



Spill# 2145389
Doc# 2528933
Date: 07/15/2013

07/15/13

Technical Report for

Marathon Oil

MOC POND C/ MOC SOLVAY

Accutest Job Number: D48109

Sampling Date: 07/10/13

Report to:

Marathon Oil Company
743 Horizon Court Suite 220
Grand Junction, CO 81056
zjtoellner@marathonoil.com

ATTN: Zach Toellner

Total number of pages in report: 47



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Scott Heideman
Laboratory Director

Client Service contact: Ann Doerr 303-425-6021

Certifications: CO (CO00049), ID, NE (CO00049), ND (R-027), NJ (CO 0007), OK (D9942), UT (NELAP CO00049), TX (T104704511)

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Test results relate only to samples analyzed.

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Sample Summary

Marathon Oil

Job No: D48109

MOC POND C/ MOC SOLVAY

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
D48109-1	07/10/13	11:00 BT	07/11/13	AQ	Surface Water	MOC_SOLVAY
D48109-2	07/10/13	14:30 BT	07/11/13	AQ	Surface Water	MOC_POND C
D48109-3	07/10/13	11:45 BT	07/11/13	AQ	Surface Water	POND C_BOTTOM



CASE NARRATIVE / CONFORMANCE SUMMARY

Client: Marathon Oil

Job No D48109

Site: MOC POND C/ MOC SOLVAY

Report Date 7/15/2013 4:49:40 PM

On 07/11/2013, 3 sample(s), 0 Trip Blank(s), and 0 Field Blank(s) were received at Accutest Mountain States (AMS) at a temperature of 5.8 °C. The samples were intact and properly preserved, unless noted below. An AMS Job Number of D48109 was assigned to the project. The lab sample ID, client sample ID, and date of sample collection are detailed in the report's Results Summary.

Specified quality control criteria were achieved for this job except as noted below. For more information, please refer to the analytical results and QC summary pages.

Volatiles by GCMS By Method SW846 8260B

Matrix AQ

Batch ID: V3V1507

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D47878-1MS, D47878-1MSD were used as the QC samples indicated.
- D47878-1MS: Dilution required due to matrix interference (sample foamed).
- D47878-1MSD: Dilution required due to matrix interference (sample foamed).

Volatiles by GC By Method SW846 8015B

Matrix AQ

Batch ID: GFA740

- All samples were analyzed within the recommended method holding time.
- Sample(s) D48109-1MS, D48109-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Matrix AQ

Batch ID: GGB1161

- All samples were analyzed within the recommended method holding time.
- Sample(s) D48026-1MS, D48026-1MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Extractables by GC By Method SW846-8015B

Matrix AQ

Batch ID: OP8188

- All samples were extracted and analyzed within the recommended method holding time.
- Sample(s) D47726-37MS, D47726-37MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Wet Chemistry By Method EPA 300.0/SW846 9056

Matrix AQ

Batch ID: GP10409

- All samples were prepared and analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D48109-3MS, D48109-3MSD were used as the QC samples for the Chloride, Sulfate, Chloride analysis.

Wet Chemistry By Method SM 2540C-2011

Matrix AQ

Batch ID: GN20952

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) D47990-2DUP were used as the QC samples for the Solids, Total Dissolved analysis.

AMS certifies that data reported for samples received, listed on the associated custody chain or analytical task order, were produced to specifications meeting AMS's Quality System precision, accuracy and completeness objectives except as noted.

Estimated non-standard method measurement uncertainty data is available on request, based on quality control bias and implicit for standard methods. Acceptable uncertainty requires tested parameter quality control data to meet method criteria.

AMS is not responsible for data quality assumptions if partial reports are used and recommends that this report be used in its entirety. This report is authorized by AMS indicated via signature on the report cover.

Summary of Hits

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Job Number: D48109
Account: Marathon Oil
Project: MOC POND C/ MOC SOLVAY
Collected: 07/10/13

Lab Sample ID	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
---------------	------------------	-----------------	----	-----	-------	--------

D48109-1 MOC_SOLVAY

TPH-DRO (C10-C28)	0.316	0.19	0.17	mg/l	SW846-8015B
Chloride	37.8	2.5		mg/l	EPA 300.0/SW846 9056
Solids, Total Dissolved	544	10		mg/l	SM 2540C-2011
Sulfate	140	2.5		mg/l	EPA 300.0/SW846 9056

D48109-2 MOC_POND C

Benzene	0.0064	0.0010	0.00025	mg/l	SW846 8260B
Toluene	0.0061	0.0020	0.0010	mg/l	SW846 8260B
Ethylbenzene	0.00085 J	0.0020	0.00025	mg/l	SW846 8260B
Xylene (total)	0.0106	0.0030	0.0020	mg/l	SW846 8260B
TPH-GRO (C6-C10)	0.142 J	0.20	0.10	mg/l	SW846 8015B
TPH-DRO (C10-C28)	0.241	0.19	0.17	mg/l	SW846-8015B
Chloride	275	10		mg/l	EPA 300.0/SW846 9056
Solids, Total Dissolved	868	10		mg/l	SM 2540C-2011
Sulfate	103	2.5		mg/l	EPA 300.0/SW846 9056

D48109-3 POND C_BOTTOM

Benzene	0.0139	0.0010	0.00025	mg/l	SW846 8260B
Toluene	0.0144	0.0020	0.0010	mg/l	SW846 8260B
Ethylbenzene	0.00094 J	0.0020	0.00025	mg/l	SW846 8260B
Xylene (total)	0.0137	0.0030	0.0020	mg/l	SW846 8260B
TPH-GRO (C6-C10)	0.173 J	0.20	0.10	mg/l	SW846 8015B
Chloride	276	10		mg/l	EPA 300.0/SW846 9056
Solids, Total Dissolved	908	10		mg/l	SM 2540C-2011
Sulfate	101	2.5		mg/l	EPA 300.0/SW846 9056

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	MOC_SOLVAY	Date Sampled:	07/10/13
Lab Sample ID:	D48109-1	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8260B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3V25611.D	1	07/12/13	BR	n/a	n/a	V3V1507
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Purgeable Aromatics

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	0.0010	0.00025	mg/l	
108-88-3	Toluene	ND	0.0020	0.0010	mg/l	
100-41-4	Ethylbenzene	ND	0.0020	0.00025	mg/l	
1330-20-7	Xylene (total)	ND	0.0030	0.0020	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
17060-07-0	1,2-Dichloroethane-D4	107%		62-130%
2037-26-5	Toluene-D8	98%		70-130%
460-00-4	4-Bromofluorobenzene	92%		69-130%

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Page 1 of 1

Client Sample ID:	MOC_SOLVAY	Date Sampled:	07/10/13
Lab Sample ID:	D48109-1	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8015B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	FA12248.D	1	07/12/13	AV	n/a	n/a	GFA740
Run #2							

Run #	Initial Volume	Final Volume
Run #1	1.0 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
67-56-1	Methanol	ND	0.50	0.40	mg/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
71-36-3	n-Butyl Alcohol	112%		25-169%		

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Page 1 of 1

Client Sample ID:	MOC_SOLVAY	Date Sampled:	07/10/13
Lab Sample ID:	D48109-1	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8015B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	GB21148.D	1	07/13/13	BD	n/a	n/a	GGB1161
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (C6-C10)	ND	0.20	0.10	mg/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
120-82-1	1,2,4-Trichlorobenzene	88%		60-140%		

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MOC_SOLVAY	Date Sampled:	07/10/13
Lab Sample ID:	D48109-1	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846-8015B SW846 3510C		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	FD26405.D	1	07/13/13	TU	07/12/13	OP8188	GFD1299
Run #2							

Run #	Initial Volume	Final Volume
Run #1	1050 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-DRO (C10-C28)	0.316	0.19	0.17	mg/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
84-15-1	o-Terphenyl	69%		20-140%		

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MOC_SOLVAY	Date Sampled:	07/10/13
Lab Sample ID:	D48109-1	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Project:	MOC POND C/ MOC SOLVAY		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	37.8	2.5	mg/l	5	07/12/13 12:19	GH	EPA 300.0/SW846 9056
Solids, Total Dissolved	544	10	mg/l	1	07/11/13	BF	SM 2540C-2011
Sulfate	140	2.5	mg/l	5	07/12/13 12:19	GH	EPA 300.0/SW846 9056

RL = Reporting Limit

Report of Analysis

Client Sample ID:	MOC_POND C	Date Sampled:	07/10/13
Lab Sample ID:	D48109-2	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8260B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3V25612.D	1	07/12/13	BR	n/a	n/a	V3V1507
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Purgeable Aromatics

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	0.0064	0.0010	0.00025	mg/l	
108-88-3	Toluene	0.0061	0.0020	0.0010	mg/l	
100-41-4	Ethylbenzene	0.00085	0.0020	0.00025	mg/l	J
1330-20-7	Xylene (total)	0.0106	0.0030	0.0020	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
17060-07-0	1,2-Dichloroethane-D4	107%		62-130%
2037-26-5	Toluene-D8	97%		70-130%
460-00-4	4-Bromofluorobenzene	93%		69-130%

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

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Client Sample ID:	MOC_POND C	Date Sampled:	07/10/13
Lab Sample ID:	D48109-2	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8015B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	FA12254.D	1	07/12/13	AV	n/a	n/a	GFA740
Run #2							

Run #	Initial Volume	Final Volume
Run #1	1.0 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
67-56-1	Methanol	ND	0.50	0.40	mg/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
71-36-3	n-Butyl Alcohol	114%		25-169%		

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

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Client Sample ID:	MOC_POND C	Date Sampled:	07/10/13
Lab Sample ID:	D48109-2	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8015B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	GB21154.D	1	07/13/13	BD	n/a	n/a	GGB1161
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (C6-C10)	0.142	0.20	0.10	mg/l	J
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
120-82-1	1,2,4-Trichlorobenzene	103%		60-140%		

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MOC_POND C	Date Sampled:	07/10/13
Lab Sample ID:	D48109-2	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846-8015B SW846 3510C		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	FD26407.D	1	07/13/13	TU	07/12/13	OP8188	GFD1299
Run #2							

Run #	Initial Volume	Final Volume
Run #1	1060 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-DRO (C10-C28)	0.241	0.19	0.17	mg/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
84-15-1	o-Terphenyl	69%		20-140%		

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MOC_POND C	Date Sampled:	07/10/13
Lab Sample ID:	D48109-2	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Project:	MOC POND C/ MOC SOLVAY		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	275	10	mg/l	20	07/12/13 13:21	GH	EPA 300.0/SW846 9056
Solids, Total Dissolved	868	10	mg/l	1	07/11/13	BF	SM 2540C-2011
Sulfate	103	2.5	mg/l	5	07/12/13 12:30	GH	EPA 300.0/SW846 9056

RL = Reporting Limit

Report of Analysis

Client Sample ID:	POND C_BOTTOM	Date Sampled:	07/10/13
Lab Sample ID:	D48109-3	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8260B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3V25613.D	1	07/12/13	BR	n/a	n/a	V3V1507
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Purgeable Aromatics

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	0.0139	0.0010	0.00025	mg/l	
108-88-3	Toluene	0.0144	0.0020	0.0010	mg/l	
100-41-4	Ethylbenzene	0.00094	0.0020	0.00025	mg/l	J
1330-20-7	Xylene (total)	0.0137	0.0030	0.0020	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
17060-07-0	1,2-Dichloroethane-D4	102%		62-130%
2037-26-5	Toluene-D8	96%		70-130%
460-00-4	4-Bromofluorobenzene	92%		69-130%

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Page 1 of 1

Client Sample ID:	POND C_BOTTOM	Date Sampled:	07/10/13
Lab Sample ID:	D48109-3	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8015B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	FA12256.D	1	07/13/13	AV	n/a	n/a	GFA740
Run #2							

Run #	Initial Volume	Final Volume
Run #1	1.0 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
67-56-1	Methanol	ND	0.50	0.40	mg/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
71-36-3	n-Butyl Alcohol	113%		25-169%		

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

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Client Sample ID:	POND C_BOTTOM	Date Sampled:	07/10/13
Lab Sample ID:	D48109-3	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846 8015B		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	GB21155.D	1	07/13/13	BD	n/a	n/a	GGB1161
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (C6-C10)	0.173	0.20	0.10	mg/l	J
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
120-82-1	1,2,4-Trichlorobenzene	104%		60-140%		

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	POND C_BOTTOM	Date Sampled:	07/10/13
Lab Sample ID:	D48109-3	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Method:	SW846-8015B SW846 3510C		
Project:	MOC POND C/ MOC SOLVAY		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	FD26409.D	1	07/13/13	TU	07/12/13	OP8188	GFD1299
Run #2							

Run #	Initial Volume	Final Volume
Run #1	1050 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-DRO (C10-C28)	ND	0.19	0.17	mg/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits		
84-15-1	o-Terphenyl	55%		20-140%		

ND = Not detected MDL - Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	POND C_BOTTOM	Date Sampled:	07/10/13
Lab Sample ID:	D48109-3	Date Received:	07/11/13
Matrix:	AQ - Surface Water	Percent Solids:	n/a
Project:	MOC POND C/ MOC SOLVAY		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
Chloride	276	10	mg/l	20	07/12/13 13:55	GH	EPA 300.0/SW846 9056
Solids, Total Dissolved	908	10	mg/l	1	07/11/13	BF	SM 2540C-2011
Sulfate	101	2.5	mg/l	5	07/12/13 12:42	GH	EPA 300.0/SW846 9056

RL = Reporting Limit

Misc. Forms

5

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

the self-certification process to demonstrate compliance with emission limits.
(Reference: Regulation No. 3, Part B, Section III.E.)

Periodic Testing Requirements

18. **AIRS Point 001:** The operator shall sample the wastewater inlet to the pond system (or the gun barrel separator tank wastewater outlet) to determine volatile organic compounds (VOC) and hazardous air pollutant (HAP) concentrations, including total hydrocarbons (including gasoline range and diesel range), benzene, toluene, ethylbenzene, xylene, and methanol. These samples shall be analyzed using EPA Method 8260 for benzene, toluene, ethylbenzene, and xylene, and EPA Method 8015 for methanol, gasoline range organics (total volatile hydrocarbons), and diesel range organics (total extractable hydrocarbons).

A sample of the wastewater inlet to the pond system (or the gun barrel separator tank wastewater outlet) shall be collected and analyzed at a minimum frequency of once per calendar month. Sample results shall be used to calculate emissions as required by Condition 12. If more frequent sampling is conducted, then all samples of the wastewater inlet to the pond collected during the calendar month will be averaged and then used to calculate emissions as specified in Condition 12. Samples shall be collected no less than at least seven (7) days apart. The operator shall maintain records of all sampling events and the records shall be made available to the Division for inspection upon request. The operator shall flag monthly records if any sampling results are noted by the laboratory as beyond QA/QC criteria limits.

ADDITIONAL REQUIREMENTS

19. A revised Air Pollutant Emission Notice (APEN) shall be filed. (Reference: Regulation No. 3, Part A, II.C)
- a. Annually whenever a significant increase in emissions occurs as follows:

For any criteria pollutant:

For sources emitting less than 100 tons per year, a change in actual emissions of five (5) tons per year or more, above the level reported on the last APEN; or

For any non-criteria reportable pollutant:

If the emissions increase by 50% or five (5) tons per year, whichever is less, above the level reported on the last APEN submitted to the Division.

- b. Whenever there is a change in the owner or operator of any facility, process, or activity, or

- c. Whenever new control equipment is installed, or whenever a different type of control equipment replaces an existing type of control equipment; or

- d. Whenever a permit limitation must be modified; or

- e. No later than 30 days before the existing APEN expires.

20. Federal regulatory program requirements (i.e. PSD, NANSR or Title V Operating Permit) shall apply to this source at any such time that this source becomes major solely by virtue of a relaxation in any permit condition. Any relaxation that increases the potential to emit above the applicable Federal program threshold will require a full review of the

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D48109: Chain of Custody

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Form 4, within thirty (30) days of December 30, 1997. The Sundry Notice Form 4 shall include a copy of the existing pit permit, if a permit was obtained, and a description of the closure process.

(2) Pits closed prior to December 30, 1997 were required to be reclaimed in accordance with the 1000 Series rules. Pits closed after December 30, 1997 shall be closed in accordance with the 900 Series rules and reclaimed in accordance with the 1000 Series rules.

(3) Operators of steel, fiberglass, concrete or other similar produced water vessels buried or partially buried and located in sensitive areas were required to repair or replace vessels and tanks found to be leaking. Operators shall repair or replace vessels and tanks found to be leaking. Operators shall submit to the Director a Sundry Notice, Form 4, describing the integrity testing results and action taken within thirty (30) days of December 30, 1997.

(4) Closure of pits and steel, fiberglass, concrete or other similar produced water vessels, and associated remediation operations conducted prior to December 30, 1997 are not subject to Rules 905., 906., 907., 909. and 910.

912. VENTING OR FLARING NATURAL GAS

a. The unnecessary or excessive venting or flaring of natural gas produced from a well is prohibited.

b. Except for gas flared or vented during an upset condition, well maintenance, well stimulation flowback, purging operations, or a productivity test, gas from a well shall be flared or vented only after notice has been given and approval obtained from the Director on a Sundry Notice, Form 4, stating the estimated volume and content of the gas. The notice shall indicate whether the gas contains more than one (1) ppm of hydrogen sulfide. If necessary to protect the public health, safety or welfare, the Director may require the flaring of gas.

c. Gas flared, vented or used on the lease shall be estimated based on a gas-oil ratio test or other equivalent test approved by the Director, and reported on Operator's Monthly Production Report, Form 7.

d. Flared gas that is subject to Sundry Notice, Form 4, shall be directed to a controlled flare in accordance with Rule 903.b.(2) or other combustion device operated as efficiently as possible to provide maximum reduction of air contaminants where practicable and without endangering the safety of the well site personnel and the public.

e. Operators shall notify the local emergency dispatch or the local governmental designee of any natural gas flaring. Notice shall be given prior to flaring when flaring can be reasonably anticipated, or as soon as possible, but in no event more than two (2) hours after the flaring occurs.

Table 910-1
CONCENTRATION LEVELS¹

Contaminant of Concern	Concentrations
	Organic Compounds in Soil
TPH (total volatile and extractable hydrocarbons)	500 mg/kg
Benzene	0.17 mg/kg ²

900-21

As of May 30, 2011

Toluene	85 mg/kg ²
Ethylbenzene	100 mg/kg ²
Xylenes (total)	175 mg/kg ²
Acenaphthene	1,000 mg/kg ²
Anthracene	1,000 mg/kg ²
Benzo(A)anthracene	0.22 mg/kg ²
Benzo(B)fluoranthene	0.22 mg/kg ²
Benzo(K)fluoranthene	2.2 mg/kg ²
Benzo(A)pyrene	0.022 mg/kg ²
Chrysene	22 mg/kg ²
Dibenzo(A,H)anthracene	0.022 mg/kg ²
Fluoranthene	1,000 mg/kg ²
Fluorene	1,000 mg/kg ²
Indeno(1,2,3-C,D)pyrene	0.22 mg/kg ²
Naphthalene	23 mg/kg ²
Pyrene	1,000 mg/kg ²
Organic Compounds in Ground Water	
Benzene	5 µg/l ³
Toluene	560 to 1,000 µg/l ³
Ethylbenzene	700 µg/l ³
Xylenes (Total)	1,400 to 10,000 µg/l ^{3,4}
Inorganics in Soils	
Electrical Conductivity (EC)	<4 mmhos/cm or 2x background
Sodium Adsorption Ratio (SAR)	<12 ⁵
pH	6-9
Inorganics in Ground Water	
Total Dissolved Solids (TDS)	<1.25 x background ⁶
Chlorides	<1.25 x background ³
Sulfates	<1.25 x background ³
Metals in Soils	
Arsenic	0.39 mg/kg ²
Barium (LDNR True Total Barium)	15,000 mg/kg ²
Boron (Hot Water Soluble)	2 mg/l ⁷
Cadmium	70 mg/kg ^{3,8}
Chromium (III)	120,000 mg/kg ²
Chromium (VI)	23 mg/kg ^{2,9}
Copper	3,100 mg/kg ²
Lead (inorganic)	400 mg/kg ²
Mercury	23 mg/kg ²
Nickel (soluble salts)	1,600 mg/kg ^{2,5}
Selenium	390 mg/kg ^{2,8}
Silver	390 mg/kg ²
Zinc	23,000 mg/kg ^{2,5}
Liquid Hydrocarbons in Soils and Ground Water	
Liquid hydrocarbons including condensate and oil	Below detection level

COGCC recommends that the latest version of EPA SW 846 analytical methods be used where possible and that analyses of samples be performed by laboratories that maintain state or national accreditation programs.

- ¹ Consideration shall be given to background levels in native soils and ground water.
- ² Concentrations taken from CDPHE-HMWMD Table 1 Colorado Soil Evaluation Values (December 2007).
- ³ Concentrations taken from CDPHE-WQCC Regulation 41 - The Basic Standards for Ground Water.
- ⁴ For this range of standards, the first number in the range is a strictly health-based value, based on the WQCC's established methodology for human health-based standards. The second number in the range is a maximum contaminant level (MCL), established under the Federal Safe Drinking Water Act which has been

900-22

As of May 30, 2011

GC/MS Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

Method Blank Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
V3V1507-MB	3V25598.D	1	07/12/13	BR	n/a	n/a	V3V1507

The QC reported here applies to the following samples:

Method: SW846 8260B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	1.0	0.25	ug/l	
100-41-4	Ethylbenzene	ND	2.0	0.25	ug/l	
108-88-3	Toluene	ND	2.0	1.0	ug/l	
1330-20-7	Xylene (total)	ND	3.0	2.0	ug/l	

CAS No.	Surrogate Recoveries	Limits
17060-07-0	1,2-Dichloroethane-D4	96% 62-130%
2037-26-5	Toluene-D8	94% 70-130%
460-00-4	4-Bromofluorobenzene	91% 69-130%

Blank Spike Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
V3V1507-BS	3V25599.D	1	07/12/13	BR	n/a	n/a	V3V1507

The QC reported here applies to the following samples:

Method: SW846 8260B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
71-43-2	Benzene	50	49.5	99	70-130
100-41-4	Ethylbenzene	50	47.5	95	70-130
108-88-3	Toluene	50	48.3	97	70-130
1330-20-7	Xylene (total)	150	156	104	70-130

CAS No.	Surrogate Recoveries	BSP	Limits
17060-07-0	1,2-Dichloroethane-D4	91%	62-130%
2037-26-5	Toluene-D8	97%	70-130%
460-00-4	4-Bromofluorobenzene	103%	69-130%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: D48109
Account: MOILCOGJ Marathon Oil
Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
D47878-1MS ^a	3V25604.D	100	07/12/13	BR	n/a	n/a	V3V1507
D47878-1MSD ^a	3V25605.D	100	07/12/13	BR	n/a	n/a	V3V1507
D47878-1 ^a	3V25603.D	100	07/12/13	BR	n/a	n/a	V3V1507

The QC reported here applies to the following samples:

Method: SW846 8260B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	D47878-1 ug/l	Spike Q ug/l	MS ug/l	MS %	MSD ug/l	MSD %	RPD	Limits Rec/RPD
71-43-2	Benzene	ND	5000	4910	98	4980	100	1	62-130/30
100-41-4	Ethylbenzene	ND	5000	4710	94	4700	94	0	63-130/30
108-88-3	Toluene	ND	5000	4820	96	4750	95	1	60-130/30
1330-20-7	Xylene (total)	ND	15000	15500	103	15400	103	1	67-130/30

CAS No.	Surrogate Recoveries	MS	MSD	D47878-1	Limits
17060-07-0	1,2-Dichloroethane-D4	90%	91%	103%	62-130%
2037-26-5	Toluene-D8	98%	98%	94%	70-130%
460-00-4	4-Bromofluorobenzene	102%	100%	92%	69-130%

(a) Dilution required due to matrix interference (sample foamed).

* = Outside of Control Limits.

GC Volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

Method Blank Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GC3727-MB	FA12240.D	1	07/12/13	AV	n/a	n/a	GFA740

The QC reported here applies to the following samples:

Method: SW846 8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	Result	RL	MDL	Units	Q
67-56-1	Methanol	ND	0.50	0.40	mg/l	

CAS No.	Surrogate Recoveries	Limits
71-36-3	n-Butyl Alcohol	112% 25-169%

Method Blank Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GGB1161-MB	GB21135.D	1	07/13/13	BD	n/a	n/a	GGB1161

The QC reported here applies to the following samples:

Method: SW846 8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-GRO (C6-C10)	ND	0.20	0.10	mg/l	

CAS No.	Surrogate Recoveries	Limits
120-82-1	1,2,4-Trichlorobenzene	87% 60-140%

7.1.2

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Blank Spike Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GC3727-BS	FA12242.D	1	07/12/13	AV	n/a	n/a	GFA740

The QC reported here applies to the following samples:

Method: SW846 8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	Spike mg/l	BSP mg/l	BSP %	Limits
67-56-1	Methanol	25	23.6	94	70-130

CAS No.	Surrogate Recoveries	BSP	Limits
71-36-3	n-Butyl Alcohol	90%	25-169%

* = Outside of Control Limits.

Blank Spike Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GGB1161-BS	GB21136.D	1	07/13/13	BD	n/a	n/a	GGB1161

The QC reported here applies to the following samples:

Method: SW846 8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	Spike mg/l	BSP mg/l	BSP %	Limits
	TPH-GRO (C6-C10)	2.2	2.20	100	70-130

CAS No.	Surrogate Recoveries	BSP	Limits
120-82-1	1,2,4-Trichlorobenzene	94%	60-140%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GC3727-MS	FA12244.D	1	07/12/13	AV	n/a	n/a	GFA740
GC3727-MSD	FA12246.D	1	07/12/13	AV	n/a	n/a	GFA740
D48109-1	FA12248.D	1	07/12/13	AV	n/a	n/a	GFA740

The QC reported here applies to the following samples:

Method: SW846 8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	D48109-1 mg/l	Spike Q	MS mg/l	MS %	MSD mg/l	MSD %	RPD	Limits Rec/RPD
67-56-1	Methanol	ND	25	23.7	95	23.5	94	1	25-176/30

CAS No.	Surrogate Recoveries	MS	MSD	D48109-1	Limits
71-36-3	n-Butyl Alcohol	84%	84%	112%	25-169%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
D48026-1MS	GB21143.D	1	07/13/13	BD	n/a	n/a	GGB1161
D48026-1MSD	GB21144.D	1	07/13/13	BD	n/a	n/a	GGB1161
D48026-1	GB21142.D	1	07/13/13	BD	n/a	n/a	GGB1161

The QC reported here applies to the following samples:

Method: SW846 8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	D48026-1 mg/l	Spike Q	MS mg/l	MS %	MSD mg/l	MSD %	RPD	Limits Rec/RPD
	TPH-GRO (C6-C10)	ND	2.2	2.23	101	2.22	101	0	60-145/30

CAS No.	Surrogate Recoveries	MS	MSD	D48026-1	Limits
120-82-1	1,2,4-Trichlorobenzene	82%	94%	91%	60-140%

* = Outside of Control Limits.

GC Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

Method Blank Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP8188-MB	FD26467.D	1	07/14/13	TU	07/12/13	OP8188	GFD1299

The QC reported here applies to the following samples:

Method: SW846-8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	Result	RL	MDL	Units	Q
	TPH-DRO (C10-C28)	ND	0.20	0.18	mg/l	

CAS No.	Surrogate Recoveries	Limits
84-15-1	o-Terphenyl	59% 20-140%

8.1.1

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Blank Spike Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP8188-BS	FD26469.D	1	07/14/13	TU	07/12/13	OP8188	GFD1299

The QC reported here applies to the following samples:

Method: SW846-8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	Spike mg/l	BSP mg/l	BSP %	Limits
	TPH-DRO (C10-C28)	20	14.1	71	36-140

CAS No.	Surrogate Recoveries	BSP	Limits
84-15-1	o-Terphenyl	67%	20-140%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: D48109

Account: MOILCOGJ Marathon Oil

Project: MOC POND C/ MOC SOLVAY

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP8188-MS	FD26393.D	1	07/13/13	TU	07/12/13	OP8188	GFD1299
OP8188-MSD	FD26395.D	1	07/13/13	TU	07/12/13	OP8188	GFD1299
D47726-37	FD26397.D	1	07/13/13	TU	07/12/13	OP8188	GFD1299

The QC reported here applies to the following samples:

Method: SW846-8015B

D48109-1, D48109-2, D48109-3

CAS No.	Compound	D47726-37 mg/l	Spike Q	MS mg/l	MS %	MSD mg/l	MSD %	RPD	Limits Rec/RPD
	TPH-DRO (C10-C28)	ND	20	16.6	83	14.8	74	11	28-140/30

CAS No.	Surrogate Recoveries	MS	MSD	D47726-37	Limits
84-15-1	o-Terphenyl	77%	67%	65%	20-140%

* = Outside of Control Limits.

General Chemistry

QC Data Summaries

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: D48109
Account: MOILCOGJ - Marathon Oil
Project: MOC POND C/ MOC SOLVAY

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Bromide	GP10409/GN20984	0.050	0.0	mg/l	20	20.5	102.5	90-110%
Chloride	GP10409/GN20984	0.50	0.0	mg/l	20	19.4	97.0	90-110%
Fluoride	GP10409/GN20984	0.10	0.0	mg/l	10	9.26	92.6	90-110%
Nitrogen, Nitrate	GP10409/GN20984	0.010	0.0	mg/l	4.52	4.41	97.6	90-110%
Nitrogen, Nitrite	GP10409/GN20984	0.0040	0.0	mg/l	6.09	5.90	96.9	90-110%
Solids, Total Dissolved	GN20952	10	0.0	mg/l	400	393	98.3	90-110%
Sulfate	GP10409/GN20984	0.50	0.0	mg/l	30	29.6	98.7	90-110%

Associated Samples:

Batch GN20952: D48109-1, D48109-2, D48109-3

Batch GP10409: D48109-1, D48109-2, D48109-3

(*) Outside of QC limits

DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: D48109
Account: MOILCOGJ - Marathon Oil
Project: MOC POND C/ MOC SOLVAY

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Solids, Total Dissolved	GN20952	D47990-2	mg/l	12100	12100	0.0	0-20%

Associated Samples:

Batch GN20952: D48109-1, D48109-2, D48109-3

(*) Outside of QC limits

MATRIX SPIKE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: D48109
Account: MOILCOGJ - Marathon Oil
Project: MOC POND C/ MOC SOLVAY

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Bromide	GP10409/GN20984	D48109-3	mg/l	2.2	12.5	15.3	104.8	80-120%
Bromide	GP10409/GN20984	D48109-3	mg/l	2.4	12.5	15.3	104.8	80-120%
Chloride	GP10409/GN20984	D48109-3	mg/l	276	200	465	94.5	80-120%
Chloride	GP10409/GN20984	D48109-3	mg/l	229	200	465	94.5	80-120%
Fluoride	GP10409/GN20984	D48109-3	mg/l	5.0	12.5	12.6	80.8	80-120%
Fluoride	GP10409/GN20984	D48109-3	mg/l	2.5	12.5	12.6	80.8	80-120%
Nitrogen, Nitrate	GP10409/GN20984	D48109-3	mg/l	0.0	2.83	2.9	102.7	80-120%
Nitrogen, Nitrate	GP10409/GN20984	D48109-3	mg/l	0.0	2.83	2.9	102.7	80-120%
Nitrogen, Nitrite	GP10409/GN20984	D48109-3	mg/l	0.0	1.52	1.6	105.1	80-120%
Nitrogen, Nitrite	GP10409/GN20984	D48109-3	mg/l	0.0	1.52	1.6	105.1	80-120%
Sulfate	GP10409/GN20984	D48109-3	mg/l	101	50	147	96.6	80-120%
Sulfate	GP10409/GN20984	D48109-3	mg/l	98.7	50	147	96.6	80-120%

Associated Samples:

Batch GP10409: D48109-1, D48109-2, D48109-3

(*) Outside of QC limits

(N) Matrix Spike Rec. outside of QC limits

9.3

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MATRIX SPIKE DUPLICATE RESULTS SUMMARY
GENERAL CHEMISTRY

Login Number: D48109
Account: MOILCOGJ - Marathon Oil
Project: MOC POND C/ MOC SOLVAY

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MSD Result	RPD	QC Limit
Bromide	GP10409/GN20984	D48109-3	mg/l	2.2	12.5	15.3	0.0	20%
Bromide	GP10409/GN20984	D48109-3	mg/l	2.4	12.5	15.3	0.0	20%
Chloride	GP10409/GN20984	D48109-3	mg/l	276	200	466	0.2	20%
Chloride	GP10409/GN20984	D48109-3	mg/l	229	200	466	0.2	20%
Fluoride	GP10409/GN20984	D48109-3	mg/l	5.0	12.5	12.5	0.8(a)	20%
Fluoride	GP10409/GN20984	D48109-3	mg/l	2.5	12.5	12.5	0.8(a)	20%
Nitrogen, Nitrate	GP10409/GN20984	D48109-3	mg/l	0.0	2.83	2.8	3.5	20%
Nitrogen, Nitrate	GP10409/GN20984	D48109-3	mg/l	0.0	2.83	2.8	3.5	20%
Nitrogen, Nitrite	GP10409/GN20984	D48109-3	mg/l	0.0	1.52	1.6	0.0	20%
Nitrogen, Nitrite	GP10409/GN20984	D48109-3	mg/l	0.0	1.52	1.6	0.0	20%
Sulfate	GP10409/GN20984	D48109-3	mg/l	101	50	148	0.7	20%
Sulfate	GP10409/GN20984	D48109-3	mg/l	98.7	50	148	0.7	20%

Associated Samples:

Batch GP10409: D48109-1, D48109-2, D48109-3

(*) Outside of QC limits

(N) Matrix Spike Rec. outside of QC limits

(a) Spike recovery indicates possible matrix interference and/or sample nonhomogeneity.