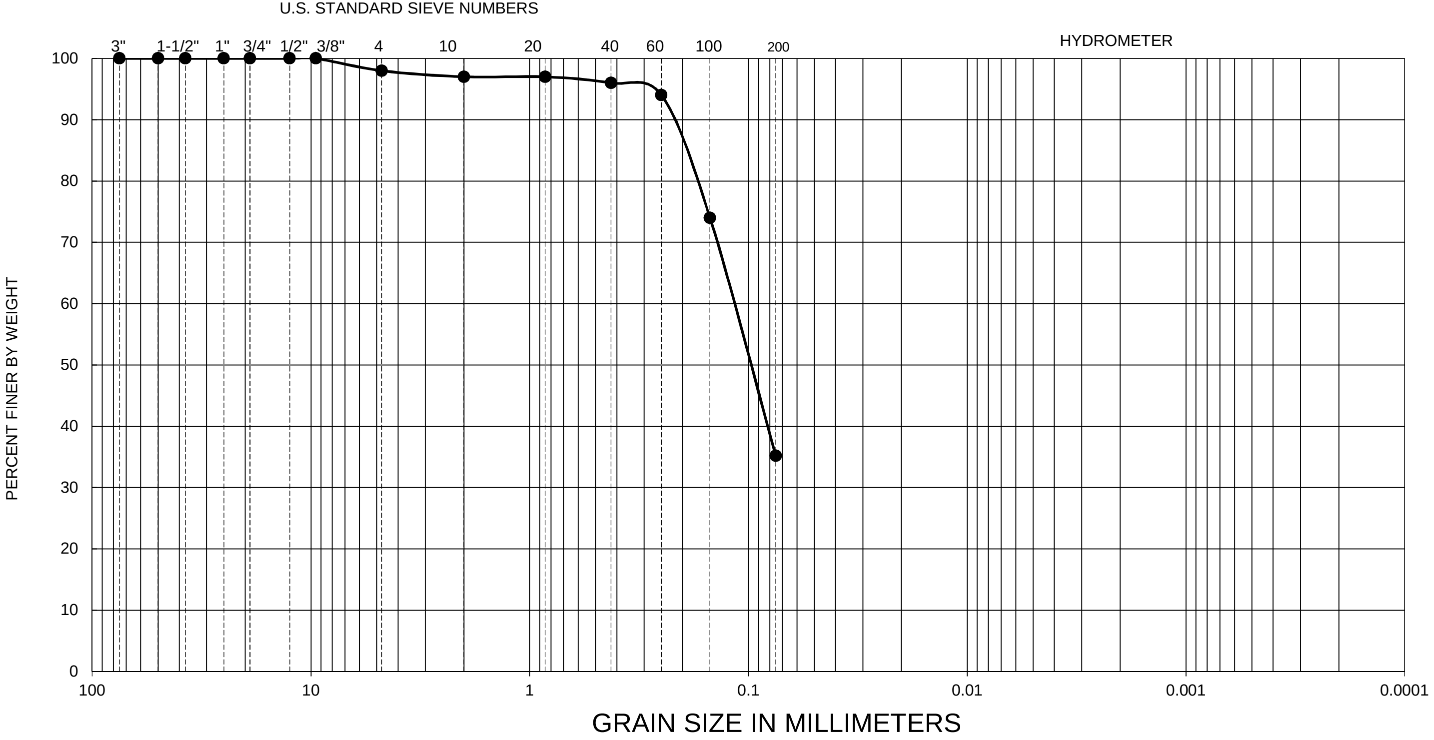
R-Value tests were performed on selected soil samples to evaluate resistance value of the near surface soils. The tests were performed using modified effort in general accordance with ASTM Test Method D2844.

CORROSION TESTS

A series of chemical tests were performed on three representative samples of the near surface soils to estimated pH, resistivity and sulfate and chloride contents. The test procedures were in general accordance with the California Tests 417, 422, and 643.

Date Tested: **3/7/2016**

USCS	**GRAVEL**		**SAND**			**FINES**	
	Coarse	**Fine**	**Coarse**	**Medium**	**Fine**	**Silt**	**Clay**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
B1	S3	10-12	35.2	SM

Sample Description	dark brown Silty sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	98
	No. 10	2.0 mm	97
	No. 20	0.85 mm	97
	No. 40	0.425 mm	96
	No. 60	0.25 mm	94
	No 100	0.15 mm	74
	No 200	.075 mm	35.2

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 6913

KLEINFELDER
Bright People. Right Solutions.

Checked by:	Moi A.	Tech:	Uly P.
Project No.	20163965	Date:	23-Mar-16

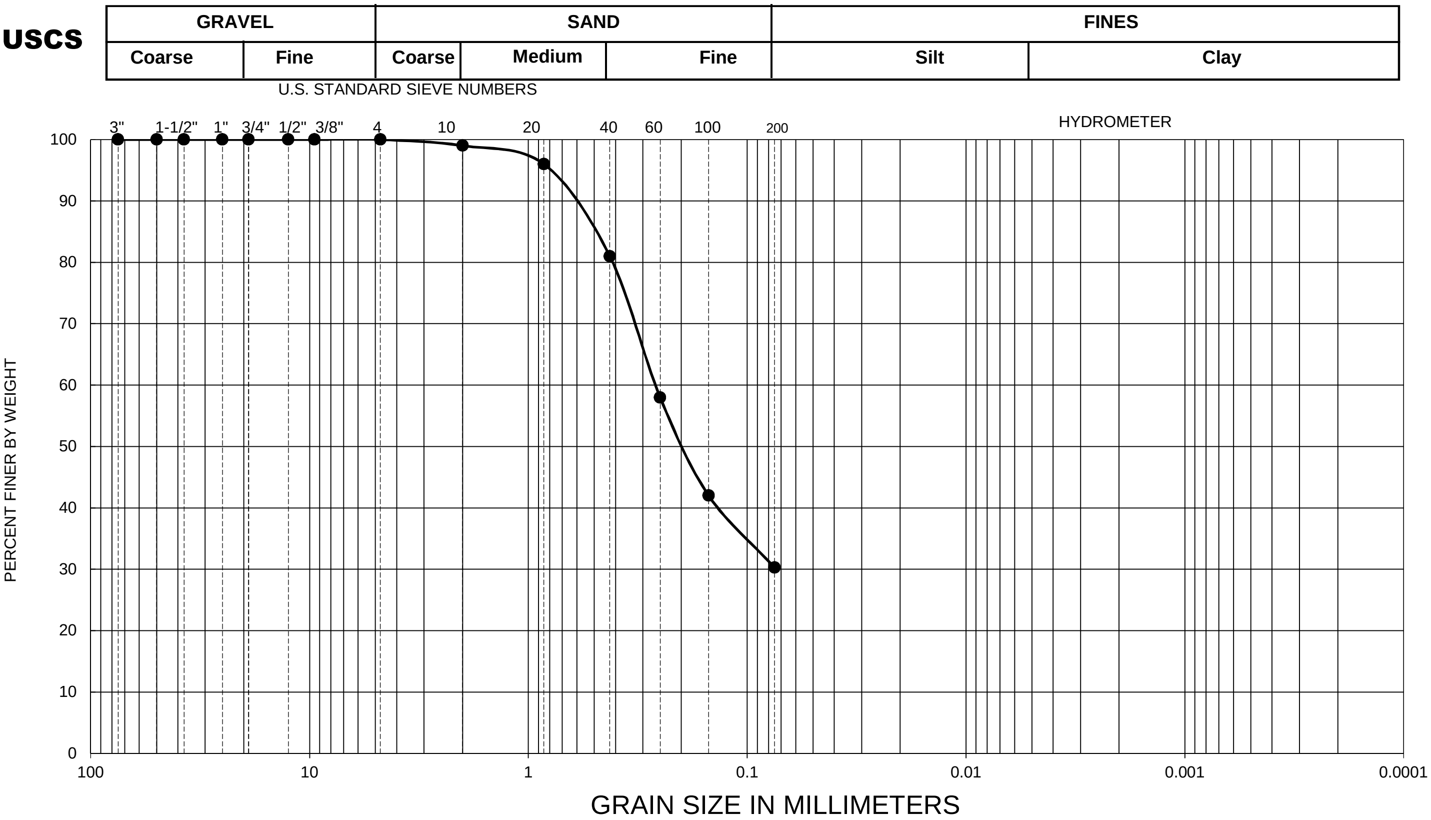
GRADATION TEST RESULTS

Legacy International Center
San Diego, California

FIGURE

F-1

Date Tested: **3/7/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
B2	S5	21	30.3	SC

Sample Description	yellowish brown Clayey sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	99
	No. 20	0.85 mm	96
	No. 40	0.425 mm	81
	No. 60	0.25 mm	58
	No 100	0.15 mm	42
	No 200	.075 mm	30.3

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 6913

KLEINFELDER
Bright People. Right Solutions.

Checked by:	Moi A.	Tech:	Uly P.
Project No.	20163965	Date:	23-Mar-16

GRADATION TEST RESULTS

Legacy International Center
San Diego, California

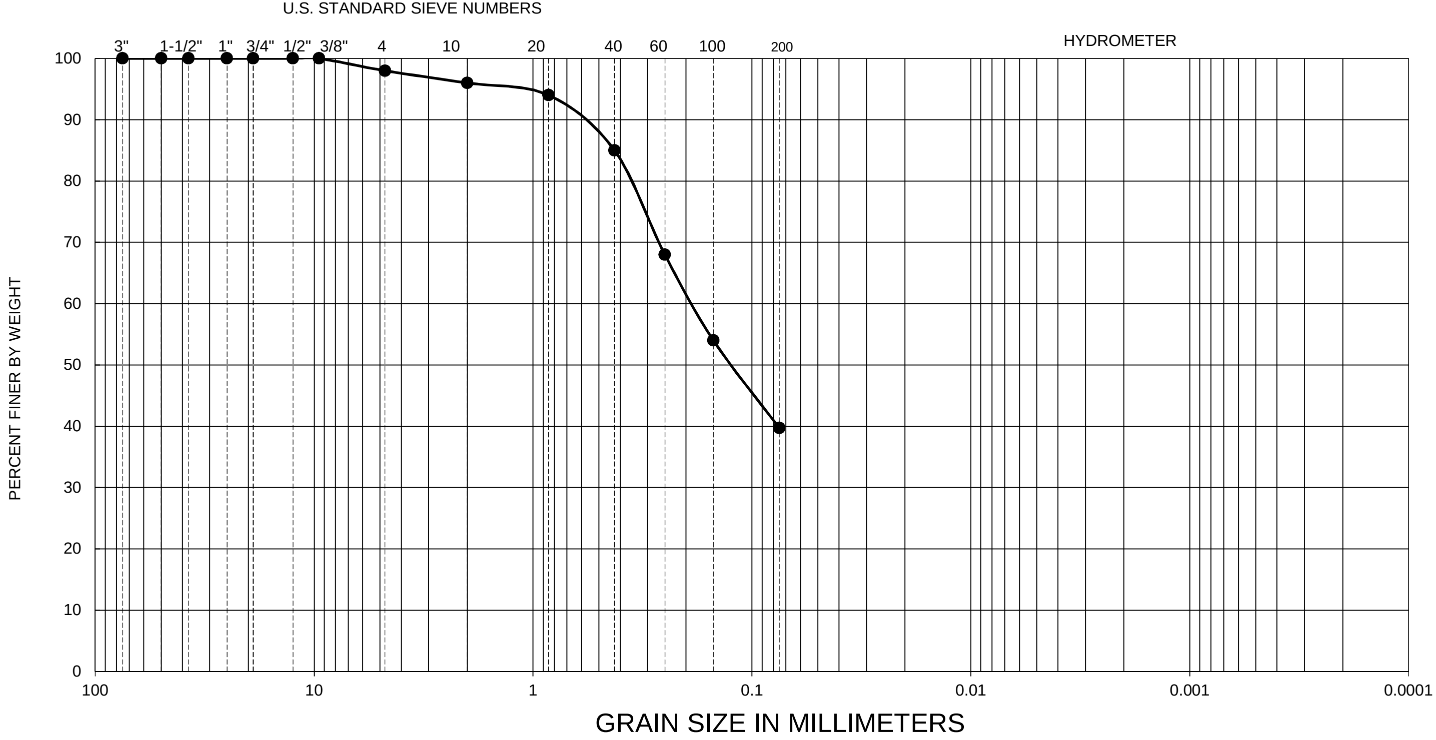
FIGURE

F-2

Date Tested: **3/7/2016**

USCS

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
B3	S3	10-12	39.7	SC

Sample Description	daark yellowish brown	Clayey sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	98
	No. 10	2.0 mm	96
	No. 20	0.85 mm	94
	No. 40	0.425 mm	85
	No. 60	0.25 mm	68
	No 100	0.15 mm	54
	No 200	.075 mm	39.7

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 6913

KLEINFELDER
Bright People. Right Solutions.

Checked by:	Moi A.	Tech:	Uly P.
Project No.	20163965	Date:	23-Mar-16

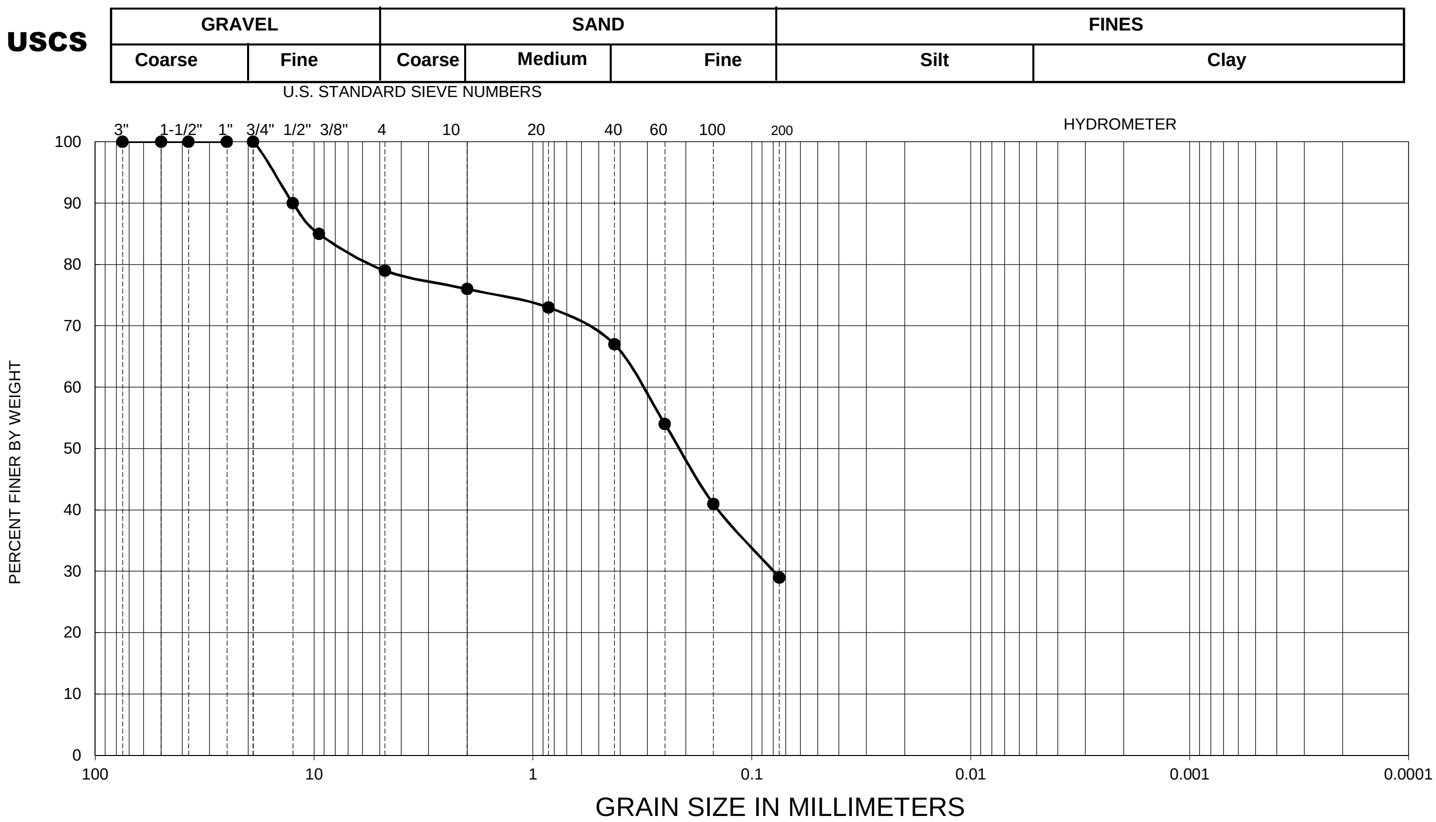
GRADATION TEST RESULTS

Legacy International Center
San Diego, California

FIGURE

F-3

Date Tested: **3/7/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
B3	S4	16	29.0	SC

Sample Description	brown Clayey sand with gravel

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	90
	3/8"	9.5 mm	85
	No. 4	4.75 mm	79
	No. 10	2.0 mm	76
	No. 20	0.85 mm	73
	No. 40	0.425 mm	67
	No. 60	0.25 mm	54
	No 100	0.15 mm	41
	No 200	.075 mm	29.0

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Project No.	20163965	Date:	23-Mar-16

GRADATION TEST RESULTS

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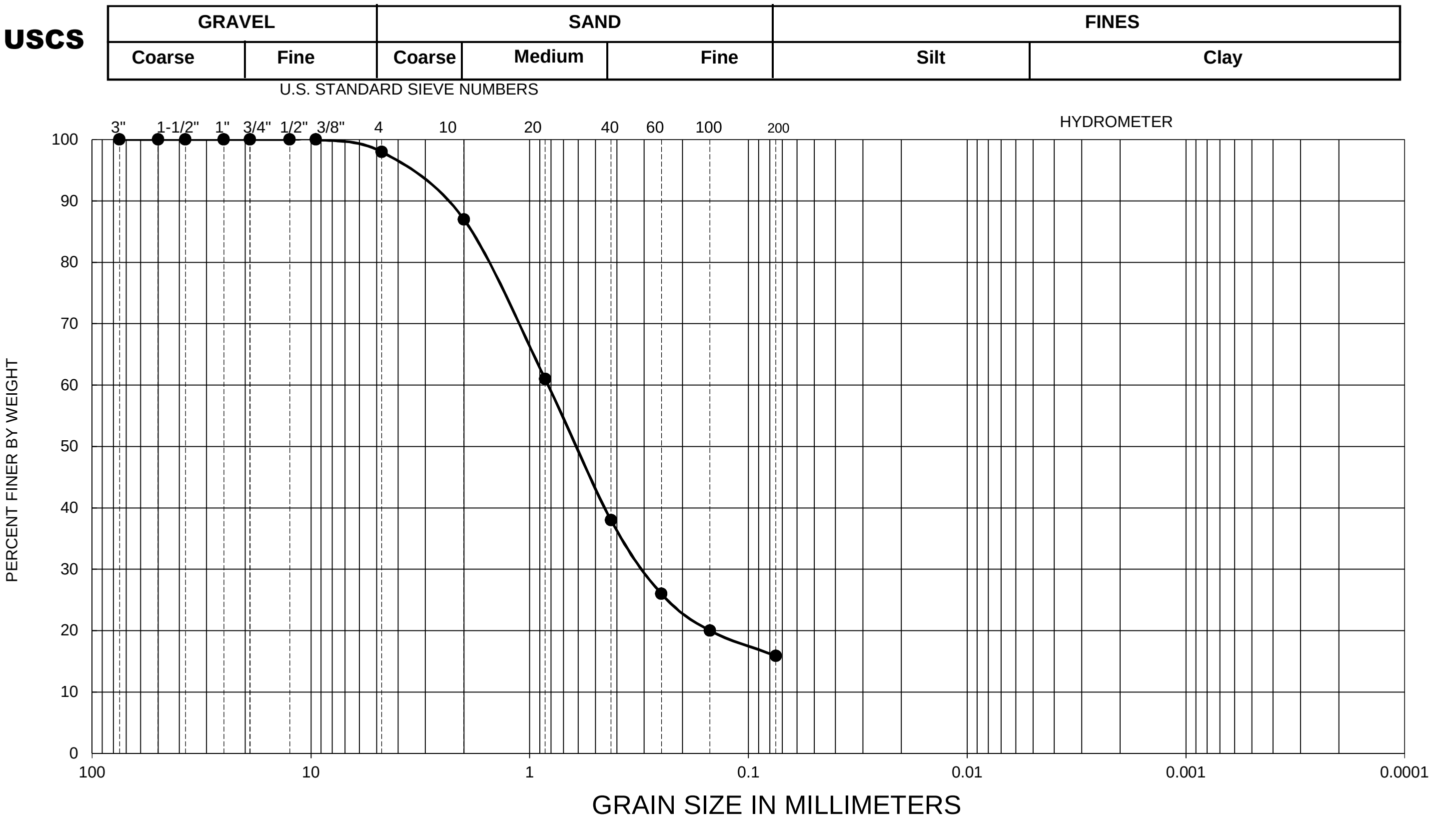
FIGURE

F-4

Date Tested: **3/1/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
B5	S5	16	15.9	SM

Sample Description	brown Silty sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	98
	No. 10	2.0 mm	87
	No. 20	0.85 mm	61
	No. 40	0.425 mm	38
	No. 60	0.25 mm	26
	No 100	0.15 mm	20
	No 200	.075 mm	15.9

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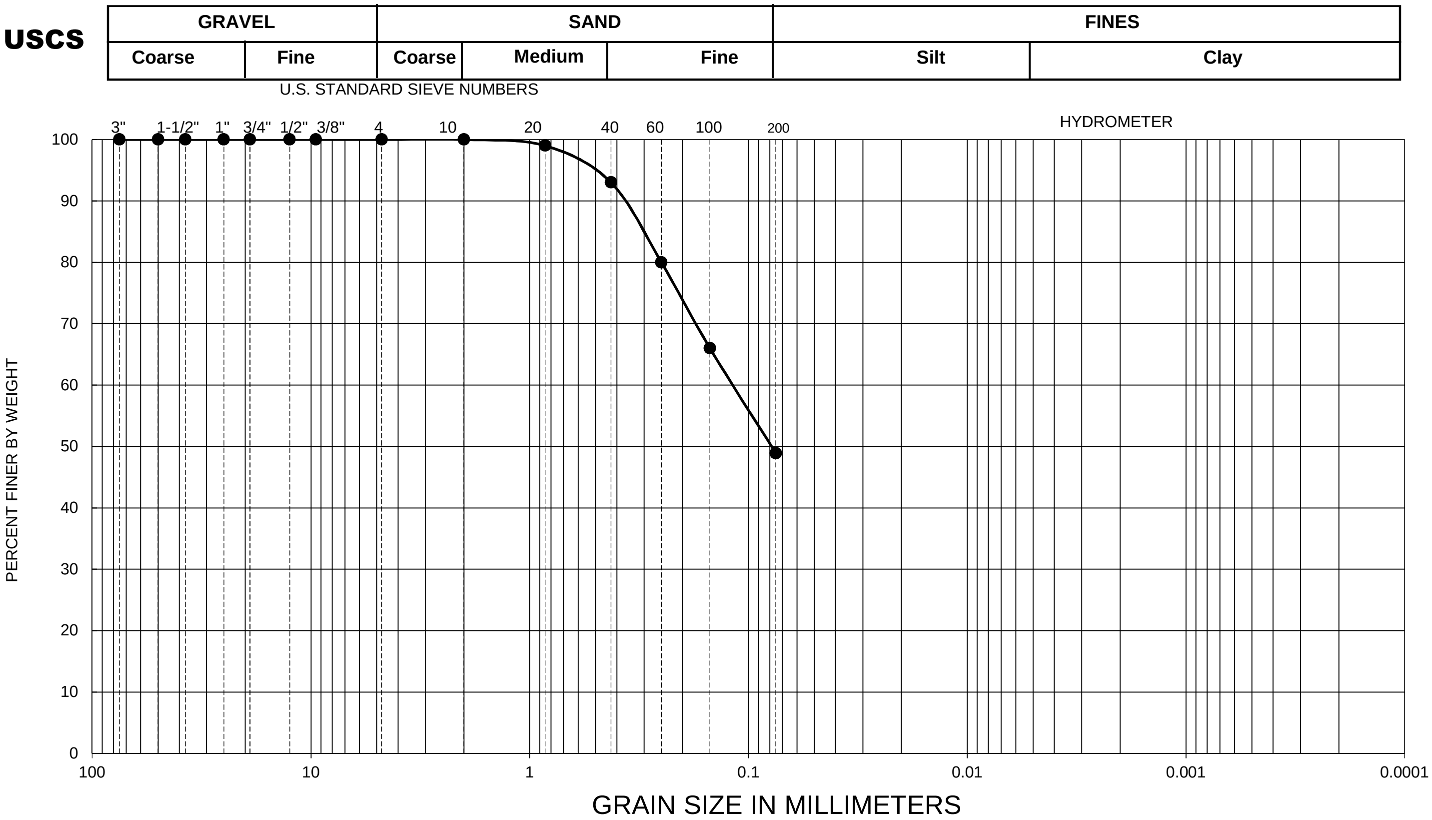
FIGURE

F-5

Date Tested: **3/7/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
B8	S2	6	48.9	SC

Sample Description	yellowish brown Clayey sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	99
	No. 40	0.425 mm	93
	No. 60	0.25 mm	80
	No 100	0.15 mm	66
	No 200	.075 mm	48.9

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GRADATION TEST RESULTS

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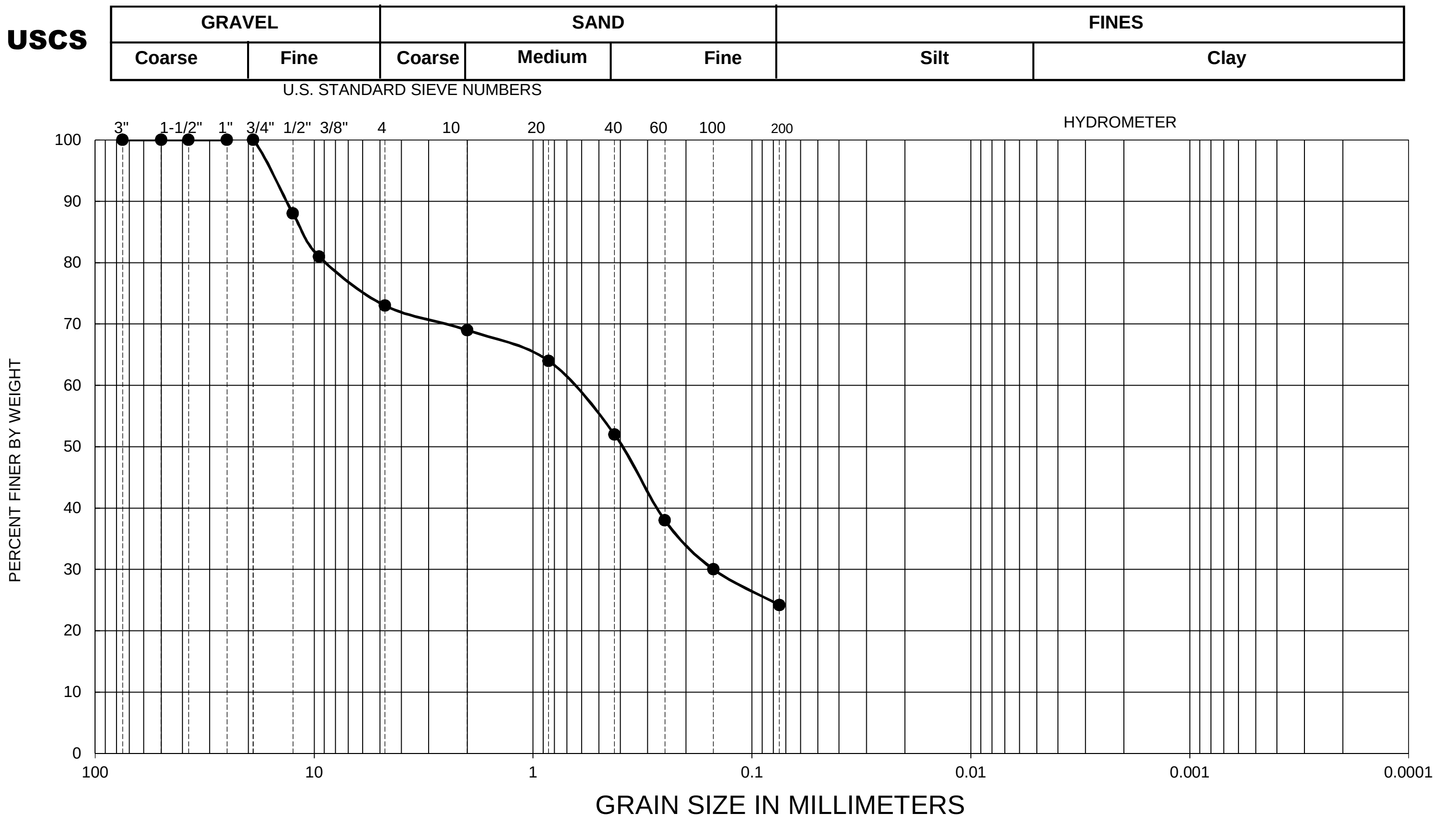
FIGURE

F-6

Date Tested: **3/2/2016**



Boring No.	**Sample No.**	**Depth (ft)**	**Passing 200 (%)**	**USCS Classification**
B9	S3	10.5	24.2	SC

Sample Description	brown Clayey sand with gravel

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	88
	3/8"	9.5 mm	81
	No. 4	4.75 mm	73
	No. 10	2.0 mm	69
	No. 20	0.85 mm	64
	No. 40	0.425 mm	52
	No. 60	0.25 mm	38
	No 100	0.15 mm	30
	No 200	.075 mm	24.2

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GRADATION TEST RESULTS

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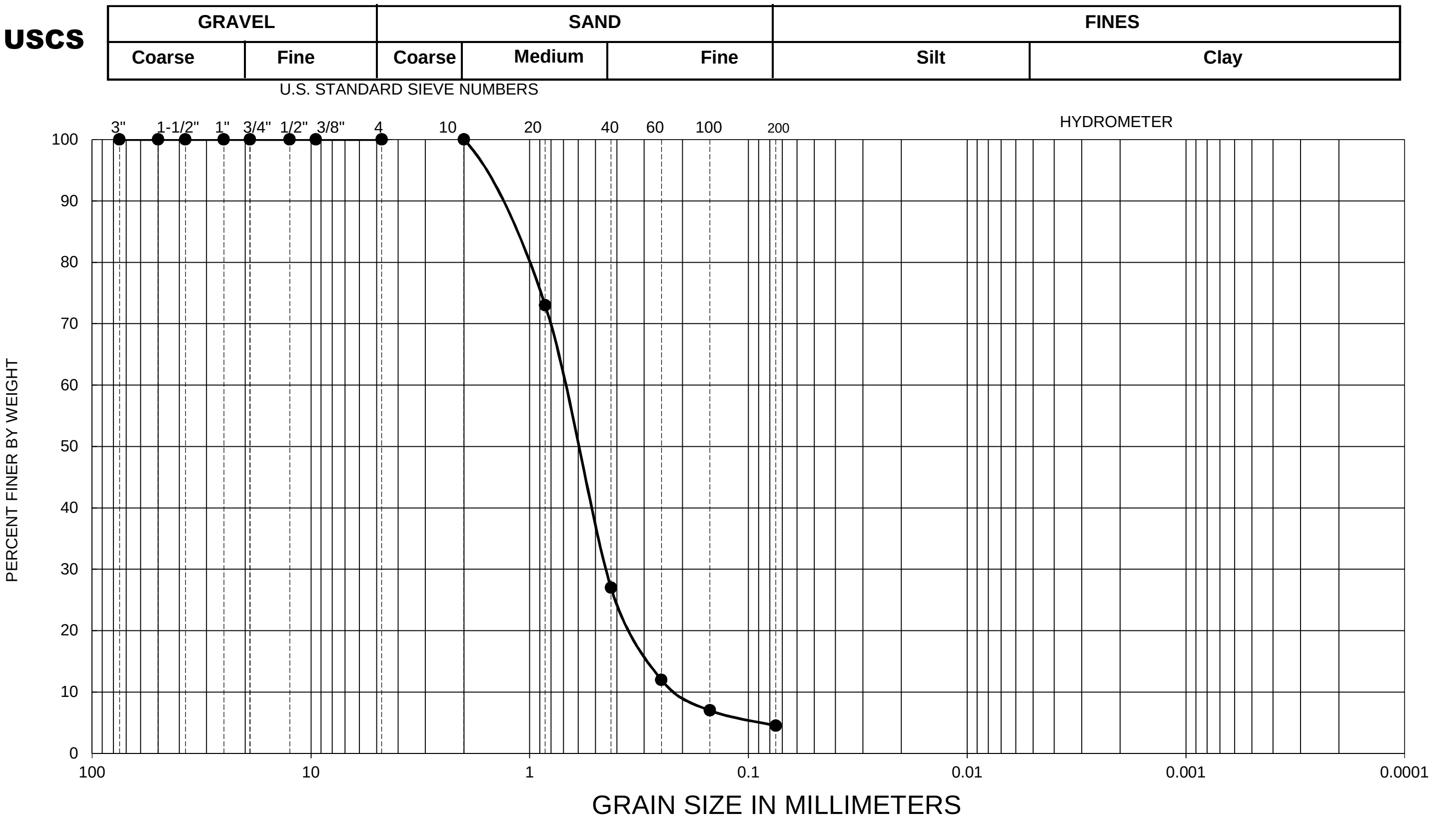
FIGURE

F-7

Date Tested: **3/1/2016**



Boring No.	**Sample No.**	**Depth (ft)**	**Passing 200 (%)**	**USCS Classification**
B11	S5	15.5	4.5	SP

Sample Description	brown Poorly graded sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	73
	No. 40	0.425 mm	27
	No. 60	0.25 mm	12
	No 100	0.15 mm	7
	No 200	.075 mm	4.5

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FIGURE

F-8

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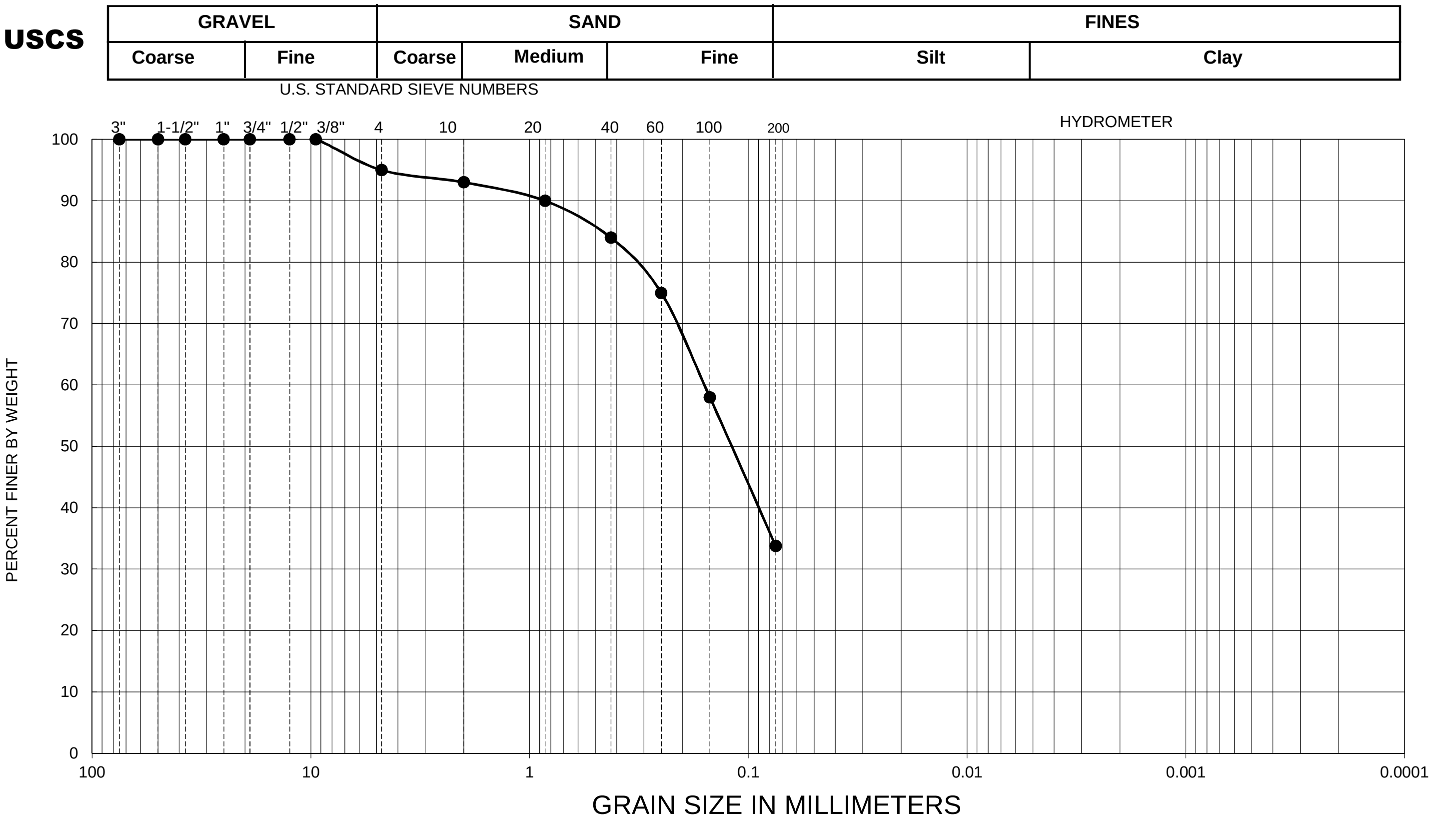
Date Tested: **3/1/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
B12	S4	16	33.8	SC

Sample Description	brown Clayey sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	95
	No. 10	2.0 mm	93
	No. 20	0.85 mm	90
	No. 40	0.425 mm	84
	No. 60	0.25 mm	75
	No 100	0.15 mm	58
	No 200	.075 mm	33.8

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GRADATION TEST RESULTS

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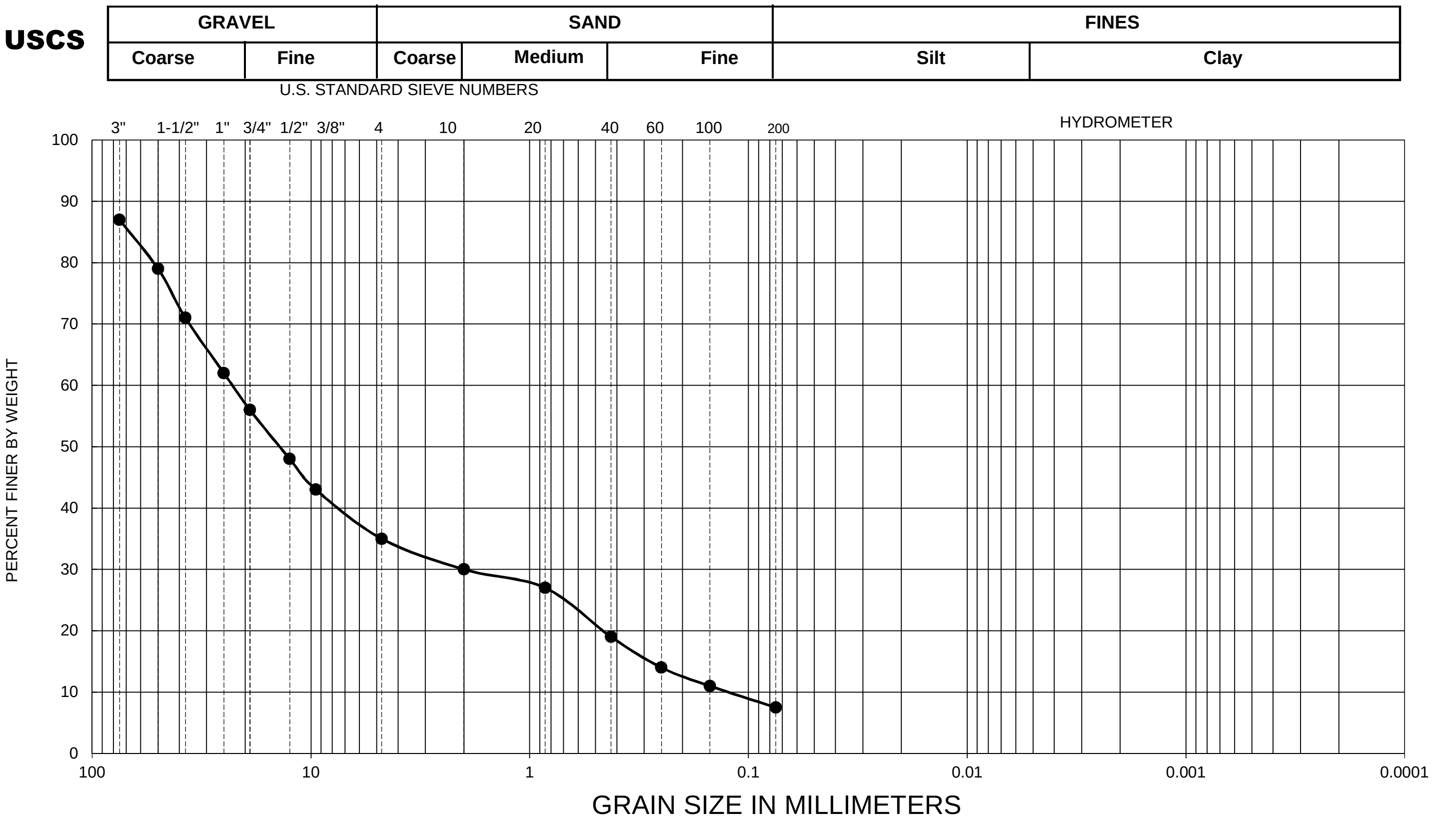
FIGURE

F-9

Date Tested: **3/18/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD1	S3	10.5-11	7.5	GW-GC

Sample Description	light yellowish brown	Well-graded gravel with clay and sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	87
	2"	50 mm	79
	1.5"	37.5 mm	71
	1"	25 mm	62
	3/4"	19 mm	56
	1/2"	12.5 mm	48
	3/8"	9.5 mm	43
	No. 4	4.75 mm	35
	No. 10	2.0 mm	30
	No. 20	0.85 mm	27
	No. 40	0.425 mm	19
	No. 60	0.25 mm	14
	No 100	0.15 mm	11
	No 200	.075 mm	7.5

Note: 100% passing 6".

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GRADATION TEST RESULTS

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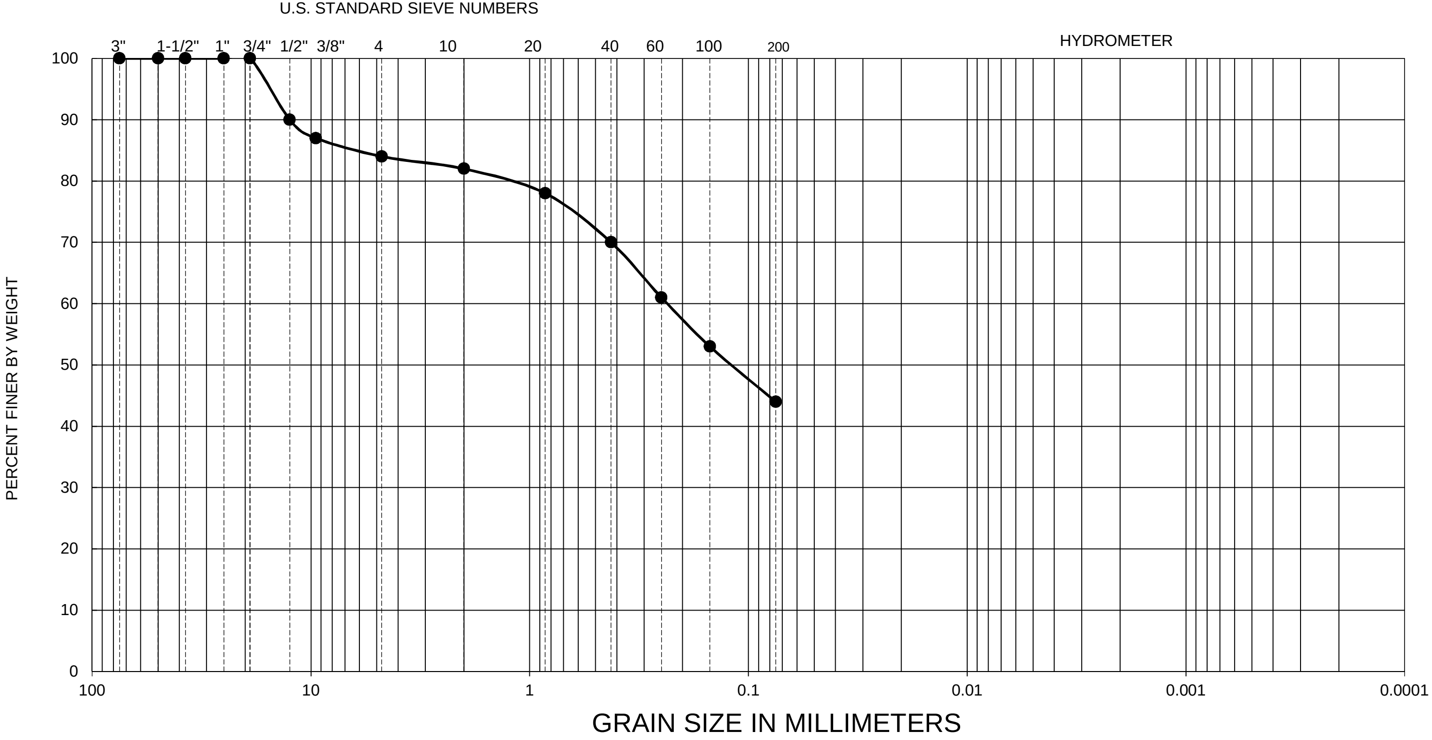
FIGURE

F-10

Date Tested: **3/2/2016**

USCS

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD2	S2	11-12.5	44.0	SC

Sample Description	brown Clayey sand with gravel

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	90
	3/8"	9.5 mm	87
	No. 4	4.75 mm	84
	No. 10	2.0 mm	82
	No. 20	0.85 mm	78
	No. 40	0.425 mm	70
	No. 60	0.25 mm	61
	No 100	0.15 mm	53
	No 200	.075 mm	44.0

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GRADATION TEST RESULTS

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San Diego, California

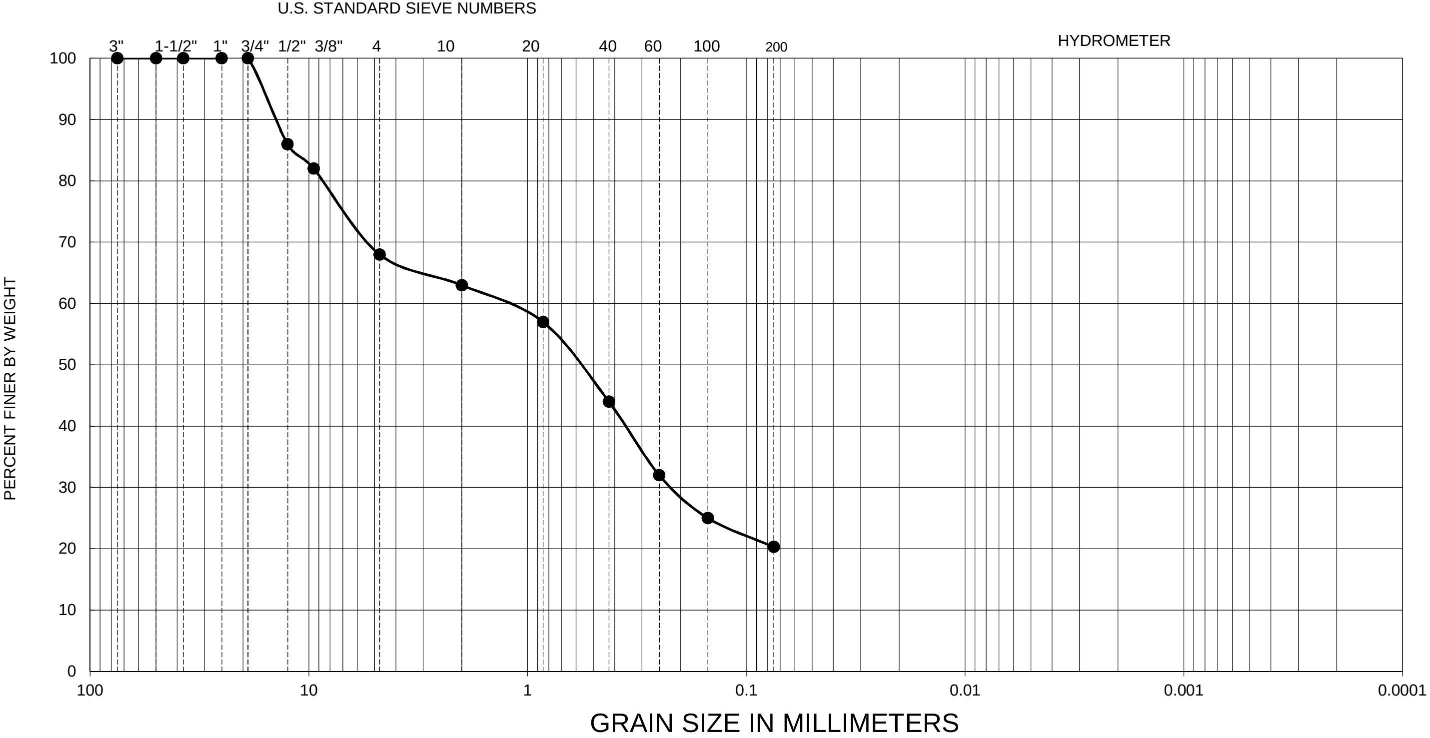
FIGURE

F-11

Date Tested: **3/2/2016**

USCS

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD2	S4	18-19	20.3	SC

Sample Description	light brown Clayey sand with gravel

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	86
	3/8"	9.5 mm	82
	No. 4	4.75 mm	68
	No. 10	2.0 mm	63
	No. 20	0.85 mm	57
	No. 40	0.425 mm	44
	No. 60	0.25 mm	32
	No 100	0.15 mm	25
	No 200	.075 mm	20.3

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GRADATION TEST RESULTS

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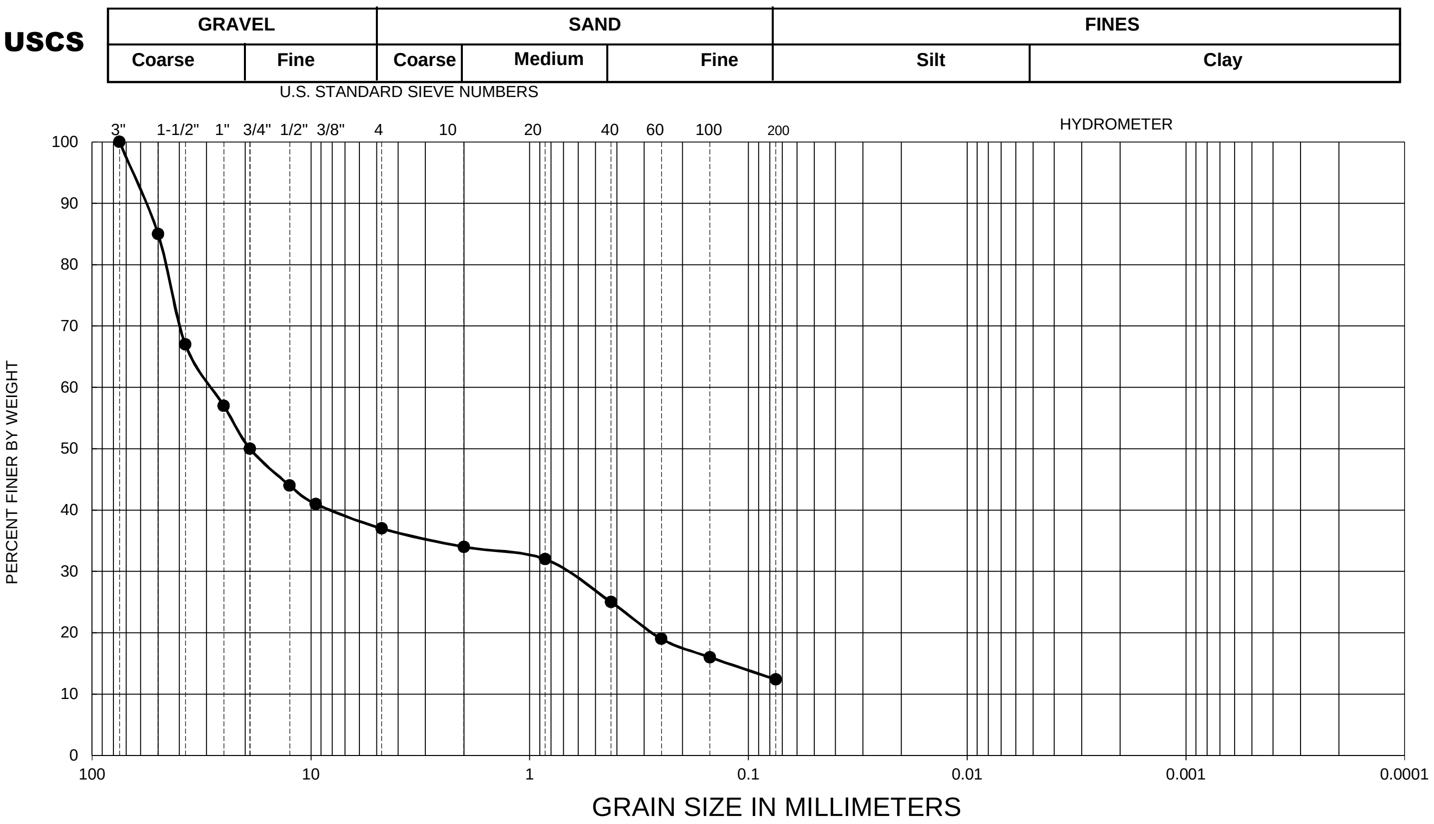
FIGURE

F-12

Date Tested: **3/18/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD3	S3	10-10.5	12.4	GC

Sample Description	yellowish brown Clayey gravel with sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	85
	1.5"	37.5 mm	67
	1"	25 mm	57
	3/4"	19 mm	50
	1/2"	12.5 mm	44
	3/8"	9.5 mm	41
	No. 4	4.75 mm	37
	No. 10	2.0 mm	34
	No. 20	0.85 mm	32
	No. 40	0.425 mm	25
	No. 60	0.25 mm	19
	No 100	0.15 mm	16
	No 200	.075 mm	12.4

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FIGURE

F-13

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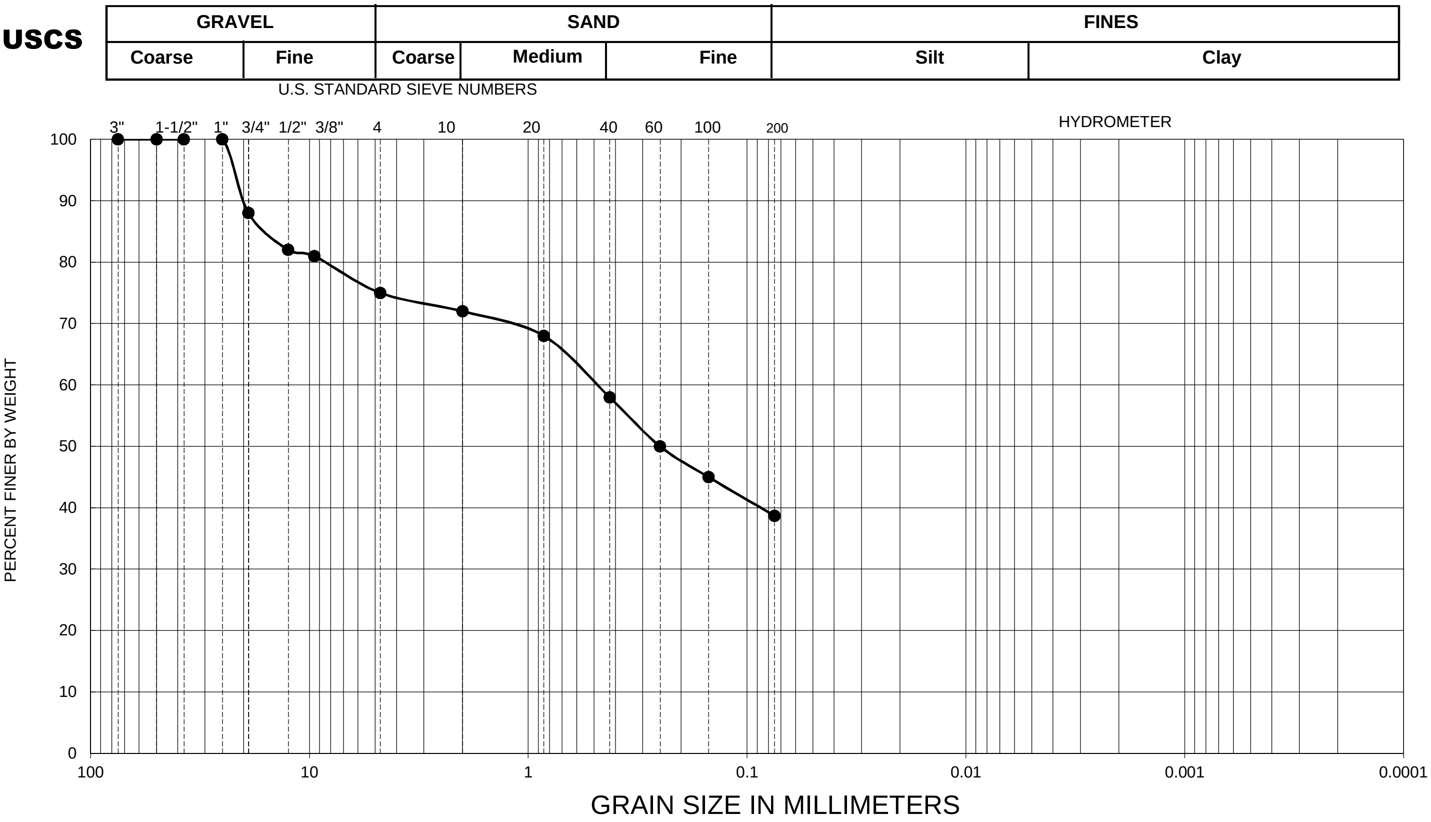
Project No.	20163965	Date:	23-Mar-16

Date Tested: **3/17/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD3	S4	13-13.5	38.7	SC

Sample Description	dark brown Clayey sand with gravel

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	88
	1/2"	12.5 mm	82
	3/8"	9.5 mm	81
	No. 4	4.75 mm	75
	No. 10	2.0 mm	72
	No. 20	0.85 mm	68
	No. 40	0.425 mm	58
	No. 60	0.25 mm	50
	No 100	0.15 mm	45
	No 200	.075 mm	38.7

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GRADATION TEST RESULTS

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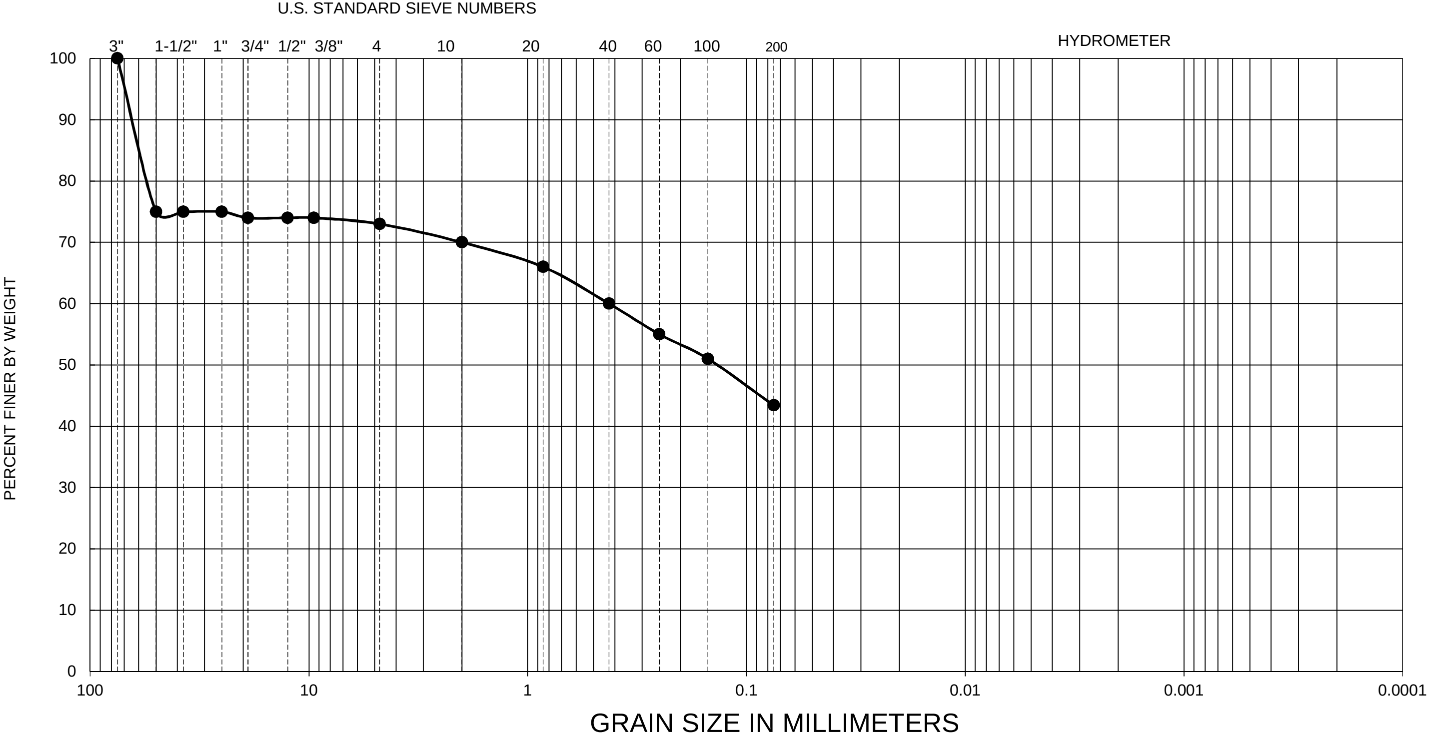
FIGURE

F-14

Date Tested: **3/17/2016**

USCS

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD3	S5	21.5-22	43.4	SC

Sample Description	yellowish brown Clayey sand with gravel

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	75
	1.5"	37.5 mm	75
	1"	25 mm	75
	3/4"	19 mm	74
	1/2"	12.5 mm	74
	3/8"	9.5 mm	74
	No. 4	4.75 mm	73
	No. 10	2.0 mm	70
	No. 20	0.85 mm	66
	No. 40	0.425 mm	60
	No. 60	0.25 mm	55
	No 100	0.15 mm	51
	No 200	.075 mm	43.4

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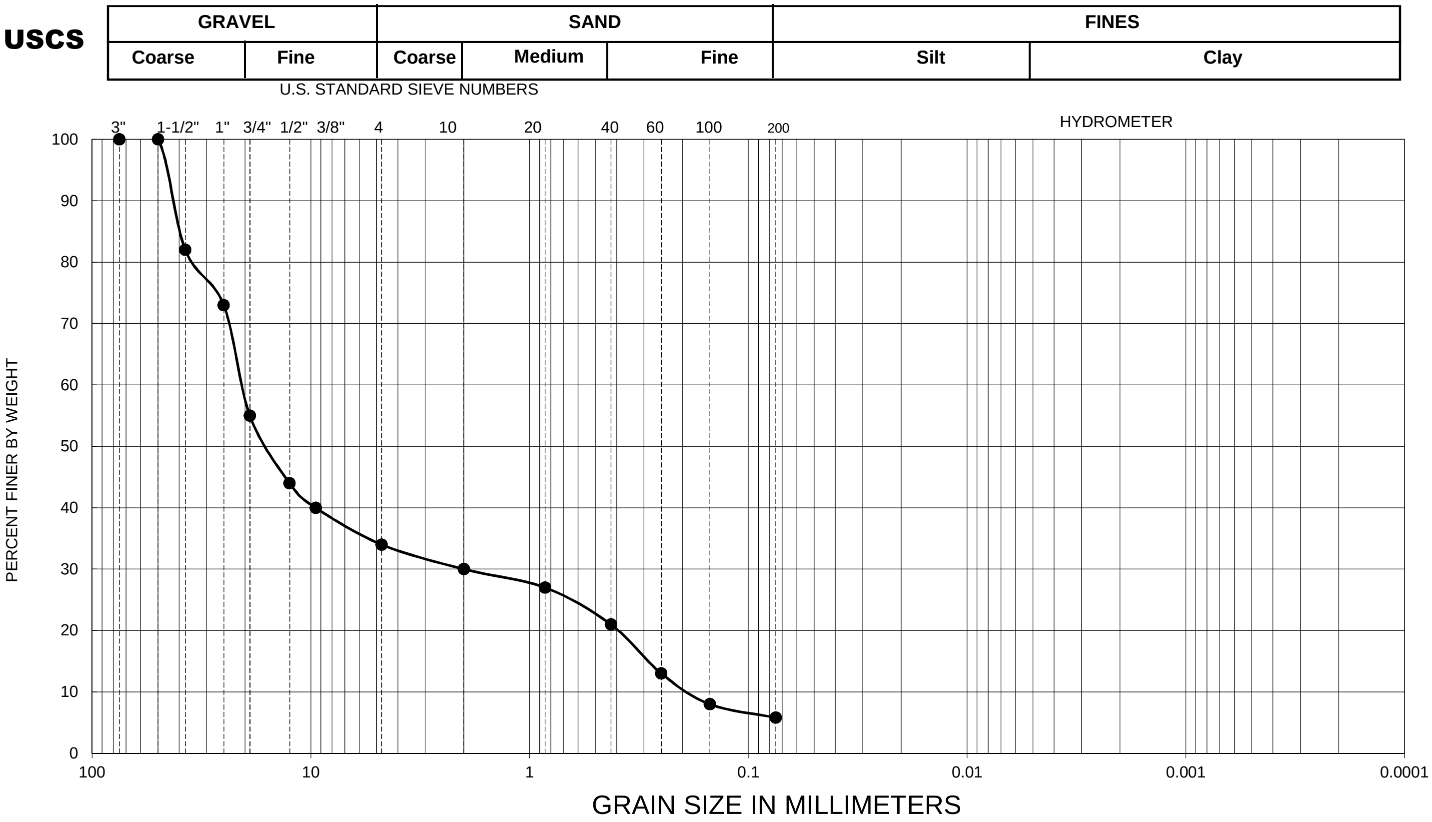
FIGURE

F-15

Date Tested: **3/18/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD3	S7	30-30.5	5.8	GW-GM

Sample Description	yellowish brown Well-graded gravel with silt and sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	82
	1"	25 mm	73
	3/4"	19 mm	55
	1/2"	12.5 mm	44
	3/8"	9.5 mm	40
	No. 4	4.75 mm	34
	No. 10	2.0 mm	30
	No. 20	0.85 mm	27
	No. 40	0.425 mm	21
	No. 60	0.25 mm	13
	No 100	0.15 mm	8
	No 200	.075 mm	5.8

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GRADATION TEST RESULTS

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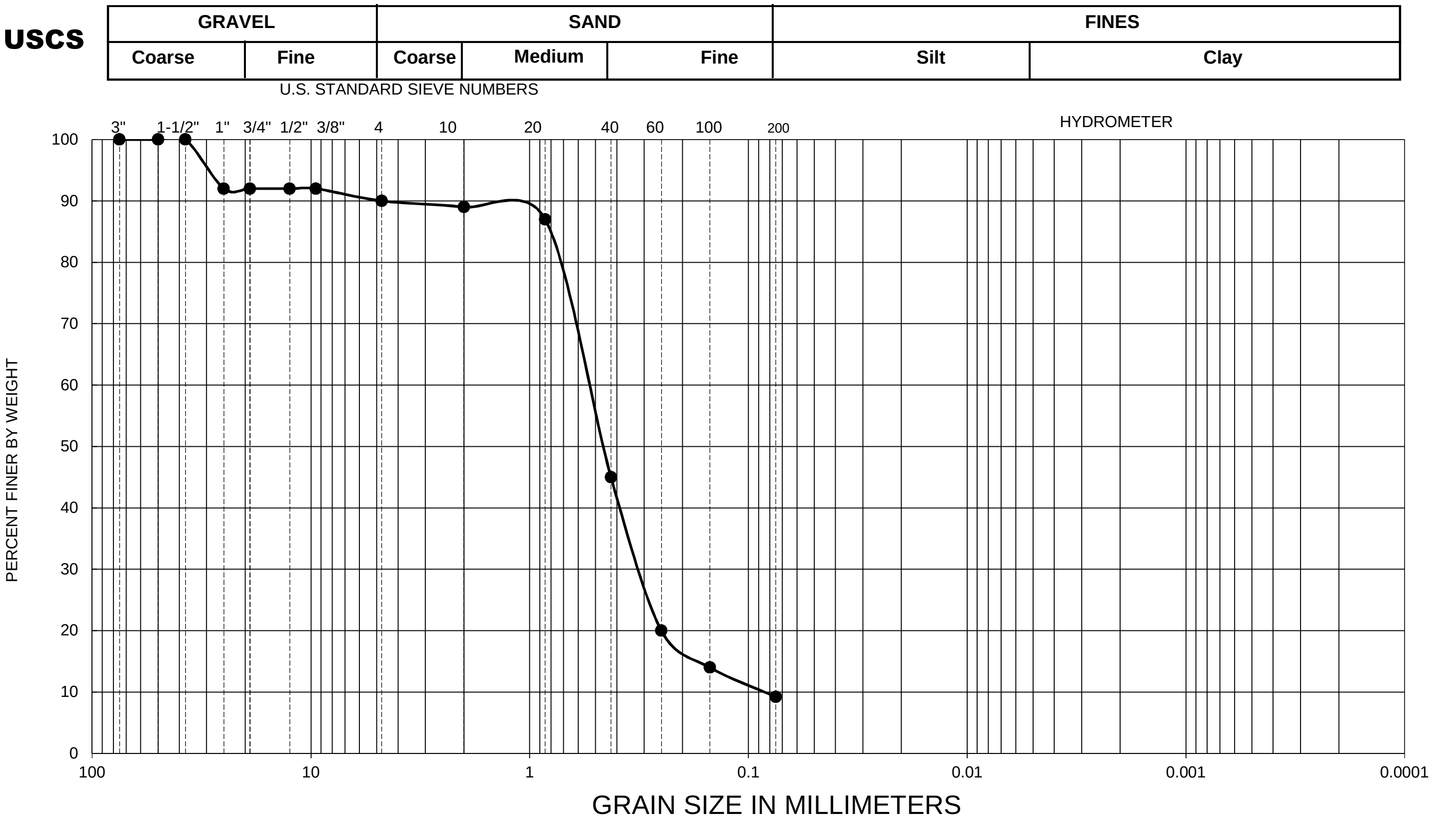
FIGURE

F-16

Date Tested: **3/17/2016**



Boring No.	**Sample No.**	**Depth (ft)**	**Passing 200 (%)**	**USCS Classification**
LD3	S9	43-43.5	9.2	SW-SM

Sample Description	reddish brown Well-graded sand with silt

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	92
	3/4"	19 mm	92
	1/2"	12.5 mm	92
	3/8"	9.5 mm	92
	No. 4	4.75 mm	90
	No. 10	2.0 mm	89
	No. 20	0.85 mm	87
	No. 40	0.425 mm	45
	No. 60	0.25 mm	20
	No 100	0.15 mm	14
	No 200	.075 mm	9.2

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GRADATION TEST RESULTS

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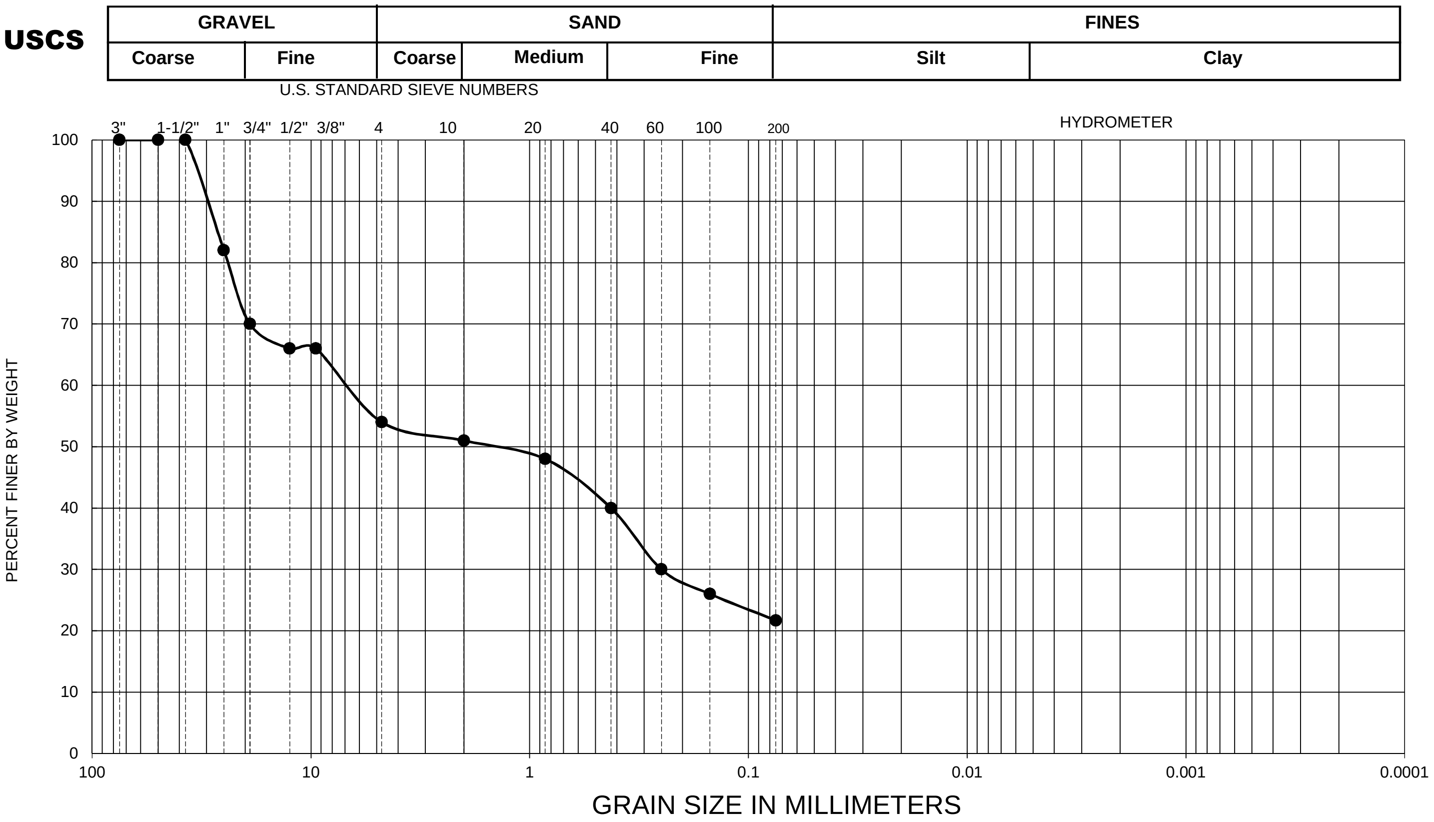
FIGURE

F-17

Date Tested: **3/18/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD4	S2	9-9.5	21.7	SC

Sample Description	brown Clayey sand with gravel

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	82
	3/4"	19 mm	70
	1/2"	12.5 mm	66
	3/8"	9.5 mm	66
	No. 4	4.75 mm	54
	No. 10	2.0 mm	51
	No. 20	0.85 mm	48
	No. 40	0.425 mm	40
	No. 60	0.25 mm	30
	No 100	0.15 mm	26
	No 200	.075 mm	21.7

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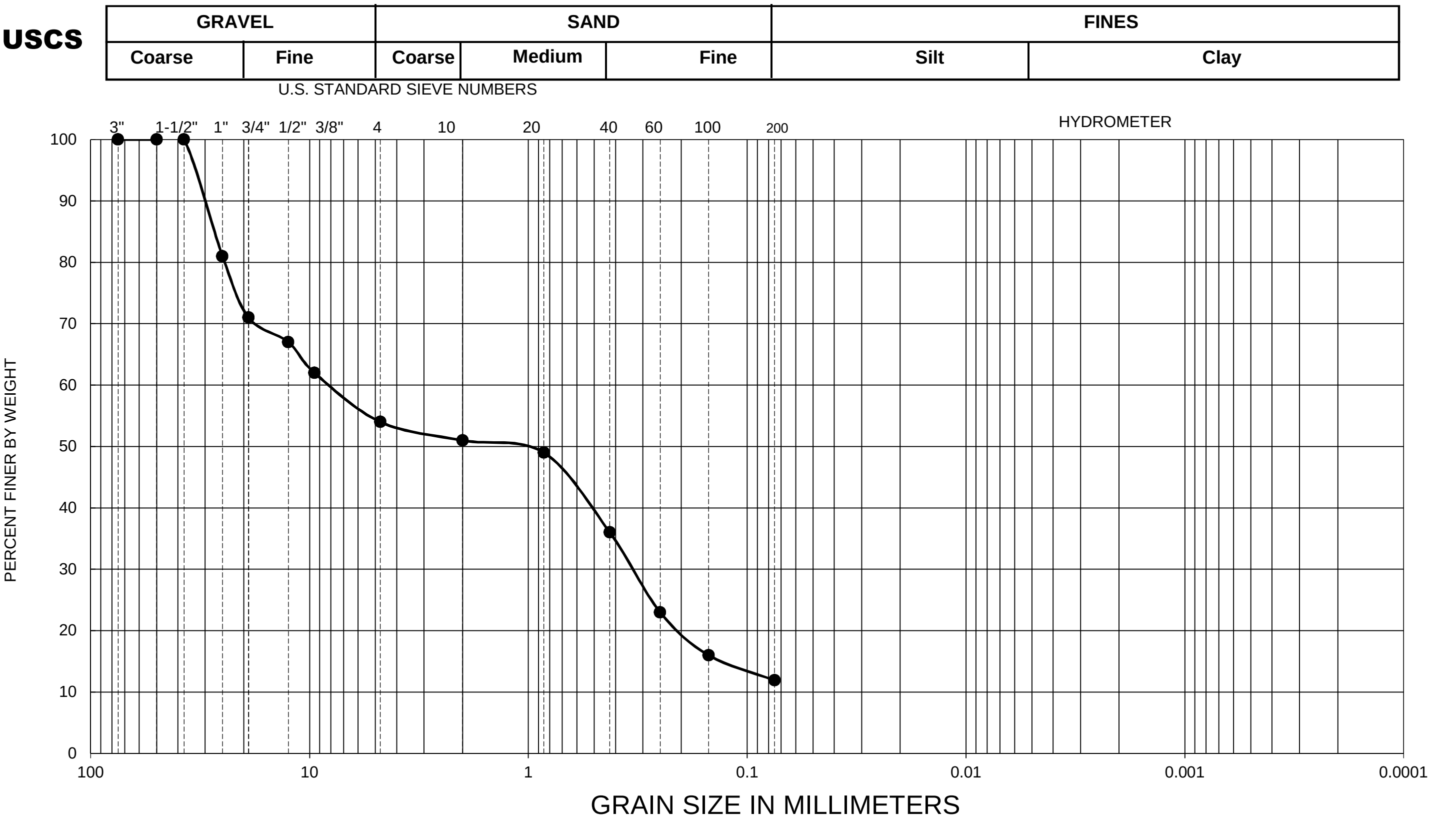
FIGURE

F-18

Date Tested: **3/18/2016**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
LD4	S3	14-14.5	11.9	SP-SC

Sample Description	yellowish brown Poorly graded sand with clay and gravel

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	81
	3/4"	19 mm	71
	1/2"	12.5 mm	67
	3/8"	9.5 mm	62
	No. 4	4.75 mm	54
	No. 10	2.0 mm	51
	No. 20	0.85 mm	49
	No. 40	0.425 mm	36
	No. 60	0.25 mm	23
	No 100	0.15 mm	16
	No 200	.075 mm	11.9

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FIGURE

F-19

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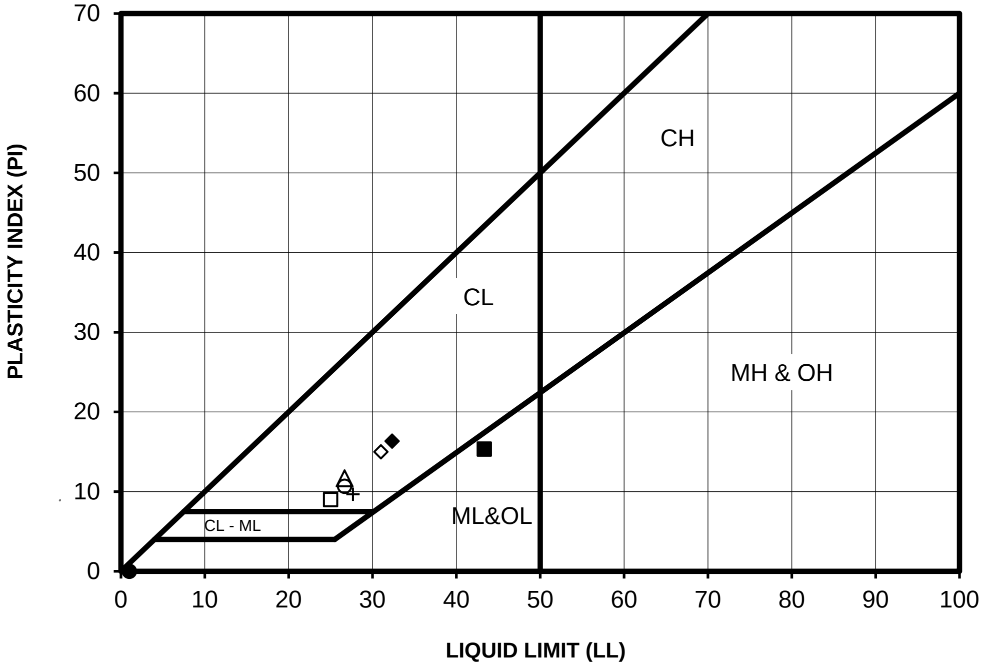
Project No.	20163965	Date:	23-Mar-16

Date Tested : 3/4-14/2016

SYMBOL	SAMPLE NAME	DEPTH (ft)	LL	PL	PI	USCS CLASSIFICATION (Minus No. 40 Sieve Fraction)	USCS (Entire Sample)
●	B1-S3	10-12	NP	NP	NP	ML	SM
■	B1-S5	21	43	28	15	ML	SM
◆	B2-S3	11	32	16	16	CL	SC
○	B2-S5	21	27	16	11	CL	SC
□	B3-S3	10-12	25	16	9	CL	SC
△	B3-S6	26	27	15	12	CL	SC
+	B5-S3	6	28	18	10	CL	CL
◇	B6-S2	8.5	31	16	15	CL	CL



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ATTERBERG LIMITS TEST RESULTS

FIGURE

F-20

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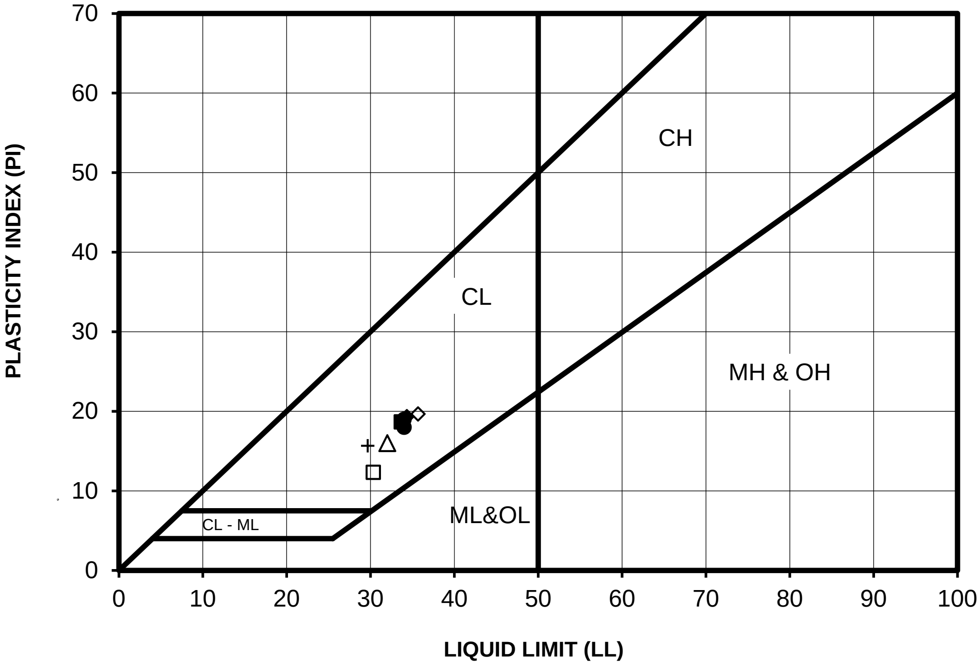
TECH:Uly P.
PROJECT NO: 20163965
23-Mar-16

Date Tested : 3/10-23/2016

SYMBOL	SAMPLE NAME	DEPTH (ft)	LL	PL	PI	USCS CLASSIFICATION (Minus No. 40 Sieve Fraction)	USCS (Entire Sample)
●	B8-S2	6	34	16	18	CL	SC
■	B9-S3	10.5	34	15	19	CL	SC
◆	B10-S2	6	34	15	19	CL	CL
○	B12-S2	6	34	15	19	CL	SC
□	B12-S4	16	30	18	12	CL	SC
△	LD2-S2	11-12.5	32	16	16	CL	SC
+	LD2-S4	18-19	30	14	16	CL	SC
◇	LD3-S4	13-13.5	36	16	20	CL	SC



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

Limitations: Pursuant to applicable codes, the results presented in this report are for the exclusive use of the client and the registered design professional in responsible charge. The results apply only to the samples tested. If changes to the specification were made and not communicated to Kleinfelder, Kleinfelder assumes no responsibility for pass/fail statements (meets/did not meet), if provided. This report may not be reproduced, except in full, without written approval of Kleinfelder.

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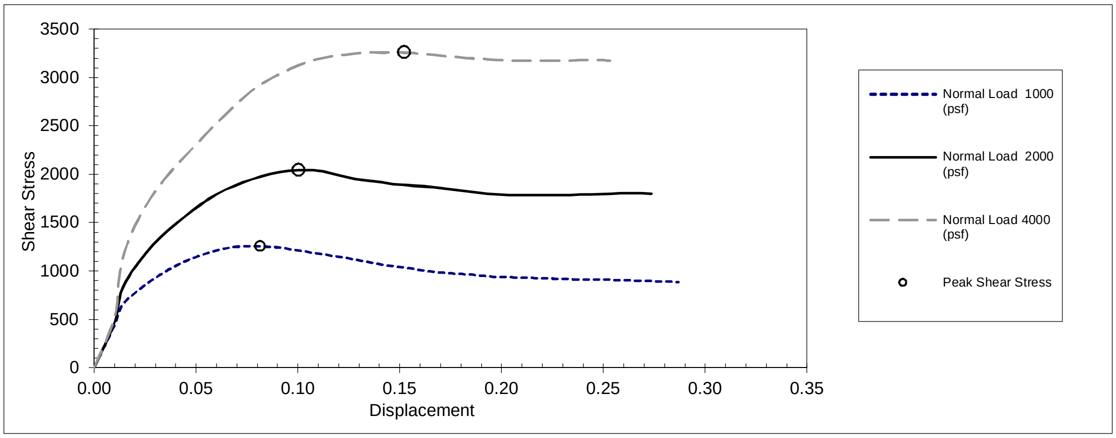
ATTERBERG LIMITS TEST RESULTS

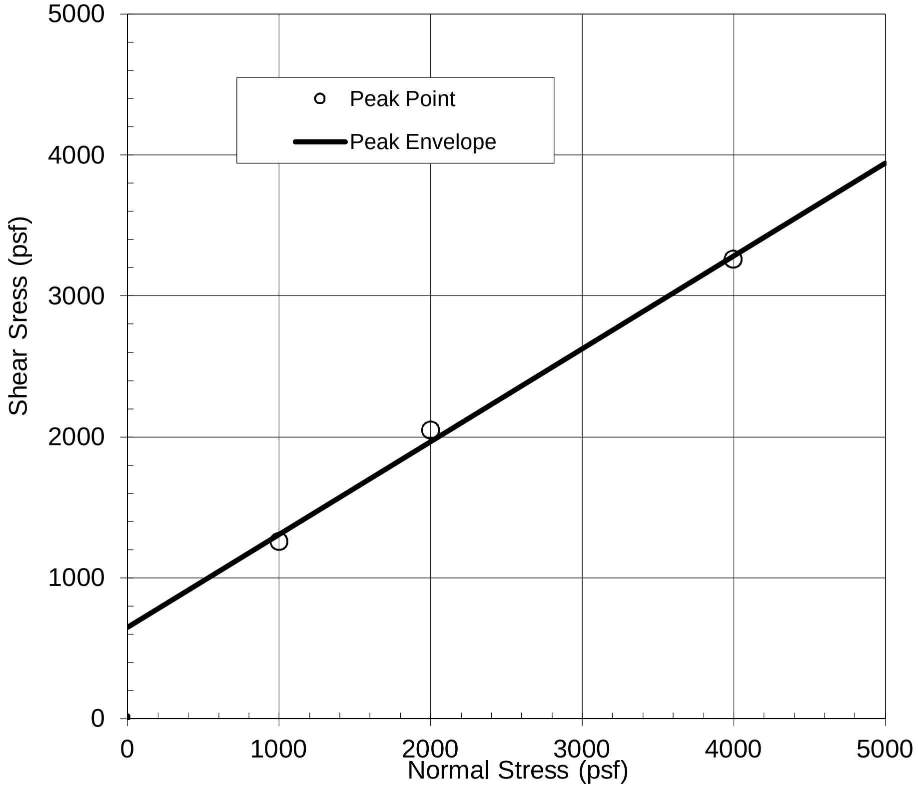
Legacy International Center
San Diego, California

FIGURE

F-21

Checked by: Moi A. | TECH:Uly
PROJECT NO: 20163965 | 23-Mar-16





Strain Rate =	0.00709	inch/min		Shear Strength			
Date Tested:	3/3/2016			Peak			
Boring No.	Sample No.	Depth	UCSC	Cohesion (psf)	Friction Angle (deg)	Moisture Content (%)	Dry Density (pcf)
B6	S2	8.5'	CL	647	33.4	19.6	108.9
Sample description:		dark reddish brown sandy clay					

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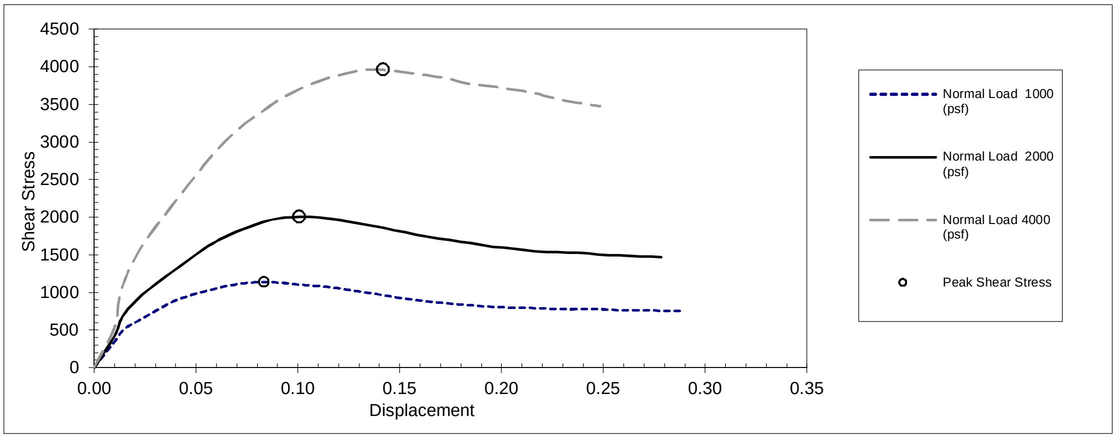
Direct Shear Test Results (ASTM D 3080)

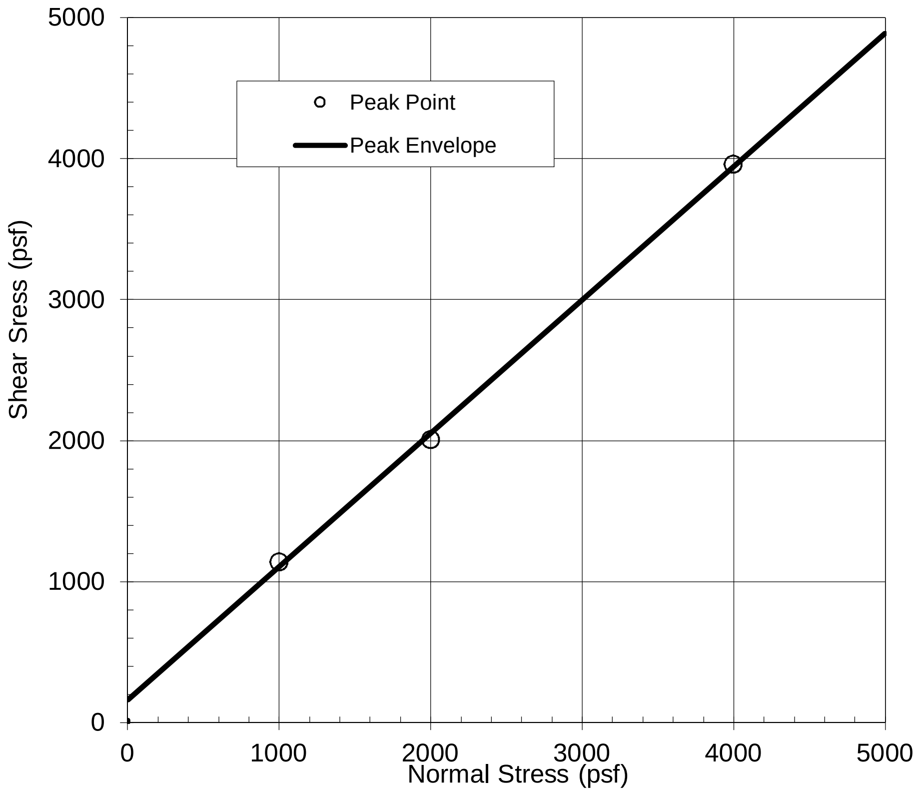
Figure

Legacy International Center
San Diego, California

F-22

Checked By:	Tech : Uly
Project # 20163965	23-Mar-16





Strain Rate =	0.00709	inch/min		Shear Strength			
Date Tested:	3/4/2016			Peak			
Boring No.	Sample No.	Depth	UCSC	Cohesion (psf)	Friction Angle (deg)	Moisture Content (%)	Dry Density (pcf)
B8	S2	6'	SC	160	43.4	15.8	111.9
Sample description:		yellowish brown clayey sand					

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Checked By: Tech : Uly

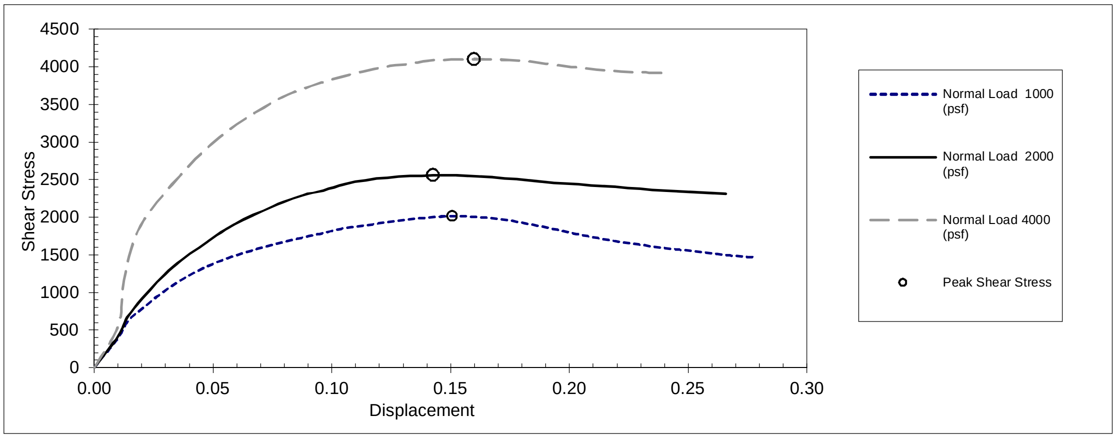
Project # 20163965 23-Mar-16

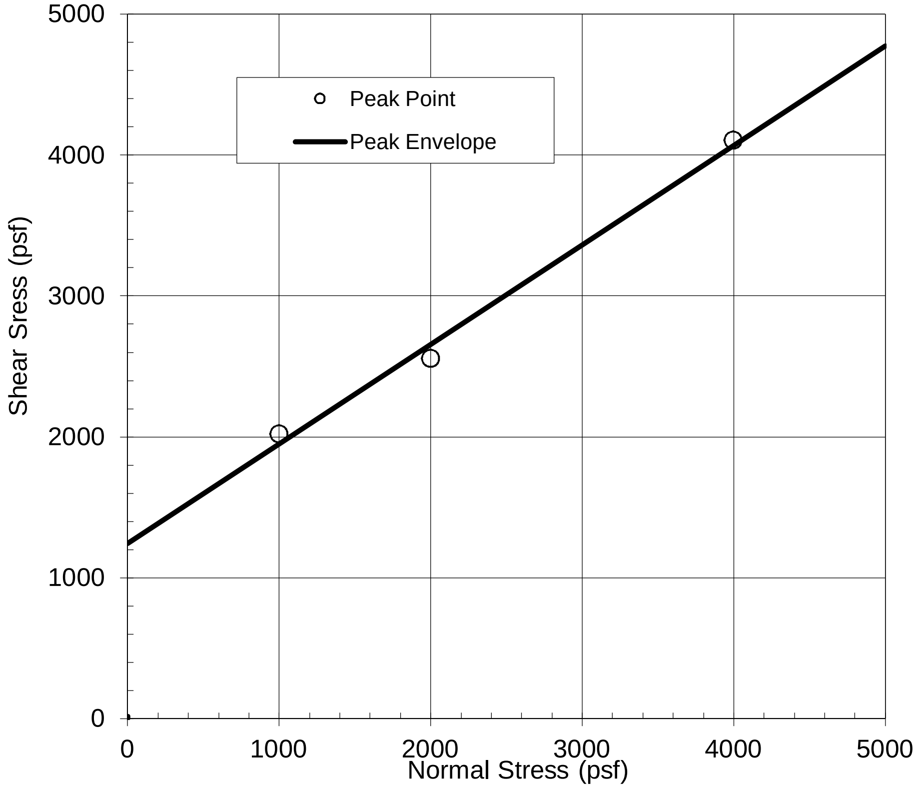
Direct Shear Test Results (ASTM D 3080)

Legacy International Center
San Diego, California

Figure

F-23





Strain Rate =	0.00709	inch/min		Shear Strength			
Date Tested:	3/7/2016			Peak			
Boring No.	Sample No.	Depth	UCSC	Cohesion (psf)	Friction Angle (deg)	Moisture Content (%)	Dry Density (pcf)
B10	S2	6'	CL	1243	35.2	15.7	112.9
Sample description:		yellowish brown sandy clay					

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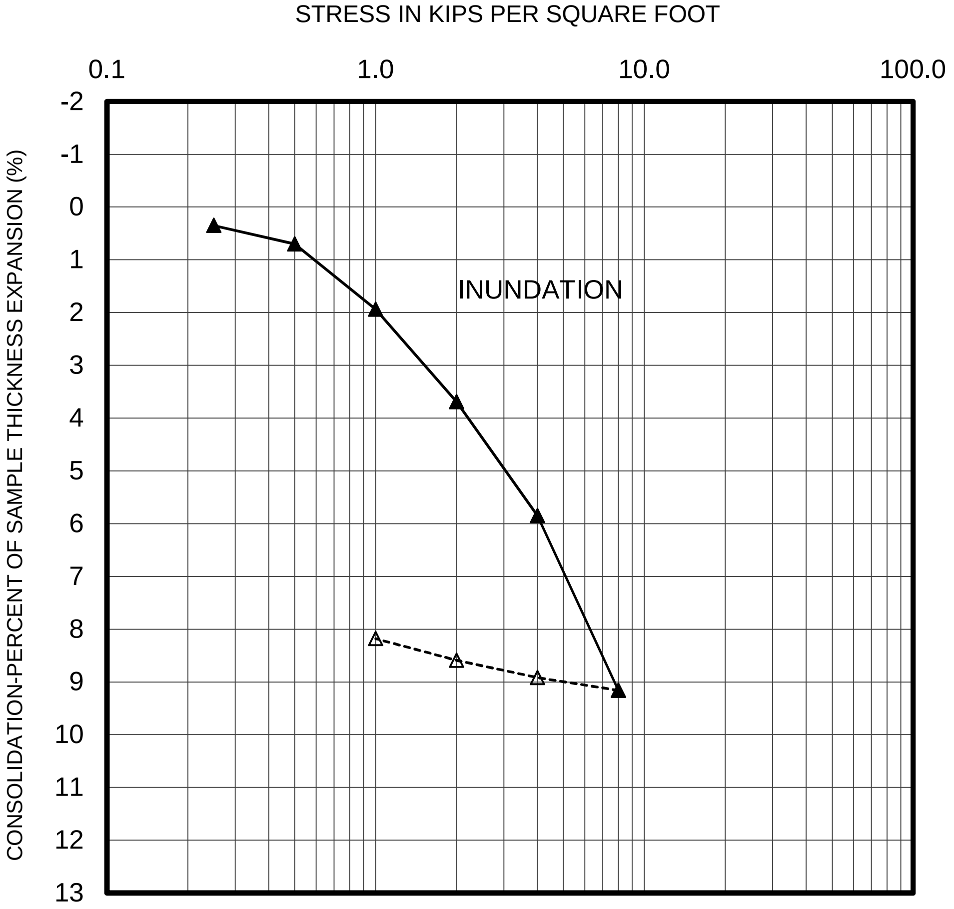
Checked By:	Tech : Uly	**Direct Shear Test Results (ASTM D 3080)**	Figure
Project # 20163965	23-Mar-16	**Legacy International Center San Diego, California**	**F-24**



Moisture Content = 25.5%
Dry Density = 99.5 pcf
Cc' = 10.5%
Cr' = 1%

- - ● - - -	Seating Cycle	**Boring No.**	**B2**
—●—	Loading Prior to Inundation	**Sample No.**	**S5**
—▲—	Loading After Inundation	**Depth**	**21'**
- - △ - - -	Rebound Cycle	**Sample Description**	yellowish brown clayey sand

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

KLEINFELDER
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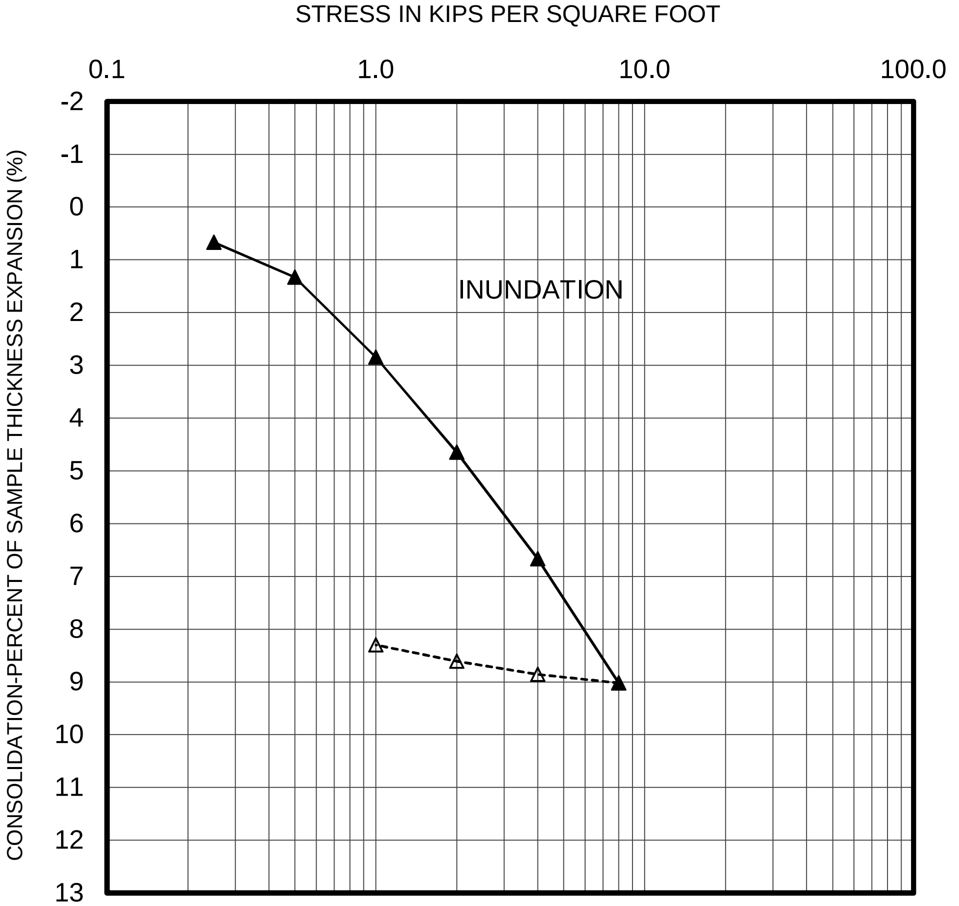
CONSOLIDATION TEST

FIGURE

Legacy International Center
San Diego, California

F-25

Checked by:	Moi A.	Tech	Uly
Project No.	20163965	Date:	3/23/2016



Moisture Content = 22.3%
Dry Density = 105.3 pcf
Cc' = 7.8%
Cr' = 1%

- - ● - - -	Seating Cycle	**Boring No.**	**B3**
—●—	Loading Prior to Inundation	**Sample No.**	**S6**
—▲—	Loading After Inundation	**Depth**	**26'**
- - △ - - -	Rebound Cycle	**Sample Description**	yellowish brown clayey sand

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

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CONSOLIDATION TEST

FIGURE

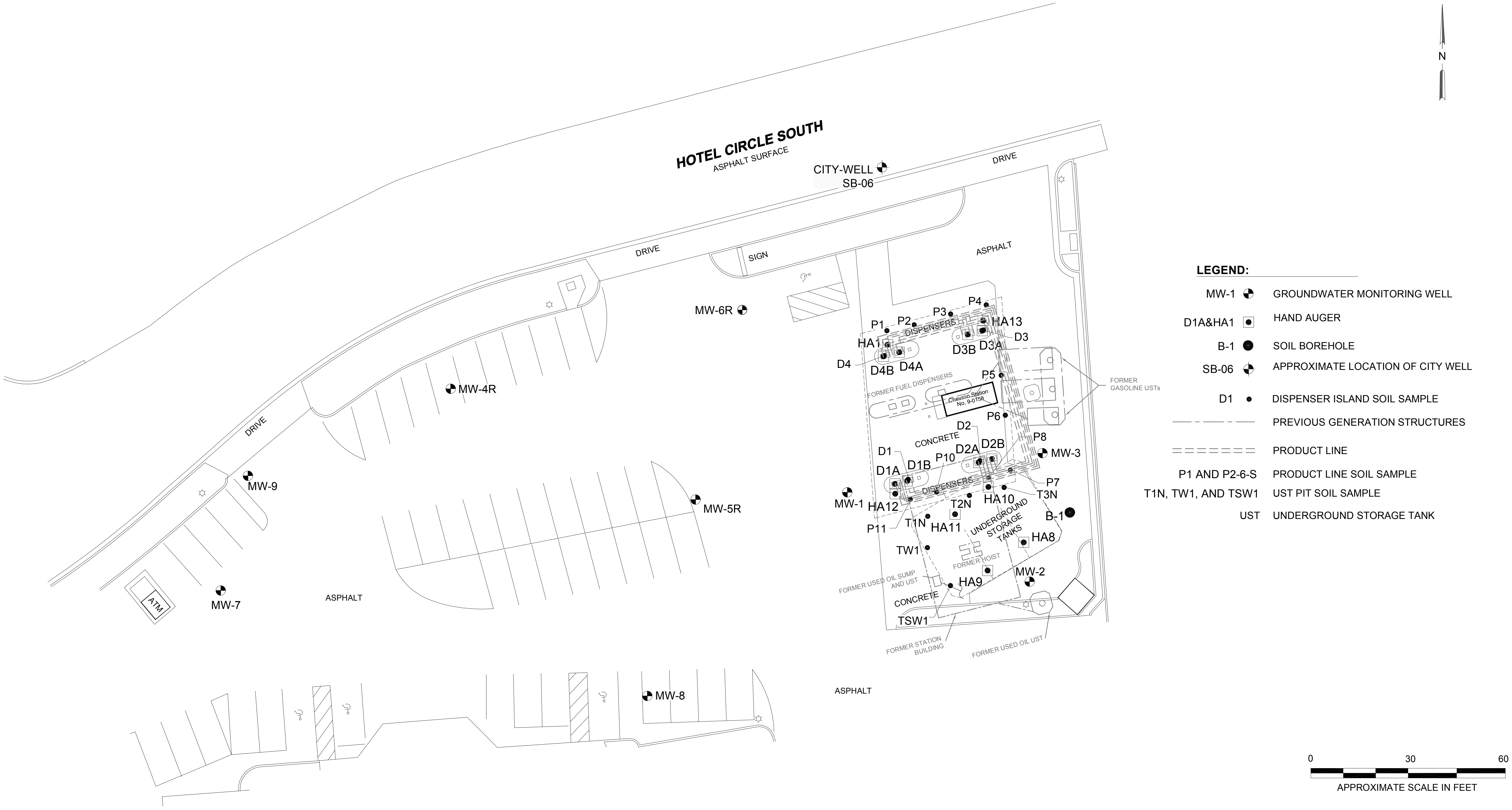
Legacy International Center
San Diego, California

F-26

Checked by:	Moi A.	Tech	Uly
Project No.	20163965	Date:	3/23/2016

APPENDIX E

STANTEC SITE PLAN WITH SAMPLING LOCATIONS



MAP REFERENCE: SOUTHERN CALIFORINA SURVEY, FEBRUARY 21, 2005

Stantec 2655 CAMINO DEL RIO NORTH, SUITE 302 SAN DIEGO, CALIFORNIA PHONE: (619) 296-6195/296-6199 (FAX)	PREPARED FOR: CHEVRON SERVICE STATION No. 9-0158 925 HOTEL CIRCLE SOUTH SAN DIEGO, CALIFORNIA		SITE PLAN WITH SAMPLING LOCATIONS	FIGURE: 2
	JOB NUMBER: 211902234	DRAWN BY: JA	CHECKED BY:	APPROVED BY:	DATE: 05/07/201

FILEPATH:M:\CADD-08\Projects 2010\Chevron\9-0158-2010\Revised CAP\9-0158 2010507 SPSP.dwg|jalonzo|Jun 04, 2010 at 14:31|Layout: SPSP

9-0158 2010507 SP

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January 19, 2017
Project No. 20163965.001A

Mr. Jim Reed, PE, RA, Leed®AP, RPA
Carrier Johnson + Culture
1301 Third Avenue
San Diego, California 92101

Subject: **Addendum No. 1**
Storm Water Infiltration Study
Legacy International Center
Mission Valley Campus
875 Hotel Circle South
San Diego, California

Dear Mr. Reed:

In response to the request of Mr. Chris Morrow of Project Design Consultants, Kleinfelder is pleased to present this addendum to our Strom Water Infiltration Study for proposed Legacy International Center in San Diego, California dated November 17, 2016. This letter should be is subject to the same limitations presented therein.

Attached is a copy of the City's LDR-Geology review comments last dated January 11, 2017 and the requested revised Form I-8 for BMP-3, BMP-7 and BMP-9.

Please call if you have any questions.

Respectfully submitted,

KLEINFELDER

REGISTERED PROFESSIONAL ENGINEER
MOI ARZAMENDI
No. GE 2275
Exp: 6-30-17
GEOTECHNICAL
STATE OF CALIFORNIA

Moi Arzamendi, PE, GE2275
Senior Project Geotechnical Engineer

Cycle Issues DRAFT

THE CITY OF SAN DIEGO
Development Services Department
1222 First Avenue, San Diego, CA 92101-4154

L64A-003B

Project Information

Project Nbr: **332401** **Title:** Legacy International Center
Project Mgr: Dye, Morris (619) 446-5201 mdye@sandiego.gov

Review Information

Cycle Type: 48 LDR-Geology(Submit)
Submitted: 01/03/2017 Deemed Complete on 01/03/2017
Reviewing Discipline: LDR-Geology
Cycle Distributed: 01/03/2017
Reviewer: **Quinn, Jim**
(619) 446-5334
jpquinn@sandiego.gov
Assigned: 01/04/2017
Started: 01/10/2017
Review Due: 01/25/2017
Hours of Review: 0.00
Completed:
Next Review Method: Conditions
Closed:

. The reviewer has indicated they want to review this project again. Reason chosen by the reviewer: New Document Required.
. The reviewer has requested more documents be submitted.
. Your project still has 10 outstanding review issues with LDR-Geology (8 of which are new issues).
. The reviewer has not signed off 1 job.

332401-17 (12/15/2014)

Draft Conditions

Cleared?	Issue Num	Issue Text
☐	15	The Owner/Permittee shall submit a geotechnical investigation report or update letter that specifically addresses the proposed construction plans. The geotechnical investigation report or update letter shall be reviewed for adequacy by the Geology Section of Development Services prior to the issuance of any construction permit. (From Cycle 17)
☐	16	The Owner/Permittee shall submit an as-graded geotechnical report prepared in accordance with the City's "Guidelines for Geotechnical Reports" following completion of the grading. The as-graded geotechnical report shall be reviewed for adequacy by the Geology Section of Development Services prior to grading permit close-out. (From Cycle 17)

332401-48 (1/10/2017)

Submitted Reports

Cleared?	Issue Num	Issue Text
☐	17	Storm Water Infiltration Study, Legacy International Center, Mission Valley Campus, 875 Hotel Circle South, San Diego, California, prepared by Kleinfelder, dated November 17, 2016 (their project no. 20163965.001A) Geotechnical Investigation, Legacy International Center, Mission Valley Campus, 875 Hotel Circle South, San Diego, California, prepared by Kleinfelder, dated April 13, 2016 (their project no. 20163965.001A) (New Issue)

Comments

Cleared?	Issue Num	Issue Text
☐	18	Submit the proposed development plans. (New Issue)
☐	19	Submit an addendum geotechnical report that addresses or provides the following: (New Issue)
☐	20	Revise Appendix C, BMP-3, criteria 5 to indicate testing could not be performed due to the presence of strong hydrocarbon odors at the time of drilling. (New Issue)

Cleared?	Issue Num	Issue Text
☐	21	Revise Appendix C, BMP-7, criteria 5 to indicate calculated infiltration rate based on measurement is 0.268 inch/hour. Reliable infiltration rate (calculated rate/2) is 0.134 inch/hour. (New Issue)
☐	22	Appendix C, BMP-7, criteria 6 indicates yes infiltration in any appreciable quantity could be allowed without increasing risk of geotechnical hazards. However, the summary suggests that infiltration of storm water could increase the risk of geotechnical hazards. Provide a summary response that is not ambiguous. (New Issue)
☐	23	Revise Appendix C, BMP-9, criteria 5 to indicate calculated infiltration rate based on measurement is 0.047 inch/hour. Reliable infiltration rate (calculated rate/2) is 0.023 inch/hour. (New Issue)
☐	24	Appendix C, BMP-9, criteria 6 indicates yes infiltration in any appreciable quantity could be allowed without increasing risk of geotechnical hazards. However, the summary suggests that infiltration of storm water could increase the risk of geotechnical hazards. Provide a summary response that is not ambiguous. (New Issue)

BMP-3

Categorization of Infiltration Feasibility Condition	Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling.

Notwithstanding, the results of other percolation tests in the low lying area adjacent of Hotel Circle South (Borings BMP-1, BMP-2 and BMP-4/6) indicated zero (0) infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to practically impermeable. In this respect, the subsurface materials in the immediate area of BMP-3 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-1 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities (i.e., water, sewer, storm water, gas, electric, fiber optic, telephone and cable), and 3) groundwater mounding due to a very shallow existing groundwater condition. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. It should be recognized that a shallow groundwater table exists throughout the majority of the northern portion of the project site. The normal groundwater level in the northern portion of the site is less than 10 feet below the ground surface. Seasonal high groundwater is expected to be even shallower. Likewise, a potentially hydrocarbon contaminated soil and groundwater condition is believed to have existed (or may still exist) at the northeast corner of the site where a Chevron gas station formerly existed (San Diego Department of Health ID No. H21151-004). Numerous documents prepared by both Stantec and SECOR (2001 through 2005) have identified petroleum hydrocarbon contaminated materials in this area. After a limited site cleanup following a Corrective Action Plan approved by the DEH, a No-Further-Action notice (Case Closure) was issued by the DEH (November 29, 2010) which was contingent on actual land use at that time. However, purposeful infiltration of storm water into an area of potentially contaminated conditions that have a shallow groundwater table is not recommended.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling. See response to Criteria No.1. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling. See response to Criteria No.1. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

BMP-3

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling.

See response to Criteria No.1.

Likewise, a potentially hydrocarbon contaminated soil and groundwater condition is believed to have existed (or may still exist) at the northeast corner of the site where a Chevron gas station formerly existed (San Diego Department of Health ID No. H21151-004). Numerous documents prepared by both Stantec and SECOR (2001 through 2005) have identified petroleum hydrocarbon contaminated materials in this area. After a limited site cleanup following a Corrective Action Plan approved by the DEH, a No-Further-Action notice (Case Closure) was issued by the DEH (November 29, 2010) which was contingent on actual land use at that time. However, purposeful infiltration of storm water into an area of potentially contaminated conditions that have a shallow groundwater table is not recommended.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The planned percolation test in Boring BMP-3 could not be performed due to the presence of strong hydrocarbon odors at the time of drilling.

See response to Criteria No.1.

However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td>If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td colspan="2"></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

BMP-7

Categorization of Infiltration Feasibility Condition			Form I-8
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: See results of percolation test for Boring BMP-7 which indicated less than 0.5 inches per hour infiltration rate due to the presence alluvial soils consisting of lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D). These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to very poor. In this respect, the subsurface materials in the immediate area of BMP-7 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-7 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

BMP-7

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City Engineer to substantiate findings

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: The results of percolation testing in Boring BMP-7 indicated a calculated infiltration rate of 0.268 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.134 inch per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The results of percolation testing in Boring BMP-7 indicated a calculated infiltration rate of 0.268 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.134 inch per hour. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures. Likewise, wetting of fill soils is highly not recommended due to the potential of induced ground settlement. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

BMP-7

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-7 indicated a calculated infiltration rate of 0.268 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.134 inch per hour.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
The results of percolation testing in Boring BMP-7 indicated a calculated infiltration rate of 0.268 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.134 inch per hour.
However, it does not appear that storm water infiltration would likely cause a violation of down stream water rights.
This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.
If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td></td></tr>
</table>

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BMP-9

<table>
<tr><td colspan="3">Categorization of Infiltration Feasibility Condition</td><td colspan="2">Form I-8</td></tr>
<tr><td colspan="5">Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td colspan="2">Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>1</td><td colspan="2">Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td></td><td>X</td></tr>
<tr><td colspan="5">Provide basis:
See results of percolation test for Boring BMP-9 which indicated less than 0.5 inches per hour infiltration rate due to the presence alluvial soils consisting of clayey SAND (SC) and lean CLAY (CL). USDA Soil Survey Maps (attached at the end of this Appendix) erroneously indicate fine sandy loam in the project area ad should not be used to evaluate actual site conditions. Correlations with other actual on-site subsurface explorations and laboratory test results by both Kleinfelder (2016) and Geocon (2013) indicated very low permeability near-surface fine-grain soils (see Appendix D).

These reports include numerous subsurface field explorations (small and large diameters boreholes and cone penetrometer tests) and laboratory test results which extensively characterize the site conditions with respect to encountered subsurface materials and anticipated ground behavior. Qualitatively, these materials may be considered to have drainage characteristics that are considered poor to very poor. In this respect, the subsurface materials in the immediate area of BMP-9 are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>2</td><td colspan="2">Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td></td><td>X</td></tr>
<tr><td colspan="5">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour based the results of percolation testing in Boring BMP-9 and other cited substantiative existing information. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
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<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
As stated in Criteria 1 above, the on-site materials are likely to have an "estimated reliable infiltration rate" less than 0.5 inches per hour. Notwithstanding, it is unlikely that potential water balance issues such as seasonality of ephemeral streams of increased discharge of contaminated groundwater to surface waters will occur.

This is not a geotechnical criterion and should be completed by the Storm Water Quality Management Plan (SWQMP) preparer or other qualified professional.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td></td></tr>
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Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: The results of percolation testing in Boring BMP-9 indicated a calculated infiltration rate of 0.047 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.023 inch per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: The results of percolation testing in Boring BMP-9 indicated a calculated infiltration rate of 0.047 inches per hour. A reliable infiltration rate (calculated rate / 2) is 0.023 inch per hour. Notwithstanding, a rigorous and thorough review of the proposed site grading plans and geotechnical investigation report (Kleinfelder, 2016) for the project indicates that there does exist the possibility of "increasing risk of geotechnical hazards" such as: 1) expansive soils, 2) affected buried utilities and 3) buried structures. Likewise, wetting of fill soils is highly not recommended due to the potential of induced ground settlement. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

BMP-9

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<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
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