Green Book, 2012. Standard Specifications for Public Works Construction

LADPW, 2006. Manual for Preparation of Geotechnical Reports, County of Los Angeles, Department of Public Works, July 2010.

Seed, H.B. and Robert V. Whitman, 1970. "Design of Earth Retaining Structures for Dynamic Loads," State-of-the-art paper presented at the 1970 American Society of Civil Engineers (ASCE) Specialty Conference on Lateral Stresses in the Ground and Design of Earth-Retaining Structures, June 22-24, 1970, Cornell University, Ithaca, New York.

United State Geologic Survey (USGS), 2008a. Preliminary version of the "2008 NSHMP PSHA Interactive Deaggregation" website, *at:* http://eqint.cr.usgs.gov/deaggint/2008/index.php

United States Geological Survey (USGS), 2008b, Ground Motion Parameter Calculator, *Available for download at:* http://earthquake.usgs.gov/hazards/designmaps/javacalc.php

Willdan Geotechnical, 2004. Final Structural Foundation Report, Geotechnical Investigation, Improvements to the Kanan Road Interchange, City of Agoura Hills, California, December 17, 2004.

Appendix A. Log of Test Borings (LOTB)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	LA		NA	1	8

ROSS KHIABANI — REGISTERED CIVIL ENGINEER — 6/24/2013 DATE

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL CIVIL ENGINEER — STATE OF CALIFORNIA — CIVIL

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

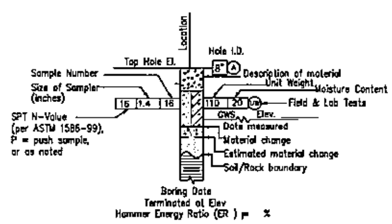
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
	A	Auger Boring
	R P	Rotary drilled boring Rotary percussion boring (air)
	R	Rotary drilled diamond core
	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778-95)
□	O	Other

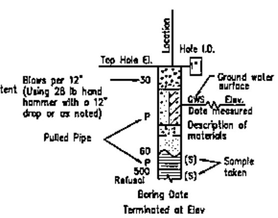
Note: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

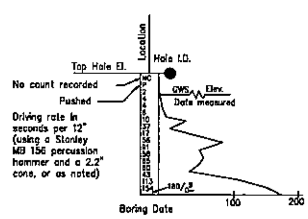
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	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 can be formed without crumbling when drier than the plastic limit.



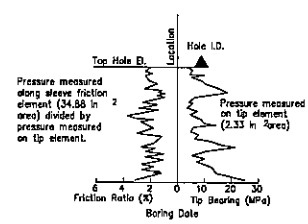
AUGER BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 53C-0290	SOIL LEGEND
PREPARED BY:	PREPARED BY: SM		WILLDAN GEOTECHNICAL	POST MILE NA	LOG OF TEST BORINGS
CHECKED BY:	CHECKED BY: RK				

CU
EA

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

SHEET 1 OF 8

FILE => $REQUEST

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
06	LA		NA	2	6

ROSS KHIABANI — REGISTERED CIVIL ENGINEER — 6/24/2013 DATE

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — ROSS KHIABANI — No. [illegible] — Exp. [illegible] — CIVIL — STATE OF CALIFORNIA

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PP) Pocket Penetrometer
- (W) Passing # 200 (ASTM D 1140-00)
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166); Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 4767)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 inches)
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Description	Criteria
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

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

ENGINEERING SERVICES	GEOTECHNICAL SERVICES
PREPARED BY:	PREPARED BY: SM
CHECKED BY:	CHECKED BY: RK

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN

WILLDAN GEOTECHNICAL

53C-0280

NA

SOIL LEGEND

LOG OF TEST BORINGS

CU

EA

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

0 1 2 3

STANDARD PRINTS BEARING EARLIER REVISION DATES

SHEET 2 OF 6

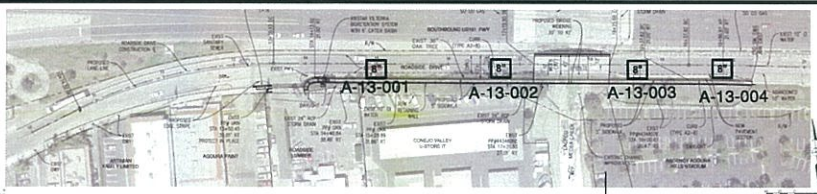
FILE => $REQUEST

BENCH MARK

LACBM No. 10004 (MALIBU QUAD)
ELEV= 877.40 (NAVD '00, 2008ADJ.)
NW COR KANAN RD & AGOURA RD.

BASIS OF BEARINGS

CALIFORNIA STATE PLANE ZONE 5, NAD83 (2007 EPOCH)



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
06	LA			3	6

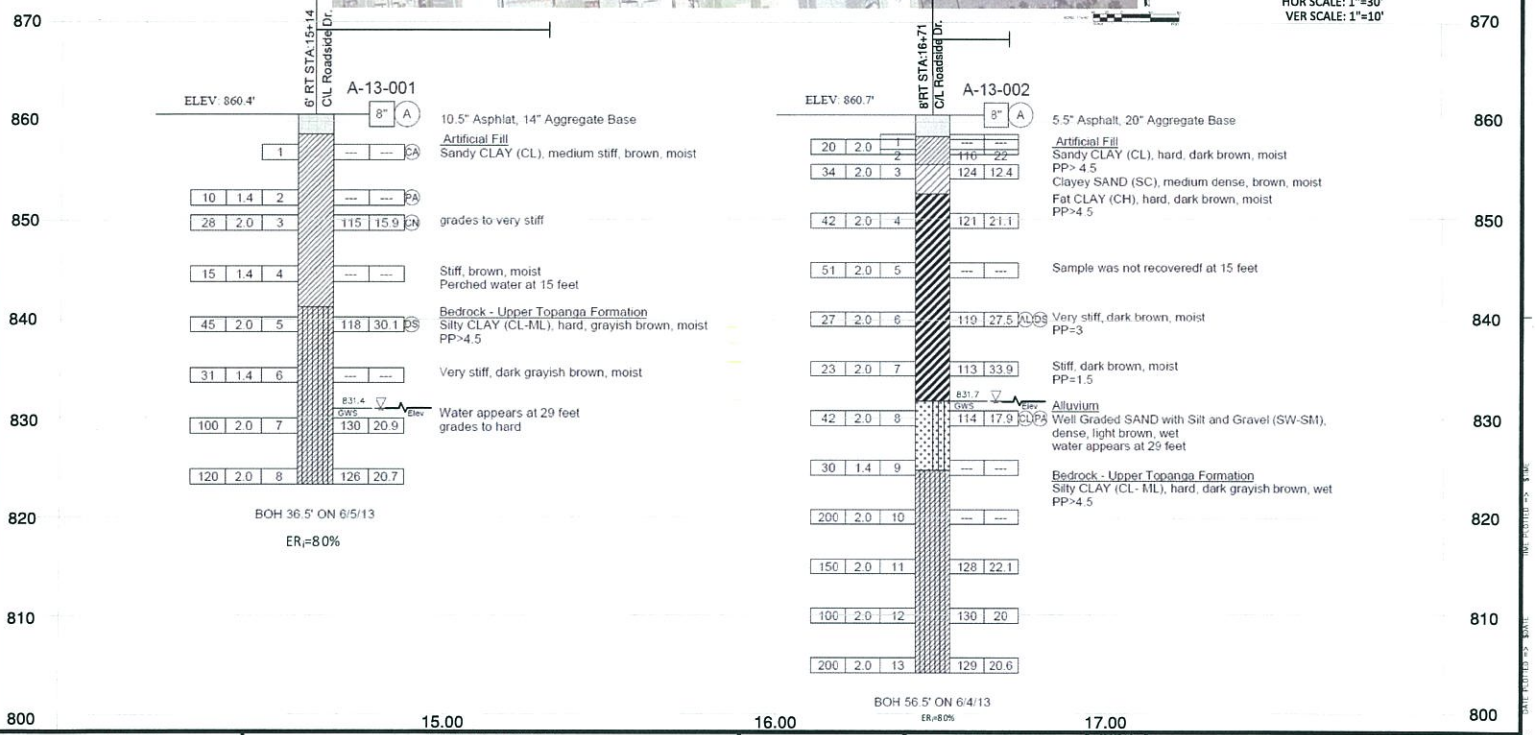
ROSS KHABANI
REGISTERED CIVIL ENGINEER — 6/24/13 DATE

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — ROSS KHABANI — No. C37158 — Exp. 6/30/14 — CIVIL — STATE OF CALIFORNIA

HOR SCALE: 1"=30'
VER SCALE: 1"=10'



ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 53C-0290	Roadside Drive Bridge Widening
FUNCTIONAL SUPERVISOR	DRAWN BY: SM	FIELD INVESTIGATION BY:			POST MILES	LOG OF TEST BORINGS
NAME:	CHECKED BY: RK	SM		WILLDAN GEOTECHINCAL	NA	
005 CIVIL LOG OF TEST BORINGS SHEET	ORIGINAL SCALE IN INCHES FOR REDUCED PLANS: 0 1 2 3		CU ——— EA ———	DISREGARD PRINTS BEARING EARLIER REVISION DATES	REVISION DATES	SHEET 3 OF 6

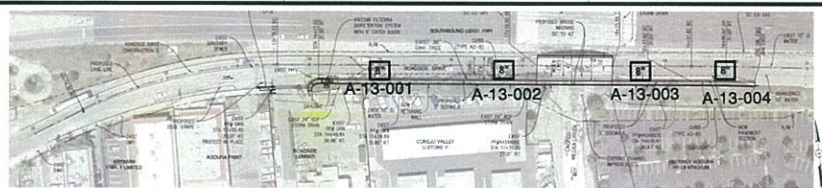
FILE => $REQUEST

BENCH MARK

LACBM No. 10004 (MALIBU QUAD)
ELEV= 877.40 (NAVD 'DD, 2008ADJ)
NW COR KANAN RD & AGOURA RD.

BASIS OF BEARINGS

CALIFORNIA STATE PLANE ZONE 5, NAD88 (2007 EPOCH)



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
06	LA			4	6

ROSS KHIABANI — REGISTERED CIVIL ENGINEER — DATE 8/24/13

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — ROSS KHIABANI — No. C37156 — Exp. 6/30/14 — CIVIL — STATE OF CALIFORNIA

HOR SCALE: 1"=30'
VER SCALE: 1"=10'

A-13-003

5' RT STA:18+57 C/L Roadside Dr.

ELEV. 861.4' — 8" (A)

						7.5" Asphalt, 22" Aggregate Base
		1	---	---	(EI)(R)	Artificial Fill Sandy CLAY (CL), medium stiff, brown, moist
8	1.4	2	---	---		
33	2.0	3	123	24		grades to very stiff PP=2
22	2.0	4	107	23.9		PP=2.5 Silty SAND(SM), medium dense, dark gray, moist
38	2.0	5	113	16.6	(W)	
35	2.0	6	123	19.9	(PA)	Alluvium Well Graded SAND with Silt and Gravel (SW-SM), medium dense, dark brown, moist Water appears at 28 feet No recovery at 30 feet
44	2.0	7	---	---		
200	2.0	8	130	23	(PA)(DS)	Bedrock - Upper Topanga Formation Silty CLAY (CL-ML), hard, dark brown, wet PP>4.5
200	2.0	9	131	23	(AL)	
300	2.0	10	130	20.2	(PA)	
100	2.0	11	129	21.9		
100	2.0	12	---	---		

833.4 GWS — Elev

BOH 56.5' ON 6/5/13
ER=80%

A-13-004

5'RT STA:19+36 C/L Roadside Dr.

ELEV. 861.8' — 8" (A)

						6.5" Asphalt, 18" Aggregate Base
		1	---	---	(CP)	Artificial Fill Sandy CLAY (CL), stiff, brown, moist
23	2.0	2	127	31.5		
19	2.0	3	128	24.8		
21	2.0	4	119	29.1		
52	2.0	5	121	12.1	(PA)	Alluvium Silty SAND with Gravel (SM), dense, brown, moist 4 rings recovered
23	2.0	6	128	23	(W)	Silty SAND (SM), medium dense, grayish brown, moist
54	2.0	7	94	29		Bedrock - UpperTopanga Formation Silty CLAY (CL-ML), hard, brown, moist PP>4.5
100	2.0	8	129	23	(DS)	Hard, dark gray, moist

BOH 36.5' ON 6/4/13
ER=80%

Elevations: 870, 860, 850, 840, 830, 820, 810, 800

Stations: 18.00, 19.00, 20.00

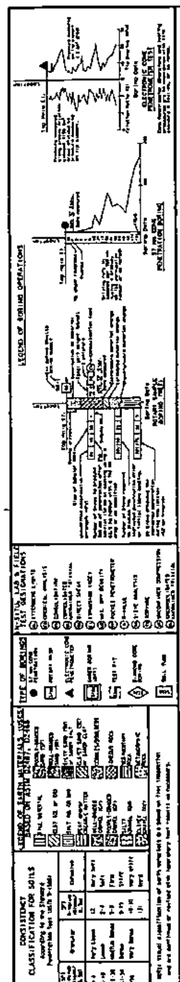
ER=80%

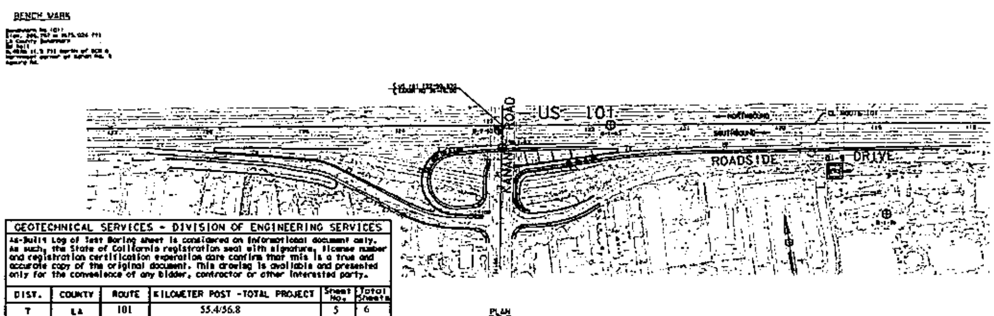
ENGINEERING SERVICES	GEOTECHNICAL SERVICES		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 53C-0290	Roadside Drive Bridge Widening
FUNCTIONAL SUPERVISOR	DRAWN BY: SM	FIELD INVESTIGATION BY: SM		WILLDAN GEOTECHINCAL	POST MILES NA	LOG OF TEST BORINGS
NAME:	CHECKED BY: RK					

GDS CIVIL LOG OF TEST BORINGS SHEET — ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3 — CU — EA — DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES — SHEET 4 OF 6

FILE => $REQUEST

USERNAME => $USER — DATE PLOTTED => $DATE — TIME PLOTTED => $TIME





DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
7	LA	101	55.4/56.8		

12/17/04
GEOTECHNICAL PROFESSIONAL

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

ARROYO GEOTECHNICAL
13200 Brooks Drive Unit B
Baldwin Park, CA. 91706

CITY OF AGOURA HILLS
30001 Ladyface Court
Agoura Hills, CA. 91310

GEOTECHNICAL SERVICES - DIVISION OF ENGINEERING SERVICES

As-Built Log of Test Boring sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certification experation date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

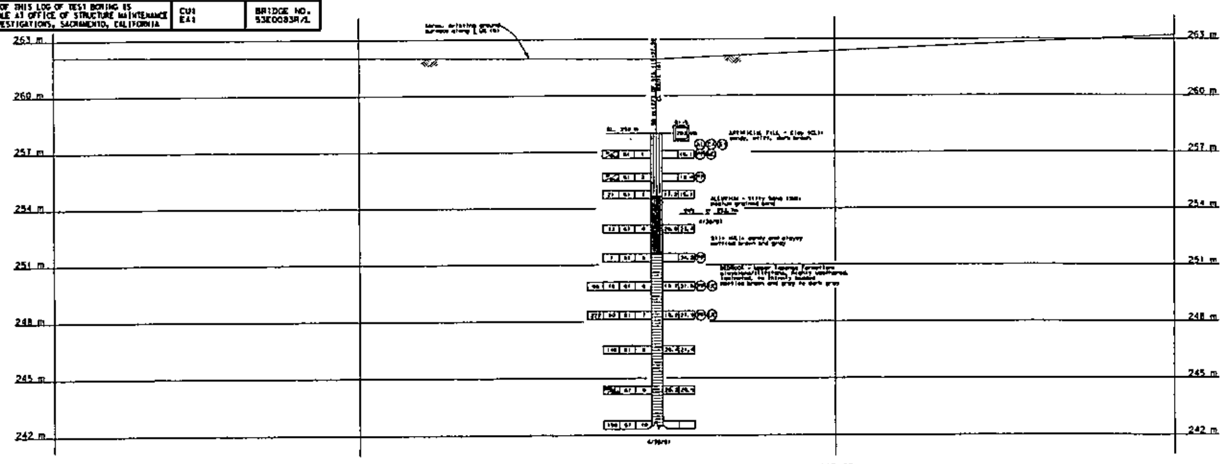
DIST.	COUNTY	ROUTE	KILOMETER POST -TOTAL PROJECT	Sheet No.	Total Sheets
7	LA	101	55.4/56.8	5	6

Ross Khiabani — 6/24/2013
REGISTERED CIVIL ENGINEER — DATE

Medea Creek Bridge Widening

LOG OF TEST BORINGS

NOTE: A COPY OF THIS LOG OF TEST BORING IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA | CU: EA: | BRIDGE NO. 53E0083R/L



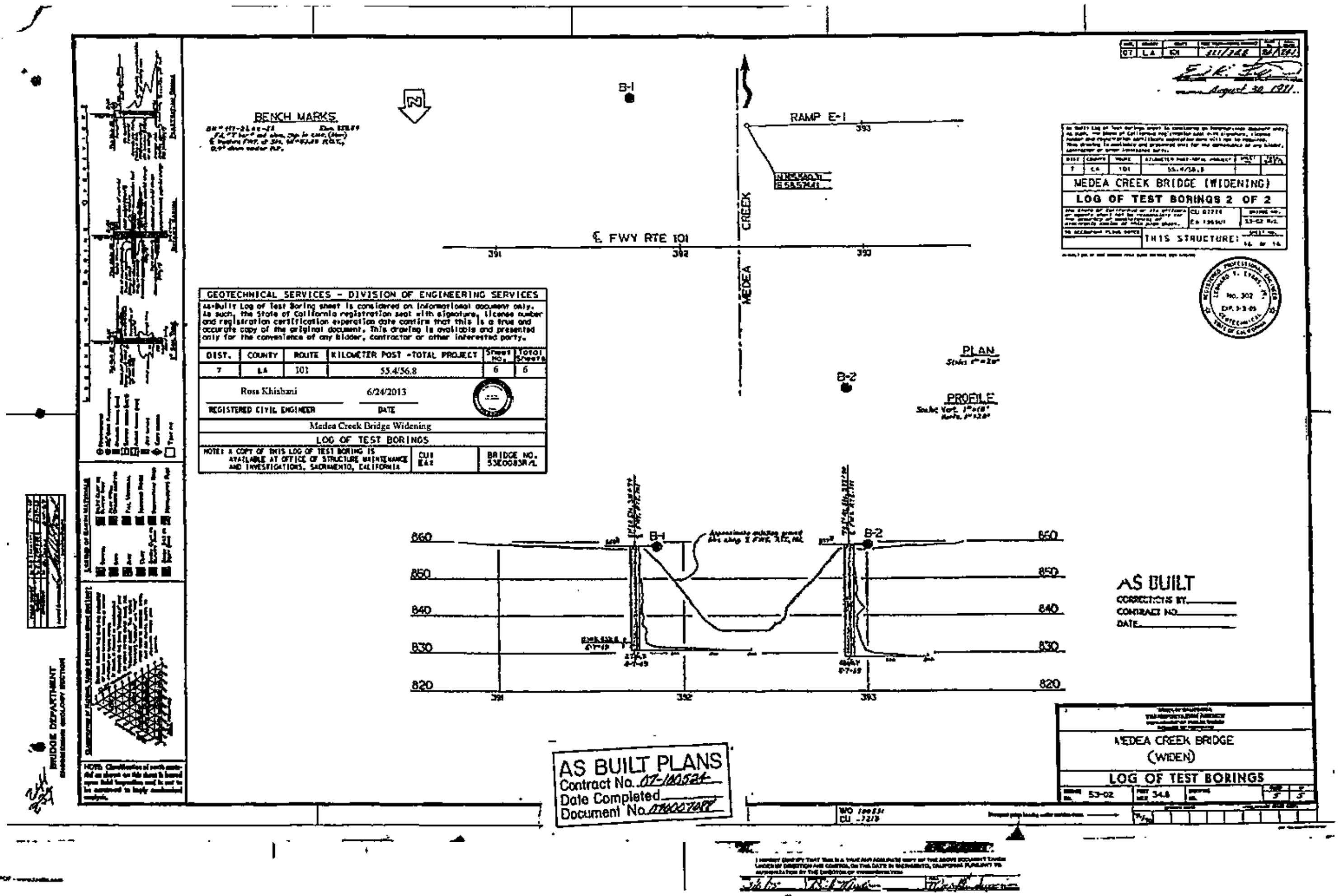
DESIGN OVERSIGHT	DRAWN BY	LORRAINE MUTO	LORRAINE MUTO FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	PETER L. LIU PROJECT ENGINEER
SIGN OFF DATE	CHECKED BY	LEONARD T. EVANS Jr.	DATE: 4-30-01		

BRIDGE NO. 53-02 R/L
KILOMETER POST 55.9

MEDEA CREEK BRIDGE (WIDENING)
LOG OF TEST BORINGS 3 OF 3

CU 07274
EA 1965U1

14 | 16



GEOTECHNICAL SERVICES - DIVISION OF ENGINEERING SERVICES

As-Built Log of Test Boring sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certification experation date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	KILOMETER POST -TOTAL PROJECT	Sheet No.	Total Sheets
7	LA	101	55.4/56.8	6	6

Ross Khiabani — REGISTERED CIVIL ENGINEER

6/24/2013 — DATE

Medea Creek Bridge Widening

LOG OF TEST BORINGS

NOTE: A COPY OF THIS LOG OF TEST BORING IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

CU: EA:

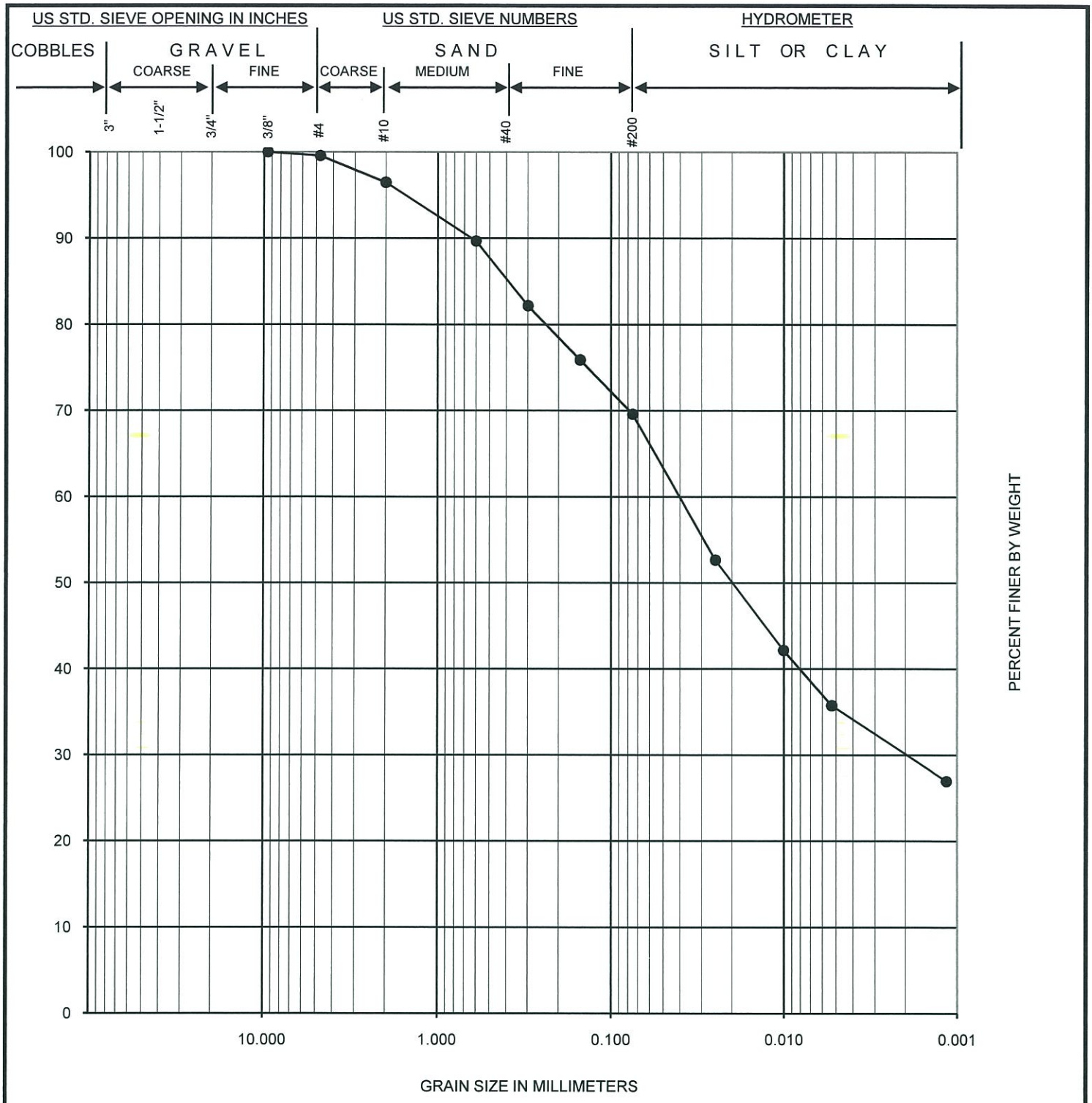
BRIDGE NO. 53E0083R/L

Appendix B. Laboratory Test Results

TABLE B-1 -- SUMMARY OF LABORATORY TEST RESULTS

Roadside Drive Bridge Widening, Los Angeles, California

Boring No.	Depth (ft)	USCS Soil Description	Gradation (ASTM D422) (% Gravel : Sand : Fines)	Atterberg Limits (ASTM D4318)		Expansion Index (ASTM D 4829)	Direct Shear (ASTM D3080 / CT-236)				Collapse Potential I_c (ASTM D5333)	Consolidation (ASTM D2435)			Compaction Test (CT-216)		R-Value (CT-301)	Corrosivity (CT-412, 417, 643)			
				Liquid Limit	Plasticity Index		Peak		Ultimate						Max Density (pcf)	Opt. Moisture (%)		pH	Soluble Sulfates (ppm)	Soluble Chlorides (ppm)	Minimum Resistivity (ohm-cm)
							c (psf)	ϕ (degrees)	c (psf)	ϕ (degrees)		P_c (ksf)	C_c	C_r							
A-13-001	3 to 8	Sandy CLAY (CL)																7.7	4800	240	674
	7.5	Sandy CLAY (CL)	0:30:70																		
	10	Sandy CLAY (CL)										2.1	0.0332	0.0122							
	20.0	Silty CLAY (CL-ML)					260	27	150	22											
A-13-002	20	Fat CLAY (CH)		63	44		1070	16	640	20											
	30.0	Well Graded SAND with Silt and Gravel (SW-SM)	27:62:11								0.08										
A-13-003	3 to 8	Sandy CLAY (CL)				62											6				
	20	Silty SAND (SM)	0:62:38																		
	25	Silty SAND (SM)	7:74:19																		
	36	Silty CLAY (CL-ML)					1490	26	450	32											
	40	Silty CLAY (CL-ML)		45	27																
	45	Silty CLAY (CL-ML)	0:13:87																		
A-13-004	3.0	Sandy CLAY (CL)													114	14.5					
	20	Silty SAND with Gravel (SM)	10:59:31																		
	25	Silty SAND(SM)	0:82:18																		
	35	Silty CLAY (CL-ML)					620	25	120	29											

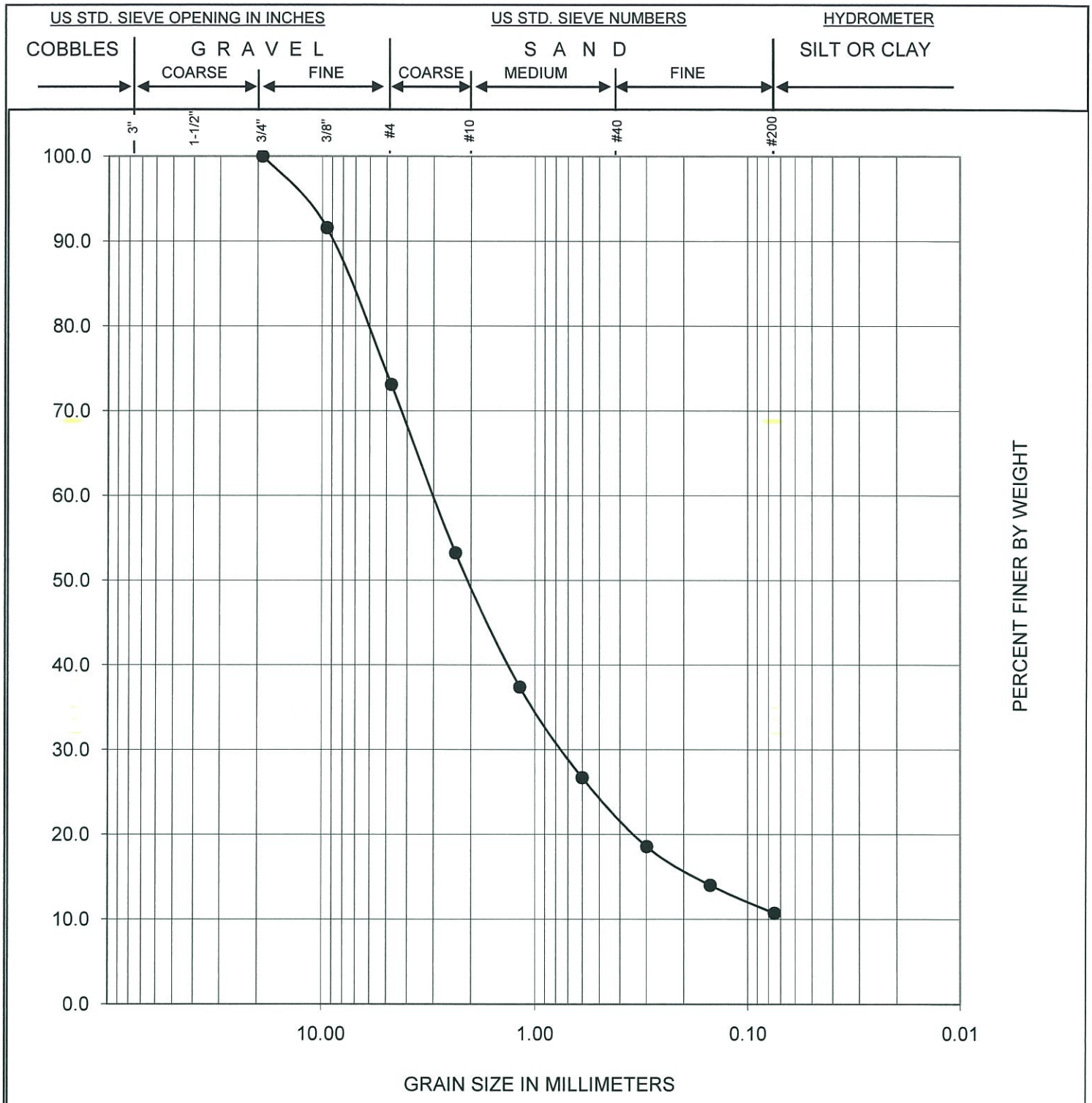


SAMPLE NO.	DEPTH	SYMBOL	CLASSIFICATION	NAT.W%	LL	PL	PI
A-13-001	7.5'	CL	DK. GRAYISH BROWN SANDY CLAY				

GRAIN SIZE ANALYSIS

WILLDAN Geotechnical *extending your reach*

Roadside Drive Bridge Widening | **Project No. 101480-2000** | **6/21/2013**



Project No. : 101480-4000

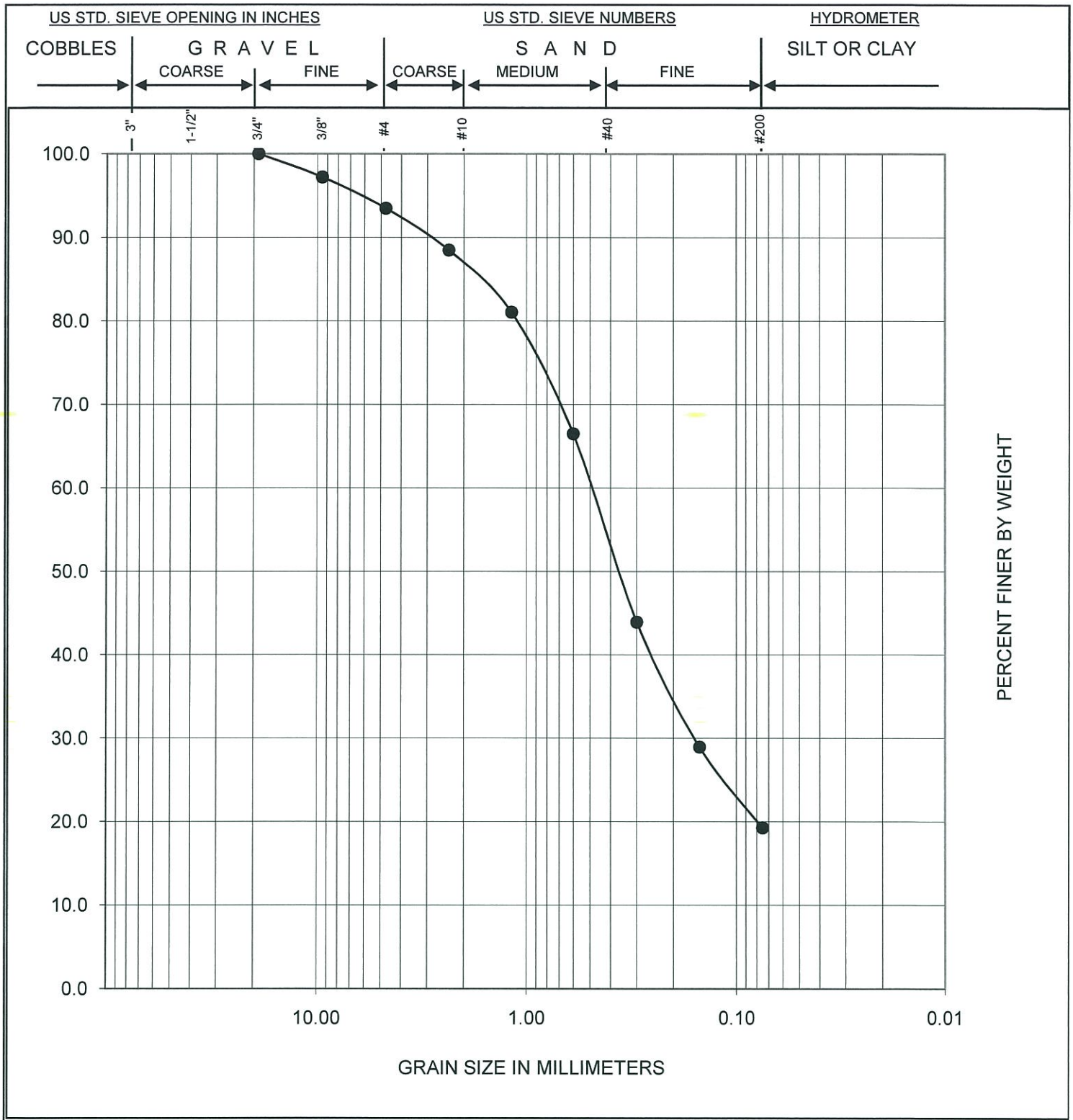
Project Name : ROADSIDE DRIVE BRIDGE

Boring No.	Sample No.	Depth	Symbol	Classification	Nat.W %	LL	PL	PI
A-13-002	R-7	30'	SW-SM	LT. BROWN WELL GRADED SAND WITH SILT & GRAVEL		-	-	-

GRAIN SIZE CURVE

WILLDAN Geotechnical

extending your reach



Project No. : 101480-4000

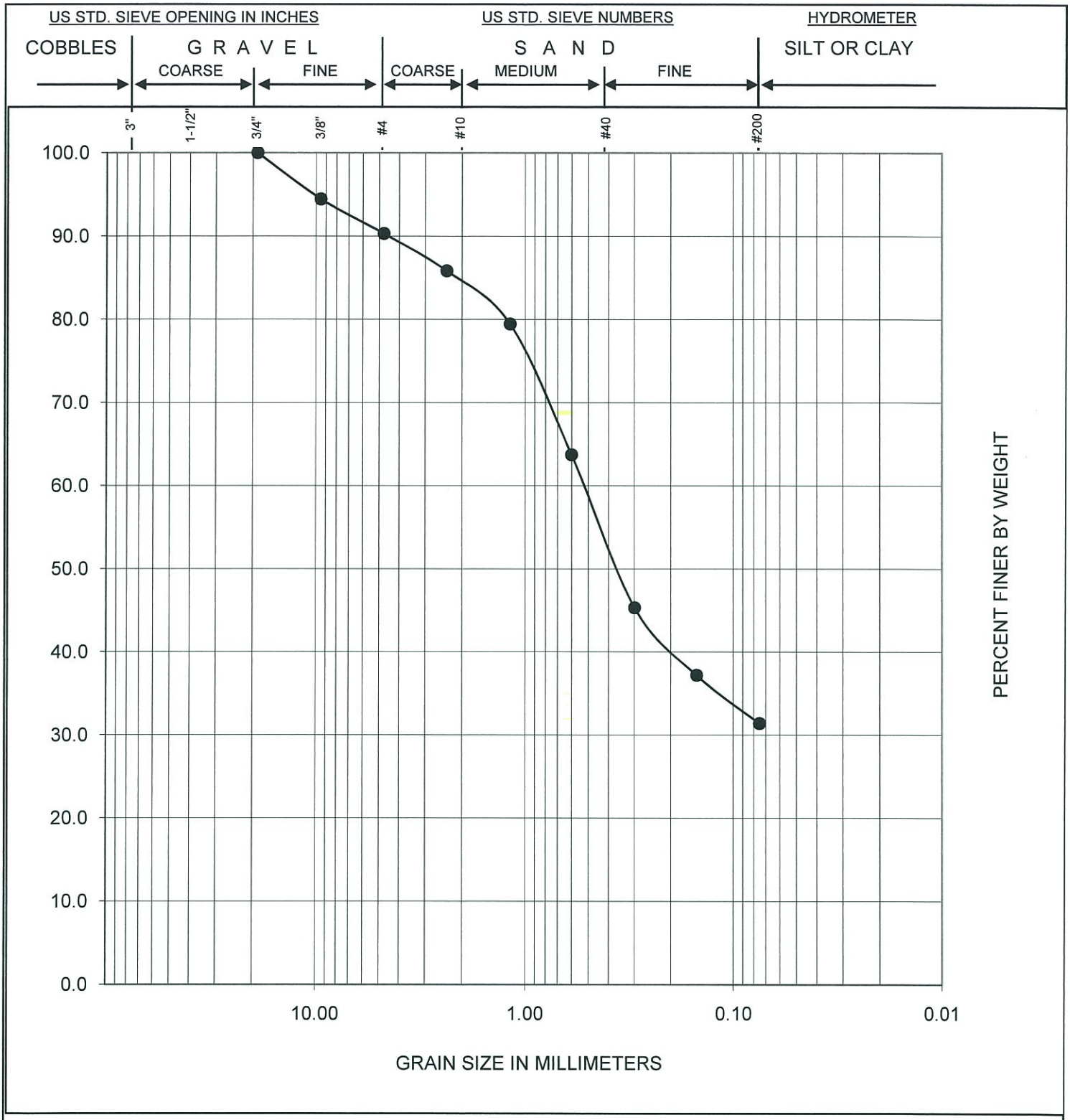
Project Name : ROADSIDE DRIVE BRIDGE

Boring No.	Sample No.	Depth	Symbol	Classification	Nat.W %	LL	PL	PI
A-13-003	R-5	25' - 26.5'	SM	DK. BROWN SILTY SAND		-	-	-

GRAIN SIZE CURVE

WILLDAN Geotechnical

extending your reach



Project No. : 101480-4000

Project Name : ROADSIDE DRIVE BRIDGE

Boring No.	Sample No.	Depth	Symbol	Classification	Nat.W %	LL	PL	PI
A-13-004	R-4	20'	SM	BROWN SILTY SAND WITH GRAVEL		-	-	-

GRAIN SIZE CURVE

WILLDAN Geotechnical

extending your reach

PROJECT NAME : ROADSIDE DRIVE BRIDGE PROJECT NO : 101480-4000

BORING NO. : A-13-002 SAMPLE NO./DEPTH : R-5 / 20' TESTED BY : RMC DATE: 17-Jun-13

SAMPLE DESCRIPTIONS/CLASSIFICATION : LT. BROWN FAT CLAY (CH)

PLASTIC LIMIT

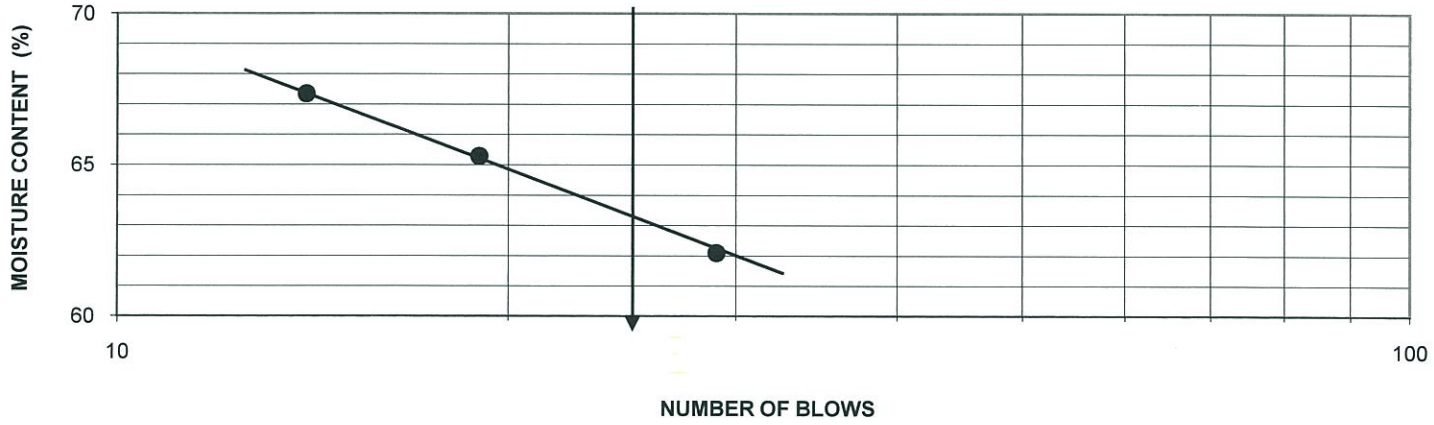
DETERMINATION NO.		1	2
DISH NO.		8	
MASS, DISH + WET SOIL	(g)	36.39	
MASS, DISH + DRY SOIL	(g)	33.76	
MASS OF WATER	(g)	2.63	
MASS OF DISH	(g)	20.21	
MASS OF DRY SOIL	(g)	13.55	
MOISTURE CONTENT	(%)	19.4	

LIQUID LIMIT

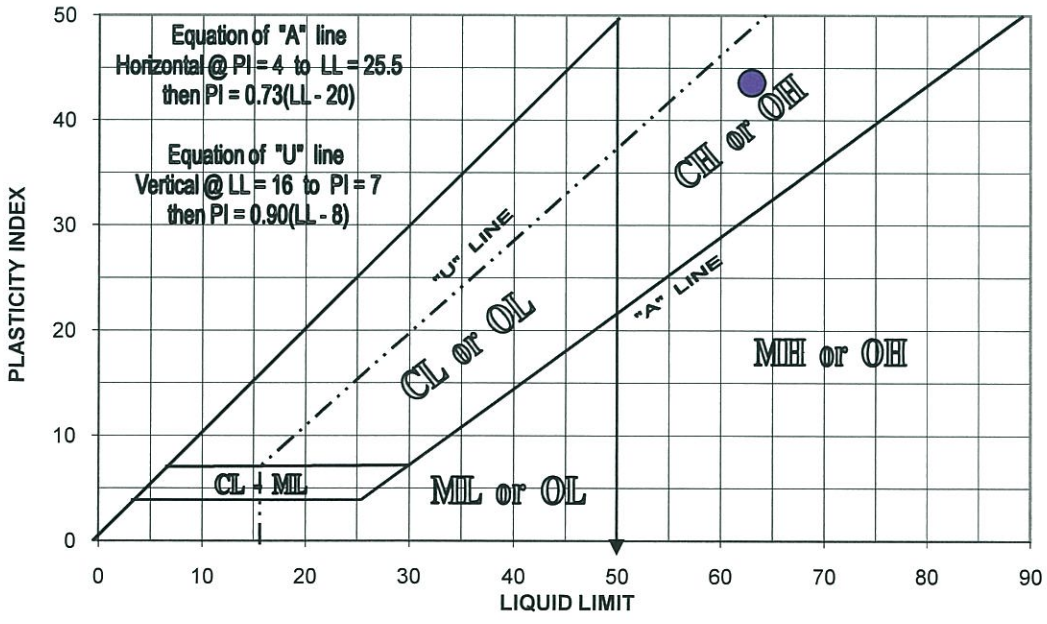
DETERMINATION NO.		1	2	3
DISH NUMBER		2	17	1
MASS, DISH + WET SOIL	(g)	39.11	38.41	36.12
MASS, DISH + DRY SOIL	(g)	35.77	32.45	30.78
MASS OF WATER	(g)	3.34	5.96	5.34
MASS OF DISH	(g)	30.39	23.32	22.85
MOISTURE CONTENT	(%)	62.1	65.3	67.3
NUMBER OF BLOWS		29	19	14

NATURAL MOISTURE CONTENT,%

FLOW CURVE



PLASTICITY CHART



RESULT SUMMARY

NATURAL MOISTURE CONTENT, (%)	
LIQUID LIMIT (LL)	63
PLASTIC LIMIT (PL)	19
PLASTICITY INDEX (PI)	44
SYMBOL FROM PLASTICITY CHART	CL

METHOD OF PREPARATION		METHOD OF LL DETERMINATION	
DRY	X	MULTIPOINT	X
WET		ONE-POINT	

REMARKS :

ATTERBERG LIMITS

(ASTM D4318)

WILLDAN Geotechnical extending your reach

PROJECT NAME : ROADSIDE DRIVE BRIDGE PROJECT NO : 101480-4000

BORING NO. : A-13-003 SAMPLE NO./DEPTH : R-8 / 40' TESTED BY : RMC DATE: 17-Jun-13

SAMPLE DESCRIPTIONS/CLASSIFICATION : DK. GRAYISH BROWN LEAN CLAY (CL)

PLASTIC LIMIT

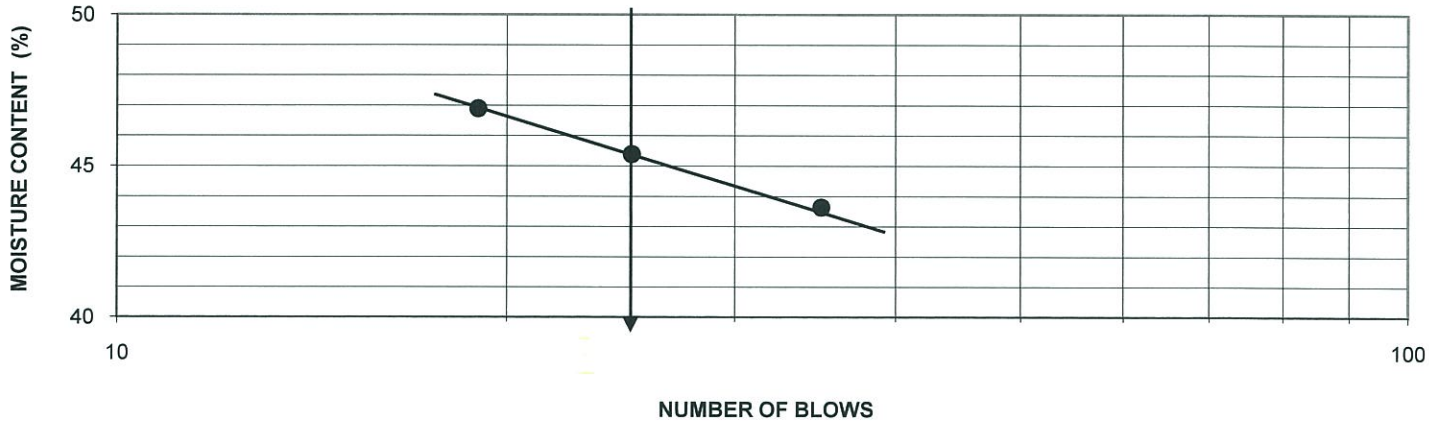
DETERMINATION NO.		1	2
DISH NO.		18	
MASS, DISH + WET SOIL	(g)	33.49	
MASS, DISH + DRY SOIL	(g)	31.42	
MASS OF WATER	(g)	2.07	
MASS OF DISH	(g)	20.21	
MASS OF DRY SOIL	(g)	11.21	
MOISTURE CONTENT	(%)	18.5	

LIQUID LIMIT

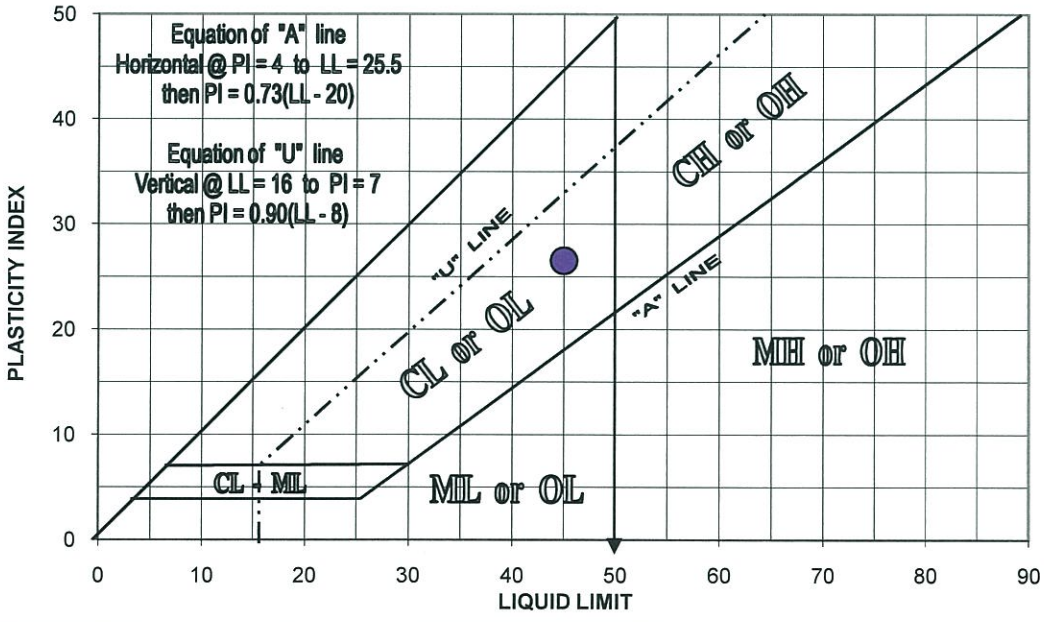
DETERMINATION NO.		1	2	3
DISH NUMBER		13	17	22
MASS, DISH + WET SOIL	(g)	34.07	35.03	32.60
MASS, DISH + DRY SOIL	(g)	31.26	32.52	29.74
MASS OF WATER	(g)	2.81	2.51	2.86
MASS OF DISH	(g)	24.82	26.99	23.64
MOISTURE CONTENT	(%)	43.6	45.4	46.9
NUMBER OF BLOWS		35	25	19

NATURAL MOISTURE CONTENT,%

FLOW CURVE



PLASTICITY CHART



RESULT SUMMARY

NATURAL MOISTURE CONTENT, (%)	
LIQUID LIMIT (LL)	45
PLASTIC LIMIT (PL)	18
PLASTICITY INDEX (PI)	27
SYMBOL FROM PLASTICITY CHART	CL

METHOD OF PREPARATION		METHOD OF LL DETERMINATION	
DRY	X	MULTIPOINT	X
WET		ONE-POINT	

REMARKS :

ATTERBERG LIMITS

(ASTM D4318)

WILLDAN Geotechnical — extending your reach

JOB NAME :	Roadside Bridge Widening ph.3	JOB NUMBER:	101480-4000
SAMPLE NUMBER :	A-13-004	TESTED BY :	MR
SAMPLE DEPTH	3' to 8'	DATE :	13-Jun-13
SAMPLE DESCRIPTIONS / CLASSIFICATION :	Brown Sandy Clay (CL)		

TEST STANDARD	ASTM D 698 - 07			**ASTM D 1557- 07**		
METHOD	A	B	-	A	B	**C**
TRIAL NUMBER	1	2	3	4	5	
WATER ADDED, (ml)	-2%	0%	2%	4%		
WT. OF SOIL + MOLD, (g)	3849.4	3980.5	4018	3907.5		
WT.OF MOLD, (g)	2045	2045	2045	2045		
WT. OF WET SOIL, (g)	1804.4	1935.5	1973	1862.5		
WET DENSITY, (pcf)	119.5	128.1	130.6	123.3		
CAN NUMBER	A48	A133	A139	A135		
WET SOIL + TARE, (g)	510.80	395.20	774.70	779.00		
DRY SOIL + TARE, (g)	471.60	361.60	679.30	667.50		
TARE, (g)	102.70	103.80	96.20	96.00		
DRY SOIL, (g)	368.90	257.80	583.10	571.50		
WATER, (g)	39.20	33.60	95.40	111.50		
MOISTURE CONTENT, (%)	10.6	13.0	16.4	19.5		
DRY DENSITY, (pcf)	108.0	113.4	112.3	103.2		

DIAMETER OF MOLD : 4 in.

VOLUME OF MOLD : 0.0333 $ft.^3$

SCALPED ON SIEVE SIZE / NO. : No.4

PERCENT RETAINED, (%) : <1.0

MAXIMUM DRY DENSITY : 114.0 pcf.

OPT. MOISTURE CONTENT : 14.5 %

FOR OVERSIZE CORRECTION (ASTM D4718):

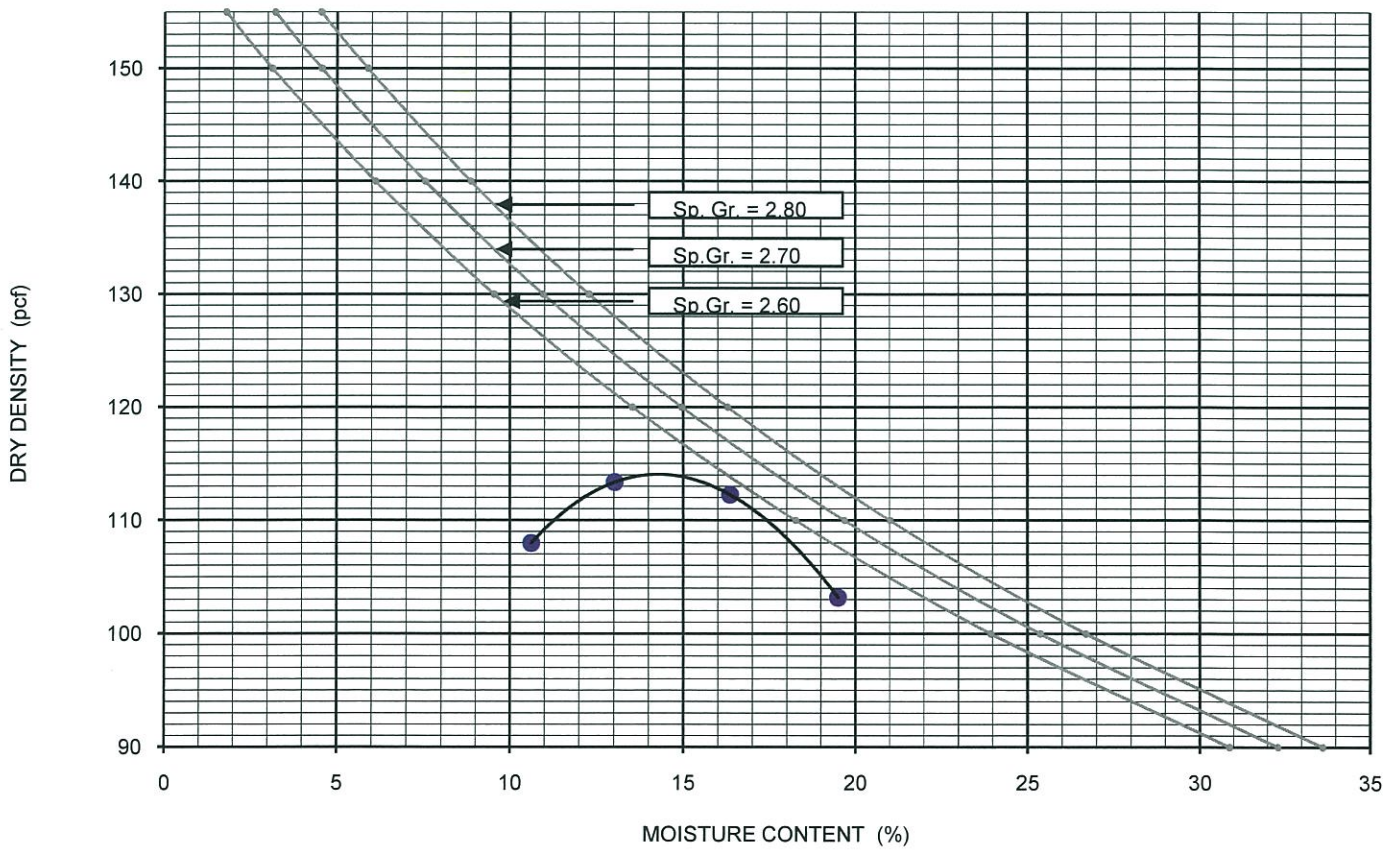
%,Finer Fraction,(P_f) = - % Moisture = 0.0

%,Oversize Fraction,(P_c) = <1.0 Assumed S.G. = 2.64

Corrected MDD of Total Materials, (pcf) = -

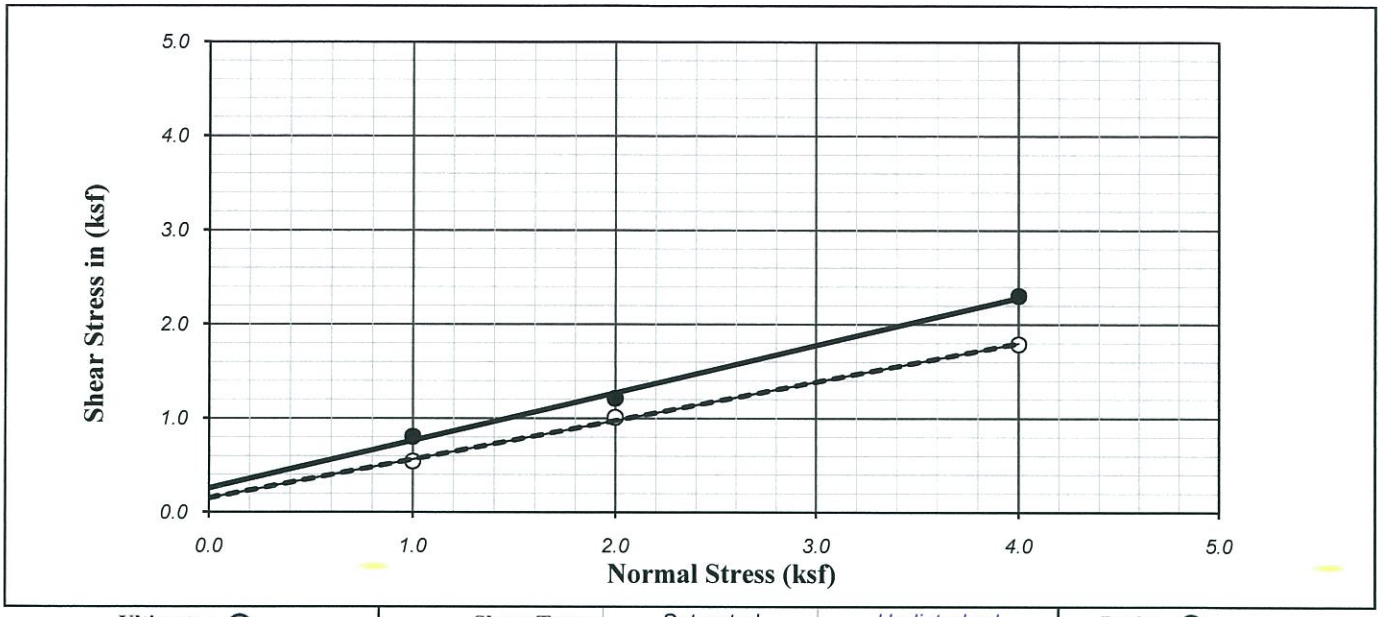
Corrected OMC of Total Materials, (%) = -

Remarks :

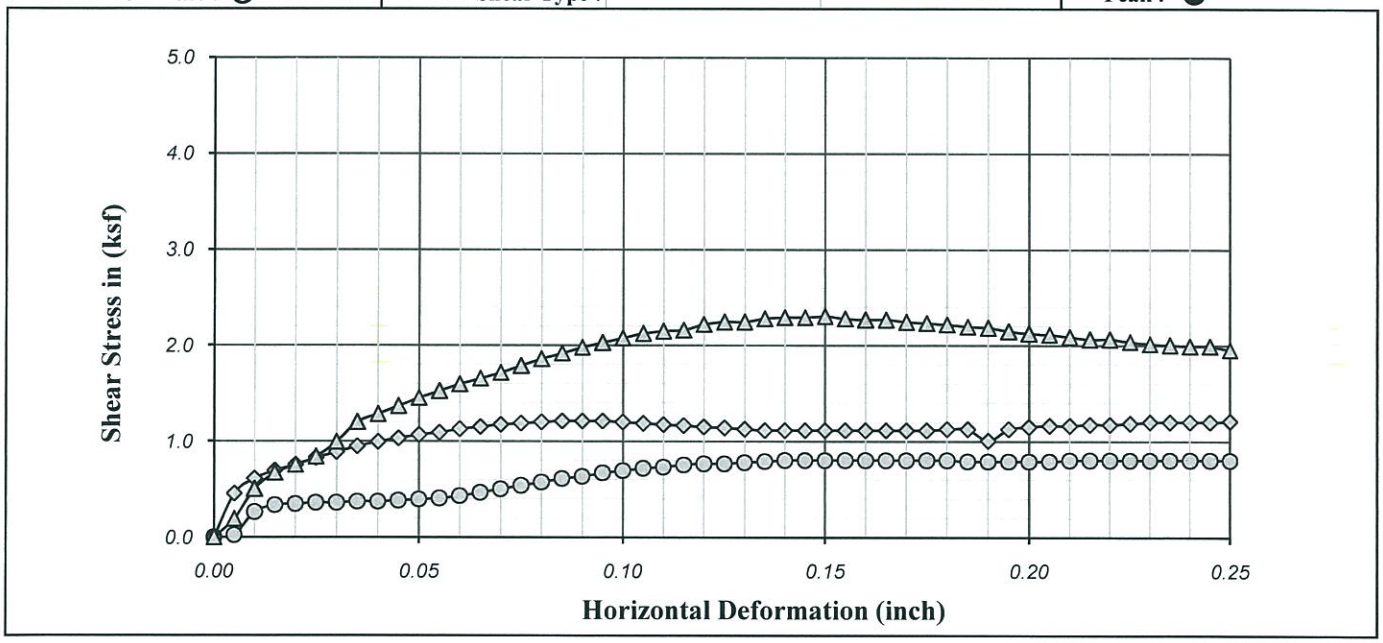


COMPACTION TEST

WILLDAN Geotechnical — extending your reach



Ultimate : ○	Shear Type :	Saturated	*Undisturbed*	Peak : ●



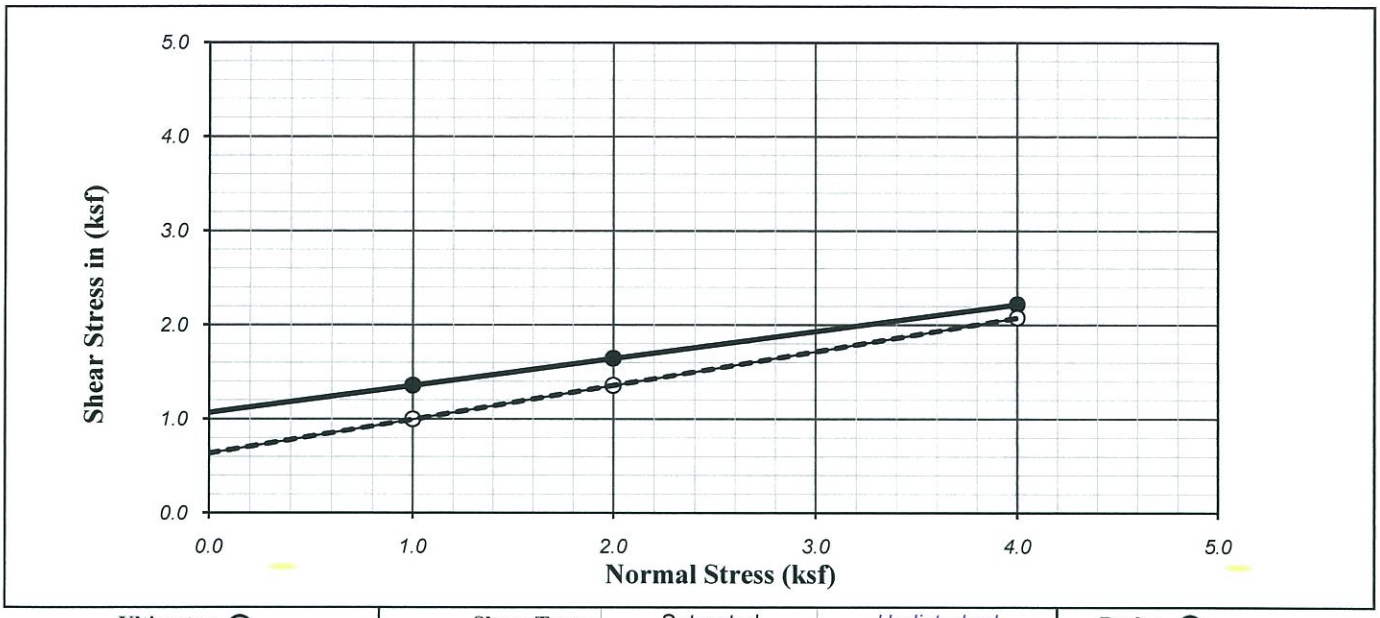
Boring No. :	A-13-001	**Strength Intercept (C) :**	0.26	(ksf)	**Peak**	0.15	(ksf)	**Ultimate**
Sample No. :	R-4		12.35	(kPa)		7.18	(kPa)	
Depth (ft/m) :	20.0	**Friction Angle (Ø) :**	27	Degree		22	Degree	
Description :	Grayish Brown Silty Clay (CL)						**Shear Rate (inch/min.):**	0.01

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
○	37.44	87.17	13.72	0.93	1.00	47.88	0.80	38.50	0.54	25.86
◇	38.26	85.19	13.41	0.98	2.00	95.76	1.21	58.03	1.01	48.26
△	35.75	88.24	13.89	0.91	4.00	191.52	2.30	110.32	1.79	85.61
Remark										

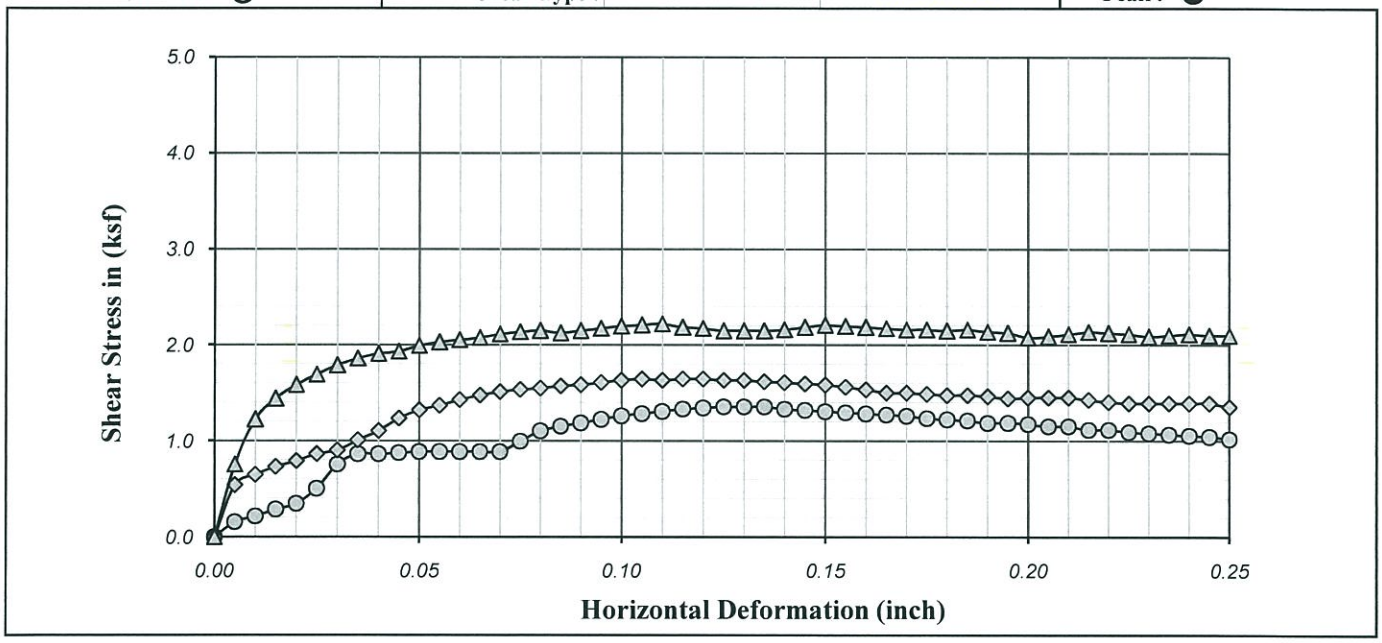
Direct Shear Test

WILLDAN Geotechnical — *extending your reach*

Roadside Drive Bridge Widening | **Proj. No. 101480-4000** | **Date: 06/18/2013**



Ultimate : ○	Shear Type :	Saturated	*Undisturbed*	Peak : ●



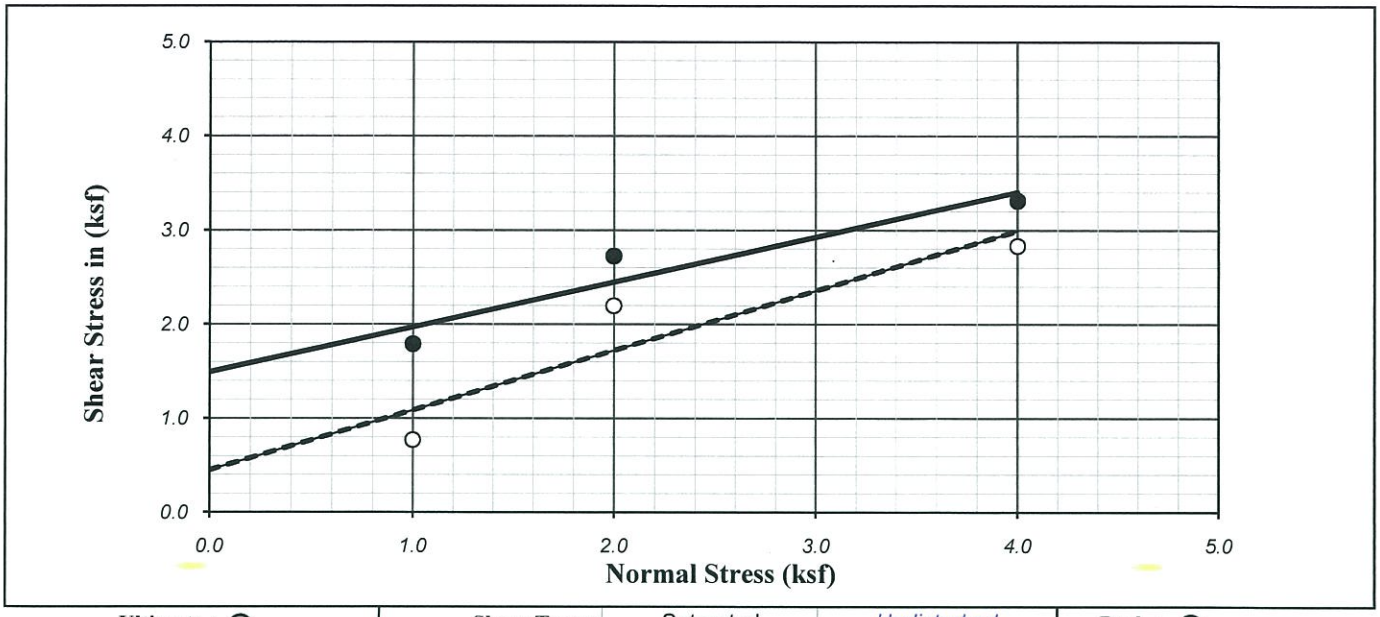
Boring No. :	A-13-002	**Strength Intercept (C) :**	1.07	(ksf)	**Peak**	0.64	(ksf)	**Ultimate**
Sample No. :	R-5		51.14	(kPa)		30.45	(kPa)	
Depth (ft/m) :	20.0	**Friction Angle (Ø) :**	16	Degree		20	Degree	
Description :	Brown Fat Clay (CH)						**Shear Rate (inch/min.):**	0.01

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
○	30.80	90.52	14.25	0.86	1.00	47.88	1.36	64.93	1.00	47.69
◇	30.25	91.69	14.43	0.84	2.00	95.76	1.64	78.71	1.36	64.93
△	30.92	92.08	14.50	0.83	4.00	191.52	2.22	106.29	2.08	99.40
Remark										

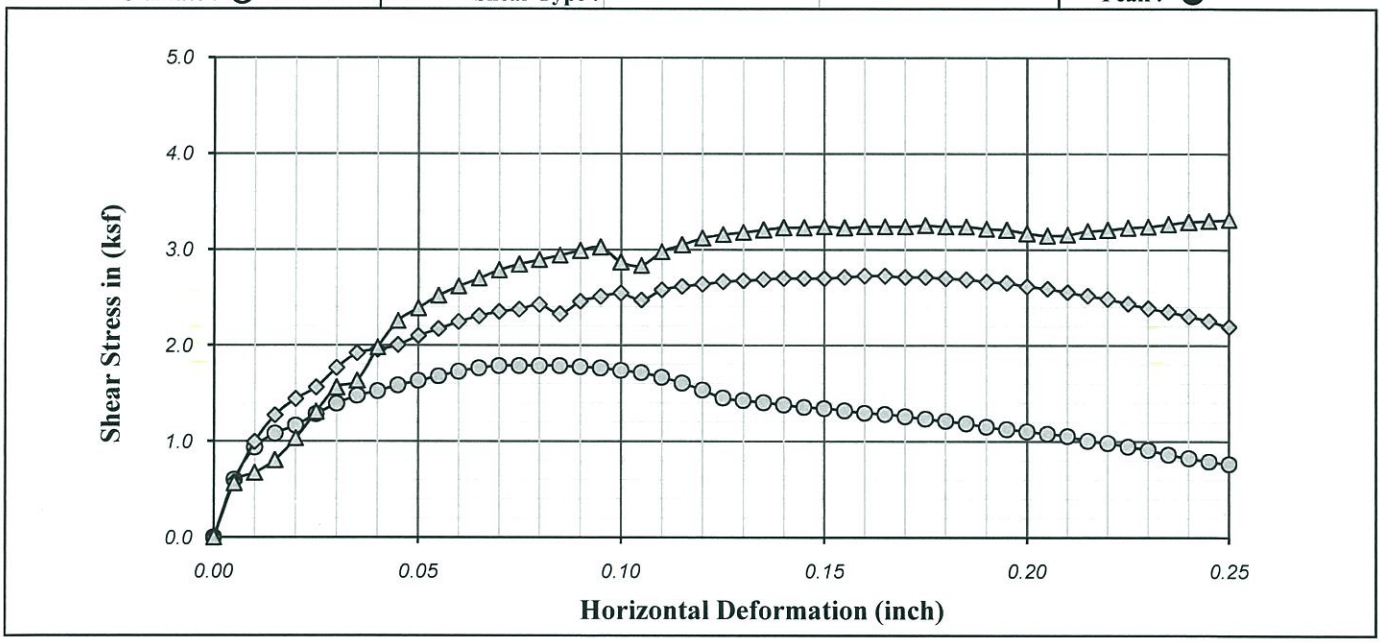
Direct Shear Test

WILLDAN Geotechnical — *extending your reach*

Roadside Drive Bridge Widening | **Proj. No. 101480-4000** | **Date: 06/18/2013**



Ultimate : ○	Shear Type :	Saturated	Undisturbed	Peak : ●



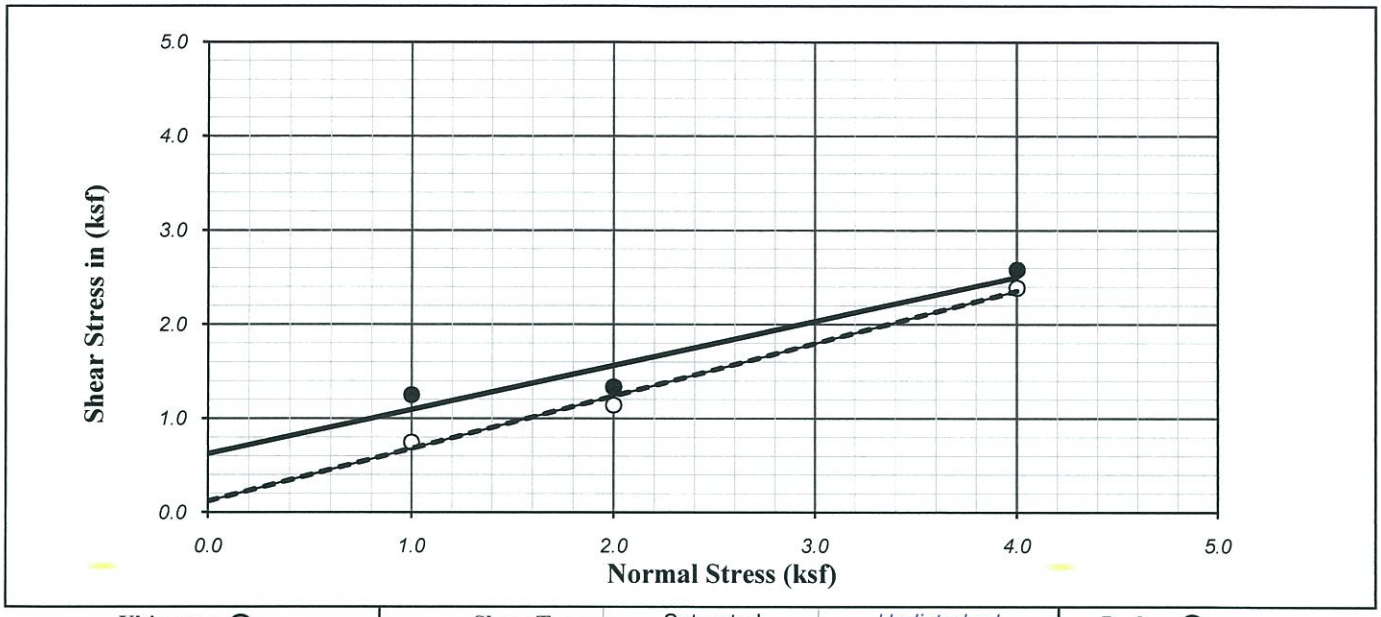
Boring No. :	A-13-003	**Strength Intercept (C) :**	1.49	(ksf)	**Peak**	0.45	(ksf)	**Ultimate**
Sample No. :	R-7		71.53	(kPa)		21.55	(kPa)	
Depth (ft/m) :	35.0	**Friction Angle (Ø) :**	26	Degree		32	Degree	
Description :	Dk. Grayish Brown Silty Clay (CL)						**Shear Rate (inch/min.):**	0.01

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
○	22.63	105.37	16.59	0.60	1.00	47.88	1.79	85.61	0.77	36.77
◇	23.08	108.75	17.12	0.55	2.00	95.76	2.72	130.43	2.20	105.14
△	23.16	103.98	16.37	0.62	4.00	191.52	3.31	158.58	2.83	135.60
Remark										

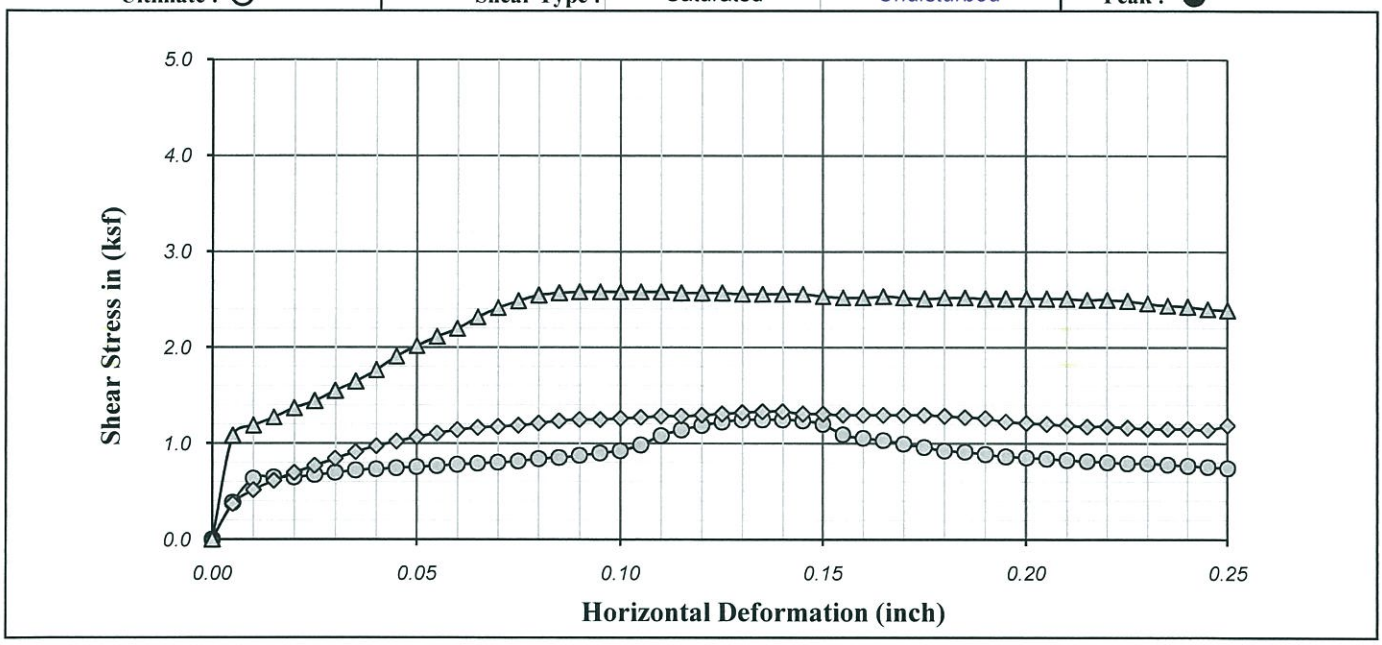
Direct Shear Test

WILLDAN Geotechnical — extending your reach

Roadside Drive Bridge Widening | **Proj. No. 101480-4000** | **Date: 06/11/2013**



Ultimate : ○	Shear Type :	Saturated	Undisturbed	Peak : ●



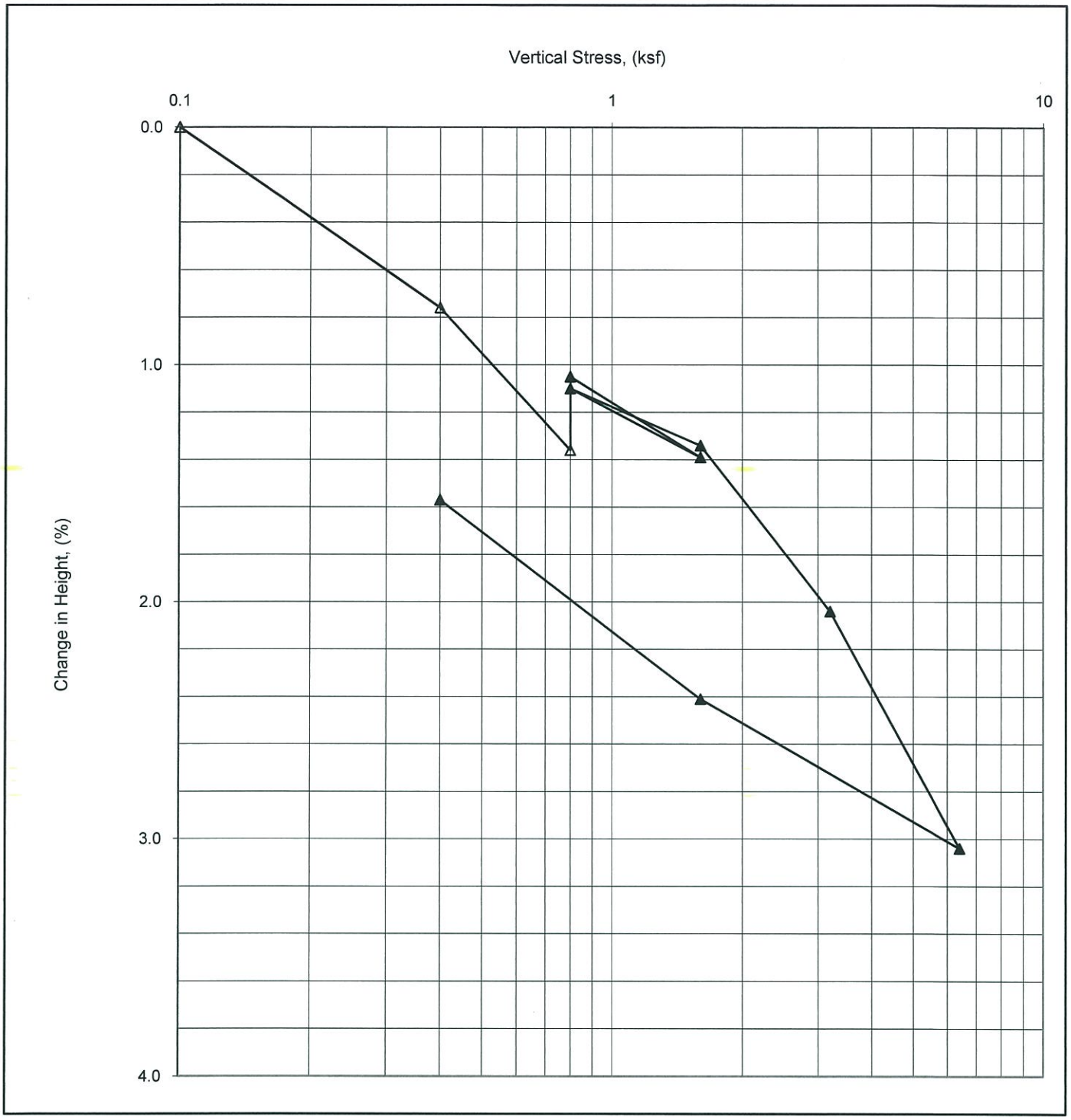
Boring No. :	A-13-004	Strength Intercept (C) :	0.62	(ksf)	Peak	0.12	(ksf)	Ultimate
Sample No. :	R-7		29.88	(kPa)		5.75	(kPa)	
Depth (ft/m) :	35.0	Friction Angle (Ø) :	25	Degree		29	Degree	
Description :	Dk. Grayish Brown Silty Clay (CL)						Shear Rate (inch/min.):	0.01

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
○	22.52	106.06	16.70	0.59	1.00	47.88	1.25	59.75	0.74	35.62
◇	22.84	105.54	16.61	0.60	2.00	95.76	1.33	63.78	1.14	54.58
△	23.67	105.12	16.55	0.60	4.00	191.52	2.58	123.53	2.39	114.34
Remark										

Direct Shear Test

WILLDAN Geotechnical — extending your reach

Roadside Drive Bridge Widening | **Proj. No. 101480-4000** | **Date: 06/13/2013**



Boring No. : A-13-001 Sample No. / Depth : R-2 @ 10' Liquid Limit -

Sample Descriptions / Classification : BROWN SANDY CLAY (CL) Plastic Limit -

Sp. Gravity : 2.68 (Assumed) Compression Index, C_c 0.033 Swell Index, C_s 0.012

	Specimen Height (inches)	Moisture Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
Initial	1.0000	15.9	114.8	93.1	0.457
Final	0.9843	16.6	116.6	102.4	0.434

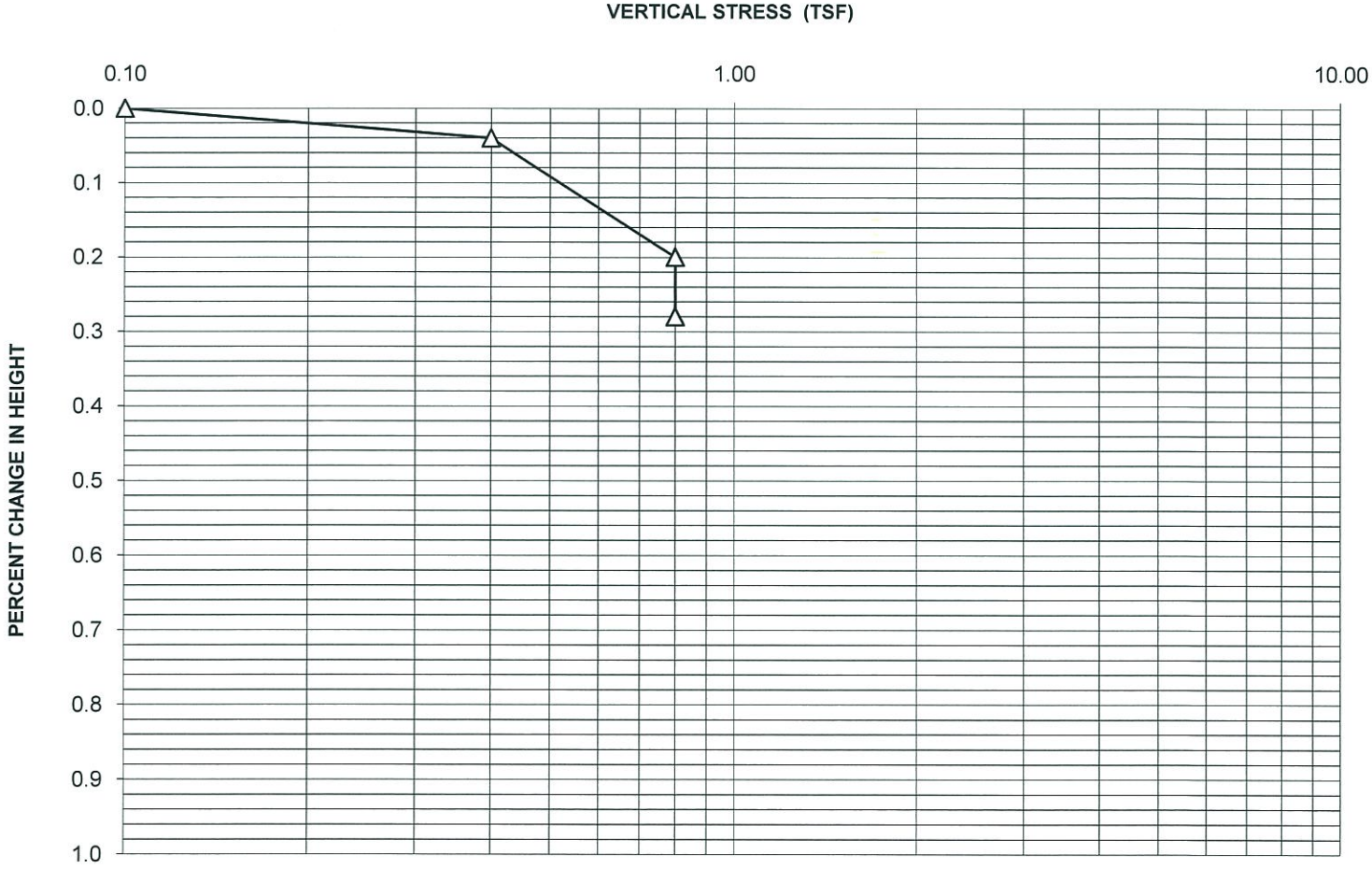
Consolidation Test
(ASTM D2435)

WILLDAN Geotechnical *extending your reach*

ROADSIDE DRIVE BRIDGE | **Project No. 100958-1004** | **Date: 6/24/2013**

PROJECT NAME :	ROADSIDE DR. BRIDGE			PROJECT NUMBER :	101480-4000
BORING NO.: A-13-002	SAMPLE NO. : R-7	DEPTH 30 ft.	MOISTURE & DENSITY DATA	BEFORE TEST	AFTER TEST
APPROPRIATE VERTICAL STRESS :	0.400 tsf	(0.800 ksf	WET WEIGHT + RING,(g)	181.74	185.15
FRAME NO. : 1	TECHNICIAN:	RMC	DRY WEIGHT + RING,(g)	160.11	160.11
SOIL DESCRIPTIONS :	BR. WELL GRADED SAND WITH SILT & GRAVEL(SW-SM)		WEIGHT OF WATER,(g)	21.63	25.04
SPECIMEN TYPE :	Undisturbed sample	LIQUID LIMIT :	WEIGHT OF RING,(g)	-	41.37
REMARKS :	"Seat, load and inundate only - No time-rate"		DRY WEIGHT OF SOIL,(g)	118.74	118.74
	Saturated & Dense		MOISTURE CONTENT,(%)	18.2	21.1
			DRY DENSITY,(Pcf)	99.1	99.1

DATE OF READING	TIME	LOAD (KG)	STRESS (KSF)	DIAL READING (INCHES)	% CONSOL	DATE OF READING	TIME	LOAD (KG)	STRESS (TSF)	DIAL READING (INCHES)	% CONSOL
11-Jun-13	9:40		0.1	0.2394	0.00						
	9:45		0.40	0.2390	0.04						
	10:46	(+) H_2O	0.80	0.2374	0.20						
12-Jun-13	10:50			0.2366	0.28						



COLLAPSE POTENTIAL, I_c (%)	COLLAPSE INDEX$_{(2\ TSF)}$, I_e (%)	DEGREE OF COLLAPSE
0.08		SLIGHT

POTENTIAL OF SOILS

(ASTM D-5333-03)

WILLDAN Geotechnical — extending your reach

'R' VALUE CA 301

Client: Willdan Geotechnical Date: 6/24/13 By: LD

Client's Job No.: 101480-4000 **Sample No.:** A-13-003 / Bulk @ 3' - 8'

GLA Reference: 2005-224 Soil Type: Brown, Sandy Clay w. Gravel

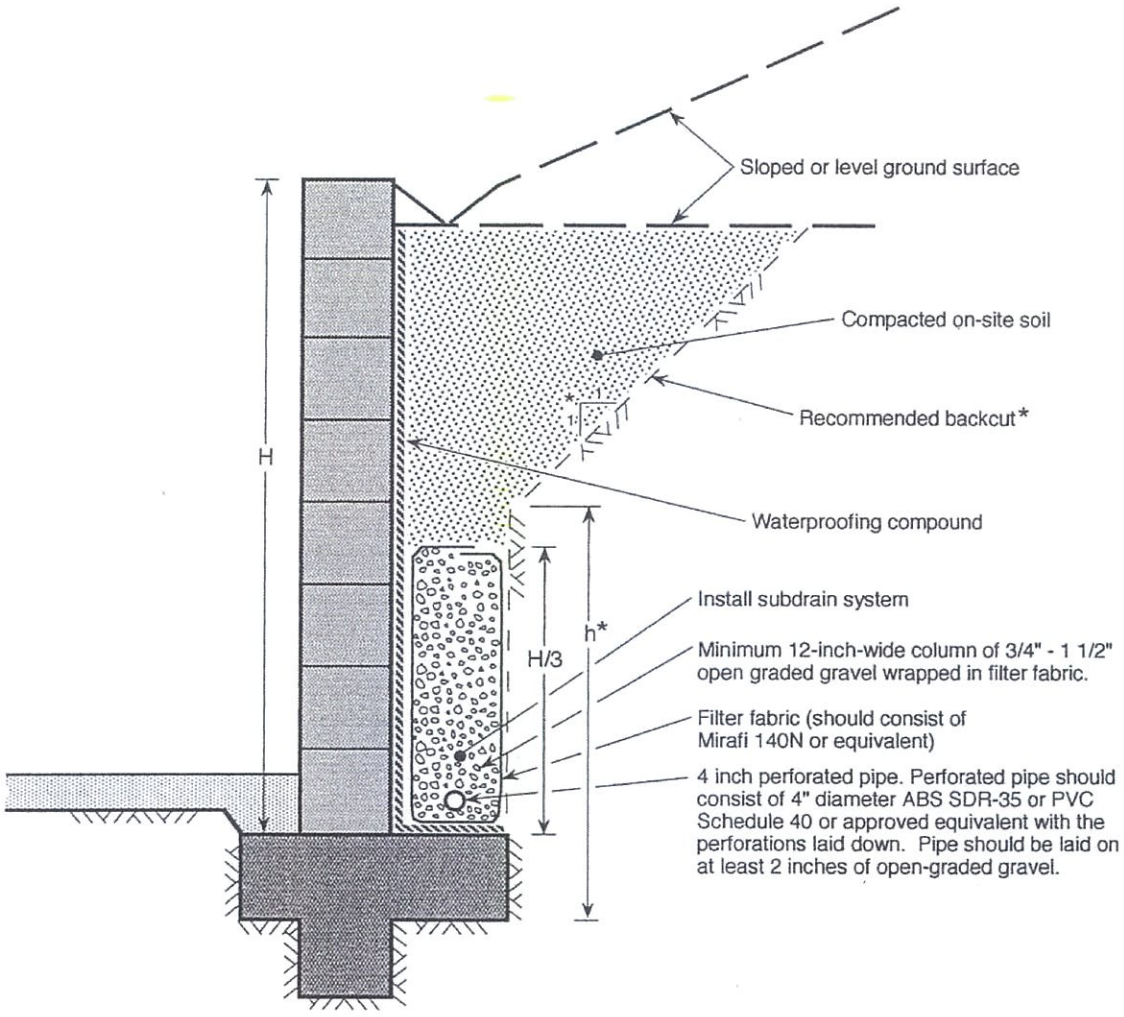
TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	**100**	**70**	**50**	
Initial Moisture Content	%	**17.0**	**17.0**	**17.0**	
Water Added	ml	**20**	**40**	**60**	
Moisture at Compaction	%	19.0	20.9	22.9	
Sample & Mold Weight	gms	**3140**	**3137**	**3144**	
Mold Weight	gms	**2102**	**2105**	**2103**	
Net Sample Weight	gms	1038	1032	1041	
Sample Height	in.	**2.487**	**2.48**	**2.492**	
Dry Density	pcf	106.3	104.3	103.0	
Pressure	lbs	**5860**	**3725**	**2090**	
Exudation Pressure	psi	467	297	166	
Expansion Dial	x 0.0001	**109**	**70**	**28**	
Expansion Pressure	psf	472	303	121	
Ph at 1000lbs	psi	**42**	**55**	**71**	
Ph at 2000lbs	psi	**100**	**121**	**148**	
Displacement	turns	**3.69**	**4.05**	**4049**	
R' Value		29	17	4	
Corrected 'R' Value		**29**	**17**	**4**	

FINAL 'R' VALUE	
By Exudation Pressure (@ 300 psi):	**17**
By Epansion Pressure :	**6**
TI = 5	

Geo-Logic ASSOCIATES

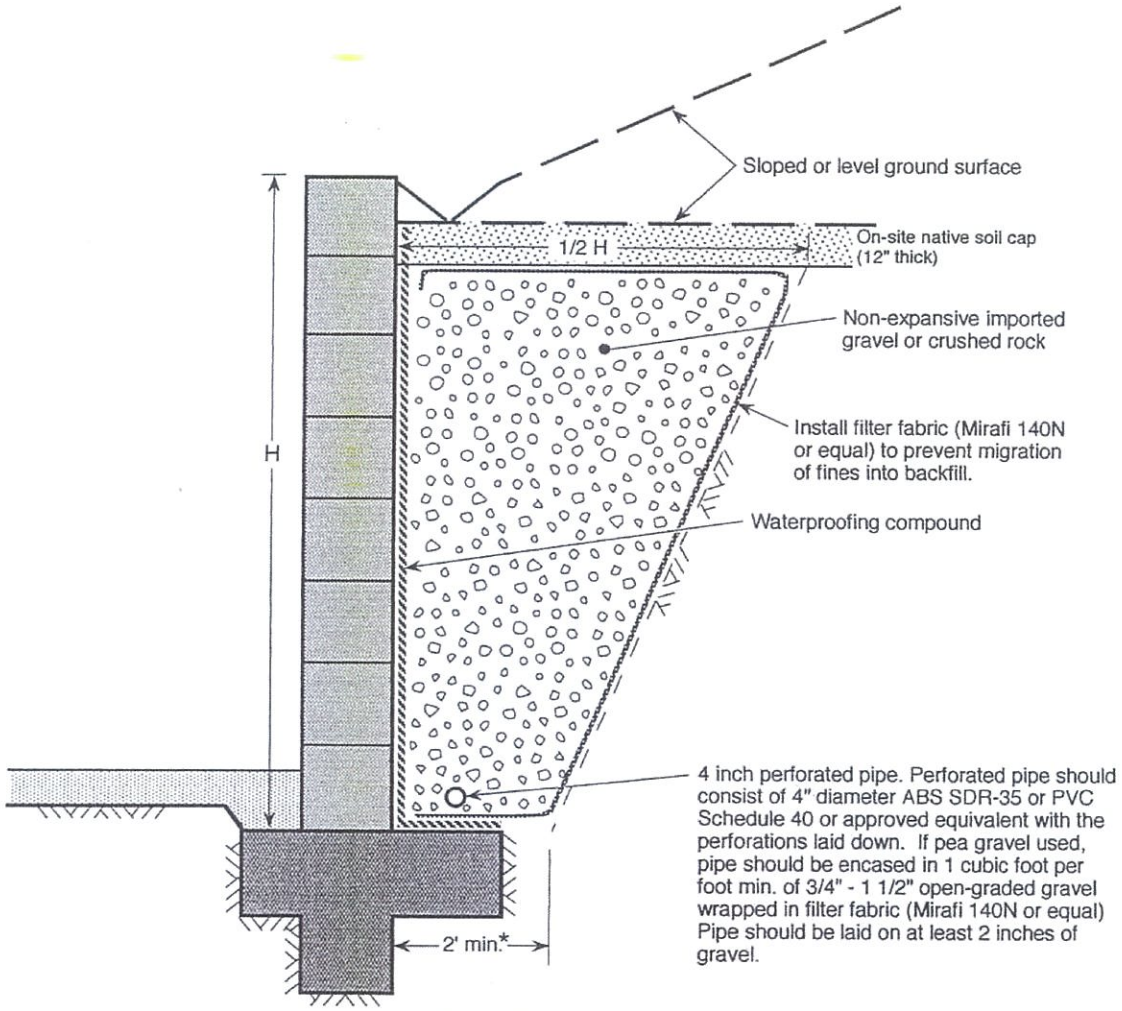
Appendix C. Typical Retaining Wall Backfill

NATIVE SOIL BACKFILL



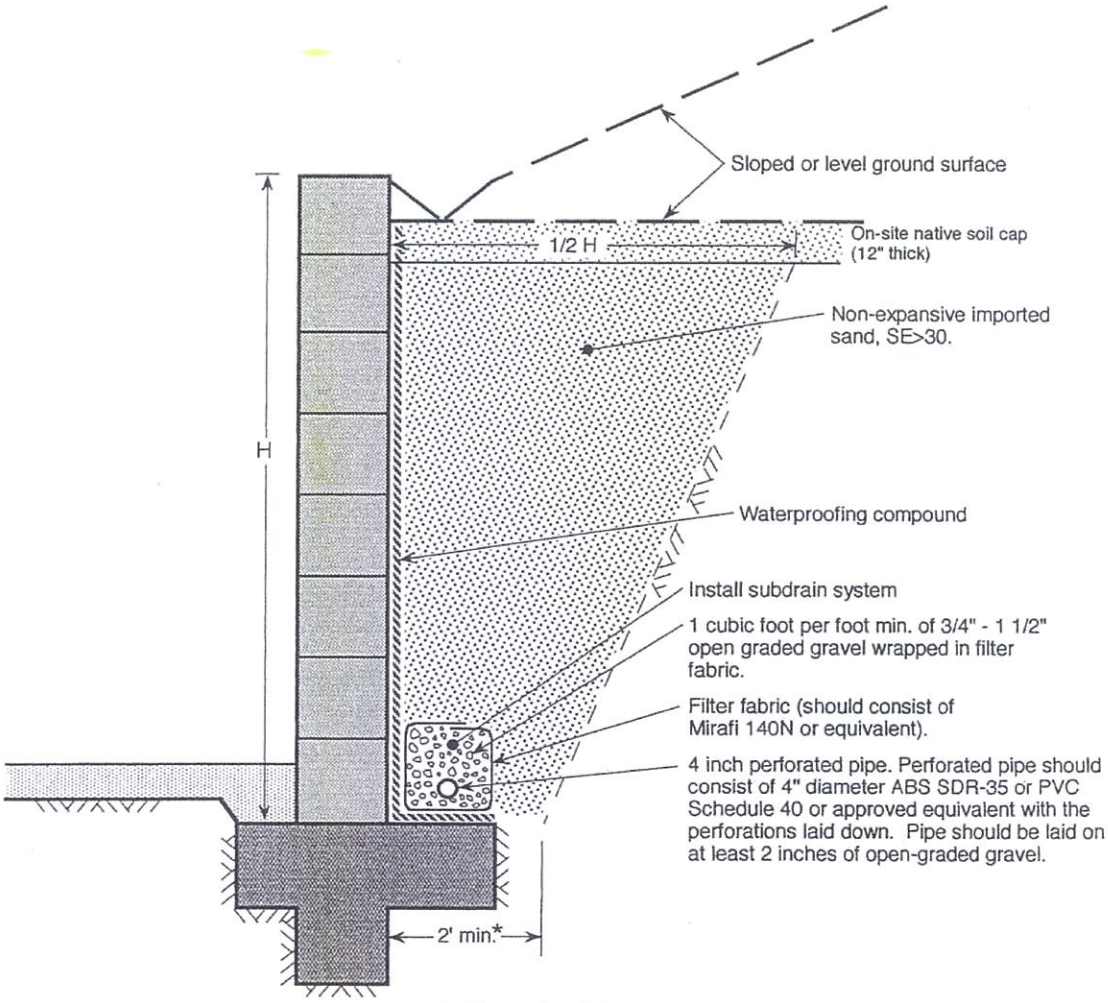
* Vertical height (h) and slope angle of backcut per soils report. Based on geologic conditions, configuration of backcut may require revisions (i.e. reduced vertical height, revised slope angle, etc.)

IMPORTED GRAVEL OR CRUSHED ROCK BACKFILL



* At base of wall, the non-expansive backfill materials should extend to a min. distance of 2' or to a horizontal distance equal to the heel width of the footing, whichever is greater.

IMPORTED SAND BACKFILL



* At base of wall, the non-expansive backfill materials should extend to a min. distance of 2' or to a horizontal distance equal to the heel width of the footing, whichever is greater.

Appendix D. Liquefaction Analyses

Project Information

Project Name:	Roadside Drive Bridge Widening
Project No.:	101480-2000
Boring No.:	A-13-002

Input Data

Earthquake Magnitude, M =	6.79	>>> MSF =	1.21
Peak Ground Acceleration, a_{max} (g) =	0.55		
Water Table Depth Encountered in the Boring, D_{wo} (ft) =	29		
Water Table Depth for Liquefaction Analysis, D_w (ft) =	10		
Borehole Diameter, d_s (in) =	4.15	>>> C_b =	1.00
Measured Energy Ratio, ER_m $(\%)$ =	75	>>> C_t =	1.25
Standard split spoon sampler without room for liners?	Yes		
Split spoon sampler with room for liners but with the liner absent?	No		
Maximum Liquefaction Depth, D_{max} (ft) =	50		

Equations (Applicable for Saturated Sand Soils*)

$N_{60} = C_E C_T C_B C_S N_m$

C_N = Min(1.7,(P_a/σ'_{vo})^(0.784-0.0768*Min([N_1]$_{60}$, 46)^0.5))

$(N_1)_{60} = C_N N_{60}$

$(N_1)_{60-cs} = (N_1)_{60} + \Delta(N_1)_{60}$

$\Delta(N_1)_{60} = \exp(1.63+9.7/(FC+0.01)-(15.7/(FC+0.01))^2)$

$\Delta(N_1)_{60}$: From Table 4 on Page 126

$r_d = \exp(M*(0.106+0.118*\sin(z/37.01+5.142))-1.126*\sin(z/38.48+5.133)-1.012)$

$CSR = 0.65*a_{max}*(\sigma_{vo}/\sigma'_{vo})*r_d$

MSF = Min(1.8 , 6.9*exp(-M/4)-0.058)

K_σ = Min(1.1 , 1-Ln(σ'_{vo}/P_a)/(18.9-2.55*(Min([N_1]$_{60-cs}$, 37)^0.5))

CRR *(for M=7.5 &* $\sigma'_{vo} = P_a$ *)* = exp([N_1]$_{60-cs}$/14.1+([N_1]$_{60-cs}$/126)^2-([N_1]$_{60-cs}$/23.6)^3+([N_1]$_{60-cs}$/25.4)^4-2.8)

P_a = 1 atm = 101.4 kPa = 2115 psf

CRR = Min(2 , MSF*K_σ*CRR (for M=7.5 & σ'_{vo}=P_a))

FS = Factor of Safety for Liquefaction = Min(2 , CRR/CSR)

*If FC > 35% and PI > 7, soil is considered as clay-like (Clay) soil ; otherwise soil is considered as sand-like (Sand) soil.

Layer No.	Calculated Layer Depth (ft) Top	Calculated Layer Depth (ft) Bottom	Depth, z (ft)	Unit Weight γ_{tot} (pcf)	Unit Weight γ_{moist} (pcf)	Field Blow Count N (blows/ft)	Field Blow Count Sampler Type	Fine Content FC %	Plasticity Index PI	Soil Type	Field SPT Blow Count N_m (blows/ft)	Liquefaction Soil Behavior	C_E	C_T	N_{60} (blows/ft)	Total Stress σ_{vo} (psf)	Effective Stress σ'_{vo} (psf)	C_N	$(N_1)_{60}$ (blows/ft)	Liquefaction Triggering $\Delta(N_1)_{60-T}$ (blows/ft)	$(N_1)_{60-CS-T}$ (blows/ft)	r_d	CSR	K_σ	CRR	FS	Lateral Displacement $\Delta(N_1)_{60-L}$ (blows/ft)	$(N_1)_{60-CS-L}$ (blows/ft)	γ_{lim} (rad)	F_R	γ_{max} (rad)	ΔLDI (ft)	LDI (ft)	Volumetric Reconsolidation Settlement ε_v	ΔS_{v-1D} (in)	S_{v-1D} (in)
1	0.00	5.00	2.50	116.0	116.0	20.0	CD	70.0	Plastic	Fine	14.4	Clay	0.75	1.00	13.5	290	290	1.70	23.0	5.6	28.6	1.00	0.358	1.10	N.L.	N.L.	4.8	27.8	0.000	0.000	0.000	0.00	0.09	0.000	0.00	0.27
2	5.00	8.00	5.00	124.0	124.0	34.0	CD	38.0	Plastic	Granular	18.7	Clay	0.80	1.00	18.7	600	600	1.58	29.5	5.6	35.1	0.99	0.354	1.10	N.L.	N.L.	3.0	32.5	0.000	0.000	0.000	0.00	0.09	0.000	0.00	0.27
3	8.00	12.50	10.00	121.0	121.0	42.0	CD	70.0	Plastic	Fine	30.2	Clay	0.85	1.00	32.1	1205	1205	1.19	38.2	5.6	43.8	0.97	0.347	1.10	N.L.	N.L.	4.8	43.0	0.000	0.000	0.000	0.00	0.09	0.000	0.00	0.27
4	12.50	17.50	15.00	121.0	121.0	51.0	CD	70.0	Plastic	Fine	36.7	Clay	0.95	1.00	43.6	1810	1810	1.04	45.3	5.6	50.9	0.95	0.340	1.05	N.L.	N.L.	4.8	50.1	0.000	0.000	0.000	0.00	0.09	0.000	0.00	0.27
5	17.50	22.50	20.00	119.0	119.0	27.0	CD	70.0	Plastic	Fine	19.4	Clay	0.95	1.00	23.0	2405	2405	0.95	21.9	5.6	27.5	0.92	0.329	0.98	N.L.	N.L.	4.8	26.7	0.000	0.000	0.000	0.00	0.09	0.000	0.00	0.27
6	22.50	28.80	25.00	113.0	113.0	23.0	CD	70.0	Plastic	Fine	16.6	Clay	0.95	1.00	19.7	2970	2970	0.85	16.7	5.6	22.3	0.89	0.318	0.96	N.L.	N.L.	4.8	21.5	0.000	0.000	0.000	0.00	0.09	0.000	0.00	0.27
7	28.80	31.60	30.00	114.0	114.0	42.0	CD	11.0	Non-plastic	Granular	23.1	Sand	1.00	1.00	28.9	3540	3478	0.82	23.7	1.6	25.3	0.87	0.317	0.92	0.330	1.04	1.1	24.8	0.091	0.244	0.032	0.09	0.09	0.008	0.27	0.27
8	31.60	35.80	35.00	130.0	130.0	30.0	SPT	11.0	Non-plastic	Granular	30.0	Sand	1.00	1.00	37.5	4190	3816	0.81	30.4	1.6	32.0	0.84	0.330	0.88	0.683	2.00	1.1	31.5	0.038	0.000	0.000	0.00	0.00	0.000	0.00	0.00
9	35.80	42.50	40.00	130.0	130.0	200.0	CD	87.0	Plastic	Fine	144.0	Clay	1.00	1.00	180.0	4840	4154	0.84	151.2	5.5	156.7	0.81	0.337	0.80	N.L.	N.L.	5.5	156.7	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
10	42.50	47.50	45.00	128.0	128.0	150.0	CD	87.0	Plastic	Fine	108.0	Clay	1.00	1.00	135.0	5480	4482	0.82	110.7	5.5	116.2	0.78	0.341	0.78	N.L.	N.L.	5.5	116.2	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
11	47.50	52.50	50.00	130.0	130.0	100.0	CD	87.0	Plastic	Fine	72.0	Clay	1.00	1.00	90.0	6130	4820	0.81	72.9	5.5	78.4	0.75	0.341	0.76	N.L.	N.L.	5.5	78.4	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
12	52.50	55.00	55.00	129.0	129.0	200.0	CD	87.0	Plastic	Fine	144.0	Clay	1.00	1.00	180.0	6775	5153	0.79	142.2	5.5	147.7	0.72	0.338	0.74	N.L.	N.L.	5.5	147.7	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
																															LDI =	0.09				S_{v-1D} =	0.27

Project Information

Project Name:	Roadside Drive Bridge Widening
Project No.:	101480-2000
Boring No.:	A-13-003

Input Data

Earthquake Magnitude, M =	6.79	>>> MSF =	1.21
Peak Ground Acceleration, a_{max} (g) =	0.55		
Water Table Depth Encountered in the Boring, D_w (ft) =	28		
Water Table Depth for Liquefaction Analysis, D_w (ft) =	10		
Borhole Diameter, d_B (in) =	4.15	>>> C_B =	1.00
Measured Energy Ratio, ER_m (%) =	75	>>> C_E =	1.25
Standard split spoon sampler without room for liners?	Yes		
Split spoon sampler with room for liners but with the liner absent?	No		
Maximum Liquefaction Depth, D_{max} (ft) =	50		

Equations (Applicable for Saturated Sand Soils*)

$N_{60} = C_E C_B C_S C_R N_m$

$C_N = \text{Min}(1.7, |P_a/\sigma'_{vo}|^{0.784-0.0768*\text{Min}([N_1]_{60}, 46)^{0.5}})$

$(N_1)_{60} = C_N N_{60}$

$(N_1)_{60\text{-}CS} = (N_1)_{60}+\Delta(N_1)_{60}$

$\Delta(N_1)_{60} = \exp(1.63+9.7/(FC+0.01)-(15.7/(FC+0.01))^2)$

$\Delta(N_1)_{60}$: From Table 4 on Page 126

$r_d = \exp(M*[0.106+0.118*\sin(z/37.01+5.142)]-1.126*\sin(z/38.48+5.133)-1.012)$

$CSR = 0.65*a_{max}*(\sigma_{vo}/\sigma'_{vo})*r_d$

$MSF = \text{Min}(1.8 , 6.9*\exp(-M/4)-0.058)$

$K_\sigma = \text{Min}(1.1 , 1-\ln(\sigma'_{vo}/P_a)/(18.9-2.55*\text{Min}([N_1]_{60\text{-}CS}, 37)^{0.5}))$

CRR (for $M=7.5$ & $\sigma'_{vo}=P_a$) $= \exp([N_1]_{60\text{-}CS}/14.1+([N_1]_{60\text{-}CS}/126)^2-([N_1]_{60\text{-}CS}/23.6)^3+([N_1]_{60\text{-}CS}/25.4)^4-2.8)$

P_a = 1 atm = 101.4 kPa = 2115 psf

$CRR = \text{Min}(2 , MSF*K_\sigma*CRR\ (\text{for } M=7.5 \text{ \& } \sigma'_{vo}=P_a))$

FS = Factor of Safety for Liquefaction = Min(2 , CRR/CSR)

*If FC > 35% and PI > 7, soil is considered as clay-like (Clay) soil ; otherwise soil is considered as sand-like (Sand) soil

Layer No.	Calculated Layer Depth (ft) Top	Calculated Layer Depth (ft) Bottom	Depth, z (ft)	Unit Weight γ_{sat} (pcf)	Unit Weight γ_{moist} (pcf)	Field Blow Count N (blows/ft)	Field Blow Count Sampler Type	Fine Content FC %	Plasticity Index PI	Soil Type	Field SPT Blow Count N_m (blows/ft)	Liquefaction Soil Behavior	C_B	C_S	N_{60} (blows/ft)	Total Stress σ_{vo} (psf)	Effective Stress σ'_{vo} (psf)	C_N	$(N_1)_{60}$ (blows/ft)	Liquefaction Triggering $\Delta(N_1)_{60\text{-}T}$ (blows/ft)	Liquefaction Triggering $(N_1)_{60\text{-}CS\text{-}T}$ (blows/ft)	Liquefaction Triggering r_d	Liquefaction Triggering CSR	Liquefaction Triggering K_σ	Liquefaction Triggering CRR	Liquefaction Triggering FS	Lateral Displacement $\Delta(N_1)_{60\text{-}S}$ (blows/ft)	Lateral Displacement $(N_1)_{60\text{-}CS\text{-}S}$ (blows/ft)	Lateral Displacement γ_{lim} (rad)	Lateral Displacement F_α	Lateral Displacement γ_{max} (rad)	Lateral Displacement ΔLDI (ft)	Lateral Displacement LDI (ft)	Volumetric Reconsolidation Settlement ε_v	Volumetric Reconsolidation Settlement $\Delta S_{v\text{-}10}$ (in)	Volumetric Reconsolidation Settlement $S_{v\text{-}10}$ (in)
1	0.00	8.75	7.50	123.0	123.0	8.0	SPT	70.0	Plastic	Fine	8.0	Clay	0.80	1.00	8.0	923	923	1.53	12.2	5.6	17.8	0.98	0.350	1.08	N.L.	N.L.	4.8	17.0	0.000	0.000	0.000	0.00	0.32	0.000	0.00	0.93
2	8.75	12.50	10.00	123.0	123.0	33.0	CD	70.0	Plastic	Fine	23.8	Clay	0.85	1.00	25.3	1231	1231	1.21	30.6	5.6	36.2	0.97	0.347	1.10	N.L.	N.L.	4.8	35.4	0.000	0.000	0.000	0.00	0.32	0.000	0.00	0.93
3	12.50	17.00	15.00	107.0	107.0	22.0	CD	70.0	Plastic	Fine	15.8	Clay	0.95	1.00	18.8	1766	1766	1.08	20.3	5.6	25.9	0.95	0.340	1.02	N.L.	N.L.	4.8	25.1	0.000	0.000	0.000	0.00	0.32	0.000	0.00	0.93
4	17.00	22.50	20.00	113.0	113.0	38.0	CD	38.0	Non-plastic	Granular	20.9	Sand	0.95	1.00	24.8	2331	2331	0.96	23.8	5.6	29.4	0.92	0.329	0.98	0.532	1.62	3.0	26.8	0.071	0.120	0.008	0.04	0.32	0.002	0.13	0.93
5	22.50	27.50	25.00	123.0	123.0	35.0	CD	19.0	Non-plastic	Granular	19.3	Sand	0.95	1.00	22.9	2946	2946	0.86	19.7	4.3	24.0	0.89	0.318	0.96	0.310	0.97	1.6	21.3	0.137	0.447	0.038	0.19	0.28	0.010	0.60	0.80
6	27.50	36.00	30.00	123.0	123.0	44.0	CD	19.0	Non-plastic	Granular	24.2	Sand	1.00	1.00	30.3	3561	3436	0.82	24.8	4.3	29.1	0.87	0.322	0.92	0.481	1.49	1.6	26.4	0.075	0.145	0.011	0.09	0.09	0.002	0.20	0.20
7	36.00	37.50	35.00	130.0	130.0	200.0	CD	87.0	Plastic	Fine	144.0	Clay	1.00	1.00	180.0	4211	3774	0.86	154.8	5.5	160.3	0.84	0.335	0.83	N.L.	N.L.	5.5	160.3	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
8	37.50	42.50	40.00	130.0	130.0	200.0	CD	87.0	Plastic	Fine	144.0	Clay	1.00	1.00	180.0	4861	4112	0.84	151.2	5.5	156.7	0.81	0.342	0.80	N.L.	N.L.	5.5	156.7	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
9	42.50	47.50	45.00	131.0	131.0	300.0	CD	87.0	Plastic	Fine	216.0	Clay	1.00	1.00	270.0	5516	4455	0.82	221.4	5.5	226.9	0.78	0.345	0.78	N.L.	N.L.	5.5	226.9	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
10	47.50	52.50	50.00	129.0	129.0	100.0	CD	87.0	Plastic	Fine	72.0	Clay	1.00	1.00	90.0	6161	4788	0.81	72.9	5.5	78.4	0.75	0.345	0.76	N.L.	N.L.	5.5	78.4	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
11	52.50	55.00	55.00	129.0	129.0	100.0	CD	87.0	Plastic	Fine	72.0	Clay	1.00	1.00	90.0	6806	5121	0.79	71.1	5.5	76.6	0.72	0.342	0.74	N.L.	N.L.	5.5	76.6	0.000	0.000	0.000	0.00	0.00			
																																LDI =	0.32			$S_{v\text{-}10}$ =	0.93

Project Information

Project Name:	Roadside Drive Bridge Widening
Project No.:	101480-2000
Boring No.:	A-13-004

Input Data

Earthquake Magnitude, M =	6.79	>>> MSF =	1.21
Peak Ground Acceleration, a_{max} (g) =	0.55		
Water Table Depth Encountered in the Boring, D_w (ft) =	100		
Water Table Depth for Liquefaction Analysis, D_w (ft) =	10		
Borehole Diameter, d_s (in) =	4.15	>>> C_b =	1.00
Measured Energy Ratio, ER_m $(\%)$ =	75	>>> C_s =	1.25
Standard split spoon sampler without room for liners?	Yes		
Split spoon sampler with room for liners but with the liner absent?	No		
Maximum Liquefaction Depth, D_{max} (ft) =	50		

Equations (Applicable for Saturated Sand Soils*)

$N_{60} = C_E C_T C_B C_S N_m$

C_N = Min{1.7,(P_a/σ'_{vo})^(0.784-0.0768*Min{$(N_1)_{60}$, 46}^0.5)}

$(N_1)_{60} = C_N N_{60}$

$(N_1)_{60\text{-}cs} = (N_1)_{60} + \Delta(N_1)_{60}$

$\Delta(N_1)_{60\text{-}T}$ = exp{1.63+9.7/[FC+0.01]-[15.7/[FC+0.01]]^2}

$\Delta(N_1)_{60\text{-}S}$: From Table 4 on Page 126

r_d = exp{M*[0.106+0.118*sin(z/37.01+5.142)]-1.126*sin(z/38.48+5.133)-1.012}

CSR = 0.65*a_{max}*[σ_{vo}/σ'_{vo}]*r_d

MSF = Min{1.8 , 6.9*exp(-M/4)-0.058}

K_σ = Min{1.1 , 1-1n(σ'_{vo}/P_a)/(18.9-2.55*[Min{$(N_1)_{60\text{-}cs}$, 37}^0.5)}

CRR *(for M=7.5 & σ'_{vo}=P_a)* = exp{$(N_1)_{60\text{-}CS}$/14.1+[$(N_1)_{60\text{-}CS}$/126]^2-[$(N_1)_{60\text{-}CS}$/23.6]^3+[$(N_1)_{60\text{-}CS}$/25.4]^4-2.8}

P_a = 1 atm = 101.4 kPa = 2115 psf

CRR = Min{2 , MSF*K_σ*CRR (for M=7.5 & σ'_{vo}=P_a)}

FS = Factor of Safety for Liquefaction = Min{2 , CRR/CSR}

*If FC > 35% and PI > 7, soil is considered as clay-like (Clay) soil , otherwise soil is considered as sand-like (Sand) soil.

Layer No.	Calculated Layer Depth (ft)		Depth, z (ft)	Unit Weight		Field Blow Count		Fine Content FC %	Plasticity Index PI	Soil Type	Field SPT Blow Count N_m (blows/ft)	Liquefaction Soil Behavior	C_B	C_S	N_{60} (blows/ft)	Total Stress σ_{vo} (psf)	Effective Stress σ'_{vo} (psf)	C_N	$(N_1)_{60}$ (blows/ft)	Liquefaction Triggering						Lateral Displacement						Volumetric Reconsolidation Settlement		
	Top	Bottom		γ_{wet} (pcf)	γ_{moist} (pcf)	N (blows/ft)	Sampler Type												$\Delta(N_1)_{60\text{-}S}$ (blows/ft)	$(N_1)_{60\text{-}CS\text{-}T}$ (blows/ft)	r_d	CSR	K_σ	CRR	FS	$\Delta(N_1)_{60\text{-}S}$ (blows/ft)	$(N_1)_{60\text{-}CS\text{-}S}$ (blows/ft)	γ_{lim} (rad)	F_R	γ_{max} (rad)	ΔLDI (ft)	LDI (ft)	ε_v	$\Delta S_{v\text{-}1D}$ (in)	$S_{v\text{-}1D}$ (in)
1	0.00	8.50	7.00	127.0	127.0	23.0	CD	70.0	Plastic	Fine	16.6	Clay	0.80	1.00	16.6	889	889	1.43	23.7	5.6	29.3	0.98	0.350	1.10	N.L.	N.L.	4.8	28.5	0.000	0.000	0.000	0.00	1.40	0.000	0.00	1.62
2	8.50	12.50	10.00	128.0	128.0	19.0	CD	70.0	Plastic	Fine	13.7	Clay	0.85	1.00	14.6	1273	1273	1.26	18.4	5.6	24.0	0.97	0.347	1.06	N.L.	N.L.	4.8	23.2	0.000	0.000	0.000	0.00	1.40	0.000	0.00	1.62
3	12.50	19.00	15.00	119.0	119.0	21.0	CD	70.0	Plastic	Fine	15.1	Clay	0.95	1.00	17.9	1868	1868	1.06	19.0	5.6	24.6	0.95	0.340	1.02	N.L.	N.L.	4.8	23.8	0.000	0.000	0.000	0.00	1.40	0.000	0.00	1.62
4	19.00	22.50	20.00	121.0	121.0	52.0	CD	31.0	Non-plastic	Granular	28.6	Sand	0.95	1.00	34.0	2473	2473	0.95	32.3	5.4	37.7	0.92	0.329	0.96	2.000	2.00	2.5	34.8	0.023	0.000	0.000	0.00	1.40	0.000	0.00	1.62
5	22.50	27.00	25.00	128.0	128.0	23.0	CD	18.0	Non-plastic	Granular	12.7	Sand	0.95	1.00	15.1	3113	3113	0.82	12.4	4.1	16.5	0.89	0.318	0.96	0.196	0.62	1.5	13.9	0.310	0.758	0.310	1.40	1.40	0.030	1.62	1.62
6	27.00	32.50	30.00	94.0	94.0	54.0	CD	87.0	Plastic	Fine	38.9	Clay	1.00	1.00	48.6	3583	3583	0.86	41.8	5.5	47.3	0.87	0.311	0.84	N.L.	N.L.	5.5	47.3	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
7	32.50	35.00	35.00	129.0	129.0	100.0	CD	87.0	Plastic	Fine	72.0	Clay	1.00	1.00	90.0	4228	4228	0.83	74.7	5.5	80.2	0.84	0.300	0.80	N.L.	N.L.	5.5	80.2	0.000	0.000	0.000	0.00	0.00	0.000	0.00	0.00
																															LDI =	1.40			$S_{v\text{-}1D}$ =	1.62

WILLDAN Geotechnical | extending your reach

November 1, 2013

Ms. Roxanne Hughes
Willdan Engineering
374 Poli Street, Suite 101
Ventura, CA 93001

Subject: **Response to Geotechnical Review**
Geotechnical and Foundation Report
Roadside Drive and Bridge Widening Over Medea Creek
Agoura Hills, California
Willdan Geotechnical Project No. 101480-4000

Reference: **Draft Geotechnical and Foundation Report**
Roadside Drive and Bridge Widening Over Medea Creek
Agoura Hills, California
Willdan Geotechnical Project No. 101480-4000, dated July 10, 2013

As requested, Willdan Geotechnical (Willdan) is providing this letter in response to the geotechnical review performed by GeoDynamics, Inc., to the above referenced report prepared by Willdan. Our responses to the review comments are presented below. For convenience, the review comment is provided in italic followed by our response. The GeoDynamics review letter is attached for reference.

Report Review Comments:

Comment 1: *The submitted report is labeled "DRAFT" and not signed or stamped. The final submitted report should be signed and stamped by the project geotechnical engineer.*

Response: Acknowledged. The draft report was provided to the project team of Willdan Engineering for review. The final report is signed and stamped by the geotechnical engineer.

Comment 2: *The consultant states on page 12 that "The subsurface soils at the bridge site are classified as sandy clay and clayey silt. Additionally, bedrock occurs at relatively shallow depth. As such, it is our professional opinion that the bridge site is not susceptible to liquefaction under the design seismic scenario." On page 14, the consultant states that "The sandy alluvial deposits overlying the shallow bedrock are not expected to undergo appreciable settlement or compaction when subjected to strong seismic shaking. This is in accordance with the result obtained from our collapse test on Alluvium materials." The consultant should address the following items regarding the above quotes:*

- *The consultant should provide further discussion and substantiate the conclusions regarding seismic settlement. The consultant should specifically discuss how these conclusions were derived from the hydrocollapse test.*

Response: Acknowledged. The statement in regard to hydro-collapse test results is corrected in the Final Report. The project site is predominantly underlain by clayey materials including sandy clay fill and alluvium deposits and silty clay bedrock which are not susceptible to seismic settlement. As shown in the LOTB and Figure 3 of the report, an alluvium sandy lens/layer with an average thickness of about 10 feet was encountered in Borings A-13-002, A-13-003 and A-13-004, within depths between about 19 and 36 feet below ground surface (bgs).

We have performed liquefaction analyses using the soils profile encountered in the mentioned three borings (see Appendix D of Report)). The analyses indicate that the estimated liquefaction settlement will be 0.27, 0.93 and 1.62 inch for the soils within Borings A-13-002, A-13-003 and A-13-004, respectively. The blow counts obtained in Boring A-13-004 are not consistent with the ones obtained in the other two borings and, in our opinion, does not represent the average consistency of the sandy layer. Furthermore, this boring is not located within the influence zone of the bridge foundation and is not considered in the foundation settlement calculations. Considering the results of the liquefaction analyses for the Borings A-13-002 and A-13-003 and an average thickness of 10 feet for the sandy layer, we estimate that the seismically induced settlement for the soils underlying the foundations will be about 0.50 inch. Therefore, the foundations will not undergo appreciable seismic settlement and our recommendations presented in the report suffice for the pile foundation design.

- *There appear to be some layers/lenses of underlying materials (some are within the proposed bridge area) that are susceptible to liquefaction potential and related hazards. For example: soils in A-13-003 at about 25 ft and below, A-13-004 at about 25 ft, and possible others. As such, the consultant should provide a more detailed assessment of the potential for liquefaction and seismic settlements of some of the underlying materials. The potential for adverse impacts on the proposed development due to liquefaction and related hazards should be evaluated and mitigation measures should be recommended as necessary.*

Response: See the response to the previous comment.

Comment 3: *There seems to be some discrepancy between the recommended shear strength parameters in Table 3, "Idealized Soils Properties" and the reported test results. For example, shear strength parameters assigned to artificial fill and alluvial deposits appear to have been interchanged with one another. The consultant should review and revise as necessary recommended soil property values.*

Response: Shear tests have been performed on four selected samples including A-13-001 at 20 feet bgs (sample 1), A-13-002 at 20 feet bgs (sample 2), A-13-003 at 36 feet deep bgs (sample 3), and A-13-004 at 35 feet bgs (sample 4). Samples 1 and 2 are representative of fill material, and samples 3 and 4 are representative of bedrock layer. Due to high disturbance of the samples obtained from sandy layer, no shear test was performed on the samples from this layer. The relevant parameters for sandy layer have been assumed based on the soil condition and engineering judgment, as well as using the presumptive values provided in acceptable references.

Comment 4: *The consultant indicates on page 15 that "The downward capacities are based on combination of friction resistance between the pile and surrounding soils and a fraction of toe-bearing resistance at the tip of the pile." For end bearing resistance to be activated, the bottom of the pile excavation should be cleaned from any compressible materials. The consultant should provide recommendations to verify that the bottom of the pile is clean of all sloughed and loose materials.*

Response: **Acknowledged.** In second paragraph of Page 17 of the report, it has been recommended that the bottom of the drilled shaft shall be observed and confirmed by the Geotechnical Engineer. However, same recommendation is provided in the Final Report for installation of the CIDH piles for abutments and piers.

Comment 5: *Some of the proposed piles could be located close to an existing slope where setback is required. The City of Agoura Hills has more stringent setback requirements than the California Building Code. The consultant should clarify if the portion of piles above the setback line would be considered in providing any vertical or lateral resistance.*

Response: Reduction factors such as no resistance on top and reduced lateral resistance due to sloping conditions are considered in the lateral resistance capacities of piles as discussed in page 18 of the report. These recommendations should be incorporated into design by the project's structural/civil engineer.

Comment 6: *The consultant should evaluate the lateral deformation of piles due to the applied lateral loads and moments. Mitigation measures should be recommended as necessary.*

Response: Acknowledged. The lateral deflection for the piles has been evaluated and presented in the Final Report. These deflections are based on the soil strength and reasonable assumptions for the pile's structural section, and should be considered as preliminary. The final design of the piles for lateral resistance and deformation is a structural matter and is referred to the project's structural engineer.

Comment 7: *The consultant should discuss the minimum recommended removal and recompaction (overexcavation) within the proposed grading areas.*

Response: The grading works of the proposed improvements consist only of backfilling behind the retaining walls and fill slopes for the road widening. The recommendations for these grading works have been provided in Sections 13.1 and 13.2 of the report.

If you have any questions regarding our responses or require additional information, please don't hesitate to contact us.

Respectfully submitted,

WILLDAN GEOTECHNICAL

Ross Khiabani
Principal Engineer
C 37156, GE 2202

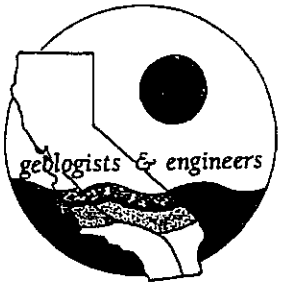
Distribution: (4) Addressee

Attachments: Copy of Review Letter

APPENDIX F

Preliminary Environmental Site Assessment (ESA)

California



Environmental

PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT - PHASE I UPDATE
Revised North Bound Ramp Configurations
Proposed Kanan Road/U.S. 101 Interchange Improvements
North Side of U.S. 101 Freeway near Canwood Avenue
South Side of U.S. 101 Freeway near Roadside Drive
Design Modification including Access Road and West End
of Southbound Interchange Improvement
Agoura Hills, California

FOR

WILLDAN ASSOCIATES
13191 Crossroads Parkway North, Suite 405
Industry, California 91746-3497

Attention: Mr. Robert Sun

CE Job No.: EV600-2145 June 2002

1161 Calle Suerte, Suite G • Camarillo, CA 93012 • (805) 445-7117 • FAX (805) 445-8599 • Lic. #A732377

TABLE OF CONTENTS

Page

TEXT

TABLE OF CONTENTS

Page

TEXT
(continued)

TABLES

ILLUSTRATIONS

APPENDICES

EXECUTIVE SUMMARY

An Environmental Site Assessment - Phase I Update was performed for the subject property identified as proposed Highway 101/Kanan Road Interchange Improvement Project, Agoura Hills, California. The scope of work for the Phase I Assessment meets ASTM E 1527-00 Standard Practice for environmental site assessments. The purpose of the Phase I report was to provide information regarding the potential for hazardous material impacts to the soil and groundwater beneath the subject property. The scope of work included a site reconnaissance, research of land use records and other sources for preliminary indications of hazardous materials use, storage or disposal on the property.

The site utilization history indicates the project area was initially developed with a small ranch building in the early 1920's. Three residential structures occupied the northern portion of the project area in 1953. Commercial development in the project area occurred in the 1970's and early 1980's.

Businesses within the project area are identified on the standard government databases researched for this report. Six nearby facilities are listed on the Leaking Underground Storage Tank database. The Chevron and Shell service stations reported releases of fuel hydrocarbons into the soil and groundwater in 1997 and 1988, respectively. Both sites are active Regional Water Quality Control Board LUST cases. The PacBell facility, Hillside Rubbish Company, Agoura Equipment Rentals & Supplies, and Agoura Building Materials are also listed as facilities that had a release to the subsurface. At the PacBell facility, low levels of hydrocarbons were reported well below the "de minimus" levels and required no further action. The Los Angeles Regional Water Quality Control Board signed off on the remaining LUST sites, stating that remedial action was completed or deemed unnecessary. No releases have been report from the other UST operators in the area, including the Auto 10-Minute Lube facility or the USA service station.

Previous subsurface assessments conducted by California Environmental found that groundwater and soil impacted with fuel hydrocarbons underlie portions of the project area. Shallow soil impacted with fuel hydrocarbons is generally confined to the areas near the release points at the Chevron and Shell service stations. Gasoline impacted groundwater is present offsite of the Chevron and Shell service stations but the fuel impacts in the area of the proposed improvement project are probably below a depth of 5 feet. Additional assessment is required in order to evaluate the origin and distribution of fuel hydrocarbon impacts north of Canwood Avenue west of Medea Creek. Impacts in that area are likely related to percolation of contaminated surface water discharge.

Sampling of shallow soils for the presence of aerially deposited lead was also accomplished. No hazardous levels of lead were found. Additional assessment for lead impacts in soil is not recommended.

California Environmental has completed a Phase I Environmental Site Assessment Update within the scope and limitations of ASTM 1527-00 for the project area. This assessment has revealed no evidence of recognized environmental conditions other than those discussed above.

INTRODUCTION

The following report presents the findings of the Preliminary Environmental Site Assessment – Phase I Update performed for the project area. The scope of the Phase I study meets ASTM E 1527-00 *Standard Practice For Environmental Site Assessments* and included research of available land use records and other sources for preliminary indications of hazardous material use, storage or disposal in the project area. This update was requested to incorporate project design modifications proposed following the preparation of the Phase I report in August 2000. The findings of this study are intended to provide information to the client regarding potential hazardous material impacts to the soil and groundwater beneath the site. The independent conclusions represent California Environmental's professional judgement based on the conditions that existed and the information and data available during the course of this study. Factual information regarding operation, conditions, and test data provided by others, the client, the owner, or their representatives have been assumed to be correct and complete. This report includes **GENERAL FINDINGS** and **CONCLUSIONS AND RECOMMENDATIONS**, which together with the remainder of this report are subject to the **NOTICE** at the end of the report.

The scope of work included:

- A walkover of the site.
- Review of building permits maintained by the City of Agoura Hills, Department of Building and Safety.
- Contact with the EDR Company to review historical Sanborn Fire Insurance maps.
- Contact with the Los Angeles, Department of Health Services, Public Health Investigation Division to review their files.
- Contact with the South Coast Air Quality Management District to review their files.

- Review of Oil Field Maps published by the State of California, Division of Oil, Gas and Geothermal Resources.
- Review of previous environmental reports prepared by Tetra Tech, Inc., Willdan Associates, and California Environmental.
- Contact with the County of Los Angeles, Department of Public Works, Environmental Affairs Division for review of underground storage tank files and industrial waste records for the project area.
- Review of the following lists and maps of suspect or known contaminated sites:
  - California Regional Water Quality Control Board, (RWQCB) - Computer Case Listing of Reported Underground Tank Leaks, covering Los Angeles County.
  - California Governor's Office of Planning and Research - *Hazardous Waste and Substance Sites - Cortese List and Contaminated Wells List*, which includes the Bond Expenditure Plan (BEP) sites.
  - California Environmental Protection Agency, Department of Toxic Substances Control - *CalSites List*.
  - California Department of Health Services, *Hazardous Waste Information System*, (HWIS) and Tanner Report.
  - California Integrated Waste Management Board, *Solid Waste Information System* - (SWIS) List.
  - State Water Resources Board, Solid Waste Assessment Test Program (SWAT).
  - State Water Resources Control Board, *Hazardous Substances Storage Container Database* (UST).
  - U.S. Environmental Protection Agency Superfund Program - *National Priorities List* (NPL).
  - U.S. Environmental Protection Agency - *Comprehensive Environmental Response, Compensation, and Liability Information System* (CERCLIS).
  - U.S. Environmental Protection Agency, *Toxic Release Inventory System* (TRIS).
  - U.S. Environmental Protection Agency, *Resource Conservation and Recovery Information, System Treatment, Storage and Disposal Facilities*, (RCRIS-TSDF).
  - U.S. Environmental Protection Agency, *Resource Conservation and Recovery Information System, Large Quantity Generators*, (RCRIS-LQG).

- U.S. Environmental Protection Agency, *Resource Conservation and Recovery Information System, Small Quantity Generators*, (RCRIS-SQG).
- U.S. Environmental Protection Agency - *Superfund Amendment and Reauthorization Act, Title III*, (SARA Title III).
- U.S. Environmental Protection Agency, *Emergency Response Notification System* (ERNS).
- U.S. Environmental Protection Agency, *Facility Index System* (FINDS).
- U.S. Environmental Protection Agency, *Civil Enforcement Docket* (DOCKET).

- Preparation of this report.

SITE DESCRIPTION

LOCATION

The project area includes portions of public and private land located to the north and south of Ventura Freeway (US/101) at the Kanan Road interchange. The northern portion of the project is located adjacent to the north of the Ventura Freeway between Kanan Road and Clareton Drive. The southern portion of the project extends approximately 700 meters to the east and west from Kanan Road, along the south side of the Ventura Freeway. Also included in the project area is a proposed access road, which extends from the terminus of Roadside Drive southerly towards Agoura Road, and a partial cloverleaf road configuration located on the southbound interchange on the west-end of Kanan Road, see enclosed **PLOT PLANS**. The project site is located within the City of Agoura Hills, California, see **VICINITY MAP**. The street addresses associated with the project area include 5005 through 5298 Kanan Road, 29007 through 29525 Canwood Street, and 29293 through 29399, 29505, 29508, and 29529 Agoura Road.

SITE RECONNAISSANCE

The site conditions were observed during a reconnaissance conducted by Ms. Susan Martin on February 5, 2002. An Environmental Field Reconnaissance Questionnaire was completed during the site visit. The questionnaire is included in **APPENDIX I.** The features described below are shown on the enclosed **PLOT PLANS.** Photographs of the project area are included as **PLATES 1-4.**

Description of Property

Northern Area

The northern project area consists of the north portion of the Ventura Freeway interchange, which includes portions of the east-west trending Canwood Avenue, and developed and undeveloped properties located adjacent to the north of Canwood Avenue. Approximately eight structures are present in the northern project area. The structures consist of the Shell service station, McDonald's restaurant, Denny's restaurant, Pizza Hut, a small strip mall, antique/craft store, and two small businesses. A thirty-acre parcel of undeveloped land is located adjacent to the north of Canwood Avenue between the Denny's Restaurant and Medea Creek. The north-south trending Medea Creek bisects the eastern portion of the undeveloped property, see **PLOT PLAN - NORTH.** Unpaved footpaths exist along Medea Creek. Surface water within Medea Creek flows in a southerly direction. Heavy vegetation including trees and grasses were observed along the Medea Creek. Access to the property is via Canwood Street to the south and Kanan Road to the northwest.

The project area is bound to the south by the Ventura Freeway; to the west by Kanan Road, with a Southern California Edison substation located beyond; undeveloped land and residences to the north; and commercial properties to the east.

Southern Area

The southern project area consists of the south portion of the Ventura Freeway interchange, including a partial cloverleaf road configuration located on the southbound interchange on the west-end of Kanan Road, portions of the east-west trending Roadside Drive, developed land located adjacent to the south of Roadside Drive, and the proposed north-south trending access road located between Roadside Drive and Agoura Road. The properties adjacent to the south of Roadside Drive are developed with a Chevron service station, International House of Pancakes, a commercial strip mall, PacBell, a self-storage facility, El Pollo Loco, Agoura 10 Minute Auto Lube, Independent Electric Supplies, Agoura Equipment Rentals, and the County of Los Angeles Department of Animal Control Center, see **PLOT PLAN - SOUTH**. Access to the property is via Roadside Drive to the north and Kanan Road to the east.

The project is bound to the east by Kanan Road, with commercial properties located beyond; to the north by the US (101) Ventura Freeway; and to the south and west by commercial property.

Proposed Project

The proposed freeway improvements for the north and south sides of the Kanan Road/U.S. 101 Interchange are shown on the enclosed **PLOT PLAN NORTH** and **PLOT PLAN SOUTH**.

Topography and Drainage

The project area topography ranges from generally level to moderately sloped. The elevation of the property ranges from approximately 850 feet to 950 feet. Drainage from the northern portion of the property is via sheetflow towards Medea Creek near the eastern portion of the property. No odors, sheens, or foreign material were observed within the Medea Creek at time of the site reconnaissance.

Drainage from the southern portion of the property is to the west along Roadside Drive. Storm drains are located along the southern portion of Roadside Drive.

Past Uses of the Properties

No evidence of the past uses, treatment, storage, disposal or generation of hazardous substances was observed during the site reconnaissance.

Use of Hazardous Substances

Hazardous substance use was observed in the project area at the time of the site reconnaissance. Fuels are stored at the Shell and Chevron service stations. PCE is used in the dry cleaners located at 5182 Kanan Road and 5009/5015 Kanan Road. Waste oil is stored at the Agoura 10 Minute Lube. Diesel fuel is stored in an underground tank located at the PacBell facility. Above ground storage tanks and machine equipment storage is stored at the Agoura Equipment Rentals and Agoura Building Materials located at 29439 and 29403 Agoura Road, east of the proposed access road. Medical waste and film developing waste is also generated on nearby sites.

Storage Tanks

The Agoura 10 Minute Lube (29338 Roadside Drive) is located to the south of the US (101) Ventura Freeway. The facility operates one 1,000-gallon waste oil underground storage tank. The tank was installed in approximately 1983. No releases of waste oil have been reported from this facility.

The Hillside Rubbish Company (29431 Agoura Road) is located south of the US (101) Ventura Freeway. Six USTs were installed onsite between 1974 and 1983. This site reportedly had a gasoline

release from an underground storage tank on March 27, 1990. Groundwater beneath the site was impacted. On February 10, 1997, the Los Angeles Regional Water Quality Control Board (RWQCB) signed off on the site and remedial action was completed or deemed unnecessary.

Agoura Equipment Rentals (29439 Agoura Road) is located south of the US (101) Ventura Freeway. Three product and waste oil USTs historically existed on the property. This site reportedly had a gasoline release from an underground tank on August 2, 1993. On September 20, 1996, the Los Angeles RWQCB signed off on the site and remedial action was deemed complete.

Agoura Building Materials (29403 Agoura Road) is located south of the US (101) Ventura Freeway. This site reportedly had a gasoline release from an underground tank on November 20, 1995. The groundwater beneath the site was reportedly not impacted. The Los Angeles RWQCB signed off on the site on December 10, 1996.

The Pacific Bell facility (29300 Roadside Drive) occupies the property located to the south of the US (101) Ventura Freeway. A reported release of diesel fuel occurred from an UST at this facility in 1995. According to the RWQCB, no action has been taken by the responsible party after the initial report of a release of product from the UST. A representative of PacBell indicated that the UST at the facility was replaced in 1992. PacBell had no record of the release of diesel fuel occurring at this facility. The database report indicates "de minimus" levels of TPH in soil (180 ppm) at the PacBell site.

The Chevron service station (5051 Kanan Road) is located south of the U.S. 101 Ventura Freeway at the southwest corner of Kanan Road and Roadside Drive. The facility operates four 10,000-gallon USTs.

The tanks were installed in 1987. A release of fuel hydrocarbons to the subsurface soil was reported from this facility in 1988. The site is in the monitoring and remediation phase of groundwater clean-up work.

The Shell service station (5134 Kanan Road, northeast corner of Canwood Street and Kanan Road) occupies a property located to the north of the Ventura Freeway. The service station operates four underground storage tanks. The RWQCB file indicates that the site had a gasoline release in 1988. A plume of gasoline including methyl tert-butyl ether (MtBE) is present beneath the project area and extends offsite to the east.

No other evidence of existing aboveground or underground storage tanks was observed on the project area during the site reconnaissance.

Containers of Hazardous or Unidentified Substances

No evidence of containers of hazardous or unidentified substances was observed in the project area at the time of the site reconnaissances other than those substances noted above.

Solid Waste Disposal

No evidence of onsite disposal or landfilling of solid waste material was observed during the site reconnaissance.

Poly-Chlorinated Biphenyls (PCBs)

No evidence of PCB containing equipment or transformers was observed on the project area at time of the site reconnaissance.

Fluorescent lights are located within the project area buildings. No building demolition is contemplated for the project. Fluorescent lights manufactured prior to 1977 may have ballasts capacitors that contain PCBs, which is recognized by the EPA as a suspect carcinogen. Used fluorescent lamp tubes are considered to be hazardous mercury-bearing waste requiring proper disposal in accordance with local, state, and federal requirements. The onsite lights were not inspected during the site reconnaissance. Subject buildings constructed prior to 1977 should have the fluorescent light ballasts inspected for PCB content labels prior to disposal.

Heating/Cooling Equipment

Heating and cooling equipment were not observed during the site reconnaissance.

Asbestos

Sampling of asbestos containing material (ACM) was not included in the scope of work for this study. Buildings should have an asbestos survey conducted by a certified asbestos consultant prior to demolition or renovation.

Wastewater Disposal

No evidence of wastewater disposal or treatment systems was observed on the project area at the time of the site reconnaissance. The Los Angeles County Department of Public Works maintains industrial waste records for grease interceptors located at the McDonald's, Denny's, and El Pollo Loco Restaurants.

Radon

Radon sampling was not included in the scope of this study. No habitable structures are proposed as part of the project. However, the EDR research report indicates that the average level of radon at 63 sites located within Los Angeles County, was less than one picoCurie per Liter (pCi/L). The Federal Action Level for radon is four pCi/L.

Lead

Sampling of suspect lead in paint was not included in the scope of work for this project. In 2000, California Environmental conducted sampling for lead in soil within the proposed realignment for the Ventura Freeway, see **PLOT PLANS**. The survey consisted of collecting approximately 33 shallow soil samples. The soil samples were analyzed for lead per EPA Method 7420. The laboratory analysis found that lead in soil was not above regulated levels. Additional lead in soil assessment work was not recommended at that time. The tests for lead in soil are summarized in **APPENDIX IV**, which also includes the analytical test report.

Wells

Groundwater monitoring wells were observed at the Chevron service station property and along Roadside Drive, adjacent to the International House of Pancakes Restaurant, and within the adjacent

parking lot, see **PLOT PLAN SOUTH**. Groundwater monitoring wells are also present at the Shell service station and at the eastern portion of the McDonald's Restaurant property located to the east of the Shell service station, see **PLOT PLAN NORTH**. The monitoring wells are part of the ongoing soil and groundwater assessments for the Chevron and Shell service stations. No other evidence of dry wells, irrigation wells, injection wells, oil wells, abandoned wells, monitoring wells, or other wells was observed in the project area at the time of the site reconnaissance.

Odor

No evidence of strong, pungent or noxious odors was noted on the subject property at the time of the site reconnaissance.

Stressed Vegetation

No evidence of stressed vegetation was observed in the project area at the time of the site reconnaissance.

Stained Soil or Pavement

No evidence of staining or residue was observed on the subject property at the time of the site reconnaissance.

Other Conditions of Concern

Two dry cleaning facilities are located near the project area. Dry cleaning facilities use chlorinated solvents, specifically tetrachloroethylene, in the dry cleaning operations. The Murre Cleaners (5182 Kanan Road) is located at the north end of Kanan Plaza. The dry cleaners occupies the unit located near

the northern portion of the structure. A second dry cleaning facility is located within the shopping center located to the south of Roadside Drive at 5009-5015 Kanan Road. There have been no reported releases of chlorinated solvents from these two facilities.

During the summer of 2000, California Environmental observed apparent surface water discharges which contained gasoline emanate from the Shell service station on the north side of the project. This discharge apparently flowed down Canwood Street towards the east and into an unpaved area in the vicinity of Boring B4 excavated by California Environmental during the summer of 2000 to evaluate the apparent release. No other conditions of environmental concern regarding potential sources of soil and/or groundwater contamination were observed on the project area at the time of the site reconnaissance.

SITE DRIVE-BY

A drive by of the area within a one-quarter mile radius of the project area was conducted to help identify nearby sites that possibly use, store or generate hazardous materials. The project area is located in a commercial area of Agoura Hills. A list of selected environmental risk sites identified within a one-quarter mile radius of the project area is included in the **STANDARD ENVIRONMENTAL RECORD SOURCES** section of this report.

PREVIOUS WORK/RWQCB FILE REVIEW

A *Preliminary Environmental Site Assessment, Soil and Groundwater Assessment, Vicinity of 29007 through 29025 Canwood Street, Agoura Hills, California* and a *Preliminary Environmental Site Assessment – Phase I Subsurface Assessment for Fuel Hydrocarbons and Lead in Soil* were prepared by California Environmental in June and August 2000, respectively. Soil and groundwater sampling was conducted on the property located to the north of Canwood Drive (adjacent to the east of the Denny's restaurant). Soil borings were excavated adjacent to the offsite dry cleaning facility (5182 Kanan Road) and near the central portion of the property. No detectable levels of gasoline hydrocarbons or halogenated volatile organic compounds were found in soil other than methylene chloride, at concentrations up to 25 µg/L (ppb). The detectable level of methylene chloride was attributed to the methylene chloride stored in the mobile laboratory. Groundwater samples were obtained from four locations near the southern and northern portions of the property. Three groundwater grab samples were obtained near the southern portion of the property where a surface drainage pipe extends and discharges on the project area. Up to 4,400,000 µg/L of TPH, 38,000 µg/L of benzene, 13,000 µg/L of toluene, 54,000 µg/L of ethylbenzene, 84,000 µg/L of xylenes, and 44,000µg/L of MtBE were detected in the groundwater samples. The levels of BTEX hydrocarbons were well above the current Maximum Contaminant Levels (MCLs) for drinking water.

The assessment work completed by consultants for the Chevron and Shell service station and the assessment completed by California Environmental indicated that fuel hydrocarbon impacts in soil would most likely be below future grading work for the proposed improvement project as long as the depth of the excavation remained several feet above present and historic high groundwater levels. Near

surface hydrocarbon impacted soils from the UST releases were likely to be found only in the area of the releases on the respective service station properties. The one known exception to this is the surface drain discharge point in the north project area. Near surface TPH impacted soil should be anticipated in this area.

Shallow soil samples were obtained and tested for aerially deposited lead. Hydraulic push and hand auger tests holes were excavated in the project area on the north and south sides of the US/101 Freeway. The results of the shallow soil sampling show lead in soil below regulated levels and further assessment was not recommended.

An *Initial Site Assessment – Draft, Proposed Improvements to the US101/Kanan Road Interchange, Agoura Hills, California* was prepared by Tetra Tech, Inc., dated July 13, 1999. The objective of the assessment was to evaluate the potential for hazardous substances and soil contamination within and adjacent to the existing and proposed right-of-way for the northeastern quadrant of the US101/Kanan Road Interchange. The report concluded that the gasoline contaminated soil may be encountered during the encroachment along the south side of the Shell service station (Alternative 1). Sampling for aerially deposited lead throughout the planned construction area was also recommended.

An *Initial Site Assessment Report for Kanan Road Interchange Improvements at US101, Agoura Hills, California* was prepared by Willdan, dated January 1999. The objective of the assessment was to identify existing and/or potential hazardous wastes along the proposed improvements to the south side of the US 101/Kanan Road Interchange. The report concluded that additional Phase I and Phase II

investigations should be completed to determine the scope and extent of any impacts from hazardous substances and for aerially deposited lead.

A *Draft Report of Phase I Environmental Site Assessment for the 30 Acre Parcel, Riverwalk Promenade (Future) including 29007 and 29009-29025 Canwood Street, Agoura Hills, California*, was prepared by Mission Geoscience, Inc., dated April 10, 1998. This site includes a portion of the northern project area. The site consists of an approximate thirty acre, rectangular shaped parcel of land developed with two small commercial office buildings and a warehouse in the southeastern portion of the property. Three suspect ACM samples (roof material (2) and vinyl floor tile (1)) were obtained from the onsite structures. The floor tile contained 5% asbestos. The two samples of the roofing material were nondetect for ACM. No indications of recognized environmental conditions were reported for the property.

On February 13, 2002, a representative of California Environmental visited the office of the Los Angeles Regional Water Quality Control Board (RWQCB) to conduct a file review to update the regulatory status of the Shell and Chevron service stations.

Shell Service Station (5134 Kanan Road)

The Shell service station is located on the north side of the project area. The Shell service station file indicates that the site had a gasoline release as early as 1988. Site assessment work including sampling of 27 borings and sixteen groundwater monitoring wells has occurred at the site since the discovery of the release. Recent groundwater monitoring data shows that the depth to groundwater is variable in the northern project area. Groundwater is approximately ten feet bgs near the McDonalds restaurant.

Approximately 100-200 feet north of that location, the depth to groundwater is approximately 30 feet bgs. The Shell service station occupies a topographic high relative to the adjacent property to the east. The topographic low point in the area is Medea Creek. The groundwater flow probably follows the topography of the ground surface which slopes in an east-southeast direction towards Medea Creek. A plume of gasoline including methyl tert-butyl ether (MtBE) is present beneath the project area east of the Shell station (see **PLOT PLAN - NORTH**).

A letter dated March 8, 2000, from the IT Corporation to Ms. Elizabeth Hughes, Ms. Valerie Hunken, and Investor Real Estate Companies requested access to install two groundwater monitoring wells east of the McDonalds restaurant. The proposed wells are approximately 75 feet to the north of the Denny's restaurant. The wells were not installed by IT. Mr. Pat McCullough of the IT Corporation, indicated in a telephone conversation on June 30, 2000, that first quarter laboratory analyses found a decreasing trend in the concentrations of petroleum hydrocarbons. The RWQCB has apparently verbally agreed with the IT Corporation to postpone the installatión of the two monitoring wells pending receipt of additional monitoring data.

The most recent groundwater monitoring report found in the RWQCB file included the First and Second Quarter – 2001 data obtained by the IT Group. The analytical test data from the downgradient well (MWJ – east of McDonald's) indicate that the fuel hydrocarbon plume is continuing to migrate to the east. The groundwater sample obtained on March 19, 2001 shows a significant increase in both the total TPH gas concentration and MtBE concentration in groundwater. IT Group requested in a report dated July 10, 2001, that the RWQCB evaluate the site for low risk closure. According to our review of the

RWQCB file, that request has not been acted upon. Additional wells will probably be required to assess and monitor the Shell plume configuration.

Chevron Service Station (5051 Kanan Road)

The Chevron Service Station is located at 5051 Kanan Road, on the south side of the project area. According to RWQCB correspondence reviewed in the file, a hydrocarbon release from a UST was reported on August 13, 1992. The Chevron service station upgraded the three 10,000-gallon USTs, product piping and dispenser islands in 1997. During the upgrade activities, approximately 266 cubic yards of impacted soil was excavated from the site. An additional 26 cubic yards of impacted soil was excavated in July 1997. Assessment, excavation(s), groundwater monitoring, and a high-vacuum dual-phase extraction event have all been performed onsite to date. Holguin, Fahan & Associates, Inc. prepared a *Fourth Quarter 2001 Quarterly Groundwater Progress Report.* The report indicated that eighteen groundwater monitoring wells were located onsite or adjacent to the site (see **PLOT PLAN-SOUTH**). Groundwater was reported at depths of 7-16 feet bgs. with a west-southwest flow direction.

On October 3, 2001, the groundwater monitoring wells were purged and sampled. Laboratory analysis found concentrations of TPH as gasoline (from 1,782 to 22,900 µg/L) in 14 of the 18 wells. Benzene (up to 5,830 µg/L) was detected in the wells. MtBE (up to 1,480 µg/L) was also detected. The latest technical review from the RWQCB dated June 25, 2001, indicates that the Chevron property is undergoing additional assessment and interim remedial action. The interim remedial action includes installation of additional monitoring wells and extraction wells. Also, Chevron has proposed the use of a mobile extraction and treatment system to help remove the high levels of fuel hydrocarbons from

beneath the site. The approximate extent of TPH impacts associated with the Chevron release is shown on the attached **PLOT PLAN SOUTH.**

HYDROGEOLOGY

The project area is located within Lindero Canyon between the Simi Hills and the Santa Monica Mountains. The site is located near the western boundary of Los Angles County. The nearest ground water basins to the project area are the Conejo Groundwater Basin (located approximately three miles to the west) and the San Fernando Groundwater Basin (located approximately eight miles to the east). Regional surface drainage flows south along Medea Creek towards Lindero Canyon. Groundwater in the vicinity of the site flows through unconsolidated earth materials above the bedrock and through fractures in the bedrock. The depth to groundwater is highly variable in the project area (2-35^{+} ft.).

The *Geologic Map of the Thousand Oaks Quadrangle*, by T. Dibblee Jr., dated 1993, was reviewed. The geologic map indicates that the project area is underlain by older alluvium and bedrock. Two prominent hills located near the northwestern and eastern portions of the property are underlain by andesitic flows and breccas of the Conejo Volcanics.

A *Groundwater Investigation Report – Pacific Bell Facility, 29300 Roadside Drive, Agoura Hills, California*, was prepared for Grover/Hollingsworth and Associates, dated April 24, 1994. The scope of work included observing the site conditions, logging of bucket auger and hollow stem auger borings, installation of piezometers, and obtaining groundwater elevation data. The subsurface exploration included three hollow stem auger borings with piezometer installations. During the excavation of the

exploratory borings, groundwater was encountered at various depths. MW1 located near the northwestern portion of the property contained water at 2.5 feet bgs. Groundwater level data indicated that the groundwater gradient slopes from the east to the west. Groundwater levels beneath the Chevron plume area ranged from 7-20 feet bgs. The depth to groundwater on the north side of the project area is 10-30 ft. bgs.

SITE UTILIZATION HISTORY

BUILDING AND GRADING PERMIT RESEARCH

The City of Agoura Hills, Department of Building and Safety was visited for the purpose of researching building permits and Certificates of Occupancy for the project area. No building permits were available for 29505, 29508, 29529 Agoura Road, located adjacent to the proposed access road. The building permit information found is summarized below on **TABLE I.**

TABLE I
Building Permits

Date	Permit No.	Owner	Purpose	Description of Work
5005 Kanan Road				
9/13/95	005420	Panlan Inc.	Bakery	Tenant improvement
8/16/95	005422	Stan Cameron	--	Toilet, sink, water heater, 17 outlets, 10 branch circuits, type II hood
5007 Kanan Road				
8/24/98	008767	Dan Florry	--	Non-bearing wall in lobby and storage closet, 2 outlets
5009-5029 Kanan Road				
8/26/92	--	Patty Kanan	--	8 house sewer connecting to public sewer
10/27/92	00387	Patty Kanan	--	73 outlets, 60 light fixtures
11/20/92	00417	Panlan Inc.	Shopping center	10 compressors, 10 furnaces
6/17/92	11377	Panlan Inc.	Shopping center	Retaining wall at west end
11/17/92	00400	Panlan Inc.	Shopping center	Building/install 12x3'4" tenant cabinet
5011 Kanan Road				
9/3/92	00163	Patty Kanan	--	12 roof drains
Date	**Permit No.**	**Owner**	**Purpose**	**Description of Work**
5015 Kanan Road				
2/23/83	--	Mrs. Cannon	Retail sales	Add petition walls in store, 2 –8x8 offices
3/17/85	--	Mrs. Cannon	--	8 outlets
2/24/88	01645	Mr. Han	Dry cleaners	1 absorption unit, 1 boiler, 2 compressors, 7 check valves, 1 sink, 1 gas system
2/25/88	01648	Mr. Han	Dry cleaners	Internal imp. for dry cleaning
5017 Kanan Road				
2/22/96	006161	Laurie Hall	Nail salon	New sign
5019 Kanan Road				
5/21/98	003320	Kanan Properties	Shop	New sign, interior remodel, 4 outlets, 1 toilet, 1 water heater vent, repair/alteration for drainage and/or vent pipe
5021 Kanan Road				
9/30/48	008321	Kanan Properties		Wall sign
3/3/92	11165	Dan Chang	Restaurant	Delete and add cooking equipment, decorate and install counter, 1 grease interceptor
10/21/92	000239	Kanan Properties		Misc. conduits and conductors
6/1/98	008374	Harien Sacks	Retail	Interior work, retail remodel, 15 outlets, 18 light fixtures

TABLE I
Building Permits
(continued)

Date	Permit No.	Owner	Purpose	Description of Work
10/27/99	010250	Kanan Properties		Opening in the diving wall, non-bearing partition wall
5023 Kanan Road				
11/2/94	002229	Panlin Inc.	--	Repair cracked slab, install door carpet, demo. existing non-bearing wall
11/2/94	002308	Shahla Seehot	--	Sign face change
5/22/96	006551	Renter – Lynette Wilkins	--	Tenant improvement
5025 Kanan Road				
8/2/90	08100	Kanan Properties	--	Change sign face
9/29/98	008727	Kanan Properties	--	Construct 2 rooms, plumbing, tenant improvement – 7 air inlets/outlets, 1 toilet, 1 laboratory, 12 outlets, 15 light fixtures, 1 water heater
10/15/98	008828	Kanan Properties	--	New sign
5027 Kanan Road				
6/10/96	006612	Panlin Inc.	--	New walls, plumbing and electrical
7/22/96	006901	Kanan Village – Laurie Hall	Fitness	Wall sign
8/12/96	006897	Panlin Inc.	--	New walls, plumbing, and electrical
8/12/96	006041	Panlin Inc.	--	23-outlets, 15 light fixtures
8/12/96	006040.	Panlin Inc.	--	6 air inlets and outlets
8/12/96	006039	Panlin Inc.	--	Lavatory, toilet, water heater
5029 Kanan Road				
8/12/82	--	Kanan	--	3 sinks, water closet, dishwasher, water heater, gas system, 8 outlets
9/23/82	--	The "Collage"	--	compressor
12/17/96	06892	Panlin Inc.	--	Tenant improvement and relocate interior window
5033 Kanan Road				
12/11/97	008006	Patricia K. Kanan Family Trust	Restaurant	Repair/replace roof, mansard, restucco, repair/add curbs and A.C. paving, add planter area
5051 Kanan Road				
6/11/81	--	Chevron USA	Gas station	Replacing product tanks and product, vent lines 4-10,000 gal
5/20/83	--	Chevron USA	Gas station	Erect steel pay booth to existing building

TABLE I
Building Permits
(continued)

Date	Permit No.	Owner	Purpose	Description of Work
5/24/85	--	Chevron USA	Gas station	Demo existing gas station, raze existing service station and rebuild with self serve gas station
6/27/85	--	Chevron USA	Gas station	60 outlets, 40 light fixtures
7/16/85	--	Chevron USA	Gas station	House sewer connecting to public sewer
7/16/85	--	Chevron USA	Gas station	3 water closet, 3 lavatory, 2 floor drains
5/21/87	--	Chevron USA	Gas station	Replace underground tanks
5134 Kanan Road				
6/9/81	--	Shell Oil Co.	Gas station	Connect house sewer to public sewer
5/29/81	--	Shell Oil Co.	Gas station	Install 4-12,000 fuel tanks and piping, 1-water closet, 1-lavatory, 1-lawn sprinkler system, 1-water heater, 2-floor drains, 12-outlets, 12-light fixtures
7/6/84	--	Shell Oil Co.	Gas station	Pay booth and office and toilet 6'-x30' toilet and storage building
10/26/84	07144	Shell Oil Co.	Gas station	New 20x48 ft. food mart and remodel ext. facia of building
8/9/91	09717	Shell Oil Co.	Gas station	Remove 4 existing underground tanks and replace with 4 new underground tanks
12/12/95	005533	Shell Oil Co.	Gas station	New 20x50 ft. foodmart, new 16x42 carwash
4/17/95	002920	Shell Oil Co.	Gas station	21-outlets, 19-light fixtures
5/9/00	000403	Shell Oil Co.	Gas station	Restripe existing handicap parking for van parking. Relocate existing restroom fixtures to required 18", 1-lavatory, 1-toilet, 2-outlets, 1-fan
5146 Kanan Road				
9/26/90	08301	Pizza Hut	Food	Add circuit breaker
5148 Kanan Road				
--	--	Carvez	--	Add sign
10/13/94	002371	Bambino's Boy's and Girls Hair Styling	Hair cutting	Paint existing signs from red to brown
5152 Kanan Road				
5/14/86	--	Tanning Center	Nails	New outlets

TABLE I
Building Permits
(continued)

Date	Permit No.	Owner	Purpose	Description of Work
		5156 Kanan Road		
8/21/86	--	Prescriptions Only Inc.	Prescriptions	6 outlets
4/26/95	002974	Doug @ Agoura Sew and Vac Center	Sells computers	New sign
		5158 Kanan Road		
5/19/81	--	Bruce Rogers	--	Construction of handicapped bathroom
7/9/81	--	D&B Developers	Optical Shop	Wall sign
7/2/81	--	Rogers Optical	Optical Shop	Partition with door
7/9/81	--	Rogers Optical	Optical Shop	4 light fixtures
		5160 Kanan Road		
5/19/81	--	Parkway Calabasas Partnership		New sink
5/19/81	Dr. M. Dunn	--		150 ft. partition wall
5/19/81	Dr. M. Dunn	--		New outlets
5/19/81	Dr. M. Dunn	--		Alteration to existing HVAC system
		5162 Kanan Road		
12/19/94	002600	98¢ Super Deals	--	Sign
6/26/95	003227	WP Discount Store – Mark Burkes	Hair salon	Wall, plumbing, general improvements
6/28/95	003246	Elan's Hair Design	Hair salon	Face change
7/2/95	004333	Burkes Investment	--	Outlets
7/18/95	004315	Burkes Investment Co.	Hair salon	Tenant improvement
6/30/99	009907	Kanan	--	Sign
		5170 Kanan Road		
11/2/81	--	D&B Developers	Jewelry shop	Sign
11/2/81	--	D&B Developers	Jewelry shop	Circuit for sign
11/12/92	--	Kathleen Silvers	--	Face change
		5182 Kanan Road		
9/1/87	06284	Young H. Han	Dry cleaners	Exhaust for circuits
10/19/89	06719	Young H. Han	Dry cleaners	Sign
		5190 Kanan Road		
12/14/95	005743	Vicki		Change sign, cabinet color
1/4/99	009250	Burks Development	Sandwich shop	Cosmetic changes
1/4/99	009251	Burks Development	Sandwich shop	Dishwasher, sink, toilet, urinal
1/4/99	009252	Burks Development	Sandwich shop	Outlets
1/19/99	009321	Burks Development		Sink
5/12/99	009687	Kanan Village	Deli	Sign
		5280-5298 Kanan Road		
4/20/98	008319	Burks Development	Karate	Sign

TABLE I
Building Permits
(continued)

Date	Permit No.	Owner	Purpose	Description of Work
5290 Kanan Road				
2/9/98	008148	Kanan Plaza	Fitness studio	Tenant improvement
2/10/98	008151	Kanan Plaza	Fitness studio	Tenant improvement
4/20/98	008319	Burks Development	Karate	Sign
5292 Kanan Road				
6/25/80	--	Kanan Canwood Joint Venture	--	--
4/10/81	--	D&B Developers	--	Outlets
4/10/81	--	--	--	Evaporative cooler
4/10/81	--	--	--	Ventilation system, grease hood
4/10/81	--	Kanan Canwood Joint Venture	--	Toilet, sink, water heater, gas system
5/5/81	--	D&B Developers	Food	Sign
5/5/81	--	D&B Developers	--	Circuit breaker
5294 Kanan Road				
7/6/83	--	D&B Developers	Frames	Sign
11/27/95	005867	Burkes Development	Pictures	Sign
5298 Kanan Road				
1/20/84	--	Jerry Dempton	Liquor store	Sign
1/20/84	--	Jerry Dempton	Liquor store	Water heater
1/20/84	--	Jerry Dempton	Liquor store	Light fixture
--	--	Jerry Dempton	--	Compressor
29007 Canwood				
11/11/69	--	H. Warshoeaky, Mr. Floyd, Lindal Cedar Homes	Office	Air conditioning, circuit breaker, compressor, percolation soil
5/10/73	--	As above	As above	As above
29025 Canwood				
1/11/30	00892	Kenlite Concrete	Retail	Garden wall
11/24/87	00477	Gary Faulkes	Retail	Change parking from asphalt to concrete
3/22/99	009508	Richard Young	Retail	Outlets/light fixtures
29145 Canwood				
1/8/93	00514	Dennys	Restaurant	Internal remodel – paint, carpet, outlets
3/15/93	00699	Dennys	Restaurant	New roof shingles
1/8/93	00517	Dennys	Restaurant	3 toilets, 2 lavatory, 7 sinks, 2 drains
29161 Canwood				
11/4/88	06087	Lopaty	Restaurant	--
9/29/89	06548	McDonald's Corp.	Restaurant	1 air handling unit, 1 compressor, 1 ventilation system, 1 furnace

TABLE I
Building Permits
(continued)

Date	Permit No.	Owner	Purpose	Description of Work
11/15/89	06926	Valley Meat	Restaurant	Fire sprinkler, tenant improvement
1/5/90	07060	McDonald's Corp.	Restaurant	Compressor, 1 evaporative coil
2/7/90	07499	McDonald's Corp.	Restaurant	Install "french fryer" and grill
3/20/90	07458	McDonald's Corp.	Restaurant	Outlets
3/27/90	07487	McDonald's Corp.	Restaurant	Install fire suppression system for grill and fryer
3/29/90	07500	McDonald's Corp.	Restaurant	2 hood ventilation systems
4/9/90	07551	McDonald's Corp.	Restaurant	Outlets
3/20/94	07457	McDonald's Corp.	Restaurant	12 gas system, 1 outlet
29219 Canwood				
7/22/99	010005	Canwood Corp. Center	Office	Water service
7/22/99	010001	Canwood Corp. Center	Office	Installation of building sewer
2/22/00	000204	Silagi Development	Office	7 inlets/outlets, bath fans
3/27/00	000350	Silagi Development	Office	8 fire dampers
29229 Canwood				
4/17/00	--	Silagi	Office	Wall sign, outlets
29525 Canwood				
2/24/98	007336	Mr. Greg Greenstein	Medical offices	Foundation repair of existing medical building
29293 Agoura Road				
5/26/81	--	Pacific Telephone	Office	Maintenance of office
10/23/81	--	Pacific Telephone	Office	Maintenance
11/13/81	--	Pacific Telephone	Office	164 outlets, 93 light fixtures
11/19/81	--	Pacific Telephone	Office	4 water closet, 5 lavatory, 1 sink, 1 water heater, 1 urinal, 1 drinking fountain
3/12/82	--	Pacific Telephone	Office	1 heat pump, 3 ventilation systems
9/20/82	--	Pacific Telephone	Office	Connect building to house sewer
29295 Agoura Road				
10/18/79	--	Pacific Telephone Company	Office	Install restroom facilities, drinking fountain and firehose cabinets
6/10/83	--	--	--	Grading, add outlets, light fixtures, air handling systems, ventilation systems,
12/4/87	00663	Pacific Bell	Office	Internal improvements
5/8/97	007313	Christian Church of the Hills	Office	Tenant improvements to develop for church use

TABLE I
Building Permits
(continued)

Date	Permit No.	Owner	Purpose	Description of Work
3/2/98	008186	Christian Church of the Hills	Office	Toilets, urinals, water heater
3/3/98	008190	Christian Church of the Hills	Office	Change roofing to rock wall
3/10/98	008215	Christian Church of the Hills	Office	Air inlets and outlets
6/1/99	008487	Christian Church of the Hills	Office	Sign
29301 Agoura Road				
9/10/34	--	Los Virgenes Storage	Storage	Outlet and light fixtures
11/23/82	--	Conejo Investors Realty		Power apparatus
12/16/82	--	Los Virgenes Storage	Storage	Upgrades
3/26/97	07152	Trip Aiken		Pole sign to be cut down, install new sign
3/26/97	07153	Trip Aiken		One branch circuit for sign
29395 Agoura Road				
7/9/86	--	Agoura Road Group		Construct new building, add ventilation system, outlets and light fixtures
6/11/87	--	MSG Enterprises	Office	Construct new building, add ventilation system, outlets and light fixtures
10/1/87	--	Agoura Road Group		Construct new building, add ventilation system, outlets and light fixtures
12/21/87	--	MSG Enterprises		Tenant improvements
6/21/89	05760	Agoura Road Group		Outlets and light fixtures
4/16/97	006654	Marty Green		2 power appliances
4/6/99	009423	Agoura Road Group		Divide office space, add door
4/5/99	009457	Agoura Road Group		Move one wall and door, divide warehouse, add t-bar
29399 Agoura Road				
7/9/86	--	The Agoura Road Group		Construct new building, add outlets and light fixtures, ventilation system
16/1/87	--	MSG Enterprises		
8/17/88	--	--	--	Provide offices, reading room assembly hall, in existing building, add restroom facilities
2/14/91	--	--	--	--

TABLE I
Building Permits
(continued)

Date	Permit No.	Owner	Purpose	Description of Work
5284 Kanan Road				
1/27/00	000111	Kanan/Canwood Joint Venture	--	Building new office space
5288 Kanan Road				
8/25/82	--	Vicki	--	Toilet
10/24/91	10261	Kanan Plaza/Burks Development	Beauty shop	Sign
6/16/94	002025	Salon Kanan	--	Sign
29229 Canwood				
10/31/91	10234	Patty Kanan	Storage	Christmas tree lot
5/5/92	11232	Patty Kanan	--	1 outlet, 1 sink, 1 water heater
5/5/92	11233	Patty Kanan	--	1 outlet, 1 sink, 1 water heater
3/3/99	009456	Moshe Silagi	--	Grading
7/7/99	--	--		Construct new building

UNDERGROUND STORAGE TANK PERMIT RESEARCH

The County of Los Angeles, Department of Public Works was visited by our personnel to research their files for underground storage tank (UST) permits and industrial waste records. The research included UST records for the Chevron and Shell service stations and grease interceptor records for the McDonalds, El Pollo Loco and Denny's restaurants.

The record research indicated that three 10,000-gallon USTs were installed at the Chevron service station in 1987. The Chevron service station upgraded the three 10,000-gallon USTs, product piping and dispenser islands in 1997. During the upgrade activities, approximately 266 cubic yards of impacted soil was excavated from the site. An additional 26 cubic yards of impacted soil was excavated in July 1997. Eighteen groundwater monitoring wells were installed throughout the project area, along Roadside Drive,

adjacent Park and Ride lot, and within the shopping center located to the west. MtBE was detected in five of the eleven groundwater monitoring wells at levels ranging from 440 µg/L to 37,000 µg/L.

The Shell service station (5134 Kanan Road) file included inspection reports, fee permit receipts and system certifications, and a letter from the RWQCB. The letter, dated June 12, 1998, from the RWQCB to Shell Oil Products Company indicated that laboratory results from the May 1998 quarterly report identified elevated levels of MtBE in onsite and offsite (McDonald's Restaurant parking lot) monitoring wells. The RWQCB required Shell Oil Products Company to evaluate if a new or ongoing release of fuel hydrocarbons from the existing UST had occurred. See the **PREVIOUS WORK** section of this report for additional information regarding the Shell service station.

LACHD AND SCAQMD FILE REVIEW

Inquiry letters were sent to the Los Angeles County Health Department (LACHD) and South Coast Air Quality Management District (SCAQMD) for any information the agencies may have regarding soil, water or air contamination at the site. The LACHD response will be forwarded should a file exist for the subject property address. The LACHD and SCAQMD response letters be are attached in **APPENDIX II.**

SCAQMD maintained records for Murre Cleaners (5182 Kanan Road), Agoura Cleaners (5015 Kanan Road), It's The Main Event (29399 Agoura Road), and Shell Oil Company (5134 Kanan Road). No other records were on file for the other project area addresses. Murre Cleaners was issued a permit to operate in November 1998. A Notice to Comply (change in ownership/daily and weekly records) was issued in August 1999. A second Notice to Comply was issued in November 2001 for failure to submit daily poundage logs, daily and weekly inspection and 2000 Annual Report.

Agoura Cleaners was issued a Permit to Operate in October 1996. A Notice to Comply was issued in June 1997 for failure to submit initial compliance and annual reports, for poor record keeping, and for operating the dry cleaning machine without a permit. A second Notice to Comply was issued on November 15, 2001 for failure to submit a 2000 annual report.

It's The Main Event obtained a permit to operate a spray booth in 1987. Notices to Comply or Notices of Violation were not on file for this address.

Shell Oil Company operated gasoline dispensing equipment from 1982 to 1998. A Notice of Violation was issued in December 1996 for the failure to maintain the vapor recovery systems. A second Notice of Violation was issued in March 2001 for improperly installing the vapor recovery hose.

HISTORICAL AERIAL PHOTOGRAPHS

Historical aerial photographs were reviewed as part of California Environmental's *Preliminary Environmental Site Assessment – Phase I* report, dated August 2000. The aerial photographs reviewed are part of the aerial photograph collection maintained by the County of Ventura, Department of Public Works. Two aerial photographs were reviewed for the project area. The historical aerial photographs are summarized below in **TABLE II.**

TABLE II
Historical Aerial Photograph Collection

Date	Photo ID	Description
1953	AXI9K12	The project area is developed with approximately three dwellings and two small structures located north of the present-day US 101 Freeway. Undeveloped land and an area cultivated with row crops are located along the south side of the present-day US 101 Freeway. The remainder of the property is undeveloped. The property is bound to the west by undeveloped land; to the south by undeveloped land and Agoura Road; to the east by several dwellings and undeveloped land; and to the north by undeveloped land. Medea Creek is located to the east of the property.
1960 1964	-- HA-WE 131	No available aerial photograph.
1984	PW VEN 4-30	No available aerial photograph.
1989	PW VEN 7-44	The project area is developed with commercial structures located along the northern and southern portions of the present-day US 101 Freeway. Canwood Avenue extends adjacent to the north of the freeway. Roadside Drive extends along the southern side of the present-day US 101 Freeway. The property is bound to the west by commercially developed land; to the south by commercial properties and Agoura Road; to the east by commercial land; and to the north by undeveloped land and residences. Medea Creek is located to the east of the property.

Historical aerial photograph data was obtained from the *Initial Site Assessment – Draft, Proposed Improvements to the US101/Kanan Road Interchange, Agoura Hills, California* prepared by Tetra Tech, Inc., dated July 13, 1999. The aerial photograph summary indicated that the northern portion of the project area was undeveloped from approximately 1945 to 1960. The US 101 Freeway and Kanan Road

were observed in the current alignment in 1953. Agoura Road located to the south of the freeway existed in the 1945 photograph. Development of the property, including the Shell service station, SCE substation, and the Denny's restaurant were identified in the 1970 aerial photograph. The McDonalds restaurant was identified in the 1977 aerial photograph with the shopping center located to the north of the service station first appearing in the 1989 aerial photograph.

HISTORICAL FIRE INSURANCE

The EDR Company was contacted to review historical Sanborn Fire Insurance Maps for the project area. There is no Sanborn Fire Insurance Map coverage available for the project area. The EDR response letter is included in **APPENDIX II** of this report.

HISTORIC TOPOGRAPHIC MAPS

Historical USGS topographic maps were reviewed as part of this study. The topographic base of the *Geologic Map of Parts of Los Angeles and Ventura Counties, California* (USGS Bulletin 753, Plate 1, 1924) shows a small structure near the northeastern portion of the property. No other development was observed on or near the project area.

The USGS 7.5 minute Thousand Oaks topographic quadrangle, dated 1950 (photo revised in 1981), was reviewed. The topographic map indicates that the project area was undeveloped in 1950. The property contained several structures located on the northern and southern portions of the project area in the 1981 photorevision.

The USGS Photostatic Positive Index, Thousand Oaks, topographic quadrangle, dated 1960, was reviewed. The topographic map indicates that the project area was developed with two small residences in 1960.

NEARBY CONTAMINATED SITES RESEARCH

LANDFILLS

The Major Waste Systems maps for Los Angeles County and the Solid Waste Information Systems (SWIS) list were reviewed to identify landfill and transfer stations located near the property. The Agoura Road Limited Volume Transfer Operation (29020 Agoura Road) is reportedly located approximately 1,400 feet southeast of the Kanan Road U.S. 101 Interchange. The address for this facility may be inaccurate. The Hillside Rubbish Facility at 29431 Agoura Road is probably the correct address for this listing. This facility processes construction/demolition and mixed municipal materials. No Notices of Violation were listed in the EDR database for the offsite facility. There are no other landfills or transfer stations located within a 2,000-foot radius of the of the project area. There are no permitted hazardous waste landfills located in Los Angeles County.

OIL FIELD MAPS

Oil field maps published by the State of California, Division of Oil, Gas and Geothermal Resources were researched to determine if oil production occurred on or near the project area. Wildcat Map No. W2-1 shows that there are no oil wells or oil fields located within a 2,000-radius of the project area.

STANDARD ENVIRONMENTAL RECORDS SOURCES

A database search of government records sources was performed by EDR Company to locate known or suspect contaminated sites and sites, which store, generate, or use hazardous materials near the project area. Several facilities located within the project area were listed as facilities that generate and/or store hazardous materials or facilities that have had a release to the subsurface. Environmental risk sites found to exist within one-quarter mile radius of the project area are listed below in **TABLE III**. The EDR report, including a description of the databases searched, is included as **APPENDIX III**.

TABLE III
Standard Environmental Record Sources

Name	Address	Distance from Subject Property	Source(s)
Half Hour Photo	5166 Kanan Rd.	Project Area	HAZNET
Agoura Shell Shell Oil Shell #204-0048-0107 Josephine E. Gomes	5134 Kanan Rd.	Project Area	UST ERNS CA FID UST LUST Cortese HIST UST
Murre Cleaners	5182 Kanan Rd.	Project Area	RCRIS-SQG FINDS HAZNET CLEANERS
Orthopedic Consultants Medical Group Agoura Family Practice Agoura Orthopedic Associates Affiliates in Medical Specialties Dentistry for Children	29525 Canwood St.	Project Area	HAZNET
Pacific Bell Pacific Bell Agoura 11/B1-245	29300 Roadside Dr.	Project Area	RCRIS-SQG FINDS HAZNET LUST Cortese CA FID UST LOS ANGELES CO. HMS HIST UST UST

TABLE III
Standard Environmental Record Sources
(continued)

Name	Address	Distance from Subject Property	Source(s)
Auto Lube Care Globe Environmental Services Agoura 10 Minute Lube Conejo Car Wash	29338 Roadside Dr.	Project Area	HIST UST RCRIS-SQG FINDS HAZNET CA FID UST
Chevron USA Chevron #9-5348	5051 N. Kanan Rd.	Project Area	CA FID UST LUST Cortese UST HIST UST HAZNET
Agoura Cleaners	5015 Kanan Rd.	Project Area	RCRIS-SQG FINDS
Agoura Cleaner	5009 Kanan Rd.	Project Area	HAZNET CLEANERS
USA Gasoline Corp. #83	5000 Kanan Rd.	Project Area	UST
Agoura Building Materials	29149 Agoura Rd.	Project Area	HAZNET
J D Daniels	29166 Roadside Dr.	Project Area	RCRIS-SQG FINDS HAZNET
Jiffy Lube	29162 Roadside Dr.	Project Area	UST
Michael S. Shore DC	29134 Roadside Dr.	Project Area	HAZNET
Agoura Road Limited Volume Transfer Op.	29020 Agoura Rd.	Project Area	SWF/LF
Kinkos Compugraphics	5045 Cornell Rd.	Project Area	RCRIS-SQG FINDS HAZNET
Agoura Hills Target Range	5040 Cornell Road	Project Area	RCRIS-SQG FINDS
Hillside Rubbish Co. Hillside Rubbish/Westlake Trucking Agoura Building Materials	29431 Agoura Rd. 29431 Agoura Rd. W	Project Area	CA FID UST LOS ANGELES CO. HMS LUST Cortese HAZNET
Agoura Equipment Rental & Supplies	29439 Agoura Rd.	Project Area	LUST Cortese CA FID UST HIST UST
Marathon Copier Service	5171 Clareton Dr.	2,050 ft. ENE	RCRIS-SQG FINDS
Agoura One Hour Photo	5636 Kanan Rd.	2,860 ft. N	RCRIS-SQG FINDS
Jim Dandy Cleaners	28708 Roadside Dr.	3,510 ft. ESE	RCRIS-SQG FINDS HAZNET CLEANERS

TABLE III
Standard Environmental Record Sources
(continued)

Name	Address	Distance from Subject Property	Source(s)
Calabasas Sanitary Landfill	26919 Ventura Blvd.	3,745 ft. E	CA BOND EXP.PLAN HIST UST
Westlake Truck Leasing	29395 Agoura Rd., Ste 202	3,840 ft. W	RCRIS-SQG FINDS HAZNET
Electronic Space Products Int.	5310 Derry Ave., Unit U	4,050 ft. E	RCRIS-SQG FINDS LOS ANGELES CO. HMS
Exxon Service Station Exxon RAS #7-3364 (former) Exxon Company UST – SS#73364 Agoura Hills Ultramar & Service	30245 Canwood St.	4,690 ft. W	HIST UST HAZNET Cortese LUST CA FID UST LOS ANGELES CO. HMS UST
Fire Station #65	4206 Cornell Rd.	5,090 ft. SSE	HIST UST

Note: A search of public information databases may omit some nearby contaminated sites due to missing or inaccurate information in the public record.

The orphan site summary in the EDR database report lists small quantity generators (i.e. auto repair and medical offices) of hazardous wastes. The properties are located greater than 500 feet from the subject site and are not expected to have an impact on the subject property.

GENERAL FINDINGS

During the research phase of this study, the following information was obtained:

- Aerial photograph research indicates that the project area was developed with a dwelling, two small structures, and cultivated with row crops in 1953. The project area is developed with structures located on the northern and southern portions of the project area in 1989.

- Building permit research indicates that the commercial structures were generally constructed in the late 1970's to early 1980's.

- The Shell service station located within the northern portion of the project area, had a gasoline release in 1988. A plume of gasoline in groundwater, including methyl tert-butyl ether (MtBE), is present east of the Shell service station.

- A letter, dated March 8, 2000, from IT Corporation requested access to install two groundwater monitoring wells on the vacant property located east of Denny's restaurant.

- A Quarterly Groundwater Monitoring Report for Spring 2001 for the Shell service station indicates that the gasoline fuel hydrocarbons have migrated east of monitoring well MWJ. MWJ is the most easterly monitoring well. Additional wells will likely be required for assessment of the easterly extent of the fuel hydrocarbon plume which emanates from the Shell station.

- The Chevron service station upgraded the three 10,000-gallon USTs, product piping and dispenser islands in 1997. During the upgrade activities, approximately 266 cubic yards of impacted soil was excavated from the site. An additional 26 cubic yards of impacted soil was excavated in July 1997. Eighteen groundwater monitoring wells were installed throughout the project area. Interim remedial action to remove high levels of fuel hydrocarbons from beneath the site by pumping is proposed. High levels of gasoline fuel hydrocarbons and the additive MtBE are present in the plume which emanates from the Chevron station.

- California Environmental prepared a *Preliminary Environmental Site Assessment, Soil and Groundwater Sampling, Proposed Riverwalk Promenade, Vicinity of 29007 through 29025 Canwood Street, Agoura Hills, California*, dated June 2000. Seven groundwater samples were obtained from beneath the north project area. The borings were excavated adjacent to the offsite dry cleaning facility and near the central portion of the property. Elevated levels of gasoline hydrocarbons were detected in groundwater beneath the area adjacent to Canwood Street.

- California Environmental prepared a *Preliminary Environmental Site Assessment-Phase I Subsurface Assessment for Fuel Hydrocarbons and Lead in Soil*, dated August 2000. Fuel hydrocarbons were not found in soil samples obtained from the south and north sides of Roadside Drive in the south project area. Analysis of shallow soil samples showed non-hazardous levels of lead in soil within the project area. Subsurface assessment work conducted by California Environmental beneath the north project area shows an area of shallow fuel hydrocarbon impacts in

soil and groundwater just north of Canwood Street and east of Medea Creek. A future lead enforcement agency may require additional assessment and remedial clean up of this impacted zone.

- Previous assessment work conducted for the Shell and Chevron service station shows that shallow (<5 feet) fuel impacts in soil are generally restricted to the soil in the vicinity of the tank pit and piping. Offsite groundwater monitor wells show groundwater at a depth of 10 to 30 feet below the ground surface with decreasing levels of fuel hydrocarbons to the east and downgradient away from the Shell service station property.

- Previous subsurface assessment work completed by California Environmental found no detectable PCE in shallow soil east of the dry cleaners at Kanan Plaza .

- There are no listed oil wells located within a 2,000-foot radius of the project area.

- The depth to groundwater beneath the project area is highly variable (2-35^{+} feet). The groundwater gradient in the northern portion of the property is toward the southeast. The groundwater gradient in the southern portion of the property is toward the west. The groundwater gradient probably follows the topographic contours.

During the site reconnaissance, the following observations were made:

- The project area is developed with several commercial structures that include service stations, auto repair, restaurants, and retail businesses.

- The north-south trending Medea Creek bisects the eastern portion of the north project area. Surface water flows in a southerly direction within Medea Creek.

- Existing underground storage tanks were observed near the project area at the Chevron and Shell service stations.

- No evidence of onsite disposal or landfilling of solid waste material was observed on the project area. Some areas of apparent filling were noted in the northern, central, and southern portions of the proposed access road (south). Miscellaneous pieces of trash and debris were observed in the area around the proposed access road.

- No evidence of PCB containing material or transformers was observed on the project area.

- Groundwater monitoring wells were observed on and in the vicinity of the Shell and Chevron service station properties.

- The area surrounding the project area consists of commercial property.

CONCLUSIONS AND RECOMMENDATIONS

Historical research indicates that the project area was developed with a small structure located on the northeastern portion of the property in 1924. The remainder of the property was undeveloped. Three dwellings and two small structures occupied the northern portion of the property in 1953. The southern portion of the property beyond the Ventura Freeway was cultivated with row crops and undeveloped land. Commercial development of the property occurred in the 1970's and early 1980's. The Shell service station and Denny's restaurant were observed in the 1970 aerial photograph. The McDonalds restaurant was identified in the 1977 aerial photograph. The Chevron service station was remodeled with a new service station and USTs during the 1980s.

Seven project area and adjacent businesses were identified as facilities that store hazardous materials (fuels and waste oils) in underground storage tanks. These facilities include the Shell service station, Chevron service station, Agoura 10 Minute Lube, Pacific Bell, Hillside Rubbish Company, Agoura Equipment Rentals & Supplies, and Agoura Building Materials.

The Agoura 10 Minute Lube Station and Carwash (29338 Roadside Dr.) is listed on the HMS, UST, CaFID, RCRIS-SQG, FINDS, and HAZNET databases. The site operates one underground waste oil storage tank. No leaks of waste oil from the UST were reported from this property.

The Chevron service station (5051 Kanan Rd.) is listed on the HAZNET, HMS, LUST, Cortese, CaFID, UST, ERNS databases. The record research indicated that three 10,000-gallon USTs were installed at the Chevron service station in 1987. The Chevron service station upgraded the three 10,000-gallon USTs,

product piping and dispenser islands in 1997. During the upgrade activities, approximately 266 cubic yards of impacted soil was excavated from the site. An additional 26 cubic yards of impacted soil were excavated in July 1997. The most recent groundwater quality data was found in the Fourth Quarter 2001 Quarterly Groundwater Progress Report submitted by Holguin, Fahan & Associates, Inc. on November 29, 2001. Elevated levels of fuel hydrocarbons persist beneath the Chevron plume area. The site is currently undergoing interim remedial action through the use of a transportable treatment unit to remediate high levels of fuel hydrocarbons in groundwater. Installation of additional monitoring wells will probably be required by the RWQCB. Groundwater quality data indicate up to 23 ppm of gas in groundwater along with elevated levels of benzene, MtBE, and TBA.

The Pacific Bell facility (29300 Roadside Drive) was identified as a facility that stores and generates hazardous materials. A reported release of diesel fuel occurred from a UST at this facility in 1995. According to the RWQCB, no action has been taken by the responsible party after the initial report of a product release from the UST. A representative of PacBell indicated that USTs at the facility had been replaced in 1992. PacBell had no record of the release of diesel fuel occurring at this facility. *De minimus* levels of TRPH (180 mg/kg) were reported at this facility.

The Shell service station (5134 Kanan Rd.) is listed on the HAZNET, HMS, LUST, Cortese, CaFID, UST, ERNS databases. The RWQCB file indicated that the site had a gasoline release as early as 1988. A plume of gasoline with methyl tert-butyl ether (MtBE) is present beneath the project area. Recent groundwater monitoring data from April 2001 indicates that the gasoline plume from the Shell station has migrated east of well location MWJ (towards McDonald's). Additional wells will probably be required by the RWQCB to characterize the easterly extent of the Shell station plume.

The Hillside Rubbish Company (29431 Agoura Rd.) is listed on the CA FID UST, LOS ANGELES CO. HMS, LUST, HAZNET, and Cortese databases. A UST gasoline release reportedly impacted the groundwater beneath the site on March 27, 1990. On February 10, 1997, the RWQCB signed off on the site, however, low levels of MtBE were reported in the groundwater.

Agoura Equipment Rental & Supplies (29439 Agoura Rd.) is listed on the LUST, Cortese, CA FID UST, and HIST UST databases. A gasoline UST release reportedly impacted the soil beneath the site on August 2, 1993. On September 20, 1996, the Los Angeles RWQCB signed off on the site as no further action.

Agoura Building Materials (29403 Agoura Rd.) is listed on the HAZNET, LUST, Cortese, and Los Angeles Co. HMS databases. A UST gasoline release reportedly impacted the soil beneath the site on November 20, 1995. On December 10, 1996, the Los Angeles RWQCB signed off on the site as no further action.

In July/August 2000, soil and groundwater sampling was conducted by California Environmental on the property located to the north of Canwood Drive (adjacent to the east of the Denny's restaurant). Seven borings were excavated on the property. The borings were excavated adjacent to the offsite dry cleaning facility and near the central portion of the property. Nine soil samples were obtained from these three borings. No detectable levels of gasoline hydrocarbons or halogenated volatile organic compounds were found in soil other than methylene chloride. Up to 25 µg/L (ppb) of methylene chloride was detected in soil sample B1 @ 10 ft. The detectable level of methylene chloride is most likely from the methylene chloride stored within the mobile laboratory.

Groundwater samples were obtained from four locations near the southern and northern portions of the property. The maximum depth of the groundwater sampling point was 45 feet located near the offsite dry cleaning facility. The remaining three groundwater grab samples were obtained near the southern portion of the property where a surface drainage pipe extends and discharges onto the project area. Elevated levels of gasoline hydrocarbons were detected in groundwater beneath this area. Up to 4,400,000 µg/L of TPH, 38,000 µg/L of benzene, 13,000 µg/L of toluene, 54,000 µg/L of ethylbenzene, 84,000 µg/L of xylenes, and 44,000 µg/L of MtBE were detected in groundwater samples. The levels of hydrocarbons detected in the laboratory analysis are well above the current Maximum Contaminant Levels (MCLs) for drinking water. Groundwater is present at depths of 12 and 17 feet bgs. The future lead enforcement agency for remedial clean-up of this site may require additional assessment work to define the extent of the fuel hydrocarbon impacts in soil and in groundwater.

Shallow soil samples were previously obtained and tested for aerially deposited lead. Hydraulic push and hand auger test holes were excavated in the project area on the north and south sides of the US/101 Freeway. The results (see **APPENDIX IV**) of the shallow soil sampling show that lead in soil is not above regulated levels. Additional lead in soil assessment work is not recommended.

California Environmental has performed a Phase I Environmental Site Assessment - Update in conformance with the scope and limitations of ASTM 1527-00 for the project area - proposed 101 Freeway improvement located near the intersection of Canwood Street and Kanan Road, California. This assessment has revealed no evidence of additional recognized environmental conditions other than those discussed above. The assessment work completed by consultants for Chevron and Shell and the assessment completed by California Environmental indicates that fuel hydrocarbon impacts in soil will

probably be below future grading work for the proposed improvements as long as the depth of the excavation is several feet above present and historic high groundwater levels. Near surface hydrocarbon impacted soils from the UST releases are likely to be found only in the area of the releases on the respective service station properties. The one known exception to this is the surface drain discharge point in the north project area near California Environmental Boring 4. Near surface fuel impacted soil is present in this area.

This report is subject to the following **NOTICE**:

NOTICE

All properties are subject to some element of environmental risk and the risk cannot be eliminated. Industrial and commercial properties developed prior to modern environmental laws are especially risk prone to environmental hazards which include, but are not limited to, wastes which may be toxic, ignitable, corrosive or reactive. The potential for these environmental hazards to impact the use of the property can be reduced by the identification and mitigation of the hazards prior to development or redevelopment of the property. Due to the difficulty in locating underground wastes, in some cases it is not always possible to ascertain that hazardous wastes are present on the property prior to development.

A Phase I environmental site assessment does not utilize subsurface exploration to check for the presence of hazardous wastes on the property. The experience of the assessor, along with the research of available reports, aerial photographs and land use records are used to evaluate the potential for hazardous wastes to occur on the site. Based on the information gained from the audit, subsurface exploration may be recommended to check for the presence of hazardous wastes. Preexisting environmental problems such as the presence of hazardous wastes in the soil or groundwater, can be concealed by grading activities and site improvements. If such wastes are present these wastes cannot be observed by the auditor.

The subsurface conditions described herein have been ascertained from excavations on the site as indicated, and should in no way be construed to reflect variations which may occur between or beyond these excavations. The chemical laboratory testing described herein was performed by a state certified testing laboratory. The state certified testing laboratory assumes responsibility for the testing procedures used in their analysis.

This report was prepared with the skill and competence as commonly used by environmental professionals in this area. No warranty, expressed or implied, of any kind is made or intended in connection with this report, or by the fact you are being furnished this report, or by any other oral or written statement.

Should you have any questions or desire any additional information, please contact the undersigned.

Respectfully submitted,

Charles I. Buckley
Certified Hydrogeologist No. 55
Registered Environmental Assessor II No. 20116

REFERENCES AND QUALIFICATIONS

1. County of Los Angeles, Department of Public Works, *File Review*, July 2000.

2. LACHD and SCAQMD, *File Review*, February 2002.

3. Ventura County Historical Aerial Photograph Collection, *Photograph Research*, July 2000.

4. EDR-Radius Map With Geocheck, Inquiry No. 0730686.lr, February 2002.

5. State Of California, Division of Oil, Gas and Geothermal Resource, *Wildcat Map W2-1*, 1987.

6. Geologic Map of Thousand Oaks Quadrangle, *Map Review*, 1993.

7. Grover Hollingsworth and Associates, *Groundwater Investigation Report, Pacific Bell Facility, 29300 Roadside Drive, Agoura Hills, California*, April 14, 1994.

8. California Environmental, *Preliminary Environmental Site Assessment – Phase I, Subsurface Assessment for Fuel Hydrocarbons and Lead in Soil*, August 2000.

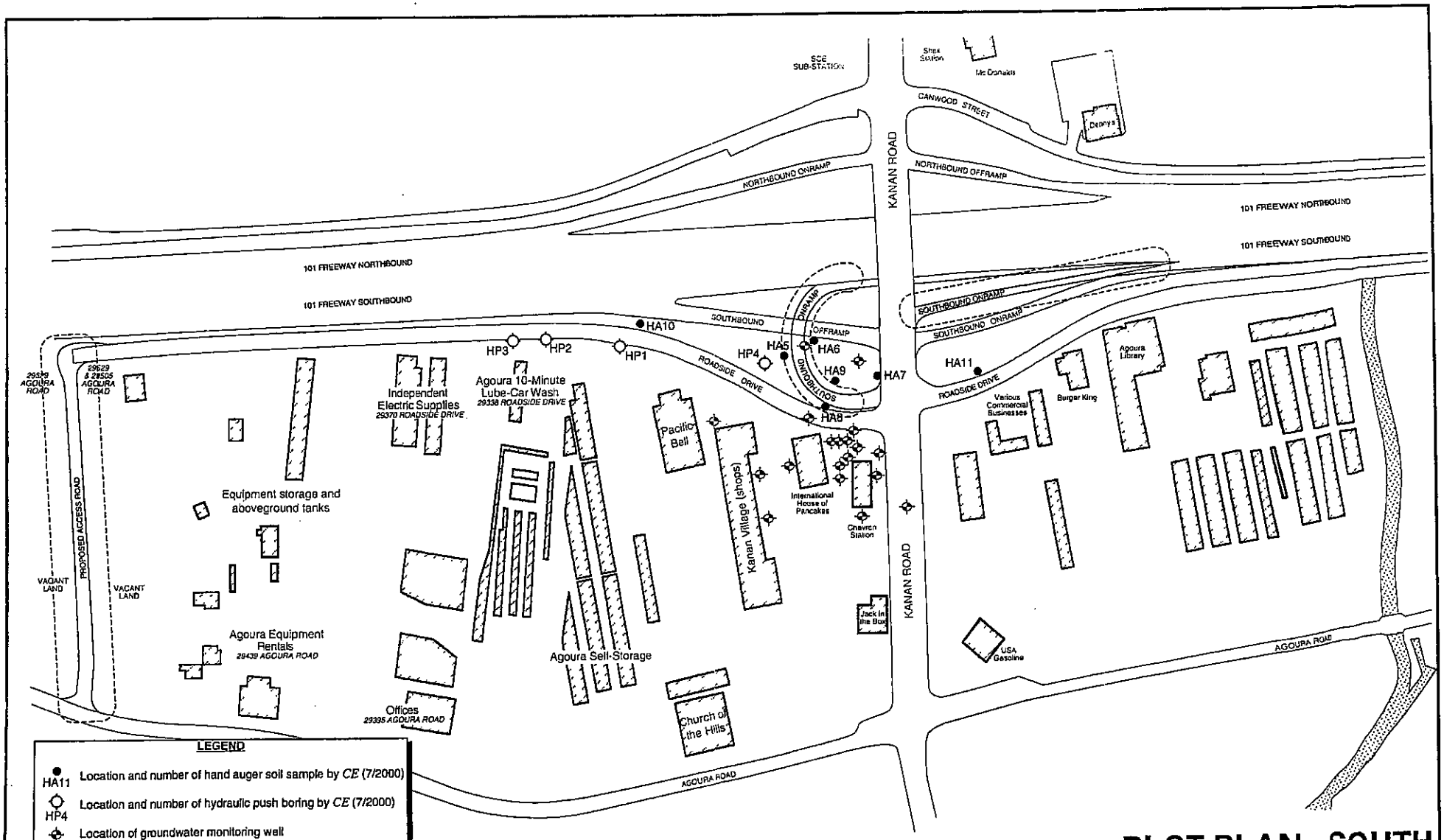
9. Tetra Tech, Inc., *Initial Site Assessment, Proposed Improvements to the US-101/Kanan Road Interchange, Agoura Hills, CA*, July 13, 1999.

10. Willdan, *Initial Site Assessment Report for Kanan Road Interchange Improvements at U.S. 101*, January 1999.

11. The IT Group, *Low-Risk Site Closure Request, Shell Branded Service Station, 5134 Kanan Road, Agoura Hills, CA*, July 10, 2001.

12. The IT Group, *Second Quarter 2001 Groundwater Monitoring Report, Shell Branded Service Station, 5134 Kanan Road, Agoura Hills, CA*, July 12, 2001.

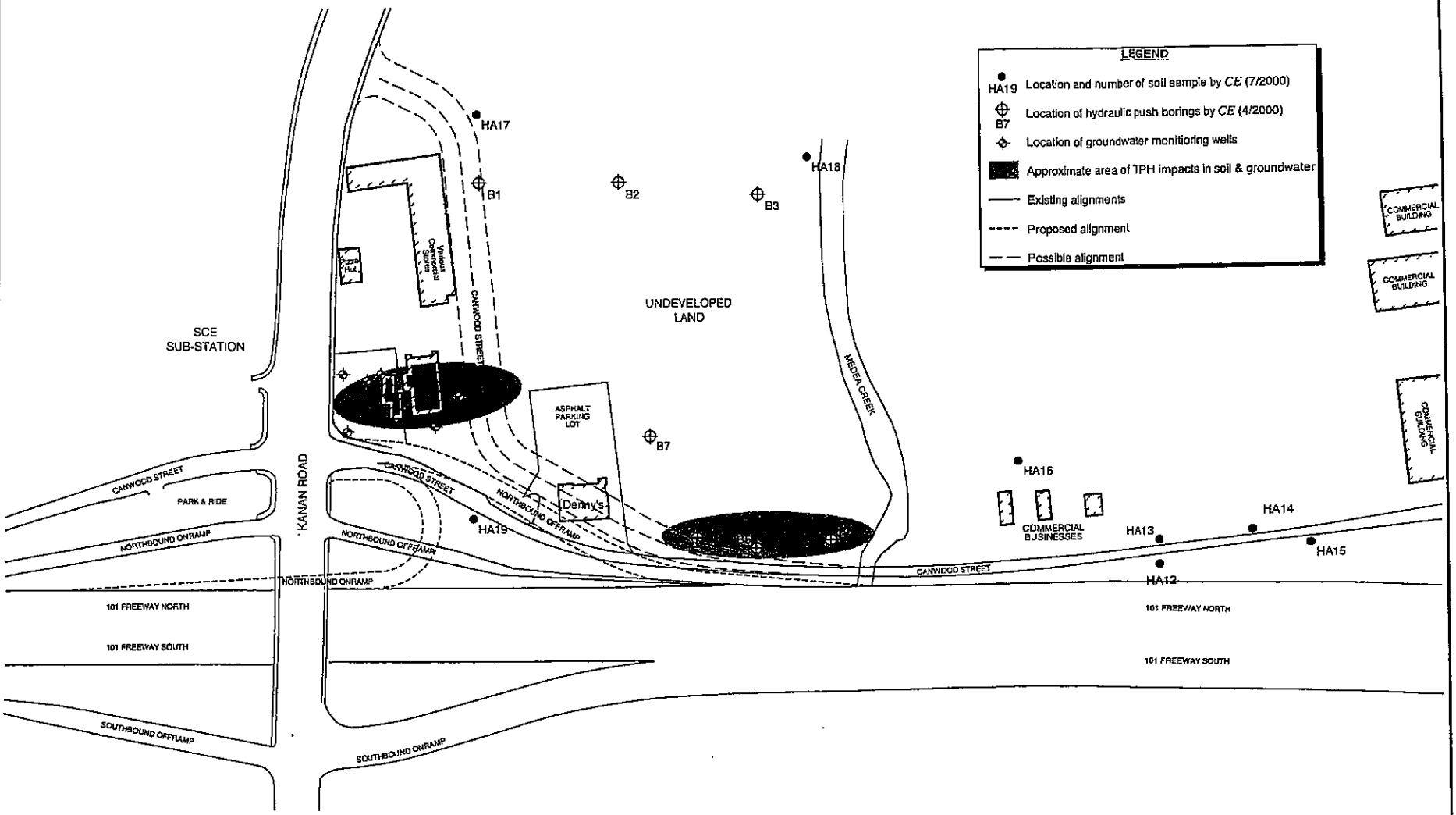
13. Holguin, Fahan & Associates Inc., *Quarterly Progress Report, Fourth Quarter 2001*.



PLOT PLAN - SOUTH

California Environmental			
Client: Willdan Associates		Job #: EV600-2145	
Site Name: Kanan Road / 101 Freeway		Date: June 2002	
Location: Agoura Hills, California 91301		By: ERN	Checked By: CIB

REFERENCE: Wildan Associates Site Map, 10/29/98



REFERENCE: Willdan Associates Site Map, 10/29/98

PLOT PLAN - NORTH

California Environmental			
Client	Willdan Associates	Job #	EV600-2145
Site Name	Kanan Road/101 Freeway	Date	June 2002
Location	Agoura Hills, California 91301	By ERN	Checked By CIB

APPENDIX G

Hydraulic Analysis

HYDRAULIC ANALYSIS

For:

ROADSIDE DRIVE IMPROVEMENTS OVER MEDEA CREEK

Prepared For:

CITY OF AGOURA HILLS
LOS ANGELES COUNTY, CALIFORNIA

Prepared By:

WILLDAN
Serving Public Agencies

2401 East Katella Avenue, Suite 450
Anaheim, California 92806
(714) 978-8200, fax (714) 978-8299

REGISTERED PROFESSIONAL ENGINEER
KENNETH C. TAYLOR
NO. 56185
CIVIL ENGINEER
STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:

Kenneth C. Taylor, P.E
R.C.E. No. 56185
January 2013

TABLE OF CONTENTS

I. INTRODUCTION

This report presents the results of our hydraulic analysis associated with the proposed improvements of Roadside Drive Bridge over Medea Creek. The object of this study is to provide a technical hydraulic analysis for the proposed improvements

II. PROJECT DESCIPTION

The proposed project involves improvements and widening to the Roadside Drive Bridge over Madea Creek, in the City of Agoura Hills. See vicinity Map in ***Appendix "A"***

The existing Roadside Drive bridge is being widen to the south by 12-feet. This widening will include 2 new piers columns per bent that will be in line with the existing piers. No changes are required to the channel for these improvements.

Immediately upstream of the US-101 Bridge, Canwood Street traverses Medea Creek. As part of a separate project the existing Canwood Street Bridge will be widened. This design for the Canwood Bridge is being performed by others as part of the Oak Development and is not part of this study. However, for modeling purposes, the analysis does consider and include the Madea Creek channel improvements proposed by this development.

Existing Condition

Medea Creek is partially improved between the US-101 freeway and the Ventura County Border. Medea Creek provides flood protection for the central drainage area of the City and intercepts flow from Medea Creek Canyon extending into Ventura County. The Los Angeles County Flood Control District (LACFCD) has implemented a floodplain management program to comply with FEMA. The LACFCD has defined Medea Creek within FEMA's 100-year flood zone. Within the study area, underneath and upstream of the US-101 Interchange, Medea Creek consists of natural channel vegetation, and a meandering channel. Downstream of the US-101 Interchange, the creek consists of concrete lined channel.

Under existing conditions, Medea Creek base flood is contained within an improved channel from the US-101 freeway to approximately 1150 feet downstream of the freeway. From the US-101 freeway to approximately 1640 feet north of the freeway, Medea Creek base flood spills over the defined riverbank into the floodplain.

The hydraulic analysis of this report wase based on the 100-year frequency rainfall runoff discharge value of 203.88 m^3/s (7,200 cfs), provided to us by the FEMA effective model and approved hydrology upstream of this project site.

Proposed Condition

It is necessary to determine to what extent the project improvements will cause existing flood waters to rise, encroach beyond existing longitudinal limits, and/or inundate limits of the project improvements.

New cross-sectional data for the proposed improvements were inputted into the HEC-RAS calculations generated for the existing Medea Creek.

III. CHANNEL HYDRAULIC ANALYSIS

HEC-RAS version 4.1.0 water surface profile computer model program was used to analyze both the existing and the future conditions for maximum hydraulic conveyance and ensure criteria regarding the necessary level of flood protection. The HEC-RAS program is intended for calculating water surface profile for steady flow in natural and man-made channels. The water surface profile analysis for the proposed bridge improvements were generated using existing aerial topography.

Hydraulic Model Assumptions

- The existing hydraulic analysis HEC-RAS model channel cross sections were taken from the previously approved HEC-RAS analysis. These cross-sections were generated using digital topography. Cross sections were generated for approximately 366 m (1200 linear feet) upstream of the US-101 freeway and oriented perpendicular to the direction of flow.
- The proposed hydraulic analysis HEC-RAS model channel sections upstream of the project were obtained from the Oak Creek development Hydraulic report prepared by PSOMAS dated August 19, 2002. The FEC-RAS model includes all proposed channel improvements from station 20 to 7.
- Manning's roughness coefficient of 0.040 corresponds to a natural rough channel, and roughness coefficient of 0.075-0.080, corresponds to a very rough channel with heavy vegetation growth. These values were used to calculations with the banks of Medea Creek. A value of 0.025 was used for the channel bed upstream and underneath the bridge. A value of 0.017 was used for the concrete lined channel upstream and a value of 0.060 was used for the future graded area between the drop structure and the US-101 freeway respectively.
- 100-year frequency rainfall runoff discharge value of 203.88 m^3/s (7,200 cfs) was used, as provided by FEMA.
- The US-101 and Roadside Drive bridges have 3 rows of piers and each pier is taken as 0.6096 m (2.0 feet). In the bridge modeling approach, the option with the highest energy answer was selected. For the purpose of water surface elevation computation, 1.2192 m (4.0 feet) was added to each pier width to account for debris within the creek. The total pier width is 1.829 m (6.0 feet).

Results

The existing hydraulic analysis results are shown in appendix "B" of this report. The proposed hydraulic analysis results are shown in appendix "C" of this report.
The following table summarizes the flood channel data for the 100-year frequency peak discharge for each section of the channel in both pre- and post-improvement conditions. Only station 7 to .6 are relevant to this project.

Comparision of floodwater Elevations in Pre- and Post-improvement Conditions

Comments	Station No.	Flood Surface Elevation (m) Existing	Flood Surface Elevation (m) Proposed	Difference (m)
	7	260.65	260.65	0.00
Canwood St.	6.5 BR U	260.61	260.61	0.00
	6.5 BR D	260.45	260.45	0.00
	6	260.49	260.49	0.00
	5	260.50	260.51	+0.01
US-101	4.5 BR U	260.33	260.34	+0.01
	4.5 BR D	260.11	260.12	+0.01
	4	260.19	260.20	+0.01
	3	260.19	260.20	+0.01
Roadside Drive	2.5 BR U	259.93	259.94	+0.01
	2.5 BR D	259.92	259.92	0.00
	2	260.00	260.00	0.00
	1	260.00	260.00	0.00
Concrete Channel	.9	257.87	257.87	0.00
	.8	257.82	257.82	0.00
	.7	257.77	257.77	0.00
	.6	257.74	257.74	0.00

IV. SUMMARY AND RESULTS

The results of our study shows that the proposed construction causes the Base Flood Elevation (BFE) to rise by 0.01 m (0.03ft) which is less than 0.3 m (1 ft) in the immediate vicinity of the proposed project. There is no change in the BFE downstream of the proposed project. The computed rise in the BFE lies within the given tolerance of 0.3m (1 ft) defined by FEMA.

The boundaries of the flood plain are changed by the proposed upstream Oak Creek development. In the existing condition the 100-year flood spills over the riverbanks into the floodplain. In the proposed condition the 100-year flood will be retained in the remodeled river channel.

Shear stress calculations are performed within HEC-RAS to assess the potential for erosion and sediment transport. For grass vegetative lining for slope protection, the computed total stress at the toe of the bank shall be less than 143.6 N/m^2 (3.0 lb/ft^2). When the shear stress exceeds 143.6 N/m^2 (3.0 lb/ft^2), concrete stream bank protection will be required. The shear stress calculations indicate that there are no sections that exceed the maximum shear stress as a result of these improvements.

V. FLOODPLAIN EVALUATION

A. Properties at Risk

None.

B. Discussion

1. The risk flood damage associated with this project is negligible. Floodplain widths associated with the proposed improvement will not increase. The 100-year flood will be retained in the remodeled river condition.

2. Impacts on natural and beneficial floodplain values will be negligible as a result of this project.

3. No incompatible floodplain development will be associated with this project.

4. The proposed project improvements are not a significant encroachment.

5. The proposed project improvements are not a significant longitudinal encroachment.

VI. SCOUR ANALYSIS

Purpose and Scope

The scour analysis calculations were performed using HEC-RAS version 4.1.0 program. This program computes pier scour based on the Colorado State University (CSU) equation. Channel depth, velocity, pier shape and width, pier angle and length of pier information were obtained from the existing channel condition with the proposed bridge widening. The pier width was set at actual pier width 0.41 m (16 in) and did not account for debris blockage.

Input Data

For Contraction Scour all of the variables except K1 and D50 are obtained automatically from the HEC-RAS output file. To compute contraction scour, the user is only required to

enter the D50 (mean size fraction of the bed material) and a water temperature to compute the K1 factor.

For Pier scour the user is only required to enter the pier nose shape (K1), the angle of attack for flow hitting the piers, the condition of the bed (K3), and a D90 size fraction for the bed material. All other values are automatically obtained from the HEC-RAS output file.

Abutment scour is computed separately for the left and right abutment. The user is only required to enter the abutment type (spill-through, vertical, vertical with wing walls).

The total scour is a combination of the contraction scour and the individual pier and abutment scour at each location.

The required variables are as follows:

- K1 = 1.0
- K3 = 1.10
- D50 = 0.09 mm (0.00295 ft)
- D90 = 0.61 mm (0.0020 ft)
- Vertical Abutments

Conclusions and Recommendations

The following table shows a summary of the computed results, including the total scour.

Roadside Drive (Sta. 2.5):

- Contraction Scour Channel = 1.04 m (3.41 ft)
- Pier Scour All Piers = 3.81 m (12.5 ft)
- Combined Scour Depths: Pier Scour + Contraction Scour= 4.85 m (15.91 ft)

Based on the computed scour results, a scour depth of 4.90 m (16.0 ft) is recommended for the design. To protect the existing Medea Creek from adverse effects due to scour, channel improvements should be implemented.

As recommended by the Federal Highway Administration (FHWA) HEC-18 Circular, chapter 2, a permanent method for designing bridges to resist scour is to place the top of the pile cap below the depth of the total scour. Additional countermeasures for protection against pier scour, includes the placement of Rip-Rap along the channel invert and side slopes.

Based on the calculated approach velocities of 2.13 m/s (7.0 ft/s), the Los Angeles County Hydraulic Design Manual recommends a 100-lb ungrouted Rip-Rap with a thickness of 18 inches. At a minimum, the limits of the channel improvements should be implemented to within the bridge widening.

Aggradation and degradation is the channel bed elevation change as a result of a modification change to the stream or watershed. The downstream concrete rectangular channel located immediately downstream of the bridge acts as a grade control structure thus stabilizing the channel bed elevation fluctuation and limiting the long-term effects of aggradation and degradation. Therefore, aggradation and degradation are negligible.

The HEC-RAS output files for the bridge scour analysis are shown in appendix "D".

VII. RISK ASSEMENT STATEMENT

The floodplain encroachment risk associated with the Roadside Drive Road improvements is minimal. This conclusion is based on a site visit, review of topography, engineering judgment, and the following Floodplain Evaluation Study discussion and documentation.

Preparer

The Location Hydraulic Study, Risk Assessment, Floodplain Evaluation, and Calculations were prepared under the supervision of Kenneth C. Taylor P.E., Director of Engineering at Willdan.

APPENDIX "A"

VICINITY MAP

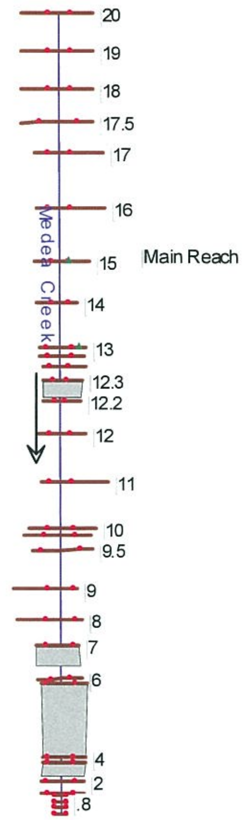
WILLDAN Engineering

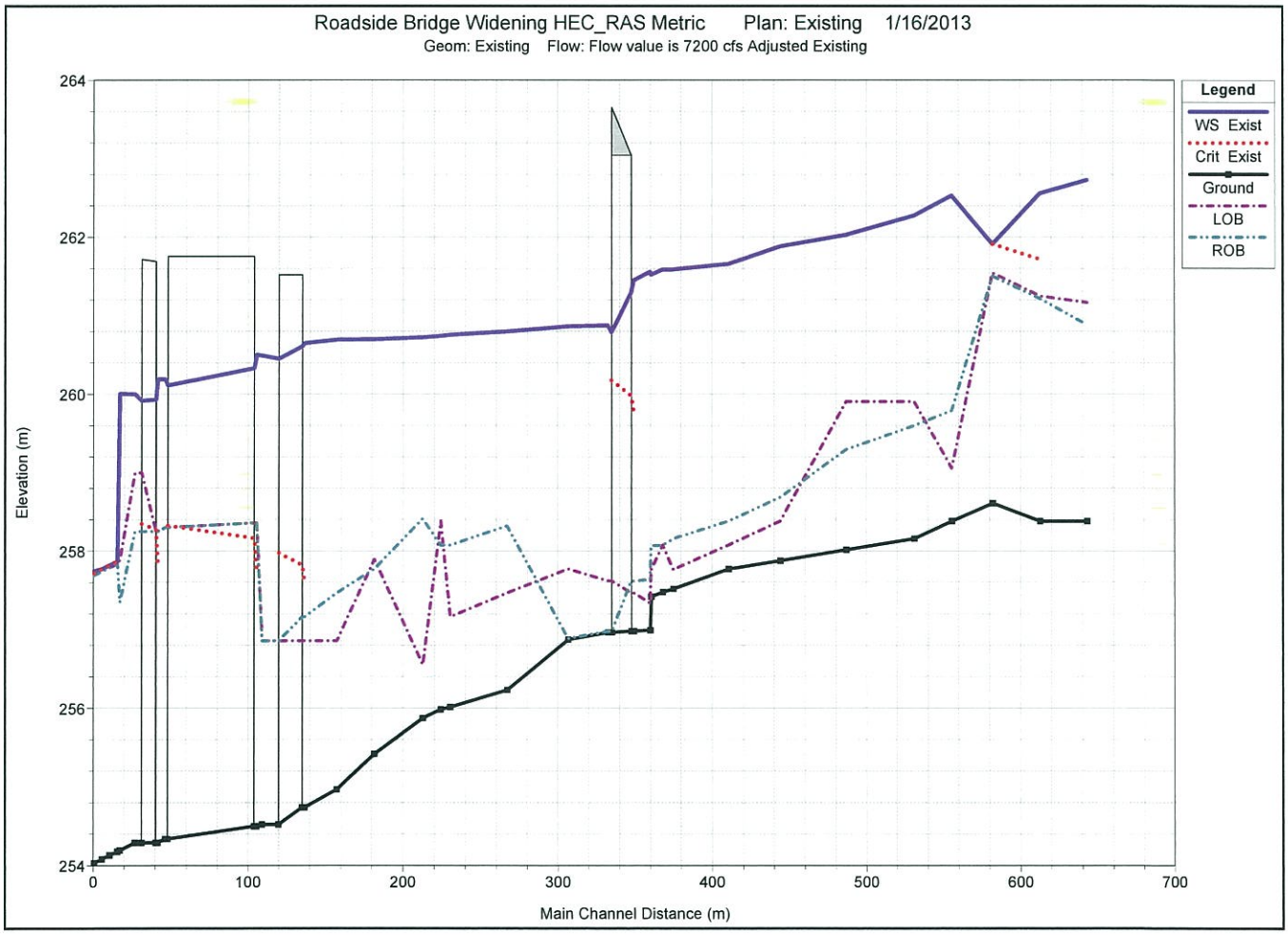
0 0.125 0.25 0.5 0.75 1 Miles

ROADSIDE DRIVE BRIDGE WIDENING PROJECT
CITY OF AGOURA HILLS

APPENDIX "B"

EXISTING CONDITION
HYDRAULIC ANALYSIS


20
19
18
17.5
17
16
Medea Creek
15
Main Reach
14
13
12.3
12.2
12
11
10
9.5
9
8
7
6
4
2
.8


Roadside Bridge Widening HEC_RAS Metric Plan: Existing 1/16/2013
Geom: Existing Flow: Flow value is 7200 cfs Adjusted Existing
Legend
WS Exist
Crit Exist
Ground
LOB
ROB
Elevation (m)
264
262
260
258
256
254
0
100
200
300
400
500
600
700
Main Channel Distance (m)

HEC-RAS Plan: Exist River: Medea Creek Reach: Main Reach Profile: Exist

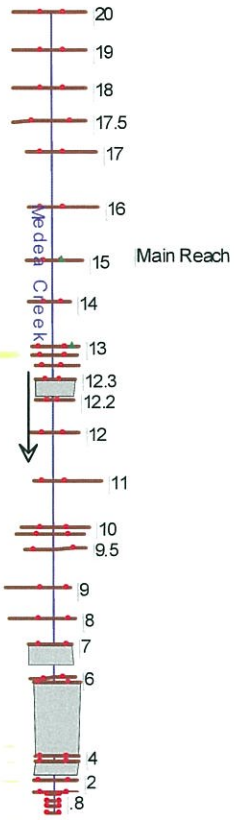
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Main Reach	20	Exist	190.29	258.38	262.73		263.09	0.000476	2.79	90.17	45.11	0.48
Main Reach	19	Exist	190.29	258.38	262.56	261.72	263.06	0.000714	3.20	69.50	32.25	0.58
Main Reach	18	Exist	190.29	258.61	261.91	261.91	262.97	0.002223	4.57	43.37	26.51	0.97
Main Reach	17.5	Exist	190.29	258.38	262.53		262.62	0.001733	1.36	140.33	44.81	0.22
Main Reach	17	Exist	190.29	258.16	262.27		262.54	0.005320	2.25	86.51	43.10	0.38
Main Reach	16	Exist	190.29	258.02	262.03		262.29	0.005985	2.36	87.34	48.12	0.40
Main Reach	15	Exist	203.88	257.88	261.88	260.57	262.09	0.003271	1.85	101.58	38.82	0.30
Main Reach	14	Exist	203.88	257.77	261.66		261.95	0.005021	2.29	85.33	30.42	0.37
Main Reach	13	Exist	203.88	257.52	261.59	259.68	261.79	0.002900	1.77	106.57	34.44	0.29
Main Reach	12.8	Exist	203.88	257.48	261.59		261.76	0.002926	1.82	108.86	34.45	0.29
Main Reach	12.65	Exist	203.88	257.42	261.52		261.74	0.003345	1.93	99.69	32.57	0.31
Main Reach	12.6	Exist	203.88	256.99	261.56		261.72	0.002149	1.67	114.97	33.50	0.25
Main Reach	12.3	Exist	203.88	256.98	261.45	259.77	261.69	0.003071	1.94	95.65	32.00	0.30
Main Reach	12.25		Bridge									
Main Reach	12.2	Exist	203.88	256.96	260.87		261.29	0.006528	2.60	72.16	27.67	0.43
Main Reach	12	Exist	203.88	256.87	260.86		261.06	0.003206	1.81	104.41	36.63	0.30
Main Reach	11	Exist	203.88	256.23	260.80		260.94	0.002247	1.57	123.10	45.29	0.25
Main Reach	10	Exist	203.88	256.01	260.76		260.86	0.001586	1.39	141.20	44.25	0.21
Main Reach	9.6	Exist	203.88	255.98	260.74		260.85	0.001785	1.42	138.72	42.75	0.22
Main Reach	9.5	Exist	203.88	255.87	260.72		260.83	0.001985	1.38	142.27	44.06	0.23
Main Reach	9	Exist	203.88	255.42	260.70		260.78	0.001031	1.14	162.31	49.69	0.17
Main Reach	8	Exist	203.88	254.97	260.69		260.76	0.000710	1.03	187.45	51.15	0.15
Main Reach	7	Exist	203.88	254.74	260.65	257.57	260.75	0.000156	1.46	155.90	35.36	0.21
Main Reach	6.5		Bridge									
Main Reach	6	Exist	203.88	254.52	260.49		260.69	0.000323	2.10	111.33	31.54	0.29
Main Reach	5	Exist	203.88	254.50	260.50	257.73	260.68	0.000323	1.90	113.26	31.78	0.28
Main Reach	4.5		Bridge									
Main Reach	4	Exist	203.88	254.34	260.19		260.42	0.000460	2.17	99.57	29.78	0.33
Main Reach	3	Exist	203.88	254.29	260.19	257.80	260.42	0.000442	2.14	101.05	30.01	0.32
Main Reach	2.5		Bridge									
Main Reach	2	Exist	203.88	254.29	260.00		260.23	0.000496	2.12	98.67	29.43	0.34
Main Reach	1	Exist	203.88	254.19	260.00		260.22	0.000184	2.10	105.03	29.91	0.31
Main Reach	0.9	Exist	203.88	254.18	257.87	257.87	259.73	0.004076	6.04	33.73	9.14	1.00
Main Reach	.8	Exist	203.88	254.13	257.82	257.82	259.68	0.004076	6.04	33.73	9.14	1.00
Main Reach	.7	Exist	203.88	254.08	257.77	257.77	259.63	0.004076	6.04	33.73	9.14	1.00
Main Reach	.6	Exist	203.88	254.03	257.74	257.72	259.58	0.004002	6.00	33.96	9.14	0.99

HEC-RAS Plan: Exist River: Medea Creek Reach: Main Reach Profile: Exist

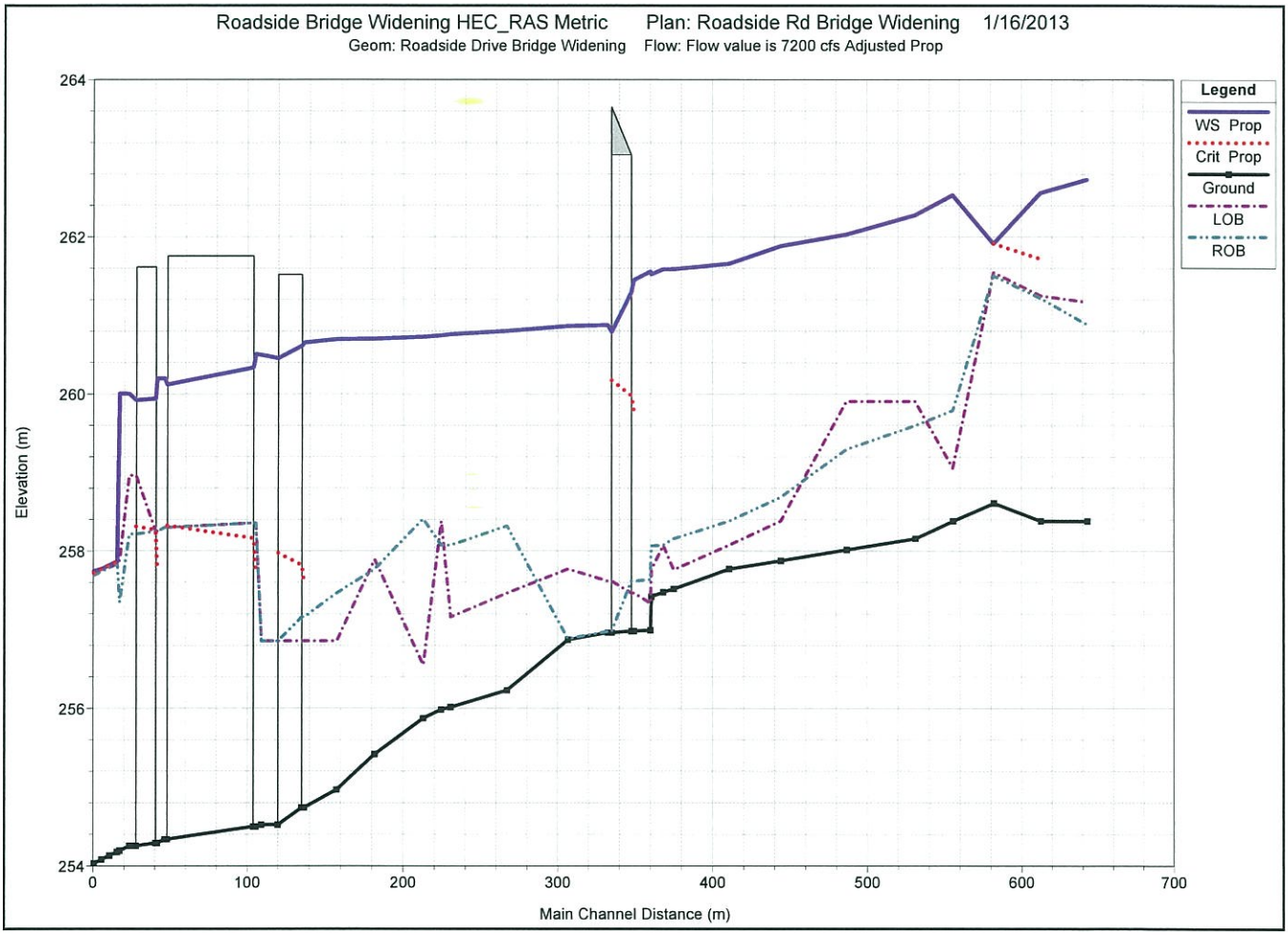
Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl
			(m)	(m)	(m)	(m)	(m)	(m)	(m3/s)	(m3/s)	(m3/s)	(m/s)
Main Reach	12.6	Exist	261.72	261.56		0.02	0.01	33.50	64.43	113.52	25.93	1.67
Main Reach	12.3	Exist	261.69	261.45	259.77	0.01	0.03	32.00	86.32	86.02	31.54	1.94
Main Reach	12.25 BR U	Exist	261.65	261.29	259.98	0.14	0.08	27.62	85.97	98.61	19.29	2.37
Main Reach	12.25 BR D	Exist	261.42	260.79	260.17	0.02	0.11	23.66	71.11	81.72	51.05	3.18
Main Reach	12.2	Exist	261.29	260.87		0.12	0.11	27.67	73.91	83.93	46.05	2.60
Main Reach	12	Exist	261.06	260.86		0.10	0.02	36.63	60.29	110.99	32.60	1.81
Main Reach	8	Exist	260.76	260.69		0.01	0.00	51.15	2.87	124.23	76.78	1.03
Main Reach	7	Exist	260.75	260.65	257.57	0.00	0.00	35.36	9.35	168.87	25.65	1.46
Main Reach	6.5 BR U	Exist	260.74	260.61	257.82	0.01	0.01	29.88	13.16	165.56	25.16	1.72
Main Reach	6.5 BR D	Exist	260.72	260.45	257.98	0.01	0.02	25.77	17.83	178.09	7.96	2.39
Main Reach	6	Exist	260.69	260.49		0.00	0.01	31.54	11.15	180.24	12.49	2.10
Main Reach	5	Exist	260.68	260.50	257.73	0.00	0.04	31.78	5.00	198.06	0.82	1.90
Main Reach	4.5 BR U	Exist	260.64	260.33	258.16	0.11	0.02	25.08	6.67	195.68	1.33	2.50
Main Reach	4.5 BR D	Exist	260.50	260.11	258.32	0.00	0.08	23.91	6.90	192.84	4.15	2.83
Main Reach	4	Exist	260.42	260.19		0.00	0.00	29.78	4.68	197.12	2.08	2.17
Main Reach	3	Exist	260.42	260.19	257.80	0.00	0.06	30.01	4.88	196.79	2.21	2.14
Main Reach	2.5 BR U	Exist	260.35	259.93	258.27	0.02	0.01	23.10	5.98	194.34	3.57	2.94
Main Reach	2.5 BR D	Exist	260.32	259.92	258.35	0.00	0.09	23.52	1.35	198.93	3.61	2.84
Main Reach	2	Exist	260.23	260.00		0.00	0.00	29.43	0.72	201.43	1.73	2.12
Main Reach	1	Exist	260.22	260.00		0.00	0.49	29.91	2.23	198.18	3.47	2.10

APPENDIX "C"

PROPOSED CONDITION
HYDRAULIC ANALYSIS


20
19
18
17.5
17
16
Medea Creek
15
Main Reach
14
13
12.3
12.2
12
11
10
9.5
9
8
7
6
4
2
.8

Ne XS)


Roadside Bridge Widening HEC_RAS Metric Plan: Roadside Rd Bridge Widening 1/16/2013
Geom: Roadside Drive Bridge Widening Flow: Flow value is 7200 cfs Adjusted Prop
Legend
WS Prop
Crit Prop
Ground
LOB
ROB
Elevation (m)
264
262
260
258
256
254
0
100
200
300
400
500
600
700
Main Channel Distance (m)

HEC-RAS Plan: BridgeWdn River: Medea Creek Reach: Main Reach Profile: Prop

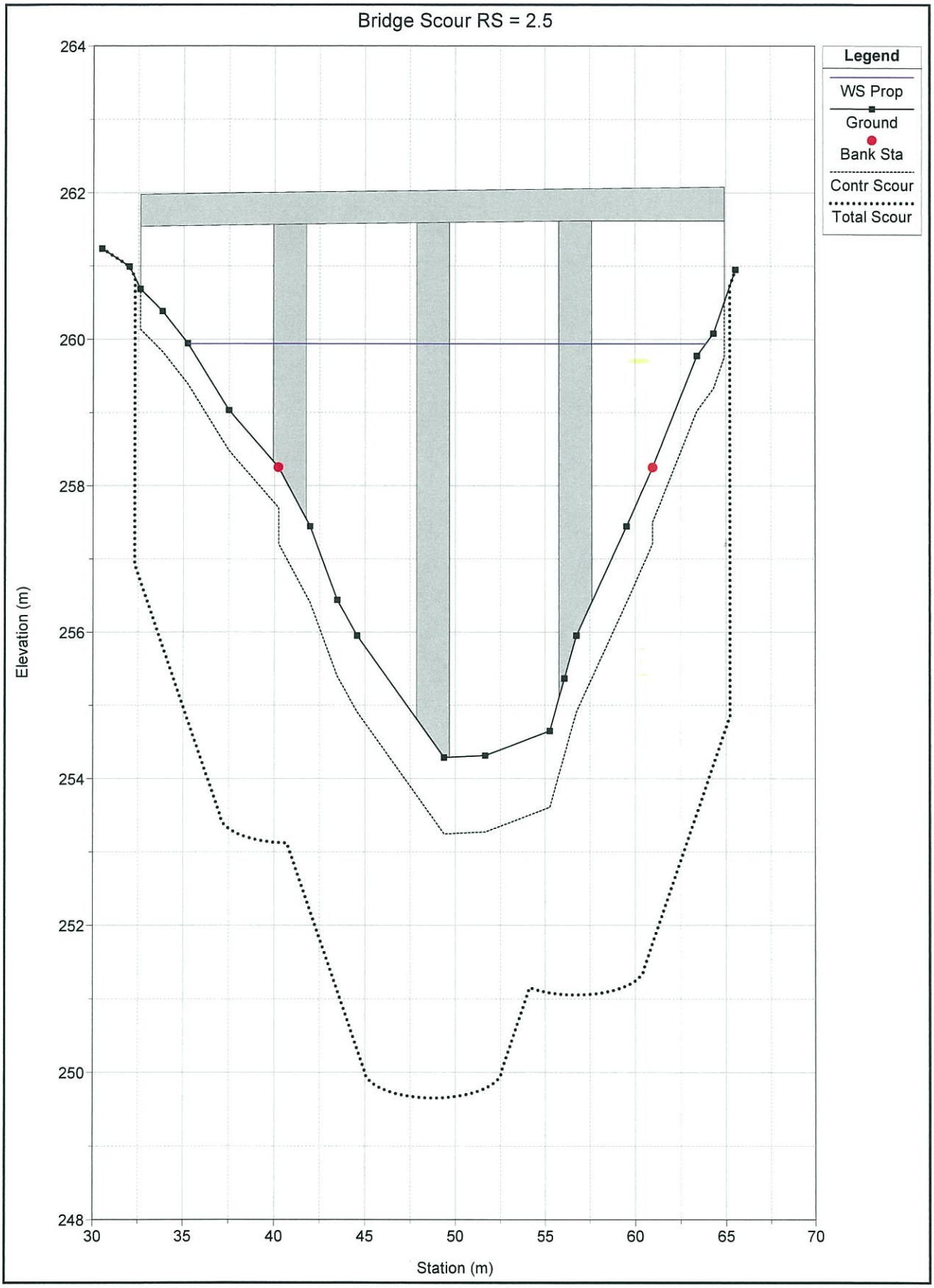
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Main Reach	20	Prop	190.29	258.38	262.73		263.09	0.000476	2.79	90.17	45.11	0.48
Main Reach	19	Prop	190.29	258.38	262.56	261.72	263.06	0.000714	3.20	69.50	32.25	0.58
Main Reach	18	Prop	190.29	258.61	261.91	261.91	262.97	0.002223	4.57	43.37	26.51	0.97
Main Reach	17.5	Prop	190.29	258.38	262.53		262.62	0.001733	1.36	140.35	44.81	0.22
Main Reach	17	Prop	190.29	258.16	262.28		262.54	0.005318	2.25	86.53	43.12	0.38
Main Reach	16	Prop	190.29	258.02	262.03		262.29	0.005980	2.36	87.37	48.13	0.40
Main Reach	15	Prop	203.88	257.88	261.88	260.57	262.09	0.003288	1.85	101.61	38.82	0.30
Main Reach	14	Prop	203.88	257.77	261.66		261.95	0.005016	2.29	85.36	30.43	0.37
Main Reach	13	Prop	203.88	257.52	261.59	259.68	261.79	0.002897	1.77	108.60	34.44	0.29
Main Reach	12.8	Prop	203.88	257.48	261.59		261.77	0.002923	1.82	108.89	34.46	0.29
Main Reach	12.65	Prop	203.88	257.42	261.52		261.74	0.003341	1.93	99.73	32.58	0.31
Main Reach	12.6	Prop	203.88	256.99	261.56		261.72	0.002147	1.67	115.01	33.50	0.25
Main Reach	12.3	Prop	203.88	256.98	261.45	259.77	261.69	0.003067	1.94	95.69	32.00	0.30
Main Reach	12.25		Bridge									
Main Reach	12.2	Prop	203.88	256.96	260.88		261.29	0.006501	2.60	72.26	27.68	0.43
Main Reach	12	Prop	203.88	256.87	260.86		261.06	0.003193	1.81	104.55	36.65	0.30
Main Reach	11	Prop	203.88	256.23	260.80		260.94	0.002236	1.57	123.29	45.31	0.25
Main Reach	10	Prop	203.88	256.01	260.76		260.87	0.001579	1.39	141.40	44.26	0.21
Main Reach	9.6	Prop	203.88	255.98	260.74		260.86	0.001777	1.42	138.91	42.76	0.22
Main Reach	9.5	Prop	203.88	255.87	260.73		260.83	0.001976	1.38	142.47	44.07	0.23
Main Reach	9	Prop	203.88	255.42	260.70		260.79	0.001026	1.14	162.55	49.70	0.17
Main Reach	8	Prop	203.88	254.97	260.70		260.76	0.000708	1.03	187.69	51.17	0.15
Main Reach	7	Prop	203.88	254.74	260.65	257.57	260.75	0.000155	1.46	166.07	35.36	0.20
Main Reach	6.5		Bridge									
Main Reach	6	Prop	203.88	254.52	260.49		260.70	0.000322	2.10	111.50	31.57	0.29
Main Reach	5	Prop	203.88	254.50	260.51	257.73	260.68	0.000322	1.89	113.43	31.83	0.28
Main Reach	4.5		Bridge									
Main Reach	4	Prop	203.88	254.34	260.20		260.43	0.000458	2.16	99.78	29.81	0.33
Main Reach	3	Prop	203.88	254.29	260.20	257.80	260.42	0.000439	2.13	101.27	30.04	0.32
Main Reach	2.5		Bridge									
Main Reach	2	Prop	203.88	254.25	260.00		260.22	0.000481	2.10	99.71	29.61	0.33
Main Reach	1	Prop	203.88	254.19	260.00		260.22	0.000184	2.10	105.03	29.91	0.31
Main Reach	0.9	Prop	203.88	254.18	257.87	257.87	259.73	0.004076	6.04	33.73	9.14	1.00
Main Reach	.8	Prop	203.88	254.13	257.82	257.82	259.68	0.004076	6.04	33.73	9.14	1.00
Main Reach	.7	Prop	203.88	254.08	257.77	257.77	259.63	0.004076	6.04	33.73	9.14	1.00
Main Reach	.6	Prop	203.88	254.03	257.74	257.72	259.58	0.004002	6.00	33.96	9.14	0.99

HEC-RAS Plan: BridgeWdn River: Medea Creek Reach: Main Reach Profile: Prop

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl
			(m)	(m)	(m)	(m)	(m)	(m)	(m3/s)	(m3/s)	(m3/s)	(m/s)
Main Reach	12.6	Prop	261.72	261.56		0.02	0.01	33.50	64.44	113.51	25.93	1.67
Main Reach	12.3	Prop	261.69	261.45	259.77	0.01	0.03	32.00	86.33	86.01	31.55	1.94
Main Reach	12.25 BR U	Prop	261.65	261.29	259.98	0.14	0.08	27.63	85.98	98.60	19.30	2.37
Main Reach	12.25 BR D	Prop	261.42	260.79	260.17	0.02	0.11	23.67	71.13	81.65	51.08	3.17
Main Reach	12.2	Prop	261.29	260.88		0.12	0.11	27.68	73.93	83.89	46.07	2.60
Main Reach	12	Prop	261.06	260.85		0.10	0.02	36.65	60.31	110.95	32.62	1.81
Main Reach	8	Prop	260.76	260.70		0.01	0.00	51.17	2.88	124.17	76.83	1.03
Main Reach	7	Prop	260.75	260.65	257.57	0.00	0.00	35.36	9.36	168.85	25.67	1.46
Main Reach	6.5 BR U	Prop	260.75	260.61	257.82	0.01	0.01	29.88	13.17	165.52	25.19	1.72
Main Reach	6.5 BR D	Prop	260.72	260.45	257.98	0.01	0.02	25.80	17.86	178.04	7.99	2.39
Main Reach	6	Prop	260.70	260.49		0.00	0.01	31.57	11.17	180.19	12.52	2.10
Main Reach	5	Prop	260.68	260.51	257.73	0.00	0.04	31.83	5.03	198.03	0.82	1.89
Main Reach	4.5 BR U	Prop	260.64	260.34	258.16	0.11	0.02	25.12	6.72	195.82	1.34	2.50
Main Reach	4.5 BR D	Prop	260.51	260.12	258.32	0.00	0.08	23.95	6.95	192.75	4.18	2.82
Main Reach	4	Prop	260.43	260.20		0.00	0.00	29.81	4.71	197.07	2.10	2.16
Main Reach	3	Prop	260.42	260.20	257.80	0.00	0.06	30.04	4.91	196.74	2.23	2.13
Main Reach	2.5 BR U	Prop	260.36	259.94	258.27	0.03	0.01	23.15	6.04	194.23	3.61	2.93
Main Reach	2.5 BR D	Prop	260.31	259.92	258.31	0.00	0.09	23.71	1.48	198.64	3.76	2.81
Main Reach	2	Prop	260.22	260.00		0.00	0.00	29.61	0.78	201.31	1.80	2.10
Main Reach	1	Prop	260.22	260.00		0.00	0.49	29.91	2.23	198.18	3.47	2.10

APPENDIX "D"

SCOUR ANALYSIS


Bridge Scour RS = 2.5
Legend
WS Prop
Ground
Bank Sta
Contr Scour
Total Scour
Elevation (m)
Station (m)
264
262
260
258
256
254
252
250
248
30
35
40
45
50
55
60
65
70

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (m):	1.01	4.40	0.86
	Approach Velocity (m/s):	0.83	2.16	0.71
	Br Average Depth (m):	0.87	4.26	0.78
	BR Opening Flow (m3/s):	6.04	194.23	3.61
	BR Top WD (m):	4.68	15.54	2.93
	Grain Size D50 (mm):	0.09	0.09	0.09
	Approach Flow (m3/s):	4.71	197.07	2.10
	Approach Top WD (m):	5.64	20.73	3.45
	K1 Coefficient:	0.690	0.690	0.690
Results				
	Scour Depth Ys (m):	0.55	1.04	0.75
	Critical Velocity (m/s):	0.28	0.36	0.27
	Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (m):	1.83
	Grain Size D50 (mm):	0.09000
	Depth Upstream (m):	5.90
	Velocity Upstream (m/s):	2.57
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (m):	9.14
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	0.61000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (m):	3.81
	Froude #:	0.34
	Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (m):

	Channel:	4.85

APPENDIX H

Preliminary Drainage and SUMSP Report

PRELIMINARY DRAINAGE & SUSMP REPORT
FOR THE

ROADSIDE DRIVE BRIDGE WIDENING PROJECT

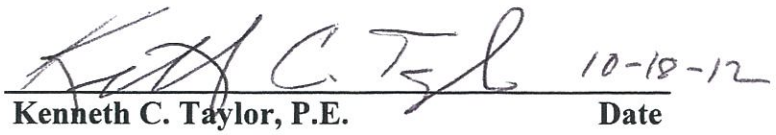
Prepared For:

City of Agoura Hills
30001 Ladyface Court
Agoura Hills, CA 913001

Prepared by:

2401 East Katella Avenue, Suite 450
Anaheim, California 92806
Kenneth C. Taylor, P.E.
(714) 978-8200

Prepared by:



Kenneth C. Taylor, P.E. **Date** 10-18-12

DATE: 10/18/2012

TABLE OF CONTENTS

I. INTRODUCTION

The City of Agoura Hills proposes to widen the existing Roadside Drive Bridge located southeast of the US 101 Freeway interchange at Kanan Road. ***See Attachment A.*** The bridge was constructed in 1964, is approximately 0.3 miles east of Kanan Road, and spans Medea Creek. The bridge's two traffic lanes travel east and west, with a total travel width of 24-feet. Based on the "Bridge Inspection Report" dated April 12, 2010, the existing bridge has a sufficiency rating of 78.6' and is classified as functionally obsolete due to its poor deck geometry and narrow approaches. With an average daily traffic (ADT) of 3,300, the bridge has become a bottleneck due to its narrow approaches that are less than the adjacent roadway width on either side.

In addition, the bridge has two-foot width sidewalks on both the north and south sides and no pedestrian walkway from the west approach which creates an unsafe environment for pedestrians and bicyclists.

The purpose of this project is to improve traffic operations on Roadside Drive by widening the approach roadways and the bridge including rehabilitating the bridge to meet current federal guidelines.

II. TOPOGRAPHY

The project site is located in the City of Agoura Hills in Los Angeles County. The topography of the site is characterized as moderate to steep hillside terrain in the areas north and south of the 101 Freeway. The project site consists of both developed and undeveloped land uses.

According to the Los Angeles County Department of Public Works Hydrologic Map 1-H1-24, the project site soil classification is type 028 and consists mostly of silty, stiff clay. ***See Attachment C.***

III. EXISTING DRAINAGE PATTERNS

The storm water runoff within the vicinity of the project site surface drains to the roadway and is collected by an existing storm drain system and conveyed to Medea Creek.

The existing sump catch basin (L = 3.5 feet) located on the west side of the existing driveway for the Roadside Lumber property drains the roadway and other tributary areas. The tributary area for the existing catch basin extends and collects runoff from the Kanan Road/Roadside Drive intersection to the west as well as flows from the high point 170 feet east of the Roadside Drive Bridge. The sump location has minimal retention capabilities due to the existing roadway grades north of the existing driveway for the Roadside Lumber property. Flows that exceed the capacity of the sump will flow down the existing Roadside Lumber driveway. Flows collected in the existing catch basin

outlet to Medea Creek through an existing 24" RCP storm drain system which runs parallel to Roadside Drive per Los Angeles County Road Department project number 2012N, DWG No. 62253, sheet 2 of 2. ***See Attachment H.***

IV. HYDROLOGY

The runoff for the Twenty five (25)-year storm event was calculated utilizing the Modified Rational Method in conformance with the County of Los Angeles criteria (LACDPW), Section 7.3. The following calculations and tasks were performed:

A. Topographic maps and a visual survey were utilized to establish hydrologic contributory areas and street flow patterns.

B. Prepared a hydrology map of the watershed to summarize the drainage boundaries, drainage acreage, and flow rates. ***See Attachment B.***

C. Determined drainage areas for the proposed and existing inlet.

D. Utilized the Modified Rational Method established by the County of Los Angeles to perform mainline and inlet hydrology calculations per the January 2006 Los Angeles County Department of Public Works Hydrology Manual.

E. Prepared hydrology calculations using the Excel application "TC_calc_vol.xls", developed by the Los Angeles County Department of Public Works, was used to calculate Time of Concentration (Tc) of all subareas and peak runoff for small areas. ***See Attachment E.***

F. The proposed drainage inlet locations were determined based on the design water spread during a 25-year design storm event. Local standards for the Roadside Drive frontage road allow half of the outside lane to be inundated in a 25-year storm event. In addition, inlets are proposed at the low point and other appropriate locations to maintain historical drainage patterns and minimize flooding.

G. Sized catch basins using Bentley Flowmaster software which utilizes HEC 22 methodology to perform pavement drainage and inlet calculations. ***See Attachment D.***

V. PROPOSED DRAINAGE IMPROVEMENTS

The flooded width calculations provided in Attachment D show that the existing 3.5-foot catch basin located west of the Roadside Lumber driveway is currently undersized. In order to intercept the (25)-year storm event, the basin needs to have more capacity. The project proposes to remove this existing catch basin and replace it with a properly sized catch basin of 16 feet. Additionally, the project will incorporate a 6-foot catch basin located on the southside of the roadway just east of the Roadside Lumber driveway, which is upstream of the replaced catch basin. The 6-foot catch basin will intercept any

additional flows generated by the proposed road widening, which occurs east of the existing Roadside Lumber driveway. Intercepted flows in each catch basin will be piped to the existing storm drain located along side Roadside Drive that currently outlets to Medea Creek on the west side of the channel just downstream of the existing bridge and proposed bridge improvements.

Twenty-four inch lateral pipes will be used for each catch basin which is greater than the minimum of 18-inches required by LACDPW per Section D-3.4 of the Los Angeles County Flood Control District Hydraulic Design Manual, March 1982.

VI. STORMWATER QUALITY

All storm drain discharge locations, catch basins and general storm water runoff management shall comply with the Standard Urban Stormwater Mitigation Plan (SUSMP) issued by the Los Angeles Regional Water Quality Control Board. The Los Angeles Municipal Storm Water permit (NPDES Permit No: CAS004001, December 13, 2001; amended September 14, 2006 by Order R4-2006¬0074, and August 9, 2007 by Order R4-20070042) issued by the California Regional Water Quality Control Board, Los Angeles Region, requires that permittees, which include the Los Angeles County Flood Control District, County of Los Angeles, and City of Los Angeles to require new development and redevelopment projects within specific project categories to incorporate the provisions contained in the Los Angeles Countywide Standard Urban Stormwater Mitigation Plan (SUSMP).

General requirements of the SUSMP include:

1) post-development peak storm water runoff discharge rates shall not exceed the estimate pre-development rate where the increased peak storm water discharge rate will result in increased potential for downstream erosion,
2) conserve natural areas,
3) minimize storm water pollutants of concern,
4) protect slopes and channels,
5) provide storm drain stenciling and signage,
6) properly design outdoor material storage areas,
7) properly design trash storage areas,
8) provide proof of ongoing BMP maintenance
9) post-construction treatment control BMPs are required to incorporate, at a minimum, either a volumetric or flow based treatment control design standard or both, to mitigate (infiltrate, filter, or treat) storm water runoff.

"Development Planning for Stormwater Management, A Manual for the Standard Urban Storm Water Mitigation Plan (SUSMP)" prepared by the Los Angeles County Department of Public Works in September 2002, serves as a guideline for compliance with the SUSMP.

Additionally, the 3rd edition of "Development BMP Handbook Part B. – Planning Activities" prepared by the Stormwater Management Division, Bureau of Sanitation, Department of Public Works, City of Los Angeles and adopted by the City of Los Angeles, Board of Public Works on June 30, 2004 as authorized by Section 64.72 of the

Los Angeles Municipal Code approved by Ordinance No. 173494, identifies Site Specific Mitigation for new development and/or redevelopment projects not requiring a SUSMP, but which may potentially have adverse impacts on stormwater quality (Section 1).

These "Site Specific" projects include Major Transportation projects such as a bridge widening. Projects subject to the Site Specific Mitigation requirement will be required to incorporate appropriate stormwater mitigation measures or apply SUSMP methodologies to satisfy stormwater requirements.

POLLUTANTS OF CONCERN

According to EPA Table 4-31 from "Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters", Chapter 4, typical highway runoff constituents include:

- **Particulates:** pavement wear, vehicles, atmostphere, maintenance
- **Nitrogen and phosphorus:** atmosphere, roadside fertilizer applications
- **Lead:** leaded gasoline (auto exhaust), tire wear (lead oxide filler material, lubricating oil and grease, bearing wear)
- **Zinc:** tire wear (filler material), motor oil (stabilizing additive), grease
- **Iron:** auto body rust, steel highway structures (guard rails, bridges, etc.), moving engine parts
- **Copper:** metal plating, bearing and brushing wear, moving engine parts, brake lining wear, fungicides and insecticides
- **Cadmium:** tire wear (filler material), insecticide application
- **Chromium:** Metal plating, moving engine parts, brake lining wear
- **Nickel:** diesel fuel and gasoline (exhaust), lubricating oil, metal plating, brushing wear, brake lining wear, asphalt paving
- **Manganese:** moving engine parts
- **Cyanide:** Anticake compound (ferric ferrocyanide, sodium ferrocyanide, yellow prussiate of soda) used to keep deicing salt granular
- **Sodium, Calcium, Chloride:** deicing salts
- **Sulphate:** Roadway beds, fuel, deicing salts
- **Petroleum:** Spills, leaks or blow-by of motor lubricants, antifreeze and hydraulic fluids, asphalt surface leachate

THE 303(d) LIST

The Los Angeles Regional Water Quality Control Board (RWQCB) has jurisdiction over this project. The project is located within the Santa Monica Bay Watershed Management Area (WMA). Stormwater from this project discharges to Medea Creek, within what is considered Reach 2 (Above confluence with Lindero). Reach 2 (Above confluence with Lindero) is on the 2006 303(d) list. The listed pollutants/stressors of concern are Algae, Sedimentation/Siltation, Selenium, and Trash.

SOURCE CONTROL BMPs

Source Control BMPs include any schedules of activities, prohibitions of practices, maintenance procedures, managerial practices or operational practices that aim to prevent stormwater pollution by reducing the potential for contamination at the source of pollution.

Site specific mitigation for major transportation projects as indicated in Table 3-3 of the City of Los Angeles "Development BMP Handbook Part B – Planning Activities" includes the following:

- Source control for public education/participation,
- Employee training,
- Conserve natural areas/vegetative controls,
- Protect slopes and channels,
- Provide storm drain system stenciling and signage,
- Loading/unloading dock areas,
- Waste handling and disposal,
- Vehicle fleet management,
- Repair/maintenance bays,
- Parking areas,
- Provide proof of ongoing BMP maintenance
- Design standards for treatment control BMPs.

The following is a brief description of each Source Control BMP that applies to this road widening project:

- Conserve Natural Areas – The project will limit clearing and grading of native vegetation at the project site to the minimum needed for the project. The project will also promote natural vegetation along the side slopes of the roadway as well any affected areas near Medea Creek.
- Minimize Stormwater Pollutants of Concern – A catch basin screen will be provided for the existing catch basin within the project to prevent trash from entering into the basin. The project's proposed catch basin will incorporate a Filtera filtration system to pretreat flows before entering Medea Creek.
- Protect Slopes and Channels – The project will stabilize permanent channel crossings, and vegetate slopes with native or drought tolerant vegetation where disturbed soils occur.
- Provide Storm Drain System Stenciling and Signage – All drainage structures shall be stenciled with prohibitive language such as: "NO DUMPING – DRAINS TO OCEAN"
- Provide Proof of Ongoing BMP Maintenance – City will provide maintenance of BMPs for each catch basin.
- Design Standards for Treatment Control BMPs – post construction treatment control BMPs will incorporate at a minimum, flow based treatment control designs to treat the volume of runoff produced from 0.75-inches of rainfall as

generated by the rainfall intensities contained in Table 1, Appendix A of "Development Planning for Stormwater Management" LACDPW, September 2002.

WATER QUALITY DESIGN

The project will incorporate BMP's to treat runoff produced from the project area before entering Medea Creek. The proposed catch basin located on the westside of the existing Roadside Lumber driveway will incorporate a Catch Basin Trash Capture Devise: Connector Pipe Screens (CPS), by Waterway Solutions, or an approved equal. The proposed catch basin located upstream, to the east of the driveway, will incorporate a Filtera filtration system. Catch basin BMP design criteria is attached. ***See Attachment G.***

Water Quality flows based on the volume of runoff produced from 0.75-inches of rainfall were calculated for BMP sizing. ***See Attachment F.***

The calculated flow based volume is 0.05 cfs for the proposed Filtera filtration system.

The proposed 4' x 4' Filtera Unit, has the capacity to treat up to 0.22 cfs. The Filtera Unit was implemented on this project, because it meets the treatment requirements and it also is similar to the BMP devices the City is currently operating and maintaining within the City in more than two locations.

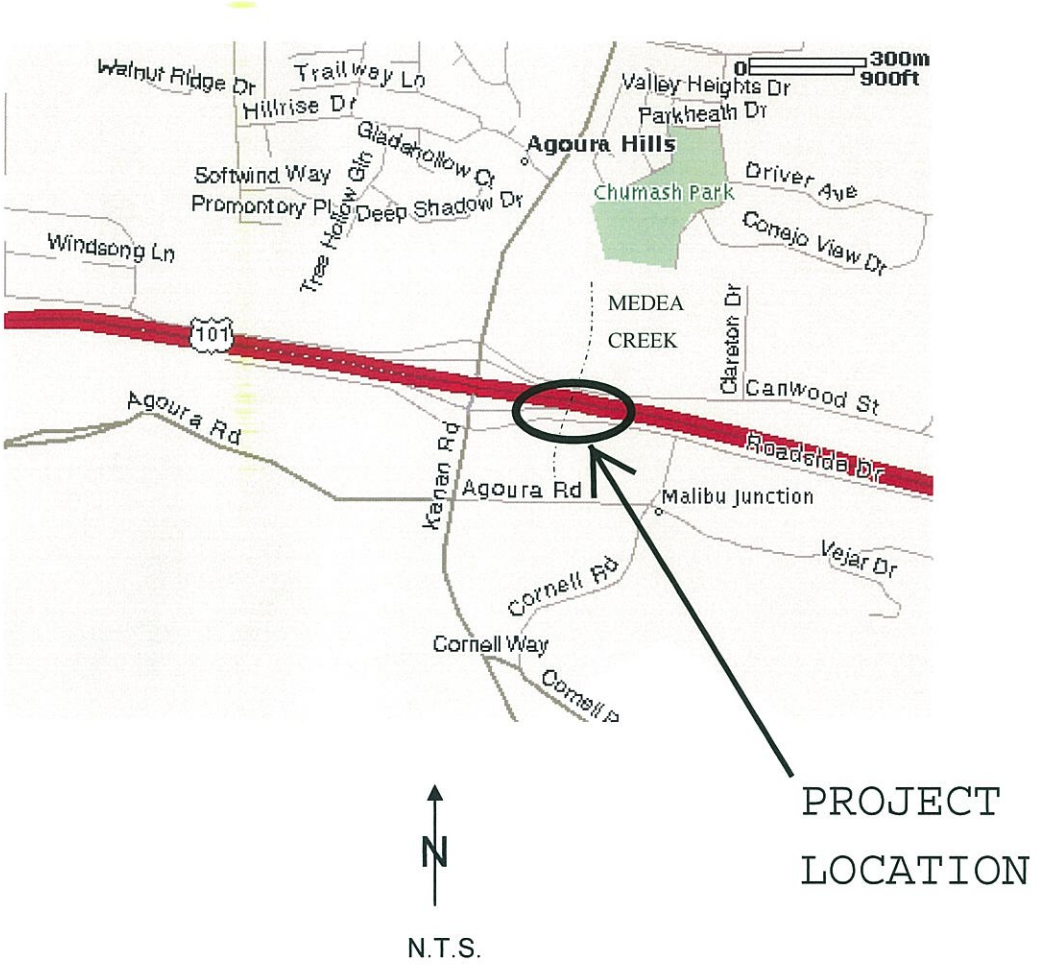
ATTACHMENT A
PROJECT LOCATION MAP

Attachment A

VICINITY MAP

FOR

ROADSIDE DRIVE BRIDGE WIDENING PROJECT



N.T.S.

ATTACHMENT B
HYDROLOGY MAP PROPOSED CONDITION

DIST.	COUNTY	ROUTE	POST MILE TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
6	LA				

Prepared for:
CLIENT LINE 1
CLIENT LINE 2
CLIENT LINE 3

Prepared by:
WILLDAN ENGINEERING
2150 RIVER PLAZA DRIVE, SUITE 300
SACRAMENTO, CALIFORNIA 95833

LEGEND

- EXISTING INLET
- PROPOSED INLET
- A-1 / 1.12 — AREA DESIGNATION / AREA IN ACRES
- 2 — NODE
- DRAINAGE BOUNDARY

PROPOSED HYDROLOGY MAP

HORZ 1"=50'

DESIGNED BY	K. TAYLOR	DATE	X
DRAWN BY	S. McCRACKEN	DATE	X
CHECKED BY	X	DATE	X
APPROVED	X	DATE	X

JOHN ENGLAND
PROJECT ENGINEER

PLANNING STUDY

MEDEA CREEK BRIDGE (WIDENING)

BRIDGE NO. 53C-0290	UNIT: X
SCALE: AS SHOWN	PROJECT NUMBER & PHASE:

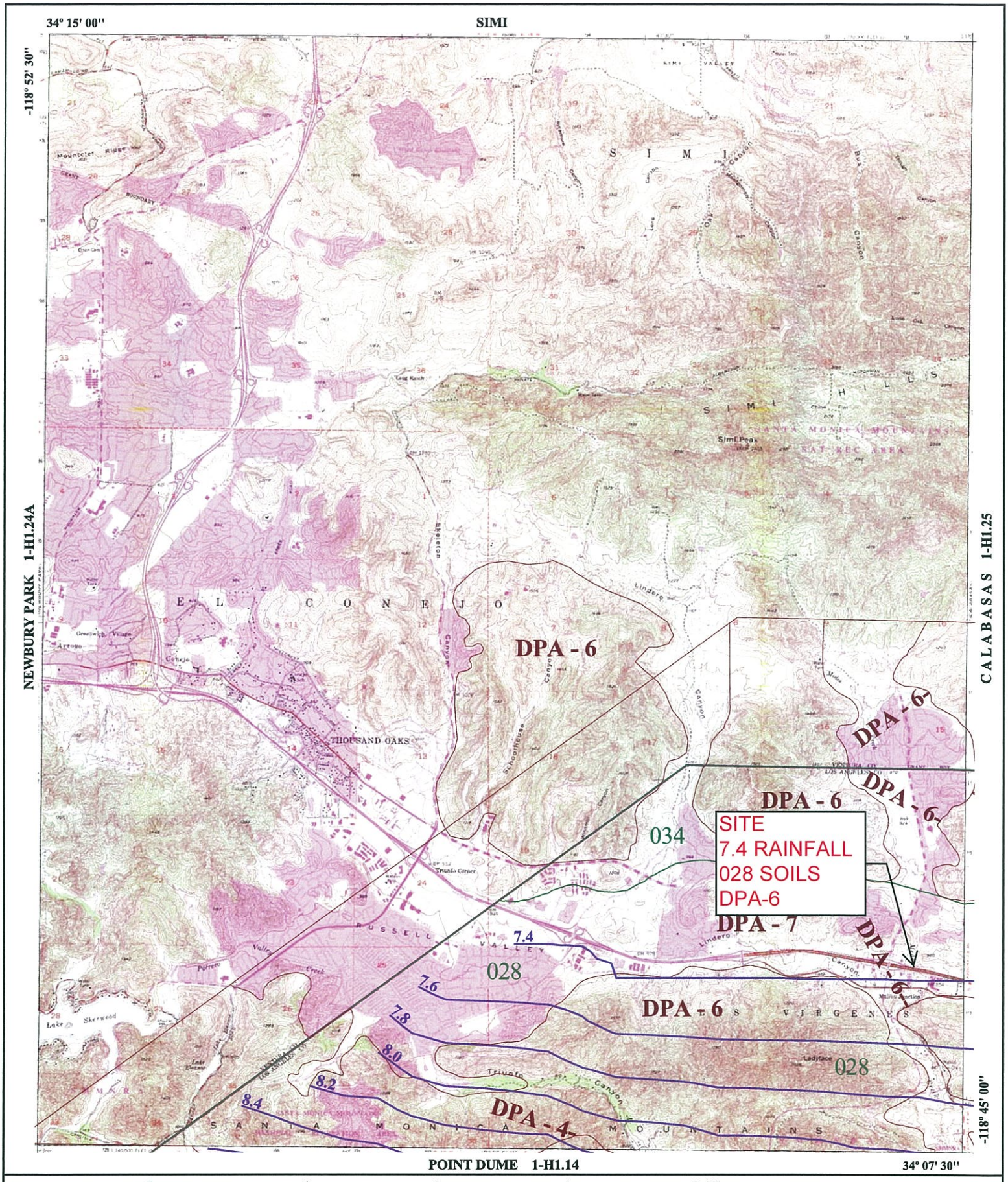
CONTRACT NO.:

X
BRIDGE ENGINEER
X
BRM OFF DATE

ADVANCE PLANNING STUDY SHEET (ENGLISH) (REV. 7/18/12)

FILE =>pl-Hydrology Map.dwg

ATTACHMENT C
LACDPW HYDROLOGIC MAPS


34° 15' 00"
SIMI
-118° 52' 30"
NEWBURY PARK 1-H1.24A
CALABASAS 1-H1.25
-118° 45' 00"
POINT DUME 1-H1.14
34° 07' 30"
DPA - 6
DPA - 7
DPA - 4
SITE
7.4 RAINFALL
028 SOILS
DPA-6
034
028
7.4
7.6
7.8
8.0
8.2
8.4
THOUSAND OAKS
E L C O N E J O
S I M I H I L L S
SANTA MONICA MOUNTAINS
S A N T A M O N I C A M O U N T A I N S
016 SOIL CLASSIFICATION AREA
7.2 INCHES OF RAINFALL
DPA - 6 DEBRIS POTENTIAL AREA
1 0 1 2 Miles
25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714
THOUSAND OAKS
50-YEAR 24-HOUR ISOHYET
1-H1.24
LOS ANGELES COUNTY PUBLIC WORKS
Public Service That Works

ATTACHMENT D
FHWA HY-22 SPREAD CALCULATIONS

Worksheet for Curb Inlet Area A1 25yr

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	3.23	ft³/s
Slope	0.03400	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Efficiency	100.00	%
Local Depression	2.00	in
Local Depression Width	2.00	ft

Results

Curb Opening Length	15.26	ft
Intercepted Flow	3.23	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.32	ft
Depth	0.27	ft
Flow Area	0.66	ft²
Gutter Depression	0.13	ft
Total Depression	0.29	ft
Velocity	4.89	ft/s
Equivalent Cross Slope	0.12699	ft/ft
Length Factor	1.00	
Total Interception Length	15.26	ft

Worksheet for Curb Inlet On Grade A2 25yr 2%

Project Description

Solve For	Efficiency

Input Data

Discharge	0.90	ft³/s
Slope	0.00290	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	4.81	ft
Local Depression	2.00	in
Local Depression Width	2.00	ft

Results

Efficiency	100.00	%
Intercepted Flow	0.90	ft³/s
Bypass Flow	0.00	ft³/s
Spread	7.13	ft
Depth	0.27	ft
Flow Area	0.63	ft²
Gutter Depression	0.13	ft
Total Depression	0.29	ft
Velocity	1.42	ft/s
Equivalent Cross Slope	0.12873	ft/ft
Length Factor	1.14	
Total Interception Length	4.23	ft

ATTACHMENT E
TC CALCULATOR HYDROLOGY
(25-YEAR)

A-1
25 YEAR

Project	Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calculated	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Tc Equation
A1 25yr	1	1.12	0.9	25	28	820	0.034	6.5	7	3.31	0.62	0.87	3.23	Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135

A-2
25 YEAR

Project	Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calculated	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Tc Equation
A2 25yr	1	0.35	0.9	25	28	575	0.0029	6.5	9	2.94	0.59	0.87	0.9	Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135

ATTACHMENT F
WATER QUALITY DISCHARGE
POST DEVELOPMENT BMP WATER QUALITY TREATMENT SUMMARY

A-1
3/4 INCH PEAK MITIGATED FLOW RATE

Project	Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calculated	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Tc Equation
A1 SUSMP	1	1.12	0.9	0.75	28	820	0.034	0.75	30	0.19	0.1	0.82	0.17	Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135

A-2
3/4 INCH PEAK MITIGATED FLOW RATE

Project	Subarea	Area (acres)	%imp	Frequency	Soil Type	Length (ft)	Slope (ft/ft)	Isohyet (in.)	Tc-calculated	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Tc Equation
A2 0.75	1	0.35	0.9	25	28	575	0.0029	0.75	30	0.19	0.1	0.82	0.05	Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135

ATTACHMENT G
BMP DESIGN CRITERIA

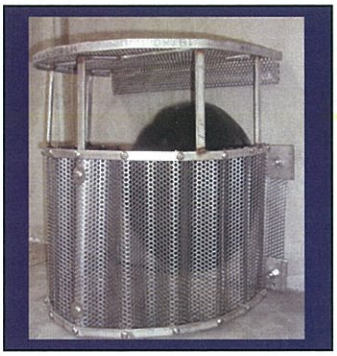
Protect our Waterways, Beaches and Oceans

WATERWAY SOLUTIONS

Stormwater Debris Screens & Filters

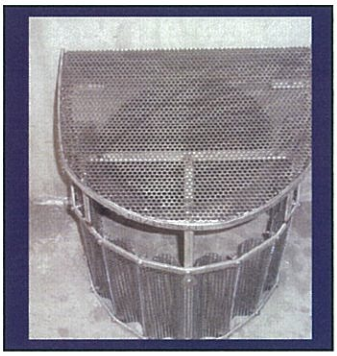
Catch Basin Trash Capture Devices: Connector Pipe Screens (CPS)

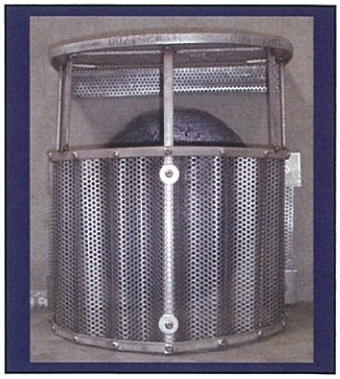
- Certified "full capture" device by Los Angeles & San Francisco Water Quality Boards
  - Captures all particles > 5 mm
  - Meets hydraulic design standards of > flow rate from 1-year, 1 hour storm and bypass of maximum inlet design capacity
- GRATE and *Wavy* Trash Catchers made from innovative corrugated perforated screen:
  - Meets hydraulic standards in less space
  - Ensures bypass requirement compliance
- Increases catch basin holding capacity:
  - Reduces time intervals between clean-outs & maintenance costs
  - Minimizes flooding potential
- Best (and sometimes only) solution for shallow, narrow, smaller & longer catch basins
- Designed by Mike Soliman, P.E. former Assistant Head, Design Div., LA County Public Works, Flood Control & Water Quality
- Constructed from 304 Stainless Steel: Permanent installations, expected life of 15 -20 years, 5 year warranty.
- Also made in cost-saving, non-leaching, high-strength Plastic.
- Conventional (non-corrugated) Waterway Solutions' Connector Pipe Screens (CPS) available for less-challenging catch basins



GRATE Trash Catcher™
***Wavy* Trash Catcher ™**
Conventional CPS

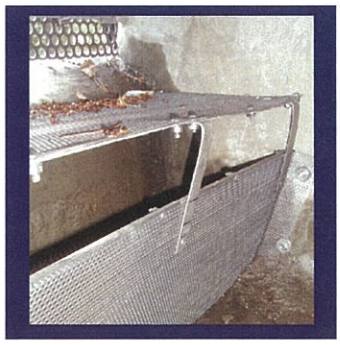
Trash Capture Devices for ANY type of Catch Basin!

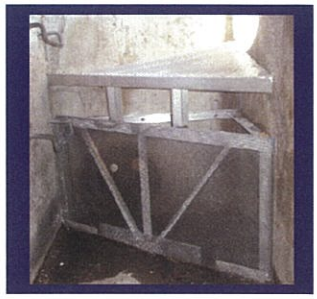




"Wavy" Corrugated CPS: Increased effectiveness in a smaller footprint

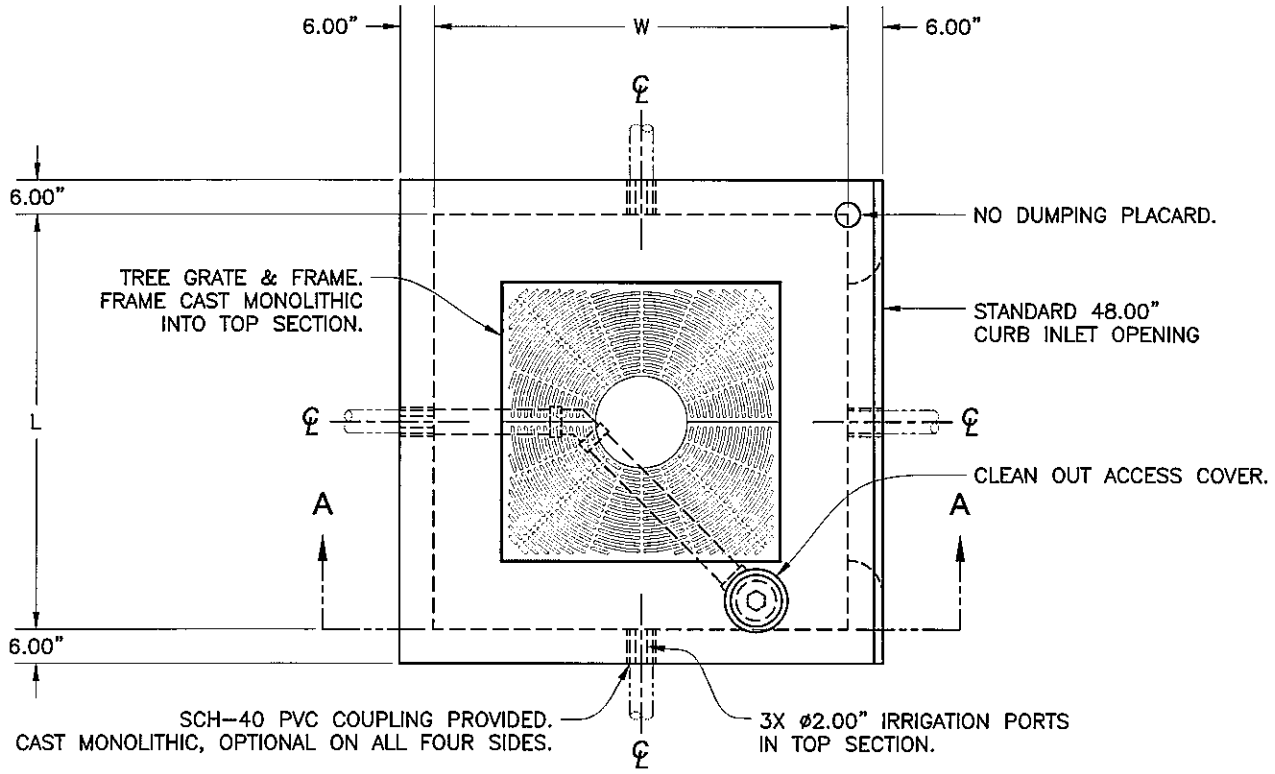
"Grate Trash Catcher" CPS: Effective in catch basins as small as 18" x 18" x 18"

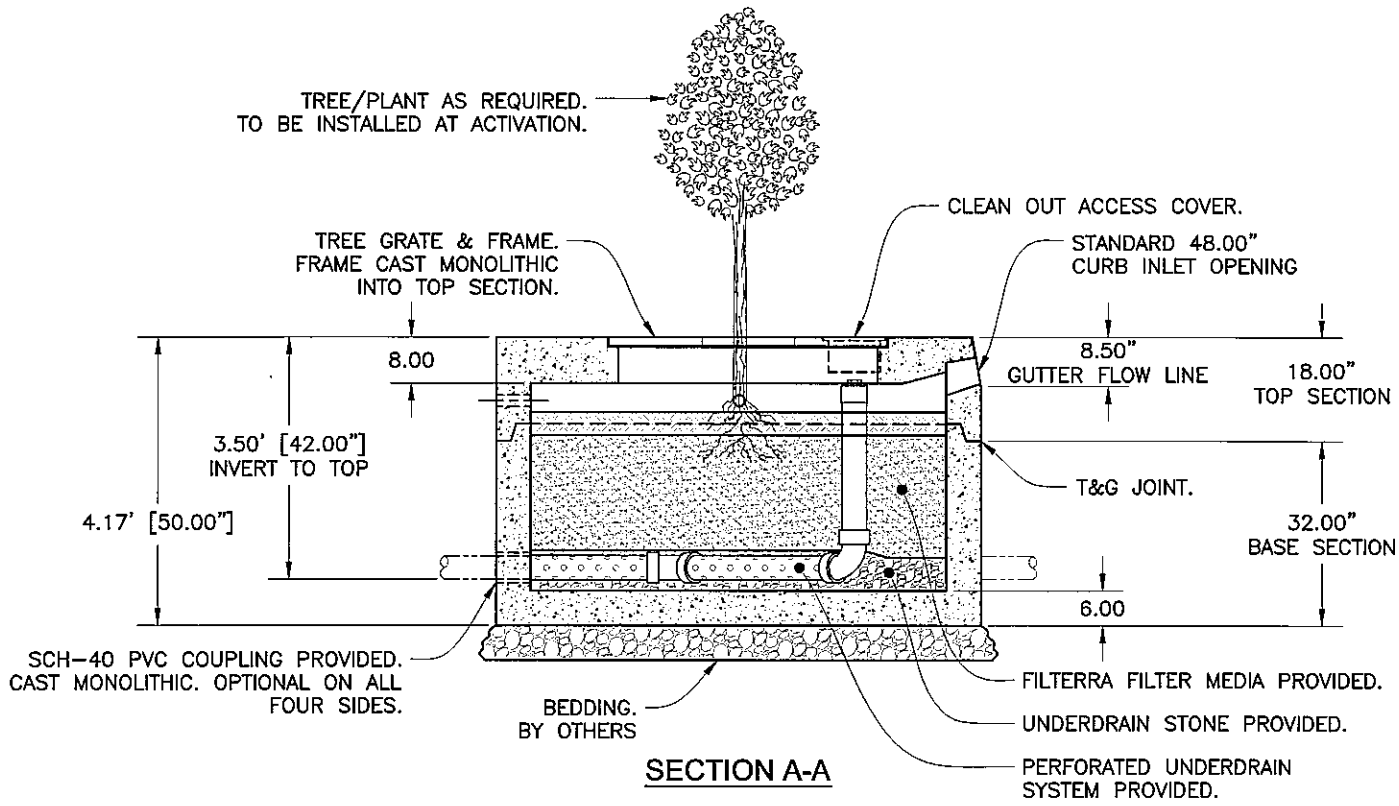




Waterway Solutions, 824 E. Anaheim Street, Wilmington CA 90744, 562-592-5989, www.waterwaysolution.com

K-FTST





SECTION A-A

TABULATION				
Size / Designation	L (Feet)	W (Feet)	Tree Grate Quantity / Size	Outlet Pipe PVC SCH-40
4' x 4'	4.00'	4.00'	1Ea. / 3' x 3'	Ø4.00"
6' x 6'	6.00'	6.00'	1Ea. / 3' x 3'	Ø4.00"

TITLE

Precast Filterra® Unit

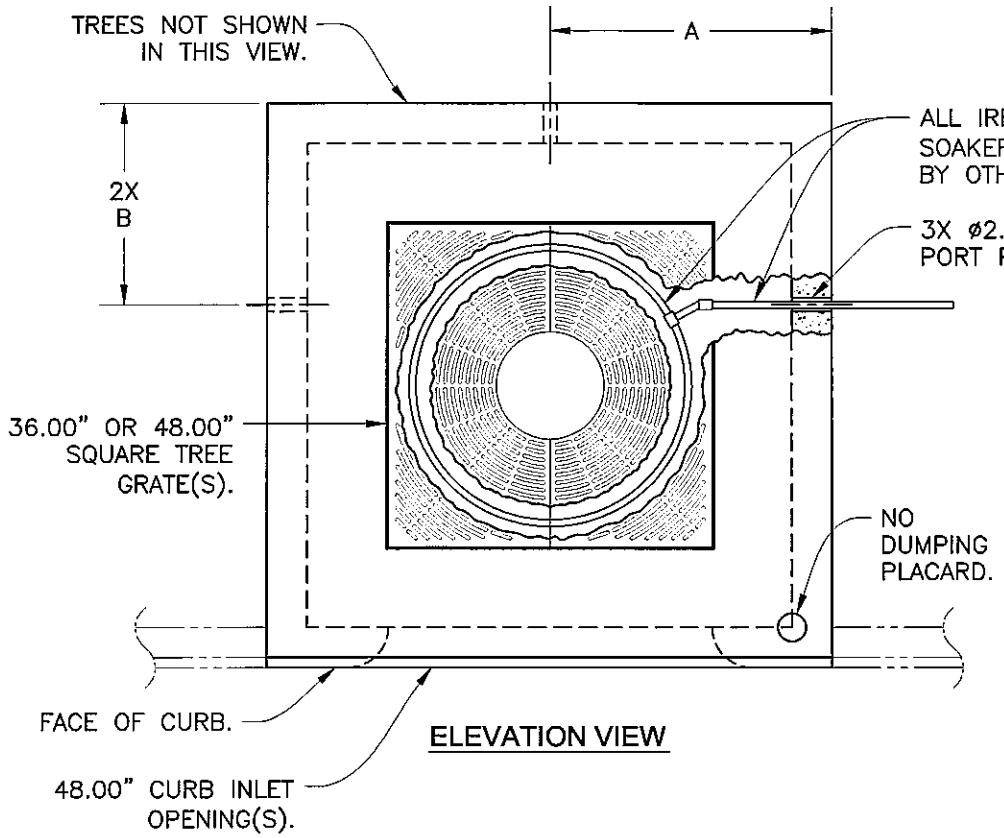
Standard Configuration (Square)

KriStar Enterprises, Inc.
360 Sutton Place, Santa Rosa, CA 95407
Ph: 800.579.8819, Fax: 707.524.8186, www.kristar.com

filterra®
US PAT 6,277,274 AND 6,569,321

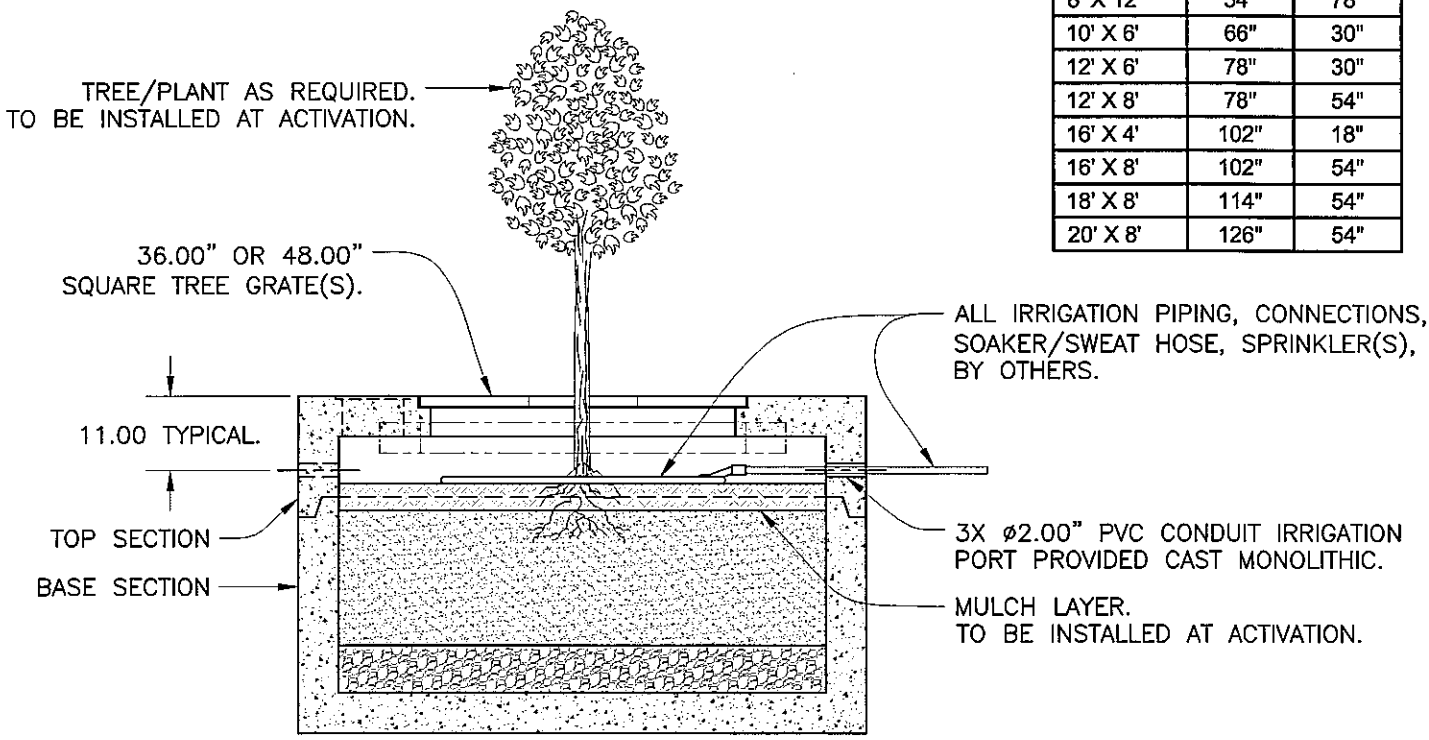
DRAWING NO.	REV	F-ECO	DATE
K-FTST	03	0006 JPR 6/17/11	JPR 1/7/11

K-FTIRR



ELEVATION VIEW

TABULATION		
UNIT SIZE (FEET)	A (INCHES)	B (INCHES)
4' X 4'	30"	18"
4' X 6'	18"	42"
4' X 6.5'	18"	45"
4' X 8'	18"	54"
4' X 16'	18"	102"
6' X 4'	42"	18"
6.5' X 4'	45"	18"
8' X 4'	54"	18"
8' X 16'	54"	102"
8' X 18'	54"	114"
8' X 20'	54"	126"
6' X 6'	42"	42"
6' X 8'	42"	54"
6' X 10'	42"	66"
6' X 12'	42"	78"
8' X 6'	54"	30"
8' X 12'	54"	78"
10' X 6'	66"	30"
12' X 6'	78"	30"
12' X 8'	78"	54"
16' X 4'	102"	18"
16' X 8'	102"	54"
18' X 8'	114"	54"
20' X 8'	126"	54"



ELEVATION VIEW

TITLE

Filterra®

Irrigation Planning Layout

KriStar Enterprises, Inc.
360 Sutton Place, Santa Rosa, CA 95407
Ph: 800.579.8819, Fax: 707.524.8186, www.kristar.com

filterra® US PAT 6,277,274 AND 6,569,321

DRAWING NO.	REV	F--ECO	DATE
K-FTIRR	03	0006 JRR 6/17/11	JRR 1/7/11

filterra
Bioretention Systems
CELEBRATING 10 YEARS
by KRISTAR

Table 1: Filterra® Quick Sizing Table
(Western Zone - 0.2 in/hr Uniform Intensity Approach)

Filterra® Box Sizes (feet)	Recommended Commercial Contributing Drainage Area (acres) where C = 0.85	Outlet Pipe
4x4	up to 0.22	4" SCH-40 PVC
4x6 or 6x4	0.23 to 0.33	4" SCH-40 PVC
4x6.5 or 6.5x4	0.23 to 0.35	4" SCH-40 PVC
4x8 or 8x4	0.34 to 0.44	4" SCH-40 PVC
4x16 or 16x4	up to 0.87	6" SCH-40 PVC
Standard 6x6	0.45 to 0.49	4" SCH-40 PVC
6x8 or 8x6	0.50 to 0.65	4" SCH-40 PVC
6x10 or 10x6	0.66 to 0.82	4" SCH-40 PVC
6x12 or 12x6	0.83 to 0.98	6" SCH-40 PVC
8x12 or 12x8	0.99 to 1.31	6" SCH-40 PVC
8x16 or 16x8	up to 1.75	6" SCH-40 PVC
8x18 or 18x8	up to 1.96	6" SCH-40 PVC
8x20 or 20x8	up to 2.18	6" SCH-40 PVC

Filterra® Box Sizes (feet)	Recommended Residential Contributing Drainage Area (acres) where C = 0.50	Outlet Pipe
4x4	up to 0.37	4" SCH-40 PVC
4x6 or 6x4	0.38 to 0.60	4" SCH-40 PVC
4x6.5 or 6.5x4	0.38 to 0.60	4" SCH-40 PVC
4x8 or 8x4	0.61 to 0.74	4" SCH-40 PVC
4x16 or 16x4	up to 1.48	6" SCH-40 PVC
Standard 6x6	0.75 to 0.83	4" SCH-40 PVC
6x8 or 8x6	0.84 to 1.11	4" SCH-40 PVC
6x10 or 10x6	1.12 to 1.39	6" SCH-40 PVC
6x12 or 12x6	1.40 to 1.67	6" SCH-40 PVC
8x12 or 12x8	1.68 to 2.22	6" SCH-40 PVC
8x16 or 16x8	up to 2.97	6" SCH-40 PVC
8x18 or 18x8	up to 3.34	6" SCH-40 PVC
8x20 or 20x8	up to 3.71	6" SCH-40 PVC

Notes:

1. Additional Filterra Box sizes are available by contacting KriStar.
2. All boxes are standard 3.5 feet depth (INV to TC).
3. A standard PVC pipe coupling is cast into the wall for easy connection to discgarge drain.
4. Dimensions shown are internal. Please add 1' to the internal dimensions to obtain the external dimensions (using 6" walls).
5. In line with TR55 data, for Commerical Developments a minimum (runoff coefficient) C factor of 0.85 is recommended. For Residential Developments, use of C factors less than 0.5 require individual site review by KriStar.
6. Please ask for Sizing Tables for other target treatment goals, e.g. 0.3 in/hr.
7. This sizing table is valid for CA, NV, AZ, CO, UT, NM. For the state of HI, please contact a Filterra® representative.

NEW FILTERRA MODEL

CONTACT US FOR DETAILS

filterra Bioretention Systems CELEBRATING 10 YEARS by KRISTAR

Filterra® Curb Inlet with Internal Bypass System

Combining stormwater treatment with internal peak flow bypass in one packaged design.

Filterra® Curb Inlet with Internal Bypass

The Filterra Curb Inlet with Internal Bypass system incorporates biofiltration and an internal high flow bypass chamber into one single structure. This new system eliminates the need and cost of installing a separate bypass structure and enables placement on grade or at low points. The system is designed for decentralized treatment of stormwater runoff and meets Low Impact Development guidelines in most jurisdictions.

Filterra uses biofiltration to capture and immobilize pollutants of concern, such as: trash/debris, sediment, TSS, oil/grease, nutrients and metals.

Initial runoff flows are conveyed internally from the Filterra weir tray and into the Filterra media chamber. Runoff is then filtered and treated through engineered soil media and passes into the underdrain system, which then discharges into the internal bypass chamber. Higher peak flows bypass the biofiltration media chamber over the Filterra weir tray and outlet through the internal bypass chamber.

Features and Benefits

Best Value for High Density Areas.

- **Compact size**
- **Needs no external bypass**
- **Accepts flow from both directions**
- **Simple maintenance**

Versatile.

Filterra Curb Inlet with Bypass models can be used for:

- **New construction**
- **Retrofits**
- **Commercial or residential applications.**

Filterra Curb Inlet with Bypass can be placed:

- **At sidewalk locations**
- **In parking lots**
- **At roadway improvement projects**
- **In parking lot low-spot islands**

Maintenance. Maintenance is simple and safe, and the first year is provided FREE with the purchase of every unit. The procedure is so easy you can perform it yourself.

Expected Pollutant Removal

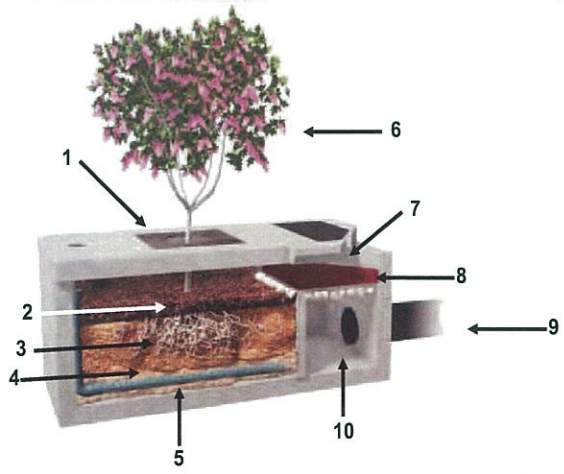
(Ranges Varying with Particle Size, Pollutant Loading and Site Conditions)

TSS Removal	85%
Phosphorus Removal	60% - 70%
Zinc Removal	> 66%
Copper Removal	>58%
Nitrogen Removal	43%
TPH* Removal	> 93%

*Total Petroleum Hydrocarbons

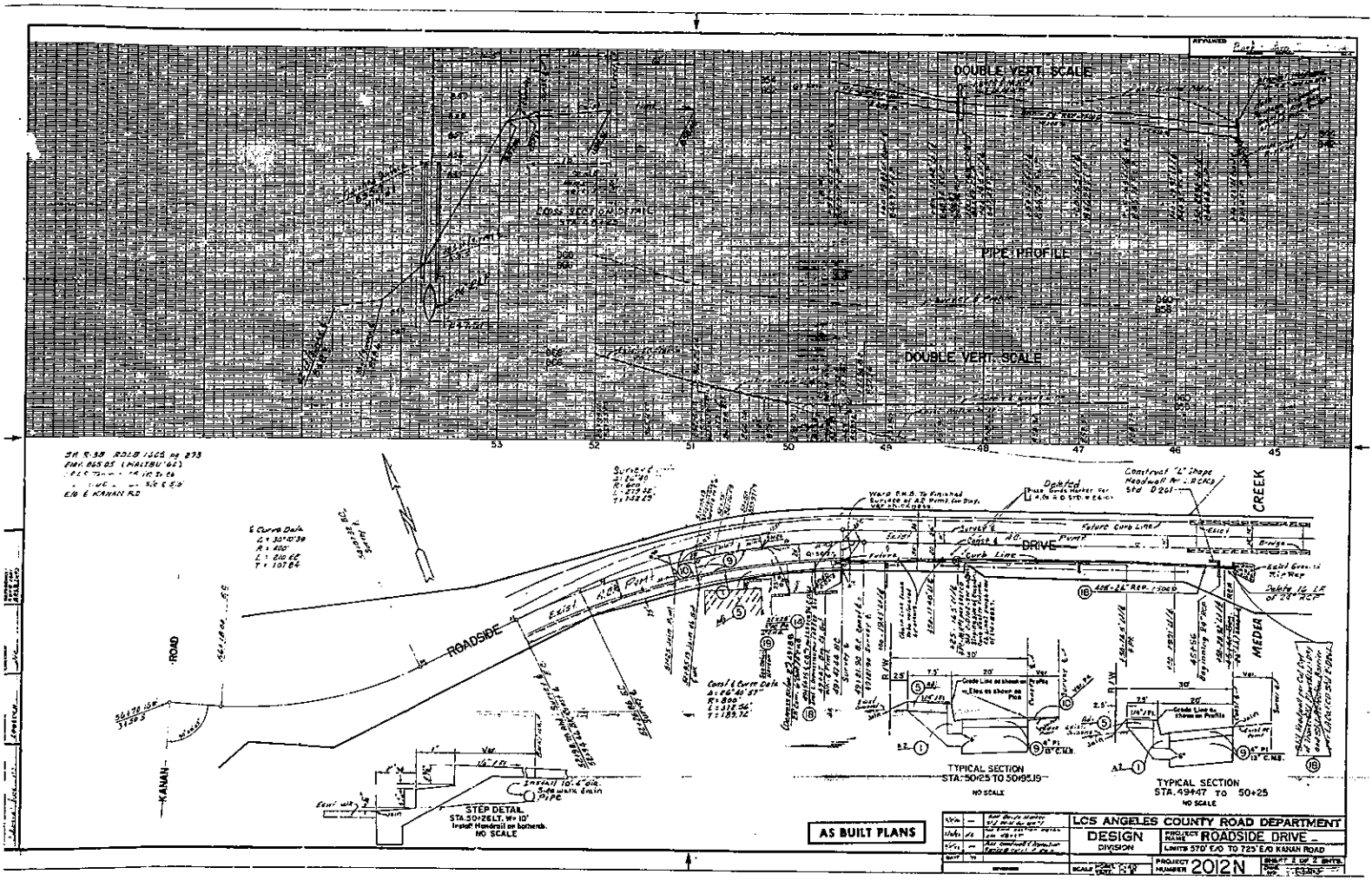
Information on the pollutant removal efficiency of the filter soil/plant media is based on third party lab and field studies.

Filterra media has been TAPE and TARP tested and approved.



1. Cast Iron Tree Grate for Maintenance Access
2. Protective Mulch Layer
3. Biofiltration Chamber
4. Filterra Engineered Soil Media
5. Perforated Underdrain Pipe
6. Native Tree or Shrubs (numerous plant choice available)
7. Curb Inlet Opening (various widths available)
8. Internal Weir Tray and Inlet to Biofilter Chamber
9. Outlet
10. Internal Bypass Chamber

ATTACHMENT H
REFERENCES


DOUBLE VERT. SCALE
TYPE I PROFILE
DOUBLE VERT. SCALE
ROADSIDE DRIVE
KANAN ROAD
MEDER CREEK
STEP DETAIL
STA. 50+26 LT. W= 10'
NO SCALE
TYPICAL SECTION
STA. 50+25 TO 50+95.19
NO SCALE
TYPICAL SECTION
STA. 49+47 TO 50+25
NO SCALE
AS BUILT PLANS
LOS ANGELES COUNTY ROAD DEPARTMENT
DESIGN DIVISION
PROJECT NAME ROADSIDE DRIVE
LIMITS 570' E/O TO 725' E/O KANAN ROAD
PROJECT NUMBER 2012N

APPENDIX I

Kanan Road/Agoura Road Traffic Analysis

Kimley-Horn
and Associates, Inc.

TECHNICAL MEMORANDUM

Date: September 26, 2012

To: Michael Choi, P.E
Kimley-Horn and Associates, Inc.

From: Sri Chakravarthy, P.E, T.E
Rossina Chichiri
Kimley-Horn and Associates, Inc.

Subject: Kanan Road/Agoura Road Intersection Traffic Analysis

INTRODUCTION

This memorandum presents the traffic analysis completed to evaluate the current and future traffic operations at the intersection of Kanan Road with Agoura Road in the City of Agoura Hills and summarizes the impacts of Agoura Road widening project. The analysis was completed as part of the Agoura Road widening project. This memorandum evaluates the intersection Level of Service conditions for both morning and evening peak hour conditions under the following scenarios:

1. Existing conditions
2. Future conditions without intersection improvements and
3. Future conditions with intersection improvements (without project conditions)

ANALYSIS METHODOLOGY

In accordance with the City of Agoura Hills practices, the intersection level of service (LOS) was calculated using the Intersection Capacity Utilization (ICU) methodology for the study intersection. The ICU method compares existing or future projected traffic volumes at an intersection to the capacity of the intersection to produce a volume-to-capacity (V/C) ratio, which in turn determines LOS. LOS is a qualitative measure of traffic flow ranging from nearly free-flow at LOS A to overloaded stop-and-go conditions at LOS F. This calculation assumes an intersection capacity of 1,600 vehicles per hour per lane (vphpl), 2,880 vehicles per hour for dual left turn lanes and includes a loss factor of 0.05 (5%) to account for the yellow and all-red signal clearance intervals.

LOS C is typically considered the minimum desirable LOS for this area of the City. **Table 1** provides LOS definitions for signalized intersections.

Table 1 – Level of Service Definitions for Signalized Intersections

Level of Service (LOS)	ICU Method Volume to Capacity (V/C) Ratio	Definition
A	0.000 to 0.600	EXCELLENT. No Vehicle waits longer than one red light and no approach phase is fully used.
B	0.601 to 0.700	VERY GOOD. An occasional approach phase is fully utilized; many drivers begin to feel somewhat restricted within groups of vehicles.
C	0.701 to 0.800	GOOD. Occasionally drivers may have to wait through more than one red light; backups may develop behind turning vehicles.
D	0.801 to 0.900	FAIR. Delays may be substantial during portions of the rush hours, but enough lower volume periods occur to permit clearing of developing lines, preventing excessive backups
E	0.901 to 1.000	POOR. Represents the most vehicles intersection approaches can accommodate; may be long line of waiting vehicles through several signal cycles.
F	Exceeds 1.000	FAILURE. Backups from nearby locations or on cross streets may restrict or prevent movement of vehicles out of the intersection approaches. Tremendous delays with continuously increasing queue lengths

Source: Highway Capacity Manual, Special Report 209, Transportation Research Board, 2000.

EXISTING CONDITIONS

Weekday AM and PM peak period analysis was completed for the both existing conditions and future conditions. Traffic volume data taken in 2007 were provided by the City. The AM peak period counts were taken from 7 AM to 9 AM and the PM peak period counts were taken from 4 PM to 6 PM. The counts used in this analysis were taken from the highest hour within the peak period. Existing (2011) traffic volumes were derived by applying an annual growth percent per year to 2007 traffic volumes to account for cumulative background growth. This is a conservative assumption, since the growth rate factor is applied to all vehicle movements at the study intersection. **Figure 1** illustrates the existing AM and PM peak hour intersection turning movement counts and the existing lane configuration.

Table 2 presents the Existing peak-hour intersection operating conditions.

Table 2: Intersection LOS Summary for Existing Conditions

Intersection	AM Peak Hour		PM Peak Hour	
	ICU	LOS	ICU	LOS
Kanan Road/Agoura Road	0.65	B	0.61	B

Table 2 indicates that the intersection currently operates at LOS B for both peak-hours based upon the ICU methodology. Traffic count and analysis worksheets for this scenario are provided in **Appendix A**.

FUTURE WITHOUT PROJECT CONDITIONS

The future without project scenario represents future conditions at the study intersection without any project improvements. To properly estimate the future traffic conditions, traffic estimates from cumulative development projects in the project vicinity were added to the existing traffic volumes. The cumulative development project traffic information was obtained from the Agoura Village Specific Plan available from the City.

Table 3 presents the Future Conditions peak-hour intersection operating conditions.

Table 3: Intersection LOS Summary for Future without Project Conditions

Intersection	AM Peak Hour		PM Peak Hour	
	ICU	LOS	ICU	LOS
Kanan Road/Agoura Road	0.70	B	0.95	E

Table 3 indicates the intersection would operate at an acceptable LOS of B during the AM peak hour and an unacceptable LOS of E during the PM peak hour based upon both ICU methodology. Analysis worksheets for this scenario are provided in **Appendix B**.

FUTURE WITH PROJECT CONDITIONS

Improvements would be required for the intersection of Kanan Road and Agoura Road to improve the LOS to acceptable (C or better) level for PM future traffic conditions. The following intersection improvements were identified below to improve the LOS in the future scenario:

- Convert the permissive left-turn movements for eastbound and westbound movements to protected left-turn movements,
- install an overlap phase for the southbound and westbound right-turn movement,
- install an additional left-turn lane for eastbound and southbound movements, and
- install an additional through lane for southbound movement

Figure 2 illustrates the future AM and PM peak hour intersection turning movement counts and the future lane configuration. **Table 4** presents the intersection operating conditions under the future with project conditions.

Table 4: Intersection LOS Summary for Future with Project Conditions

Intersection	AM Peak Hour		PM Peak Hour	
	ICU	LOS	ICU	LOS
Kanan Road/Agoura Road	0.49	A	0.64	B

Table 4 indicates that the proposed improvements would improve the LOS to B or better during both AM and PM peak hours. Analysis worksheets for this scenario are provided in **Appendix C**.

CONGESTION MANAGEMENT PLAN (CMP) ANALYSIS

The Los Angeles County Congestion Management Program (CMP) requires a regional traffic impact analysis (TIA) for:

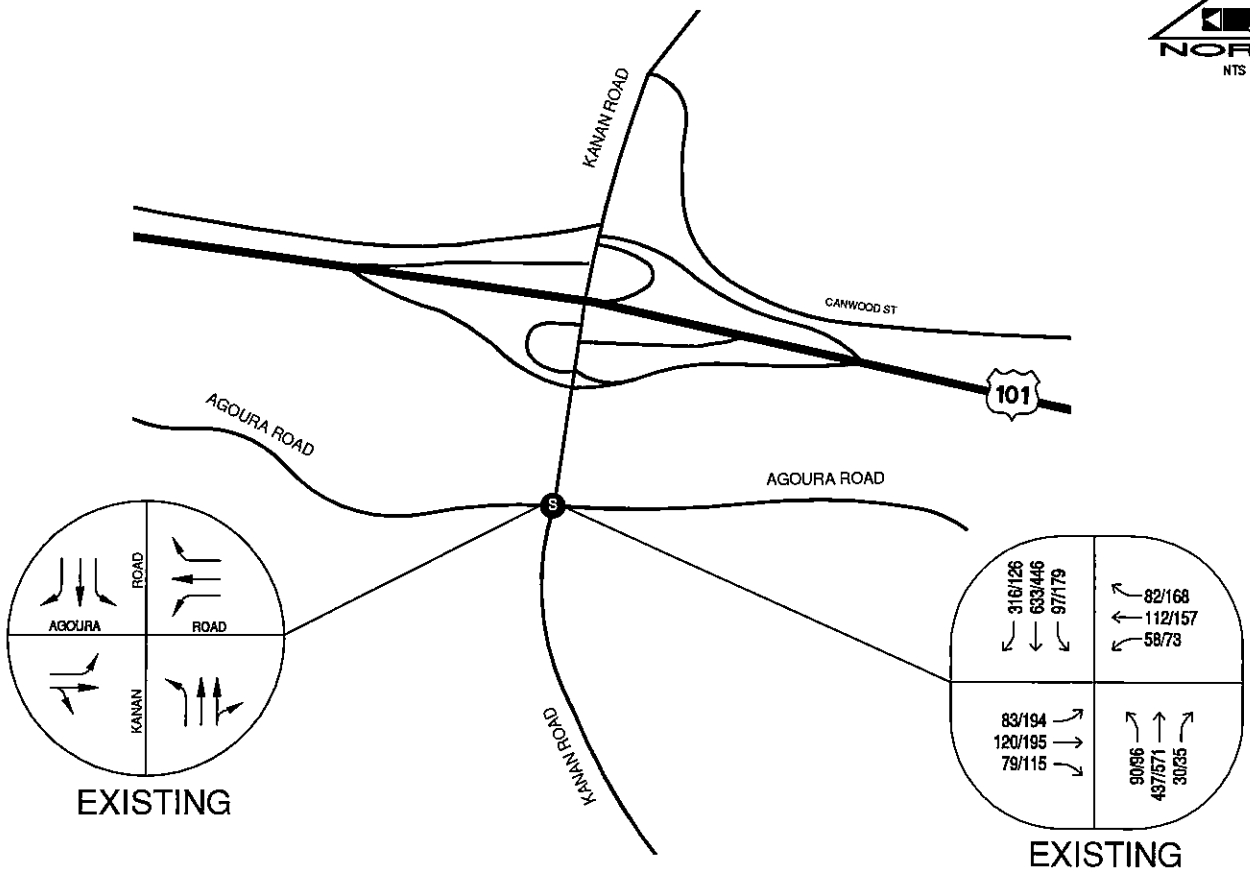
- All CMP arterial monitoring intersections where a project would add 50 or more trips to roadways during either the AM or PM weekday peak hour; and
- All CMP mainline freeway monitoring locations where the proposed project would add 150 or more trips in either direction, during either the AM or PM weekday peak hour.

There are no CMP facilities within the project area; hence no CMP analysis is required.

GENERAL PLAN IMPROVEMENTS

As part of the recently completed General Plan Update, several infrastructure improvements were identified throughout the City. Segments of Agoura Road were forecasted to operate at LOS D or worse during AM and PM peak conditions. As a result, widening of Agoura Road to two travel lanes in each direction was identified as a required improvement. Portions of Agoura Road have already been widened to two travel lanes in each direction with raised medians. This project would widen the remaining portions of Agoura Road that would result in continuous two travel lanes in each direction with raised medians wherever feasible. This improvement would increase the capacity of Agoura Road and would result in an LOS of C or better during AM and PM peak periods.

FIGURES

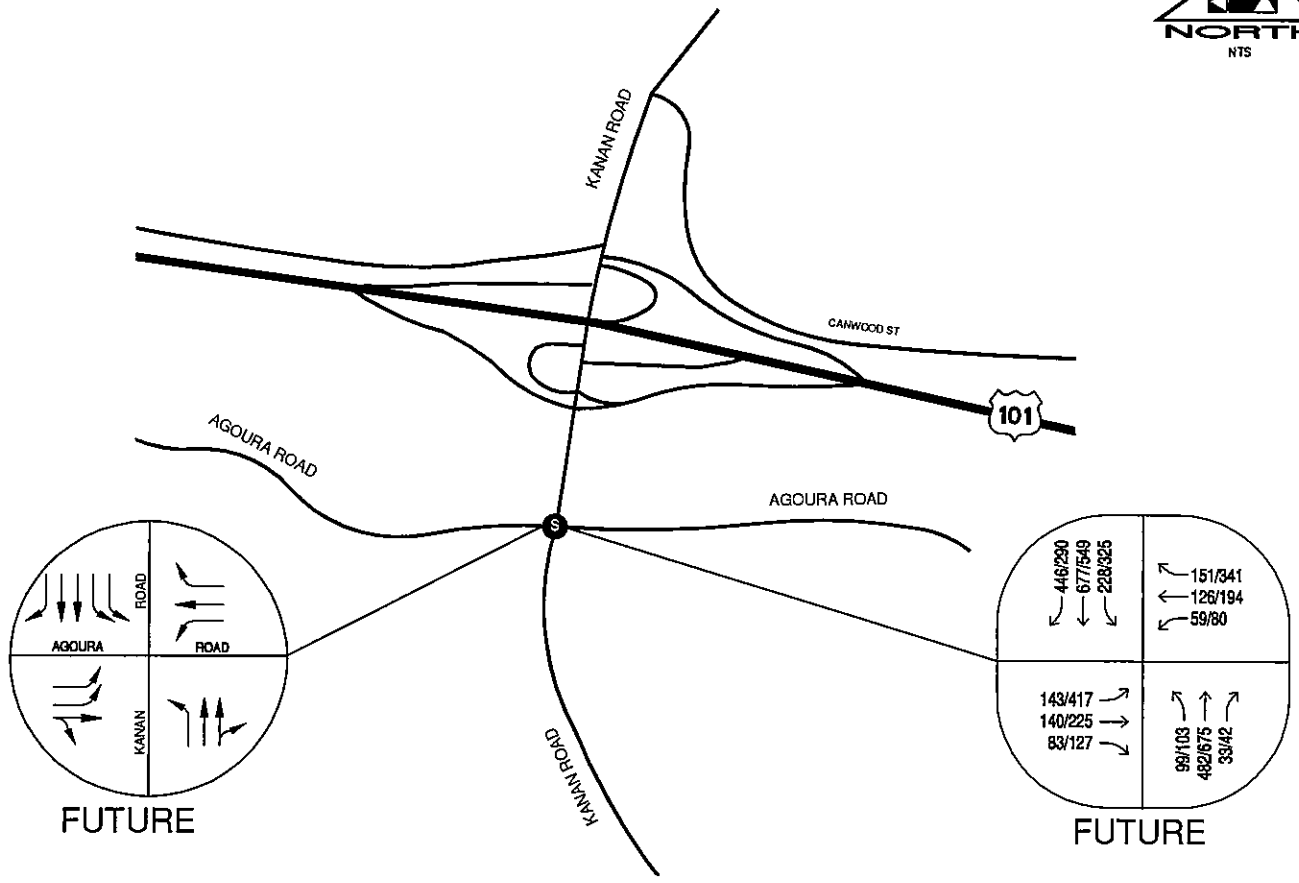


Kanan Road/Agoura Road
Intersection Traffic Analysis
Figure 1 - Existing Lane Configuration and Turning Movement Volumes

LEGEND	
S	Signalized Project Intersection
	Lane Configuration
← XX/XX	AM/PM Peak Hour Traffic Volumes

Kinley-Horn ©2011 and Associates, Inc.

Apr 21, 2011 – 4:27pm – USER rossina.chichiri
K:\LOS_CIVIL\99083017 Agoura Road Widening\Documents\Traffic Study\DWG\Final Figures.dwg



Kanan Road/Agoura Road
Intersection Traffic Analysis
Figure 2 - Future Lane Configuration and
Turning Movement Volumes

LEGEND

- (S) Signalized Project Intersection
- Lane Configuration
- ← XX/XX AM/PM Peak Hour Traffic Volumes

Kinley-Horn ©2011 and Associates, Inc.

Apr 21, 2011 – 4:26pm – USER rossina.chichiri
K:\LOS_CIVIL\99083017 Agoura Road Widening\Documents\Traffic Study\DWG\Final Figures.dwg

APPENDIX A

Existing AM

Scenario Report

Scenario:	Ex AM
Command:	Ex AM
Volume:	Ex AM
Geometry:	Existing
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

Existing AM

Turning Movement Report

Volume Type	Northbound Left	Thru	Right	Southbound Left	Thru	Right	Eastbound Left	Thru	Right	Westbound Left	Thru	Right	Total Volume
#1 Kanan Rd / Agoura Rd													
Base	90	437	30	97	633	316	83	120	79	58	112	82	2137
Added	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	90	437	30	97	633	316	83	120	79	58	112	82	2137

Existing AM

Level Of Service Computation Report
ICU 2(Loss as Green Time %) Method (Future Volume Alternative)

Intersection #1 Kanan Rd / Agoura Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.645
Loss Time (sec):	5 (Y+R=4.0 sec)	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	34	Level Of Service:	B

Street Name:	Kanan Road						Agoura Road					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0	1	1 0	1 0	1	0 1	1 0	0	1 0	1 0	1	0 1
Volume Module:												
Base Vol:	90	437	30	97	633	316	83	120	79	58	112	82
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	90	437	30	97	633	316	83	120	79	58	112	82
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	90	437	30	97	633	316	83	120	79	58	112	82
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	90	437	30	97	633	316	83	120	79	58	112	82
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	90	437	30	97	633	316	83	120	79	58	112	82
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	90	437	30	97	633	316	83	120	79	58	112	82
Saturation Flow Module:												
Sat/Lane:	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.87	0.13	1.00	1.00	1.00	1.00	0.60	0.40	1.00	1.00	1.00
Final Sat.:	1600	2994	206	1600	1600	1600	1600	965	635	1600	1600	1600
Capacity Analysis Module:												
Vol/Sat:	0.06	0.15	0.15	0.06	0.40	0.20	0.05	0.12	0.12	0.04	0.07	0.05
Crit Moves:	****				****			****			****	

Existing AM

Lane Geometry Report

Number of approach lanes: (L) (LT) (T) (RT) (R) (LTR)

Node	Intersection	NB	SB	EB	WB
1	Kanan Rd / Agoura Rd	101100	101010	100100	101010

Existing PM

Scenario Report

Scenario:	Ex PM
Command:	Ex PM
Volume:	Ex PM
Geometry:	Existing
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

Existing PM

Turning Movement Report

Volume Type	Northbound Left	Thru	Right	Southbound Left	Thru	Right	Eastbound Left	Thru	Right	Westbound Left	Thru	Right	Total Volume
#1 Kanan Rd / Agoura Rd													
Base	96	571	35	179	446	126	194	195	115	73	157	168	2355
Added	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	96	571	35	179	446	126	194	195	115	73	157	168	2355

Existing PM

Level Of Service Computation Report
ICU 2(Loss as Green Time %) Method (Future Volume Alternative)

Intersection #1 Kanan Rd / Agoura Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.609
Loss Time (sec):	5 (Y+R=4.0 sec)	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	31	Level Of Service:	B

Street Name:	Kanan Road						Agoura Road					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0	1	1 0	1 0	1	0 1	1 0	0	1 0	1 0	1	0 1
Volume Module:												
Base Vol:	96	571	35	179	446	126	194	195	115	73	157	168
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	96	571	35	179	446	126	194	195	115	73	157	168
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	96	571	35	179	446	126	194	195	115	73	157	168
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	96	571	35	179	446	126	194	195	115	73	157	168
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	96	571	35	179	446	126	194	195	115	73	157	168
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	96	571	35	179	446	126	194	195	115	73	157	168
Saturation Flow Module:												
Sat/Lane:	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.88	0.12	1.00	1.00	1.00	1.00	0.63	0.37	1.00	1.00	1.00
Final Sat.:	1600	3015	185	1600	1600	1600	1600	1006	594	1600	1600	1600
Capacity Analysis Module:												
Vol/Sat:	0.06	0.19	0.19	0.11	0.28	0.08	0.12	0.19	0.19	0.05	0.10	0.11
Crit Moves:	****				****			****			****	

Existing PM

Lane Geometry Report

Number of approach lanes: (L) (LT) (T) (RT) (R) (LTR)

Node	Intersection	NB	SB	EB	WB
1	Kanan Rd / Agoura Rd	101100	101010	100100	101010

APPENDIX B

Scenario Report

Scenario:	Future wo proj AM
Command:	Cumul wo Proj AM
Volume:	Cumul AM
Geometry:	Existing
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

Turning Movement Report

Volume Type	Northbound Left	Thru	Right	Southbound Left	Thru	Right	Eastbound Left	Thru	Right	Westbound Left	Thru	Right	Total Volume
#1 Kanan Rd / Agoura Rd													
Base	99	482	33	228	677	446	143	140	83	59	126	151	2667
Added	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	99	482	33	228	677	446	143	140	83	59	126	151	2667

Level Of Service Computation Report
ICU 2(Loss as Green Time %) Method (Base Volume Alternative)

Intersection #1 Kanan Rd / Agoura Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.696
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	38	Level Of Service:	B

Street Name:	Kanan Road						Agoura Road					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Permitted			Permitted		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1 0	1	1 0	1 0	1	0 1	1 0	0	1 0	1 0	1	0 1
Volume Module:												
Base Vol:	99	482	33	228	677	446	143	140	83	59	126	151
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	99	482	33	228	677	446	143	140	83	59	126	151
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	99	482	33	228	677	446	143	140	83	59	126	151
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	99	482	33	228	677	446	143	140	83	59	126	151
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	99	482	33	228	677	446	143	140	83	59	126	151
Saturation Flow Module:												
Sat/Lane:	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.87	0.13	1.00	1.00	1.00	1.00	0.63	0.37	1.00	1.00	1.00
Final Sat.:	1600	2995	205	1600	1600	1600	1600	1004	596	1600	1600	1600
Capacity Analysis Module:												
Vol/Sat:	0.06	0.16	0.16	0.14	0.42	0.28	0.09	0.14	0.14	0.04	0.08	0.09
Crit Moves:	****				****			****		****		

Lane Geometry Report

Number of approach lanes: (L) (LT) (T) (RT) (R) (LTR)

Node	Intersection	NB	SB	EB	WB
1	Kanan Rd / Agoura Rd	101100	101010	100100	101010

Cumulative PM

Scenario Report

Scenario:	Future wo proj PM
Command:	Cumul wo Proj PM
Volume:	Cumul PM
Geometry:	Existing
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

Cumulative PM

Turning Movement Report

Volume	Northbound			Southbound			Eastbound			Westbound			Total
Type	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Volume
#1 Kanan Rd / Agoura Rd													
Base	103	675	42	325	549	290	417	225	127	80	194	341	3368
Added	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	103	675	42	325	549	290	417	225	127	80	194	341	3368

Cumulative PM

Level Of Service Computation Report
ICU 2(Loss as Green Time %) Method (Future Volume Alternative)

Intersection #1 Kanan Rd / Agoura Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.948
Loss Time (sec):	5 (Y+R=4.0 sec)	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	131	Level Of Service:	E

Street Name:	Kanan Road									Agoura Road					
Approach:	North Bound			South Bound			East Bound			West Bound					
Movement:	L	T	R	L	T	R	L	T	R	L	T	R			
Control:	Protected			Protected			Permitted			Permitted					
Rights:	Include			Include			Include			Include					
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0			
Lanes:	1	0 1	1 0	1	0 1	0 1	1	0 0	1 0	1	0 1	0 1			
Volume Module:															
Base Vol:	103	675	42	325	549	290	417	225	127	80	194	341			
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Initial Bse:	103	675	42	325	549	290	417	225	127	80	194	341			
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0			
Cumul Proj:	0	0	0	0	0	0	0	0	0	0	0	0			
Initial Fut:	103	675	42	325	549	290	417	225	127	80	194	341			
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
PHF Volume:	103	675	42	325	549	290	417	225	127	80	194	341			
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0			
Reduced Vol:	103	675	42	325	549	290	417	225	127	80	194	341			
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
FinalVolume:	103	675	42	325	549	290	417	225	127	80	194	341			
Saturation Flow Module:															
Sat/Lane:	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600			
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Lanes:	1.00	1.88	0.12	1.00	1.00	1.00	1.00	0.64	0.36	1.00	1.00	1.00			
Final Sat.:	1600	3013	187	1600	1600	1600	1600	1023	577	1600	1600	1600			
Capacity Analysis Module:															
Vol/Sat:	0.06	0.22	0.22	0.20	0.34	0.18	0.26	0.22	0.22	0.05	0.12	0.21			
Crit Moves:		****		****			****					****			

Cumulative PM

Lane Geometry Report

Number of approach lanes: (L) (LT) (T) (RT) (R) (LTR)

Node	Intersection	NB	SB	EB	WB
1	Kanan Rd / Agoura Rd	101100	101010	100100	101010

APPENDIX C

Scenario Report

Scenario:	Future w proj AM
Command:	Cumul w Proj AM
Volume:	Cumul AM
Geometry:	Future w Proj
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

Turning Movement Report

Volume Type	Northbound Left	Thru	Right	Southbound Left	Thru	Right	Eastbound Left	Thru	Right	Westbound Left	Thru	Right	Total Volume
#1 Kanan Rd / Agoura Rd													
Base	99	482	33	228	677	446	143	140	83	59	126	151	2667
Added	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	99	482	33	228	677	446	143	140	83	59	126	151	2667

Level Of Service Computation Report
ICU 2(Loss as Green Time %) Method (Future Volume Alternative)

Intersection #1 Kanan Rd / Agoura Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.492
Loss Time (sec):	5 (Y+R=4.0 sec)	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Street Name:	Kanan Road						Agoura Road					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Ovl			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0	1	1 0	2 0	2	0 1	2 0	0	1 0	1 0	1	0 1
Volume Module:												
Base Vol:	99	482	33	228	677	446	143	140	83	59	126	151
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	99	482	33	228	677	446	143	140	83	59	126	151
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	99	482	33	228	677	446	143	140	83	59	126	151
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	99	482	33	228	677	446	143	140	83	59	126	151
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	99	482	33	228	677	446	143	140	83	59	126	151
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	99	482	33	228	677	446	143	140	83	59	126	151
Saturation Flow Module:												
Sat/Lane:	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Adjustment:	1.00	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.87	0.13	2.00	2.00	1.00	2.00	0.63	0.37	1.00	1.00	1.00
Final Sat.:	1600	2995	205	2880	3200	1600	2880	1004	596	1600	1600	1600
Capacity Analysis Module:												
Vol/Sat:	0.06	0.16	0.16	0.08	0.21	0.28	0.05	0.14	0.14	0.04	0.08	0.09
Crit Moves:	****					****		****		****		

Lane Geometry Report

Number of approach lanes: (L) (LT) (T) (RT) (R) (LTR)

Node	Intersection	NB	SB	EB	WB
1	Kanan Rd / Agoura Rd	101100	202010	200100	101010

Scenario Report

Scenario:	Future w proj PM
Command:	Cumul w Proj PM
Volume:	Cumul PM
Geometry:	Future w Proj
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

Turning Movement Report

Volume Type	Northbound Left	Thru	Right	Southbound Left	Thru	Right	Eastbound Left	Thru	Right	Westbound Left	Thru	Right	Total Volume
#1 Kanan Rd / Agoura Rd													
Base	103	675	42	325	549	290	417	225	127	80	194	341	3368
Added	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	103	675	42	325	549	290	417	225	127	80	194	341	3368

Level Of Service Computation Report
ICU 2(Loss as Green Time %) Method (Future Volume Alternative)

Intersection #1 Kanan Rd / Agoura Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.639
Loss Time (sec):	5 (Y+R=4.0 sec)	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Street Name:	Kanan Road						Agoura Road					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Ovl			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0	1	1 0	2 0	2	0 1	2 0	0	1 0	1 0	1	0 1
Volume Module:												
Base Vol:	103	675	42	325	549	290	417	225	127	80	194	341
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	103	675	42	325	549	290	417	225	127	80	194	341
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Cumul Proj:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	103	675	42	325	549	290	417	225	127	80	194	341
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	103	675	42	325	549	290	417	225	127	80	194	341
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	103	675	42	325	549	290	417	225	127	80	194	341
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	103	675	42	325	549	290	417	225	127	80	194	341
Saturation Flow Module:												
Sat/Lane:	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Adjustment:	1.00	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.88	0.12	2.00	2.00	1.00	2.00	0.64	0.36	1.00	1.00	1.00
Final Sat.:	1600	3013	187	2880	3200	1600	2880	1023	577	1600	1600	1600
Capacity Analysis Module:												
Vol/Sat:	0.06	0.22	0.22	0.11	0.17	0.18	0.14	0.22	0.22	0.05	0.12	0.21
Crit Moves:		****		****				****		****		

Lane Geometry Report

Number of approach lanes: (L) (LT) (T) (RT) (R) (LTR)

Node	Intersection	NB	SB	EB	WB
1	Kanan Rd / Agoura Rd	101100	202010	200100	101010