Columbia Analytical Services

pH Run Log

Service Request #(s): 4082

Time: 0820

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/2011
pH 4 Buffer	524-63011001	8/31/11
pH 7 Buffer	524-63011002	11/31/12
pH 10 Buffer	524-63021001	9/30/11

Slope	Prep.Run #
98.0%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled #)

Sample	#	pH	Temp. °C
pH 2.000	5	2.005	21.1°
pH 4.000		4.008	20.9°
pH 7.000		6.997	21.0°
pH 10.000		9.989	21.0°
I.V=6.46 EXP: 11/30/12 Ref#:519-11230903C		6.384	21.1°
DI H2O		2.020	21.4°
pH 2.000		2.000	21.1°
TIME: 1515		SR	
pH 2.000	5	2.021	23.0°
4082-1.01		2.095	12.6°
-2.01		1.764	12.4°
-3.01		1.898	12.8°
-4.01		1.882	13.8°
-5.01		1.869	14.1°
-6.01		1.846	14.5°
-7.01		1.809	15.0°
pH 2.000		2.024	22.6°

Sample	#	pH	Temp. °C

Spike not added

pH Adjustments: ☒ **7196A**: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14

☐ **7199A**: Diluted NaOH _____ EXP: _____

Comments: _____

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 11/1/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: _____ Date: 11/2/10

Reviewer: KP Date: 11/3/10

pH.XLS

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

Service Request#(s): 4087 Run#: 223492

Stock#: 524-10191001 T.V=10ppm EXP: 3/1/11 Prep Run#:

CV/CCV#: 524-11011001 T.V=0.0579ppm EXP: 11/15/10 Conc. H_2SO_4 Lot#: EMD 49384 EXP: 11/20/14

Coloring Reagent Ref#: 524-11011002 EXP: 11/15/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.99992847
Absorbance @ 540 nm	0.000	0.010	0.055	0.112	

	Sample #	Sample Vol.(mL)	Dilution (pH ✓)		Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	ICB	10ml	—	✓	0.000	0.000	0.000	0.000638	<0.004
2	ICV 0.0579PPM		—	✓	0.000	0.066	0.066	0.0593	102%
3	MB		—	✓	0.000	0.000	0.000	0.000638	<0.004
4	LCS 0.040PPM		—	✓	0.000	0.043	0.043	0.0389	97%
5	4082-1.01		—	✓	0.004	0.005	0.001	0.00153	<0.004
6	-1.01 MS 0.05PPM		—	✓	0.004	0.060	0.056	0.0505	101%
7	-1.01 MSD		—	✓	0.004	0.060	0.056	0.0505	101% 0% RPD
8	-2.01		—	✓	0.000	0.000	0.000	0.000638	<0.004
9	-2.01 MS 0.03PPM		—	✓	0.000	0.033	0.033	0.0300	100%
10	-3.01		—	✓	0.000	0.002	0.002	0.00342	<0.004
11	-4.01		—	✓	0.000	0.002	0.002	0.00342	
12	-5.01		—	✓	0.006	0.006	0.000	0.000638	<LOD
13	CCV1 0.0579PPM		—	✓	0.000	0.064	0.064	0.0576	99%
	CCB1		—	✓	0.000	0.000	0.000	0.000638	<0.004
14	4082-6.01		—	✓	0.000	0.000	0.000		
15	-7.01		—	✓	0.000	0.000	0.000		
16	CCV2 0.0579PPM		—	✓	0.000	0.064	0.064	0.0576	99%
17	CCB2		—	✓	0.000	0.000	0.000	0.000638	<0.004

pH Requirement: Method 7196A (2 ± 0.5) * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-11011001 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of @1/10 ↑ 10 ml of sample (T.V.= 0.03ppm)

Comments:

Prepared By: Date/Time: 11/2/10 @1530

Analyzed By: Date/Time: 11/2/10 @1546

Reviewed By: Date: 11/3/10

Cr6LIQ.xls

4/8/09 SIG-04080901 ICV/LCV 1000PPM F FOR ICO3
SR PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F01052
EXP: 5/1/2010

4/8/09 SIG-04080902 ICV/CCV (ICO3) 1000PPM NO2
SR PURCHASED INORGANIC VENTURES ICNO21-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 SIG-04080903 NH3 FILLING SOLN
SR PURCHASED. THERMO SCIENTIFIC 951202
LOT # MT 1 P/N 70263-A04
EXP 4/8/10

4/9/09 SIG-04090901 0.1 N H2SO4
SR 5.6 ml Conc H2SO4 (EMD 47050; EXP: 9/13/10) TO 2L W/DI
EXP: 4/9/10

4/9/09 SIG-04090902 TSS-LCS T.V= 193 mg/L
SR 0.0193g S18-09160603 (EXP: 2010) TO 100 ml W/DI H2O
EXP: 4/10/09

4/9/09 SIG-04090903 1000 PPM F STANDARD
SR PURCHASED. ERA CAT # 050 125ml
LOT # 200109
EXP: 1/2011

4/9/09 SIG-04090904 ICV/CCV Cr-Lot Std T.V=115.8 PPM
SR PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 S19-11200901 MBTH SOLUTION FOR O3-AIR
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/4/14)
↑100ml w/DI + 0.5ml H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 S19-11200902 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑1L w/ DI
H_2O
EXP: 11/20/10

11/20/09 S19-11200903 AMMONIA pH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 S19-11200904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010-500mL
LOT 1905343
EXP: 5/2011

11/20/09 S19-11200905A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 S19-11230901 1000ppm SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H10627, EXP: 8/31/14) ↑100ml
w/DI H_2O
5/23/10

11/23/09 S19-11230902 1000 PPM SO_3 (ICV/CCV)
0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 S19-11230903 A, B, C, D pH REFERENCE
PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 S19-11240901 1000 PPM SO_4 Standard
PURCHASED CAT # ICC-006
LOT # K00794
EXP: 9/30/13

11/25/09 S19- ~~11/25~~ 11250901 (11/25/09) 0.1N H_2SO_4
5.6ml Conc H_2SO_4 (EMD 47050 EXP: 9/13/10)
EXP: ~~11/25~~ 9/13/10 (11/25/09)

11/30/09 S19- 11300901 Cr^{6+} Coloring Reagent
0.2500g Diphenylcarbohydrazide (EMD 47103[illegible]; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 47154D; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 S19- 11300902 25133 ppb Stock for O_3 in AIR
0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 S19- 11300903 25133 ppb ICV/CCV FOR O_3 in AIR
0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Aprroved By:
Initial: KL Date: 12/22/09

1/27/10 524-01271001 1000PPM SO_3 (STOCK)
Sa 0.1591g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 524-01271002 1000PPM SO_3 (ICV/CCV)
Sa 0.1607g Na_2SO_3 (Mallinckrodt H25469; EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr^{6+} Sol'n T.V = 0.579PPM
Sa 0.5ml 519-01090904 (115.8PPM; EXP: 12/2010) ↑ 100ml
w/ DI H_2O
EXP: 2/15/10

2/1/10 524-02011002 Cr^{6+} Coloring Reagent
Sa 0.2500g Diphenylcarbohydrazide (EMD ~~4703~~ 47103731 [Sa 2/1/10]
EXP: 1/30/13) ↑ 50 ml w/ Acetone (EMD 471540; EXP: 9/24/12)
EXP: 2/15/10

2/2/10 524-02021001 Cr^{6+} 1000PPM STOCK
Sa Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-03011001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-03011002 pH 7.000 Buffer
Purchased 500 ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-03011003 1000 PPM Cl (LCS)
Purchased 120 ml Cat # 1955-4
RICA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-03011004 NH3 Filling Sol'n
Purchased 60 ml Order 952302
Thermo Scientific LOT # MT1
P/N: 703613-A04
EXP: 3/1/11

3/2/10 SV
524-03021001 pH 10.000 buffer
Purchased 500 ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

524-10191001 10PPM Cr6+ Sol'n

10/19/10 SR 1.0ml S24-0202 1001 (1000PPM Cr6+; EXP: 3/1/11) ↑ 100ml w/ DI H2O
EXP: 3/1/11

10/19/10 SR 524-10191002 ICV/CCV Cr6+ T.V = 0.574PPM
0.5ml S19-0409090904 (T.V = 115.8 mg/L; EXP 12/2010)
↑ 100ml w/ DI
EXP: 11/2/10

10/19/10 SR 524-10191003 Cr6+ Coloring Reagent
0.2500g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)
EXP: 11/2/10

10/22/10 SR 524-1022 1001 25133ppb Stock 03

0.05 ml Pyridine-4-carboxaldehyde Alfa AESAR 10140598 ;Exp: 8/11/12) up to 500 ml w/ DI Water.

EXP: 11/5/10

10/22/10 SR 524-1022 1002 25133ppb ICV/CCV for 03

0.05 ml Pyridine-4-carboxaldehyde TCI IGINC ;Exp: 8/10/12) up to 500 ml w/ DI Water.

EXP 11/05/10

10/28/10
S24-10281002 1000 PPM SO3 ICV/CCV

0.1607 Na2SO3 (Mallinckrodt Lot #H25469; Exp: 8/11/14) up to 100 ml w/ DI Water.

EXP: 11/11/10

11/1/10
S24-11011001 ICV/CCV Cr^{6+} T.V = 0.579 PPM
0.5ml S19-04090904 (T.V=115.8 mg/L ; EXP: 12/2010)
↑ 100ml w/ DI
EXP: 11/15/10

11/1/10
S24-11011002 Cr^{6+} Coloring Reagent
0.2500g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 47154D; EXP: 9/24/12).
EXP: 11/15/10

LABORATORY REPORT

November 12, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL GW Mon. 4Q10 / G486090

Dear David:

Enclosed are the results of the samples submitted to our laboratory on November 1, 2010. For your reference, these analyses have been assigned our service request number P1004069.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle CAS Project No: P1004069
Project: JPL GW Mon. 4Q10 / G486090

CASE NARRATIVE

The samples were received intact under chain of custody on November 1, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Project ID: JPL GW Mon. 4Q10 / G486090
Service Request: P1004069

Date Received: 11/1/10
Time Received: 13:35

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-3-5	P1004069-001	Water	11/1/10	09:16	X
MW-3-4	P1004069-002	Water	11/1/10	10:06	X
MW-3-3	P1004069-003	Water	11/1/10	10:29	X
MW-3-2	P1004069-004	Water	11/1/10	10:50	X
MW-3-1	P1004069-005	Water	11/1/10	11:22	X
DUPE-04-4Q10	P1004069-006	Water	11/1/10	00:00	X
EB-09-11/01/10	P1004069-007	Water	11/1/10	11:07	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Columbia Analytical Services INC.
An Employee - Owned Company

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

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: P100 4069

CAS Contact:

Company Name & Address (Reporting Information)
BATTELLE
3990 OLD TOWN AVE., C-205
SAN DIEGO, CA 92110

Project Name: JPL GW MON. 4Q10

Project Number: G486090

Project Manager: DAVID CONNER

P.O. # / Billing Information: 214319 / BATTELLE ATTN: GERALD TOMPKINS 505 KING AVE. COLUMBUS, OH 43201

Phone: (619) 726-7311

Fax:

Email Address for Result Reporting:

Sampler (Print & Sign): CHRISTIE BRANDON

Analysis Method and/or Analytes

Preservative Code

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted) TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	0 Cr III (7196)	Remarks
MW-3-5		11/01/10	0916	W	1						X	
MW-3-4			1006		1						X	
MW-3-3			1029		1						X	
MW-3-2			1050		1						X	
MW-3-1			1122		1						X	
DUP-04-4Q10		11/01/10	—	W	1						X	DUPLICATE
EB-09-11/01/10		11/01/10	1107	W	1						X	EQUIPMENT BLANK

Preservative Key

0	None
1	HCL
2	HNO3
3	H2SO4
4	NaOH
5	Zn Acetate
6	Asc Acid
7	Other

Report Tier Levels - please select
Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge ____
Tier V - (client specified) ____
MRL required Yes / No
MDL / PQL / J required Yes / No
EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)		Date: 11/01/10	Time: 1500	Received by: (Signature)		Date: 11/1/10	Time: 1307
Relinquished by: (Signature)		Date: 11/1/10	Time: 1335	Received by: (Signature)		Date: 11/01/10	Time: 1335
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Date:	Time:

Cooler / Blank / Ice / No Ice
Temperature 6 °C

Client: Battelle **Service Request:** P1004069
Project: JPL GW Mon. 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1004069-001.01					
	7196A				
		11/1/10	1350	SMO / SSTAPLES	
		11/1/10	1446	In Lab / SANDERSON	
		11/1/10	1605	P-37 / SANDERSON	
P1004069-002.01					
	7196A				
		11/1/10	1350	SMO / SSTAPLES	
		11/1/10	1446	In Lab / SANDERSON	
		11/1/10	1605	P-37 / SANDERSON	
P1004069-003.01					
	7196A				
		11/1/10	1350	SMO / SSTAPLES	
		11/1/10	1446	In Lab / SANDERSON	
		11/1/10	1605	P-37 / SANDERSON	
P1004069-004.01					
	7196A				
		11/1/10	1350	SMO / SSTAPLES	
		11/1/10	1446	In Lab / SANDERSON	
		11/1/10	1605	P-37 / SANDERSON	
P1004069-005.01					
	7196A				
		11/1/10	1350	SMO / SSTAPLES	
		11/1/10	1446	In Lab / SANDERSON	
		11/1/10	1605	P-37 / SANDERSON	
P1004069-006.01					
	7196A				
		11/1/10	1350	SMO / SSTAPLES	
		11/1/10	1446	In Lab / SANDERSON	
		11/1/10	1605	P-37 / SANDERSON	
P1004069-007.01					
	7196A				
		11/1/10	1350	SMO / SSTAPLES	
		11/1/10	1446	In Lab / SANDERSON	
		11/1/10	1605	P-37 / SANDERSON	

Columbia Analytical Services™ 2655 Park Center Drive, Suite A, Simi Valley, CA 93065 | 805.526.7161 | www.caslab.com

Sample Acceptance Check Form

Client: Battelle Work order: P1004069

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 11/1/10 Date opened: 11/1/10 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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature _____ °C Blank Temperature 6 °C			
10	Was a **trip blank** received?	☐	☐	☒
	Trip blank supplied by CAS: _____			
11	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004069-001.01	125mL Plastic NP					
P1004069-002.01	125mL Plastic NP					
P1004069-003.01	125mL Plastic NP					
P1004069-004.01	125mL Plastic NP					
P1004069-005.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

Columbia Analytical Services INC
2655 Park Center Drive, Suite A, Simi Valley, CA 93065 | 805.526.7161 | www.caslab.com

Sample Acceptance Check Form

Client: Battelle Work order: P1004069

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 11/1/10 Date opened: 11/1/10 by: SSTAPLES

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004069-006.01	125mL Plastic NP					
P1004069-007.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);
Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL GW Mon. 4Q10
Project Number : G486090
Sample Matrix : WATER

Service Request : P1004069
Date Collected : 11/01/10
Date Received : 11/01/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-3-5	P1004069-001	0.010	0.004	1	NA	11/01/10 15:25	ND	
MW-3-4	P1004069-002	0.010	0.004	1	NA	11/01/10 15:25	ND	
MW-3-3	P1004069-003	0.010	0.004	1	NA	11/01/10 15:25	ND	
MW-3-2	P1004069-004	0.010	0.004	1	NA	11/01/10 15:25	ND	
MW-3-1	P1004069-005	0.010	0.004	1	NA	11/01/10 15:25	ND	
DUPE-04-4Q10	P1004069-006	0.010	0.004	1	NA	11/01/10 15:25	ND	
EB-09-11/01/10	P1004069-007	0.010	0.004	1	NA	11/01/10 15:25	ND	
Method Blank	P1004069-MB	0.010	0.004	1	NA	11/01/10 15:25	ND	

Approved By Karen Rya Date : 11/1/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL GW Mon. 4Q10 / G486090

Service Request: P1004069
Date Analyzed: 11/01/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: Karen Rya Date: 11/1/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL GW Mon. 4Q10 / G486090

Service Request: P1004069
Date Analyzed: 11/01/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0551	95	90-110
CCV1	0.0579	0.0569	98	90-110
CCV2	0.0579	0.0569	98	90-110

Approved By: Karen Rya Date: 11/1/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1004069
Project Name :	JPL GW Mon. 4Q10	**Date Collected :**	NA
Project Number :	G486090	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	11/01/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1004069-LCS	Basis :	NA
Test Notes :			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0371	93	90-109	

Approved By Karen Ryan Date : 11/1/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1004069
Project Name :	JPL GW Mon. 4Q10	**Date Collected :**	11/01/10
Project Number :	G486090	**Date Received :**	11/01/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	11/01/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name :	MW-3-5		Units :	mg/L (ppm)
Lab Code :	P1004069-001MS	P1004069-001DMS	Basis :	NA
Test Notes :				

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0389	0.0407	78	81	78-112	5	

Approved By Karen Ryan Date : 11/1/10

Report By:SAnderson

Columbia Analytical Services

pH Run Log

Service Request #(s): 4069

Time: 1130

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/2011
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-03011002	1/31/12
pH 10 Buffer	524-03021001	9/30/11

Slope	Prep.Run #
98.6%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled #)

Sample	#	pH	Temp. °C
pH 2.000	5	2.000	22.3°
pH 4.000		4.009	22.2°
pH 7.000		7.013	22.2°
pH 10.000		10.012	22.3°
TN-6.46 EXP: 11/09/2 Ref#: 519-11230903C		6.395 99%	22.1°
DI H2O		2.002	20.7°
pH 2.000		1.999	22.4°
TIME: 1450			
pH 2.000	5	2.011	22.3°
4069-1.01		1.847	12.8°
-2.01		1.835	13.9°
-3.01		1.848	14.4°
-4.01		1.979	14.7°
-5.01		2.055	15.1°
-6.01		2.086	15.0°
-7.01		1.766	14.9°
pH 2.000		1.993	21.9°

Sample	#	pH	Temp. °C
space not used			

pH Adjustments: ☑ **7196A**: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14
☐ **7199A**: Diluted NaOH ________ EXP: ________

Comments: ________________

Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 11/1/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: [signature] Date: 11/1/10

Reviewer: [signature] Date: 11/1/10

pH.XLS

Columbia Analytical Services™

Hexavalent Chromium (Liquids)

Method EPA 7196A

Service Request#(s): 4069 Run#: 223310

Stock#: 524-10191001 T.V=10 PPM EXP: 3/1/11 Prep Run#: —

CV/CCV#: 524-11011001 T.V=0.579 PPM EXP: 11/5/10 Conc. H_2SO_4 Lot#: EMD 49384 EXP: 11/20/14

Coloring Reagent Ref#: 524-11011002 EXP: 11/15/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.999465485
Absorbance @ 540 nm	0.000	0.010	0.052	0.111	

	Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	ICB	10ml	—	✓	0.000	0.000	0.000	0.00102	<0.004
2	ICV 0.0579PPM		—	✓	0.000	0.060	0.060	0.0551	95%
3	MB		—	✓	0.000	0.000	0.000	0.00102	<0.004
4	LCS 0.040PPM		—	✓	0.000	0.040	0.040	0.0371	93%
5	4069-1.01		—	✓	0.000	0.002	0.002	0.00283	<0.004
6	-1.01 MS 0.05PPM		—	✓	0.000	0.042	0.042	0.0389	78% } 50% RPD
7	-1.01 MSD		—	✓	0.000	0.044	0.044	0.0407	81% }
8	-2.01		—	✓	0.000	0.001	0.001	0.00193	<0.004
9	-3.01		—	✓	0.000	0.001	0.001	↓	↓
10	-4.01		—	✓	0.000	0.000	0.000	0.00102	
11	-5.01		—	✓	0.000	0.000	0.000	↓	
12	-5.01 VS 0.03PPM		—	✓	0.000	0.030	0.030	0.0281	94%
13	CCV1 0.0579PPM / CCB1		—	✓	0.000	0.062 / 0.000	0.062 / 0.000	0.0569 / 0.00103	98% / <0.004
14	4069-6.01		—	✓	0.000	0.002	0.002	0.00283	<0.004
15	-7.01		—	✓	0.000	0.000	0.000	0.00102	↓
16	CCV2 0.0579PPM		—	✓	0.000	0.062	0.062	0.0569	98%
17	CCB2		~	✓	0.000	0.000	0.000	0.00102	<0.004

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-11011001 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of @ 1/10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: Date/Time: 11/1/10 @1510

Analyzed By: Date/Time: 11/1/10 @1525

Reviewed By: Date: 11/1/10

Cr6LIQ.xls

4/8/09 SIG-04080901 ICV/LCV 1000PPM F FOR ICO3
SR PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F01052
EXP: 5/1/2010

4/8/09 SIG-04080902 ICV/CCV (ICO3) 1000PPM NO2
SR PURCHASED INORGANIC VENTURES ICNO21-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 SIG-04080903 NH3 FILLING SOLN
SR PURCHASED. THERMO SCIENTIFIC 951202
LOT # MT 1 P/N 70263-A04
EXP 4/8/10

4/9/09 SIG-04090901 0.1N H2SO4
SR 5.6 ml Conc H2SO4 (EMD 47050; EXP: 9/13/10) T 2L W/DI
EXP: 4/9/10

4/9/09 SIG-04090902 TSS-LCS T.V = 193 mg/L
SR 0.0193g S18-09160603 (EXP: 2010) T 100 ml W/ DI H2O
EXP: 4/10/09

4/9/09 SIG-04090903 1000 PPM F STANDARD
SR PURCHASED. ERA CAT # 050 125ml
LOT # 200109
EXP: 1/2011

4/9/09 SIG-04090904 ICV/CCV Cr-6 Std T.V = 115.8 PPM
SR PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 SIG-11200901 MBTH SOLUTION FOR O3-A1
0.5000g MBTH (ALDRICH LOT 54696EK; EXP: 8/A/14)
↑100mL w/DI + 0.5mL H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 SIG-11200902 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑1L w/ DI H_2O
EXP: 11/20/10

11/20/09 SIG-11200903 AMMONIA PH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 SIG-11200904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010 – 500mL
LOT 1905343
EXP: 5/2011

11/20/09 SIG-11200905 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 SIG-11230901 1000PPM SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H10627, EXP: 8/31/14) ↑100ml w/DI H_2O
5/23/10

11/23/09 SR — 519-1230902 — 1000 ppm SO_3 (ICV/CCV)
0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 SR — 519-1230903 A,B,C,D — pH REFERENCE
PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 SR — 519-1240901 — 1000 ppm SO_4 Standard
PURCHASED CAT # ICC-006
LOT # K607794
EXP: 9/30/13
SR 11/25/09

11/25/09 SR — 519-~~H25~~ 1250901 — 0.1N H_2SO_4
5.6ml conc H_2SO_4 (EMD 47050 EXP: 9/13/10)
EXP: ~~11/25~~ 9/13/10
SR 11/25/09

11/30/09 SR — 519-1300901 — Cr^{6+} Coloring Reagent
0.2500g diphenylcarbohydrazide (EMD) 47103ED; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 47154D; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 SR — 519-1300902 — 25133 ppb Stock for O_3 in Air
0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 SR — 519-1300903 — 25133 ppb ICV/CCV for O_3 in Air
0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: KL Date: 12/22/09

1/27/10 524-01271001 1000PPM SO_3 (STOCK)
0.1591 g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 524-01271002 1000 PPM SO_3 (ICV/CCV)
0.1607g Na_2SO_3 (Mallinckrodt H25469; EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr^{6+} Sol'n T.V = 0.579PPM
0.5ml 519-04090904 (115.8PPM; EXP: 12/2010) ↑ 100ml w/ DI H_2O
EXP: 2/15/10

2/1/10 524-02011002 Cr^{6+} Coloring Reagent
0.2500g Diphenylcarbohydrazide (EMD ~~4703~~ 47103721 EXP: 1/30/13) ↑ 50 ml w/ Acetone (EMD 47154D; EXP: 9/24/12)
EXP: 2/15/10

2/2/10 524-02021001 Cr^{6+} 1000 PPM STOCK
Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-03011001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-03011002 pH 7.000 Buffer
Purchased 500 ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-03011003 1000 PPM Cl (LCS)
Purchased 120 ml Cat # 1955-4
RICCA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-03011004 NH3 Filling Sol'n
Purchased 60 ml Order 95130 2
Thermo Scientific LOT # MT1
P/N: 703613-A04
EXP: 3/1/11

3/2/10 SV
524-03021001 pH 10.000 buffer
Purchased 500 ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

524-10191001 10PPM Cr6+ Soln

10/19/10 SR 1.0ml S24-0202 1001 (1000PPM Cr6+; EXP: 3/1/11) ↑ 100ml W/DI H2O
EXP: 3/1/11

10/19/10 SR 524-10191002 ICV/CCV Cr6+ T.V = 0.579PPM
0.5ml S19-0409090904 (T.V = 115.8 mg/L; EXP 12/2010)
↑ 100ml W/DI
EXP: 11/2/10

10/19/10 SR 524-10191003 Cr6+ Coloring Reagent
0.2500g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)
EXP: 11/2/10

10/22/10 SR 524-10221001 25133ppb Stock 03

0.05 ml Pyridine-4-carboxaldehyde Alfa AESAR 10140598 ;Exp: 8/11/12) up to 500 ml w/ DI Water.

EXP: 11/5/10

10/22/10 SR 524-10221002 25133ppb ICV/CCV Cr03

0.05 ml Pyridine-4-carboxaldehyde TCI IGINC ;Exp: 8/10/12) up to 500 ml w/ DI Water.

EXP 11/05/10

10/28/10 JV

S24-10281002 1000 PPM SO_3 ICV/CCV

0.1607 Na_2SO_3 (Mallinckrodt Lot #H25469; Exp: 8/11/14) up to 100 ml w/ DI Water.

EXP: 11/11/10

11/1/10 JV

S24-11011001 ICV/CCV Cr^{6+} T.V = 0.579 PPM

0.5 ml S19-04090904 (T.V = 115.8 mg/L ; EXP: 12/2010)

↑ 100 ml W/ DI

EXP: 11/15/10

11/1/10 JV

S24-11011002 Cr^{6+} Coloring Reagent

0.2500g 1,5-Diphenylcarbohydrazide (EMD 47703721; EXP: 1/30/13) ↑ 50 ml W/ Acetone (EMD 47154D; EXP: 9/24/12).

EXP: 11/15/10

LABORATORY REPORT

November 12, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL GW Mon 4Q10 / G486090

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 29, 2010. For your reference, these analyses have been assigned our service request number P1004049.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle
Project: JPL GW Mon 4Q10 / G486090

CAS Project No: P1004049

CASE NARRATIVE

The samples were received intact under chain of custody on October 29, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Project ID: JPL GW Mon 4Q10 / G486090
Service Request: P1004049

Date Received: 10/29/10
Time Received: 13:10

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-4-5	P1004049-001	Water	10/29/10	09:13	X
MW-4-4	P1004049-002	Water	10/29/10	09:42	X
MW-4-3	P1004049-003	Water	10/29/10	10:05	X
MW-4.2	P1004049-004	Water	10/29/10	10:28	X
MW-4-1	P1004049-005	Water	10/29/10	10:55	X
EB-08-10/29/10	P1004049-006	Water	10/29/10	10:46	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Columbia Analytical Services, Inc.
An Employee - Owned Company

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

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: P1004049

CAS Contact:

Analysis Method and/or Analytes

Company Name & Address (Reporting Information)	BATTELLE 3990 OLD TOWN AVE., C-205 SAN DIEGO, CA 92110
Project Name	SPL GW MON 4Q10
Project Number	G4B600
Project Manager	DAVID CONNER
P.O. # / Billing Information	214319 / BATTELLE ATTN: GERALD TOMPKINS 505 KING AVE. COLUMBUS, OH 43201
Phone	(619) 726-7311
Fax	
Email Address for Result Reporting	
Sampler (Print & Sign)	CHASE BROWN

Preservative Key
0 None
1 HCL
2 HNO3
3 H2SO4
4 NaOH
5 Zn Acetate
6 Asc Acid
7 Other

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted)	TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	Preservative Code: 0	Cr VI (7196)	Remarks
MW-4-5	1	10/29/10	0913	W	1							X		
MW-4-4	2		0942		2							X		MS/MSD
MW-4-3	3		1005		1							X		QC LEVEL IV
MW-4-2	4		1028		1							X		
MW-4-1	5		1055		1							X		
EB-08-10/29/10	6	10/29/10	1046	W	1							X		EQUIPMENT BLANK

Report Tier Levels - please select
Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge ____
Tier V - (client specified) ____
MRL required Yes / No
MDL / PQL / J required Yes / No
EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)		Date: 10/29/10	Time: 1230	Received by: (Signature)		Date: 10/29/10	Time: 1230
Relinquished by: (Signature)		Date: 10/29/10	Time: 1510	Received by: (Signature)		Date: 10/29/10	Time: 1510
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Date:	Time:

Cooler / Blank / Ice / No Ice
Temperature 1 °C

5 of 21

Client: Battelle **Service Request:** P1004049
Project: JPL GW Mon 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1004049-001.01					
	7196A				
		10/29/10	1427	SMO / SSTAPLES	
		10/29/10	1428	P-37 / SSTAPLES	
		10/29/10	1440	In Lab / SANDERSON	
		10/29/10	1624	P-37 / SANDERSON	
P1004049-002.01					
	7196A				
		10/29/10	1427	SMO / SSTAPLES	
		10/29/10	1428	P-37 / SSTAPLES	
		10/29/10	1440	In Lab / SANDERSON	
		10/29/10	1624	P-37 / SANDERSON	
P1004049-002.02					
		10/29/10	1428	SMO / SSTAPLES	
		10/29/10	1440	In Lab / SANDERSON	
		10/29/10	1624	P-37 / SANDERSON	
P1004049-003.01					
	7196A				
		10/29/10	1427	SMO / SSTAPLES	
		10/29/10	1428	P-37 / SSTAPLES	
		10/29/10	1440	In Lab / SANDERSON	
		10/29/10	1624	P-37 / SANDERSON	
P1004049-004.01					
	7196A				
		10/29/10	1427	SMO / SSTAPLES	
		10/29/10	1428	P-37 / SSTAPLES	
		10/29/10	1440	In Lab / SANDERSON	
		10/29/10	1624	P-37 / SANDERSON	
P1004049-005.01					
	7196A				
		10/29/10	1427	SMO / SSTAPLES	
		10/29/10	1428	P-37 / SSTAPLES	
		10/29/10	1440	In Lab / SANDERSON	
		10/29/10	1624	P-37 / SANDERSON	
P1004049-006.01					
	7196A				
		10/29/10	1427	SMO / SSTAPLES	
		10/29/10	1428	P-37 / SSTAPLES	
		10/29/10	1440	In Lab / SANDERSON	
		10/29/10	1624	P-37 / SANDERSON	

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Sample Acceptance Check Form

Client: Battelle Work order: P1004049

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/29/10 Date opened: 10/29/10 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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature _____ °C Blank Temperature 4 °C			
10	Was a **trip blank** received?	☐	☐	☒
	Trip blank supplied by CAS: _____			
11	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004049-001.01	125mL Plastic NP					
P1004049-002.01	125mL Plastic NP					
P1004049-002.02	125mL Plastic NP					
P1004049-003.01	125mL Plastic NP					
P1004049-004.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

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Sample Acceptance Check Form

Client: Battelle Work order: P1004049

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/29/10 Date opened: 10/29/10 by: SSTAPLES

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004049-005.01	125mL Plastic NP					
P1004049-006.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL GW Mon 4Q10
Project Number : G486090
Sample Matrix : WATER

Service Request : P1004049
Date Collected : 10/29/10
Date Received : 10/29/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-4-5	P1004049-001	0.010	0.004	1	NA	10/29/10 16:00	ND	
MW-4-4	P1004049-002	0.010	0.004	1	NA	10/29/10 16:00	ND	
MW-4-3	P1004049-003	0.010	0.004	1	NA	10/29/10 16:00	ND	
MW-4.2	P1004049-004	0.010	0.004	1	NA	10/29/10 16:00	ND	
MW-4-1	P1004049-005	0.010	0.004	1	NA	10/29/10 16:00	ND	
EB-08-10/29/10	P1004049-006	0.010	0.004	1	NA	10/29/10 16:00	ND	
Method Blank	P1004049-MB	0.010	0.004	1	NA	10/29/10 16:00	ND	

Approved By Kara Rya Date : 10/30/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Battelle	**Service Request:**	P1004049
Project:	JPL GW Mon 4Q10 / G486090	**Date Analyzed:**	10/29/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: Karen Rya Date: 10/30/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL GW Mon 4Q10 / G486090

Service Request: P1004049
Date Analyzed: 10/29/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0593	102	90-110
CCV1	0.0579	0.0575	99	90-110
CCV2	0.0579	0.0575	99	90-110

Approved By: Kara Rya Date: 10/30/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1004049
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	NA
Project Number :	G486090	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/29/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1004049-LCS	Basis :	NA
Test Notes :			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0396	99	90-109	

Approved By Karen Ryan Date : 10/30/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1004049
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	10/29/10
Project Number :	G486090	**Date Received :**	10/29/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/29/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-4-4
Lab Code : P1004049-002MS P1004049-002DMS
Test Notes :

Units : mg/L (ppm)
Basis : NA

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0521	0.0521	104	104	78-112	<1	

Approved By Karen Ryan Date : 10/30/10

Report By:SAnderson

pH Run Log

Service Request #(s): 4049

Time: 1430

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/2011
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-03611002	1/31/12
pH 10 Buffer	524-03021001	9/30/11

Slope	Prep.Run #
96.5%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # in column labeled #)

Sample	#	pH	Temp. °C	Sample	#	pH	Temp. °C
pH 2.000	5	2.018	22.8°				
pH 4.000		4.005	22.7°				
pH 7.000		6.995	22.9°				
pH 10.000		10.020	22.9°				
7.026.06 Exp: 1/2012 Ref#: 519-11230903C		6.390 99%	23.0°	space not used			
DI H2O		2.005	22.1°				
pH 2.000		2.005	22.7°				
4049-1.01		1.979	17.2°				
-2.01		1.896	17.3°				
-3.01		1.778	15.9°				
-4.01		2.052	17.2°				
-5.01		1.774	16.6°				
-6.01		1.817	16.9°				
pH 2.000		2.009	22.8°				

pH Adjustments: ☑ **7196A**: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14
☐ **7199A**: Diluted NaOH ________ EXP: ________

Comments: Note: All samples filtered prior to pH ADJUST

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 10/25/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: [signature] Date: 10/29/10

Reviewer: KR Date: 10/29/10

pH.XLS

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

Service Request#(s): 4049 Run#: 223087

Stock#: 524-1019100 1 T.V=10ppm EXP: 3/1/11 Prep Run#:

CV/CCV#: 524-1019100 2 T.V=0.579ppm EXP. 11/3/10 Conc. H_2SO_4 Lot#: EMD 49284 EXP: 11/20/14

Coloring Reagent Ref#: 524-1019003 EXP. 11/5/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.99998630
Absorbance @ 540 nm	0.000	0.011	0.056	0.111	

	Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	ICB *	10ml	—	✓	0.000	0.000	0.000	-0.0000435	<0.004
2	ICV 0.0579PPM		—	✓	0.000	0.066	0.066	0.0593	102%
3	MB		—	✓	0.000	0.001	0.001	0.00056	<0.004
4	LCS 0.04PPM		—	✓	0.000	0.044	0.044	0.0396	99%
5	4049-1.01		—	✓	0.000	0.002	0.002	0.00176	<0.004
6	-1.01 MS 0.03PPM		—	✓	0.000	0.032	0.032	0.0288	96%
7	-2.01		—	✓	0.000	0.000	0.000	-0.0000435	<0.004
8	-2.01 MS 0.05PPM		—	✓	0.000	0.058	0.058	0.0521	104% 1% RPD
9	-2.01 MSD		—	✓	0.000	0.058	0.058	0.0521	104%
10	-3.01		—	✓	0.000	0.002	0.002	0.00176	<0.004
11	-4.01		—	✓	0.000	0.000	0.000	-0.0000435	<0.004
12	-5.01		—	✓	0.000	0.002	0.002	0.00176	<0.004
13	CCV1 0.0579PPM		—	✓	0.000	0.064	0.064	0.0575	99%
14	CCB1		—	✓	0.000	0.000	0.000	-0.0000435	<0.004
15	4049-6.01		—	✓	0.000	0.000	0.000	↓	↓
16	CCV2 0.0579PPM		—	✓	0.000	0.064	0.064	0.0575	99%
17	CCB2	↓	—	✓	0.000	0.000	0.000	-0.0000435	<0.004

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-1019100 2 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-1019100 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.5 ml of @ to ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: Date/Time: 10/29/10 @ 1545

Analyzed By: Date/Time: 10/29/10 @ 1600

Reviewed By: Date: 10/29/10

4/8/09 SV — SIG-04080901 ICV/CCV 1000PPM F FOR ICQ3
PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F0105B
EXP: 5/1/2010

4/8/09 SV — SIG-04080902 ICV/CCV (ICQ3) 1000PPM NO2
PURCHASED INORGANIC VENTURES ICND21-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 SV — SIG-04080903 NH3 FILLING SOLN
PURCHASED. THERMO SCIENTIFIC 951202
LOT # MT1 P/N 70263-A04
EXP 4/8/10

4/9/09 SV — SIG-04090901 0.1N H2SO4
5.6 ml Conc H2SO4 (END 47050; EXP: 9/13/10) T 2L W/DI
EXP: 4/9/10

4/9/09 SV — SIG-04090902 TSS-LCS T.V = 193 mg/L
0.0193g S18-09160603 (EXP: 2010) T 100 ml W/DI H2O
EXP: 4/10/09

4/9/09 SV — SIG-04090903 1000 PPM F STANDARD
PURCHASED. ERA CAT # 050 125ML
LOT # 200109
EXP: 1/2011

4/9/09 SV — SIG-04090904 ICV/CCV Cr-6 Std T.V = 115.8 PPM
PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 SIG-11200901 MBTH SOLUTION FOR O3-A1
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/31/14)
↑100mL W/DI + 0.3mL H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 SIG-11200902 2N NaOH
2.00g NaOH (EMD 47032713; EXP: 10/11/12) ↑1L w/ DI H_2O
EXP: 11/2010

11/20/09 SIG-11200903 AMMONIA PH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 SIG-11200904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010 - 500mL
LOT 1905343
EXP: 5/2011

11/20/09 SIG-11200905 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 SIG-11230901 1000PPM SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H10627, EXP: 8/31/14) ↑100mL
W/DI H_2O
5/23/10

11/23/09 SIG-1123090Z 1000 ppm SO_3 (ICV/CCV)
JR 0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 SIG-1123090 3 A,B,C,D pH REFERENCE
JR PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 SIG-1124090 1 1000 ppm SO_4 Standard
JR PURCHASED CAT # ICC-006
LOT # K007794
EXP: 9/30/13

SR 11/25/09
11/25/09 SIG-~~H/25~~ 1125090 1 0.1N H_2SO_4
~~5~~ml conc H_2SO_4 (EMD 47050 EXP: 9/13/10)
EXP: ~~H/25~~ 9/13/10
SR 11/25/09

11/30/09 SIG-1130090 1 Cr^{6+} Coloring Reagent
JR 0.2500g diphenylcarbohydrazide (EMD) 47103ED; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 47154D; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 SIG-1130090 2 25133 ppb Stock for O_3 in Air
JR 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 SIG-1130090 3 25133 ppb ICV/CCV for O_3 in Air
JR 0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: KL Date: 12/22/09

1/27/10 524-0127001 10000PPM SO_3 (STOCK)
JR 0.1541 g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14) ↑ 100ml W/ DI H_2O
EXP: 7/27/10

1/27/10 524-0127002 1000PPM SO_3 (ICV/CCV)
JR 0.1607g Na_2SO_3 (Mallinckrodt H25469; EXP: 8/11/14) ↑ 100ml W/ DI H_2O
EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr^{6+} Sol'n T.V = 0.579PPM
JR 0.5ml 519-04090904 (115.8 PPM; EXP: 12/2010) ↑ 100ml W/ DI H_2O
EXP: 2/15/10

2/1/10 524-02011002 Cr^{6+} Coloring Reagent
JR 0.2500g Diphenylcarbohydrazide (EMD ~~47103731~~ 2/1/10 EXP: 1/30/13) ↑ 50 ml W/Acetone (EMD 47154D; EXP: 9/24/12
EXP: 2/15/10

2/2/10 524-02021001 Cr^{6+} 1000 PPM STOCK
JR Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-03011001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-03011002 pH 7.000 Buffer
Purchased 500 ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-03011003 1000 PPM Cl (LCS)
Purchased 120 ml Cat # 1955-4
RICCA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-03011004 NH3 Filling Sol'n
Purchased 60 ml Orion 951202
Thermo Scientific LOT # MT1
P/N: 702613-A04
EXP: 3/1/11

3/2/10 SV
524-03021001 pH 10.000 buffer
Purchased 500 ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

524-10191001 10ppm Cr6+ Soln

10/19/10 1.0ml 524-02021001 (1000ppm Cr6+; EXP: 3/1/11) ↑ 100ml w/DI H2O

EXP: 3/1/11

10/19/10 524-10191002 ICV/CCV Cr6+ T.V = 0.579ppm

0.5ml 519-04090904 (T.V = 115.8 mg/L; EXP 12/2010) ↑ 100ml w/DI

EXP: 11/2/10

10/19/10 524-10191003 Cr6+ Coloring Reagent

0.2500g 1,5-Diphenylcarbohydrazide (EMD 4710372I; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)

EXP: 11/2/10

LABORATORY REPORT

November 11, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL GW Mon. 4Q10 / G486090

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 28, 2010. For your reference, these analyses have been assigned our service request number P1004031.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle CAS Project No: P1004031
Project: JPL GW Mon. 4Q10 / G486090

CASE NARRATIVE

The samples were received intact under chain of custody on October 28, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Project ID: JPL GW Mon. 4Q10 / G486090
Service Request: P1004031

Date Received: 10/28/10
Time Received: 12:45

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-22-5	P1004031-001	Water	10/27/10	08:25	X
MW-22-4	P1004031-002	Water	10/27/10	08:47	X
MW-22-3	P1004031-003	Water	10/27/10	09:11	X
MW-22-2	P1004031-004	Water	10/27/10	09:47	X
MW-22-1	P1004031-005	Water	10/27/10	10:13	X
DUPE-03-4Q10	P1004031-006	Water	10/27/10	00:00	X
EB-07-10/28/10	P1004031-007	Water	10/27/10	10:04	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Page 1 of 1

Columbia Analytical Services INC.
An Employee - Owned Company

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

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.: P1004031

CAS Contact:

Company Name & Address (Reporting Information)
BATTELLE
3990 OLD TOWN AVE., C-205
SAN DIEGO, CA 92110

Project Name: JPL GW MON. 4Q10

Project Number: 64486090

Project Manager: DAVID CONNER

P.O. # / Billing Information: 214319 / BATTELLE
ATTN: GERALD TOMPKINS
505 KING AVE.
COLUMBUS, OH 43201

Phone: (619) 726-7311

Fax:

Email Address for Result Reporting:

Sampler (Print & Sign): CLAUDE BAGGOON

Analysis Method and/or Analytes

Preservative Code

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted)	TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	0	Remarks
MW-22-5	1	10/28/10	0825	W	1							X	
MW-22-4	2		0847		1							X	
MW-22-3	3		0911		1							X	
MW-22-2	4		0947		1							X	
MW-22-1	5		1013		1							X	
DUPE-03-4Q10	6		—		1							X	DUPLICATE
EB-07-10/28/10	7	10/28/10	1004	W	1							X	EQUIPMENT BLANK

CrVI (7196)

Preservative Key

0	None
1	HCL
2	HNO3
3	H2SO4
4	NaOH
5	Zn Acetate
6	Asc Acid
7	Other

Report Tier Levels - please select

Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge ____
Tier V - (client specified) ____

MRL required Yes / No
MDL / PQL / J required Yes / No

EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)		Date: 10/28/10	Time: 1200	Received by: (Signature)		Date: 10/28/10	Time: 1200
Relinquished by: (Signature)		Date: 10/28/10	Time: 1245	Received by: (Signature)		Date: 10/28/10	Time: 1245
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Date:	Time:

Cooler / Blank / Ice / No Ice

Temperature 3.0 °C

5 of 21

Client: Battelle **Service Request:** P1004031
Project: JPL GW Mon. 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1004031-001.01					
	7196A				
		10/28/10	1303	SMO / MZAMORA	
		10/28/10	1304	P-37 / MZAMORA	
		10/28/10	1409	In Lab / SANDERSON	
		10/28/10	1521	P-37 / SANDERSON	
P1004031-002.01					
	7196A				
		10/28/10	1303	SMO / MZAMORA	
		10/28/10	1304	P-37 / MZAMORA	
		10/28/10	1409	In Lab / SANDERSON	
		10/28/10	1521	P-37 / SANDERSON	
P1004031-003.01					
	7196A				
		10/28/10	1303	SMO / MZAMORA	
		10/28/10	1304	P-37 / MZAMORA	
		10/28/10	1409	In Lab / SANDERSON	
		10/28/10	1521	P-37 / SANDERSON	
P1004031-004.01					
	7196A				
		10/28/10	1303	SMO / MZAMORA	
		10/28/10	1304	P-37 / MZAMORA	
		10/28/10	1409	In Lab / SANDERSON	
		10/28/10	1521	P-37 / SANDERSON	
P1004031-005.01					
	7196A				
		10/28/10	1303	SMO / MZAMORA	
		10/28/10	1304	P-37 / MZAMORA	
		10/28/10	1409	In Lab / SANDERSON	
		10/28/10	1521	P-37 / SANDERSON	
P1004031-006.01					
	7196A				
		10/28/10	1303	SMO / MZAMORA	
		10/28/10	1304	P-37 / MZAMORA	
		10/28/10	1410	In Lab / SANDERSON	
		10/28/10	1521	P-37 / SANDERSON	
P1004031-007.01					
	7196A				
		10/28/10	1303	SMO / MZAMORA	
		10/28/10	1304	P-37 / MZAMORA	
		10/28/10	1410	In Lab / SANDERSON	
		10/28/10	1521	P-37 / SANDERSON	

Columbia Analytical Services™ 2655 Park Center Drive, Suite A, Simi Valley, CA 93065 | 805.526.7161 | www.caslab.com

Sample Acceptance Check Form

Client: Battelle Work order: P1004031

Project: JPL GW Mon. 4Q10 / G486090

Sample(s) received on: 10/28/10 Date opened: 10/28/10 by: MZAMORA

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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature _____ °C Blank Temperature 3 °C			
10	Was a **trip blank** received?	☐	☐	☒
	Trip blank supplied by CAS: _____			
11	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004031-001.01	125mL Plastic NP					
P1004031-002.01	125mL Plastic NP					
P1004031-003.01	125mL Plastic NP					
P1004031-004.01	125mL Plastic NP					
P1004031-005.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): _____

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

Sample Acceptance Check Form

Client: Battelle Work order: P1004031

Project: JPL GW Mon. 4Q10 / G486090

Sample(s) received on: 10/28/10 Date opened: 10/28/10 by: MZAMORA

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004031-006.01	125mL Plastic NP					
P1004031-007.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);
Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL GW Mon. 4Q10
Project Number : G486090
Sample Matrix : WATER

Service Request : P1004031
Date Collected : 10/27/10
Date Received : 10/28/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-22-5	P1004031-001	0.010	0.004	1	NA	10/28/10 14:40	ND	
MW-22-4	P1004031-002	0.010	0.004	1	NA	10/28/10 14:40	ND	
MW-22-3	P1004031-003	0.010	0.004	1	NA	10/28/10 14:40	ND	
MW-22-2	P1004031-004	0.010	0.004	1	NA	10/28/10 14:40	ND	
MW-22-1	P1004031-005	0.010	0.004	1	NA	10/28/10 14:40	ND	
DUPE-03-4Q10	P1004031-006	0.010	0.004	1	NA	10/28/10 14:40	ND	
EB-07-10/28/10	P1004031-007	0.010	0.004	1	NA	10/28/10 14:40	ND	
Method Blank	P1004031-MB	0.010	0.004	1	NA	10/28/10 14:40	ND	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Battelle	**Service Request:**	P1004031
Project:	JPL GW Mon 4Q10 / G486090	**Date Analyzed:**	10/28/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: Karen Rya Date: 10/28/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL GW Mon 4Q10 / G486090

Service Request: P1004031
Date Analyzed: 10/28/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0587	101	90-110
CCV1	0.0579	0.0569	98	90-110
CCV2	0.0579	0.0569	98	90-110

Approved By: Karen Ryan Date: 10/28/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1004031
Project Name :	JPL GW Mon. 4Q10	**Date Collected :**	NA
Project Number :	G486090	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/28/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1004031-LCS	Basis :	NA

Test Notes :

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0398	100	90-109	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1004031
Project Name :	JPL GW Mon. 4Q10	**Date Collected :**	10/27/10
Project Number :	G486090	**Date Received :**	10/28/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/28/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-22-5
Lab Code : P1004031-001MS P1004031-001DMS
Test Notes :

Units : mg/L (ppm)
Basis : NA

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0533	0.0524	107	105	78-112	2	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

Columbia Analytical Services

pH Run Log

Service Request #(s): 4031

Time: 0850

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/2011
pH 4 Buffer	524-0301/1001	8/31/11
pH 7 Buffer	524-0301/1002	11/31/12
pH 10 Buffer	524-0302/1001	9/30/11

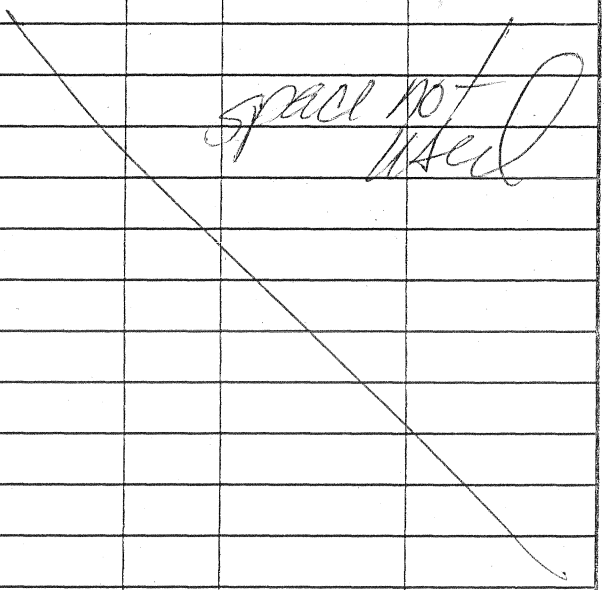
Slope	Prep.Run #
97.1	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled #)

Sample	#	pH	Temp. °C
pH 2.000	5	2.002	22.5°
pH 4.000		3.987	22.2°
pH 7.000		6.991	22.2°
pH 10.000		9.991	22.3°
Ref#: TH-6.46 Exp:1/2012 519-11230930		6.376	22.4°
DI H2O		2.044	21.4°
pH 2.000		2.000	22.5°
TIME:	1400		
pH 2.000	5	2.007	21.3°
HA31-1.01	—	2.007	14.3°
-2.01		1.947	13.6°
-3.01		1.852	14.2°
-4.01		2.035	14.2°
-5.01		1.883	14.7°
-6.01		1.842	14.4°
-7.01		1.829	15.4°
pH 2.000		2.021	21.1°

Sample	#	pH	Temp. °C



pH Adjustments: ☒ **7196A**: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14

☐ **7199A**: Diluted NaOH _____ EXP: _____

Comments: _____

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 10/25/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: _____ Date: 10/28/10

Reviewer: KR Date: 10/28/10

pH.XLS

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

Service Request#(s): 4031 Run#: 222834

Stock#: S24-10191001 T.V=100PPM EXP: 3/6/11 Prep Run#:

ICV/CCV#: S24-10191002 T.V=0.0579PPM EXP: 11/7/10 Conc. H_2SO_4 Lot#: EMD 45284 EXP: 11/20/14

Coloring Reagent Ref#: S24-10191003 EXP: 4/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.99998598
Absorbance @ 540 nm	0.000	0.011	0.055	0.111	

	Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	ICB	10ml	—	✓	0.000	0.000	0.000	0.000124	<0.004
2	ICV 0.0579PPM	—	—	✓	0.000	0.065	0.065	0.0587	101%
3	MB		—	✓	0.000	0.000	0.000	0.000124	<0.004
4	LCS 0.040PPM		—	✓	0.000	0.044	0.044	0.0398	100%
5	4031-1.01		—	✓	0.000	0.002	0.002	0.00193	<0.004
6	-1.01 MS 0.05PPM		—	✓	0.000	0.059	0.059	0.0533	107% 2%
7	-1.01 MSD		—	✓	0.000	0.058	0.058	0.0524	105% 2%
8	-2.01		—	✓	0.000	0.002	0.002	0.00193	<0.004
9	-2.01 MS 0.03PPM		—	✓	0.000	0.035	0.035	0.0317	106%
10	-3.01		—	✓	0.000	0.002	0.002	0.00193	<0.004
11	-4.01		—	✓	0.001	0.002	0.001	0.00102	<0.004
12	-5.01		—	✓	0.002	0.004	0.002	0.00193	<0.004
13	CCV1 0.0579PPM / CCB1		—	✓	0.000 / 0.000	0.063 / 0.000	0.063 / 0.000	0.0569 / 0.000124	98% / <0.004
14	4031-6.01		—	✓	0.000	0.001	0.001	0.00102	
15	-7.01		—	✓	0.000	0.000	0.000	0.000124	
16	CCV2 0.0579PPM		—	✓	0.000	0.063	0.063	0.0569	98%
17	CCB2		—	✓	0.000	0.000	0.000	0.000124	<0.004

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of S24-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579 ppm)

MS/MSD spiked with 0.05 ml of S24-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ____ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of ✓ @1/10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: Date/Time: 10/28/10 @1425

Analyzed By: Date/Time: 10/28/10 @1440

Reviewed By: KR Date: 10/28/10

Cr6LIQ.xls

4/8/09 SIG-04080901 ICV/CCV 1000PPM F FOR ICC3
SV PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F01052
EXP: 5/1/2010

4/8/09 SIG-04080902 ICV/CCV (ICC3) 1000PPM NO_2
SV PURCHASED INORGANIC VENTURES ICND21-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 SIG-04080903 NH_3 FILLING SOLN
SV PURCHASED. THERMO SCIENTIFIC 95202
LOT # MT1 P/N 70263-A04
EXP 4/8/10

4/9/09 SIG-04090901 0.1N H_2SO_4
SV 5.6 ml Conc H_2SO_4 (EMD 47050; EXP: 9/13/10) T 2L w/ DI
EXP: 4/9/10

4/9/09 SIG-04090902 TSS-LCS T.V = 193 mg/L
SV 0.0193g S18-09160603 (EXP: 2010) T 100 ml w/ DI H_2O
EXP: 4/10/09

4/9/09 SIG-04090903 1000 PPM F STANDARD
SV PURCHASED. ERA CAT # 050 125ml
LOT # 200109
EXP: 1/2011

4/9/09 SIG-04090904 ICV/CCV 2nd Std T.V = 115.8 PPM
SV PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 SIG-11200901 MBTH SOLUTION FOR O3-AIR
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/14) T 100 mL w/ DI + 0.5 mL H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 SIG-11200902 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) T 1L w/ DI H_2O
EXP: 11/2010

11/20/09 SIG-11200903 AMMONIA PH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 SIG-11200904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010 - 500mL
LOT 1905343
EXP: 5/2011

11/20/09 SIG-11200905 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 SIG-11230901 1000PPM SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H10627, exp: 8/31/14) T 100 mL w/ DI H_2O
5/23/10

11/23/09 S19-11230902 1000 PPM SO_3 (ICV/CCV)
[initials] 0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑100ml w/DI
EXP: 5/23/10

11/23/09 S19-11230903 A,B,C,D pH REFERENCE
[initials] PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 S19-11240901 1000 PPM SO_4 Standard
[initials] PURCHASED CAT # ICC-006
LOT # K00794
EXP: 9/30/13

11/25/09 S19- ~~11/25~~ 11250901 (correction initialed 11/25/09) 0.1N H_2SO_4
[initials] 5.6ml Conc H_2SO_4 (EMD 47050 EXP: 9/13/10)
EXP: ~~11/25~~ 9/13/10 (correction initialed 11/25/09)

11/30/09 S19- 11300901 Cr^{6+} Coloring Reagent
[initials] 0.2500g Diphenylcarbohydrazide (EMD 47103E01; EXP: 1/30/13) ↑50ml w/ Acetone (EMD 47154D; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 S19- 11300902 25133 ppb Stock for O_3 in AIR
[initials] 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑500ml deionized H_2O
EXP: 12/14/09

11/30/09 S19-11300903 25133 ppb ICV/CCV for O_3 in AIR
[initials] 0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑500ml W/DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: KL Date: 12/22/09

1/27/10 524-01271001 1000PPM SO_3 (STOCK)
0.1591 g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 524-01271002 1000 PPM SO_3 (ICV/CCV)
0.1607g Na_2SO_3 (Mallinckrodt H25469, EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr^{6+} Soln T.V = 0.579PPM
0.5ml 519-04090904 (115.8PPM; EXP: 12/2010) ↑ 100ml w/ DI H_2O
EXP: 2/15/10

2/1/10 524-02011002 Cr^{6+} Coloring Reagent
0.2500g Diphenylcarbohydrazide (EMD ~~4710~~ 47103721 EXP: 1/30/13) ↑ 50 ml w/Acetone (EMD 47154D; EXP: 9/24/12)
EXP: 2/15/10

2/2/10 524-02021001 Cr^{6+} 1000 PPM STOCK
Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-0301001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-0301002 pH 7.000 Buffer
Purchased 500ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-0301003 1000 PPM Cl (LCS)
Purchased 120ml Cat # 1955-4
RICCA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-0301004 NH3 Filling Sol'n
Purchased 60ml Orion 951202
Thermo Scientific LOT # MT1
P/N: 703613-A04
EXP: 3/1/11

3/2/10 SV
524-0302001 pH 10.000 buffer
Purchased 500ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

S24-10191001 10ppm Cr^{6+} S0/1

10/19/10 1.0ml S24-02021001 ($1000ppm\ Cr^{6+}$; EXP: 3/1/11) ↑ 100ml W/DI H_2O
EXP: 3/1/11

10/19/10 S24-10191002 ICV/CCV Cr^{6+} T.V = 0.579ppm
0.5ml S19-04090904 (T.V = 115.8 mg/L; EXP 12/2010)
↑ 100ml W/DI
EXP: 11/2/10

10/19/10 S24-10191003 Cr^{6+} Coloring Reagent
0.2500g 1,5-Diphenylcarbohydrazide (EMD 4710372I; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)
EXP: 11/2/10

LABORATORY REPORT

November 10, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL GW Mon 4Q10 / G486090

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 27, 2010. For your reference, these analyses have been assigned our service request number P1004004.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle CAS Project No: P1004004
Project: JPL GW Mon 4Q10 / G486090

CASE NARRATIVE

The samples were received intact under chain of custody on October 27, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Project ID: JPL GW Mon 4Q10 / G486090
Service Request: P1004004

Date Received: 10/27/10
Time Received: 13:25

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-11-5	P1004004-001	Water	10/27/10	07:32	X
MW-11-4	P1004004-002	Water	10/27/10	08:01	X
MW-11-3	P1004004-003	Water	10/27/10	08:27	X
MW-11-2	P1004004-004	Water	10/27/10	08:50	X
MW-11-1	P1004004-005	Water	10/27/10	09:17	X
EB-06-10/27/10	P1004004-006	Water	10/27/10	09:05	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Columbia Analytical Services INC.
An Employee - Owned Company

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

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.: P1004004

CAS Contact:

Company Name & Address (Reporting Information)
BATTELLE
3990 OLD TOWN AVE., C-205
SAN DIEGO, CA 92110

Project Name: SPL GW MON 4Q10

Project Number: G-486090

Project Manager: DAVID CONNEW

P.O. # / Billing Information: 214319 / BATTELLE ATTN: GERALD TOMPKINS 505 KING AVE. COLUMBUS, OH 43201

Phone: (619) 726-7311

Fax:

Email Address for Result Reporting:

Sampler (Print & Sign): CHASE BRODON

Analysis Method and/or Analytes

Preservative Code

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted)	TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	0												Remarks
												Cr VI (7196)												
MW-11-5	1	10/27/10	0732	W	1							X												
MW-11-4	2		0801		1							X												QC LEVEL IV
MW-11-3	3		0827		1							X												
MW-11-2	4		0850		1							X												
MW-11-1	5		0917		1							X												
EB-06-10/27/10	6	10/27/10	0905	W	1							X												EQUIPMENT BLANK

Preservative Key

0	None
1	HCL
2	HNO3
3	H2SO4
4	NaOH
5	Zn Acetate
6	Asc Acid
7	Other

Report Tier Levels - please select

Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge ____
Tier V - (client specified) ____
MRL required Yes / No
MDL / PQL / J required Yes / No
EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)		Date: 10/27/10	Time: 1100	Received by: (Signature)		Date: 10/27/10	Time: 1100
Relinquished by: (Signature)		Date: 10/27/10	Time: 1325	Received by: (Signature)		Date: 10/27/10	Time: 1325
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Date:	Time:

Cooler / Blank / Ice / No Ice
Temperature 3°C °C

Client: Battelle **Service Request:** P1004004
Project: JPL GW Mon 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1004004-001.01					
	7196A				
		10/27/10	1359	SMO / MZAMORA	
		10/27/10	1359	P-37 / MZAMORA	
		10/27/10	1416	In Lab / SANDERSON	
		10/28/10	1522	P-37 / SANDERSON	
P1004004-002.01					
	7196A				
		10/27/10	1359	SMO / MZAMORA	
		10/27/10	1359	P-37 / MZAMORA	
		10/27/10	1416	In Lab / SANDERSON	
		10/28/10	1522	P-37 / SANDERSON	
P1004004-003.01					
	7196A				
		10/27/10	1359	SMO / MZAMORA	
		10/27/10	1359	P-37 / MZAMORA	
		10/27/10	1416	In Lab / SANDERSON	
		10/28/10	1522	P-37 / SANDERSON	
P1004004-004.01					
	7196A				
		10/27/10	1359	SMO / MZAMORA	
		10/27/10	1359	P-37 / MZAMORA	
		10/27/10	1416	In Lab / SANDERSON	
		10/28/10	1522	P-37 / SANDERSON	
P1004004-005.01					
	7196A				
		10/27/10	1359	SMO / MZAMORA	
		10/27/10	1359	P-37 / MZAMORA	
		10/27/10	1416	In Lab / SANDERSON	
		10/28/10	1522	P-37 / SANDERSON	
P1004004-006.01					
	7196A				
		10/27/10	1359	SMO / MZAMORA	
		10/27/10	1359	P-37 / MZAMORA	
		10/27/10	1415	In Lab / SANDERSON	
		10/28/10	1522	P-37 / SANDERSON	

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Sample Acceptance Check Form

Client: Battelle Work order: P1004004

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/27/10 Date opened: 10/27/10 by: MZAMORA

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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature _____ °C Blank Temperature 3 °C			
10	Was a **trip blank** received?	☐	☒	☐
	Trip blank supplied by CAS: _____			
11	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004004-001.01	125mL Plastic NP					
P1004004-002.01	125mL Plastic NP					
P1004004-003.01	125mL Plastic NP					
P1004004-004.01	125mL Plastic NP					
P1004004-005.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): _____

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

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Sample Acceptance Check Form

Client: Battelle Work order: P1004004

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/27/10 Date opened: 10/27/10 by: MZAMORA

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004004-006.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL GW Mon 4Q10
Project Number : G486090
Sample Matrix : WATER

Service Request : P1004004
Date Collected : 10/27/10
Date Received : 10/27/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-11-5	P1004004-001	0.010	0.004	1	NA	10/27/10 14:55	ND	
MW-11-4	P1004004-002	0.010	0.004	1	NA	10/27/10 14:55	ND	
MW-11-3	P1004004-003	0.010	0.004	1	NA	10/27/10 14:55	ND	
MW-11-2	P1004004-004	0.010	0.004	1	NA	10/27/10 14:55	ND	
MW-11-1	P1004004-005	0.010	0.004	1	NA	10/27/10 14:55	ND	
EB-06-10/27/10	P1004004-006	0.010	0.004	1	NA	10/27/10 14:55	ND	
Method Blank	P1004004-MB	0.010	0.004	1	NA	10/27/10 12:20	ND	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Battelle	**Service Request:**	P1004004
Project:	JPL GW Mon 4Q10 / G486090	**Date Analyzed:**	10/27/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND
CCB3	0.010	0.004	ND

Approved By: Karen Ryan Date: 10/28/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL GW Mon 4Q10 / G486090

Service Request: P1004004
Date Analyzed: 10/27/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0601	104	90-110
CCV1	0.0579	0.0601	104	90-110
CCV2	0.0579	0.0601	104	90-110
CCV3	0.0579	0.0591	102	90-110

Approved By: Karen Ryan Date: 10/28/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1004004
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	NA
Project Number :	G486090	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/27/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1004004-LCS	Basis :	NA
Test Notes :			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0405	101	90-109	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1004004
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	10/27/10
Project Number :	G486090	**Date Received :**	10/27/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/27/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-11-5
Lab Code : P1004004-001MS P1004004-001DMS
Test Notes :

Units : mg/L (ppm)
Basis : NA

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0503	0.0513	101	103	78-112	<1	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

Columbia Analytical Services™

pH Run Log

Service Request #(s): 3998 4004

Time: 0930

Sample	VWR lot #	Exp.
pH 2 Buffer	SG-1120904	5/2011
pH 4 Buffer	S24-0311001	8/31/11
pH 7 Buffer	S24-0301002	11/31/12
pH 10 Buffer	S24-0321001	9/30/11

Slope	Prep.Run #
97.3%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # in column labeled #)

Sample	#	pH	Temp. °C
pH 2.000	5	1.989	22.7°
pH 4.000	↓	4.000	22.6°
pH 7.000		6.997	22.6°
pH 10.000		10.006	22.5°
Ref#: SG-112309BC		6.388	22.7°
DI H2O		2.004	20.8°
pH 2.000	↓	1.990	22.7°
TIME:			
pH 2.000	5	2.003	22.9°
3998-1.01	↓	1.917	19.1°
↓ -2.01		2.033	18.6°
pH 2.000	↓	2.004	23.0°
TIME: 1425			
pH 2.000	5	2.005	23.1°
4004-1.01	↓	2.086	10.7°
↓ -2.01		1.993	10.4°
↓ -3.01	↓	1.831	11.3°

Sample	#	pH	Temp. °C
4004-4.01	5	2.041	11.0°
↓ -5.01	↓	1.895	11.9°
↓ 6.01		2.089	12.4°
pH 2.000	↓	2.012	22.4°

pH Adjustments: ☒ **7196A**: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14

☐ **7199A**: Diluted NaOH _____ EXP: _____

Comments: _____

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 10/25/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: _____ Date: 10/27/10

Reviewer: KR Date: 10/27/10

pH.XLS

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

Service Request#(s): 3998 4004 Run#: 222611

Stock#: 524-10191001 T.V=10ppm EXP: 3/1/11 Prep Run#:

CV/CCV#: 524-10191002 T.V=0.579ppm EXP: 11/5/10 Conc. H_2SO_4 Lot#: EMD 49284 EXP ~~11/2/10~~ 11/20/14 & 10/27/10

Coloring Reagent Ref#: 524-10191003 EXP: 10/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.99994428
Absorbance @ 540 nm	0.000	0.010	0.050	0.102	

	Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	ICB	10ml	—	✓	0.000	0.000	0.000	0.000269	<0.004
2	ICV 0.0579ppm		—	✓	0.000	0.061	0.061	0.0601	104%
3	MB		—	✓	0.000	0.000	0.000	0.000269	<0.004
4	LCS 0.040ppm		—	✓	0.000	0.041	0.041	0.0405	101%
5	3998-1.01		—	✓	0.000	0.000	0.000	0.000269	<0.004
6	-1.01 MS 0.05ppm		—	✓	0.000	0.052	0.052	0.0513	103%
7	-1.01 MSD J		—	✓	0.000	0.052	0.052	0.0513	103% 0%
8	-2.01		—	✓	0.000	0.033	0.033	0.0326	109%
9	-2.01 VS 0.03ppm		—	✓	0.000	0.000	0.000	0.000269	<0.004
10	CCV1 0.0579ppm		—	✓	0.000	0.061	0.061	0.0601	104%
11	CCB1		—	✓	0.000	0.000	0.000	0.000269	<0.004
12	CCB2 TIME: @1455		—	✓	0.000	0.000	0.000	0.000269	J
13	CCB2 0.0579ppm		—	✓	0.000	0.061	0.061	0.0601	104%
14	4004-1.01		—	✓	0.002	0.004	0.002	0.00223	<0.004
15	-1.01 MS 0.05ppm		—	✓	0.002	0.053	0.051	0.0503	101%
16	-1.01 MSD J		—	✓	0.002	0.054	0.052	0.0513	103% 2%
17	-2.01		—	✓	0.000	0.000	0.000	0.000269	<0.004

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of _____ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of @ 10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments: _____

Prepared By: _____ Date/Time: 10/27/10 @ 1205 & 1440

Analyzed By: _____ Date/Time: 10/27/10 @ 1220 & 1455

Reviewed By: _____ Date: 10/27/10

Cr6LIQ.xls

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

Service Request#(s): 4004

Stock#: S24-10191001 T.V=10PPM EXP:3/1/11

CCV/CCV#: S24-10191002 T.V=0.579PPM EXP:11/6/10

Run#: 222611

Prep Run#:

Conc. H_2SO_4 Lot#: EMD 49284 EXP: 11/20/14

Coloring Reagent Ref#: S24-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	*NA*	*0.05/50*	*0.25/50*	*0.5/50*	*Corr. Coeff.*
Concentration mg/L	*0.00*	*0.01*	*0.05*	*0.1*	0.9999947428
Absorbance @ 540 nm	0.000	0.010	0.050	0.102	

	Sample #	Sample Vol.(mL)	Dilution (pH ✓)		Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
11	4004-2.01VS 0.03PPM	10ml	—	✓	0.000	0.033	0.033	0.0326	109%
12	-3.01		—	✓	0.000	0.000	0.000	0.000269	<0.004
13	-4.01		—	✓	0.000	0.001	0.001	0.00125	<0.004
14	-5.01		—	✓	0.000	0.000	0.000	0.000269	
15	-6.01		—	✓	0.000	0.000	0.000	✓	
16	CVS 0.0579PPM		—	✓	0.000	0.060	0.060	0.0591	102%
17	CCB3	↓	—	✓	0.000	0.000	0.000	0.000269	<0.004
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									

pH Requirement: Method 7196A (2 ± 0.5) * Samples filtered prior to pH adjustment

ICV/CCV spiked with 6.0 ml of S24-10241002 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of S24-1024 1001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of ↓ @10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: [signature] Date/Time: 10/27/10 @ 1440

Analyzed By: [signature] Date/Time: 10/27/10 @ 1455

Reviewed By: [signature] Date: 10/27/10

Cr6LIQ.xls

4/8/09 SV — SIG-04080901 ICV/LCV 1000PPM F FOR ICQ3
PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F01052
EXP: 5/1/2010

4/8/09 SV — SIG-04080902 ICV/CCV (ICQ3) 1000PPM NO_2
PURCHASED INORGANIC VENTURES ICND21-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 SV — SIG-04080903 NH_3 FILLING SOLN
PURCHASED. THERMO SCIENTIFIC 95202
LOT # MT1 P/N 70263-A04
EXP 4/8/10

4/9/09 SV — SIG-04090901 0.1N H_2SO_4
5.6 ml Conc H_2SO_4 (EMD 47050; EXP: 9/13/10) T 2L W/ DI
EXP: 4/9/10

4/9/09 SV — SIG-04090902 TSS-LCS T.V = 193 mg/L
0.0193g S18-09160603 (EXP: 2010) T 100 ml W/ DI H_2
EXP: 4/10/09

4/9/09 SV — SIG-04090903 1000 PPM F STANDARD
PURCHASED. ERA CAT # 050 125ml
LOT # 200109
EXP: 1/2011

4/9/09 SV — SIG-04090904 ICV/CCV Cu-Ct Std T.V = 115.8 PPM
PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 S19-11200901 MBTH SOLUTION FOR O3-AIR
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/1/14)
↑100ml w/DI + 0.5ml H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 S19-11200902 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑ 1L w/ DI H_2O
EXP: 11/20/10

11/20/09 S19-11200903 AMMONIA PH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 S19-11200904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010-500mL
LOT 1905343
EXP: 5/2011

11/20/09 S19-11200905 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 S19-11230901 1000ppm SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H10627; EXP: 8/31/14) ↑100ml w/DI H_2O
5/23/10

11/23/09 SIG-1123090Z 1000 ppm SO_3 (ICV/CCV)
SR 0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 SIG-1123090Z A,B,C,D pH REFERENCE
SR PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 SIG-1124090Z 1000 ppm SO_4 Standard
SR PURCHASED CAT # ICC-006
LOT # K00794
EXP: 9/30/13
SR 11/25/09

11/25/09 SIG-~~H25~~ 1125090Z 0.1N H_2SO_4
SR 5.6ml conc H_2SO_4 (EMD 47050 EXP: 9/13/10)
EXP: ~~9/25~~ 9/13/10
SR 11/25/09

11/30/09 SIG-1130090Z Cr^{6+} Coloring Reagent
SR 0.2500g Diphenylcarbohydrazide (EMD) 47103ED; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 47152D; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 SIG-1130090Z 25133 ppb Stock for O_3 in Air
SR 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 SIG-1130090Z 25133 ppb ICV/CCV for O_3 in Air
SR 0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: [illegible] Date: 12/22/09

1/27/10 524-01271001 1000PPM SO_3 (STOCK)
0.1591 g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 524-01271002 1000 PPM SO_3 (ICV/CCV)
0.1607g Na_2SO_3 (Mallinckrodt H25469; EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr^{6+} Soln T.V = 0.579PPM
0.5ml 519-04090904 (115.8PPM; EXP: 12/2010) ↑ 100ml
w/ DI H_2O
EXP: 2/15/10

2/1/10 524-02011002 Cr^{6+} Coloring Reagent
0.2500g Diphenylcarbohydrazide (EMD ~~47103~~ 47103721
EXP: 1/30/13) ↑ 50 ml w/Acetone (EMD 47154D; EXP: 9/24/12
EXP: 2/15/10

2/2/10 524-02021001 Cr^{6+} 1000 PPM STOCK
Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-03011001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-03011002 pH 7.000 Buffer
Purchased 500 ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-03011003 1000 PPM Cl (LCS)
Purchased 120 ml Cat # 1955-4
RICA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-03011004 NH3 Filling Sol'n
Purchased 60 ml Orion 951202
Thermo Scientific LOT # MT1
P/N. 703613-A04
EXP: 3/1/11

3/2/10 SV
524-03021001 pH 10.000 buffer
Purchased 500 ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

S24-10191001 10ppm Cr6+ Soln

10/19/10 1.0ml S24-02021001 (1000ppm Cr6+; EXP: 3/1/11) ↑ 100ml

W/DI H2O

EXP: 3/1/11

10/19/10 S24-10191002 ICV/CCV Cr6+ T.V = 0.579ppm

0.5ml S19-04090904 (T.V = 115.8 mg/L; EXP 12/2010)

↑ 100ml W/DI

EXP: 11/2/10

10/19/10 S24-10191003 Cr6+ Coloring Reagent

0.2500g 1,5-Diphenylcarbohydrazide (EMD 47/03721; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)

EXP: 11/2/10

LABORATORY REPORT

November 10, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL-GW-4Q10 / G005862 / JPL GWM

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 27, 2010. For your reference, these analyses have been assigned our service request number P1003998.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle CAS Project No: P1003998
Project: JPL-GW-4Q10 / G005862 / JPL GWM

CASE NARRATIVE

The samples were received intact under chain of custody on October 27, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Service Request: P1003998
Project ID: JPL-GW-4Q10 / G005862 / JPL GWM

Date Received: 10/27/10
Time Received: 09:45

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-1	P1003998-001	Water	10/26/10	13:14	X
MW-9	P1003998-002	Water	10/26/10	16:46	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Columbia Analytical Services INC.
An Employee - Owned Company

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

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. P1003998

CAS Contact:

Company Name & Address (Reporting Information)	Project Name
Battelle 505 King Ave Columbus OH 43201	JPL-GW-4Q10 Project Number G005862 / JPL GWM
Project Manager: David Conner	P.O. # / Billing Information: 214375 / Battelle 505 King Ave Columbus OH 43201
Phone: 614 726-7311	Fax: 614 458-6641
Email Address for Result Reporting: connerd@battelle.org	Sampler (Print & Sign): David Loera / David L

Analysis Method and/or Analytes

Preservative Code

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted)	TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	0 Hexavalent Cr (7196)	Remarks
MW-1	(1)	10/26/10	1314	AQ	1P							X	
MW-9	(2)	10/26/10	1646	AQ	1P							X	

Preservative Key

0	None
1	HCL
2	HNO3
3	H2SO4
4	NaOH
5	Zn Acetate
6	Asc Acid
7	Other

Report Tier Levels - please select

Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge X
Tier V - (client specified) ____

MRL required Yes / No
MDL / PQL / J required Yes / No

EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
David L	10/26/10	1800	[signature]	10/27/10	0945
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Cooler / Blank / Ice / No Ice
Temperature 3°C °C

Client: Battelle **Service Request:** P1003998
Project: JPL-GW-4Q10/G005862 / JPL GWM

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1003998-001.01					
	7196A				
		10/27/10	0953	SMO / MZAMORA	
		10/27/10	0954	P-37 / MZAMORA	
		10/27/10	1017	In Lab / SANDERSON	
		10/27/10	1355	P-37 / SANDERSON	
P1003998-002.01					
	7196A				
		10/27/10	0953	SMO / MZAMORA	
		10/27/10	0954	P-37 / MZAMORA	
		10/27/10	1017	In Lab / SANDERSON	
		10/27/10	1355	P-37 / SANDERSON	

Columbia Analytical Services™ 2655 Park Center Drive, Suite A, Simi Valley, CA 93065 | 805.526.7161 | www.caslab.com

Sample Acceptance Check Form

Client: Battelle Work order: P1003998

Project: JPL-GW-4Q10 / G005862 / JPL GWM

Sample(s) received on: 10/27/10 Date opened: 10/27/10 by: MZAMORA

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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature ____ °C Blank Temperature 3 °C			
10	Was a **trip blank** received?	☐	☐	☒
	Trip blank supplied by CAS:			
11	Were **custody seals** on outside of cooler/Box?	☒	☐	☐
	Location of seal(s)? Top of cooler, down the front. Sealing Lid?	☒	☐	☐
	Were signature and date included?	☒	☐	☐
	Were seals intact?	☒	☐	☐
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003998-001.01	125mL Plastic NP					
P1003998-002.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL-GW-4Q10
Project Number : G005862 / JPL GWM
Sample Matrix : WATER

Service Request : P1003998
Date Collected : 10/26/10
Date Received : 10/27/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-1	P1003998-001	0.010	0.004	1	NA	10/27/10 12:20	ND	
MW-9	P1003998-002	0.010	0.004	1	NA	10/27/10 12:20	ND	
Method Blank	P1003998-MB	0.010	0.004	1	NA	10/27/10 12:20	ND	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL-GW-4Q10 / G005862 / JPL GWM

Service Request: P1003998
Date Analyzed: 10/27/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND

Approved By: Karen Ryan Date: 10/28/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL-GW-4Q10 / G005862 / JPL GWM

Service Request: P1003998
Date Analyzed: 10/27/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0601	104	90-110
CCV1	0.0579	0.0601	104	90-110

Approved By: Karen Ryan Date: 10/28/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003998
Project Name :	JPL-GW-4Q10	**Date Collected :**	NA
Project Number :	G005862 / JPL GWM	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/27/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1003998-LCS	Basis :	NA
Test Notes :			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0405	101	90-109	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003998
Project Name :	JPL-GW-4Q10	**Date Collected :**	10/26/10
Project Number :	G005862 / JPL GWM	**Date Received :**	10/27/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/27/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name :	MW-1		Units :	mg/L (ppm)
Lab Code :	P1003998-001MS	P1003998-001DMS	Basis :	NA
Test Notes :				

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0513	0.0513	103	103	78-112	<1	

Approved By Karen Ryan Date : 10/28/10

Report By:SAnderson

Columbia Analytical Services™

pH Run Log

Service Request #(s): 3998 4004

Time: 0930

Sample	VWR lot #	Exp.
pH 2 Buffer	SG-1120904	5/2011
pH 4 Buffer	S24-0301001	8/31/11
pH 7 Buffer	S24-0301002	11/31/12
pH 10 Buffer	S24-0302001	9/30/11

Slope	Prep.Run #
97.3%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled #)

Sample	#	pH	Temp. °C
pH 2.000	5	1.989	22.7°
pH 4.000	↓	4.000	22.6°
pH 7.000		6.997	22.6°
pH 10.000		10.006	22.5°
Ref#: SG-112309BC		6.388	22.7°
DI H2O		2.004	20.8°
pH 2.000	↓	1.990	22.7°
TIME:			SR
pH 2.000	5	2.003	22.9°
3998-1.01	↓	1.917	19.1°
↓ -2.01		2.033	18.6°
pH 2.000	↓	2.004	23.0°
TIME: 1425			SR
pH 2.000	5	2.005	23.1°
4004-1.01	↓	2.086	10.7°
↓ -2.01		1.993	10.4°
↓ -3.01	↓	1.831	11.3°

Sample	#	pH	Temp. °C
4004-4.01	5	2.041	11.0°
↓ -5.01	↓	1.895	11.9°
↓ 6.01		2.089	12.4°
pH 2.000	↓	2.012	22.4°

pH Adjustments: ~~7196A~~: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14

☐ **7199A**: Diluted NaOH _____ EXP: _____

Comments: _____

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 10/25/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: _____ Date: 10/27/10

Reviewer: KR Date: 10/27/10

pH.XLS

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

Service Request#(s): 3998 4004 Run#: 222611

Stock#: 524-10191001 T.V=10ppm EXP: 3/1/11 Prep Run#:

CV/CCV#: 524-10191002 T.V=0.579ppm EXP: 11/1/10 Conc. H_2SO_4 Lot#: EMD 49284 EXP ~~4/2/10~~ 11/20/14 & 10/27/

Coloring Reagent Ref#: 524-10191003 EXP: 10/1/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.9994428
Absorbance @ 540 nm	0.000	0.010	0.050	0.102	

	Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	ICB	10ml	—	✓	0.000	0.000	0.000	0.000269	<0.004
2	ICV 0.0579ppm		—	✓	0.000	0.061	0.061	0.0601	104%
3	MB		—	✓	0.000	0.000	0.000	0.000269	<0.004
4	LCS 0.040ppm		—	✓	0.000	0.041	0.041	0.0405	101%
5	3998-1.01		—	✓	0.000	0.000	0.000	0.000269	<0.004
6	-1.01 MS 0.05ppm		—	✓	0.000	0.052	0.052	0.0513	103%
7	-1.01 MSD J		—	✓	0.000	0.052	0.052	0.0513	103% 0%
8	-2.01		—	✓	0.000	0.033	0.033	0.0326	109%
9	-2.01 LCS 0.03ppm		—	✓	0.000	0.000	0.000	0.000269	<0.004
10	CCV1 0.0579ppm		—	✓	0.000	0.061	0.061	0.0601	104%
11	CCB1		—	✓	0.000	0.000	0.000	0.000269	<0.004
12	CCB2 TIME: @1455		—	✓	0.000	0.000	0.000	0.000269	J
13	CCV2 0.0579ppm		—	✓	0.000	0.061	0.061	0.0601	104%
14	4004-1.01		—	✓	0.002	0.004	0.002	0.00223	<0.004
15	-1.01 MS 0.05ppm		—	✓	0.002	0.053	0.051	0.0503	101%
16	-1.01 MSD J		—	✓	0.002	0.054	0.052	0.0513	103% 2%
17	-2.01		—	✓	0.000	0.000	0.000	0.000269	<0.004

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of @ 10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: Date/Time: 10/27/10 @ 1205 & 1440

Analyzed By: Date/Time: 10/27/10 @ 1220 & 1455

Reviewed By: Date: 10/27/10

Cr6LIQ.xls

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

Service Request#(s): 4004

Stock#: S24-10191001 IV=100PPM EXP: 3/1/11

CCV/CCV#: S24-~~10191001~~ 10191002 T.V=0.0579PPM EXP: 11/3/10

Run#: 222611

Prep Run#:

Conc. H_2SO_4 Lot#: EMD 49284 EXP: 11/20/14

Coloring Reagent Ref#: S24-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.9999947428
Absorbance @ 540 nm	0.000	0.010	0.050	0.102	

	Sample #	Sample Vol.(mL)	Dilution (pH ✓)		Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	4004-2.01VS 0.03PPM	10ml	—	✓	0.000	0.033	0.033	0.0326	109%
2	-3.01		—	✓	0.000	0.000	0.000	0.000269	<0.004
3	-4.01		—	✓	0.000	0.001	0.001	0.00125	<0.004
4	-5.01		—	✓	0.000	0.000	0.000	0.000269	
5	-6.01		—	✓	0.000	0.000	0.000	J	
6	CVS 0.0579PPM		—	✓	0.000	0.060	0.060	0.0591	102%
7	CVB3	↓	—	✓	0.000	0.000	0.000	0.000269	<0.004
8									
9									
10						Spike MS/MSD			
11									
12									
13									
14									
15									
16									
17									

pH Requirement: Method 7196A (2 ± 0.5) * Samples filtered prior to pH adjustment

ICV/CCV spiked with 6.0 ml of S24-10241002 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of S24-10241001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of ↓ @10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: [signature] Date/Time: 10/27/10 @ 1440

Analyzed By: [signature] Date/Time: 10/27/10 @ 1455

Reviewed By: [signature] Date: 10/27/10

Cr6LIQ.xls

4/8/09 SIG-04080901 ICV/CCV 1000PPM F FOR IC03
SV PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F0105
EXP: 5/1/2010

4/8/09 SIG-04080902 ICV/CCV (IC03) 1000PPM NO_2
SV PURCHASED INORGANIC VENTURES ICN021-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 SIG-04080903 NH_3 FILLING SOLN
SV PURCHASED. THERMO SCIENTIFIC 951202
LOT # MT1 P/N 70263-A04
EXP 4/8/10

4/9/09 SIG-04090901 0.1N H_2SO_4
SV 5.6 ml Conc H_2SO_4 (END 47050; EXP: 9/13/10) T 2L W/DI
EXP: 4/9/10

4/9/09 SIG-04090902 TSS-LCS T.V = 193 mg/L
SV 0.0193g S18-09160603 (EXP: 2010) T 100 ml W/DI H_2
EXP: 4/10/09

4/9/09 SIG-04090903 1000PPM F STANDARD
SV PURCHASED. ERA CAT # 060 125ml
LOT # 200109
EXP: 1/2011

4/9/09 SIG-04090904 ICV/CCV 4-Lot Std T.V = 115.8 PPM
SV PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 SIG-1120090901 MBTH SOLUTION FOR O3-AIR
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/14) T 100 mL W/ DI + 0.5 mL H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 SIG-1120090902 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) T 1L W/ DI H_2O
EXP: 11/2010

11/20/09 SIG-1120090903 AMMONIA PH ADJUSTING ISA
PURCHASED
THERMO SCIENTIFIC ORION 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 SIG-1120090904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010 - 500mL
LOT 1905343
EXP: 5/2011

11/20/09 SIG-1120090905 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
THERMO SCIENTIFIC 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 SIG-1123090901 1000PPM SO_3 (STOCK)
0.1591g Na_2SO_3 (JT Baker H10627; EXP: 8/31/14) T 100 mL W/ DI H_2O
5/23/10

11/23/09 SIG-1123090Z 1000 ppm SO_3 (ICV/CCV)
SR 0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 SIG-1123090 3 A,B,C,D pH REFERENCE
SR PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 SIG-1124090 1 1000 ppm SO_4 Standard
SR PURCHASED CAT # ICC-006
LOT # K007944
EXP: 9/30/13
SR 11/25/09

11/25/09 SIG-~~H25~~ 1125090 1 0.1N H_2SO_4
SR 5.6ml conc H_2SO_4 (EMD 4705D EXP: 9/13/10)
EXP: ~~11/25~~ 9/13/10
SR 11/25/09

11/30/09 SIG-1130090 1 Cr^{6+} Coloring Reagent
SR 0.2500g Diphenylcarbohydrazide (EMD) 4710ZD; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 4715ZD; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 SIG-1130090 2 25133 ppb Stock for O_3 in Air
SR 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 SIG-1130090 3 25133ppb ICV/CCV for O_3 in Air
SR 0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: VL Date: 12/22/09

1/27/10 S24-01271001 1000PPM SO_3 (STOCK)
Sr 0.1591g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 S24-01271002 1000PPM SO_3 (ICV/CCV)
Sr 0.1607g Na_2SO_3 (Mallinckrodt H25469; EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 S24-02011001 ICV/CCV Cr^{6+} Soln T.V = 0.579PPM
Sr 0.5ml S19-04090904 (115.8PPM; EXP: 12/2010) ↑ 100ml
w/ DI H_2O
EXP: 2/15/10

2/1/10 S24-02011002 Cr^{6+} Coloring Reagent
Sr 0.2500g Diphenylcarbohydrazide (EMD ~~4703~~ 47103721 Sr 2/1/10
EXP: 1/30/13) ↑ 50 ml w/Acetone (EMD 47154D; EXP: 9/24/12
EXP: 2/15/10

2/2/10 S24-02021001 Cr^{6+} 1000PPM STOCK
Sr Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-03011001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-03011002 pH 7.000 Buffer
Purchased 500ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-03011003 1000 PPM Cl (LCS)
Purchased 120ml Cat # 1955-4
RICA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-03011004 NH3 Filling Sol'n
Purchased 60ml Orion 951202
Thermo Scientific LOT # MT1
P/N. 702613-A04
EXP: 3/1/11

3/2/10 SV
524-03021001 pH 10.000 buffer
Purchased 500ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

S24-10191001 10PPM Cr^{6+} Soln

10/19/10 1.0ml S24-02021001 ($1000PPM Cr^{6+}$; EXP: 3/1/11) ↑ 100ml W/DI H_2O

EXP: 3/1/11

10/19/10 S24-10191002 ICV/CCV Cr^{6+} T.V = 0.579PPM

0.5ml S19-04090904 (T.V = 115.8 mg/L; EXP 12/2010) ↑ 100ml W/DI

EXP: 11/2/10

10/19/10 S24-10191003 Cr^{6+} Coloring Reagent

0.2500g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)

EXP: 11/2/10

LABORATORY REPORT

November 15, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL GW Mon 4Q10 / G486090

Dear David:

Your CAS report number P1003975 has been revised for the samples submitted on October 26, 2010. The Laboratory Control Sample Summary was corrected to report the proper result. The revised report page has been indicated by the "Revised Page" footer located at the bottom right of the page.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle CAS Project No: P1003975
Project: JPL GW Mon 4Q10 / G486090

CASE NARRATIVE

The samples were received intact under chain of custody on October 26, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Project ID: JPL GW Mon 4Q10 / G486090
Service Request: P1003975

Date Received: 10/26/10
Time Received: 15:45

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-14-5	P1003975-001	Water	10/26/10	09:15	X
MW-14-4	P1003975-002	Water	10/26/10	10:05	X
MW-14-3	P1003975-003	Water	10/26/10	10:36	X
MW-14-2	P1003975-004	Water	10/26/10	11:11	X
MW-14-1	P1003975-005	Water	10/26/10	11:44	X
DUPE-02-4Q10	P1003975-006	Water	10/26/10	00:00	X
EB-05-10/26/10	P1003975-007	Water	10/26/10	11:28	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Page 1 of 1

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An Employee - Owned Company

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

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.: P1003975

CAS Contact:

Company Name & Address (Reporting Information)	Project Name	Project Manager	P.O. # / Billing Information
BATTELLE 3990 OLD TOWN AVE., C-205 SAN DIEGO, CA 92110	SPL GW MON 4Q10 Project Number: G466090	DAVID CONNEW	214319/BATTELLE ATTN: GERALD TOMPKINS 505 KING AVE. COLUMBUS, OH 43201

Phone: (619) 726-7311 Fax:

Email Address for Result Reporting:

Sampler (Print & Sign): CHASE BROGDON

Analysis Method and/or Analytes

Preservative Code

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted) TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	0 Cr III (7196)	Remarks
MW-14-5	1	10/26/10	0915	W	1						X	
MW-14-4	2		1005		1						X	QC LEVEL III
MW-14-3	3		1036		2						X	MS/MSD
MW-14-2	4		1111		1						X	
MW-14-1	5		1144		1						X	
DUPE-02-4Q10	6		—		1						X	DUPLICATE
EB-05-10/26/10	7	10/26/10	1128	W	1						X	EQUIPMENT BLANK

Preservative Key

0	None
1	HCL
2	HNO3
3	H2SO4
4	NaOH
5	Zn Acetate
6	Asc Acid
7	Other

Report Tier Levels - please select

Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge ____
Tier V - (client specified) ____
MRL required Yes / No
MDL / PQL / J required Yes / No
EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

	Date	Time		Date	Time
Relinquished by: (Signature)	10/26/10	1500	Received by: (Signature)	10/26/10	1500
Relinquished by: (Signature)	10/26/10	1545	Received by: (Signature)	10/26/10	1545
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Cooler / Blank / Ice / No Ice
Temperature 3°C °C

5 of 22

Client: Battelle **Service Request:** P1003975
Project: JPL GW Mon 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1003975-001.01					
	7196A				
		10/26/10	1605	SMO / MZAMORA	
		10/26/10	1606	P-37 / MZAMORA	
		10/26/10	1616	In Lab / SANDERSON	
		10/27/10	1145	P-37 / SANDERSON	
P1003975-002.01					
	7196A				
		10/26/10	1605	SMO / MZAMORA	
		10/26/10	1606	P-37 / MZAMORA	
		10/26/10	1616	In Lab / SANDERSON	
		10/27/10	1145	P-37 / SANDERSON	
P1003975-003.01					
	7196A				
		10/26/10	1605	SMO / MZAMORA	
		10/26/10	1606	P-37 / MZAMORA	
		10/26/10	1616	In Lab / SANDERSON	
		10/27/10	1145	P-37 / SANDERSON	
P1003975-003.02					
		10/26/10	1605	SMO / MZAMORA	
		10/26/10	1606	P-37 / MZAMORA	
		10/26/10	1616	In Lab / SANDERSON	
		10/27/10	1145	P-37 / SANDERSON	
P1003975-004.01					
	7196A				
		10/26/10	1605	SMO / MZAMORA	
		10/26/10	1606	P-37 / MZAMORA	
		10/26/10	1616	In Lab / SANDERSON	
		10/27/10	1145	P-37 / SANDERSON	
P1003975-005.01					
	7196A				
		10/26/10	1605	SMO / MZAMORA	
		10/26/10	1606	P-37 / MZAMORA	
		10/26/10	1616	In Lab / SANDERSON	
		10/27/10	1145	P-37 / SANDERSON	
P1003975-006.01					
	7196A				
		10/26/10	1605	SMO / MZAMORA	
		10/26/10	1606	P-37 / MZAMORA	
		10/26/10	1616	In Lab / SANDERSON	
		10/27/10	1145	P-37 / SANDERSON	
P1003975-007.01					
	7196A				

Client: Battelle **Service Request:** P1003975
Project: JPL GW Mon 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
		10/26/10	1605	SMO / MZAMORA	
		10/26/10	1606	P-37 / MZAMORA	
		10/26/10	1616	In Lab / SANDERSON	
		10/27/10	1145	P-37 / SANDERSON	

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Sample Acceptance Check Form

Client: Battelle Work order: P1003975

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/26/10 Date opened: 10/26/10 by: MZAMORA

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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature _____ °C Blank Temperature 3 °C			
10	Was a **trip blank** received?	☐	☐	☒
	Trip blank supplied by CAS: _____			
11	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003975-001.01	125mL Plastic NP					
P1003975-002.01	125mL Plastic NP					
P1003975-003.01	125mL Plastic NP					
P1003975-003.02	125mL Plastic NP					
P1003975-004.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): _____

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

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Sample Acceptance Check Form

Client: Battelle Work order: P1003975

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/26/10 Date opened: 10/26/10 by: MZAMORA

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003975-005.01	125mL Plastic NP					
P1003975-006.01	125mL Plastic NP					
P1003975-007.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL GW Mon 4Q10
Project Number : G486090
Sample Matrix : WATER

Service Request : P1003975
Date Collected : 10/26/10
Date Received : 10/26/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-14-5	P1003975-001	0.010	0.004	1	NA	10/26/10 17:00	ND	
MW-14-4	P1003975-002	0.010	0.004	1	NA	10/26/10 17:00	ND	
MW-14-3	P1003975-003	0.010	0.004	1	NA	10/26/10 17:00	ND	
MW-14-2	P1003975-004	0.010	0.004	1	NA	10/26/10 17:00	ND	
MW-14-1	P1003975-005	0.010	0.004	1	NA	10/26/10 17:00	ND	
DUPE-02-4Q10	P1003975-006	0.010	0.004	1	NA	10/26/10 17:00	ND	
EB-05-10/26/10	P1003975-007	0.010	0.004	1	NA	10/26/10 17:00	ND	
Method Blank	P1003975-MB	0.010	0.004	1	NA	10/26/10 17:00	ND	

Approved By Karen Ryan Date : 10/27/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Battelle	**Service Request:**	P1003975
Project:	JPL GW Mon 4Q10 / G486090	**Date Analyzed:**	10/26/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: Karen Ryan Date: 10/27/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Battelle	**Service Request:**	P1003975
Project:	JPL GW Mon 4Q10 / G486090	**Date Analyzed:**	10/26/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0570	98	90-110
CCV1	0.0579	0.0561	97	90-110
CCV2	0.0579	0.0570	98	90-110

Approved By: Karen Ryan Date: 10/27/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003975
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	NA
Project Number :	G486090	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/26/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1003975-LCS	Basis :	NA

Test Notes :

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0389	97	90-109	

Approved By Karen Ryan Date : 11/15/10

Revised Page

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003975
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	10/26/10
Project Number :	G486090	**Date Received :**	10/26/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/26/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-14-3
Lab Code : P1003975-003MS P1003975-003DMS
Test Notes :

Units : mg/L (ppm)
Basis : NA

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0498	0.0498	100	100	78-112	<1	

Approved By Karen Ryan Date : 10/27/10

Report By:SAnderson

Columbia Analytical Services INC

pH Run Log

Service Request #(s): 3975

Time: 0823

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/2011
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-03011002	1/31/12
pH 10 Buffer	524-03021001	9/30/11

Slope	Prep.Run #
98.3%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled #)

Sample	#	pH	Temp. °C	Sample	#	pH	Temp. °C
pH 2.000	5	2.000	22.0°	3975-6.01	5	1.905	12.3°
pH 4.000		4.010	22.0°	↓ -7.01		1.919	13.4°
pH 7.000		7.002	22.0°	pH 2.000	↓	2.012	22.7°
pH 10.000		10.007	22.0°				
T.V=6.46 Exp: 1/12 Ref#: 519-11230903C		6.393	22.2°				
DI H2O		2.089	19.0°				
pH 2.000	↓	2.006	21.8°				
pH 10.000	6	9.998	22.1°				
DI H2O	6	9.241	22.1°				
pH 10.000	6	10.011	22.1°	Space not used			
TIME: 1622							
pH 2.000	5	2.020	23.2°				
3975-1.01		2.003	9.2°				
-2.01		2.041	9.6°				
-3.01		1.842	10.3°				
-4.01		1.852	10.1°				
↓ -5.01	↓	1.849	11.3°				

pH Adjustments: ☒ **7196A**: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14

☐ **7199A**: Diluted NaOH ________ EXP: ________

Comments:

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 10/25/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: [signature] Date: 10/26/10

Reviewer: KR Date: 10/27/10

pH.XLS

Columbia Analytical Services

Hexavalent Chromium (Liquids)

Method EPA 7196A

Service Request#(s): 3975 Run#: 222443

Stock#: 524-10191001 T.V=10ppm EXP: 3/1/11 Prep Run#: —

ICV/CCV#: 524-10191002 T.V=0.0579ppm EXP: 11/2/10 Conc. H_2SO_4 Lot#: EM10 99284 EXP: 11/20/14

Coloring Reagent Ref#: 524-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.99981837
Absorbance @ 540 nm	0.000	0.010	0.053	0.110	

	Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	ICB	10ml	—	✓	0.000	0.000	0.000	0.000739	<0.004
2	ICV 0.0579PPM		—	✓	0.000	0.062	0.062	0.0570	98%
3	MB		—	✓	0.000	0.000	0.000	0.000739	<0.004
4	LCS 0.040PPM		—	✓	0.000	0.042	0.042	0.0389	97%
5	3975-1.01		—	✓	0.000	0.000	0.000	0.000739	<0.004
6	-1.01 MS 0.03PPM		—	✓	0.000	0.033	0.033	0.0307	102%
7	-2.01		—	✓	0.000	0.000	0.000	0.000739	<0.004
8	-3.01		—	✓	0.000	0.000	0.000	↓	↓
9	-3.01 MS 0.05PPM		—	✓	0.000	0.054	0.054	0.0498	100% } 1% RPD
10	-3.01 MSD ↓		—	✓	0.000	0.054	0.054	0.0498	100% } RPD
11	-4.01		—	✓	0.000	0.002	0.002	0.00255	<0.004
12	-5.01		—	✓	0.000	0.000	0.000	0.000739	<0.004
13	CCV1 0.0579PPM / CCB1		—	✓	0.000 / 0.000	0.061 / 0.000	0.061 / 0.000	0.0561 / 0.000739	97% / <0.004
14	3975-6.01		—	✓	0.000	0.000	0.000	↓	↓
15	↓ -7.01		—	✓	0.000	0.000	0.000	↓	↓
16	CCV2 0.0579PPM		—	✓	0.000	0.062	0.062	0.0570	98%
17	CCB2	↓	~	✓	0.000	0.000	0.000	0.000739	<0.004

pH Requirement: Method 7196A (2 ± 0.5) * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001@10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments: —

Prepared By: _____ Date/Time: 10/26/10 @ 1645

Analyzed By: _____ Date/Time: 10/26/10 @ 1760

Reviewed By: _____ Date: 10/27/10

Cr6LIQ.xls

4/8/09 SV — SIG-04080901 ICV/LCV 1000PPM F FOR ICO3
PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F01052
EXP: 5/1/2010

4/8/09 SV — SIG-04080902 ICV/CCV (ICO3) 1000PPM NO2
PURCHASED INORGANIC VENTURES ICNO21-1
LOT # C2-NOX02065
EXP: 5/1/10

4/8/09 SV — SIG-04080903 NH3 FILLING SOLN
PURCHASED. THERMO SCIENTIFIC 95202
LOT # MT I P/N 70263-A04
EXP 4/8/10

4/9/09 SV — SIG-04090901 0.1N H2SO4
5.6 ml Conc H2SO4 (EMD 47050; EXP: 9/13/10) TO 2L W/ DI
EXP: 4/9/10

4/9/09 SV — SIG-04090902 TSS-LCS T.V = 193 mg/L
0.0193g S18-09160603 (EXP: 2010) TO 100 ml W/ DI H2O
EXP: 4/10/09

4/9/09 SV — SIG-04090903 1000 PPM F STANDARD
PURCHASED. ERA CAT # 050 125ml
LOT # 200109
EXP: 1/2011

4/9/09 SV — SIG-04090904 ICV/CCV Cr-Ct Std T.V = 115.8 PPM
PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 SIG-1120090 1 MBTH SOLUTION FOR O3-AIR
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/14)
T 100 ml w/ DI + 0.5 ml H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 SIG-1120090 2 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) T 1L w/ DI H_2O
EXP: 11/2010

11/20/09 SIG-1120090 3 AMMONIA PH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 SIG-1120090 4 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010 - 500mL
LOT 1905343
EXP: 5/2011

11/20/09 SIG-1120090 5 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 SIG-1123090 1 1000PPM SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H1062, EXP: 8/31/14) T 100 ml w/ DI H_2O
5/23/10

11/23/09 SIG-1123090Z 1000 ppm SO_3 (ICV/CCV)
SR 0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 SIG-1123090 3 A, B, C, D pH REFERENCE
SR PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 SIG-1124090 1 1000 ppm SO_4 Standard
SR PURCHASED CAT # ICC-006
LOT # K007794
EXP: 9/30/13
SR 11/25/09

11/25/09 SIG-~~H25~~ 1125090 1 0.1N H_2SO_4
SR ~~5.6~~ml conc H_2SO_4 (EMD 4705D EXP: 9/13/10)
EXP: ~~H25~~ 9/13/10
SR 11/25/09

11/30/09 SIG-1130090 1 Cr^{6+} Coloring Reagent
SR 0.250g diphenylcarbohydrazide (EMD) 4710ED; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 4715ED; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 SIG-1130090 2 25133 ppb Stock for O_3 in Air
SR 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 SIG-1130090 3 25133 ppb ICV/CCV for O_3 in Air
SR 0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGTINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: ~~VL~~ Date: 12/22/09

1/27/10 S24-01271001 1000PPM SO_3 (STOCK)
Sr 0.1591 g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 S24-01271002 1000 PPM SO_3 (ICV/CCV)
Sr 0.1607g Na_2SO_3 (Mallinckrodt H25469; EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 S24-02011001 ICV/CCV Cr^{6+} Soln T.V = 0.579PPM
Sr 0.5ml S19-04090904 (115.8 PPM; EXP: 12/2010) ↑ 100ml w/ DI H_2O
EXP: 2/15/10

2/1/10 S24-02011002 Cr^{6+} Coloring Reagent
Sr 0.2500g Diphenylcarbohydrazide (EMD ~~47103~~ 47103721 Sr 2/1/10 EXP: 1/30/13) ↑ 50 ml w/Acetone (EMD 47154D; EXP: 9/24/12
EXP: 2/15/10

2/2/10 S24-02021001 Cr^{6+} 1000 PPM STOCK
Sr Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-03011001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-03011002 pH 7.000 Buffer
Purchased 500 ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-03011003 1000 PPM Cl (LCS)
Purchased 120 ml Cat # 1955-4
RICA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-03011004 NH3 Filling Sol'n
Purchased 60 ml Orion 951202
Thermo Scientific LOT # MT1
P/N: 708613-A04
EXP: 3/1/11

3/2/10 SV
524-03021001 pH 10.000 buffer
Purchased 500 ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

S24-10191001 10PPM Cr^{6+} Soln

10/19/10 1.0ml S24-02021001 (1000PPM Cr^{6+}; EXP: 3/1/11) ↑ 100ml W/DI H_2O

EXP: 3/1/11

10/19/10 S24-10191002 ICV/CCV Cr^{6+} T.V = 0.579PPM

0.5ml S19-04090904 (T.V = 115.8 mg/L; EXP 12/2010) ↑ 100ml W/DI

EXP: 11/2/10

10/19/10 S24-10191003 Cr^{6+} Coloring Reagent

0.2500g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)

EXP: 11/2/10

LABORATORY REPORT

November 2, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL GW Mon 4Q10 / G486090

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 25, 2010. For your reference, these analyses have been assigned our service request number P1003956.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle CAS Project No: P1003956
Project: JPL GW Mon 4Q10 / G486090

CASE NARRATIVE

The samples were received intact under chain of custody on October 25, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Project ID: JPL GW Mon 4Q10 / G486090
Service Request: P1003956

Date Received: 10/25/10
Time Received: 13:40

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-20-5	P1003956-001	Water	10/25/10	09:14	X
MW-20-4	P1003956-002	Water	10/25/10	09:43	X
MW-20-3	P1003956-003	Water	10/25/10	10:09	X
MW-20-2	P1003956-004	Water	10/25/10	10:34	X
MW-20-1	P1003956-005	Water	10/25/10	11:01	X
EB-04-10/25/10	P1003956-006	Water	10/25/10	10:50	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Page 1 of 1

Columbia Analytical Services INC.
An Employee - Owned Company

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

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. P1003456

CAS Contact:

Company Name & Address (Reporting Information)	Project Name
BATTELLE 3990 OLD TOWN AVE, C-205 SAN DIEGO, CA 92110	SPL GW MON 4Q10
Project Manager	**Project Number**
DAVID CONNEN	64860 90
Phone / **Fax**	**P.O. # / Billing Information**
(619) 726-7311	214319 / BATTELLE ATTN: GERALD TOMPKINS 505 KING AVE. COLUMBUS, OH 43201
Email Address for Result Reporting	**Sampler (Print & Sign)** CHASE BROGDON

Analysis Method and/or Analytes

Preservative Code

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted)	TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	0 Cr VI (7196)	Remarks
MW-20-5	1	10/25/10	0914	W	2							X	MS/MSD, QC LEVEL IV
MW-20-4	2		0943		1							X	
MW-20-3	3		1009		1							X	
MW-20-2	4		1034		1							X	
MW-20-1	5		1101		1							X	
EB-04-10/25/10	6	10/25/10	1050	W	1							X	EQUIPMENT BLANK

Preservative Key

0	None
1	HCL
2	HNO3
3	H2SO4
4	NaOH
5	Zn Acetate
6	Asc Acid
7	Other

5 of 20

Report Tier Levels - please select

Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge ____
Tier V - (client specified) ____

MRL required Yes / No
MDL / PQL / J required Yes / No

EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)		Date: 10/25/10	Time: 1300	Received by: (Signature)		Date: 10/25/10	Time: 1300
Relinquished by: (Signature)		Date: 10/25/10	Time: 1340	Received by: (Signature)		Date: 10/25/10	Time: 1340
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Date:	Time:

Cooler / Blank / Ice / No Ice
Temperature 3 °C °C

Columbia Analytical Services™ 2655 Park Center Drive, Suite A, Simi Valley, CA 93065 | 805.526.7161 | www.caslab.com

Sample Acceptance Check Form

Client: Battelle Work order: P1003956

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/25/10 Date opened: 10/25/10 by: MZAMORA

Note: This form is used forall 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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature _____ °C Blank Temperature 3 °C			
10	Was a **trip blank** received?	☐	☐	☒
	Trip blank supplied by CAS: _____			
11	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003956-001.01	125mL Plastic NP					
P1003956-001.02	125mL Plastic NP					
P1003956-002.01	125mL Plastic NP					
P1003956-003.01	125mL Plastic NP					
P1003956-004.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

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Sample Acceptance Check Form

Client: Battelle Work order: P1003956

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/25/10 Date opened: 10/25/10 by: MZAMORA

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003956-005.01	125mL Plastic NP					
P1003956-006.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL GW Mon 4Q10
Project Number : G486090
Sample Matrix : WATER

Service Request : P1003956
Date Collected : 10/25/10
Date Received : 10/25/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-20-5	P1003956-001	0.010	0.004	1	NA	10/25/10 15:40	ND	
MW-20-4	P1003956-002	0.010	0.004	1	NA	10/25/10 15:40	ND	
MW-20-3	P1003956-003	0.010	0.004	1	NA	10/25/10 15:40	ND	
MW-20-2	P1003956-004	0.010	0.004	1	NA	10/25/10 15:40	ND	
MW-20-1	P1003956-005	0.010	0.004	1	NA	10/25/10 15:40	ND	
EB-04-10/25/10	P1003956-006	0.010	0.004	1	NA	10/25/10 15:40	ND	
Method Blank	P1003956-MB	0.010	0.004	1	NA	10/25/10 15:40	ND	

Approved By Karen Rya Date : 10/26/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL GW Mon 4Q10 / G486090

Service Request: P1003956
Date Analyzed: 10/25/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: Karen Ryan Date: 10/26/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL GW Mon 4Q10 / G486090

Service Request: P1003956
Date Analyzed: 10/25/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0607	105	90-110
CCV1	0.0579	0.0607	105	90-110
CCV2	0.0579	0.0607	105	90-110

Approved By: Karen Rya Date: 10/26/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003956
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	NA
Project Number :	G486090	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/25/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1003956-LCS	Basis :	NA
Test Notes :			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0409	102	90-109	

Approved By Karen Ryan Date : 10/26/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003956
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	10/25/10
Project Number :	G486090	**Date Received :**	10/25/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/25/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-20-5
Lab Code : P1003956-001MS P1003956-001DMS
Test Notes :

Units : mg/L (ppm)
Basis : NA

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0513	0.0513	103	103	78-112	<1	

Approved By Karen Ryan Date : 10/26/10

Report By:SAnderson

Columbia Analytical Services™

pH Run Log

Service Request #(s): 3956

Time: 0840

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/2011
pH 4 Buffer	524-0301/001	8/31/11
pH 7 Buffer	524-0301/002	1/31/12
pH 10 Buffer	524-0302/001	9/30/11

Slope	Prep.Run #
98.7%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled #)

Sample	#	pH	Temp. °C
pH 2.000	5	2.007	22.1°
pH 4.000		4.003	22.1°
pH 7.000		7.007	22.2°
pH 10.000		10.007	22.2°
Ref#: 519-11230903 TVE 6146 EXP: 11/2012		6.413	22.1°
DI H2O		2.070	20.9°
pH 2.000		2.002	22.0°
TIME: 1500			
pH 2.070	5	2.013	22.9°
3956-1.01		1.855	15.9°
-2.01		1.790	16.8°
-3.01		2.015	17.0°
-4.01		1.766	17.4°
-5.01		2.038	17.3°
-6.01		1.857	18.2°
pH 2.000		2.010	22.4°

Sample	#	pH	Temp. °C
Space not used			

pH Adjustments: ☒ **7196A**: Diluted/Conc H_2SO_4 MD 49284 EXP: 11/20/14

☐ **7199A**: Diluted NaOH _____ EXP: _____

Comments: _____

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 10/25/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: _____ Date: 10/25/10

Reviewer: KR Date: 10/25/10

pH.XLS

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

Service Request#(s): 3956 Run#: 222230

Stock#: 524-10191001 T.V=10PPM EXP:3/1/11 Prep Run#:

ICV/CCV#: 524-10191002 T.V=0.579PPM EXP: 11/2/10 Conc. H_2SO_4 Lot#: EM0 49284 EXP: 11/20/14

Coloring Reagent Ref#: 524-10191003 EXP: 11/02/10

Working Curve:

Prep Dilution		NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L		0.00	0.01	0.05	0.1	0.999949191
Absorbance @ 540 nm		0.000	0.010	0.052	0.106	

	Sample #	Sample Vol.(mL)	Dilution (pH ✓)		Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	ICB	10ml	—	✓	0.000	0.000	0.000	0.000426	<0.004
2	ICV 0.0579PPM		—	✓	0.000	0.064	0.064	0.0607	105%
3	MB		—	✓	0.000	0.001	0.001	0.00137	<0.004
4	LCS 0.040PPM		—	✓	0.000	0.043	0.043	0.0409	103%
5	3956-1.01		—	✓	0.001	0.002	0.001	0.00137	<0.004
6	-1.01 MS 0.05PPM		—	✓	0.001	0.055	0.054	0.0513	103%
7	-1.01 MSD ✓		—	✓	0.001	0.055	0.054	0.0513	103% RPD 0%
8	-2.01		—	✓	0.001	0.002	0.001	0.00137	<0.004
9	-2.01 VS 0.03PPM		—	✓	0.001	0.028	0.027	0.0259	86%
10	-3.01		—	✓	0.002	0.004	0.002	0.00231	<0.004
11	-4.01		—	✓	0.001	0.002	0.001	0.00137	<0.004
12	-5.01		—	✓	0.002	0.004	0.002	0.00231	<0.004
13	CCV1 0.0579PPM		—	✓	0.000	0.064	0.064	0.0607	105%
14	CCB1		—	✓	0.000	0.000	0.000	0.000426	<0.004
15	3956-6.01		—	✓	0.000	0.000	0.000	✓	✓
16	CCV2 0.0579PPM		—	✓	0.000	0.064	0.064	0.0607	105%
17	CCB2	✓	—	✓	0.000	0.000	0.000	0.000426	<0.004

pH Requirement: Method 7196A (2 ± 0.5) * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: Date/Time: 10/25/10 @ 1525

Analyzed By: Date/Time: 10/25/10 @ 1540

Reviewed By: Date: 10/25/10

4/8/09 SIG-04080901 ICV/LCV 1000PPM F FOR ICQ3
SV PURCHASED. INORGANIC VENTURES ICF1-1
LOT # 62-F01052
EXP: 5/1/2010

4/8/09 SIG-04080902 ICV/CCV (ICQ3) 1000PPM NO_2
SV PURCHASED INORGANIC VENTURES ICND21-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 SIG-04080903 NH_3 FILLING SOLN
SV PURCHASED. THERMO SCIENTIFIC 95202
LOT # MT1 P/N 70263-A04
EXP 4/8/10

4/9/09 SIG-04090901 0.1N H_2SO_4
SV 5.6ml Conc H_2SO_4 (EMD 47050, EXP: 9/13/10) TO 2L W/DI
EXP: 4/9/10

4/9/09 SIG-04090902 TSS-LCS T.V = 193 mg/L
SV 0.0193g S18-09160603 (EXP: 2010) TO 100ml W/DI H_2O
EXP: 4/10/09

4/9/09 SIG-04090903 1000 PPM F STANDARD
SV PURCHASED. ERA CAT # 050 125ml
LOT # 200109
EXP: 1/2011

4/9/09 SIG-04090904 ICV/CCV Cr-6 Std T.V = 115.8 PPM
SV PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 SIG-1120090901 MBTH SOLUTION FOR O3-AIR
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/14)
↑100 mL W/ DI + 0.5 mL H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 SIG-1120090902 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑1L w/ DI H_2O
EXP: 11/2010

11/20/09 SIG-1120090903 AMMONIA PH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 SIG-1120090904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010 - 500mL
LOT 1905343
EXP: 5/2011

11/20/09 SIG-1120090905 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 SIG-1123090901 1000PPM SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H10627, EXP: 8/31/14) ↑100 mL W/ DI H_2O
5/23/10

11/23/09 SIG-1123090Z 1000 ppm SO_3 (ICV/CCV)
SR 0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 SIG-1123090 3 A, B, C, D pH REFERENCE
SR PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 SIG-1124090 1 1000 ppm SO_4 Standard
SR PURCHASED CAT # ICC-006
LOT # K007944
EXP: 9/30/13
SR 11/25/09

11/25/09 SIG-~~H25~~ 1125090 1 0.1N H_2SO_4
SR 5.6ml conc H_2SO_4 (EMD 47050 EXP: 9/13/10)
EXP: ~~H25~~ 9/13/10
SR 11/25/09

11/30/09 SIG-1130090 1 Cr^{6+} Coloring Reagent
SR 0.2500g Diphenylcarbohydrazide (EMD) 47103ED; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 47154D; EXP: 5/24/12)
EXP: 12/20/09

11/30/09 SIG-1130090 2 25133 ppb Stock for O_3 in Air
SR 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 SIG-1130090 3 25133 ppb ICV/CCV for O_3 in Air
SR 0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: ~~KL~~ Date: 12/22/09

1/27/10 524-01271001 1000PPM SO_3 (STOCK)
0.1591g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 524-01271002 1000 PPM SO_3 (ICV/CCV)
0.1607g Na_2SO_3 (Mallinckrodt H25469; EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr^{6+} Soln T.V = 0.579PPM
0.5ml 519-04090904 (115.8PPM; EXP: 12/2010) ↑ 100ml w/ DI H_2O
EXP: 2/15/10

2/1/10 524-02011002 Cr^{6+} Coloring Reagent
0.2500g Diphenylcarbohydrazide (EMD 47103721 EXP: 1/30/13) ↑ 50 ml w/Acetone (EMD 47154D; EXP: 9/24/12
EXP: 2/15/10

2/2/10 524-02021001 Cr^{6+} 1000 PPM STOCK
Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-03011001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-03011002 pH 7.000 Buffer
Purchased 500 ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-03011003 1000 PPM Cl (LCS)
Purchased 120 ml Cat # 1955-4
RICCA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-03011004 NH3 Filling Soln
Purchased 60 ml Order 95120 2
Thermo Scientific LOT # MT1
P/N: 702613-A04
EXP: 3/1/11

3/2/10 SV
524-03021001 pH 10.000 buffer
Purchased 500 ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

524-10191001 10PPM Cr6+ Soln

10/19/10 1.0ml S24-02021001 (1000PPM Cr6+; EXP: 3/1/11) ↑ 100ml w/ DI H2O
EXP: 3/1/11

10/19/10 524-10191002 ICV/CCV Cr6+ T.V = 0.574PPM
0.5ml S19-04090904 (T.V = 115.8 mg/L; EXP 12/2010)
↑ 100ml w/ DI
EXP: 11/2/10

10/19/10 524-10191003 Cr6+ Coloring Reagent
0.2500g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)
EXP: 11/2/10

LABORATORY REPORT

November 2, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL GW Mon 4Q10 / G486090

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 22, 2010. For your reference, these analyses have been assigned our service request number P1003940.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle CAS Project No: P1003940
Project: JPL GW Mon 4Q10 / G486090

CASE NARRATIVE

The samples were received intact under chain of custody on October 22, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Project ID: JPL GW Mon 4Q10 / G486090
Service Request: P1003940

Date Received: 10/22/10
Time Received: 13:40

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-17-5	P1003940-001	Water	10/22/10	09:35	X
MW-17-4	P1003940-002	Water	10/22/10	10:07	X
MW-17-3	P1003940-003	Water	10/22/10	10:34	X
MW-17-2	P1003940-004	Water	10/22/10	10:57	X
MW-17-1	P1003940-005	Water	10/22/10	11:40	X
EB-03-10/22/10	P1003940-006	Water	10/22/10	11:11	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Page 1 of 1

Columbia Analytical Services INC.
An Employee - Owned Company

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Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

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.: P1003940

CAS Contact:

Company Name & Address (Reporting Information)	Project Name	Project Number
BATTELLE 3990 OLD TOWN AVE., C-205 SAN DIEGO, CA 92110	JPL GW MON 4Q10	GF86090

Project Manager	P.O. # / Billing Information
DAVID CONNER	214319/BATTELLE ATTN: GERALD TOMPKINS 505 KING AVE. COLUMBUS, OH 43201

Phone	Fax
(619) 726-7311	

Email Address for Result Reporting

Sampler (Print & Sign): CHRIS BROWN

Analysis Method and/or Analytes

Preservative Code

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted)	TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	0	Cr VI (7196)	Remarks
MW-17-5	1	10/22/10	0935	W	1							X		
MW-17-4	2		1007		2							X		MS/MSD
MW-17-3	3		1034		1							X		
MW-17-2	4		1057		1							X		
MW-17-1	5		1140		1							X		
EB-03-10/22/10	6	10/22/10	1111	W	1							X		EQUIPMENT BLANK

Preservative Key

0	None
1	HCL
2	HNO3
3	H2SO4
4	NaOH
5	Zn Acetate
6	Asc Acid
7	Other

Report Tier Levels - please select

Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge ____
Tier V - (client specified) ____

MRL required Yes / No
MDL / PQL / J required Yes / No

EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)		Date: 10/22/10	Time: 1300	Received by: (Signature)		Date: 10/22/10	Time: 1300
Relinquished by: (Signature)		Date: 10/22/10	Time: 1340	Received by: (Signature)		Date: 10/22/10	Time: 1340
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Date:	Time:

Cooler / Blank / Ice / No Ice
Temperature 3°C °C

5 of 22

Client: Battelle **Service Request:** P1003940
Project: JPL GW Mon 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1003940-001.01					
	7196A				
		10/22/10	1416	SMO / MZAMORA	
		10/22/10	1416	P-37 / MZAMORA	
		10/22/10	1426	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	
P1003940-002.01					
		10/22/10	1416	SMO / MZAMORA	
		10/22/10	1416	P-37 / MZAMORA	
		10/22/10	1426	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	
P1003940-002.02					
	7196A				
		10/22/10	1416	SMO / MZAMORA	
		10/22/10	1416	P-37 / MZAMORA	
		10/22/10	1426	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	
P1003940-003.01					
	7196A				
		10/22/10	1416	SMO / MZAMORA	
		10/22/10	1416	P-37 / MZAMORA	
		10/22/10	1426	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	
P1003940-004.01					
	7196A				
		10/22/10	1416	SMO / MZAMORA	
		10/22/10	1416	P-37 / MZAMORA	
		10/22/10	1426	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	
P1003940-005.01					
	7196A				
		10/22/10	1416	SMO / MZAMORA	
		10/22/10	1416	P-37 / MZAMORA	
		10/22/10	1426	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	
P1003940-006.01					
	7196A				
		10/22/10	1416	SMO / MZAMORA	
		10/22/10	1416	P-37 / MZAMORA	
		10/22/10	1426	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	

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Sample Acceptance Check Form

Client: Battelle Work order: P1003940

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/22/10 Date opened: 10/22/10 by: MZAMORA

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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature _____ °C Blank Temperature 3 °C			
10	Was a **trip blank** received?	☐	☐	☒
	Trip blank supplied by CAS: _____			
11	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003940-001.01	125mL Plastic NP					
P1003940-002.01	125mL Plastic NP					
P1003940-002.02	125mL Plastic NP					
P1003940-003.01	125mL Plastic NP					
P1003940-004.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

Columbia Analytical Services INC
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Sample Acceptance Check Form

Client: Battelle   Work order: P1003940

Project: JPL GW Mon 4Q10 / G486090

Sample(s) received on: 10/22/10   Date opened: 10/22/10   by: MZAMORA

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003940-005.01	125mL Plastic NP					
P1003940-006.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers):

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);
Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12)   RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL GW Mon 4Q10
Project Number : G486090
Sample Matrix : WATER

Service Request : P1003940
Date Collected : 10/22/10
Date Received : 10/22/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-17-5	P1003940-001	0.010	0.004	1	NA	10/22/10 15:20	ND	
MW-17-4	P1003940-002	0.010	0.004	1	NA	10/22/10 15:20	ND	
MW-17-3	P1003940-003	0.010	0.004	1	NA	10/22/10 15:20	ND	
MW-17-2	P1003940-004	0.010	0.004	1	NA	10/22/10 15:20	ND	
MW-17-1	P1003940-005	0.010	0.004	1	NA	10/22/10 15:20	ND	
EB-03-10/22/10	P1003940-006	0.010	0.004	1	NA	10/22/10 15:20	ND	
Method Blank	P1003940-MB	0.010	0.004	1	NA	10/22/10 15:20	ND	

Approved By Karen Ryan Date : 10/25/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Battelle	**Service Request:**	P1003940
Project:	JPL GW Mon 4Q10 / G486090	**Date Analyzed:**	10/22/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: Karen Rya Date: 10/25/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL GW Mon 4Q10 / G486090

Service Request: P1003940
Date Analyzed: 10/22/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0593	102	90-110
CCV1	0.0579	0.0602	104	90-110
CCV2	0.0579	0.0593	102	90-110

Approved By: Karen Ryan Date: 10/25/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003940
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	NA
Project Number :	G486090	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/22/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1003940-LCS	Basis :	NA
Test Notes :			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0421	105	90-109	

Approved By Karen Ryan Date : 10/25/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003940
Project Name :	JPL GW Mon 4Q10	**Date Collected :**	10/22/10
Project Number :	G486090	**Date Received :**	10/22/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/22/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-17-4
Lab Code : P1003940-002MS P1003940-002DMS
Test Notes :

Units : mg/L (ppm)
Basis : NA

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0536	0.0536	107	107	78-112	<1	

Approved By Karen Ryan Date : 10/25/10

Report By:SAnderson

Columbia Analytical Services

pH Run Log

Service Request #(s): 3937 3940

Time: 0820

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/2011
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-03011002	8/31/12
pH 10 Buffer	521-03021001	9/30/11

Slope	Prep.Run #
97.0%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled #)

Sample	#	pH	Temp. °C
pH 2.000	5	2.005	22.0°
pH 4.000		4.005	21.9°
pH 7.000		7.004	21.9°
pH 10.000		9.997	21.9°
T.V 26.46 EXP: 11/2013 Ref#: 519-11230903C		6.388	22.2°
DI H_2O		1.966	21.5°
pH 2.000		2.013	21.9°
TIME: 1415			
pH 2.000	5	2.019	22.6°
3937-1.01		2.093	20.5°
-2.01		2.105	14.6°
3940-1.01		2.050	13.1°
-2.01		1.974	12.8°
-3.01		1.850	13.7°
-4.01		1.831	13.4°
-5.01		2.096	14.6°
-6.01		1.993	14.4°

Sample	#	pH	Temp. °C
pH 2.000	5	2.019	22.4°
space not filled			

pH Adjustments: ~~7196A~~: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14

☐ **7199A**: Diluted NaOH _____ EXP: _____

Comments: _____

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 10/18/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: _____ Date: 10/22/10

Reviewer: KR Date: 10/22/10

pH.XLS

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

page 1 of 2

Service Request#(s): 3937 3940 Run#: 221998

Lock#: 524-10191001 T.V=10PPM EXP: 3/1/11 Prep Run#:

ICV/CCV#: 524-10191002 T.V=0.579PPM EXP: 3/1/11 Conc. H_2SO_4 Lot#: EMD 49284 EXP: 11/30/14

Coloring Reagent Ref#: 524-1019/003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.99998994
Absorbance @ 540 nm	0.000	0.010	0.052	0.105	

Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
ICB	10ml	—	✓	0.000	0.000	0.000	0.000299	<0.004
ICV 0.0579PPM		—	✓	0.000	0.062	0.062	0.0593	102%
MB		—	✓	0.000	0.000	0.000	0.000299	<0.004
LCS 0.0400PPM		—	✓	0.000	0.044	0.044	0.0421	105%
3937-1.01		—	✓	0.000	0.002	0.002	0.00220	<0.004
-1.01 MS 0.05PPM		—	✓	0.000	0.054	0.054	0.0516	103% } 2.1% RPD
-1.01 MSD 0.05PPM		—	✓	0.000	0.054	0.054	0.0516	103% } RPD
-2.01		—	✓	0.001	0.003	0.002	0.00220	<0.004
-2.01 VS 0.03PPM		—	✓	0.001	0.034	0.033	0.0317	106%
3940-1.01		—	✓	0.002	0.004	0.002	0.00220	<0.004
-1.01 VS 0.03PPM		—	✓	0.002	0.030	0.028	0.0269	90%
-2.01		—	✓	0.000	0.002	0.002	0.00220	<0.004
CCV1 0.0579PPM		—	✓	0.000	0.063	0.063	0.0602	104%
CCB1		—	✓	0.000	0.000	0.000	0.000299	<0.004
3940-2.01 MS 0.05PPM		—	✓	0.000	0.056	0.056	0.0536	107% } 2.1% RPD
-2.01 MSD ↓		—	✓	0.000	0.056	0.056	0.0536	107% } RPD
-3.01	✓	—	✓	0.003	0.003	0.000	0.000299	<0.004

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001@1/10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: Date/Time: 10/22/10 @1507

Analyzed By: Date/Time: 10/22/10 @1520

Reviewed By: Date: 10/22/10

Cr6LIQ.xls

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

page 2 of 2

Service Request#(s): 3937 3940 Run#: 221998

Stock#: S24-10191001 T.V=10PPM EXP: 3/1/11 Prep Run#: —

ICV/CCV#: S24-10191002 T.V=0.579ppm EXP: 11/2/10 Conc. H_2SO_4 Lot#: EMD 49734 EXP: 11/20/14

Coloring Reagent Ref#: S24-10191003

Working Curve:

Prep Dilution		NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L		0.00	0.01	0.05	0.1	0.999982
Absorbance @ 540 nm		0.000	0.010	0.052	0.105	94/5

	Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	3940-4.01	10ml	—	✓	0.000	0.000	0.000	0.000399	<0.004
2	-5.01	"	—	✓	0.001	0.002	0.001	0.00125	<0.004
3	-6.01	"	—	✓	0.000	0.000	0.000	0.000399	<0.004
4	CCV2 0.0579PPM	"	—	✓	0.000	0.062	0.062	0.0593	103%
5	CCB2	"	—	✓	0.000	0.000	0.000	0.000399	<0.004
6									
7									
8									
9									
10									
11						Space not used			
12									
13									
14									
15									
16									
17									

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of S24-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579 ppm)

MS/MSD spiked with 0.05 ml of S24-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ✓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of S24-10191001 @ 1/10 ↑ 10 ml of sample (T.V.=0.03 ppm)

Comments: _____

Prepared By: _____ Date/Time: 10/22/10 @ 1507

Analyzed By: _____ Date/Time: 10/22/10 @ 1520

Reviewed By: _____ Date: 10/22/10

Cr6LIQ.xls

4/8/09 SR — S19-04080901 ICV/CCV 1000PPM F FOR IC03
PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F01052
EXP: 5/1/2010

4/8/09 SR — S19-04080902 ICV/CCV (IC03) 1000PPM NO2
PURCHASED INORGANIC VENTURES ICNO21-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 SR — S19-04080903 NH3 FILLING SOLN
PURCHASED. THERMO SCIENTIFIC 95202
LOT # MT1 P/N 70263-A04
EXP 4/8/10

4/9/09 SR — S19-04090901 0.1N H2SO4
5.6 ml Conc H2SO4 (EMD 47050; EXP: 9/13/10) T 2L W/D.
EXP: 4/9/10

4/9/09 SR — S19-04090902 TSS-LCS T.V = 193 mg/L
0.0193g S18-09160603 (EXP: 2010) T 100ml W/DI H2
EXP: 4/10/09

4/9/09 SR — S19-04090903 1000PPM F STANDARD
PURCHASED. ERA CAT # 050 125ml
LOT # 200109
EXP: 1/2011

4/9/09 SR — S19-04090904 ICV/CCV Cr-Ox Std T.V = 115.8 PPM
PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 SIG-11200901 MBTH SOLUTION FOR O3-AIR
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/14) T 100 ml W/ DI + 0.5 ml H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 SIG-11200902 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) T 1L W/ DI H_2O
EXP: 11/2010

11/20/09 SIG-11200903 AMMONIA PH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 SIG-11200904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010 - 500mL
LOT 1905343
EXP: 5/2011

11/20/09 SIG-11200905 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 SIG-11230901 1000PPM SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H10627, EXP: 8/31/14) T 100 ml W/ DI H_2O
5/23/10

11/23/09 SIG-1123090Z 1000 ppm SO_3 (ICV/CCV)
SR 0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 SIG-1123090 3 A, B, C, D pH REFERENCE
SR PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 SIG-1124090 1 1000 ppm SO_4 Standard
SR PURCHASED CAT # ICC-006
LOT # K007794
EXP: 9/30/13
SR 11/25/09

11/25/09 SIG-~~H25~~ 1125090 1 0.1N H_2SO_4
SR 5.6ml Conc H_2SO_4 (EMD 4705D EXP: 9/13/10)
EXP: ~~9/13/10~~ 9/13/10
SR 11/25/09

11/30/09 SIG-1130090 1 Cr^{6+} Coloring Reagent
SR 0.2500g Diphenylcarbohydrazide (EMD) 4710 3E01; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 4715 4D; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 SIG-1130090 2 25133 ppb Stock for O_3 in Air
SR 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 SIG-1130090 3 25133 ppb ICV/CCV for O_3 in Air
SR 0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: KL Date: 12/22/09

1/27/10 S24-01271001 1000PPM SO_3 (STOCK)
0.1591 g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 S24-01271002 1000 PPM SO_3 (ICV/CCV)
0.1607g Na_2SO_3 (Mallinckrodt H25469, EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 S24-02011001 ICV/CCV Cr^{6+} Soln T.V = 0.579 PPM
0.5ml S19-01090904 (115.8 PPM; EXP: 12/2010) ↑ 100ml w/ DI H_2O
EXP: 2/15/10

2/1/10 S24-02011002 Cr^{6+} Coloring Reagent
0.2500g Diphenylcarbohydrazide (EMD ~~47103~~ 47103721 EXP: 1/30/13) ↑ 50 ml w/Acetone (EMD 47154D; EXP: 9/24/11)
EXP: 2/15/10

2/2/10 S24-02021001 Cr^{6+} 1000 PPM Stock
Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-0301001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-0301002 pH 7.000 Buffer
Purchased 500 ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-0301003 1000 PPM Cl (LCS)
Purchased 120 ml Cat # 1955-4
RICCA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-0301004 NH3 Filling Sol'n
Purchased 60 ml Orion 951202
Thermo Scientific LOT # MT1
P/N: 703613-A04
EXP: 3/1/11

3/2/10 SV
524-0302001 pH 10.000 buffer
Purchased 500 ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11

S24-10191001 10PPM Cr^{6+} Soln

10/19/10 1.0ml S24-0202 1001 (1000PPM Cr^{6+}; EXP: 3/1/11) ↑ 100ml W/DI H_2O

EXP: 3/1/11

10/19/10 S24-10091002 ICV/CCV Cr^{6+} T.V = 0.574PPM

0.5ml S19-0409090904 (T.V = 115.8 mg/L; EXP 12/2010) ↑ 100ml W/DI

EXP: 11/2/10

10/19/10 S24-10191003 Cr^{6+} Coloring Reagent

0.250g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP: 1/30/13) ↑ 50ml Acetone (EMD 47154; EXP: 9/24/12)

EXP: 11/2/10

LABORATORY REPORT

November 2, 2010

David Conner
Battelle
4800 Oak Grove Dr. M/S 180-801
Pasadena, CA 91109

RE: JPL-GW-4Q10 / G005862 / JPL GWM

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 22, 2010. For your reference, these analyses have been assigned our service request number P1003937.

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. 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 T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; 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: Battelle CAS Project No: P1003937
Project: JPL-GW-4Q10 / G005862 / JPL GWM

CASE NARRATIVE

The samples were received intact under chain of custody on October 22, 2010 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.

Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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: Battelle
Service Request: P1003937
Project ID: JPL-GW-4Q10 / G005862 / JPL GWM

Date Received: 10/22/10
Time Received: 09:45

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	7196A - Cr6
MW-15	P1003937-001	Water	10/21/10	16:47	X
MW-6	P1003937-002	Water	10/22/10	10:42	X

Columbia Analytical Services, Inc.

Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl *tert* -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	*Standard Methods for the Examination of Water and Wastewater*, 19th Ed., 1995.
SW	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.

Water & Soil - Chain of Custody Record & Analytical Service Request

Columbia Analytical Services INC
An Employee - Owned Company

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

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: P003937

CAS Contact:

Company Name & Address (Reporting Information)	Project Name
Battelle 505 King Ave Columbus OH 43201	JPL-GW-4Q10
	Project Number: G005862/JPL GWM
Project Manager: David Conner	P.O. # / Billing Information: 214375/Battelle 505 King Ave Columbus OH 43201
Phone: 619 726-7311 / Fax: 614 458-6604-1	
Email Address for Result Reporting: connerd@battelle.org	Sampler (Print & Sign): David Loera / David L

Analysis Method and/or Analytes

Preservative Code

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Volatile Organics GC/MS 624 ☐ 8260B ☐ Oxygenates ☐ TPH Gas ☐	TPH Gas 8015B ☐ BTEX 8021B ☐ MTBE 8021B ☐	TPH Diesel 8015B ☐ (Subcontracted)	TPH Diesel Low Level 8015B ☐ (Subcontracted)	TPH FC ☐ 8015M (Subcontracted)	Semi-Volatile Organics GC/MS 625 ☐ 8270C ☐ (Subcontracted)	0													Remarks
												Hexavalent Cr (7196)													
MW-15		10/21/10	1647	AQ	1P							X													

Preservative Key

0	None
1	HCL
2	HNO3
3	H2SO4
4	NaOH
5	Zn Acetate
6	Asc Acid
7	Other

Report Tier Levels - please select

Tier I - (Results/Default if not specified) ____
Tier II - (Results + QC) ____
Tier III - (Data Validation Package) 10% Surcharge X
Tier V - (client specified) ____

MRL required Yes / No
MDL / PQL / J required Yes / No

EDD required Yes / No
Type: ____

Project Requirements (MRLs, QAPP)

	Date	Time		Date	Time
Relinquished by: (Signature) David L	10/21/10	1800	Received by: (Signature)	10/22/10	0945
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Cooler / Blank / Ice / No Ice

Temperature ____ °C

5 of 21

Client: Battelle **Service Request:** P1003937
Project: JPL-GW-4Q10/G005862 / JPL GWM

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1003937-001.01					
	7196A				
		10/22/10	1153	SMO / SSTAPLES	
		10/22/10	1234	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	
P1003937-002.01					
	7196A				
		10/22/10	1423	SMO / MZAMORA	
		10/22/10	1424	P-37 / MZAMORA	
		10/22/10	1426	In Lab / SANDERSON	
		10/22/10	1556	P-37 / SANDERSON	

Columbia Analytical Services™ 2655 Park Center Drive, Suite A, Simi Valley, CA 93065 | 805.526.7161 | www.caslab.com

Sample Acceptance Check Form

Client: Battelle Work order: P1003937

Project: JPL-GW-4Q10 / G005862 / JPL GWM

Sample(s) received on: 10/22/10 Date opened: 10/22/10 by: SSTAPLES

Note: This form is used forall 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 **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by CAS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Was a **chain-of-custody** provided?	☒	☐	☐
5	Was the **chain-of-custody** properly completed?	☒	☐	☐
6	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
7	Was **sample volume** received adequate for analysis?	☒	☐	☐
8	Are samples within specified holding times?	☒	☐	☐
9	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature _____ °C Blank Temperature 6 °C			
10	Was a **trip blank** received?	☐	☐	☒
	Trip blank supplied by CAS: _____			
11	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
12	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
13	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
14	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003937-001.01	125mL Plastic NP					Received via Fed-ex
P1003937-002.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): _____

*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12); Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL-GW-4Q10
Project Number : G005862 / JPL GWM
Sample Matrix : WATER

Service Request : P1003937
Date Collected : 10/21,22/10
Date Received : 10/22/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-15	P1003937-001	0.010	0.004	1	NA	10/22/10 15:20	ND	
MW-6	P1003937-002	0.010	0.004	1	NA	10/22/10 15:20	ND	
Method Blank	P1003937-MB	0.010	0.004	1	NA	10/22/10 15:20	ND	

Approved By Karen Ryan Date : 10/25/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Battelle	**Service Request:**	P1003937
Project:	JPL-GW-4Q10 / G005862 / JPL GWM	**Date Analyzed:**	10/22/10

Title: Initial and Continuing Calibration Blank (ICB and CCB) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: Karen Rya Date: 10/25/10

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Battelle
Project: JPL-GW-4Q10 / G005862 / JPL GWM

Service Request: P1003937
Date Analyzed: 10/22/10

Title: Initial and Continuing Calibration Verification (ICV and CCV) Summary
Analyte: Chromium, Hexavalent
Method: 7196A
Units: mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0593	102	90-110
CCV1	0.0579	0.0602	104	90-110
CCV2	0.0579	0.0593	102	90-110

Approved By: Kara Ryan Date: 10/25/10

CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003937
Project Name :	JPL-GW-4Q10	**Date Collected :**	NA
Project Number :	G005862 / JPL GWM	**Date Received :**	NA
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/22/10

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name :	Laboratory Control Sample	Units :	mg/L (ppm)
Lab Code :	P1003937-LCS	Basis :	NA
Test Notes :			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0421	105	90-109	

Approved By Karen Ryan Date : 10/25/10

Report By:SAnderson

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client :	Battelle	**Service Request :**	P1003937
Project Name :	JPL-GW-4Q10	**Date Collected :**	10/21/10
Project Number :	G005862 / JPL GWM	**Date Received :**	10/22/10
Sample Matrix :	WATER	**Date Extracted :**	NA
		Date Analyzed :	10/22/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-15
Lab Code : P1003937-001MS P1003937-001DMS
Test Notes :

Units : mg/L (ppm)
Basis : NA

Analyte	Prep Method	Analysis Method	PQL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Spike Recovery MS	Spike Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0516	0.0516	103	103	78-112	<1	

Approved By Karen Ryan Date : 10/25/10

Report By:SAnderson

Columbia Analytical Services™

pH Run Log

Service Request #(s): 3937 3940

Time: 0820

Sample	VWR lot #	Exp.
pH 2 Buffer	519-1200904	5/2011
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-03011002	8/31/12
pH 10 Buffer	521-03021001	9/30/11

Slope	Prep.Run #
97.0%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C **pH in solid:** (3) 9045C, (4) 9045D (*Note method number in column labeled # below*)

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled #)

Sample	#	pH	Temp. °C
pH 2.000	5	2.005	22.0°
pH 4.000		4.005	21.9°
pH 7.000		7.004	21.9°
pH 10.000		9.997	21.9°
Ref#: 519-11230903C T.V 26.46 EXP: 11/2013		6.388	22.2°
DI H2O		1.966	21.5°
pH 2.000		2.013	21.9°
TIME: 1415			
pH 2.000	5	2.019	22.6°
3937-1.01		2.093	20.5°
-2.01		2.105	14.6°
3940-1.01		2.050	13.1°
-2.01		1.974	12.8°
-3.01		1.850	13.7°
-4.01		1.831	13.4°
-5.01		2.096	14.6°
-6.01		1.993	14.4°

Sample	#	pH	Temp. °C
pH 2.000	5	2.019	22.4°
		space not filled	

pH Adjustments: ☒ **7196A**: Diluted/Conc H_2SO_4 EMD 49284 EXP: 11/20/14

☐ **7199A**: Diluted NaOH _____ EXP: _____

Comments: _____

* Soil or Solid prep: 1:1(wt:vol) with DI water: ** Samples received past recommended hold time.

Date buffers and filling solution changed: 10/18/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: _____ Date: 10/22/10

Reviewer: KR Date: 10/22/10

pH.XLS

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

page 1 of 2

Service Request#(s): 3937 3940 Run#: 221998

Lock#: 524-10191001 T.V=1.0PPM EXP: 3/1/11 Prep Run#:

ICV/CCV#: 524-10191002 T.V=0.579PPM EXP: 3/1/11 Conc. H_2SO_4 Lot#: EMD 49284 EXP: 11/30/14

Coloring Reagent Ref#: 524-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.999982945
Absorbance @ 540 nm	0.000	0.010	0.052	0.105	

Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
ICB	10ml	—	✓	0.000	0.000	0.000	0.000299	<0.004
ICV 0.0579PPM		—	✓	0.000	0.062	0.062	0.0593	102%
MB		—	✓	0.000	0.000	0.000	0.000299	<0.004
LCS 0.0400PPM		—	✓	0.000	0.044	0.044	0.0421	105%
3937-1.01		—	✓	0.000	0.002	0.002	0.00220	<0.004
-1.01 MS 0.05PPM		—	✓	0.000	0.054	0.054	0.0516	103% } 1% RPD
-1.01 MSD 0.05PPM		—	✓	0.000	0.054	0.054	0.0516	103% } RPD
-2.01		—	✓	0.001	0.003	0.002	0.00220	<0.004
-2.01 VS 0.03PPM		—	✓	0.001	0.034	0.033	0.0317	106%
3940-1.01		—	✓	0.002	0.004	0.002	0.00220	<0.004
-1.01 VS 0.03PPM		—	✓	0.002	0.030	0.028	0.0269	90%
-2.01		—	✓	0.000	0.002	0.002	0.00220	<0.004
CCV1 0.0579PPM		—	✓	0.000	0.063	0.063	0.0602	104%
CCB1		—	✓	0.000	0.000	0.000	0.000299	<0.004
3940-2.01 MS 0.05PPM		—	✓	0.000	0.056	0.056	0.0536	107% } 2% RPD
-2.01 MSD		—	✓	0.000	0.056	0.056	0.0536	107% } RPD
-3.01		—	✓	0.003	0.003	0.000	0.000299	<0.004

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001@1/10 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: Date/Time: 10/22/10 @1507

Analyzed By: Date/Time: 10/22/10 @1520

Reviewed By: Date: 10/22/10

Cr6LIQ.xls

Hexavalent Chromium (Liquids)

Columbia Analytical Services™

Method EPA 7196A

page 2 of 2

Service Request#(s): 3937 3940 Run#: 221998

Stock#: S24-10191001 T.V=10PPM EXP: 3/1/11 Prep Run#: —

CV/CCV#: S24-10191002 T.V=0.579ppm EXP: 11/2/10 Conc. H_2SO_4 Lot#: EMD 49284 EXP: 11/20/14

Coloring Reagent Ref#: S24-10191003

Working Curve:

Prep Dilution		NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L		0.00	0.01	0.05	0.1	0.999894/5
Absorbance @ 540 nm		0.000	0.010	0.052	0.105	

	Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	3940-4.01	10ml	—	✓	0.000	0.000	0.000	0.000399	<0.004
2	-5.01	↓	—	✓	0.001	0.002	0.001	0.00125	<0.004
3	-6.01		—	✓	0.000	0.000	0.000	0.000399	<0.004
4	CCV2 0.0579PPM		—	✓	0.000	0.062	0.062	0.0593	103%
5	CCB2		—	✓	0.000	0.000	0.000	0.000399	<0.004
6									
7									
8									
9									
10									
11						Space not used			
12									
13									
14									
15									
16									
17									

pH Requirement: Method 7196A *(2 ± 0.5)* * Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of S24-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579 ppm)

MS/MSD spiked with 0.05 ml of S24-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ✓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of S24-10191001 @ 1/10 ↑ 10 ml of sample (T.V.=0.03 ppm)

Comments:

Prepared By: [signature] Date/Time: 10/22/10 @ 1507

Analyzed By: [signature] Date/Time: 10/22/10 @ 1520

Reviewed By: [signature] Date: 10/22/10

Cr6LIQ.xls

4/8/09 S19-04080901 ICV/CCV 1000PPM F FOR IC03
PURCHASED. INORGANIC VENTURES ICF1-1
LOT # B2-F01052
EXP: 5/1/2010

4/8/09 S19-04080902 ICV/CCV (IC03) 1000PPM NO_2
PURCHASED INORGANIC VENTURES ICNO21-1
LOT # C2-NOX02069
EXP: 5/1/10

4/8/09 S19-04080903 NH_3 FILLING SOLN
PURCHASED. THERMO SCIENTIFIC 951202
LOT # MT I P/N 702613-A04
EXP 4/8/10

4/9/09 S19-04090901 0.1 N H_2SO_4
5.6 ml Conc H_2SO_4 (EMD 47050; EXP: 9/13/10) ↑ 2L w/D.
EXP: 4/9/10

4/9/09 S19-04090902 TSS-LCS T.V = 193 mg/L
0.0193 g S18-09160603 (EXP: 2010) ↑ 100 ml w/ DI H_2
EXP: 4/10/09

4/9/09 S19-04090903 1000 PPM F STANDARD
PURCHASED. ERA CAT # 050 125 ml
LOT # 200109
EXP: 1/2011

4/9/09 S19-04090904 ICV/CCV Cr^{6+} Std T.V = 115.8 PPM
PURCHASED. ERA CAT # 984
LOT # P161-984A
EXP: 12/2010

11/20/09 SIG-11200901 MBTH SOLUTION FOR O3-AIR
0.5000g MBTH (ALDRICH LOT 54696EK ; EXP: 8/14) T 100 ml W/ DI + 0.5 ml H_2SO_4 (EMD 47050; EXP: 9/13/10)
EXP: 11/21/09

11/20/09 SIG-11200902 2N NaOH
2.00g NaOH (EMD 47022713; EXP: 10/11/12) T 1L W/ DI H_2O
EXP: 11/2010

11/20/09 SIG-11200903 AMMONIA PH ADJUSTING ISA
Purchased
Thermo Scientific Orion 951211
LOT CODE: NW1 P/N: 207475-A01
EXP: 11/20/10

11/20/09 SIG-11200904 pH 2.000 BUFFER
PURCHASED
BDH CAT NO 5010 - 500mL
LOT 1905343
EXP: 5/2011

11/20/09 SIG-11200905 A→E PH FILLING SOLUTION (3M KCl)
PURCHASED
Thermo Scientific 810007
LOT CODE: NQ1
EXP: 11/20/10

11/23/09 SIG-11230901 1000PPM SO_3 (stock)
0.1591g Na_2SO_3 (JT Baker H10627, EXP: 8/31/14) T 100 ml W/ DI H_2O
5/23/10

11/23/09 SIG-1123090Z 1000 ppm SO_3 (ICV/CCV)
0.1607g Na_2SO_3 (Mallinckrodt; H25469; EXP 8/11/14)
↑ 100ml w/ DI
EXP: 5/23/10

11/23/09 SIG-1123090 3 A,B,C,D pH REFERENCE
PURCHASED
ERA CAT # 977
LOT # 129934
EXP: 1/2012

11/24/09 SIG-1124090 1 1000 ppm SO_4 Standard
PURCHASED CAT # ICC-006
LOT # K007794
EXP: 9/30/13
SR 11/25/09

11/25/09 SIG-~~H25~~ 1125090 1 0.1N H_2SO_4
5.6ml Conc H_2SO_4 (EMD 4705D EXP: 9/13/10)
EXP: ~~9/13/10~~ 9/13/10
SR 11/25/09

11/30/09 SIG-1130090 1 Cr^{6+} Coloring Reagent
0.2500g Diphenylcarbohydrazide (EMD) 4710 3E01; EXP: 1/30/13) ↑ 50ml w/ Acetone (EMD 4715D; EXP: 9/24/12)
EXP: 12/30/09

11/30/09 SIG-1130090 2 25133 ppb Stock for O_3 in Air
0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)
↑ 500ml deionized H_2O
EXP: 12/14/09

11/30/09 SIG-1130090 3 25133 ppb ICV/CCV for O_3 in Air
0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGINC; EXP: 8/10/12)
↑ 500ml w/ DI H_2O
EXP: 12/14/09

Reviewed And Approved By:
Initial: KL Date: 12/22/09

1/27/10 524-01271001 1000PPM SO_3 (STOCK)
Jn 0.1591 g Na_2SO_3 (JT Baker H10627 EXP: 8/31/14)
↑ 100ml w/ DI H_2O
EXP: 7/27/10

1/27/10 524-01271002 1000 PPM SO_3 (ICV/CCV)
Jn 0.1607g Na_2SO_3 (Mallinckrodt H25469, EXP: 8/11/14) ↑ 100ml w/ DI H_2O
EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr^{6+} Sol/n T.V = 0.579PPM
Jn 0.5ml 519-04090904 (115.8 PPM; EXP: 12/2010) ↑ 100ml
w/ DI H_2O
EXP: 2/15/10

2/1/10 524-02011002 Cr^{6+} Coloring Reagent
Jn 0.2500g Diphenylcarbohydrazide (EMD ~~4703~~ 47103721 Jn 2/1/10
EXP: 1/30/13) ↑ 50 ml w/Acetone (EMD 47154D; EXP: 9/24/1[illegible]
EXP: 2/15/10

2/2/10 524-02021001 Cr^{6+} 1000 PPM STOCK
Jn Purchased Inorganic Ventures CGCR(6)1-1
LOT # C2-CR03026
EXP: 3/1/11

3/1/10 SV
524-03011001 pH 4.000 Buffer
Purchased 500 ml CAT # 5657-01
JT BAKER LOT # H31526
EXP 8/31/11

3/1/10 SV
524-03011002 pH 7.000 Buffer
Purchased 500 ml CAT # 5656-01
JT BAKER LOT # H47531
EXP: 1/31/12

3/1/10 SV
524-03011003 1000 PPM Cl (LCS)
Purchased 120 ml Cat # 1955-4
RICCA CHEM CO LOT # 1001395
EXP: 7/2011

3/1/10 SV
524-03011004 NH3 Filling Sol'n
Purchased 60 ml Orion 951202
Thermo Scientific LOT # MT1
P/N: 703613-A04
EXP: 3/1/11

3/2/10 SV
524-03021001 pH 10.000 buffer
Purchased 500 ml Cat # 5655-01
JT Baker LOT H34508
EXP: 9/30/11