



18501 E. Gale Ave., Suite 130  
 City of Industry, CA 91748  
 Ph: 626-964-4032  
 FX: 626-964-5832

Project No.: 4953-10-152  
 Project Name: Metro W.S.F.  
 Report To: Jag/Han  
 Company: MACTEC  
 Street: 5628 E Slawson  
 City/State/Zip: LA, CA  
 Phone & Fax: 323, 889-58 / Fax 323-721-6700  
 e-mail:

**CHAIN OF CUSTODY RECORD**

**TURNAROUND TIME**  
 Standard  
 Same Day  
 24 hours  
 Other:

**DELIVERABLES**  
 EDD  
 EDF  
 Level 3  
 Level 4

**PAGE:** \_\_\_\_\_ OF \_\_\_\_\_

Condition upon receipt:  
 Sealed Yes  No   
 Intact Yes  No   
 Chilled \_\_\_\_\_ deg C

**BILLING**

P.O. No.:  
 Bill to:

**ANALYSIS REQUEST**

1945  
 ASTM 115  
 Methane  
 Ethane  
 Butane

LAB USE ONLY	SAMPLE IDENTIFICATION				SAMPLE DATE	SAMPLE TIME	CONTAINER QTY/TPE	MATRIX	PRESERVA-TION
CO61007	01	C11913	30	6/10/11		2	PIV		Test 1 tube per depth 2nd tube is a backup.
	02	↓	55	↓		2	PIV		
	03	↓	75	↓		2	PIV		

**COMMENTS**

AUTHORIZATION TO PERFORM WORK: Raym COMPANY: Suburban DATE/TIME: 6/10/11

SAMPLED BY: Raym COMPANY: MACTEC DATE/TIME: 6/10/11

RELINQUISHED BY: Raym Suburban DATE/TIME: 6/10/11 RECEIVED BY: Randee DATE/TIME: 6/10/11 1717

RELINQUISHED BY: Raym DATE/TIME: 1717 RECEIVED BY: \_\_\_\_\_ DATE/TIME: \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE/TIME: \_\_\_\_\_ RECEIVED BY: \_\_\_\_\_ DATE/TIME: \_\_\_\_\_

METHOD OF TRANSPORT (circle one): Walk-In FedEx UPS Courier ATLI Other \_\_\_\_\_

Preservation: H=HCl N=None / Container: B=Bag C=Can V=VOA O=Other Rev. 03 - 5/7/09

JD  
6/10/11

Client: MACTEC Engineering  
 Attn: S. V. (Jag) Jagannath  
 Client's Project: Metro WSE; 4953-10-1561  
 Date Received: 6/10/2011  
 Matrix: Air  
 Units: % v/v

Natural Gas Analysis by ASTM-D1945

Lab No.:	C061007-01	C061007-02	C061007-03								
Client Sample I.D.:	C119B - 30	C119B - 55	C119B - 75								
Date Sampled:	6/10/2011	6/10/2011	6/10/2011								
Fixed Gases Date Analyzed:	6/15/2011	6/15/2011	6/15/2011								
Hydrocarbon Date Analyzed:	6/15/2011	6/15/2011	6/15/2011								
Analyst Initials:	ZK	ZK	ZK								
QC Batch #:	110614GC11A2	110614GC11A2	110614GC11A2								
Dilution Factor:	1.0	1.0	1.0								
ANALYTE	PQL	RL	Results	RL	Results	RL	Results				
Methane	0.0010	0.0010	ND	0.0010	ND	0.0010	0.012				
Ethane	0.010	0.010	ND	0.010	ND	0.010	ND				
n-Butane	0.010	0.010	ND	0.010	ND	0.010	ND				

PQL = Practical Quantitation Limit  
 ND = Not Detected (Below RL).  
 RL = PQL X Dilution Factor

Reviewed/Approved By: Mark J. Johnson  
 Mark J. Johnson  
 Operations Manager

Date: 6/23/11

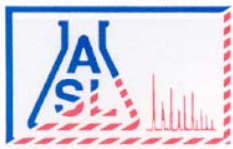
The cover letter is an integral part of this analytical report.





**FIGURES F-11.7 THROUGH F-11.34  
ANALYTICAL TESTING OF GROUNDWATER SAMPLES (PE PHASE)**





**AMERICAN SCIENTIFIC LABORATORIES, LLC**  
*Environmental Testing Services*

2520 N. San Fernando Rd., Los Angeles, CA 90065 Tel: (323) 223-9700 Fax: (323) 223-9500

**ANALYTICAL RESULTS**

**Ordered By**

MACTEC Engineering & Consulting Inc  
 5628 East Slauson Ave.  
 Los Angeles, CA 90040-

Telephone: (323)889-5300

Attn: Marty Hudson

Page: **2**

Project ID: 4953-10-1531 G165-66

Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 1664, Revision A, Oil and Grease (HEM)

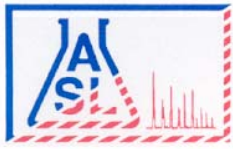
QC Batch No: 042611-1

Our Lab I.D.		267815	267817			
Client Sample I.D.		G-166-D	G-165-D			
Date Sampled		04/22/2011	04/22/2011			
Date Prepared		04/26/2011	04/26/2011			
Preparation Method						
Date Analyzed		04/26/2011	04/26/2011			
Matrix		Water	Water			
Units		mg/L	mg/L			
Dilution Factor		1	1			
<b>Analytes</b>	<b>PQL</b>	<b>Results</b>	<b>Results</b>			
<b>Conventionals</b>						
Oil and Grease	5.00	ND	ND			

**QUALITY CONTROL REPORT**

QC Batch No: 042611-1

Analytes	LCS % REC	LCS DUP % REC	LCS RPD % REC	LCS/LCSD % Limit	LCS RPD % Limit				
<b>Conventionals</b>									
Oil and Grease	92	95	3.2	80-120	<20				



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Page: 3

Project ID: 4953-10-1531 G165-66

Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 418.1, TRPH

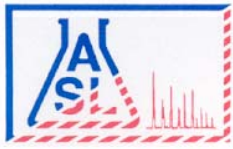
QC Batch No: W-042811-1

Our Lab I.D.		267815	267817			
Client Sample I.D.		G-166-D	G-165-D			
Date Sampled		04/22/2011	04/22/2011			
Date Prepared		04/27/2011	04/27/2011			
Preparation Method						
Date Analyzed		04/28/2011	04/28/2011			
Matrix		Water	Water			
Units		mg/L	mg/L			
Dilution Factor		1	1			
Analytes	PQL	Results	Results			
Total Recoverable Petroleum Hydrocarbons	0.500	ND	ND			

**QUALITY CONTROL REPORT**

QC Batch No: W-042811-1

Analytes	MS % REC	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit				
Total Recoverable Petroleum Hydrocarbons	104	103	<1	70-130	15				



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**Site**

241 Moreno Drive  
 Beverly Hills, CA

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Attn: Marty Hudson

Page: 4

Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 600, General Minerals

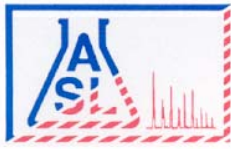
QC Batch No: 042211-1

Our Lab I.D.		267815	267816	267817		
Client Sample I.D.		G-166-D	G-166-S	G-165-D		
Date Sampled		04/22/2011	04/22/2011	04/22/2011		
Date Prepared		04/22/2011	04/22/2011	04/22/2011		
Preparation Method						
Date Analyzed		04/22/2011	04/22/2011	04/22/2011		
Matrix		Water	Water	Water		
Units		mg/L	mg/L	mg/L		
Dilution Factor		1	1	1		
Analytes	PQL	Results	Results	Results		
Conventionals						
Alkalinity, Total	10.0	215	135	145		
Bicarbonate (as CaCO3)	10.0	215	135	145		
Carbonate (as CaCO3)	10.0	ND	ND	ND		
Hydroxide (as CaCO3)	10.0	ND	ND	ND		
Chloride	1.00	352	599	753		
Conductivity (umho/cm @77F)	1.00	1620	2350	2780		
Fluoride	0.100	0.500	1.15	1.25		
Hardness (Ca,Mg) as CaCO3	10.0	440	260	900		
Nitrate as N	0.100	4.17	1.18	6.95		
pH	1.00	7.53	8.01	7.10		
Sulfate	1.00	45.4	268	54.4		
Surfactants(MBAS)	0.0500	ND	ND	ND		
Total Dissolved Solids(TDS)	10.0	1070	1510	1800		
ICP Metals						
Calcium	1.00	715	644	394		
Copper	0.0100	ND	ND	0.0177		
Iron	0.0500	1.70	0.787	1.73		
Magnesium	0.250	95.2	10.6	7.70		
Manganese	0.0200	1.74	1.15	1.23		
Potassium	1.00	15.5	23.9	4.80		
Sodium	1.00	189	492	167		
Zinc	0.0100	0.0630	0.0198	0.0687		

**QUALITY CONTROL REPORT**

QC Batch No: 042211-1

Analytes	LCS % REC	LCS/LCSD % Limit							
Conventionals									



ANALYTICAL RESULTS

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Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

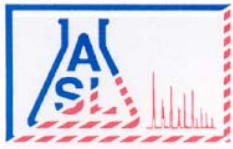
ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 600, General Minerals

QUALITY CONTROL REPORT

QC Batch No: 042211-1

Analytes	LCS % REC	LCS/LCSD % Limit								
<b>Conventionals</b>										
Alkalinity, Total	95	80-120								
Bicarbonate (as CaCO3)	95	80-120								
Carbonate (as CaCO3)	95	80-120								
Hydroxide (as CaCO3)	95	80-120								
Chloride	98	80-120								
Conductivity (umho/cm @77F)	97	80-120								
Fluoride	98	80-120								
Hardness (Ca,Mg) as CaCO3	100	80-120								
Nitrate as N	100	80-120								
pH	100	80-120								
Sulfate	95	80-120								
Surfactants(MBAS)	92	80-120								
Total Dissolved Solids(TDS)	102	80-120								
<b>ICP Metals</b>										
Calcium	106	80-120								
Copper	109	80-120								
Iron	105	80-120								
Magnesium	101	80-120								
Manganese	113	80-120								
Potassium	98	80-120								
Sodium	111	80-120								
Zinc	112	80-120								



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**ANALYTICAL RESULTS**

**Ordered By**

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 Los Angeles, CA 90040-

Telephone: (323)889-5300

Attn: Marty Hudson

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Project ID: 4953-10-1531 G165-66

Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 6010B/7470A, CCR Title 22 Metals (TTLC)

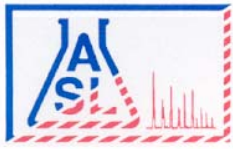
QC Batch No: 042611-1

Our Lab I.D.		267815	267816	267817		
Client Sample I.D.		G-166-D	G-166-S	G-165-D		
Date Sampled		04/22/2011	04/22/2011	04/22/2011		
Date Prepared		04/26/2011	04/26/2011	04/26/2011		
Preparation Method						
Date Analyzed		04/26/2011	04/26/2011	04/26/2011		
Matrix		Water	Water	Water		
Units		mg/L	mg/L	mg/L		
Dilution Factor		1	1	1		
Analytes	PQL	Results	Results	Results		
<b>AA Metals</b>						
Mercury	0.0005	ND	ND	ND		
<b>ICP Metals</b>						
Antimony	0.0100	ND	ND	ND		
Arsenic	0.0100	0.0258	0.0267	0.0120		
Barium	0.0100	1.21	0.921	0.840		
Beryllium	0.0050	ND	ND	ND		
Cadmium	0.0050	ND	ND	ND		
Chromium	0.0100	ND	ND	ND		
Cobalt	0.0100	ND	0.0164	0.0160		
Copper	0.0100	ND	ND	0.0177		
Lead	0.0050	ND	ND	ND		
Molybdenum	0.0100	0.0260	0.0706	ND		
Nickel	0.0100	0.0646	0.0626	0.0490		
Selenium	0.0100	0.0209	0.0192	ND		
Silver	0.0100	ND	ND	ND		
Thallium	0.0100	ND	ND	ND		
Vanadium	0.0100	ND	ND	ND		
Zinc	0.0100	0.0630	0.0198	0.0687		

**QUALITY CONTROL REPORT**

QC Batch No: 042611-1

Analytes	LCS % REC	LCS/LCSD % Limit							
<b>AA Metals</b>									
Mercury	107	80-120							
<b>ICP Metals</b>									
Antimony	100	80-120							
Arsenic	101	80-120							



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**ANALYTICAL RESULTS**

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Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

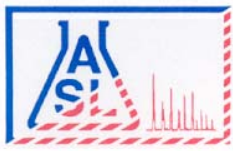
ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 6010B/7470A, CCR Title 22 Metals (TTLC)

**QUALITY CONTROL REPORT**

**QC Batch No: 042611-1**

Analytes	LCS % REC	LCS/LCSD % Limit								
<b>ICP Metals</b>										
Barium	105	80-120								
Beryllium	107	80-120								
Cadmium	104	80-120								
Chromium	103	80-120								
Cobalt	102	80-120								
Copper	104	80-120								
Lead	105	80-120								
Molybdenum	100	80-120								
Nickel	106	80-120								
Selenium	100	80-120								
Silver	100	80-120								
Thallium	104	80-120								
Vanadium	100	80-120								
Zinc	106	80-120								



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**ANALYTICAL RESULTS**

**Ordered By**

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 Los Angeles, CA 90040-

**Site**

241 Moreno Drive  
 Beverly Hills, CA

Telephone: (323)889-5300

Attn: Marty Hudson

Page: 8

Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8015B, TPH DROs and OROs (Diesel and Oil Range Organics)

**QC Batch No: W-042711-1P**

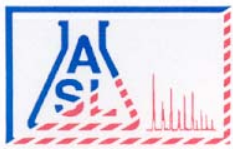
Our Lab I.D.		267815	267816	267817		
Client Sample I.D.		G-166-D	G-166-S	G-165-D		
Date Sampled		04/22/2011	04/22/2011	04/22/2011		
Date Prepared		04/27/2011	04/27/2011	04/27/2011		
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011		
Matrix		Water	Water	Water		
Units		mg/L	mg/L	mg/L		
Dilution Factor		1	1	1		
Analytes	PQL	Results	Results	Results		
TPH DROs (C10 to C28)	0.500	ND	ND	ND		
TPH OROs (C28+)	0.500	ND	ND	ND		

Our Lab I.D.		267815	267816	267817		
Surrogates	% Rec.Limit	% Rec.	% Rec.	% Rec.		
Surrogate Percent Recovery						
Chlorobenzene	70-120	116	95	116		

**QUALITY CONTROL REPORT**

**QC Batch No: W-042711-1P**

Analytes	MS % REC	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit					
Diesel	102	101	<1	75-120	<20					



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Page: 9

Project ID: 4953-10-1531 G165-66

Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

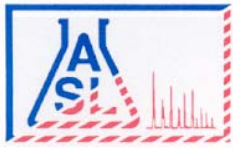
Method: 8081A, Organochlorine Pesticides

QC Batch No: 042711-1

Our Lab I.D.		267815	267817			
Client Sample I.D.		G-166-D	G-165-D			
Date Sampled		04/22/2011	04/22/2011			
Date Prepared		04/27/2011	04/27/2011			
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011			
Matrix		Water	Water			
Units		ug/L	ug/L			
Dilution Factor		1	1			
Analytes	PQL	Results	Results			
Aldrin	0.0400	ND	ND			
alpha-Hexachlorocyclohexane (Alpha-BHC)	0.120	ND	ND			
Beta-Hexachlorocyclohexane (Beta-BHC)	0.110	ND	ND			
Gamma-Chlordane	0.400	ND	ND			
alpha-Chlordane	0.400	ND	ND			
4,4'-DDD (DDD)	0.100	ND	ND			
4,4'-DDE (DDE)	0.0900	ND	ND			
4,4'-DDT (DDT)	0.0400	ND	ND			
delta-Hexachlorocyclohexane (Delta-BHC)	0.110	ND	ND			
dieldrin	0.0500	ND	ND			
Endosulfan 1	0.0600	ND	ND			
Endosulfan 11	0.0900	ND	ND			
Endosulfan sulfate	0.0700	ND	ND			
Endrin	0.0800	ND	ND			
Endrin aldehyde	0.0900	ND	ND			
Endrin ketone	0.0700	ND	ND			
gamma-Hexachlorocyclohexane (Gamma-BHC, Lindane)	0.0600	ND	ND			
Heptachlor	0.0300	ND	ND			
Heptachlor epoxide	0.0700	ND	ND			
Methoxychlor	0.100	ND	ND			
Toxaphene	10.0	ND	ND			

Our Lab I.D.		267815	267817			
Surrogates	% Rec.Limit	% Rec.	% Rec.			
Surrogate Percent Recovery						
Decachlorobiphenyl	43-169	63	60			





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**ANALYTICAL RESULTS**

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Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

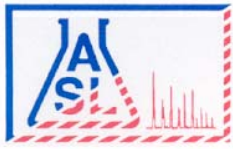
ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8081A, Organochlorine Pesticides

**QUALITY CONTROL REPORT**

**QC Batch No: 042711-1**

Analytes	LCS % REC	LCS DUP % REC	LCS RPD % REC	LCS/LCSD % Limit	LCS RPD % Limit					
Aldrin	116	105	10.0	42-122	<30					
4,4'-DDT (DDT)	109	107	1.9	25-160	<30					
dieldrin	119	115	3.4	36-146	<30					
Endrin	115	113	1.8	30-147	<30					
gamma-Hexachlorocyclohexane (Gamma-BHC, Lindane)	106	113	6.4	32-127	<30					
Heptachlor	119	108	9.7	34-111	<30					



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Attn: Marty Hudson

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Project ID: 4953-10-1531 G165-66

Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8082, Polychlorinated Biphenyls(PCBs) by Gas Chromatography

QC Batch No: 042711-1

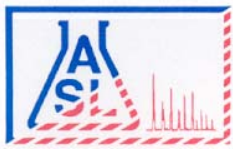
Our Lab I.D.		267815	267817			
Client Sample I.D.		G-166-D	G-165-D			
Date Sampled		04/22/2011	04/22/2011			
Date Prepared		04/27/2011	04/27/2011			
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011			
Matrix		Water	Water			
Units		ug/L	ug/L			
Dilution Factor		1	1			
Analytes	PQL	Results	Results			
Aroclor-1016 (PCB-1016)	0.650	ND	ND			
Aroclor-1221 (PCB-1221)	1.00	ND	ND			
Aroclor-1232 (PCB-1232)	0.650	ND	ND			
Aroclor-1242 (PCB-1242)	0.650	ND	ND			
Aroclor-1248 (PCB-1248)	0.650	ND	ND			
Aroclor-1254 (PCB-1254)	0.650	ND	ND			
Aroclor-1260 (PCB-1260)	0.650	ND	ND			

Our Lab I.D.		267815	267817			
Surrogates	% Rec.Limit	% Rec.	% Rec.			
Surrogate Percent Recovery						
Decachlorobiphenyl	43-169	63	60			

**QUALITY CONTROL REPORT**

QC Batch No: 042711-1

Analytes	LCS % REC	LCS DUP % REC	LCS RPD % REC	LCS/LCSD % Limit	LCS RPD % Limit					
Aroclor-1260 (PCB-1260)	106	100	5.8	39-150	<30					



**AMERICAN SCIENTIFIC LABORATORIES, LLC**  
*Environmental Testing Services*

2520 N. San Fernando Rd., Los Angeles, CA 90065 Tel: (323) 223-9700 Fax: (323) 223-9500

**ANALYTICAL RESULTS**

**Ordered By**

**Site**

MACTEC Engineering & Consulting Inc  
 5628 East Slauson Ave.  
 Los Angeles, CA 90040-

241 Moreno Drive  
 Beverly Hills, CA

Telephone: (323)889-5300

Attn: Marty Hudson

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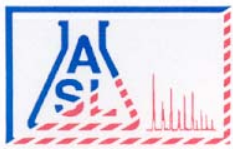
Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8260B, Volatile Organic Compounds

QC Batch No: W-042611-2B

Our Lab I.D.		267814	267815	267816	267817	
Client Sample I.D.		G-165-S	G-166-D	G-166-S	G-165-D	
Date Sampled		04/22/2011	04/22/2011	04/22/2011	04/22/2011	
Date Prepared		04/27/2011	04/27/2011	04/27/2011	04/27/2011	
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011	04/27/2011	
Matrix		Water	Water	Water	Water	
Units		ug/L	ug/L	ug/L	ug/L	
Dilution Factor		1	1	1	1	
Analytes	PQL	Results	Results	Results	Results	
Acetone	5.00	ND	ND	ND	ND	
Benzene	1.00	ND	ND	ND	ND	
Bromobenzene (Phenyl bromide)	1.00	ND	ND	ND	ND	
Bromochloromethane (Chlorobromomethane)	1.00	ND	ND	ND	ND	
Bromodichloromethane (Dichlorobromomethane)	1.00	2.81	ND	1.23	ND	
Bromoform (Tribromomethane)	5.00	ND	ND	ND	ND	
Bromomethane (Methyl bromide)	3.00	ND	ND	ND	ND	
2-Butanone (MEK, Methyl ethyl ketone)	5.00	ND	ND	ND	ND	
n-Butylbenzene	1.00	ND	ND	ND	ND	
sec-Butylbenzene	1.00	ND	ND	ND	ND	
tert-Butylbenzene	1.00	ND	ND	ND	ND	
Carbon disulfide	1.00	ND	ND	ND	ND	
Carbon tetrachloride (Tetrachloromethane)	1.00	ND	ND	ND	ND	
Chlorobenzene	1.00	ND	ND	ND	ND	
Chloroethane	3.00	ND	ND	ND	ND	
2-Chloroethyl vinyl ether	5.00	ND	ND	ND	ND	
Chloroform (Trichloromethane)	1.00	2.87	1.14	1.47	ND	
Chloromethane (Methyl chloride)	3.00	ND	ND	ND	ND	
4-Chlorotoluene (p-Chlorotoluene)	1.00	ND	ND	ND	ND	
2-Chlorotoluene (o-Chlorotoluene)	1.00	ND	ND	ND	ND	
1,2-Dibromo-3-chloropropane (DBCP)	5.00	ND	ND	ND	ND	
Dibromochloromethane	1.00	4.32	ND	2.43	ND	
1,2-Dibromoethane (EDB, Ethylene dibromide)	1.00	ND	ND	ND	ND	
Dibromomethane	1.00	ND	ND	ND	ND	
1,2-Dichlorobenzene (o-Dichlorobenzene)	1.00	ND	ND	ND	ND	
1,3-Dichlorobenzene (m-Dichlorobenzene)	1.00	ND	ND	ND	ND	
1,4-Dichlorobenzene (p-Dichlorobenzene)	1.00	ND	ND	ND	ND	
Dichlorodifluoromethane	3.00	ND	ND	ND	ND	
1,1-Dichloroethane	1.00	ND	ND	ND	ND	



**ANALYTICAL RESULTS**

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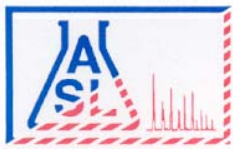
Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8260B, Volatile Organic Compounds

QC Batch No: W-042611-2B

Our Lab I.D.		267814	267815	267816	267817	
Client Sample I.D.		G-165-S	G-166-D	G-166-S	G-165-D	
Date Sampled		04/22/2011	04/22/2011	04/22/2011	04/22/2011	
Date Prepared		04/27/2011	04/27/2011	04/27/2011	04/27/2011	
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011	04/27/2011	
Matrix		Water	Water	Water	Water	
Units		ug/L	ug/L	ug/L	ug/L	
Dilution Factor		1	1	1	1	
Analytes	PQL	Results	Results	Results	Results	
1,2-Dichloroethane	1.00	ND	ND	ND	ND	
1,1-Dichloroethene (1,1-Dichloroethylene)	1.00	ND	ND	ND	ND	
cis-1,2-Dichloroethene	1.00	ND	ND	ND	ND	
trans-1,2-Dichloroethene	1.00	ND	ND	ND	ND	
1,2-Dichloropropane	1.00	ND	ND	ND	ND	
1,3-Dichloropropane	1.00	ND	ND	ND	ND	
2,2-Dichloropropane	1.00	ND	ND	ND	ND	
1,1-Dichloropropene	1.00	ND	ND	ND	ND	
cis-1,3-Dichloropropene	1.00	ND	ND	ND	ND	
trans-1,3-Dichloropropene	1.00	ND	ND	ND	ND	
Ethylbenzene	1.00	ND	ND	ND	ND	
Hexachlorobutadiene (1,3-Hexachlorobutadiene)	3.00	ND	ND	ND	ND	
2-Hexanone	5.00	ND	ND	ND	ND	
Isopropylbenzene	1.00	ND	ND	ND	ND	
p-Isopropyltoluene (4-Isopropyltoluene)	1.00	ND	ND	ND	ND	
MTBE	2.00	ND	ND	ND	ND	
4-Methyl-2-pentanone (MIBK, Methyl isobutyl ketone)	5.00	ND	ND	ND	ND	
Methylene chloride (Dichloromethane, DCM)	5.00	ND	ND	ND	ND	
Naphthalene	1.00	ND	ND	ND	ND	
n-Propylbenzene	1.00	ND	ND	ND	ND	
Styrene	1.00	ND	ND	ND	ND	
1,1,1,2-Tetrachloroethane	1.00	ND	ND	ND	ND	
1,1,2,2-Tetrachloroethane	1.00	ND	ND	ND	ND	
Tetrachloroethene (Tetrachloroethylene)	1.00	ND	ND	ND	ND	
Toluene (Methyl benzene)	1.00	ND	ND	ND	ND	
1,2,3-Trichlorobenzene	1.00	ND	ND	ND	ND	
1,2,4-Trichlorobenzene	1.00	ND	ND	ND	ND	
1,1,1-Trichloroethane	1.00	ND	ND	ND	ND	
1,1,2-Trichloroethane	1.00	ND	ND	ND	ND	
Trichloroethene (TCE)	1.00	ND	ND	ND	ND	
Trichlorofluoromethane	1.00	ND	ND	ND	ND	
1,2,3-Trichloropropane	1.00	ND	ND	ND	ND	
1,2,4-Trimethylbenzene	1.00	ND	ND	ND	ND	
1,3,5-Trimethylbenzene	1.00	ND	ND	ND	ND	
Vinyl acetate	5.00	ND	ND	ND	ND	



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**ANALYTICAL RESULTS**

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Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8260B, Volatile Organic Compounds

QC Batch No: W-042611-2B

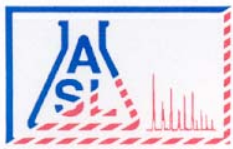
Our Lab I.D.		267814	267815	267816	267817	
Client Sample I.D.		G-165-S	G-166-D	G-166-S	G-165-D	
Date Sampled		04/22/2011	04/22/2011	04/22/2011	04/22/2011	
Date Prepared		04/27/2011	04/27/2011	04/27/2011	04/27/2011	
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011	04/27/2011	
Matrix		Water	Water	Water	Water	
Units		ug/L	ug/L	ug/L	ug/L	
Dilution Factor		1	1	1	1	
Analytes	PQL	Results	Results	Results	Results	
Vinyl chloride (Chloroethene)	3.00	ND	ND	ND	ND	
o-Xylene	1.00	ND	ND	ND	ND	
m- & p-Xylenes	2.00	ND	ND	ND	ND	

Our Lab I.D.		267814	267815	267816	267817	
Surrogates	% Rec.Limit	% Rec.	% Rec.	% Rec.	% Rec.	
Surrogate Percent Recovery						
Bromofluorobenzene	70-120	100	101	100	101	
Dibromofluoromethane	70-120	86	89	88	90	
Toluene-d8	70-120	96	97	96	98	

**QUALITY CONTROL REPORT**

QC Batch No: W-042611-2B

Analytes	MS % REC	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit					
Benzene	91	85	6.8	75-120	15					
Chlorobenzene	111	105	5.6	75-120	15					
1,1-Dichloroethene (1,1-Dichloroethylene)	80	76	5.1	75-120	15					
MTBE	102	103	<1	75-120	15					
Toluene (Methyl benzene)	109	103	5.7	75-120	15					
Trichloroethene (TCE)	98	91	7.4	75-120	15					



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**ANALYTICAL RESULTS**

**Ordered By**

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 5628 East Slauson Ave.  
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Telephone: (323)889-5300

Attn: Marty Hudson

Page: 15

Project ID: 4953-10-1531 G165-66

Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8260B, TPH GROs(Gasoline Range Organics)

**QC Batch No: W-042611-2B**

Our Lab I.D.		267814	267815	267816	267817	
Client Sample I.D.		G-165-S	G-166-D	G-166-S	G-165-D	
Date Sampled		04/22/2011	04/22/2011	04/22/2011	04/22/2011	
Date Prepared		04/27/2011	04/27/2011	04/27/2011	04/27/2011	
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011	04/27/2011	
Matrix		Water	Water	Water	Water	
Units		ug/L	ug/L	ug/L	ug/L	
Dilution Factor		1	1	1	1	
<b>Analytes</b>	<b>PQL</b>	<b>Results</b>	<b>Results</b>	<b>Results</b>	<b>Results</b>	
TPH GROs (C6 to C10)	50.0	ND	ND	ND	ND	

Our Lab I.D.		267814	267815	267816	267817	
<b>Surrogates</b>	<b>% Rec.Limit</b>	<b>% Rec.</b>	<b>% Rec.</b>	<b>% Rec.</b>	<b>% Rec.</b>	
<b>Surrogate Percent Recovery</b>						
Bromofluorobenzene	70-120	100	101	100	101	
Dibromofluoromethane	70-120	86	89	88	90	
Toluene-d8	70-120	96	97	96	98	

**QUALITY CONTROL REPORT**

**QC Batch No: W-042611-2B**

Analytes	MS % REC	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit					
Benzene	91	85	6.8	75-120	15					
Chlorobenzene	111	105	5.6	75-120	15					
1,1-Dichloroethene (1,1-Dichloroethylene)	80	76	5.1	75-120	15					
Toluene (Methyl benzene)	109	103	5.7	75-120	15					
Trichloroethene (TCE)	98	91	7.4	75-120	15					



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**ANALYTICAL RESULTS**

**Ordered By**

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 5628 East Slauson Ave.  
 Los Angeles, CA 90040-

**Site**

241 Moreno Drive  
 Beverly Hills, CA

Telephone: (323)889-5300

Attn: Marty Hudson

Page: 16

Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8270C, Semivolatile Organics

QC Batch No: 042711-1

Our Lab I.D.		267815	267816	267817		
Client Sample I.D.		G-166-D	G-166-S	G-165-D		
Date Sampled		04/22/2011	04/22/2011	04/22/2011		
Date Prepared		04/27/2011	04/27/2011	04/27/2011		
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011		
Matrix		Water	Water	Water		
Units		ug/L	ug/L	ug/L		
Dilution Factor		1	1	1		
Analytes	PQL	Results	Results	Results		
Acenaphthene	10.0	ND	ND	ND		
Acenaphthylene	10.0	ND	ND	ND		
Anthracene	10.0	ND	ND	ND		
Benz(a)anthracene (Benzo(a)anthracene)	10.0	ND	ND	ND		
Benzo(a)pyrene	10.0	ND	ND	ND		
Benzo(b)fluoranthene	10.0	ND	ND	ND		
Benzo(ghi)perylene	10.0	ND	ND	ND		
Benzo(k)fluoranthene	10.0	ND	ND	ND		
Benzidine	20.0	ND	ND	ND		
Benzoic acid	10.0	ND	ND	ND		
Benzyl alcohol	10.0	ND	ND	ND		
Bis(2-chloroethoxy)methane	10.0	ND	ND	ND		
Bis(2-chloroethyl)ether	10.0	ND	ND	ND		
Bis(2-chloroisopropyl) ether	10.0	ND	ND	ND		
Bis(2-ethylhexyl) phthalate	10.0	ND	ND	ND		
4-Bromophenyl phenyl ether	10.0	ND	ND	ND		
Butyl benzyl phthalate (Benzyl butyl phthalate)	10.0	ND	ND	ND		
4-Chloro-3-methylphenol (p-Chloro-m-cresol)	1.00	ND	ND	ND		
4-Chloroaniline	10.0	ND	ND	ND		
2-Chloronaphthalene	10.0	ND	ND	ND		
2-Chlorophenol (o-Chlorophenol)	1.00	ND	ND	ND		
4-Chlorophenyl phenyl ether	10.0	ND	ND	ND		
Chrysene	10.0	ND	ND	ND		
Di-n-butyl phthalate	10.0	ND	ND	ND		
Di-n-octyl phthalate (Dioctyl ester)	10.0	ND	ND	ND		
Dibenz(a,h)anthracene	10.0	ND	ND	ND		
Dibenzofuran	10.0	ND	ND	ND		
1,3-Dichlorobenzene (m-Dichlorobenzene)	10.0	ND	ND	ND		
1,2-Dichlorobenzene (o-Dichlorobenzene)	10.0	ND	ND	ND		





ANALYTICAL RESULTS

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Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8270C, Semivolatile Organics

QC Batch No: 042711-1

Our Lab I.D.		267815	267816	267817		
Client Sample I.D.		G-166-D	G-166-S	G-165-D		
Date Sampled		04/22/2011	04/22/2011	04/22/2011		
Date Prepared		04/27/2011	04/27/2011	04/27/2011		
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011		
Matrix		Water	Water	Water		
Units		ug/L	ug/L	ug/L		
Dilution Factor		1	1	1		
Analytes	PQL	Results	Results	Results		
1,4-Dichlorobenzene	10.0	ND	ND	ND		
3,3'-Dichlorobenzidine	20.0	ND	ND	ND		
2,4-Dichlorophenol	1.00	ND	ND	ND		
Diethyl phthalate (Diethyl ester)	10.0	ND	ND	ND		
2,4-Dimethylphenol	1.00	ND	ND	ND		
Dimethyl phthalate (Dimethyl ester)	10.0	ND	ND	ND		
2,4-Dinitrophenol	1.00	ND	ND	ND		
2,4-Dinitrotoluene	10.0	ND	ND	ND		
2,6-Dinitrotoluene (2,6-DNT)	10.0	ND	ND	ND		
1,2-Diphenylhydrazine	10.0	ND	ND	ND		
Fluoranthene	10.0	ND	ND	ND		
Fluorene	10.0	ND	ND	ND		
Hexachlorobenzene	10.0	ND	ND	ND		
Hexachlorobutadiene (1,3-Hexachlorobutadiene)	20.0	ND	ND	ND		
Hexachlorocyclopentadiene	10.0	ND	ND	ND		
Hexachloroethane	10.0	ND	ND	ND		
Indeno(1,2,3-cd)pyrene	10.0	ND	ND	ND		
Isophorone	10.0	ND	ND	ND		
2-methyl-4,6-Dinitrophenol	1.00	ND	ND	ND		
2-Methylnaphthalene	10.0	ND	ND	ND		
2-Methylphenol (o-Cresol, 2-Cresol)	1.00	ND	ND	ND		
4-Methylphenol (p-Cresol, 4-Cresol)	1.00	ND	ND	ND		
N-Nitroso-Di-n-propylamine	10.0	ND	ND	ND		
N-Nitrosodimethylamine (NDMA)	10.0	ND	ND	ND		
N-Nitrosodiphenylamine	10.0	ND	ND	ND		
Naphthalene	10.0	ND	ND	ND		
2-Nitroaniline	10.0	ND	ND	ND		
3-Nitroaniline	10.0	ND	ND	ND		
4-Nitroaniline	10.0	ND	ND	ND		
Nitrobenzene (NB)	10.0	ND	ND	ND		
2-Nitrophenol (o-Nitrophenol)	1.00	ND	ND	ND		
4-Nitrophenol	1.00	ND	ND	ND		
Pentachlorophenol	1.00	ND	ND	ND		
Phenanthrene	10.0	ND	ND	ND		
Phenol	1.00	ND	ND	ND		





ANALYTICAL RESULTS

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Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: 8270C, Semivolatile Organics

QC Batch No: 042711-1

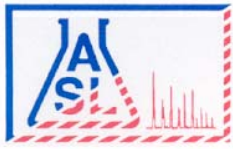
Our Lab I.D.		267815	267816	267817		
Client Sample I.D.		G-166-D	G-166-S	G-165-D		
Date Sampled		04/22/2011	04/22/2011	04/22/2011		
Date Prepared		04/27/2011	04/27/2011	04/27/2011		
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011		
Matrix		Water	Water	Water		
Units		ug/L	ug/L	ug/L		
Dilution Factor		1	1	1		
Analytes	PQL	Results	Results	Results		
Pyrene	10.0	ND	ND	ND		
1,2,4-Trichlorobenzene	10.0	ND	ND	ND		
2,4,5-Trichlorophenol	1.00	ND	ND	ND		
2,4,6-Trichlorophenol	1.00	ND	ND	ND		

Our Lab I.D.		267815	267816	267817		
Surrogates	% Rec.Limit	% Rec.	% Rec.	% Rec.		
Surrogate Percent Recovery						
2-Fluorophenol	21-105	27	35	29		
Phenol-d6	10-107	29	34	29		
2,4,6-Tribromophenol	10-123	69	77	59		
Nitrobenzene-d5	35-114	64	55	53		
2-Fluorobiphenyl	18-116	52	54	52		
Terphenyl-d14	33-141	93	102	99		

QUALITY CONTROL REPORT

QC Batch No: 042711-1

Analytes	LCS	LCS DUP	LCS RPD	LCS/LCSD	LCS RPD					
	% REC	% REC	% REC	% Limit	% Limit					
Acenaphthene	64	68	6.1	43-118	<30					
4-Chloro-3-methylphenol (p-Chloro-m-cresol)	65	64	1.6	23-117	<30					
2-Chlorophenol (o-Chlorophenol)	49	54	9.7	27-113	<30					
1,4-Dichlorobenzene	50	55	9.5	36-105	<30					
2,4-Dinitrotoluene	102	102	<1	24-120	<30					
N-Nitroso-Di-n-propylamine	75	81	7.7	41-116	<30					
4-Nitrophenol	63	56	11.8	10-133	<30					
Pentachlorophenol	64	65	1.6	9-118	<30					
Phenol	35	40	13.3	12-110	<30					
Pyrene	115	113	1.8	26-127	<30					
1,2,4-Trichlorobenzene	64	71	10.4	39-98	<30					



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**ANALYTICAL RESULTS**

**Ordered By**

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Attn: Marty Hudson

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Project ID: 4953-10-1531 G165-66  
 Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: RSKSOP-175, Dissolved Gases

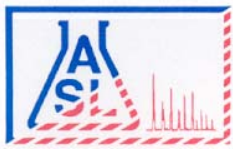
QC Batch No: 042911-1

Our Lab I.D.		267814	267815	267816	267817	
Client Sample I.D.		G-165-S	G-166-D	G-166-S	G-165-D	
Date Sampled		04/22/2011	04/22/2011	04/22/2011	04/22/2011	
Date Prepared		04/29/2011	04/29/2011	04/29/2011	04/29/2011	
Preparation Method						
Date Analyzed		04/29/2011	04/29/2011	04/29/2011	04/29/2011	
Matrix		Water	Water	Water	Water	
Units		ug/L	ug/L	ug/L	ug/L	
Dilution Factor		1	1	1	1	
Analytes	PQL	Results	Results	Results	Results	
Methane	1.00	ND	2.50	4.92	5.91	

**QUALITY CONTROL REPORT**

QC Batch No: 042911-1

Analytes	LCS % REC	LCS DUP % REC	LCS RPD % REC	LCS/LCSD % Limit	LCS RPD % Limit					
Methane	90	93	3.3	70-130	<30					



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*Environmental Testing Services*

2520 N. San Fernando Rd., Los Angeles, CA 90065 Tel: (323) 223-9700 Fax: (323) 223-9500

**ANALYTICAL RESULTS**

**Ordered By**

MACTEC Engineering & Consulting Inc  
 5628 East Slauson Ave.  
 Los Angeles, CA 90040-

Telephone: (323)889-5300

Attn: Marty Hudson

Page: **20**

Project ID: 4953-10-1531 G165-66

Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: SM2540-D, Total Suspended Solids (TSS)

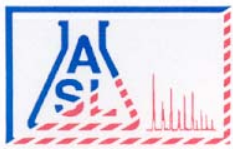
QC Batch No: 042711-1

Our Lab I.D.		267815	267816	267817		
Client Sample I.D.		G-166-D	G-166-S	G-165-D		
Date Sampled		04/22/2011	04/22/2011	04/22/2011		
Date Prepared		04/27/2011	04/27/2011	04/27/2011		
Preparation Method						
Date Analyzed		04/27/2011	04/27/2011	04/27/2011		
Matrix		Water	Water	Water		
Units		mg/L	mg/L	mg/L		
Dilution Factor		1	1	1		
<b>Analytes</b>	<b>PQL</b>	<b>Results</b>	<b>Results</b>	<b>Results</b>		
<b>Conventionals</b>						
Solids, Total Suspended (TSS)	10.0	163000	164000	7970		

**QUALITY CONTROL REPORT**

QC Batch No: 042711-1

Analytes	LCS % REC	LCS DUP % REC	LCS RPD % REC	LCS/LCSD % Limit	LCS RPD % Limit				
<b>Conventionals</b>									
Solids, Total Suspended (TSS)	104	101	2.9	80-120	20				



**AMERICAN SCIENTIFIC LABORATORIES, LLC**  
*Environmental Testing Services*

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**ANALYTICAL RESULTS**

**Ordered By**

MACTEC Engineering & Consulting Inc  
 5628 East Slauson Ave.  
 Los Angeles, CA 90040-

Telephone: (323)889-5300

Attn: Marty Hudson

Page: **21**

Project ID: 4953-10-1531 G165-66

Project Name: MTA Westside Extension

**Site**

241 Moreno Drive  
 Beverly Hills, CA

ASL Job Number	Submitted	Client
49598	04/22/2011	MACTEC

Method: SM4500-S-2-D, Sulfide (Methylene Blue Method)

QC Batch No: 042211-1

Our Lab I.D.		267815	267816	267817		
Client Sample I.D.		G-166-D	G-166-S	G-165-D		
Date Sampled		04/22/2011	04/22/2011	04/22/2011		
Date Prepared		04/22/2011	04/22/2011	04/22/2011		
Preparation Method						
Date Analyzed		04/22/2011	04/22/2011	04/22/2011		
Matrix		Water	Water	Water		
Units		mg/L	mg/L	mg/L		
Dilution Factor		1	1	1		
<b>Analytes</b>	<b>PQL</b>	<b>Results</b>	<b>Results</b>	<b>Results</b>		
<b>Conventionals</b>						
Sulfide, total	0.0200	ND	ND	ND		

**QUALITY CONTROL REPORT**

QC Batch No: 042211-1

Analytes	SM Result	SM DUP Result	RPD %	SM RPD % Limit					
<b>Conventionals</b>									
Sulfide, total	ND	ND	<1	20					

---

## LABORATORY REPORT

May 6, 2011

Molky Brar  
American Scientific Laboratories  
2520 North San Fernando Road  
Los Angeles, CA 90065

**RE: 49598**

Dear Molky:

Enclosed are the results of the samples submitted to our laboratory on April 25, 2011. For your reference, these analyses have been assigned our service request number P1101541.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-10-1; Minnesota Department of Health, NELAP Certificate No. 219474; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Sue Anderson  
Project Manager

Client: American Scientific Laboratories  
Project: 49598

CAS Project No: P1101541

---

## CASE NARRATIVE

The samples were received intact under chain of custody on April 25, 2011 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Hydrogen Sulfide Analysis

The samples were analyzed for hydrogen sulfide using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD).

---

*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.*

DETAIL SUMMARY REPORT

Client: American Scientific Laboratories  
 Project ID: 49598

Service Request: P1101541

Date Received: 4/25/2011  
 Time Received: 11:10

Sulfur Liq - Sulfur

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Sulfur Liq - Sulfur
267814	P1101541-001	Water	4/22/2011	11:45	X
267815	P1101541-002	Water	4/22/2011	12:35	X
267816	P1101541-003	Water	4/22/2011	13:20	X
267817	P1101541-004	Water	4/22/2011	14:35	X



2655 Park Center Drive, Suite A  
 Simi Valley, California 93065  
 Phone (805) 526-7161  
 Fax (805) 526-7270

**Air - Chain of Custody Record & Analytical Service Request**

Requested Turnaround Time in Business Days (Surcharges) please circle  
 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day - Standard

CAS Project No. 1101541

Company Name & Address (Reporting Information)		Project Name		Project Number		P.O. # / Billing Information		Sampler (Print & Sign)		CAS Contact		Analysis Method and/or Analytes		Comments	
American Scientific Labs 9500 N. San Fernando Road L.A. CA 90065		Project Name		49598		P.O. # / Billing Information		mckey @ asllab.com		CAS Contact		Analysis Method and/or Analytes		Dissolved Hydrogen Sulfide	
Project Manager mckey Brian mckey @ asllab.com		Project Number		49598		P.O. # / Billing Information		mckey @ asllab.com		CAS Contact		Analysis Method and/or Analytes		Dissolved Hydrogen Sulfide	
Phone 803 223 9700 Fax 803 223 9500		Project Number		49598		P.O. # / Billing Information		mckey @ asllab.com		CAS Contact		Analysis Method and/or Analytes		Dissolved Hydrogen Sulfide	
Email Address for Result Reporting mckey @ asllab.com		Project Number		49598		P.O. # / Billing Information		mckey @ asllab.com		CAS Contact		Analysis Method and/or Analytes		Dissolved Hydrogen Sulfide	
Laboratory ID Number	Date Collected	Time Collected	Sample Type (Air/Tube/Solid)	Canister ID (Bar Code # - AC, SC, etc.)	Flow Controller (Bar Code - FC #)	Sample Volume	Preserved	Temperature	Requisitioned by (Signature)	Date	Time	Requisitioned by (Signature)	Date	Time	Temperature
267814	4-22-11	12:45	water			normal	X								
267815	4-22-11	12:35	water			normal	X								
267816	4-22-11	13:00	water			normal	X								
267817	4-22-11	14:35	water			normal	X								

**Report Tier Levels - please select**

Tier I - (Results Default if not specified) \_\_\_\_\_  
 Tier II - (Results + QC) \_\_\_\_\_  
 Tier III - (Data Validation Packages) 10% Surcharge \_\_\_\_\_  
 Tier V - (Client specified) \_\_\_\_\_

EDD required: Yes / No \_\_\_\_\_  
 EDD Units: \_\_\_\_\_

Requisitioned by (Signature) Allex Date: 4-25-11 Time: 11:10  
 Requisitioned by (Signature) [Signature] Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Requisitioned by (Signature) [Signature] Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Requisitioned by (Signature) [Signature] Date: \_\_\_\_\_ Time: \_\_\_\_\_

Project Requirements (MFLS, OAPP)  
 Cooler / Blank \_\_\_\_\_  
 Temperature 6 °C

FIGURE F-11.30



**Sample Acceptance Check Form**

Client: American Scientific Laboratories Work order: P1101541

Project: 49598

Sample(s) received on: 4/25/11 Date opened: 4/25/11 by: SSTAPLES

**Note:** This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |  | Yes                                 | No                                  | N/A                                 |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Container(s) <b>supplied by CAS</b> ?  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 3 Did <b>sample containers</b> arrive in good condition?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Were <b>chain-of-custody</b> papers used and filled out?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Did <b>sample container labels</b> and/or tags agree with custody papers?                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Was <b>sample volume</b> received adequate for analysis?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Are samples within specified holding times?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 8 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Cooler Temperature <u>6</u> °C    Blank Temperature _____ °C   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9 Was a <b>trip blank</b> received?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 10 Were <b>custody seals</b> on outside of cooler/Box?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 11 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12 <b>Tubes:</b> Are the tubes capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Do they contain moisture?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 13 <b>Badges:</b> Are the badges properly capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1101541-001.01	40mL VOA NP		6		P	
P1101541-001.02	40mL VOA NP				P	
P1101541-001.03	40mL VOA NP				P	
P1101541-002.01	40mL VOA NP		6		P	
P1101541-002.02	40mL VOA NP				P	
P1101541-002.03	40mL VOA NP				P	
P1101541-003.01	40mL VOA NP		6		P	
P1101541-003.02	40mL VOA NP				P	

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_  
 Vials contained precipitate \_\_\_\_\_



RESULTS OF ANALYSIS

Page 1 of 1

**Client:** American Scientific Laboratories  
**Client Project ID:** 49598

CAS Project ID: P1101541

**Hydrogen Sulfide**

**Test Code:** GC/SCD Reduced Sulfur Analysis  
**Instrument ID:** Agilent 6890A/GC13/SCD  
**Analyst:** Wade Henton/Laurnyn Keeler  
**Matrix:** Water  
**Test Notes:**

**Date(s) Collected:** 4/22/11  
**Date Received:** 4/25/11  
**Date Analyzed:** 4/26/11

Client Sample ID	CAS Sample ID	Liquid Amount:	Purge	Injection	Result	MRL	Data
		Amount	Volume	Volume			
		ml(s)	Liter(s)	ml(s)	µg/L	µg/L	Qualifier
267814	P1101541-001	10.0	0.30	1.0	ND	0.84	
267815	P1101541-002	10.0	0.30	1.0	ND	0.84	
267816	P1101541-003	10.0	0.30	1.0	ND	0.84	
267817	P1101541-004	10.0	0.30	1.0	ND	0.84	
Method Blank	P110426-MB	10.0	0.30	1.0	ND	0.84	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** American Scientific Laboratories  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** 49598

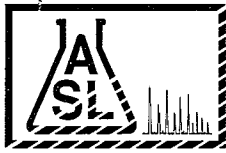
**CAS Project ID:** P1101541  
**CAS Sample ID:** P110426-DLCS

**Test Code:** GC/SCD Reduced Sulfur Analysis  
**Instrument ID:** Agilent 6890A/GC13/SCD  
**Analyst:** Wade Henton/Lauryn Keeler  
**Matrix:** Water  
**Test Notes:**

**Date Collected:** NA  
**Date Received:** NA  
**Date Analyzed:** 4/26/11  
**Liquid Amount:** 10.0 ml(s)  
**Purge Volume:** 0.30 Liter(s)  
**Injection Volume:** 0.20 ml(s)

CAS #	Compound	Spike Amount	Result		% Recovery		CAS	RPD	RPD	Data
		LCS / DLCS ug/L	LCS ug/L	DLCS ug/L	LCS	DLCS	Acceptance Limits			
7783-06-4	Hydrogen Sulfide	419	338	414	<b>81</b>	<b>99</b>	53-127	20	30	

**FIGURES F-12.1 THROUGH F-12.10  
ANALYTICAL TESTING OF TAR SANDS (PE PHASE)**



AMERICAN SCIENTIFIC LABORATORIES, LLC  
*Environmental Testing Services*

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Ordered By

MACTEC Engineering & Consulting Inc  
5628 East Slauson Ave.  
Los Angeles, CA 90040-

Number of Pages 9  
Date Received 04/20/2011  
Date Reported 04/21/2011

Telephone (323) 889-5300  
Attn Hari Ponnaboyina

Job Number	Ordered	Client
49568	04/20/2011	MACTEC

Project ID: 4953-10-1561 G-118  
Project Name: Westside Subway Extension  
Site: Los Angeles

Enclosed are the results of analyses on 2 samples analyzed as specified on attached chain of custody.

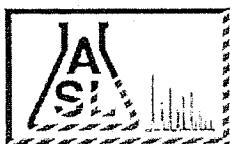
Wendy Lu  
Organics Supervisor

Rojert G. Araghi  
Laboratory Director

American Scientific Laboratories, LLC (ASL) accepts sample materials from clients for analysis with the assumption that all of the information provided to ASL verbally or in writing by our clients (and/or their agents), regarding samples being submitted to ASL, is complete and accurate. ASL accepts all samples subject to the following conditions:

- 1) ASL is not responsible for verifying any client-provided information regarding any samples submitted to the laboratory.
- 2) ASL is not responsible for any consequences resulting from any inaccuracies, omissions, or misrepresentations contained in client-provided information regarding samples submitted to the laboratory.





AMERICAN SCIENTIFIC LABORATORIES, LLC  
*Environmental Testing Services*

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ANALYTICAL RESULTS

Ordered By

MACTEC Engineering & Consulting Inc  
 5628 East Slauson Ave.  
 Los Angeles, CA 90040-

Site

Los Angeles

Telephone: (323)889-5300

Attn: Hari Ponnaboyina

Page: 2

Project ID: 4953-10-1561 G-118  
 Project Name: Westside Subway Extension

ASL Job Number	Submitted	Client
49568	04/20/2011	MACTEC

Method: 8015B, TPH DROs and OROs (Diesel and Oil Range Organics)

QC Batch No: S-042011-1P

Our Lab I.D.		267662	267663		
Client Sample I.D.		G-118 @ 49'	G-118 @ 55'		
Date Sampled		04/20/2011	04/20/2011		
Date Prepared		04/20/2011	04/20/2011		
Preparation Method					
Date Analyzed		04/20/2011	04/20/2011		
Matrix		Solid	Solid		
Units		mg/Kg	mg/Kg		
Dilution Factor		1	1		
Analytes	PQL	Results	Results		
TPH DROs (C10 to C28)	10.0	47200	97000		
TPH OROs (C28+)	50.0	21700	23600		

Our Lab I.D.		267662	267663		
Surrogates	% Rec.Limit	% Rec.	% Rec.		
Surrogate Percent Recovery					
Chlorobenzene	70-120	117	116		

QUALITY CONTROL REPORT

QC Batch No: S-042011-1P

Analytes	MS % REC	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit				
Diesel	100	100	<1	75-120	<20				





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ANALYTICAL RESULTS

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 Los Angeles, CA 90040-

Site

Los Angeles

Telephone: (323)889-5300

Attn: Hari Ponnaboyina

Page: 3

Project ID: 4953-10-1561 G-118  
 Project Name: Westside Subway Extension

ASL Job Number	Submitted	Client
49568	04/20/2011	MACTEC

Method: 8015B, TPH GROs (Gasoline Range Organics)

QC Batch No: S-042011-1

Our Lab I.D.		267662	267663			
Client Sample I.D.		G-118 @ 49'	G-118 @ 55'			
Date Sampled		04/20/2011	04/20/2011			
Date Prepared		04/20/2011	04/20/2011			
Preparation Method						
Date Analyzed		04/20/2011	04/20/2011			
Matrix		Solid	Solid			
Units		mg/Kg	mg/Kg			
Dilution Factor		5	5			
Analytes	PQL	Results	Results			
TPH GROs (C6 to C10)	2.50	85.7	51.9			

Our Lab I.D.		267662	267663			
Surrogates	% Rec.Limit	% Rec.	% Rec.			
Surrogate Percent Recovery						
Bromofluorobenzene	70-120	104	86			

QUALITY CONTROL REPORT

QC Batch No: S-042011-1

Analytes	MS % REC	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit					
Benzene	98	98	<1	75-120	<20					
Toluene	111	111	<1	75-120	<20					



# AMERICAN SCIENTIFIC LABORATORIES, LLC

## Environmental Testing Services

2520 N. San Fernando Rd., Los Angeles, CA 90065 Tel: (323) 223-9700 Fax: (323) 223-9500

### ANALYTICAL RESULTS

**Ordered By**

MACTEC Engineering & Consulting Inc  
5628 East Slauson Ave.  
Los Angeles, CA 90040-

**Site**

Los Angeles

Telephone: (323)889-5300

Attn: Hari Ponnaboyina

Page: 4

Project ID: 4953-10-1561 G-118  
Project Name: Westside Subway Extension

ASL Job Number	Submitted	Client
49568	04/20/2011	MACTEC

### Method: 8260B, Volatile Organic Compounds

QC Batch No: S-042011-1C

Our Lab I.D.		267662	267663		
Client Sample I.D.		G-118 @ 49'	G-118 @ 55'		
Date Sampled		04/20/2011	04/20/2011		
Date Prepared		04/20/2011	04/20/2011		
Preparation Method					
Date Analyzed		04/20/2011	04/20/2011		
Matrix		Solid	Solid		
Units		ug/kg	ug/kg		
Dilution Factor		5	5		
Analytes	PQL	Results	Results		
Acetone	250	ND	ND		
Benzene	10.0	ND	ND		
Bromobenzene (Phenyl bromide)	50.0	ND	ND		
Bromochloromethane (Chlorobromomethane)	50.0	ND	ND		
Bromodichloromethane (Dichlorobromomethane)	50.0	ND	ND		
Bromoform (Tribromomethane)	250	ND	ND		
Bromomethane (Methyl bromide)	150	ND	ND		
2-Butanone (MEK, Methyl ethyl ketone)	250	ND	ND		
n-Butylbenzene	50.0	ND	ND		
sec-Butylbenzene	50.0	ND	ND		
tert-Butylbenzene	50.0	ND	ND		
Carbon disulfide	50.0	ND	ND		
Carbon tetrachloride (Tetrachloromethane)	50.0	ND	ND		
Chlorobenzene	50.0	ND	ND		
Chloroethane	150	ND	ND		
2-Chloroethyl vinyl ether	250	ND	ND		
Chloroform (Trichloromethane)	50.0	ND	ND		
Chloromethane (Methyl chloride)	150	ND	ND		
4-Chlorotoluene (p-Chlorotoluene)	50.0	ND	ND		
2-Chlorotoluene (o-Chlorotoluene)	50.0	ND	ND		
1,2-Dibromo-3-chloropropane (DBCP)	250	ND	ND		
Dibromochloromethane	50.0	ND	ND		
1,2-Dibromoethane (EDB, Ethylene dibromide)	50.0	ND	ND		
Dibromomethane	50.0	ND	ND		
1,2-Dichlorobenzene (o-Dichlorobenzene)	50.0	ND	ND		
1,3-Dichlorobenzene (m-Dichlorobenzene)	50.0	ND	ND		
1,4-Dichlorobenzene (p-Dichlorobenzene)	50.0	ND	ND		
Dichlorodifluoromethane	150	ND	ND		
1,1-Dichloroethane	50.0	ND	ND		



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ANALYTICAL RESULTS

Page: 5

Project ID: 4953-10-1561 G-118  
 Project Name: Westside Subway Extension

ASL Job Number	Submitted	Client
49568	04/20/2011	MACTEC

Method: 8260B, Volatile Organic Compounds

QC Batch No: S-042011-1C

Our Lab I.D.		267662	267663		
Client Sample I.D.		G-118 @ 49'	G-118 @ 55'		
Date Sampled		04/20/2011	04/20/2011		
Date Prepared		04/20/2011	04/20/2011		
Preparation Method					
Date Analyzed		04/20/2011	04/20/2011		
Matrix		Solid	Solid		
Units		ug/kg	ug/kg		
Dilution Factor		5	5		
Analytes	PQL	Results	Results		
1,2-Dichloroethane	50.0	ND	ND		
1,1-Dichloroethene (1,1-Dichloroethylene)	50.0	ND	ND		
cis-1,2-Dichloroethene	50.0	ND	ND		
trans-1,2-Dichloroethene	50.0	ND	ND		
1,2-Dichloropropane	50.0	ND	ND		
1,3-Dichloropropane	50.0	ND	ND		
2,2-Dichloropropane	50.0	ND	ND		
1,1-Dichloropropene	50.0	ND	ND		
cis-1,3-Dichloropropene	50.0	ND	ND		
trans-1,3-Dichloropropene	50.0	ND	ND		
Ethylbenzene	10.0	26.0	16.5		
Hexachlorobutadiene (1,3-Hexachlorobutadiene)	150	ND	ND		
2-Hexanone	250	ND	ND		
Isopropylbenzene	50.0	ND	ND		
p-Isopropyltoluene (4-Isopropyltoluene)	50.0	ND	ND		
MTBE	25.0	ND	ND		
4-Methyl-2-pentanone (MIBK, Methyl isobutyl ketone)	250	ND	ND		
Methylene chloride (Dichloromethane, DCM)	250	ND	ND		
Naphthalene	50.0	ND	ND		
n-Propylbenzene	50.0	ND	ND		
Styrene	50.0	ND	ND		
1,1,1,2-Tetrachloroethane	50.0	ND	ND		
1,1,2,2-Tetrachloroethane	50.0	ND	ND		
Tetrachloroethene (Tetrachloroethylene)	50.0	ND	ND		
Toluene (Methyl benzene)	10.0	ND	ND		
1,2,3-Trichlorobenzene	50.0	ND	ND		
1,2,4-Trichlorobenzene	50.0	ND	ND		
1,1,1-Trichloroethane	50.0	ND	ND		
1,1,2-Trichloroethane	50.0	ND	ND		
Trichloroethene (TCE)	50.0	ND	ND		
Trichlorofluoromethane	50.0	ND	ND		
1,2,3-Trichloropropane	50.0	ND	ND		
1,2,4-Trimethylbenzene	50.0	ND	ND		
1,3,5-Trimethylbenzene	50.0	ND	ND		
Vinyl acetate	250	ND	ND		



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ANALYTICAL RESULTS

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Project ID: 4953-10-1561 G-118.  
 Project Name: Westside Subway Extension

ASL Job Number	Submitted	Client
49568	04/20/2011	MACTEC

Method: 8260B, Volatile Organic Compounds

QC Batch No: S-042011-1C

Our Lab I.D.		267662	267663		
Client Sample I.D.		G-118 @ 49'	G-118 @ 55'		
Date Sampled		04/20/2011	04/20/2011		
Date Prepared		04/20/2011	04/20/2011		
Preparation Method					
Date Analyzed		04/20/2011	04/20/2011		
Matrix		Solid	Solid		
Units		ug/kg	ug/kg		
Dilution Factor		5	5		
Analytes	PQL	Results	Results		
Vinyl chloride (Chloroethene)	150	ND	ND		
o-Xylene	10.0	ND	ND		
m- & p-Xylenes	20.0	ND	ND		

Comment(s):

267662:267663: Raised DL due to matrix.

Our Lab I.D.		267662	267663		
Surrogates	% Rec.Limit	% Rec.	% Rec.		
Surrogate Percent Recovery					
Bromofluorobenzene	70-120	94	106		
Dibromofluoromethane	70-120	101	94		
Toluene-d8	70-120	98	96		

QUALITY CONTROL REPORT

QC Batch No: S-042011-1C

Analytes	MS % REC	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit				
Benzene	86	88	2.3	75-120	15				
Chlorobenzene	89	92	3.3	75-120	15				
1,1-Dichloroethene (1,1-Dichloroethylene)	94	96	2.1	75-120	15				
MTBE	95	100	5.1	75-120	15				
Toluene (Methyl benzene)	85	89	4.6	75-120	15				
Trichloroethene (TCE)	96	98	2.1	75-120	15				



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ANALYTICAL RESULTS

Ordered By

MACTEC Engineering & Consulting Inc  
 5628 East Slauson Ave.  
 Los Angeles, CA 90040-

Site

Los Angeles

Telephone: (323)889-5300

Attn: Hari Ponnaboyina

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Project ID: 4953-10-1561 G-118  
 Project Name: Westside Subway Extension

ASL Job Number	Submitted	Client
49568	04/20/2011	MACTEC

Method: 8270C, Semivolatile Organics

QC Batch No: 042011-1

Our Lab I.D.		267662	267663		
Client Sample I.D.		G-118 @ 49'	G-118 @ 55'		
Date Sampled		04/20/2011	04/20/2011		
Date Prepared		04/20/2011	04/20/2011		
Preparation Method					
Date Analyzed		04/20/2011	04/20/2011		
Matrix		Solid	Solid		
Units		ug/kg	ug/kg		
Dilution Factor		5	5		
Analytes	PQL	Results	Results		
Acenaphthene	1650	ND	ND		
Acenaphthylene	1650	ND	ND		
Anthracene	1650	ND	ND		
Benz(a)anthracene (Benzo(a)anthracene)	1650	ND	ND		
Benzo(a)pyrene	1650	ND	ND		
Benzo(b)fluoranthene	1650	ND	ND		
Benzo(ghi)perylene	1650	ND	ND		
Benzo(k)fluoranthene	1650	ND	ND		
Benzoic acid	8500	ND	ND		
Benzyl alcohol	3300	ND	ND		
Bis(2-chloroethoxy)methane	1650	ND	ND		
Bis(2-chloroethyl)ether	1650	ND	ND		
Bis(2-chloroisopropyl) ether	1650	ND	ND		
Bis(2-ethylhexyl) phthalate	1650	ND	ND		
4-Bromophenyl phenyl ether	1650	ND	ND		
Butyl benzyl phthalate (Benzyl butyl phthalate)	1650	ND	ND		
4-Chloro-3-methylphenol (p-Chloro-m-cresol)	3300	ND	ND		
4-Chloroaniline	3300	ND	ND		
2-Chloronaphthalene	1650	ND	ND		
2-Chlorophenol (o-Chlorophenol)	1650	ND	ND		
4-Chlorophenyl phenyl ether	1650	ND	ND		
Chrysene	1650	ND	ND		
Di-n-butyl phthalate	1650	ND	ND		
Di-n-octyl phthalate (Diocetyl ester)	1650	ND	ND		
Dibenz(a,h)anthracene	1650	ND	ND		
Dibenzofuran	1650	ND	ND		
1,3-Dichlorobenzene (m-Dichlorobenzene)	1650	ND	ND		
1,2-Dichlorobenzene (o-Dichlorobenzene)	1650	ND	ND		
1,4-Dichlorobenzene	1650	ND	ND		



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ANALYTICAL RESULTS

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Project ID: 4953-10-1561 G-118  
 Project Name: Westside Subway Extension

ASL Job Number	Submitted	Client
49568	04/20/2011	MACTEC

Method: 8270C, Semivolatile Organics

QC Batch No: 042011-1

Our Lab I.D.		267662	267663		
Client Sample I.D.		G-118 @ 49'	G-118 @ 55'		
Date Sampled		04/20/2011	04/20/2011		
Date Prepared		04/20/2011	04/20/2011		
Preparation Method					
Date Analyzed		04/20/2011	04/20/2011		
Matrix		Solid	Solid		
Units		ug/kg	ug/kg		
Dilution Factor		5	5		
Analytes	PQL	Results	Results		
3,3'-Dichlorobenzidine	3300	ND	ND		
2,4-Dichlorophenol	8500	ND	ND		
Diethyl phthalate (Diethyl ester)	1650	ND	ND		
2,4-Dimethylphenol	1650	ND	ND		
Dimethyl phthalate (Dimethyl ester)	1650	ND	ND		
2,4-Dinitrophenol	8500	ND	ND		
2,4-Dinitrotoluene	1650	ND	ND		
2,6-Dinitrotoluene (2,6-DNT)	1650	ND	ND		
Fluoranthene	1650	ND	ND		
Fluorene	1650	ND	ND		
Hexachlorobenzene	1650	ND	ND		
Hexachlorobutadiene (1,3-Hexachlorobutadiene)	1650	ND	ND		
Hexachlorocyclopentadiene	3300	ND	ND		
Hexachloroethane	1650	ND	ND		
Indeno(1,2,3-cd)pyrene	1650	ND	ND		
Isophorone	1650	ND	ND		
2-methyl-4,6-Dinitrophenol	8500	ND	ND		
2-Methylnaphthalene	1650	ND	ND		
2-Methylphenol (o-Cresol, 2-Cresol)	1650	ND	ND		
4-Methylphenol (p-Cresol, 4-Cresol)	1650	ND	ND		
N-Nitroso-Di-n-propylamine	1650	ND	ND		
N-Nitrosodiphenylamine	1650	ND	ND		
Naphthalene	1650	ND	ND		
2-Nitroaniline	8500	ND	ND		
3-Nitroaniline	8500	ND	ND		
4-Nitroaniline	8500	ND	ND		
Nitrobenzene (NB)	1650	ND	ND		
2-Nitrophenol (o-Nitrophenol)	1650	ND	ND		
4-Nitrophenol	8500	ND	ND		
Pentachlorophenol	8500	ND	ND		
Phenanthrene	1650	ND	ND		
Phenol	1650	ND	ND		
Pyrene	1650	ND	ND		
1,2,4-Trichlorobenzene	1650	ND	ND		
2,4,5-Trichlorophenol	1650	ND	ND		



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## Environmental Testing Services

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### ANALYTICAL RESULTS

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Project ID: 4953-10-1561 G-118  
 Project Name: Westside Subway Extension

ASL Job Number	Submitted	Client
49568	04/20/2011	MACTEC

Method: 8270C, Semivolatile Organics

QC Batch No: 042011-1

Our Lab I.D.		267662	267663		
Client Sample I.D.		G-118 @ 49'	G-118 @ 55'		
Date Sampled		04/20/2011	04/20/2011		
Date Prepared		04/20/2011	04/20/2011		
Preparation Method					
Date Analyzed		04/20/2011	04/20/2011		
Matrix		Solid	Solid		
Units		ug/kg	ug/kg		
Dilution Factor		5	5		
Analytes	PQL	Results	Results		
2,4,6-Trichlorophenol	1650	ND	ND		

Comment(s):

Elevated PQLs due to matrix.

Our Lab I.D.		267662	267663		
Surrogates	% Rec.Limit	% Rec.	% Rec.		
Surrogate Percent Recovery					
2-Fluorophenol	21-105	43	43		
Phenol-d6	10-107	46	40		
2,4,6-Tribromophenol	10-123	47	28		
Nitrobenzene-d5	35-114	71	56		
2-Fluorobiphenyl	18-116	59	70		
Terphenyl-d14	33-141	57	70		

### QUALITY CONTROL REPORT

QC Batch No: 042011-1

Analytes	LCS % REC	LCS DUP % REC	LCS RPD % REC	LCS/LCSD % Limit	LCS RPD % Limit				
Acenaphthene	91	105	14.3	43-118	<30				
4-Chloro-3-methylphenol (p-Chloro-m-cresol)	79	94	17.3	23-117	<30				
2-Chlorophenol (o-Chlorophenol)	81	97	18.0	27-123	<30				
1,4-Dichlorobenzene	69	67	2.9	36-105	<30				
2,4-Dinitrotoluene	51	58	12.8	24-120	<30				
N-Nitroso-Di-n-propylamine	90	109	19.1	41-116	<30				
4-Nitrophenol	51	58	12.8	10-133	<30				
Pentachlorophenol	53	48	9.9	9-118	<30				
Phenol	84	101	18.4	12-110	<30				
Pyrene	104	108	3.8	26-127	<30				
1,2,4-Trichlorobenzene	75	76	1.3	39-98	<30				

**FIGURES F-13.1 THROUGH F-13.51  
ABRASION TESTING (PE PHASE)**



**Soil Abrasion Test****(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)****The University of Texas at Austin****Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001

Test Date	7/8/11-7/18/11
Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder

**Summary**

Boring No.	Test Depth (ft)	AVS
S-101	60-61	31
S-102	67-68	22.5
S-104	59.5-60.5	14.5
S-104	81-82	35
S-107	57-57.9	23.5
S-108	91-92	13.5
S-109	80-81	11.5
S-110	40.5-41.5	10
S-110	44-45	5
S-111	65-66	27.5
S-114	67-68	38
S-115	89-90 (GM)	5.5
S-115	89-90	8

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**Soil Abrasion Test**

(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)



The University of Texas at Austin

Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_MACTEC_001_001
Sample ID.	
Boring No.	S-101
Depth Interval	60-61 ft
Sample received	7/8/2011
Test date	7/18/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SP/SW

Test no.	Test 1	Test 2	AVS
Weight loss in mg	33	29	31

**Photograph of the test sample**



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**Soil Abrasion Test****(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)****The University of Texas at Austin****Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-102
Depth Interval	67-68 ft
Sample received	7/8/2011
Test date	7/17/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SP-SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	22	23	22.5

**Photograph of the test sample**

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## Soil Abrasion Test

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Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_MACTEC_001_001
Sample ID.	
Boring No.	S-104
Depth Interval	59.5-60.5 ft
Sample received	7/8/2011
Test date	7/17/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SP-SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	13	16	14.5

### Photograph of the test sample



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**Soil Abrasion Test**

**(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)**



**The University of Texas at Austin**

**Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-104
Depth Interval	81-82 ft
Sample received	7/8/2011
Test date	7/18/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SP

Test no.	Test 1	Test 2	AVS
Weight loss in mg	36	34	35

**Photograph of the test sample**



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**Soil Abrasion Test****(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)****The University of Texas at Austin****Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-107
Depth Interval	57-57.9 ft
Sample received	7/8/2011
Test date	7/18/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SP

Test no.	Test 1	Test 2	AVS
Weight loss in mg	24	23	23.5

**Photograph of the test sample**

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## Soil Abrasion Test

(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)



The University of Texas at Austin

Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_MACTEC_001_001
Sample ID.	
Boring No.	S-108
Depth Interval	91-92 ft
Sample received	7/8/2011
Test date	7/18/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SC/SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	15	12	13.5

### Photograph of the test sample



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**Soil Abrasion Test**

(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)



The University of Texas at Austin

Geotechnical Engineering Center  
Department of Civil, Architectural  
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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-109
Depth Interval	80-81 ft
Sample received	7/8/2011
Test date	7/17/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SC/CL

Test no.	Test 1	Test 2	AVS
Weight loss in mg	13	10	11.5

**Photograph of the test sample**



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**Soil Abrasion Test**

**(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)**



**The University of Texas at Austin**

**Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-110
Depth Interval	40.5-41.5 ft
Sample received	7/8/2011
Test date	7/18/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	CH/GC

Test no.	Test 1	Test 2	AVS
Weight loss in mg	11	9	10

**Photograph of the test sample**



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## Soil Abrasion Test

(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)



The University of Texas at Austin

Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-110
Depth Interval	44-45 ft
Sample received	7/8/2011
Test date	7/18/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	N/A

Test no.	Test 1	Test 2	AVS
Weight loss in mg	5	5	5

### Photograph of the test sample



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**Soil Abrasion Test****(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)****The University of Texas at Austin****Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-111
Depth Interval	65-66 ft
Sample received	7/8/2011
Test date	7/17/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SP

Test no.	Test 1	Test 2	AVS
Weight loss in mg	28	27	27.5

**Photograph of the test sample**

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**Soil Abrasion Test**

(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-114
Depth Interval	67-68 ft
Sample received	7/8/2011
Test date	7/17/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	38	38	38

**Photograph of the test sample**

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**Soil Abrasion Test**

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**Geotechnical Engineering Center  
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and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-115
Depth Interval	89-90 ft
Sample received	7/8/2011
Test date	7/18/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	GM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	5	6	5.5

**Photograph of the test sample**



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Department of Civil, Architectural  
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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-115
Depth Interval	89-90 ft
Sample received	7/8/2011
Test date	7/18/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	N/A

Test no.	Test 1	Test 2	AVS
Weight loss in mg	9	7	8

### Photograph of the test sample



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and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_002

Test Date	7/18/11-7/20/11
Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder

**Summary**

Boring No.	Test Depth (ft)	AVS
S-103A	71-72	21
S-103A	91-92	1.5
S-103A	113-114	2
S-106	45-46	31

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_001
Sample ID.	
Boring No.	S-103A
Depth Interval	71-72 ft
Sample received	7/18/2011
Test date	7/20/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	19	23	21

**Photograph of the test sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_MACTEC_001_002
Sample ID.	
Boring No.	S-103A
Depth Interval	91-92 ft
Sample received	7/18/2011
Test date	7/20/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	1	2	1.5

### Photograph of the test sample



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_002
Sample ID.	
Boring No.	S-103A
Depth Interval	113-114 ft
Sample received	7/18/2011
Test date	7/20/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	2	2	2

**Photograph of the test sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_002
Sample ID.	
Boring No.	S-106
Depth Interval	45-46 ft
Sample received	7/18/2011
Test date	7/20/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	N/A
Soil type description	SM/ML w/ tar

Test no.	Test 1	Test 2	AVS
Weight loss in mg	32	30	31

**Photograph of the test sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003

Test Date	8/19/11-8/23/11
Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder

### Summary

Boring No.	Test Depth (ft)	AVS
S-101	42.6-43.6	20
S-101	53-54	38
S-102	64-65	25.5
S-102	71-72	31.5
S-103A	96-97	2.5
S-103A	101-102	1.5
S-105	96-97	6.5
S-106	52-53	22
S-108	69-70	2.5
S-108	82-83	5
S-108	86-87	8
S-110	71-71.8	7
S-110	81-82	4.5
S-111	59-60	25.5
S-111	78.5-79.5	16
S-116	76-77	2
S-116	91-92	5.5
S-117	64-65	27
S-118	89-90	4

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-101
Depth Interval	42.6-43.6 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	19	21	20

**Photograph of the test sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-101
Depth Interval	53-54 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SP-SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	37	39	38

**Photograph of the test sample**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-102
Depth Interval	64-65 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SP-SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	25	26	25.5

**Photograph of the test sample**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-102
Depth Interval	71-72 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	30	33	31.5

**Photograph of the test sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-103A
Depth Interval	96-97 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	2	3	2.5

**Photograph of the test sample**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-103A
Depth Interval	101-102 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	1	2	1.5

**Photograph of the test sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-105
Depth Interval	96-97 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	ML w/ tar

Test no.	Test 1	Test 2	AVS
Weight loss in mg	6	7	6.5

**Photograph of the test sample**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-106
Depth Interval	52-53 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SM/GM w/ tar

Test no.	Test 1	Test 2	AVS
Weight loss in mg	21	23	22

**Photograph of the test sample**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_MACTEC_001_003
Sample ID.	
Boring No.	S-108
Depth Interval	69-70 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	CL/CH

Test no.	Test 1	Test 2	AVS
Weight loss in mg	3	2	2.5

**Photograph of the test sample**

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## Soil Abrasion Test

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-108
Depth Interval	82-83 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	ML/CL

Test no.	Test 1	Test 2	AVS
Weight loss in mg	5	5	5

### Photograph of the test sample



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-108
Depth Interval	86-87 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	GC

Test no.	Test 1	Test 2	AVS
Weight loss in mg	8	8	8

**Photograph of the test sample**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_MACTEC_001_003
Sample ID.	
Boring No.	S-110
Depth Interval	71-71.8 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	GM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	7	7	7

**Photograph of the test sample**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-110
Depth Interval	81-82 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SC/GC

Test no.	Test 1	Test 2	AVS
Weight loss in mg	5	4	4.5

**Photograph of the test sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-111
Depth Interval	59-60 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SP

Test no.	Test 1	Test 2	AVS
Weight loss in mg	26	25	25.5

**Photograph of the test sample**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-111
Depth Interval	78.5-79.5 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	15	17	16

**Photograph of the test sample**

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**Soil Abrasion Test**

**(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)**



**The University of Texas at Austin**

**Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-116
Depth Interval	76-77 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	2	2	2

**Photograph of the test sample**



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**Soil Abrasion Test****(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)****The University of Texas at Austin****Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-116
Depth Interval	91-92 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	6	5	5.5

**Photograph of the test sample**

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## Soil Abrasion Test

(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_MACTEC_001_003
Sample ID.	
Boring No.	S-117
Depth Interval	64-65 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	SP w/ tar

Test no.	Test 1	Test 2	AVS
Weight loss in mg	28	26	27

### Photograph of the test sample



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, California
UT reference	2011_ MACTEC_001_003
Sample ID.	
Boring No.	S-118
Depth Interval	89-90 ft
Sample received	8/19/2011
Test date	8/23/2011

Tested by	Moo Yeon Kim
Checked by	Mahdi Heidari
Steel test piece condition	Ground and polished by bench grinder
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Geologic unit	
Soil type description	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	3	5	4

**Photograph of the test sample**

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**Abrasion Value Steel Test**

(SAT: NTNU's new soil abrasion test,  
Tunnels & Tunnelling International,  
May 2006, 43-45)



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**Geotechnical Engineering Center  
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# **Soil Abrasion Test**

## **Westside Subway Extension**

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**Summary of Abrasion Value Steel Test Results**

Boring Name	Depth (ft)	Test 1	Test 2	AVERAGE
S-107	64.0-65.0	6.3	5.4	5.9
S-109	68.0-69.0	2.1	1.0	1.6
S-114	61.0-62.0	8.8	7.6	8.2
S-115	68.0-69.0	4.5	3.5	4.0
S-104	73.0-74.0	27.8	29.9	28.9
S-104	64.5-65.5	28.8	28.0	28.4
S-107	48.0-49.0	10.4	8.4	9.4
S-115	62.0-63.0	10.4	10.5	10.5
S-109	61.0-62.0	4.1	3.0	3.6
S-114	53.0-54.0	8.5	7.4	8.0

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(SAT: NTNU's new soil abrasion test, Tunnels & Tunnelling International, May 2006, 43-45)



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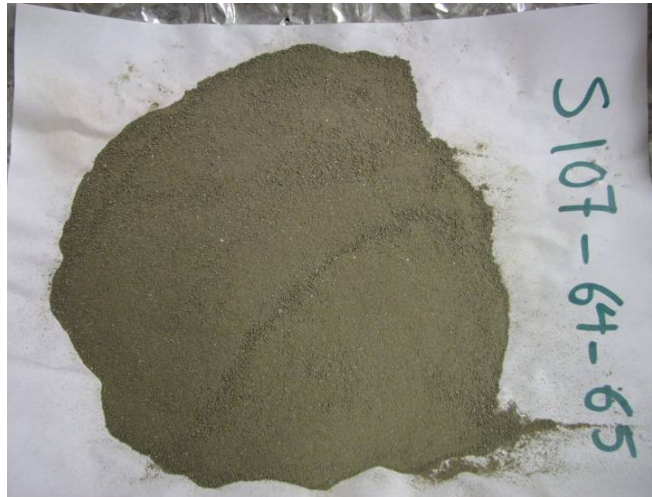
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Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-107@ 64.5
Boring No.	S-107
Depth Interval	64.0-65.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	SM/SC

Test no.	Test 1	Test 2	AVS
Weight loss in mg	6.3	5.4	5.9

**Photograph of the tested sample**



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**Abrasion Value Steel Test**

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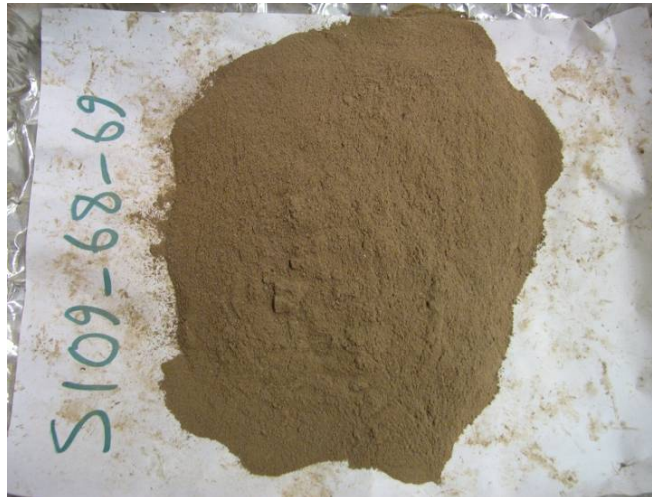
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Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-109@ 68.5
Boring No.	S-109
Depth Interval	68.0-69.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	2.1	1.0	1.6

**Photograph of the tested sample**



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**Abrasion Value Steel Test**

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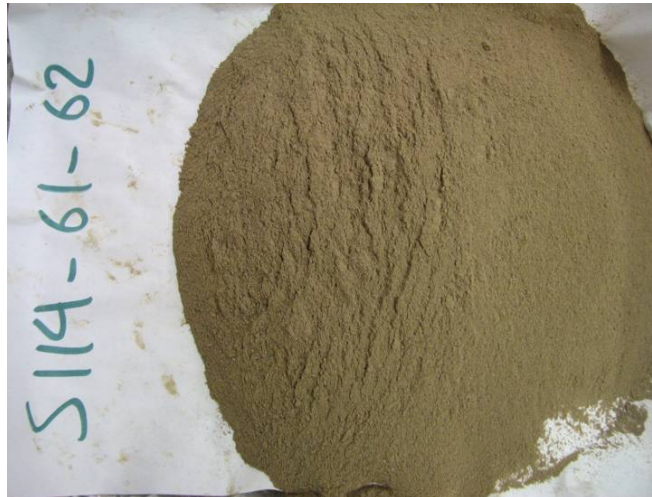
**Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-114@ 61.5
Boring No.	S-114
Depth Interval	61.0-62.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	CL/ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	8.8	7.6	8.2

**Photograph of the tested sample**



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**Abrasion Value Steel Test**

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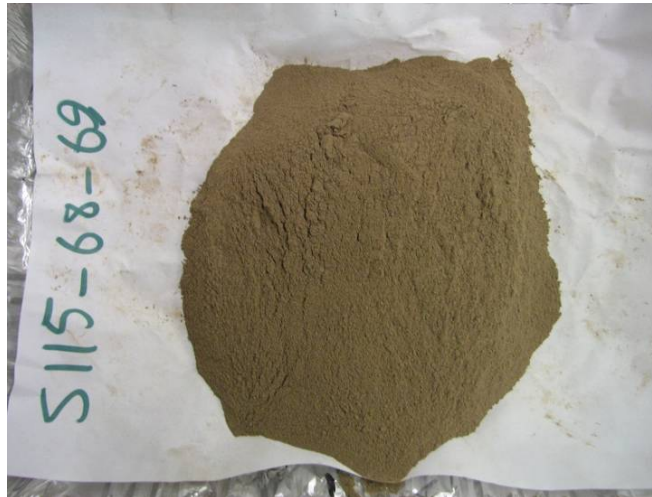
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Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-115@ 68.5
Boring No.	S-115
Depth Interval	68.0-69.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	4.5	3.5	4.0

**Photograph of the tested sample**



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**Abrasion Value Steel Test**

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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-104@ 73.5
Boring No.	S-104
Depth Interval	73.0-74.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	27.8	29.9	28.9

**Photograph of the tested sample**



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**Abrasion Value Steel Test**

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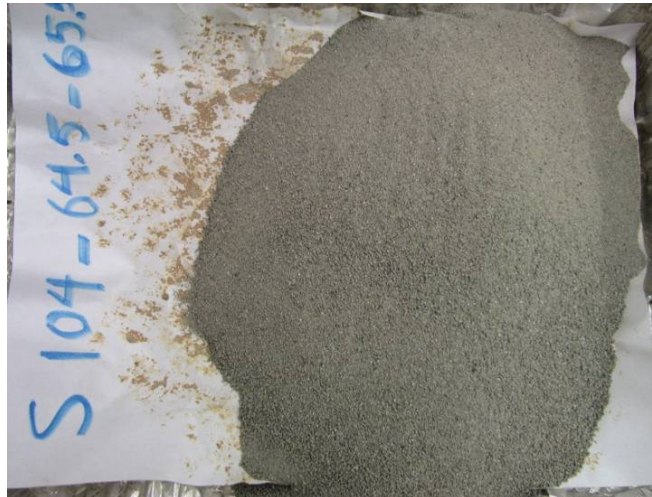
Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-104@ 65.0
Boring No.	S-104
Depth Interval	64.5-65.5

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	28.8	28.0	28.4

**Photograph of the tested sample**



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**Abrasion Value Steel Test**

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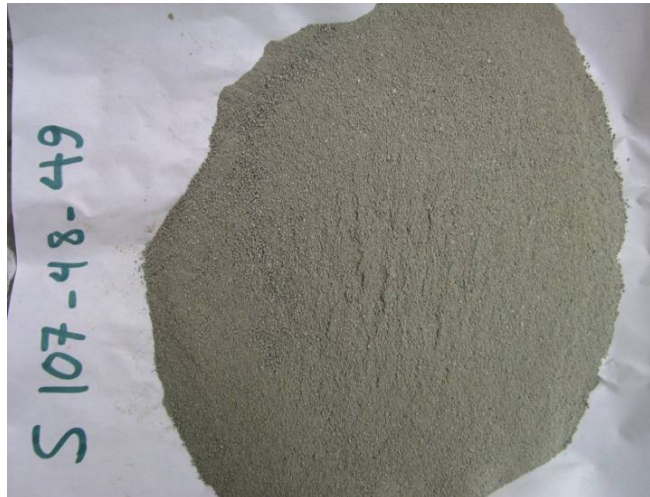
Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-107@ 48.5
Boring No.	S-107
Depth Interval	48.0-49.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	10.4	8.4	9.4

**Photograph of the tested sample**



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**Abrasion Value Steel Test**

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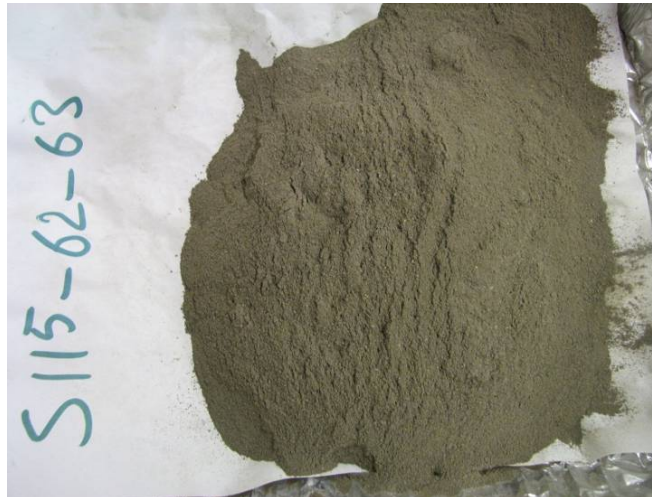
**Geotechnical Engineering Center  
Department of Civil, Architectural  
and Environmental Engineering**

Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-115@ 62.5
Boring No.	S-115
Depth Interval	62.0-63.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	SM

Test no.	Test 1	Test 2	AVS
Weight loss in mg	10.4	10.5	10.5

**Photograph of the tested sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-109@ 61.5
Boring No.	S-109
Depth Interval	61.0-62.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	ML

Test no.	Test 1	Test 2	AVS
Weight loss in mg	4.1	3.0	3.6

**Photograph of the tested sample**



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Project Name	Westside Subway Extension
Client project NO.	4953-10-1561
Location	Los Angeles, CA
UT reference	2011_ MACTEC_001_004
Sample ID.	S-114@ 53.5
Boring No.	S-114
Depth Interval	53.0-54.0

Test Date	09/1/11
Tested by	Mahdi Heidari
Checked by	Fulvio Tonon
Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder
Rock type	CL

Test no.	Test 1	Test 2	AVS
Weight loss in mg	8.5	7.4	8.0

**Photograph of the tested sample**



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**FIGURES F-14.1 THROUGH F-14.12  
UNCONFINED COMPRESSION TEST DATA (PE PHASE)**



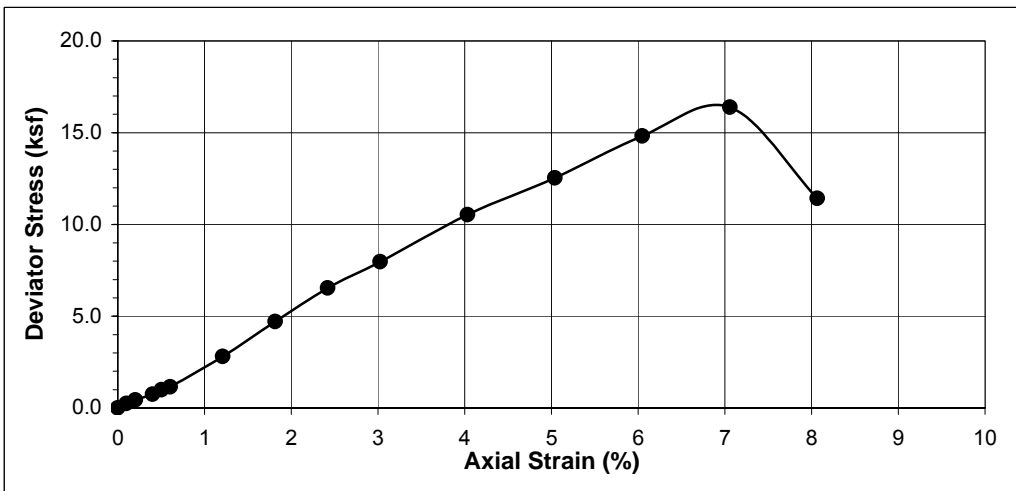
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-105**  
 Depth (feet): **85.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **85.0**  
 Moisture Content (%): **32.6**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.617**  
 Sample Height (inch): **4.959**  
 Sample Weight (gms): **789.47**

Wt. Wet Soil+Container(gms): **929.6**  
 Wt. Dry Soil+Container(gms): **737.52**  
 Wt. Container (gms): **148.68**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.000	5.38	0.00	0.00
9	0.005	5.38	0.24	0.10
16	0.010	5.39	0.43	0.20
28	0.020	5.40	0.75	0.40
37	0.025	5.41	0.99	0.50
43	0.030	5.41	1.14	0.60
106	0.060	5.44	2.80	1.21
179	0.090	5.48	4.71	1.81
250	0.120	5.51	6.53	2.42
307	0.150	5.55	7.97	3.02
410	0.200	5.61	10.53	4.03
493	0.250	5.66	12.53	5.04
589	0.300	5.73	14.81	6.05
659	0.350	5.79	16.40	7.06
464	0.400	5.85	11.42	8.07



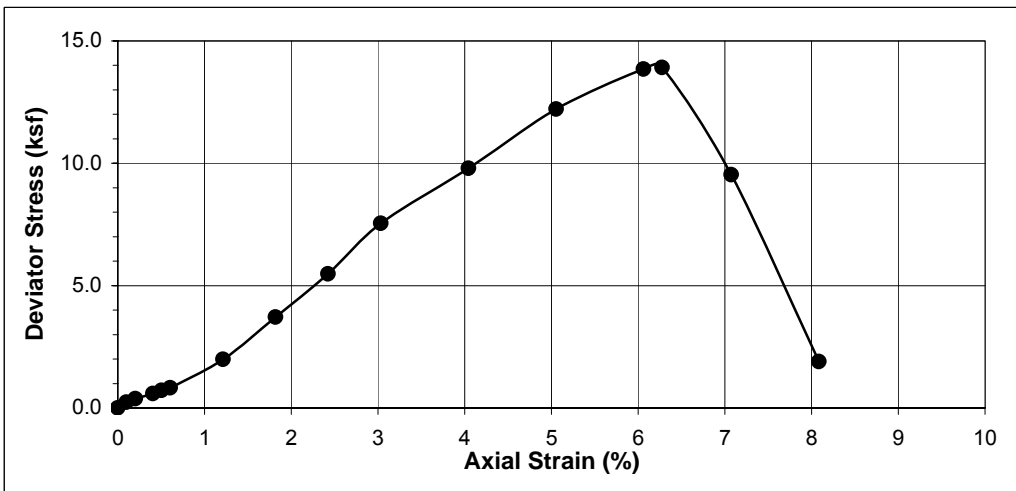
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-105**  
 Depth (feet): **105.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **89.1**  
 Moisture Content (%): **29.3**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.613**  
 Sample Height (inch): **4.947**  
 Sample Weight (gms): **802.64**

Wt. Wet Soil+Container(gms): **979.65**  
 Wt. Dry Soil+Container(gms): **798.45**  
 Wt. Container (gms): **180.64**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.000	5.36	0.00	0.00
9	0.005	5.37	0.24	0.10
14	0.010	5.37	0.38	0.20
22	0.020	5.38	0.59	0.40
27	0.025	5.39	0.72	0.51
31	0.030	5.40	0.83	0.61
75	0.060	5.43	1.99	1.21
141	0.090	5.46	3.72	1.82
209	0.120	5.50	5.48	2.43
290	0.150	5.53	7.55	3.03
380	0.200	5.59	9.79	4.04
479	0.250	5.65	12.21	5.05
549	0.300	5.71	13.85	6.06
553	0.311	5.72	13.92	6.28
382	0.350	5.77	9.53	7.07
77	0.400	5.83	1.90	8.09



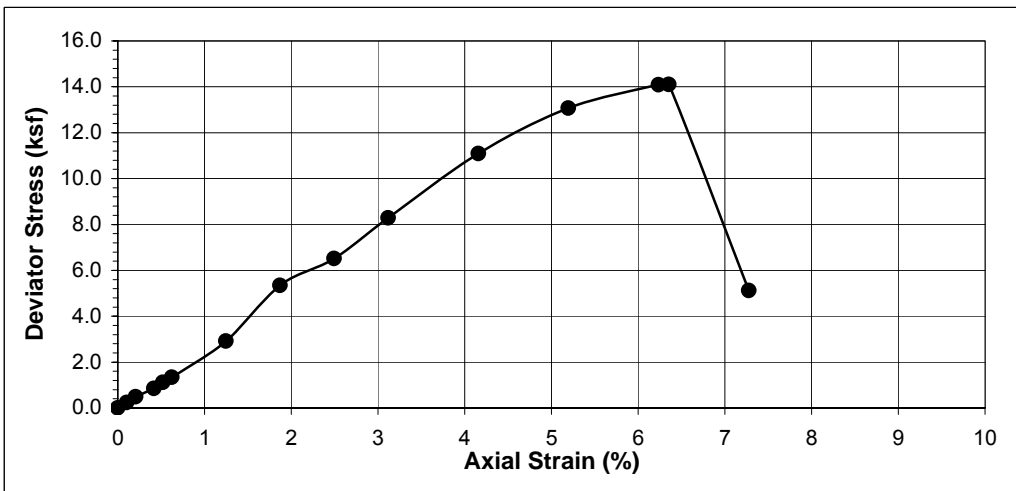
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-106**  
 Depth (feet): **89.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **73.2**  
 Moisture Content (%): **40.9**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.614**  
 Sample Height (inch): **4.811**  
 Sample Weight (gms): **699.38**

Wt. Wet Soil+Container(gms): **842.52**  
 Wt. Dry Soil+Container(gms): **640.94**  
 Wt. Container (gms): **147.67**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.000	5.37	0.00	0.00
9	0.005	5.37	0.24	0.10
18	0.010	5.38	0.48	0.21
32	0.020	5.39	0.86	0.42
42	0.025	5.39	1.12	0.52
50	0.030	5.40	1.33	0.62
110	0.060	5.43	2.91	1.25
203	0.090	5.47	5.35	1.87
249	0.120	5.50	6.51	2.49
319	0.150	5.54	8.29	3.12
431	0.200	5.60	11.08	4.16
514	0.250	5.66	13.08	5.20
560	0.300	5.72	14.09	6.24
561	0.306	5.73	14.10	6.35
206	0.350	5.79	5.13	7.27



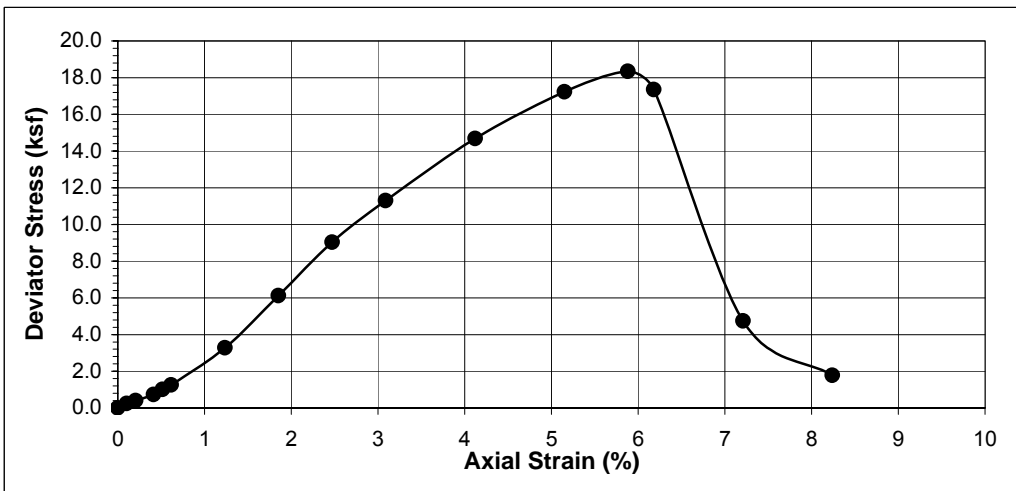
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-107**  
 Depth (feet): **90.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **91.9**  
 Moisture Content (%): **26.6**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.610**  
 Sample Height (inch): **4.854**  
 Sample Weight (gms): **793.19**

Wt. Wet Soil+Container(gms): **934.28**  
 Wt. Dry Soil+Container(gms): **768.83**  
 Wt. Container (gms): **147.88**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.000	5.35	0.00	0.00
9	0.005	5.36	0.24	0.10
15	0.010	5.36	0.40	0.21
27	0.020	5.37	0.72	0.41
38	0.025	5.38	1.02	0.52
47	0.030	5.38	1.26	0.62
123	0.060	5.42	3.27	1.24
232	0.090	5.45	6.13	1.85
344	0.120	5.49	9.03	2.47
433	0.150	5.52	11.29	3.09
569	0.200	5.58	14.68	4.12
675	0.250	5.64	17.23	5.15
724	0.286	5.68	18.34	5.88
687	0.300	5.70	17.35	6.18
190	0.350	5.77	4.75	7.21
72	0.400	5.83	1.78	8.24





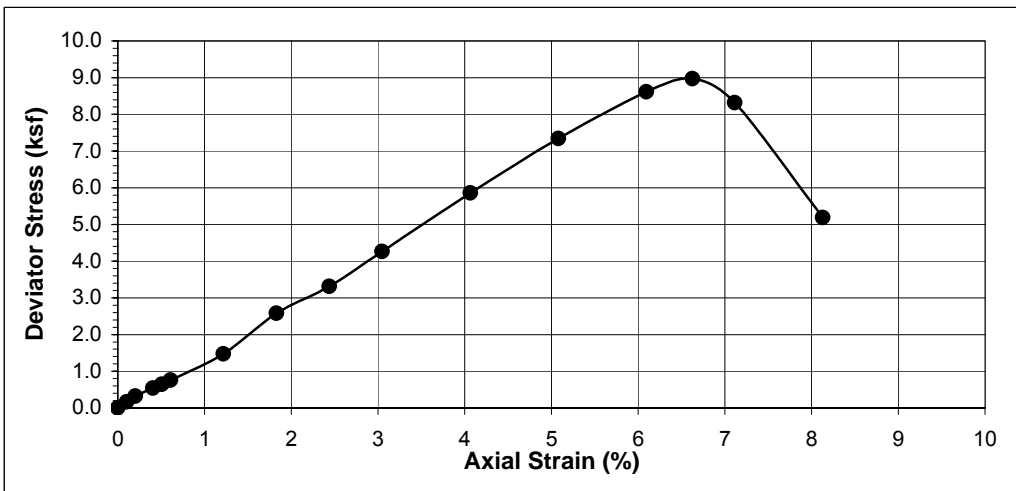
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-109**  
 Depth (feet): **70.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **83.9**  
 Moisture Content (%): **33.5**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.599**  
 Sample Height (inch): **4.920**  
 Sample Weight (gms): **767.94**

Wt. Wet Soil+Container(gms): **912.92**  
 Wt. Dry Soil+Container(gms): **720.86**  
 Wt. Container (gms): **147.63**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.000	5.31	0.00	0.00
6	0.005	5.31	0.16	0.10
12	0.010	5.32	0.33	0.20
20	0.020	5.33	0.54	0.41
24	0.025	5.33	0.65	0.51
28	0.030	5.34	0.76	0.61
55	0.060	5.37	1.47	1.22
97	0.090	5.40	2.58	1.83
125	0.120	5.44	3.31	2.44
162	0.150	5.47	4.26	3.05
225	0.200	5.53	5.86	4.07
285	0.250	5.59	7.34	5.08
338	0.300	5.65	8.61	6.10
354	0.326	5.68	8.97	6.63
330	0.350	5.71	8.32	7.11
208	0.400	5.77	5.19	8.13



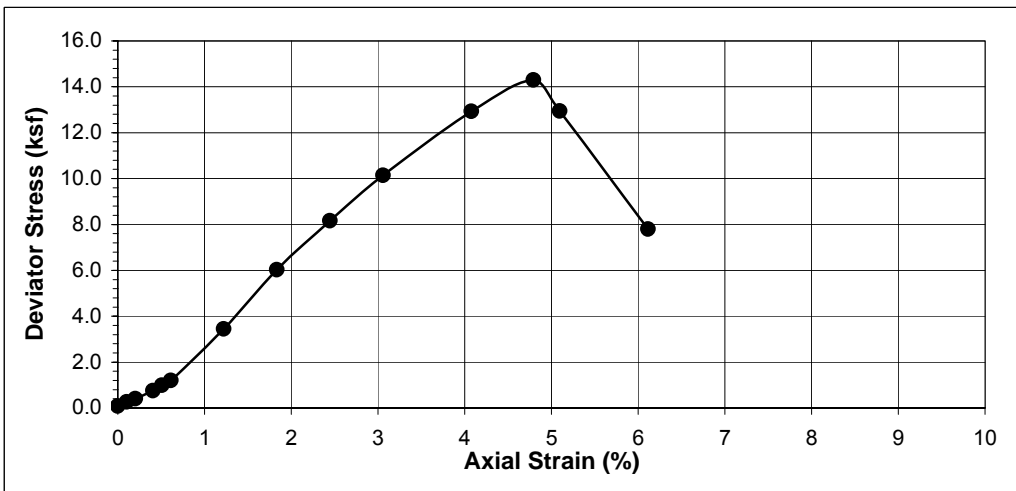
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-110**  
 Depth (feet): **125.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **82.9**  
 Moisture Content (%): **34.9**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.615**  
 Sample Height (inch): **4.905**  
 Sample Weight (gms): **773.43**

Wt. Wet Soil+Container(gms): **949.97**  
 Wt. Dry Soil+Container(gms): **750.82**  
 Wt. Container (gms): **179.99**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
3	0.000	5.37	0.08	0.00
10	0.005	5.38	0.27	0.10
15	0.010	5.38	0.40	0.20
28	0.020	5.39	0.75	0.41
37	0.025	5.40	0.99	0.51
45	0.030	5.40	1.20	0.61
130	0.060	5.44	3.44	1.22
229	0.090	5.47	6.03	1.83
312	0.120	5.51	8.16	2.45
390	0.150	5.54	10.14	3.06
503	0.200	5.60	12.94	4.08
560	0.235	5.64	14.30	4.79
509	0.250	5.66	12.95	5.10
310	0.300	5.72	7.80	6.12



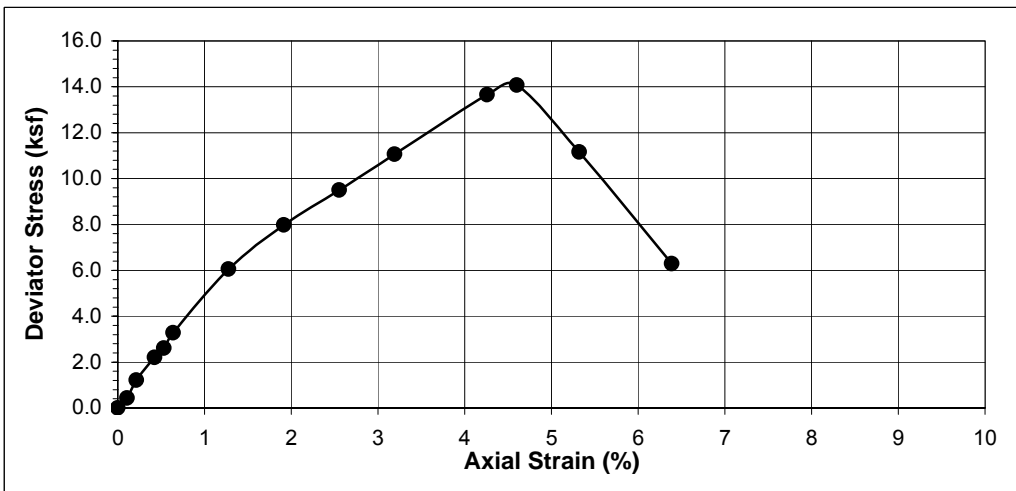
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-111**  
 Depth (feet): **105.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **83.8**  
 Moisture Content (%): **34.0**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.605**  
 Sample Height (inch): **4.697**  
 Sample Weight (gms): **738.60**

Wt. Wet Soil+Container(gms): **875.16**  
 Wt. Dry Soil+Container(gms): **691**  
 Wt. Container (gms): **150.09**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.000	5.33	0.00	0.00
16	0.005	5.34	0.43	0.11
45	0.010	5.34	1.21	0.21
82	0.020	5.35	2.21	0.43
97	0.025	5.36	2.61	0.53
122	0.030	5.36	3.28	0.64
227	0.060	5.40	6.05	1.28
301	0.090	5.43	7.98	1.92
361	0.120	5.47	9.50	2.55
423	0.150	5.51	11.06	3.19
528	0.200	5.57	13.66	4.26
546	0.216	5.59	14.07	4.60
436	0.250	5.63	11.15	5.32
249	0.300	5.69	6.30	6.39



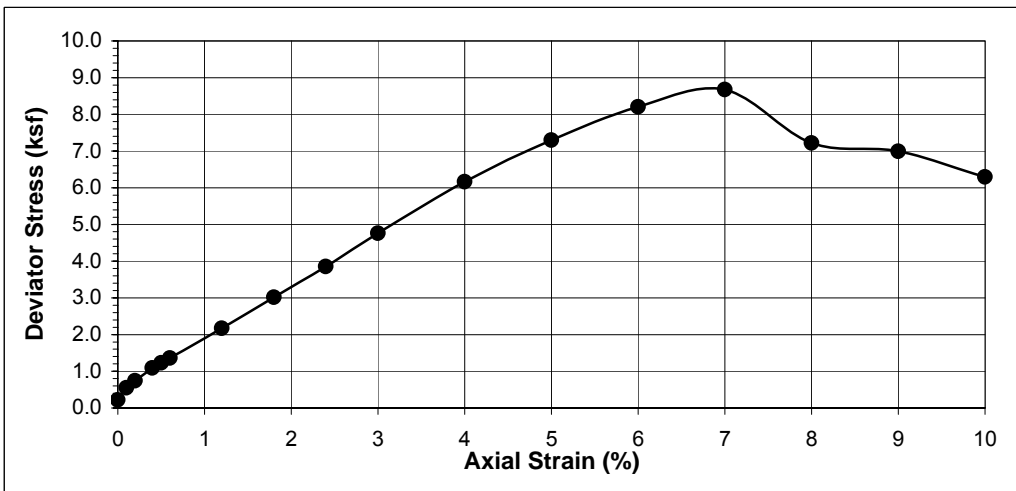
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-114**  
 Depth (feet): **98.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **89.3**  
 Moisture Content (%): **28.9**  
 Test Date: **11/29/11**

Sample Diameter (inch): **2.585**  
 Sample Height (inch): **5.000**  
 Sample Weight (gms): **792.38**

Wt. Wet Soil+Container(gms): **931.68**  
 Wt. Dry Soil+Container(gms): **756.48**  
 Wt. Container (gms): **149.23**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
8	0.000	5.25	0.22	0.00
20	0.005	5.25	0.55	0.10
27	0.010	5.26	0.74	0.20
40	0.020	5.27	1.09	0.40
45	0.025	5.27	1.23	0.50
50	0.030	5.28	1.36	0.60
80	0.060	5.31	2.17	1.20
112	0.090	5.34	3.02	1.80
144	0.120	5.38	3.86	2.40
179	0.150	5.41	4.76	3.00
234	0.200	5.47	6.16	4.00
280	0.250	5.52	7.30	5.00
318	0.300	5.58	8.20	6.00
340	0.350	5.64	8.68	7.00
286	0.400	5.70	7.22	8.00
280	0.450	5.77	6.99	9.00
255	0.500	5.83	6.30	10.00



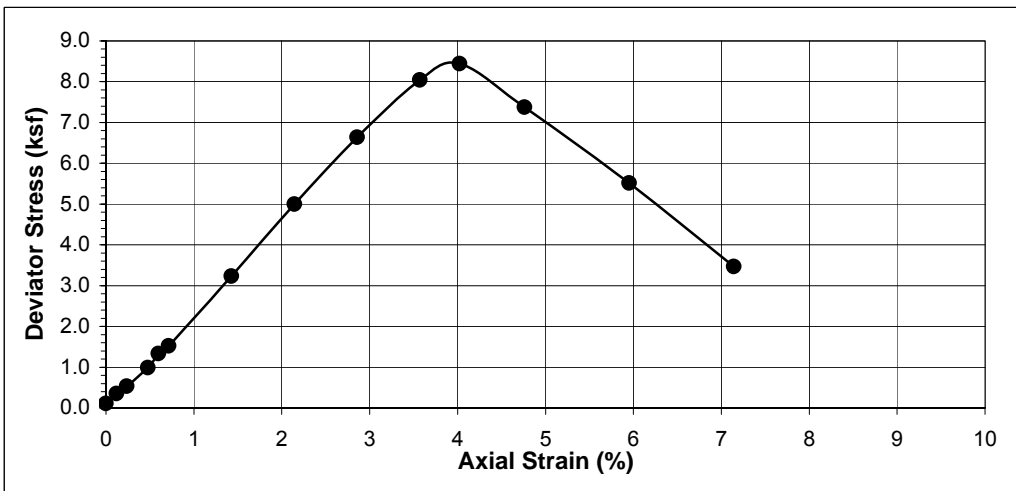
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-118**  
 Depth (feet): **82.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **83.9**  
 Moisture Content (%): **15.9**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.611**  
 Sample Height (inch): **4.200**  
 Sample Weight (gms): **574.01**

Wt. Wet Soil+Container(gms): **723.86**  
 Wt. Dry Soil+Container(gms): **645.29**  
 Wt. Container (gms): **149.85**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
4	0.000	5.35	0.11	0.00
13	0.005	5.36	0.35	0.12
20	0.010	5.37	0.54	0.24
37	0.020	5.38	0.99	0.48
50	0.025	5.39	1.34	0.60
57	0.030	5.39	1.52	0.71
122	0.060	5.43	3.23	1.43
190	0.090	5.47	5.00	2.14
254	0.120	5.51	6.64	2.86
310	0.150	5.55	8.04	3.57
327	0.169	5.58	8.44	4.02
288	0.200	5.62	7.38	4.76
218	0.250	5.69	5.51	5.95
139	0.300	5.77	3.47	7.14



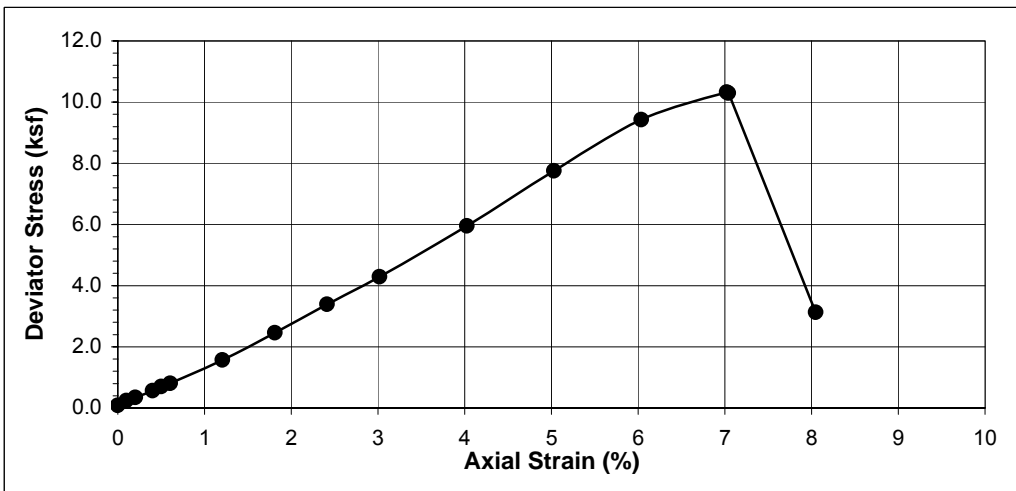
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-118**  
 Depth (feet): **88.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **80.1**  
 Moisture Content (%): **20.8**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.608**  
 Sample Height (inch): **4.970**  
 Sample Weight (gms): **674.26**

Wt. Wet Soil+Container(gms): **817.09**  
 Wt. Dry Soil+Container(gms): **702.02**  
 Wt. Container (gms): **148.09**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
3	0.000	5.34	0.08	0.00
9	0.005	5.35	0.24	0.10
13	0.010	5.35	0.35	0.20
21	0.020	5.36	0.56	0.40
26	0.025	5.37	0.70	0.50
30	0.030	5.37	0.80	0.60
59	0.060	5.41	1.57	1.21
93	0.090	5.44	2.46	1.81
129	0.120	5.47	3.39	2.41
164	0.150	5.51	4.29	3.02
230	0.200	5.57	5.95	4.02
303	0.250	5.62	7.76	5.03
372	0.300	5.69	9.42	6.04
412	0.349	5.75	10.33	7.02
411	0.350	5.75	10.30	7.04
126	0.400	5.81	3.12	8.05



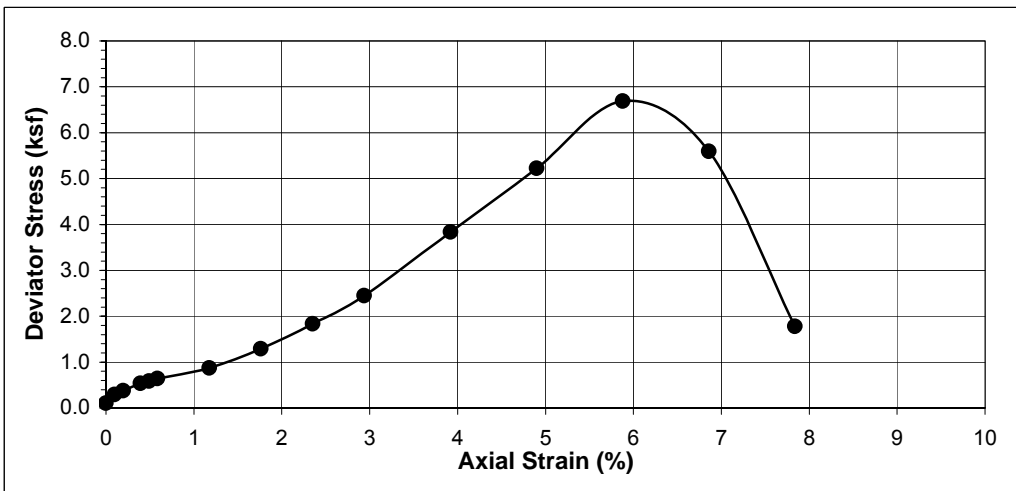
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-118**  
 Depth (feet): **100.5**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **84.3**  
 Moisture Content (%): **25.9**  
 Test Date: **10/13/11**

Sample Diameter (inch): **2.615**  
 Sample Height (inch): **5.103**  
 Sample Weight (gms): **763.28**

Wt. Wet Soil+Container(gms): **916.55**  
 Wt. Dry Soil+Container(gms): **759.75**  
 Wt. Container (gms): **154.33**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
4	0.000	5.37	0.11	0.00
11	0.005	5.38	0.29	0.10
14	0.010	5.38	0.37	0.20
20	0.020	5.39	0.53	0.39
22	0.025	5.40	0.59	0.49
24	0.030	5.40	0.64	0.59
33	0.060	5.43	0.87	1.18
49	0.090	5.47	1.29	1.76
70	0.120	5.50	1.83	2.35
94	0.150	5.53	2.45	2.94
149	0.200	5.59	3.84	3.92
205	0.250	5.65	5.23	4.90
265	0.300	5.71	6.69	5.88
224	0.350	5.77	5.59	6.86
72	0.400	5.83	1.78	7.84



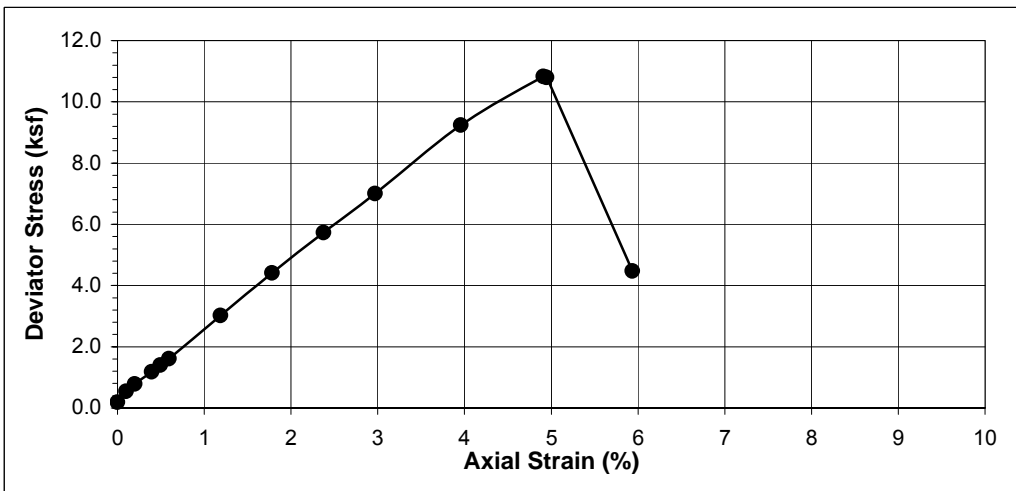
**UNCONFINED COMPRESSION TEST RESULTS  
ASTM D 2166**

Project Name: **Westside Subway Extension**  
 Project No.: **4953-10-1561**  
 Boring No.: **G-207**  
 Depth (feet): **100-101**

Sample Type: **Mod Cal**  
 Soil Description: **Siltstone**  
 Dry Density (pcf): **91.0**  
 Moisture Content (%): **29.3**  
 Test Date: **12/02/11**

Sample Diameter (inch): **2.604**  
 Sample Height (inch): **5.054**  
 Sample Weight (gms): **831.55**

Wt. Wet Soil+Container(gms): **420.41**  
 Wt. Dry Soil+Container(gms): **404**  
 Wt. Container (gms): **348.02**



Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
7	0.000	5.33	0.19	0.00
20	0.005	5.33	0.54	0.10
29	0.010	5.34	0.78	0.20
44	0.020	5.35	1.19	0.40
52	0.025	5.35	1.40	0.49
60	0.030	5.36	1.61	0.59
113	0.060	5.39	3.02	1.19
166	0.090	5.42	4.41	1.78
217	0.120	5.46	5.73	2.37
267	0.150	5.49	7.01	2.97
356	0.200	5.55	9.24	3.96
421	0.248	5.60	10.82	4.91
420	0.250	5.60	10.79	4.95
176	0.300	5.66	4.48	5.94



**APPENDIX G**  
**SUBSURFACE GAS INVESTIGATION**

**FIGURES G-1.1 THROUGH G-1.43  
ANALYTICAL TEST RESULTS (ACE PHASE)**



Mobile  
Geochemistry  
Inc.

31 August 2009

Mr. Curt Welty  
MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922  
RE: MAC081909-11

Enclosed are the results of analyses for samples received by the laboratory on 18-Aug-09 . If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script that reads 'Janis Villarreal'.

Janis Villarreal  
Laboratory Director

H&P Mobile Geochemistry operates under CA Environmental Lab Accreditation Program Numbers 1317, 1561, 1667, 1745, 1746, 2088, 2278, 2543, 2579 and 2595. National Environmental Laboratory Accreditation Conference (NELAC) Standards Lab #11845

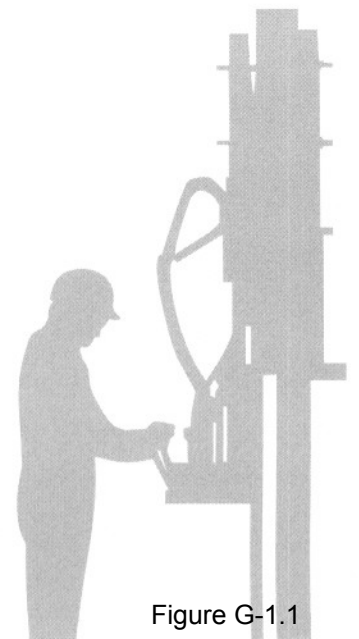


Figure G-1.1



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC081909-11  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 09:58

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
M-2-15	E908058-01	Vapor	18-Aug-09	18-Aug-09
M-2-25	E908058-02	Vapor	18-Aug-09	18-Aug-09
M-3-15	E908058-03	Vapor	18-Aug-09	18-Aug-09
M-14-15	E908058-04	Vapor	18-Aug-09	18-Aug-09
M-14-25	E908058-05	Vapor	18-Aug-09	18-Aug-09
M-15-15	E908058-06	Vapor	18-Aug-09	18-Aug-09
M-15-25	E908058-07	Vapor	18-Aug-09	18-Aug-09
M-17-15	E908058-08	Vapor	18-Aug-09	18-Aug-09
M-25-15	E908058-09	Vapor	18-Aug-09	18-Aug-09
M-21-15	E908058-10	Vapor	18-Aug-09	18-Aug-09
M-21-25	E908058-11	Vapor	18-Aug-09	18-Aug-09



MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922

Project: MAC081909-11  
Project Number: Westside Extension  
Project Manager: Mr. Curt Welty

Reported:  
31-Aug-09 09:58

### Soil Gas and Vapor Analysis

#### H&P Mobile Geochemistry

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
<b>M-2-15 (E908058-01) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	<b>15</b>	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-2-25 (E908058-02) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	ND	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-3-15 (E908058-03) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	<b>3500</b>	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-14-15 (E908058-04) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	<b>280</b>	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-14-25 (E908058-05) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	<b>7100</b>	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-15-15 (E908058-06) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	ND	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-15-25 (E908058-07) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	<b>15</b>	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-17-15 (E908058-08) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	<b>410</b>	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-25-15 (E908058-09) Vapor Sampled: 18-Aug-09 Received: 18-Aug-09</b>									
Methane	<b>12</b>	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC081909-11  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 09:58

**Soil Gas and Vapor Analysis**

**H&P Mobile Geochemistry**

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
<b>M-21-15 (E908058-10) Vapor    Sampled: 18-Aug-09    Received: 18-Aug-09</b>									
Methane	ND	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	
<b>M-21-25 (E908058-11) Vapor    Sampled: 18-Aug-09    Received: 18-Aug-09</b>									
Methane	ND	10	ppmv	1	EH91909	19-Aug-09	19-Aug-09	EPA 8015M	



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC081909-11  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 09:58

**Soil Gas and Vapor Analysis - Quality Control**  
**H&P Mobile Geochemistry**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch EH91909 - GC**

**Blank (EH91909-BLK1)**

Prepared & Analyzed: 19-Aug-09

Methane	ND	10	ppmv							
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MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922

Project: MAC081909-11  
Project Number: Westside Extension  
Project Manager: Mr. Curt Welty

Reported:  
31-Aug-09 09:58

### Notes and Definitions

DET Analyte DETECTED  
ND Analyte NOT DETECTED at or above the reporting limit  
NR Not Reported  
dry Sample results reported on a dry weight basis  
RPD Relative Percent Difference



# Chain of Custody Record



2470 Impala Dr., Carlsbad, CA 92010 • ph 760.804.9678 • fax 760.804.9159  
 3825 Industry Avenue, Lakewood, CA 90712 • ph 562.426.6991 • fax 562.426.6995

Date: 8-18-2009  
 H&P Project # MAC081909-11  
 Outside Lab: \_\_\_\_\_

Client: MACTEC Engineering & Consulting, Inc  
 Address: 5628 E. Stinson Ave.  
Los Angeles, CA 90040  
 Email: cmwelty@mactec.com Phone: 323-919-1080

Collector: KDS Page: 1 of 2  
 Client Project # Westside Expansion Project Contact: Curt Welty  
 Location: \_\_\_\_\_ Turn around time: 24 Hour  
 Fax: \_\_\_\_\_

EDF: Yes  No   
 Global ID: \_\_\_\_\_  
**Sample Receipt**  
 Intact:  Yes  No  
 Seal Intact:  Yes  No  N/A  
 Cold:  Yes  No RT  
 N/A (Received on Site)

Special Instructions: \_\_\_\_\_

Sample Name	Field Point Name	Purge Vol	Time	Date	Sample Type	Container Type	TPH <input type="checkbox"/> gasoline <input type="checkbox"/> diesel <input type="checkbox"/> ext	418.1 TRPH	8021 for BTEX/MTBE	8260B				TO-15		Total # of containers	
										BTEX / Oxygenates	TPH gas	VOC's	DTSC/LARWQCB	Ketones	Full List		BTEX/MTBE
M-2-15			1001	8/18	VAPOR	TRUCK											1
M-2-25			1010														1
M-3-15			1045														1
M-14-15			1155														1
M-14-25			1200														1
M-15-15			1221														1
M-15-25			1225														1
M-17-15			1305														1
M-25-15			1420														1
M-21-15			1540														1

Relinquished by: (Signature) <u>Curt Welty</u>	(company) <u>MACTEC</u>	Received by: (Signature) <u>KDS</u>	(company) <u>H&amp;P</u>	Date: <u>8/18/2009</u>	Time: <u>1600</u>
Relinquished by: (Signature) _____	(company) _____	Received by: (Signature) <u>Steve Reed</u>	(company) <u>H&amp;P</u>	Date: <u>8/19/09</u>	Time: <u>0800</u>
Relinquished by: (Signature) _____	(company) _____	Received by: (Signature) _____	(company) _____	Date: _____	Time: _____

\*Signature constitutes authorization to proceed with analysis and acceptance of condition on back.

Sample disposal instruction:  Disposal @ \$2.00 each  Return to client  Pickup

Figure G-1.7

# Chain of Custody Record



2470 Impala Dr., Carlsbad, CA 92010 • ph 760.804.9678 • fax 760.804.9159  
 3825 Industry Avenue, Lakewood, CA 90712 • ph 562.426.6991 • fax 562.426.6995

Date: 8-18-2007  
 H&P Project # MAC081909-11  
 Outside Lab: \_\_\_\_\_

Client: MACTEC Engineering & Consulting, Inc. Collector: KDS Page: 2 of 2  
 Address: 5628 E. Stauson Ave. Client Project # Westside Extension Project Contact: Curt Welty  
Los Angeles CA 90040 Location: \_\_\_\_\_  
 Email: Cmwelty@mactec.com Phone: 323-919-1080 Fax: \_\_\_\_\_ Turn around time: 24 HOUR

EDF: Yes  No   
 Global ID: \_\_\_\_\_

**Sample Receipt**  
 Intact:  Yes  No  
 Seal Intact:  Yes  No  N/A  
 Cold:  Yes  No  RT  
 N/A (Received on Site)

Special Instructions:

\*M-21-25: MINIMAL SAMPLE IN TEOLAR

Sample Name	Field Point Name	Purge Vol	Time	Date	Sample Type	Container Type	TPH <input type="checkbox"/> gasoline <input type="checkbox"/> diesel <input type="checkbox"/> ext	8260B							TO-15		Total # of containers					
								BTEX / Oxygenates	TPH gas	VOC's	DTSC/LARWQCB	Ketones	Full List	BTEX/MTBE	LCC (specify)	Naphthalene <input type="checkbox"/> 8260B <input type="checkbox"/> TO-15		Methane <input checked="" type="checkbox"/>	Fixed Gases <input type="checkbox"/> CO2 <input type="checkbox"/> O2 <input type="checkbox"/> N2			
M-21-25			1545	8/18	VAPOR TEOLAR																	

Relinquished by: (Signature) <u>Curt Welty</u> (company) <u>MACTEC</u>	Received by: (Signature) <u>[Signature]</u> (company) <u>H&amp;P</u>	Date: <u>8/18/2007</u>	Time: <u>1600</u>
Relinquished by: (Signature) _____ (company) _____	Received by: (Signature) <u>[Signature]</u> (company) <u>H&amp;P</u>	Date: <u>8/19/09</u>	Time: <u>0800</u>
Relinquished by: (Signature) _____ (company) _____	Received by: (Signature) _____ (company) _____	Date: _____	Time: _____

\*Signature constitutes authorization to proceed with analysis and acceptance of condition on back. Sample disposal instruction:  Disposal @ \$2.00 each  Return to client  Pickup

Figure G-1.8



Mobile  
Geochemistry  
Inc.

31 August 2009

Mr. Curt Welty  
MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922  
RE: MAC081909-14

Enclosed are the results of analyses for samples received by the laboratory on 19-Aug-09 . If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script that reads 'J. Villarreal'.

Janis Villarreal  
Laboratory Director

H&P Mobile Geochemistry operates under CA Environmental Lab Accreditation Program Numbers 1317, 1561, 1667, 1745, 1746, 2088, 2278, 2543, 2579 and 2595. National Environmental Laboratory Accreditation Conference (NELAC) Standards Lab #11845

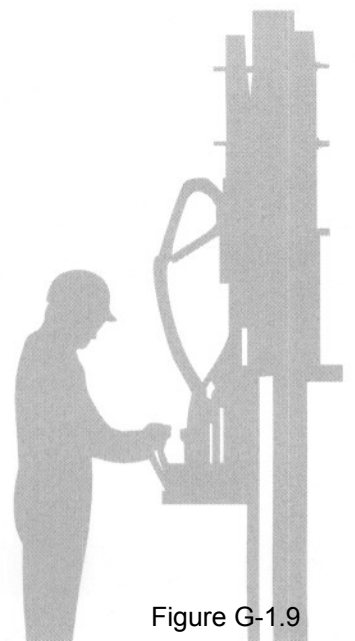


Figure G-1.9



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC081909-14  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 10:15

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
M-1-15	E908062-01	Vapor	19-Aug-09	19-Aug-09
M-4-15	E908062-02	Vapor	19-Aug-09	19-Aug-09
M-6-15	E908062-03	Vapor	19-Aug-09	19-Aug-09
M-7-25	E908062-04	Vapor	19-Aug-09	19-Aug-09
M-10-15	E908062-05	Vapor	19-Aug-09	19-Aug-09
M-11-100	E908062-06	Vapor	19-Aug-09	19-Aug-09
M-11-65	E908062-07	Vapor	19-Aug-09	19-Aug-09
M-11-15	E908062-08	Vapor	19-Aug-09	19-Aug-09
M-16-15	E908062-09	Vapor	19-Aug-09	19-Aug-09
M-16-25	E908062-10	Vapor	19-Aug-09	19-Aug-09



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC081909-14  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 10:15

**Soil Gas and Vapor Analysis**

**H&P Mobility**

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
<b>M-1-15 (E908062-01) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	ND	10	ppmv	1	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	
<b>M-4-15 (E908062-02) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	5700	10	ppmv	1	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	
<b>M-6-15 (E908062-03) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	19000	50	ppmv	5	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	
<b>M-7-25 (E908062-04) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	60000	5000	ppmv	500	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	
<b>M-10-15 (E908062-05) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	75000	5000	ppmv	500	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	
<b>M-11-100 (E908062-06) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	58000	1200	ppmv	125	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	
<b>M-11-65 (E908062-07) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	37000	1200	ppmv	125	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	
<b>M-11-15 (E908062-08) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	86000	1200	ppmv	125	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	
<b>M-16-15 (E908062-09) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
Methane	22	10	ppmv	1	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC081909-14  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 10:15

**Soil Gas and Vapor Analysis**

**H&P Mobile Geochemistry**

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
<b>M-16-25 (E908062-10) Vapor Sampled: 19-Aug-09 Received: 19-Aug-09</b>									
<b>Methane</b>	<b>27</b>	<b>10</b>	ppmv	1	EH92104	20-Aug-09	20-Aug-09	EPA 8015M	



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC081909-14  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 10:15

**Soil Gas and Vapor Analysis - Quality Control**  
**H&P Mobile Geochemistry**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

**Batch EH92104 - GC**

**Blank (EH92104-BLK1)**

Prepared & Analyzed: 20-Aug-09

Methane	ND	10	ppmv							
---------	----	----	------	--	--	--	--	--	--	--



MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922

Project: MAC081909-14  
Project Number: Westside Extension  
Project Manager: Mr. Curt Welty

Reported:  
31-Aug-09 10:15

### Notes and Definitions

DET Analyte DETECTED  
ND Analyte NOT DETECTED at or above the reporting limit  
NR Not Reported  
dry Sample results reported on a dry weight basis  
RPD Relative Percent Difference







Mobile  
Geochemistry  
Inc.

31 August 2009

Mr. Curt Welty  
MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922  
RE: MAC082109-10

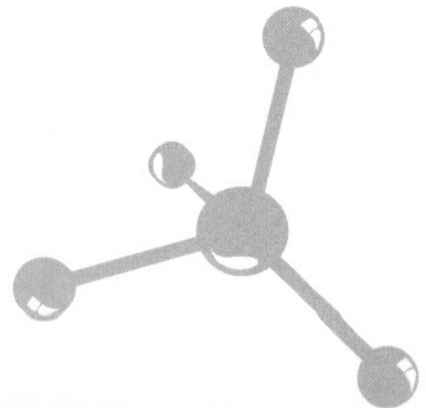
Enclosed are the results of analyses for samples received by the laboratory on 21-Aug-09 . If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script that reads "Janis Villarreal".

Janis Villarreal  
Laboratory Director

H&P Mobile Geochemistry operates under CA Environmental Lab Accreditation Program Numbers 1317, 1561, 1667, 1745, 1746, 2088, 2278, 2543, 2579 and 2595. National Environmental Laboratory Accreditation Conference (NELAC) Standards Lab #11845



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1855 Coronado Avenue, Signal Hill, California 90755  
[www.HandPmg.com](http://www.HandPmg.com) ☎ 1-800-834-9888

Figure G-1.16



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC082109-10  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 10:46

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
M-23-15	E908067-01	Vapor	20-Aug-09	21-Aug-09
M-24-15	E908067-02	Vapor	20-Aug-09	21-Aug-09
M-18-15	E908067-03	Vapor	20-Aug-09	21-Aug-09
M-18-25	E908067-04	Vapor	20-Aug-09	21-Aug-09
M-19-20	E908067-05	Vapor	20-Aug-09	21-Aug-09
M-19-40	E908067-06	Vapor	20-Aug-09	21-Aug-09
M-22-15	E908067-07	Vapor	20-Aug-09	21-Aug-09
M-20-15	E908067-08	Vapor	20-Aug-09	21-Aug-09
M-20-25	E908067-09	Vapor	20-Aug-09	21-Aug-09
M-20-65	E908067-10	Vapor	20-Aug-09	21-Aug-09
M-20-90	E908067-11	Vapor	20-Aug-09	21-Aug-09



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC082109-10  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 10:46

### Soil Gas and Vapor Analysis

#### H&P Mobile Geochemistry

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
<b>M-23-15 (E908067-01) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	ND	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-24-15 (E908067-02) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	<b>53</b>	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-18-15 (E908067-03) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	ND	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-18-25 (E908067-04) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	ND	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-19-20 (E908067-05) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	<b>2900</b>	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-19-40 (E908067-06) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	<b>310</b>	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-22-15 (E908067-07) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	<b>40</b>	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-20-15 (E908067-08) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	ND	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-20-25 (E908067-09) Vapor Sampled: 20-Aug-09 Received: 21-Aug-09</b>									
Methane	ND	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC082109-10  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 10:46

**Soil Gas and Vapor Analysis**

**H&P Mobile Geochemistry**

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
<b>M-20-65 (E908067-10) Vapor    Sampled: 20-Aug-09    Received: 21-Aug-09</b>									
Methane	ND	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	
<b>M-20-90 (E908067-11) Vapor    Sampled: 20-Aug-09    Received: 21-Aug-09</b>									
Methane	ND	10	ppmv	1	EH92404	21-Aug-09	21-Aug-09	EPA 8015M	



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC082109-10  
 Project Number: Westside Extension  
 Project Manager: Mr. Curt Welty

Reported:  
 31-Aug-09 10:46

**Soil Gas and Vapor Analysis - Quality Control**  
**H&P Mobile Geochemistry**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch EH92404 - GC**

**Blank (EH92404-BLK1)**

Prepared & Analyzed: 21-Aug-09

Methane	ND	10	ppmv							
---------	----	----	------	--	--	--	--	--	--	--



MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922

Project: MAC082109-10  
Project Number: Westside Extension  
Project Manager: Mr. Curt Welty

Reported:  
31-Aug-09 10:46

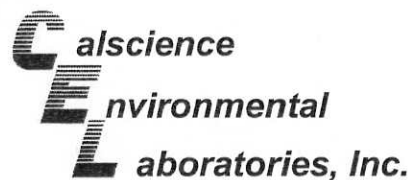
### Notes and Definitions

DET Analyte DETECTED  
ND Analyte NOT DETECTED at or above the reporting limit  
NR Not Reported  
dry Sample results reported on a dry weight basis  
RPD Relative Percent Difference









November 05, 2009

Curt Welty  
MACTEC  
5628 E. Slauson Ave.  
Los Angeles, CA 90040-2922

Subject: **Calscience Work Order No.: 09-11-0214**  
**Client Reference: Metro Westside Ext.**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 11/4/2009 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of subcontracted analysis, if any, is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

A handwritten signature in black ink that reads "Ranjit K. Clarke". The signature is written in a cursive style with a large, prominent "R" and "C".

Calscience Environmental  
Laboratories, Inc.  
Ranjit Clarke  
Project Manager

CA-ELAP ID: 1230 • NELAP ID: 03220CA • CSDLAC ID: 10109 • SCAQMD ID: 93LA0830

7440 Lincoln Way, Garden Grove, CA 92841-1427 • TEL:(714) 895-5494 • FAX: (714) 894-7501

**Analytical Report**



MACTEC  
 5628 E. Slauson Ave.  
 Los Angeles, CA 90040-2922

Date Received: 11/04/09  
 Work Order No: 09-11-0214  
 Preparation: N/A  
 Method: EPA 16

Project: Metro Westside Ext.

Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
M7-25	09-11-0214-1-A	11/04/09 10:36	Air	GC 54	N/A	11/04/09 00:00	091104L01

Parameter	Result	RL	DF	Qual	Units
Hydrogen Sulfide	1.5	1.0	1		ppm (v/v)

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
M13-65	09-11-0214-2-A	11/04/09 12:10	Air	GC 54	N/A	11/04/09 00:00	091104L01

Parameter	Result	RL	DF	Qual	Units
Hydrogen Sulfide	1000	250	250		ppm (v/v)

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	099-12-166-330	N/A	Air	GC 54	N/A	11/04/09 00:00	091104L01

Parameter	Result	RL	DF	Qual	Units
Hydrogen Sulfide	ND	1.0	1		ppm (v/v)

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers



Mobile  
Geochemistry  
Inc.

12 November 2009

Mr. Curt Welty  
MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922  
RE: MAC110409-11

Enclosed are the results of analyses for samples received by the laboratory on 04-Nov-09 . If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script that reads "Janis Villarreal".

Janis Villarreal  
Laboratory Director

H&P Mobile Geochemistry operates under CA Environmental Lab Accreditation Program Numbers 1317, 1561, 1667, 1745, 1746, 2088, 2278, 2543, 2579 and 2595. National Environmental Laboratory Accreditation Conference (NELAC) Standards Lab #11845

2470 Impala Drive, Carlsbad, California 92010 ☎ 760.804.9678 — Fax 760.804.9159  
1855 Coronado Avenue, Signal Hill, California 90755  
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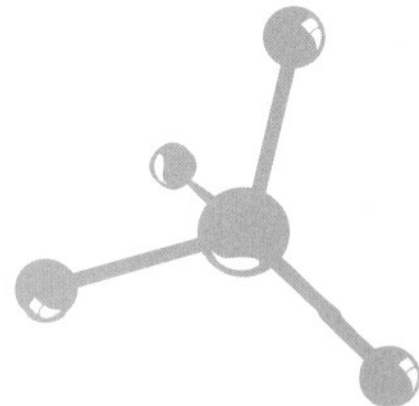


Figure G-1.26



MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922

Project: MAC110409-11  
Project Number: Metro Westside Ext. / Wilshire Blvd.  
Project Manager: Mr. Curt Welty

Reported:  
12-Nov-09 14:21

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
M7-25	E911016-01	Vapor	04-Nov-09	04-Nov-09
M13-65	E911016-02	Vapor	04-Nov-09	04-Nov-09



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC110409-11  
 Project Number: Metro Westside Ext. / Wilshire Blvd.  
 Project Manager: Mr. Curt Welty

Reported:  
 12-Nov-09 14:21

**Soil Gas and Vapor Analysis**

**H&P Mobile Geochemistry**

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
<b>M7-25 (E911016-01) Vapor Sampled: 04-Nov-09 Received: 04-Nov-09</b>									
<b>Methane</b>	<b>930000</b>	1200	ppmv	125	EK90608	05-Nov-09	05-Nov-09	EPA 8015M	
<b>M13-65 (E911016-02) Vapor Sampled: 04-Nov-09 Received: 04-Nov-09</b>									
<b>Methane</b>	<b>1000000</b>	1200	ppmv	125	EK90608	05-Nov-09	05-Nov-09	EPA 8015M	<b>A</b>



MACTEC Engineering & Consulting  
 5628 East Slauson Avenue  
 Los Angeles, CA 90040-2922

Project: MAC110409-11  
 Project Number: Metro Westside Ext. / Wilshire Blvd.  
 Project Manager: Mr. Curt Welty

Reported:  
 12-Nov-09 14:21

**Soil Gas and Vapor Analysis - Quality Control**  
**H&P Mobile Geochemistry**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

**Batch EK90608 - GC**

**Blank (EK90608-BLK1)**

Prepared & Analyzed: 05-Nov-09

Methane	ND	10	ppmv							
---------	----	----	------	--	--	--	--	--	--	--



MACTEC Engineering & Consulting  
5628 East Slauson Avenue  
Los Angeles, CA 90040-2922

Project: MAC110409-11  
Project Number: Metro Westside Ext. / Wilshire Blvd.  
Project Manager: Mr. Curt Welty

Reported:  
12-Nov-09 14:21

### Notes and Definitions

- A The determined value was 1100000 ppmv but the value was changed to 1000000 ppmv since it is assumed to be pure methane.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference



MACTEC ENGINEERING & CONSULTING INC. PROJECT  
 METRO WESTSIDE EXTENSION  
 WILSHIRE BOULEVARD  
 LOS ANGELES, CA

H&P Project #MAC110409 TECH LANDTEC

METHANE, CARBON DIOXIDE, OXYGEN, PROBE PRESSURE & BAROMETERIC PRESSURE ANALYSES OF SOIL VAPOR

Sample ID	DATE	TIME	DEPTH (feet)	METHANE (%)	CO2 (%)	OXYGEN (%)	PROBE PRESSURE " of Water	BAROMETRIC PRESSURE " of Hg
M-6-15'	11/04/09	10:04	15'	1.2	1.4	4.0	0.0	29.75
M-6-25'	11/04/09	9:58	25'	0.3	0.2	17.5	0.0	29.75
M-6-65'	11/04/09	10:00	65'	0.4	0.3	18.4	0.1	29.75
M-6-80'	11/04/09	10:02	80'	0.4	0.3	18.6	0.1	29.75
M-6-80' W	11/04/09	10:12	80'	14.1	4.5	15.0	1.4	29.75
M-7-25'	11/04/09	10:42	25'	--	--	--	>100.0	29.75
M-7-15'	11/04/09	10:44	15'	--	--	--	1.0	29.75
M-8-15'	11/04/09	11:00	15'	--	--	--	3.9	29.75
M-8-25'	11/04/09	11:02	25'	--	--	--	32.0	29.75
M-8-65'	11/04/09	11:04	65'	--	--	--	0.0	29.75
M-8-95'	11/04/09	11:06	95'	--	--	--	0.0	29.75
M-12-15'	11/04/09	11:36	15'	--	--	--	0.0	29.75
M-12-30'	11/04/09	11:38	30'	--	--	--	0.0	29.75
M-2-65'	11/04/09	11:40	65'	--	--	--	>5.0	29.75
M-12-100'	11/04/09	11:42	100'	--	--	--	>5.0	29.75
M-13-65'	11/04/09	12:01	65'	*	8.0	5.0	16.0	29.79

MDL 0.1 0.1 0.1

\* - OVER LANDTEC METER LIMITS

METHANE, CARBON DIOXIDE, OXYGEN, PROBE PRESSURE, AND BAROMETERIC PRESSURE MEASURED BY LANDTEC MODEL GEM 2000

ANALYSES PERFORMED BY: MR. KURT SCHINDLER

DATA REVIEWED BY: MS. JANIS VILLARREAL

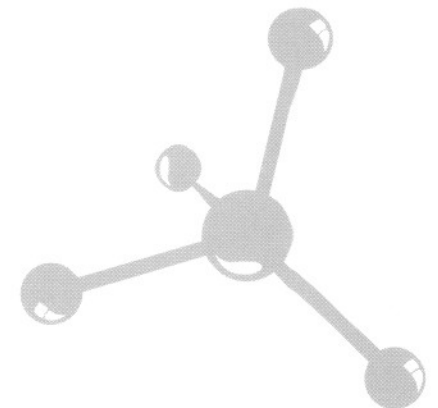


Figure G-1.31

MACTEC ENGINEERING & CONSULTING INC. PROJECT  
 METRO WESTSIDE EXTENSION  
 WILSHIRE BOULEVARD  
 LOS ANGELES, CA

H&P Project #MAC110409 TECH H2S

H2S ANALYSES OF SOIL VAPOR

Sample ID	DATE	TIME	DEPTH (feet)	H2S (ppmv)
M-6-25'	11/04/09	10:05	25'	ND
M-13-65'	11/04/09	12:05	65'	*
MDL				0.1

\* - OVER JEROME METER LIMITS

H2S MEASURED BY JEROME MODEL 631-X  
 ANALYSES PERFORMED BY: MR. KURT SCHINDLER  
 DATA REVIEWED BY: MS. JANIS VILLARREAL

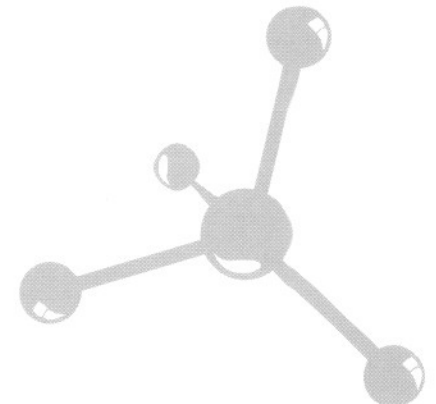
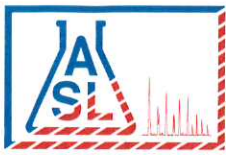


Figure G-1.32





**AMERICAN SCIENTIFIC LABORATORIES, LLC**  
*Environmental Testing Services*

2520 N. San Fernando Rd., Los Angeles, CA 90065 Tel: (323) 223-9700 Fax: (323) 223-9500

**Ordered By**

Mactec Engineering & Consulting  
2171 Campus Dr. Suite # 100  
Irvine, CA 92612-1422

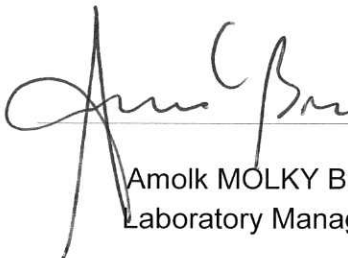
Number of Pages 2  
Date Received 09/22/2010  
Date Reported 09/23/2010


Telephone (949) 224-0050  
Attn Jay Neuhaus

Job Number	Ordered	Client
47126	09/22/2010	MACIRV

Project ID: 4953090473  
Project Name:  
Site: Wilshire Blvd. / Fairfax Ave.  
L.A., CA

Enclosed are the results of analyses on 3 samples analyzed as specified on attached chain of custody.

  
Amolk MOLKY Brar  
Laboratory Manager

  
Rojert G. Araghi  
Laboratory Director

American Scientific Laboratories, LLC (ASL) accepts sample materials from clients for analysis with the assumption that all of the information provided to ASL verbally or in writing by our clients (and/or their agents), regarding samples being submitted to ASL, is complete and accurate. ASL accepts all samples subject to the following conditions:

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