ROGERS & CALLCOTT
ENGINEERS, INC.
P.O. Box 5655, Greenville, SC 29606
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AN EMPLOYEE-OWNED COMPANY

March 21, 2012

John Abernathy
Solid Waste Groundwater Section
SC DHEC
2600 Bull Street
Columbia, SC 29201

Subject: 2011 Annual Report of Groundwater Conditions
Twelvemile Creek Sediment Management Unit - Pickens County, SC
Rogers & Callcott Project # 10-012

Dear Mr. Abernathy:

On behalf of Schlumberger Technology Corp., Rogers and Callcott has prepared this Annual Report of Groundwater Conditions for the Twelvemile Creek Sediment Management Unit (SMU) located at the Sangamo Weston Lake Hartwell Polychlorinated Biphenyl (PCB) Contamination Superfund Site in Pickens County, SC.

If you have questions or comments regarding the 2011 Annual Report, please contact me at 864-232-1556.

Sincerely,

ROGERS & CALLCOTT ENGINEERS, INC.

Patrick Sanderson
Project Manager

George Y. Maalouf, P.G.
Principal (SC Reg. #1027)

GEORGE Y. MAALOUF
REGISTERED
No. 1027
SOUTH CAROLINA
PROFESSIONAL GEOLOGIST

Attachments

Copy: Craig Zeller – EPA
Virgilio Cocianni – Schlumberger (electronic)

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U.S. EPA REGION IV

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ANNUAL REPORT OF GROUNDWATER CONDITIONS

Twelvemile Creek Sediment Management Unit

Pickens County, SC

ROGERS & CALLCOTT ENGINEERS, INC.

AIR QUALITY

HYDROGEOLOGY

ANALYTICAL LABORATORY

REGULATORY COMPLIANCE

CIVIL & ENVIRONMENTAL ENGINEERING

Prepared for:

Schlumberger Technology Corp.

March 2012

P.O. Box 5655 Greenville, SC 29606 864.232.1556 www.rogersandcallcott.com

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ACRONYMS

ft	feet
ft/yr	feet per year
MCL	maximum contaminant level
mg/L	milligrams per Liter
mL/min	milliliters per minute
NTU	nephelometric turbidity units
PCB	polychlorinated biphenyls
SC DHEC	South Carolina Department of Health and Environmental Control
Schlumberger	Schlumberger Technology Corporation
SMU	Sediment Management Unit

INTRODUCTION

On behalf of Schlumberger Technology Corp. (Schlumberger), Rogers and Callcott has prepared this Annual Report of Groundwater Conditions for the Twelvemile Creek Sediment Management Unit (SMU) located at the Sangamo Weston Lake Hartwell Polychlorinated Biphenyl (PCB) Contamination Superfund Site in Pickens County (the Site). As shown on **Figure 1**, the Site is located approximately 2.5 miles northwest of the town of Norris, SC.

Groundwater samples were collected from each of the five monitoring wells located at the SMU in June and December 2011, which marked the third and fourth sampling events, respectively. Results from the June 2011 sampling event were summarized in the *Semi-Annual Data Submittal - June 2011*, submitted to SC DHEC on September 16, 2011. This report summarizes the sampling results as well as the hydrogeologic conditions observed at the Site during the December 2011 event.

BACKGROUND

In preparation for removing two dams on Twelvemile Creek, Schlumberger constructed the SMU to contain sediment dredged from the project reach. The unit was developed in accordance with the requirements set forth in the SC DHEC landfill regulations for a Class Three landfill. Approval to operate the SMU was provided in a March 11, 2010 letter from SC DHEC (Taylor to Ferguson).

A Closure and Post-Closure Care Plan prepared by Arcadis in January 2010 describes the post-closure care activities that must be carried out during the post-closure care period at the SMU. The groundwater monitoring component of the Post-Closure Plan is described in greater detail in the *Groundwater Monitoring Plan* prepared by Arcadis in March 2010, and approved by SC DHEC on March 11, 2010. As proposed in the monitoring plan, five monitoring wells were installed along the edges of the SMU in May 2010 to meet the requirements of R.61-107.19, Part V, subpart E.258.53.d. Monitoring well locations are depicted on **Figure 2**. MW-1 was installed as the background well, located north of the SMU in an upgradient position. Wells MW-2 through MW-5 are located downgradient of the SMU, and provide compliance points. Well construction information for all wells is summarized in **Table 1**.

The Site *Groundwater Monitoring Plan* also requires quarterly sampling of all monitoring wells during the first year of monitoring, based on presumed closure after six months of operation to be followed by semi-annual post-closure sampling. Three semi-annual sampling events were conducted during SMU operation in June 2010, December 2010, and June 2011 to meet the requirements of R.61-107.19, Part V, subpart E.258.54.b. Landfilling operations were completed, and the landfill cap was installed by early November 2011. Thus, the December 2011 sampling event represents the first post-closure quarterly sampling event for the SMU.

Figure 2 provides an aerial photograph and topographical contours of the SMU following cap completion.

SITE HYDROGEOLOGY

Depth to water was measured at each monitoring well on December 21, 2011 prior to sampling. Depth-to-water measurements and groundwater elevations are summarized in **Table 2**. The approximate potentiometric groundwater surface, based on the December 2011 water levels and site topography, is shown on **Figure 2**. As the Site is located atop a north-south trending ridge with steep slopes to the east, west, and south, the inferred potentiometric surface shows a groundwater divide coinciding with the top of the ridge. As such, the estimated groundwater flow direction is partially radial, with components to the west toward Camp Creek and to the south and east toward Twelvemile Creek. Therefore, the monitoring well network appears to be sufficient for the purpose of detecting a potential release from the SMU.

Water levels dropped in all monitoring wells between June 2011 and December 2011. Groundwater level decreases ranged between 0.40 ft measured at MW-5 and 2.01 ft at MW-3. While water levels at monitoring wells MW-2 and MW-3 have fluctuated during previous sampling events, monitoring wells MW-1, MW-4, and MW-5 have shown a consistent decrease in water levels from the baseline sampling event in June 2010 through December 2011. Similar to the previous sampling events, the water table occurred in bedrock at MW-1, MW-2, and MW-3 and in saprolite at MW-4 and MW-5 in December 2011.

Using the water levels measured in December 2011, hydraulic conductivity values obtained from slug tests conducted on each monitoring well in May 2010 (**Table 1**), and an assumed effective porosity of 25%, groundwater seepage velocities (V) were calculated for the Site using the following formula:

$$V = [KI]/n_e$$

where: K is the hydraulic conductivity
I is the horizontal hydraulic gradient
n_e is the effective porosity

Due to the radial flow direction inferred at the Site, hydraulic gradients were calculated for each of the three primary flow directions (east, south, and west) using the potentiometric contours for December 2011 shown on **Figure 2**. The calculated gradients for each direction are included in **Table 2**. The calculated groundwater velocities for each direction were approximately 24 feet per year (ft/yr) in shallow bedrock to the east, 26 ft/yr in saprolite to the west, and 225 ft/yr (deep saprolite/shallow bedrock) to the south. The elevated velocity to the south is thought to represent flow in fractured rock based on the hydraulic conductivity measured at MW-4, which was approximately one order of magnitude higher than values measured at other downgradient wells.

MONITORING WELL SAMPLING AND ANALYSIS

Purging and sampling of monitoring wells was conducted following the procedures and protocols detailed in the approved *Groundwater Monitoring Plan*. A bladder pump was used to provide low flow/low stress purging and sampling at a flow rate of 100 milliliters per minute (mL/min). Groundwater samples were analyzed at the Rogers and Callcott laboratory in Greenville, SC (SC Identification # 23105) for the 15 metals and 7 PCBs listed in Appendix A of the *Groundwater Monitoring Plan*. Two groundwater seeps to the west of the Site along Camp Creek identified during previous monitoring events remained at very low flow conditions during the December 2011 sampling event and once again could not be sampled. Approximate seep locations are shown on **Figure 2**. Laboratory analytical reports are provided in **Appendix A**. The Quality Control Summary and Data Verification, including the case narrative, are provided in **Appendix B**.

RESULTS AND DISCUSSION

Table 3 provides a summary of the December 2011 analytical results. PCBs were not detected in any of the monitoring wells. Barium was detected below the Maximum Contaminant Level (MCL) for drinking water at wells MW-1, MW-2, MW-4, and MW-5 at levels similar to background concentrations at MW-1 or baseline concentrations measured in June 2010. Cobalt and nickel were the only other metals detected in December 2011. Both were detected only at MW-5 at concentrations below the baseline concentrations measured at MW-5. Furthermore, the December 2011 concentrations of cobalt (0.04 mg/L) and nickel (0.08 mg/L) were the lowest measured at MW-5 since groundwater monitoring began. After exhibiting low level detections of arsenic and lead in June 2011, MW-4 was below detection for both constituents in December 2011.

As discussed in the June 2011 *Semi-Annual Data Submittal*, the arsenic and lead detections at MW-4 coincided with increased turbidity in this well. MW-4 was redeveloped approximately two weeks before the December sampling event in an attempt to decrease turbidity and collect a sample more representative of groundwater quality at this well. The turbidity measured at well MW-4 was 46 nephelometric turbidity units (NTUs) after purging was complete prior to sample collection, representing a reduction in turbidity of approximately 70 percent from June 2011. The well development form for MW-4 is included as **Appendix C**.

Statistical analyses for detected constituents are recommended after a minimum of four sampling events have been conducted at the SMU. The December 2011 event marked the fourth sampling event for the Site. However, all metals detected in December 2011 were at or below baseline concentrations collected in June 2010 and/or the background concentrations measured at MW-1. Thus, statistical analyses are not necessary at this time. Based on the current groundwater conditions, there is no evidence that groundwater has been impacted by landfilling operations conducted at the Site.

The groundwater quality database for the SMU is included as **Appendix D** to provide current and previous sample results. This database will be updated and submitted following each successive sampling event to maintain an historical record of groundwater quality at the Site.

CLOSING

In accordance with the March 2010 *Groundwater Monitoring Plan*, quarterly groundwater monitoring for metals and PCBs at the SMU will continue for the first year after closure through the third quarter of 2012. The second quarterly sampling event is scheduled for March 2012. A Data Submittal will be prepared and submitted within 45 days after the laboratory validation of the March 2012 data is complete.

Tables

TABLES

TABLE 1
WELL CONSTRUCTION DETAILS
Twelvemile Creek SMU - Pickens County
Schlumberger Technology Corporation

Well No.	Top of Casing Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	Total Depth (ft bgs)	Depth to Bedrock (ft bgs)	Bedrock Elevation (ft bgs)	Monitored Interval[1] (ft bgs)	Hydraulic Conductivity[2] (ft/yr)	Monitored Aquifer
MW-1	931.35	928.84	70.0	60.0	868.8	53.5 - 68.5	125	Deep Saprolite/Shallow Bedrock
MW-2	893.71	891.26	65.0	51.0	840.3	53.5 - 63.5	54	Shallow Bedrock
MW-3	893.10	890.96	90.4	52.5	838.5	58.0 - 90.4	20	Shallow Bedrock
MW-4	904.30	902.07	91.5	80.0	822.1	75.0 - 90.0	789	Deep Saprolite/Shallow Bedrock
MW-5	906.94	904.52	68.0	68.0	836.5	53.0 - 68.0	90	Deep Saprolite

[1]All monitored intervals consist of 0.01-inch slot, 2-inch diameter PVC well screens except for MW-3, which is a 4-inch open bedrock boring.

[2] Hydraulic conductivity values from rising head slug tests conducted in May 2010

ft amsl - feet above mean sea level

ft bgs - feet below ground surface

TABLE 2
GROUNDWATER ELEVATIONS AND HYDRAULIC GRADIENTS - DECEMBER 2011
Twelvemile Creek SMU - Pickens County, SC
Schlumberger Technology Corporation

Well No.	Top of Casing (ft amsl)	Bedrock Elevation (ft amsl)	Depth to Water (ft BTOC)	GW Elevation (ft amsl)	Water Level Above(+) or Below(-) Top of Screen (ft)	Water Level Above (+) or Below (-) Top of Rock (ft)
MW-1	931.35	868.8	66.18	865.17	-10.2	-3.7
MW-2	893.71	840.3	57.93	835.78	-2.0	-4.5
MW-3	893.10	838.5	69.89	823.21	-9.8	-15.3
MW-4	904.30	822.1	80.41	823.89	-3.2	1.8
MW-5	906.94	836.5	63.20	843.74	-7.8	7.2

ft amsl - feet above mean sea level
ft BTOC - feet below top of casing

Water Level Gradient Calculations

Flow Direction	Rise	Run	Gradient
East	20	180	0.11
South	20	280	0.07
West	20	275	0.07

TABLE 3
SUMMARY OF ANALYTICAL RESULTS
DECEMBER 2011

Twelvemile Creek SMU - Pickens County
Schlumberger Technology Corporation

Analyte	MW-1*	MW-2	MW-3	MW-4	MW-5	MCL
Antimony	<0.005	<0.005	<0.005	<0.005	<0.005	0.006
Arsenic	<0.005	<0.005	<0.005	<0.005	<0.005	0.010
Barium	**0.01**	**0.01**	<0.01	**0.01**	**0.04**	2.0
Beryllium	<0.004	<0.004	<0.004	<0.004	<0.004	0.004
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	0.005
Chromium	<0.02	<0.02	<0.02	<0.02	<0.02	0.1
Cobalt	<0.01	<0.01	<0.01	<0.01	**0.04**	NE
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	1.3 [1]/1.0 [2]
Lead	<0.002	<0.002	<0.002	<0.002	<0.002	0.015 [1]
Nickel	<0.02	<0.02	<0.02	<0.02	**0.08**	NE
Selenium	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 [2]
Thallium	<0.002	<0.002	<0.002	<0.002	<0.002	0.002
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	NE
Zinc	<0.05	<0.05	<0.05	<0.05	<0.05	5 [2]
PCBs[3]	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005

- Results are in milligrams per Liter (mg/L)

*Background Well

Bold entries represent detections.

MCL - Maximum Contaminant Level

[1]Action level for drinking water system requiring corrosion control

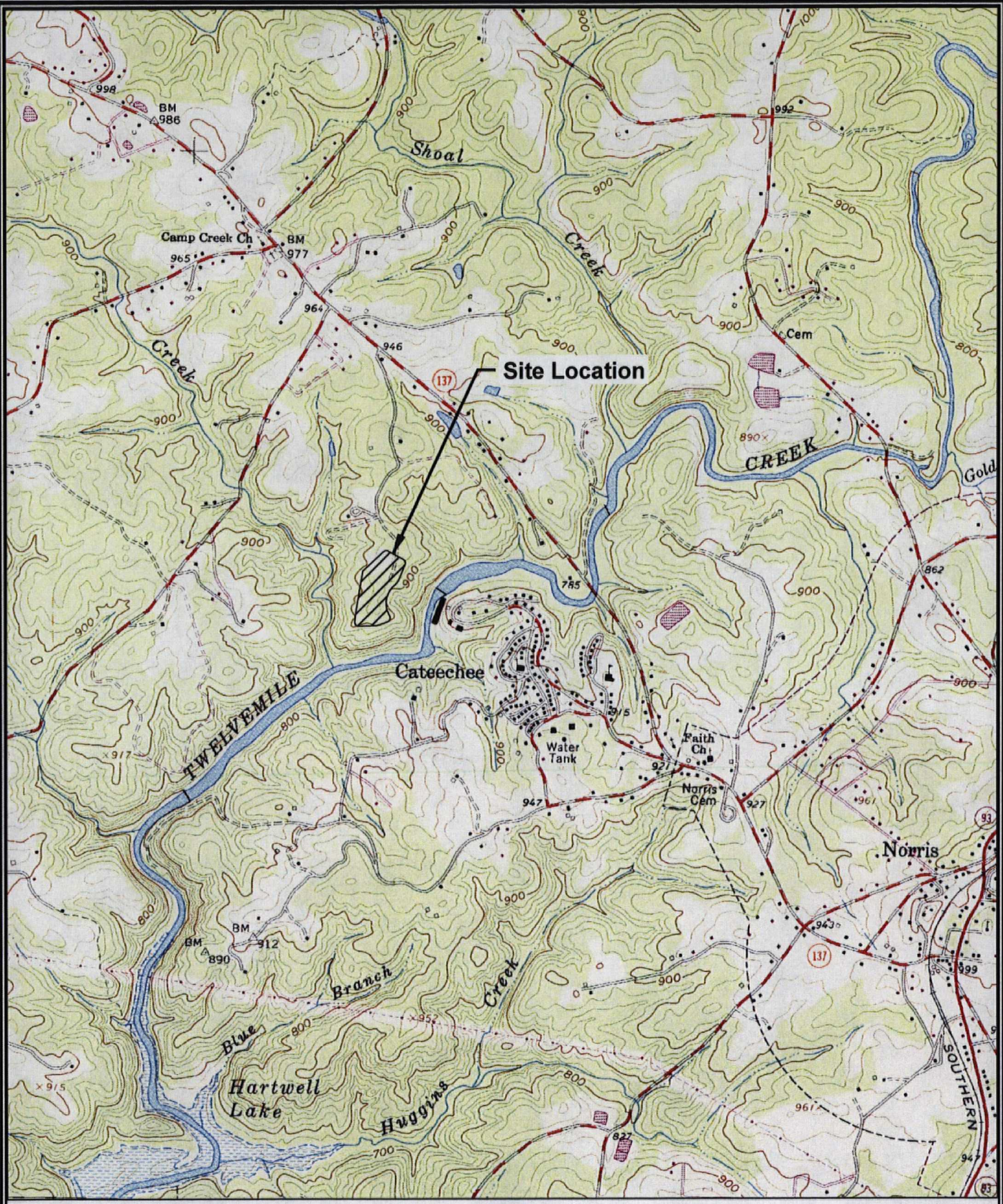
[2]Secondary MCL

[3]Comprised of polychlorinated biphenyls 1016, 1221, 1232, 1242, 1248, 1254, 1260

NE = Not Established

FIGURES

FIGURES



N
W E
S

0 1000 2000 4000 Feet

REFERENCE:
USGS SIX MILE 7.5 MIN. QUAD., 1961, PHOTOREVISED 1980

ROGERS & CALLCOTT
ENGINEERS, INC.

DRAWN BY: MAL 3/9/2012
CHECKED BY: PMS
APPROVED BY: GYM

Friday, March 09, 2012, 03:43:55 PM
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FIGURE 1
SITE LOCATION MAP

TWELVEMILE CREEK SMU
PICKENS COUNTY, SOUTH CAROLINA

ROGERS & CALLCOTT ENGINEERS, INC.

FIGURE 2
GROUNDWATER POTENTIOMETRIC MAP

TWELVEMILE CREEK SMU
PICKENS COUNTY, SOUTH CAROLINA
SCHLUMBERGER TECHNOLOGY CORP.

MONITORING WELL

MW-2
825.82 GROUNDWATER ELEVATION (FT MSL) (MEASURED 12/19/11)

GROUNDWATER FLOW DIRECTION

850 GROUNDWATER POTENTIOMETRIC LINE (DASHED WHERE INFERRED)

TOPOGRAPHIC CONTOUR

PROPERTY LINE

STREAM FLOW DIRECTION

REFERENCE:
Base map provided by Site Design, Inc. (monitoring well locations.dwg, 5/21/10, and drawing S07642.01-MONWELL.DWG, 5/5/10). Map has not been field checked.
Topography and 2011 aerial photo provided by CH2M Hill (AS-BUILT-CAP.dwg, 10/24/11, and SMU-Dec2011.jpg, 12/8/11).

DRAWN BY: MAL 3/9/2012
CHECKED BY: PMS
APPROVED BY: GYM

0 75 150 300 Feet

N

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APPENDIX A

APPENDIX A

LABORATORY ANALYTICAL REPORTS

ROGERS & CALLCOTT
LABORATORY SERVICES

P.O. Box 5655, Greenville, SC 29606
Phone: (864) 232-1556 - FAX: (864) 232-6140

AN EMPLOYEE-OWNED COMPANY

Laboratory Services Report

Client: Schlumberger Technology Corporation
Sangamo - Twelve Mile Creek Project
Attn George Maalouf
Rogers and Callcott

Date Received: 12/20/2011
Time Received: 16:35
Date Reported: 02/16/2012

South Carolina Laboratory Identification 23105
North Carolina Laboratory Certificate Number 27
NELAP Laboratory Identification E87822

Sample Number	*Sample Description*
AD15679	Schlumberger Technology TMC MW-2 grab, collected on 12/20/2011 at 10:57
AD15680	Schlumberger Technology TMC MW-2 grab, collected on 12/20/2011 at 11:25
AD15681	Schlumberger Technology TMC MW-3 grab, collected on 12/20/2011 at 12:20
AD15682	Schlumberger Technology TMC MW-3 grab, collected on 12/20/2011 at 12:53
AD15683	Schlumberger Technology TMC MW-4 grab, collected on 12/20/2011 at 14:07
AD15684	Schlumberger Technology TMC MW-4 grab, collected on 12/20/2011 at 14:47

The attached report is for the samples that were received and are referenced above. Rogers and Callcott maintains a formal QA/QC program. Unless otherwise noted, all analyses performed under NELAP certification have complied with all the requirements of the NELAC standard. The analyses met the QA/QC confidence interval for each test method unless otherwise qualified. Estimated uncertainty available upon request.

We appreciate the opportunity to be of service to you. Please contact us at (864) 232-1556 should you have any questions about this report.

Results released by: Rebecca J. Musick
authorized signature

Results reviewed by: KLH

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Sample Number	Sample Description, Date and Time Collected
AD15679	Schlumberger Technology TMC MW-2 grab, collected on 12/20/2011 at 10:57

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Depth to water	57.93	feet			12/20/2011 10:29	JHF	
Oxidation Reduction Potential-Field	- 58	mV			12/20/2011 10:55	JHF	Field
pH (Field)	7.1	Std. Units		0.1	12/20/2011 10:55	JHF	EPA 9040C
Specific Conductance at 25 C (Field)	264	umhos/cm		10	12/20/2011 10:55	JHF	EPA 9050A
Temperature (Field)	13.9	degrees C		0.1	12/20/2011 10:55	JHF	SM 2550B
Turbidity (Field)	6.9	NTU		5.0	12/20/2011 10:55	JHF	Field Screen
PCBs							
PCB-1016	< RDL	ug/l		0.5	12/28/2011 20:56	RKH	EPA 8082A
PCB-1221	< RDL	ug/l		0.5	12/28/2011 20:56	RKH	EPA 8082A
PCB-1232	< RDL	ug/l		0.5	12/28/2011 20:56	RKH	EPA 8082A
PCB-1242	< RDL	ug/l		0.5	12/28/2011 20:56	RKH	EPA 8082A
PCB-1248	< RDL	ug/l		0.5	12/28/2011 20:56	RKH	EPA 8082A
PCB-1254	< RDL	ug/l		0.5	12/28/2011 20:56	RKH	EPA 8082A
PCB-1260	< RDL	ug/l		0.5	12/28/2011 20:56	RKH	EPA 8082A
2,4,5,6-Tetrachloro-m-xylene (Surrogate)	77	%		0	12/28/2011 20:56	RKH	EPA 8082A
Decachlorobiphenyl, (Surrogate)	48	%		0	12/28/2011 20:56	RKH	EPA 8082A
S-L Extraction 3510C for PCB	Completed				12/21/2011 14:00	CGW	EPA 3510C

Sample Number	Sample Description, Date and Time Collected
AD15680	Schlumberger Technology TMC MW-2 grab, collected on 12/20/2011 at 11:25

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Antimony ICPMS	< RDL	mg/l		0.005	12/28/2011 11:00	LBH	EPA 6020A
Analysis comment for Antimony ICPMS: Antimony digested 12-27-11 at 10:21 LBH							
Arsenic ICPMS	< RDL	mg/l		0.005	01/12/2012 11:00	LBH	EPA 6020A
Barium	0.01	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Beryllium	< RDL	mg/l		0.004	12/30/2011 09:25	KFJ	EPA 6010C
Cadmium	< RDL	mg/l		0.005	12/30/2011 09:25	KFJ	EPA 6010C
Chromium	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Cobalt ICPMS	< RDL	mg/l		0.01	01/12/2012 11:00	LBH	EPA 6020A
Copper	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Lead ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
Nickel	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Selenium	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Silver	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Thallium ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A

Sample Number	Sample Description, Date and Time Collected
AD15680	Schlumberger Technology TMC MW-2 grab, collected on 12/20/2011 at 11:25

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Vanadium	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Zinc	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Digestion for Metals - ICP	Completed				12/29/2011 16:22	KFJ	EPA 3005A
Digestion for Metals - ICPMS	Completed				01/09/2012 08:50	LBH	EPA 3005A

Sample Number	Sample Description, Date and Time Collected
AD15681	Schlumberger Technology TMC MW-3 grab, collected on 12/20/2011 at 12:20

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Depth to water	69.89	feet			12/20/2011 11:49	JHF	
Oxidation Reduction Potential-Field	61	mV			12/20/2011 12:18	JHF	Field
pH (Field)	7.1	Std. Units		0.1	12/20/2011 12:18	JHF	EPA 9040C
Specific Conductance at 25 C (Field)	124	umhos/cm		10	12/20/2011 12:18	JHF	EPA 9050A
Temperature (Field)	13.7	degrees C		0.1	12/20/2011 12:18	JHF	SM 2550B
Turbidity (Field)	7.6	NTU		5.0	12/20/2011 12:18	JHF	Field Screen
PCBs							
PCB-1016	< RDL	ug/l		0.5	12/28/2011 21:29	RKH	EPA 8082A
PCB-1221	< RDL	ug/l		0.5	12/28/2011 21:29	RKH	EPA 8082A
PCB-1232	< RDL	ug/l		0.5	12/28/2011 21:29	RKH	EPA 8082A
PCB-1242	< RDL	ug/l		0.5	12/28/2011 21:29	RKH	EPA 8082A
PCB-1248	< RDL	ug/l		0.5	12/28/2011 21:29	RKH	EPA 8082A
PCB-1254	< RDL	ug/l		0.5	12/28/2011 21:29	RKH	EPA 8082A
PCB-1260	< RDL	ug/l		0.5	12/28/2011 21:29	RKH	EPA 8082A
2,4,5,6-Tetrachloro-m-xylene (Surrogate)	80	%		0	12/28/2011 21:29	RKH	EPA 8082A
Decachlorobiphenyl (Surrogate)	82	%		0	12/28/2011 21:29	RKH	EPA 8082A
L-L Extraction 3510C for PCB	Completed				12/21/2011 14:00	CGW	EPA 3510C

Sample Number	Sample Description, Date and Time Collected
AD15682	Schlumberger Technology TMC MW-3 grab, collected on 12/20/2011 at 12:53

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Antimony ICPMS	< RDL	mg/l		0.005	12/28/2011 11:00	LBH	EPA 6020A
Analysis comment for Antimony ICPMS: Antimony digested 12-27-11 at 10:21 LBH							
Arsenic ICPMS	< RDL	mg/l		0.005	01/12/2012 11:00	LBH	EPA 6020A
Barium	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Beryllium	< RDL	mg/l		0.004	12/30/2011 09:25	KFJ	EPA 6010C

Sample Number	Sample Description, Date and Time Collected
AD15682	Schlumberger Technology TMC MW-3 grab, collected on 12/20/2011 at 12:53

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Cadmium	< RDL	mg/l		0.005	12/30/2011 09:25	KFJ	EPA 6010C
Chromium	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Cobalt ICPMS	< RDL	mg/l		0.01	01/12/2012 11:00	LBH	EPA 6020A
Copper	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Lead ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
Nickel	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Selenium	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Silver	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Thallium ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
Vanadium	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Zinc	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Digestion for Metals - ICP	Completed				12/29/2011 16:22	KFJ	EPA 3005A
Digestion for Metals - ICPMS	Completed				01/09/2012 08:50	LBH	EPA 3005A

Sample Number	Sample Description, Date and Time Collected
AD15683	Schlumberger Technology TMC MW-4 grab, collected on 12/20/2011 at 14:07

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Depth to water	80.41	feet			12/20/2011 13:11	JHF	
Oxidation Reduction Potential-Field	234	mV			12/20/2011 14:05	JHF	Field
pH (Field)	5.7	Std. Units		0.1	12/20/2011 14:05	JHF	EPA 9040C
Specific Conductance at 25 C (Field)	23	umhos/cm		10	12/20/2011 14:05	JHF	EPA 9050A
Temperature (Field)	13.5	degrees C		0.1	12/20/2011 14:05	JHF	SM 2550B
Turbidity (Field)	46	NTU		5.0	12/20/2011 14:05	JHF	Field Screen
PCBs							
PCB-1016	< RDL	ug/l		0.5	12/28/2011 22:02	RKH	EPA 8082A
PCB-1221	< RDL	ug/l		0.5	12/28/2011 22:02	RKH	EPA 8082A
PCB-1232	< RDL	ug/l		0.5	12/28/2011 22:02	RKH	EPA 8082A
PCB-1242	< RDL	ug/l		0.5	12/28/2011 22:02	RKH	EPA 8082A
PCB-1248	< RDL	ug/l		0.5	12/28/2011 22:02	RKH	EPA 8082A
PCB-1254	< RDL	ug/l		0.5	12/28/2011 22:02	RKH	EPA 8082A
PCB-1260	< RDL	ug/l		0.5	12/28/2011 22:02	RKH	EPA 8082A
2,4,5,6-Tetrachloro-m-xylene (Surrogate)	86	%		0	12/28/2011 22:02	RKH	EPA 8082A
Decachlorobiphenyl, (Surrogate)	89	%		0	12/28/2011 22:02	RKH	EPA 8082A
L-L Extraction 3510C for PCB	Completed				12/21/2011 14:00	CGW	EPA 3510C

mple Number	Sample Description, Date and Time Collected
015684	Schlumberger Technology TMC MW-4 grab, collected on 12/20/2011 at 14:47

rameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
ntimony ICPMS	< RDL	mg/l		0.005	12/28/2011 11:00	LBH	EPA 6020A
Analysis comment for Antimony ICPMS: Antimony digested 12-27-11 at 10:21 LBH							
rsenic ICPMS	< RDL	mg/l		0.005	01/12/2012 11:00	LBH	EPA 6020A
arium	0.01	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
eryllium	< RDL	mg/l		0.004	12/30/2011 09:25	KFJ	EPA 6010C
admium	< RDL	mg/l		0.005	12/30/2011 09:25	KFJ	EPA 6010C
hromium	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
obalt ICPMS	< RDL	mg/l		0.01	01/12/2012 11:00	LBH	EPA 6020A
opper	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
ead ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
ickel	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
elenium	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
ilver	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
hallium ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
anadium	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
inc	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
igestion for Metals - ICP	Completed				12/29/2011 16:22	KFJ	EPA 3005A
igestion for Metals - ICPMS	Completed				01/09/2012 08:50	LBH	EPA 3005A

ROGERS & CALLCOTT LABORATORY SERVICES

P.O. Box 5655, Greenville, SC 29606
Phone (864) 232-1556 Fax (864) 232-6140
Shipping Address: 426 Fairforest Way
Greenville, SC 29607

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

Client Name: Schlumberger -TMC

Address: Cateechee, SC

Report To:

Telephone No. FAX No.

PO No. Project No. 10-012

Rogers & Callcott Lab No.	Yr 11 Date	Time	Sample Description	Total Number of Containers	PARAMETERS: PCBs	Total Metals
AD 15679	12-20	1057	MW-2	1	1	
15680		1125	MW-2	1		1
15681		1220	MW-3	1	1	
15682		1253	MW-3	1		1
15683		1407	MW-4	1	1	
15684		1447	MW-4	1		1

Filtered (Yes/No)	N	N						
Cooled (Yes/No)	Y	Y						
Container Type (P/G)	G	P						
Container Volume	2.5L	500						
Sample Type (Grab/Composite)	G	G						
Sample Source (WW, GW, DW, Other)	GW	GW						
Sample Source Chlorinated (Yes/No)	N	N						
Lab Receipt Cl, Check	NA	NA						
Lab Receipt pH Check	7	<2						
Preserved (Code)	A	B						

A–None, B–HNO_3, C–H_2SO_4, D–NaOH, E–HCL, F–$Na_2S_2O_3$, G–Boric Acid, H–Ascorbic Acid, I– ____

MCM 12-20-11

COMMENTS:

7 Aroclors: 1016, 1221, 1232, 1242, 1248, 1254, 1260

Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Ag, Tl, V, Zn

Field Data Collected

SAMPLER Relinquished by (Sig.)	Date/Time	Received by (Sig.)	Date/Time
① [signature]	12-20-11 1635	② Norma Dalley Shipper Name & #	12/20/11 1635
Relinquished by (Sig.) ③	Date/Time	Received by (Sig.) ④ Shipper Name & #	Date/Time
Relinquished by (Sig.) ⑤	Date/Time	Received by (Sig.) ⑥ Shipper Name & #	Date/Time

Seal # at'chd by ◯ Recvd. Intact by ◯ Seal # at'chd by ◯ Recvd. Intact by ◯

KNOWN HAZARDS ASSOCIATED WITH SAMPLES

Temperature of blank or representative sample
At time of collection ____ °C
At time of lab receipt 32 °C

Form Revised July 2008

R/C COC FORM

FIELD DATA LOG FOR GROUND WATER SAMPLING

ROGERS & CALLCOTT ENGINEERS, INC.

Well Number: MW-2

☐ Development
☒ Purging

Date: 12-20-11 Field Personnel: JMF/BCS

Site Name/Location: Schlumberger - TMC

Page 1 of ___

For Low Flow Sampling: Page NA

Method of Well Evacuation

Pump	Bailer
☐ Grundfos	☐ Non Disposable Teflon
☐ Submersible	☐ Disposable Teflon
☐ Peristaltic	☐ Disposable Poly
☒ Bladder	☐ Dedicated Teflon
☐ Waterra	☐ Dedicated PVC
☐ Continuous (Recovery Well)	
☐ _____	

One Volume Multiplier (gal/ft) = $\pi r^2 h$ (7.48) (r in feet)
Well Diameter (gal/ft.) 1"= 0.041; 2"= 0.163; 3"= 0.367
4"= 0.653; 6"= 1.470

Water Volume Calculations

Initial Depth to Ground Water (a): 57.93 @ 1029
Total Depth of Well (b): 66.00
Length of Water Column in Well (b-a): 8.07
Well Casing Diameter (inches): 2"
Depth to Immiscible Layer: NA

# of Casings	Gallons to be Removed	Gallons / ml Removed
1 Casing Vol = (b-a) x Multiplier	NA	
3 Casing Vol	NA	1500

Circle One that Applies

Measuring Point: TOC / Ground Surface
Riser Material: PVC / Steel / Teflon
Steel Protective Casing? Yes / No
Bollards? Yes / No
Flush Mount? Yes / No
Well Locked? Yes / No
Well Pad Condition? Okay / _____
Well Integrity Satisfactory? Okay / _____
Vegetation: Overgrown/ Moderate/ Light/ None

Water Removal / Field Analysis Data

Date	Time	Increment	Removal Rate (gal/m) or (ml/m)	Water Level, (feet)	Water Volume Removed (gal) or (ml)	pH (units) ± 0.1-Stable	Temp (°C)	Conductivity (uS/cm) 10%-Stable	Dissolved Oxygen (mg/L)	Hydrogen Sulfide (ppm)	ORP (mVolts)	Odor (Subj*)	Turbidity (NTU)	Comments
12-20-11	1040	NA	100	57.93	0.0	7.18	13.5	266.9	NA	NA	-7.1	1	< 5.0	
12-20-11	1045	1	100	58.27	500	7.16	13.5	269.0	NA	NA	-36.4	1	6.92	
12-20-11	1050	2	100	58.43	1000	7.14	13.7	263.9	NA	NA	-49.2	1	6.38	
12-20-11	1055	3	100	58.70	1500	7.11	13.9	263.7	NA	NA	-57.6	1	6.94	
								12-20-11						

* Subjective (1) None (2) Slight (3) Moderate (4) Strong

Weather Conditions/~Temp: Cloudy / 53 °F

Well Yield: (Low/ Moderate/ High)

Sample Clarity: Clear

Precipitate: none

Fe^{+2} mg/L= NA

Sample Collection Time PCBs - 1057 Metals - 1125

Comments

Reviewed by: _____ Date: _____

Revised 2/3/09

Well Number: MW-3 ☐ Development ☒ Purging

FIELD DATA LOG FOR GROUND WATER SAMPLING

ROGERS & CALLCOTT ENGINEERS, INC.

Date: 12-20-11 Field Personnel: JHF/BCS

Page 2 of ___

Site Name/Location: Schlumberger - TMC

For Low Flow Sampling: Page NA

Method of Well Evacuation

Pump	Bailer
☐ Grundfos	☐ Non Disposable Teflon
☐ Submersible	☐ Disposable Teflon
☐ Peristaltic	☐ Disposable Poly
☒ Bladder	☐ Dedicated Teflon
☐ Waterra	☐ Dedicated PVC
☐ Continuous (Recovery Well)	
☐ ___	

One Volume Multiplier (gal/ft) = $\pi r^2 h$ (7.48) (r in feet)
Well Diameter (gal/ft.) 1"= 0.041; 2"= 0.163; 3"= 0.367
4"= 0.653; 6"= 1.470

Water Volume Calculations

Initial Depth to Ground Water (a): 69.89 @ 1149
Total Depth of Well (b): 92.80
Length of Water Column in Well (b-a): 22.91
Well Casing Diameter (inches): 4"
Depth to Immiscible Layer: NA

# of Casings	Gallons to be Removed	Gallons / mLs Removed
1 Casing Vol = (b-a) x Multiplier	NA	
3 Casing Vol	NA	

Circle One that Applies

Measuring Point: TOC / Ground Surface
Riser Material: PVC / Steel / Teflon
Steel Protective Casing? Yes / No
Bollards? Yes / No
Flush Mount? Yes / No
Well Locked? Yes / No
Well Pad Condition? Okay / ___
Well Integrity Satisfactory? Okay / ___
Vegetation: Overgrown/ Moderate/ Light/ None

Water Removal / Field Analysis Data

Date	Time	Increment	Removal Rate (gal/m) or (ml/m)	Water Level, (feet)	Water Volume Removed (gal) or (ml)	pH (units) ± 0.1-Stable	Temp (°C)	Conductivity (uS/cm) 10%-Stable	Dissolved Oxygen (mg/L)	Hydrogen Sulfide (ppm)	ORP (mVolts)	Odor (Subj*)	Turbidity (NTU)	Comments
12-20-11	1203	NA	100	69.89	0.0	7.12	12.7	114.2	NA	NA	45.8	1	12.0	
12-20-11	1208	1	100	~~70.50~~ 70.05 JHF	500	7.17	13.7	123.3	NA	NA	51.9	1	8.49	
12-20-11	1213	2	100	70.25	1000	7.09	13.9	124.0	NA	NA	57.7	1	7.30	
12-20-11	1218	3	100	70.43	1500	7.10	13.7	124.5	NA	NA	60.9	1	7.57	
							12-20-11							

Weather Conditions/~Temp: Cloudy 150 °F

*Subjective (1) None (2) Slight (3) Moderate (4) Strong

Well Yield: (Low/ Moderate/ High) Sample Clarity: clear Precipitate: none Fe^{+2} mg/L= NA

Sample Collection Time PCBs - 1220 Metals - 1253

Comments

Reviewed by: ___ Date: ___

Revised 2/3/09

Well Number: MW-4 ☐ Development ☒ Purging

FIELD DATA LOG FOR GROUND WATER SAMPLING

ROGERS & CALLCOTT ENGINEERS, INC.

Date: 12-20-11 Field Personnel: JHF/BCS

Site Name/Location: Schlumberger - TMC

Page 3 of ____

For Low Flow Sampling: Page 1 of ____

Method of Well Evacuation

Pump	Bailer
☐ Grundfos	☐ Non Disposable Teflon
☐ Submersible	☐ Disposable Teflon
☐ Peristaltic	☐ Disposable Poly
☒ Bladder	☐ Dedicated Teflon
☐ Waterra	☐ Dedicated PVC
☐ Continuous (Recovery Well)	
☐ ____	

One Volume Multiplier (gal/ft) = $\pi r^2 h$ (7.48) (r in feet)
Well Diameter (gal/ft.) 1"= 0.041; 2"= 0.163; 3"= 0.367
4"= 0.653; 6"= 1.470

Water Volume Calculations

Initial Depth to Ground Water (a): 80.41 @ 1311
Total Depth of Well (b): 92.93
Length of Water Column in Well (b-a): 12.52
Well Casing Diameter (inches): 2"
Depth to Immiscible Layer: NA

# of Casings	Gallons to be Removed	Gallons / mLs Removed
1 Casing Vol = (b-a) x Multiplier	NA	
3 Casing Vol	NA	3500

Circle One that Applies

Measuring Point: TOC / Ground Surface
Riser Material: PVC / Steel / Teflon
Steel Protective Casing? Yes / No
Bollards? Yes / No
Flush Mount? Yes / No
Well Locked? Yes / No
Well Pad Condition? Okay / ____
Well Integrity Satisfactory? Okay / ____
Vegetation: Overgrown/ Moderate/ Light/ None

Water Removal / Field Analysis Data

Date	Time	Increment	Removal Rate (gal/m) or (ml/m)	Water Level, (feet)	Water Volume Removed (gal) or (ml)	pH (units) ± 0.1-Stable	Temp (°C)	Conductivity (uS/cm) 10%-Stable	Dissolved Oxygen (mg/L)	Hydrogen Sulfide (ppm)	ORP (mVolts)	Odor (Subj*)	Turbidity (NTU)	Comments
12-20-11	1330	NA	100	80.41	0.0	5.82	11.9	30.2	NA	NA	59.0	1	10.6	
12-20-11	1335	1	100	80.41	500	5.67	13.2	24.12	NA	NA	181.4	1	17.8	
12-20-11	1340	2	100	80.42	1000	5.65	13.6	24.37	NA	NA	198.8	1	30.8	
12-20-11	1345	3	100	80.42	1500	5.66	13.7	23.10	NA	NA	208.9	1	63.2	
12-20-11	1350	4	100	80.42	2000	5.69	13.9	22.65	NA	NA	217.7	1	81.1	
12-20-11	1355	5	100	80.42	2500	5.66	13.9	22.83	NA	NA	224.4	1	94.3	
12-20-11	1400	6	100	80.43	3000	5.67	13.7	22.30	NA	NA	230.3	1	58.9	
12-20-11	1405	7	100	80.43	3500	5.66	13.5	22.85	NA	NA	234.1	1	45.7	

Weather Conditions/~Temp: Rain 150 °F

* Subjective (1) None (2) Slight (3) Moderate (4) Strong

Well Yield: (Low/ Moderate/ High) Sample Clarity: Clear Precipitate: none Fe^{+2} mg/L= NA

Sample Collection Time PCBs - 1407 Metals - 1447

Comments Turbidity @ time of Metals collection = 7.70 NTU, on the post

Reviewed by: ____ Date: ____

Revised 2/3/09

Rogers and Callcott Engineers

Field Meter Calibration Record

Client: Schlumberger - TMC **Date:** 12-20-11

Conductivity Calibration - EPA 9050A

Meter Make / Model: Orion 4 Star SN: A12882 Probe: PT1-11328

Time: 0837 Analyst: JHF Cell Constant 0.463

Chemical Inventory	Conc. of Standard, µmhos/cm @25°C		Actual Reading of Standard, µmhos/cm	Actual Reading of Standard, @ Temperature, °C
11-08-29	10,35		10,12	19.3
11-08-31	92.4		100.4	19.0
11-08-34	998		994	19.3
11-08-27	SSS conc:	447	456	19.0

Temperature compensation for pH / conductivity meter : -0.1

pH Calibration - EPA 9040C

Meter Make / Model: Orion 4 Star Probe: PR1-13537

Time: 0832 Analyst: JHF Slope: 96.7

Chemical Inventory	Conc. of Buffer, units		Actual Reading of Buffer, units
11-10-07	4.0		4.01
11-08-69	7.0		7.02
11-08-70	10.0		10.08
11-09-47	SSS conc:	7.0	6.98

Turbidity Meter Calibration
Field Screen Method

Meter Make / Model: Hach 2100P SN: 9807000188 69 Date of most recent calibration: 12-1-11

Time: 0827 Analyst: JHF

Chemical Inventory	Assigned Conc. of Standard, NTU	Actual Reading of Standard, NTU
11-02-01	4.56	4.63
11-02-02	44.7	44.9
11-02-03	467	472

Reviewed by: Date:

Rogers and Callcott Engineers

Field Multi-Meter Calibration Record

Client: Schlumberger **Date:** 12-20-11

Meter Make / Model: Hana HI 9828 SN: 679203

pH Calibration
EPA 9040C

Time: Analyst: Slope:

Chemical Inventory	Expiration Date	Conc. of Buffer, units	Actual Reading, units
		4.0	
		7.0	
		10.0	
		SSS conc:	

Temperature compensation for pH meter :

Note: Temperature is recorded from the conductivity meter for reporting purposes.

ORP Calibration

Time: 0842 Analyst: JHF

Chemical Inventory	Expiration Date	Conc. of Standard @ 25°C mV	Actual Reading, mV	Actual Reading, @ Temperature °C
11-11-55	05-2016	240	240.0	20.96

Dissolved Oxygen Calibration
SM 4500 OG

Time: Analyst:

mmHG	DO Meter Reading mg/L	Winkler Titration mlS

Rogers and Callcott Engineers

Continuing Calibration Verification

Client: Schlumberger **Date:** 12-20-11

Conductivity Meter
EPA 9050A

Meter Make / Model: Orion 4 Star SN: A12882 Probe: PT1-11328

Time	Analyst	Conc. of Standard, µmhos/cm @25°C	Actual Reading of Standard, µmhos/cm
1302	JHF	99.4	103.0 @ 15.1 °C
1652	JHF	99.8	99.1 @ 16.6 °C

pH Meter
EPA 9040C

Meter Make / Model: Orion 4 Star Probe: PR1-13531

Time	Analyst	Conc. of Buffer, units	Actual Reading of Buffer, units
1300	JHF	7.0	6.98
1650	JHF	4.0	4.02

Turbidity Meter
Field Screen Method

Meter Make / Model: Hach 2100P SN: 9807000018869

Time	Analyst	Assigned Conc. of Standard, NTU	Actual Reading of Standard, NTU
1300	JHF	44.7	47.4
1650	JHF	4.56	4.85

Field Duplicate

Well ID: MW-4

Time	Analyst	Conductivity, µmhos/cm	pH, units	Turbidity, NTU	Temperature, °C
1406	JHF	22.83	5.67	40.1	13.4

Note: Refer to daily calibration log for instrument calibration and chemical inventory information / documentation.

Reviewed by: _____ Date: _____

ROGERS & CALLCOTT
LABORATORY SERVICES

P.O. Box 5655, Greenville, SC 29606
Phone: (864) 232-1556 - FAX: (864) 232-6140

AN EMPLOYEE-OWNED COMPANY

Laboratory Services Report

Client: Schlumberger Technology Corporation
Sangamo - Twelve Mile Creek Project
Attn George Maalouf
Rogers and Callcott

Date Received: 12/21/2011
Time Received: 12:30
Date Reported: 02/16/2012

South Carolina Laboratory Identification 23105
North Carolina Laboratory Certificate Number 27
NELAP Laboratory Identification E87822

Sample Number	*Sample Description*
AD15768	Schlumberger Technology TMC MW-5 grab, collected on 12/21/2011 at 10:27
AD15769	Schlumberger Technology TMC MW-5 grab, collected on 12/21/2011 at 10:57

The attached report is for the samples that were received and are referenced above. Rogers and Callcott maintains a formal QA/QC program. Unless otherwise noted, all analyses performed under NELAP certification have complied with all the requirements of the NELAC standard. The analyses met the QA/QC confidence interval for each test method unless otherwise qualified. Estimated uncertainty available upon request.

We appreciate the opportunity to be of service to you. Please contact us at (864) 232-1556 should you have any questions about this report.

Results released by: Rebecca J. Musick
authorized signature

Results reviewed by: KLH

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Sample Number	Sample Description, Date and Time Collected
AD15768	Schlumberger Technology TMC MW-5 grab, collected on 12/21/2011 at 10:27

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Depth to water	63.20	feet			12/21/2011 09:46	JHF	
Oxidation Reduction Potential-Field	242	mV			12/21/2011 10:24	JHF	Field
pH (Field)	5.5	Std. Units		0.1	12/21/2011 10:24	JHF	EPA 9040C
Specific Conductance at 25 C (Field)	175	umhos/cm		10	12/21/2011 10:24	JHF	EPA 9050A
Temperature (Field)	14.7	degrees C		0.1	12/21/2011 10:24	JHF	SM 2550B
Turbidity (Field)	13	NTU		5.0	12/21/2011 10:24	JHF	Field Screen
PCBs							
PCB-1016	< RDL	ug/l		0.5	12/28/2011 22:34	RKH	EPA 8082A
PCB-1221	< RDL	ug/l		0.5	12/28/2011 22:34	RKH	EPA 8082A
PCB-1232	< RDL	ug/l		0.5	12/28/2011 22:34	RKH	EPA 8082A
PCB-1242	< RDL	ug/l		0.5	12/28/2011 22:34	RKH	EPA 8082A
PCB-1248	< RDL	ug/l		0.5	12/28/2011 22:34	RKH	EPA 8082A
PCB-1254	< RDL	ug/l		0.5	12/28/2011 22:34	RKH	EPA 8082A
PCB-1260	< RDL	ug/l		0.5	12/28/2011 22:34	RKH	EPA 8082A
2,4,5,6-Tetrachloro-m-xylene (Surrogate)	73	%		0	12/28/2011 22:34	RKH	EPA 8082A
Decachlorobiphenyl, (Surrogate)	77	%		0	12/28/2011 22:34	RKH	EPA 8082A
S-L Extraction 3510C for PCB	Completed				12/21/2011 14:00	CGW	EPA 3510C

Sample Number	Sample Description, Date and Time Collected
AD15769	Schlumberger Technology TMC MW-5 grab, collected on 12/21/2011 at 10:57

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Antimony ICPMS	< RDL	mg/l		0.005	12/28/2011 11:00	LBH	EPA 6020A
Analysis comment for Antimony ICPMS: Antimony digested 12-27-11 at 10:21 LBH							
Arsenic ICPMS	< RDL	mg/l		0.005	01/12/2012 11:00	LBH	EPA 6020A
Barium	0.04	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Beryllium	< RDL	mg/l		0.004	12/30/2011 09:25	KFJ	EPA 6010C
Cadmium	< RDL	mg/l		0.005	12/30/2011 09:25	KFJ	EPA 6010C
Chromium	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Cobalt ICPMS	0.04	mg/l		0.01	01/12/2012 11:00	LBH	EPA 6020A
Copper	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Lead ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
Nickel	0.08	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Selenium	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Silver	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Thallium ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A

Sample Number	Sample Description, Date and Time Collected
AD15769	Schlumberger Technology TMC MW-5 grab, collected on 12/21/2011 at 10:57

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Vanadium	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Zinc	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Digestion for Metals - ICP	Completed				12/29/2011 16:22	KFJ	EPA 3005A
Digestion for Metals - ICPMS	Completed				01/09/2012 08:50	LBH	EPA 3005A

ROGERS & CALLCOTT
LABORATORY SERVICES
P.O. Box 5655, Greenville, SC 29606
Phone (864) 232-1556 Fax (864) 232-6140
Shipping Address: 426 Fairforest Way
Greenville, SC 29607

CHAIN OF CUSTODY RECORD

Client Name: Schlumberger-TMC

Address: Cateechee, SC

Report To:

Telephone No. ____ FAX No. ____

PO No. ____ Project No. 10-012

							N	N					Filtered (Yes/No)
							Y	Y					Cooled (Yes/No)
							G	P					Container Type (P/G)
							25L	500					Container Volume
							G	G					Sample Type (Grab/Composite)
							GW	GW					Sample Source (WW, GW, DW, Other)
							N	N					Sample Source Chlorinated (Yes/No)
							NA	NA					Lab Receipt Cl_2 Check MCA 12-22-11
							7	<2					Lab Receipt pH Check
							A	B					Preserved (Code) A-None B-HNO_3 C-H_2SO_4 D-NaOH E-HCL F-$Na_2S_2O_3$ G-Boric Acid H-Ascorbic Acid I- ____
Rogers & Callcott Lab No.	Yr 11 Date	Time	Sample Description	Total Number of Containers	PARAMETERS	PCBs *	Metals **						COMMENTS:
AD 15768	12-21	1027	MW-5	1		1							* 1016, 1221, 1232, 1242, 1248,
15769		1057	MW-5	1			1						1254, 1260
													** Sb, As, Ba, Be, Cd, Co, Cu, Pb,
													Ni, Se, Ag, Tl, V, Zn, Cr
													Full Data Collected

SAMPLER Relinquished by (Sig.)	Date/Time	Received by (Sig.)	Date/Time	KNOWN HAZARDS ASSOCIATED WITH SAMPLES
① [signature]	12-21-11 1230	② [signature] Shipper Name & #	12.21.11 1230	
Relinquished by (Sig.) ③	Date/Time	Received by (Sig.) ④ Shipper Name & #	Date/Time	
Relinquished by (Sig.) ⑤	Date/Time	Received by (Sig.) ⑥ Shipper Name & #	Date/Time	Temperature of blank or representative sample At time of collection ____ °C At time of lab receipt -0.2 not Fm °C
Seal # at'chd by ○ Recvd. Intact by ○		Seal # at'chd by ○ Recvd. Intact by ○		

Form Revised July 2008

R/C COC FORM

Well Number: MW-5 ☐ Development ☒ Purging

FIELD DATA LOG FOR GROUND WATER SAMPLING

ROGERS & CALLCOTT ENGINEERS, INC.

Date: 12-21-11 Field Personnel: JHF

Page 1 of 4

Site Name/Location: Schlumberger - TMC

For Low Flow Sampling: Page 1 of 1

Method of Well Evacuation

Pump	Bailer
☐ Grundfos	☐ Non Disposable Teflon
☐ Submersible	☐ Disposable Teflon
☐ Peristaltic	☐ Disposable Poly
☒ Bladder	☐ Dedicated Teflon
☐ Waterra	☐ Dedicated PVC
☐ Continuous (Recovery Well)	
☐ _____	

One Volume Multiplier (gal/ft) = $\pi r^2 h$ (7.48) (r in feet)
Well Diameter (gal/ft.) 1"= 0.041; 2"= 0.163; 3"= 0.367
4"= 0.653; 6"= 1.470

Water Volume Calculations

Initial Depth to Ground Water (a): 63.20 @ 0946
Total Depth of Well (b): 70.23
Length of Water Column in Well (b-a): 7.03
Well Casing Diameter (inches): 2"
Depth to Immiscible Layer: NA

# of Casings	Gallons to be Removed	Gallons / mL Removed
1 Casing Vol = (b-a) x Multiplier	NA	
3 Casing Vol	NA	3500

Circle One that Applies

Measuring Point: TOC / Ground Surface
Riser Material: PVC / Steel / Teflon
Steel Protective Casing? Yes / No
Bollards? Yes / No
Flush Mount? Yes / No
Well Locked? Yes / No
Well Pad Condition? Okay / _____
Well Integrity Satisfactory? Okay / _____
Vegetation: Overgrown/ Moderate/ Light/ None

Water Removal / Field Analysis Data

Date	Time	Increment	Removal Rate (gal/m) or (ml/m)	Water Level, (feet)	Water Volume Removed (gal) or (ml)	pH (units) ±0.1-Stable	Temp (°C)	Conductivity (uS/cm) 10%-Stable	Dissolved Oxygen (mg/L)	Hydrogen Sulfide (ppm)	ORP (mVolts)	Odor (Subj*)	Turbidity (NTU)	Comments
12-21-11	0949	NA	100	63.20	0.0	6.02	15.2	67.6	NA	NA	155.8	1	34.6	
12-21-11	0954	1	100	63.42	500	5.57	14.9	53.0	NA	NA	219.3	1	29.1	
12-21-11	0959	2	100	63.50	1000	5.49	14.8	59.9	NA	NA	233.6	1	22.9	
12-21-11	1004	3	100	63.52	1500	5.47	14.7	129.2	NA	NA	238.9	1	19.8	
12-21-11	1009	4	100	63.58	2000	5.46	14.6	147.9	NA	NA	241.0	1	20.0	
12-21-11	1014	5	100	63.61	2500	5.47	14.7	160.1	NA	NA	242.6	1	16.8	
12-21-11	1019	6	100	63.68	3000	5.48	14.7	166.8	NA	NA	243.8	1	13.5	
12-21-11	1024	7	100	63.76	3500	5.48	14.7	174.8	NA	NA	242.3	1	13.4	

Weather Conditions/~Temp: Cloudy / 50 °F

*Subjective (1) None (2) Slight (3) Moderate (4) Strong

Well Yield: (Low/ Moderate/ High) Sample Clarity: Clear Precipitate: none Fe^{+2} mg/L= NA

Sample Collection Time PCBs - 1027 Metals - 1057

Comments

Reviewed by: _____ Date: _____

Revised 2/3/09

Rogers and Callcott Engineers

Field Meter Calibration Record

Client: Schlumberger - TMC **Date:** 12-21-11

Conductivity Calibration - EPA 9050A

Meter Make / Model: Orion 4 Star SN: A12882 Probe: PTI-11328

Time: 0843 Analyst: JHF Cell Constant 0.460

Chemical Inventory	Conc. of Standard, µmhos/cm @25°C		Actual Reading of Standard, µmhos/cm	@ Temperature, °C
11-08-29	10.35		9.84	18.1
11-08-31	99.4		101.5	18.0
11-08-34	998		983	18.0
11-08-27	SSS conc:	447	445	18.1

Temperature compensation for pH / conductivity meter : 0.1

pH Calibration - EPA 9040C

Meter Make / Model: Orion 4 Star Probe: PBI-13531

Time: 0836 Analyst: JHF Slope: 97.4

Chemical Inventory	Conc. of Buffer, units		Actual Reading of Buffer, units
11-10-07	4.0		4.01
11-08-69	7.0		7.04
11-08-70	10.0		10.06
11-09-47	SSS conc:	7.0	6.97

Turbidity Meter Calibration
Field Screen Method

Meter Make / Model: Hach 2100P SN: 9807 00018869 Date of most recent calibration: 12-1-11

Time: 0827 Analyst: JHF

Chemical Inventory	Assigned Conc. of Standard, NTU	Actual Reading of Standard, NTU
11-02-01	4.56	4.73
11-02-02	44.7	46.4
11-02-03	467	479

Reviewed by: _____ Date: _____

Revised 07/21/11

Rogers and Callcott Engineers

Field Multi-Meter Calibration Record

Client: Schlumberger **Date:** 12-21-11

Meter Make / Model: Hama HI 9828 SN: 679203

pH Calibration
EPA 9040C

Time: Analyst: Slope:

Chemical Inventory	Expiration Date	Conc. of Buffer, units	Actual Reading, units
		4.0	
		7.0	
		10.0	
		SSS conc:	

Temperature compensation for pH meter :

Note: Temperature is recorded from the conductivity meter for reporting purposes.

ORP Calibration

Time: 0833 Analyst: JHF

Chemical Inventory	Expiration Date	Conc. of Standard @ 25°C mV	Actual Reading, mV	Actual Reading, @ Temperature °C
11-11-55	05-2016	240	240.3	18.47

Dissolved Oxygen Calibration
SM 4500 OG

Time: Analyst:

mmHG	DO Meter Reading mg/L	Winkler Titration mlS

Revised 02/13/09

Rogers and Callcott Engineers

Continuing Calibration Verification

Client: Schlumberger-TMC **Date:** 12-21-11

Conductivity Meter
EPA 9050A

Meter Make / Model: Orion 4 Star SN: A12882 Probe: PTI-11328

	Time	Analyst	Conc. of Standard, µmhos/cm @25°C	Actual Reading of Standard, µmhos/cm
End of Day	1040	JHF	99.4	100.9 @ 21.5 °C
				@ ____ °C

pH Meter
EPA 9040C

Meter Make / Model: Orion 4 Star Probe: PRI-13531

	Time	Analyst	Conc. of Buffer, units	Actual Reading of Buffer, units
End of Day	1042	JHF	7.0	6.95

Turbidity Meter
Field Screen Method

Meter Make / Model: Hach 2100P SN: 98070001 8869

	Time	Analyst	Assigned Conc. of Standard, NTU	Actual Reading of Standard, NTU
End of Day	1040	JHF	44.7	47.1

Field Duplicate

Well ID: MW-5

Time	Analyst	Conductivity, µmhos/cm	pH, units	Turbidity, NTU	Temperature, °C
1025	JHF	177.4	5.49	12.5	14.7

Note: Refer to daily calibration log for instrument calibration and chemical inventory information / documentation.

Reviewed by: _____ Date: _____

Revised 08/03/11

ROGERS & CALLCOTT
LABORATORY SERVICES

P.O. Box 5655, Greenville, SC 29606
Phone: (864) 232-1556 - FAX: (864) 232-6140

AN EMPLOYEE-OWNED COMPANY

Laboratory Services Report

Client: Schlumberger Technology Corporation
Sangamo - Twelve Mile Creek Project
Attn George Maalouf
Rogers and Callcott

Date Received: 12/19/2011
Time Received: 17:02
Date Reported: 02/16/2012

South Carolina Laboratory Identification 23105
North Carolina Laboratory Certificate Number 27
NELAP Laboratory Identification E87822

Sample Number	*Sample Description*
AD15637	Schlumberger Technology TMC Equipment Blank grab, collected on 12/19/2011 at 12:38
AD15638	Schlumberger Technology TMC MW-1 grab, collected on 12/19/2011 at 13:16
AD15639	Schlumberger Technology TMC MW-1 grab, collected on 12/19/2011 at 15:41

The attached report is for the samples that were received and are referenced above. Rogers and Callcott maintains a formal QA/QC program. Unless otherwise noted, all analyses performed under NELAP certification have complied with all the requirements of the NELAC standard. The analyses met the QA/QC confidence interval for each test method unless otherwise qualified. Estimated uncertainty available upon request.

We appreciate the opportunity to be of service to you. Please contact us at (864) 232-1556 should you have any questions about this report.

Results released by: Rebecca J. Musick
authorized signature

Results reviewed by: KLA

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Sample Number	Sample Description, Date and Time Collected
AD15637	Schlumberger Technology TMC Equipment Blank grab, collected on 12/19/2011 at 12:38

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Antimony ICPMS	< RDL	mg/l		0.005	12/28/2011 11:00	LBH	EPA 6020A
Analysis comment for Antimony ICPMS: Antimony digested 12-27-11 at 10:21 LBH							
Arsenic ICPMS	< RDL	mg/l		0.005	01/12/2012 11:00	LBH	EPA 6020A
Barium	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Beryllium	< RDL	mg/l		0.004	12/30/2011 09:25	KFJ	EPA 6010C
Cadmium	< RDL	mg/l		0.005	12/30/2011 09:25	KFJ	EPA 6010C
Chromium	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Cobalt ICPMS	< RDL	mg/l		0.01	01/12/2012 11:00	LBH	EPA 6020A
Copper	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Lead ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
Nickel	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Selenium	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Silver	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Thallium ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
Vanadium	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Zinc	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Digestion for Metals - ICP	Completed				12/29/2011 16:22	KFJ	EPA 3005A
Digestion for Metals - ICPMS	Completed				01/09/2012 08:50	LBH	EPA 3005A
PCBs							
PCB-1016	< RDL	ug/l		0.5	12/28/2011 20:24	RKH	EPA 8082A
PCB-1221	< RDL	ug/l		0.5	12/28/2011 20:24	RKH	EPA 8082A
PCB-1232	< RDL	ug/l		0.5	12/28/2011 20:24	RKH	EPA 8082A
PCB-1242	< RDL	ug/l		0.5	12/28/2011 20:24	RKH	EPA 8082A
PCB-1248	< RDL	ug/l		0.5	12/28/2011 20:24	RKH	EPA 8082A
PCB-1254	< RDL	ug/l		0.5	12/28/2011 20:24	RKH	EPA 8082A
PCB-1260	< RDL	ug/l		0.5	12/28/2011 20:24	RKH	EPA 8082A
2,4,5,6-Tetrachloro-m-xylene (Surrogate)	74	%		0	12/28/2011 20:24	RKH	EPA 8082A
Decachlorobiphenyl, (Surrogate)	89	%		0	12/28/2011 20:24	RKH	EPA 8082A
L-L Extraction 3510C for PCB	Completed				12/21/2011 14:00	CGW	EPA 3510C

Sample Number	Sample Description, Date and Time Collected
AD15638	Schlumberger Technology TMC MW-1 grab, collected on 12/19/2011 at 13:16

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Depth to water	66.18	feet			12/19/2011 12:34	JHF	
Oxidation Reduction Potential-Field	82	mV			12/19/2011 13:15	JHF	Field

Sample Number	Sample Description, Date and Time Collected
D15638	Schlumberger Technology TMC MW-1 grab, collected on 12/19/2011 at 13:16

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
pH (Field)	7.3	Std. Units		0.1	12/19/2011 13:15	JHF	EPA 9040C
Specific Conductance at 25 C (Field)	162	umhos/cm		10	12/19/2011 13:15	JHF	EPA 9050A
Temperature (Field)	14.4	degrees C		0.1	12/19/2011 13:15	JHF	SM 2550B
Turbidity (Field)	< RDL	NTU		5.0	12/19/2011 13:15	JHF	Field Screen
PCBs							
PCB-1016	< RDL	ug/l		0.5	12/29/2011 01:52	RKH	EPA 8082A
PCB-1221	< RDL	ug/l		0.5	12/29/2011 01:52	RKH	EPA 8082A
PCB-1232	< RDL	ug/l		0.5	12/29/2011 01:52	RKH	EPA 8082A
PCB-1242	< RDL	ug/l		0.5	12/29/2011 01:52	RKH	EPA 8082A
PCB-1248	< RDL	ug/l		0.5	12/29/2011 01:52	RKH	EPA 8082A
PCB-1254	< RDL	ug/l		0.5	12/29/2011 01:52	RKH	EPA 8082A
PCB-1260	< RDL	ug/l		0.5	12/29/2011 01:52	RKH	EPA 8082A
2,4,5,6-Tetrachloro-m-xylene (Surrogate)	108	%		0	12/29/2011 01:52	RKH	EPA 8082A
Decachlorobiphenyl, (Surrogate)	102	%		0	12/29/2011 01:52	RKH	EPA 8082A
S-L Extraction 3510C for PCB	Completed				12/22/2011 17:15	CGW	EPA 3510C

Sample Number	Sample Description, Date and Time Collected
D15639	Schlumberger Technology TMC MW-1 grab, collected on 12/19/2011 at 15:41

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Antimony ICPMS	< RDL	mg/l		0.005	12/28/2011 11:00	LBH	EPA 6020A
Analysis comment for Antimony ICPMS: Antimony digested 12-27-11 at 10:21 LBH							
Arsenic ICPMS	< RDL	mg/l		0.005	01/12/2012 11:00	LBH	EPA 6020A
Barium	0.01	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Beryllium	< RDL	mg/l		0.004	12/30/2011 09:25	KFJ	EPA 6010C
Cadmium	< RDL	mg/l		0.005	12/30/2011 09:25	KFJ	EPA 6010C
Chromium	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Cobalt ICPMS	< RDL	mg/l		0.01	01/12/2012 11:00	LBH	EPA 6020A
Copper	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Lead ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
Nickel	< RDL	mg/l		0.02	12/30/2011 09:25	KFJ	EPA 6010C
Selenium	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C
Silver	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Thallium ICPMS	< RDL	mg/l		0.002	01/12/2012 11:00	LBH	EPA 6020A
Vanadium	< RDL	mg/l		0.01	12/30/2011 09:25	KFJ	EPA 6010C
Zinc	< RDL	mg/l		0.05	12/30/2011 09:25	KFJ	EPA 6010C

Sample Number	Sample Description, Date and Time Collected
D15639	Schlumberger Technology TMC MW-1 grab, collected on 12/19/2011 at 15:41

Parameter	Result	Unit	Flag	RDL	Date/Time	Analyst	Method
Digestion for Metals - ICP	Completed				12/29/2011 16:22	KFJ	EPA 3005A
Digestion for Metals - ICPMS	Completed				01/09/2012 08:50	LBH	EPA 3005A

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P.O. Box 5655, Greenville, SC 29606
Phone (864) 232-1556 Fax (864) 232-6140
Shipping Address: 426 Fairforest Way
Greenville, SC 29607

CHAIN OF CUSTODY RECORD

Client Name: Schlumberger - TMC

Address: Cateechee, SC

Report To:

Telephone No.: FAX No.:

PO No.: Project No. 10-012

Rogers & Callcott Lab No.	Yr. 11 Date	Time	Sample Description	Total Number of Containers	PARAMETERS: PCBs ✱	PCBs ✱	Metals ✱✱						COMMENTS:
				Filtered (Yes/No)	N	N	N						
				Cooled (Yes/No)	Y	Y	Y						
				Container Type (P/G)	G	G	P						
				Container Volume	2.5L	4.0L	500						
				Sample Type (Grab/Composite)	G	G	G						
				Sample Source (WW, GW, DW, Other)	GW	GW	GW						
				Sample Source Chlorinated (Yes/No)	N	N	N						
				Lab Receipt Cl2 Check	NA	NA	NA						
				Lab Receipt pH Check	7	7	<2						
				Preserved (Code)	A	A	B						
AD 151637	12-19	1238	Equipment Blank	2	1		1	R					✱ 7 Aroclors: 1016, 1221, 1232,
151636		1316	MW-1	1		1							1242, 1248, 1254, 1260
151639		1541	MW-1	1			1						
													✱✱ Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb,
													Ni, Se, Ag, Tl, V, Zn

A–None, B–HNO_3, C–H_2SO_4, D–NaOH, E–HCL, F–$Na_2S_2O_3$, G–Boric Acid, H–Ascorbic Acid, I– ____

SAMPLER Relinquished by (Sig.)	Date/Time	Received by (Sig.)	Date/Time	KNOWN HAZARDS ASSOCIATED WITH SAMPLES
① [signature]	12-19-11 1702	② [signature] Shipper Name & #	12.19.11 1702	
Relinquished by (Sig.) ③	Date/Time	Received by (Sig.) ④ Shipper Name & #	Date/Time	
Relinquished by (Sig.) ⑤	Date/Time	Received by (Sig.) ⑥ Shipper Name & #	Date/Time	Temperature of blank or representative sample: At time of collection ____ °C; At time of lab receipt 0.7 °C
Seal # at'chd by ◯ Recvd. intact by ◯		Seal # at'chd by ◯ Recvd. intact by ◯		

Form Revised July 2008

R/C COC FORM

FIELD DATA LOG FOR GROUND WATER SAMPLING

ROGERS & CALLCOTT ENGINEERS, INC.

Well Number: MW-1 ☐ Development ☒ Purging

Date: 12-19-11 Field Personnel: JHF/BCS

Site Name/Location: Schlumberger - TMC

Page 1 of 3

For Low Flow Sampling: Page NA of NA

Method of Well Evacuation

Pump	Bailer
☐ Grundfos	☐ Non Disposable Teflon
☐ Submersible	☐ Disposable Teflon
☐ Peristaltic	☐ Disposable Poly
☒ Bladder	☐ Dedicated Teflon
☐ Waterra	☐ Dedicated PVC
☐ Continuous (Recovery Well)	
☐ _____	

One Volume Multiplier (gal/ft) = $\pi r^2 h$ (7.48) (r in feet)
Well Diameter (gal/ft.) 1"= 0.041; 2"= 0.163; 3"= 0.367
4"= 0.653; 6"= 1.470

Water Volume Calculations

Initial Depth to Ground Water (a): 66.18 @ 1234
Total Depth of Well (b): 70.98
Length of Water Column in Well (b-a): 4.8
Well Casing Diameter (inches): 2"
Depth to Immiscible Layer: NA

# of Casings	Gallons to be Removed	Gallons / mLs Removed
1 Casing Vol = (b-a) x Multiplier	NA	
3 Casing Vol	NA	2000

Circle One that Applies

Measuring Point: TOC / Ground Surface
Riser Material: PVC / Steel / Teflon
Steel Protective Casing? Yes / No
Bollards? Yes / No
Flush Mount? Yes / No
Well Locked? Yes / No
Well Pad Condition? Okay / _____
Well Integrity Satisfactory? Okay / _____
Vegetation: Overgrown/ Moderate/ Light/ None

Water Removal / Field Analysis Data

Date	Time	Increment	Removal Rate (gal/m) or (ml/m)	Water Level, (feet)	Water Volume Removed (gal) or (ml)	pH (units) ±0.1-Stable	Temp (°C)	Conductivity (uS/cm) 10%-Stable	Dissolved Oxygen (mg/L)	Hydrogen Sulfide (ppm)	ORP (mVolts)	Odor (Subj*)	Turbidity (NTU)	Comments
12-19-11	1255	NA	100	66.18	0.0	7.43	15.1	171.3	NA	NA	36.6	1	11.6	
12-19-11	1300	1	100	67.29	500	7.49	14.9	168.3	NA	NA	90.8	1	7.64	
12-19-11	1305	2	100	67.68	1000	7.39	14.6	162.5	NA	NA	87.7	1	6.50	
12-19-11	1310	3	100	68.28	1500	7.34	14.2	161.3	NA	NA	84.9	1	5.27	
12-19-11	1315	4	100	68.72	2000	7.31	14.4	162.2	NA	NA	81.7	1	<5.0	
							12-19-11							

Weather Conditions/~Temp: Sunny 155 °F

* Subjective (1) None (2) Slight (3) Moderate (4) Strong

Well Yield: (Low/ Moderate/ High) Sample Clarity: Clear Precipitate: none Fe^{+2} mg/L= NA

Sample Collection Time PCBs - 1316 Metals - 1541

Comments

Reviewed by: _____ Date: _____

Revised 2/3/09

Rogers and Callcott Engineers

Continuing Calibration Verification

Client: Schlumberger TMC **Date:** 12-19-11

Conductivity Meter
EPA 9050A

Meter Make / Model: Orion 4 Star SN: A12882 Probe: PTI- 11328

Time	Analyst	Conc. of Standard, µmhos/cm @25°C	Actual Reading of Standard, µmhos/cm	
1233	JHF	99.4	101.2	@ 18.6 °C
1705	JHF	998	1008	@ 21.8 °C

pH Meter
EPA 9040C

Meter Make / Model: Orion 4 Star Probe: PRI - 13531

Time	Analyst	Conc. of Buffer, units	Actual Reading of Buffer, units
JHF 12-19-11 ~~1231~~	JHF	7.0	6.95
1702	JHF	4.0	4.01

Turbidity Meter
Field Screen Method

Meter Make / Model: Hach 2100P SN:

Time	Analyst	Assigned Conc. of Standard, NTU	Actual Reading of Standard, NTU
1231	JHF	44.7	44.8
1702	JHF	4.56	4.65

Field Duplicate

Well ID: MW-1

Time	Analyst	Conductivity, µmhos/cm	pH, units	Turbidity, NTU	Temperature, °C
1316	JHF	161.9	7.30	<5.0	14.4

Note: Refer to daily calibration log for instrument calibration and chemical inventory information / documentation.

Reviewed by: Date:

Rogers and Callcott Engineers

Field Meter Calibration Record

Client: Schlumberger - TMC **Date:** 12-19-11

Conductivity Calibration - EPA 9050A

Meter Make / Model: Orion 4 Star SN: A12882 Probe: PT1-11328

Time: 1046 Analyst: JAF Cell Constant 0.473

Chemical Inventory	Conc. of Standard, µmhos/cm @25°C		Actual Reading of Standard, µmhos/cm	Actual Reading of Standard, @ Temperature, °C
11-08-29	10.35		10.48	21.5
11-08-31	99.4		100.8	21.9
11-08-34	998		1011	21.6
11-08-27	SSS conc:	447	465	21.5

Temperature compensation for pH / conductivity meter : -0.1

pH Calibration - EPA 9040C

Meter Make / Model: Orion 4 Star Probe: PR1-13531

Time: 1040 Analyst: JAF Slope: 96.6

Chemical Inventory	Conc. of Buffer, units		Actual Reading of Buffer, units
11-10-07	4.0		3.99
11-08-69	7.0		6.99
11-08-70	10.0		10.05
11-09-47	SSS conc:	7.0	6.92

Turbidity Meter Calibration
Field Screen Method

Meter Make / Model: Hach 2100P SN: 980706018869 Date of most recent calibration: 12-1-11

Time: 1011 Analyst: JAF

Chemical Inventory	Assigned Conc. of Standard, NTU	Actual Reading of Standard, NTU
11-02-01	4.56	4.65
11-02-02	44.7	45.6
11-02-03	467	472

Reviewed by: _____ Date: _____

Rogers and Callcott Engineers

Field Multi-Meter Calibration Record

Client: Schlumberger -TMC **Date:** 12-19-11

Meter Make / Model: Hama 9828 HI SN: 679203

pH Calibration
EPA 9040C

Time: Analyst: Slope:

Chemical Inventory	Expiration Date	Conc. of Buffer, units	Actual Reading, units
		4.0	
		7.0	
		10.0	
		SSS conc:	

Temperature compensation for pH meter :

Note: Temperature is recorded from the conductivity meter for reporting purposes.

ORP Calibration

Time: 1019 Analyst: JHF

Chemical Inventory	JHF Expiration Date	Conc. of Standard @ 25°C mV	Actual Reading, mV	@ Temperature °C
11-11-55	12/9/11 ~~12~~ 05-2016	240	239.9	22.85

Dissolved Oxygen Calibration
SM 4500 OG

Time: Analyst:

mmHG	DO Meter Reading mg/L	Winkler Titration mlS

APPENDIX B

APPENDIX B

DATA VERIFICATION & QUALITY CONTROL SUMMARY

ROGERS & CALLCOTT
LABORATORY SERVICES

P.O. Box 5655, Greenville, SC 29606
Phone: (864) 232-1556 - FAX: (864) 232-6140

Data Verification

Project: Schlumberger – Twelve Mile Creek Monitoring Wells Collected: December 2011

AD15637-AD15639 and AD15679-AD15684 and AD15768-AD15769

Metals – ICP EPA 6010C		
Initial Calibration	Acceptable	Results within method quality control specifications
Initial Calibration Verification	Acceptable	Results within method quality control specifications
Continuing Calibration Verification	Acceptable	Results within method quality control specifications
Blanks	Acceptable	Initial calibration blank, continuing calibration blank, and batch blank results were less than the RDL.
Interference Check Standard	Acceptable	Results within method quality control specifications
Laboratory Control Sample	Acceptable	Results within method quality control specifications
Duplicate Sample Analysis	Acceptable	Results within method quality control specifications
Spike Sample Analysis	Acceptable	Results within method quality control specifications
Post-Spike Sample Analysis	Acceptable	Results within method quality control specifications
Serial Dilution Sample Analysis	Acceptable	Results within method quality control specifications
Internal Standards	Acceptable	Results were within quality control limits.
Raw Data Review	Acceptable	No anomalies were noted in the data
Equipment Blank	Acceptable	Contaminants of interest were not detected above the RDL

Data Verification

Project: Schlumberger – Twelve Mile Creek Monitoring Wells Collected: December 2011

AD15637-AD15639 and AD15679-AD15684 and AD15768-AD15769

Metals		
Metals – ICP-MS EPA 6020A		
Requirement	**Evaluation**	**Comments**
Instrument Tuning	Acceptable	Results within method quality control specifications
Initial Calibration	Acceptable	Results within method quality control specifications
Initial Calibration Verification	Acceptable	Results within method quality control specifications
Continuing Calibration Verification	Acceptable	Results within method quality control specifications
Blanks	Acceptable	Initial calibration blank, continuing calibration blank, and batch blank results were less than the RDL
Interference Check Standard	Acceptable	Results within method quality control specifications
Laboratory Control Sample	Acceptable	Results within method quality control specifications
Duplicate Sample Analysis	Acceptable	Results within method quality control specifications
Spike Sample Analysis	Acceptable	Results within method quality control specifications
Post-Spike Sample Analysis	Acceptable	Results within method quality control specifications
Serial Dilution Sample Analysis	Acceptable	Results within method quality control specifications
Internal Standards	Acceptable	Results were within quality control limits.
Raw Data Review	Acceptable	No anomalies were noted in the data
Equipment Blank	Acceptable	Contaminants of interest were not detected above the RDL

Data Verification

Project: Schlumberger – Twelve Mile Creek Monitoring Wells Collected: December 2011

AD15637-AD15639 and AD15679-AD15684 and AD15768-AD15769

Organics		
PCBs EPA 8082		
Requirement	**Evaluation**	**Comments**
Initial Calibration	Acceptable	Results within method quality control specifications
Initial Calibration Verification	Acceptable	Results within method quality control specifications
Continuing Calibration Verification	Acceptable	Results within method quality control specifications
Blanks	Acceptable	Initial calibration blank, continuing calibration blank, and batch blank results were less than the RDL
Laboratory Control Sample	Acceptable	Results within method quality control specifications
Duplicate Sample Analysis	Acceptable	Results within method quality control specifications
Spike Sample Analysis	Acceptable	Results within method quality control specifications
Surrogates	Acceptable	Results within method quality control specifications
Raw Data Review	Acceptable	No anomalies were noted in the data.
Equipment Blanks	Acceptable	Contaminants of interest were not detected above the RDL

General		
Requirement	**Evaluation**	**Comments**
Preservation	Acceptable	Samples were properly preserved in the field
Holding Time	Acceptable	Samples were analyzed within holding time

Data Verification

Project: Schlumberger – Twelve Mile Creek Monitoring Wells Collected: December 2011

AD15637-AD15639 and AD15679-AD15684 and AD15768-AD15769

Case Narrative

Samples were collected on 12/19/11, 12/20/11, and 12/21/11 by Rogers and Callcott field personnel. The samples were received in the laboratory on 12/19/11, 12/20/11, and 12/21/11 for metals and PCB analysis.

The analytical and sample preparation methods were performed to meet or exceed the quality control requirements of the method.

Data Validator: Melissa S Ramos Date: 3/20/2012

Quality Control Summary
ICP Metals by Method EPA 6010C

Project: Schlumberger Technology - TMC
Analyst: KFJ
Analyzed: 12-2011

Batch #: 122911b2

Samples: AD15637, AD15639, AD15680, AD15682, AD15684, AD15769

Method Blank

Parameter	Result, mg/L
Barium	<0.01
Beryllium	<0.004
Cadmium	<0.005
Chromium	<0.02
Copper	<0.01
Nickel	<0.02
Selenium	<0.05
Silver	<0.01
Vanadium	<0.01
Zinc	<0.05

Laboratory Control Sample

Parameter	% Recovery	% Recovery Range
Barium	102	80-120
Beryllium	104	80-120
Cadmium	103	80-120
Chromium	101	80-120
Copper	102	80-120
Nickel	103	80-120
Selenium	98	80-120
Silver	104	80-120
Vanadium	106	80-120
Zinc	102	80-120

Quality Control Summary
ICP Metals by Method EPA 6010C

Project: Schlumberger Technology - TMC
Analyst: KFJ
Analyzed: 12-2011

Batch #: 122911b2

Samples: AD15637, AD15639, AD15680, AD15682, AD15684, AD15769

Matrix Spike

Sample #	Parameter	Spike Conc., mg/L	Sample Result, mg/L	MS Result, mg/L	MSD Result, mg/L	% Rec MS	% Rec MSD	MS/MSD RPD	% Rec Range	RPD Limit
1120168-07	Barium	0.50	0.03	0.54	0.53	102	100	2	75-125	20
1120168-07	Beryllium	0.50	ND	0.51	0.51	102	102	0	75-125	20
1120168-07	Cadmium	0.50	ND	0.51	0.50	102	100	2	75-125	20
1120168-07	Chromium	0.50	ND	0.50	0.50	100	100	0	75-125	20
1120168-07	Copper	0.50	ND	0.51	0.50	102	100	2	75-125	20
1120168-07	Nickel	0.50	ND	0.51	0.51	102	102	0	75-125	20
1120168-07	Selenium	0.50	ND	0.49	0.50	98	100	2	75-125	20
1120168-07	Silver	0.50	ND	0.52	0.51	104	102	2	75-125	20
1120168-07	Vanadium	0.50	ND	0.52	0.52	104	104	0	75-125	20
1120168-07	Zinc	0.50	ND	0.51	0.51	102	102	0	75-125	20
AD15684	Barium	0.50	0.01	0.51	0.51	100	100	0	75-125	20
AD15684	Beryllium	0.50	ND	0.51	0.51	102	102	0	75-125	20
AD15684	Cadmium	0.50	ND	0.50	0.50	100	100	0	75-125	20
AD15684	Chromium	0.50	ND	0.50	0.50	100	100	0	75-125	20
AD15684	Copper	0.50	ND	0.51	0.51	102	102	0	75-125	20
AD15684	Nickel	0.50	ND	0.51	0.51	102	102	0	75-125	20
AD15684	Selenium	0.50	ND	0.50	0.50	100	100	0	75-125	20
AD15684	Silver	0.50	ND	0.51	0.52	102	104	2	75-125	20
AD15684	Vanadium	0.50	ND	0.52	0.52	104	104	0	75-125	20
AD15684	Zinc	0.50	ND	0.51	0.50	102	100	2	75-125	20

Quality Control Summary
ICP Metals by Method EPA 6010C

Project: Schlumberger Technology - TMC
Analyst: KFJ
Analyzed: 12-2011

Batch #: 122911b2

Samples: AD15637, AD15639, AD15680, AD15682, AD15684, AD15769

Sample #	Parameter	Spike Conc., mg/L	Sample Result, mg/L	Post Spike PS Result, mg/L	% Rec PS	% Rec Range
1120168-07	Barium	0.50	0.03	0.53	100	80-120
1120168-07	Beryllium	0.50	ND	0.50	100	80-120
1120168-07	Cadmium	0.50	ND	0.50	100	80-120
1120168-07	Chromium	0.50	ND	0.49	98	80-120
1120168-07	Copper	0.50	ND	0.50	100	80-120
1120168-07	Nickel	0.50	ND	0.50	100	80-120
1120168-07	Selenium	0.50	ND	0.49	98	80-120
1120168-07	Silver	0.50	ND	0.50	100	80-120
1120168-07	Vanadium	0.50	ND	0.51	102	80-120
1120168-07	Zinc	0.50	ND	0.50	100	80-120
AD15684	Barium	0.50	0.01	0.51	100	80-120
AD15684	Beryllium	0.50	ND	0.51	102	80-120
AD15684	Cadmium	0.50	ND	0.50	100	80-120
AD15684	Chromium	0.50	ND	0.50	100	80-120
AD15684	Copper	0.50	ND	0.51	102	80-120
AD15684	Nickel	0.50	ND	0.51	102	80-120
AD15684	Selenium	0.50	ND	0.50	100	80-120
AD15684	Silver	0.50	ND	0.51	102	80-120
AD15684	Vanadium	0.50	ND	0.51	102	80-120
AD15684	Zinc	0.50	ND	0.50	100	80-120

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Quality Control Summary
ICP Metals by Method EPA 6010C

Project: Schlumberger Technology - TMC
Analyst: KFJ
Analyzed: 12-2011

Batch #: 122911b2

Samples: AD15637, AD15639, AD15680, AD15682, AD15684, AD15769

Serial Dilution

Sample #	Parameter	Sample Result, mg/L	Serial Dilution Result, mg/L	Serial Dilution Acceptance Range	
1120168-07	Barium	0.03	NE	NE	NE
1120168-07	Beryllium	ND	NE	NE	NE
1120168-07	Cadmium	ND	NE	NE	NE
1120168-07	Chromium	ND	NE	NE	NE
1120168-07	Copper	ND	NE	NE	NE
1120168-07	Nickel	ND	NE	NE	NE
1120168-07	Selenium	ND	NE	NE	NE
1120168-07	Silver	ND	NE	NE	NE
1120168-07	Vanadium	ND	NE	NE	NE
1120168-07	Zinc	ND	NE	NE	NE
AD15684	Barium	0.03	NE	NE	NE
AD15684	Beryllium	ND	NE	NE	NE
AD15684	Cadmium	ND	NE	NE	NE
AD15684	Chromium	ND	NE	NE	NE
AD15684	Copper	ND	NE	NE	NE
AD15684	Nickel	ND	NE	NE	NE
AD15684	Selenium	ND	NE	NE	NE
AD15684	Silver	ND	NE	NE	NE
AD15684	Vanadium	ND	NE	NE	NE
AD15684	Zinc	ND	NE	NE	NE

Note: The serial dilution is not evaluated (NE) if the analyte concentration of the diluted sample is less than 10 times the RDL

Rogers and Callcott Laboratory Services

Quality Control Summary
ICPMS Metals by Method EPA 6020A

Project: Schlumberger Technology - TMC
Analyst: LBH
Analyzed: 01-2012

Batch #: 010912b1

Samples: AD15637, AD15639, AD15680, AD15682, AD15684, AD15769

Method Blank

Parameter	Result, mg/L
Arsenic	<0.005
Cobalt	<0.01
Lead	<0.002
Thallium	<0.002

Laboratory Control Sample

Parameter	% Recovery	% Recovery Range
Arsenic	105	80-120
Cobalt	102	80-120
Lead	102	80-120
Thallium	102	80-120

Matrix Spike

Sample #	Parameter	Spike Conc., mg/L	Sample Result, mg/L	MS Result, mg/L	MSD Result, mg/L	% Rec MS	% Rec MSD	MS/MSD RPD	% Rec Range	RPD Limit
1120145-17	Arsenic	0.060	ND	0.062	0.062	103	103	0	75-125	20
1120145-17	Cobalt	0.060	ND	0.060	0.060	100	100	0	75-125	20
1120145-17	Lead	0.060	ND	0.061	0.060	102	100	2	75-125	20
1120145-17	Thallium	0.060	ND	0.061	0.061	102	102	0	75-125	20

Post Spike

Sample #	Parameter	Spike Conc., mg/L	Sample Result, mg/L	PS Result, mg/L	% Rec PS	% Rec Range
1120145-17	Arsenic	0.070	ND	0.073	104	80-120
1120145-17	Cobalt	0.070	ND	0.071	101	80-120
1120145-17	Lead	0.070	ND	0.072	103	80-120
1120145-17	Thallium	0.070	ND	0.072	103	80-120

Rogers and Callcott Laboratory Services

Quality Control Summary
ICPMS Metals by Method EPA 6020A

Project: Schlumberger Technology - TMC
Analyst: LBH
Analyzed: 01-2012

Batch #: 010912b1

Samples: AD15637, AD15639, AD15680, AD15682, AD15684, AD15769

Serial Dilution

Sample #	Parameter	Sample Result, mg/L	Serial Dilution Result, mg/L	Serial Dilution Acceptance Range	
1120145-17	Arsenic	ND	NE	NE	NE
1120145-17	Cobalt	ND	NE	NE	NE
1120145-17	Lead	ND	NE	NE	NE
1120145-17	Thallium	ND	NE	NE	NE

Note: The serial dilution is not evaluated (NE) if the analyte concentration of the diluted sample is less than 10 times the RDL

Rogers and Callcott Laboratory Services

Quality Control Summary
ICPMS Metals by Method EPA 6020A

Project: Schlumberger Technology - TMC
Analyst: LBH
Analyzed: 12-2011

Batch #: 122711b2

Samples: AD15637, AD15639, AD15680, AD15682, AD15684, AD15769

Method Blank

Parameter	Result, mg/L
Antimony	<0.005

Laboratory Control Sample

Parameter	% Recovery	% Recovery Range
Antimony	100	80-120

Matrix Spike

Sample #	Parameter	Spike Conc., mg/L	Sample Result, mg/L	MS Result, mg/L	MSD Result, mg/L	% Rec MS	% Rec MSD	MS/MSD RPD	% Rec Range	RPD Limit
AD15682	Antimony	0.020	ND	0.021	0.021	105	105	0	75-125	20

Post Spike

Sample #	Parameter	Spike Conc., mg/L	Sample Result, mg/L	PS Result, mg/L	% Rec PS	% Rec Range
AD15682	Antimony	0.025	ND	0.025	100	80-120

Serial Dilution

Sample #	Parameter	Sample Result, mg/L	Serial Dilution Result, mg/L	Serial Dilution Acceptance Range	
AD15682	Arsenic	ND	NE	NE	NE

Note: The serial dilution is not evaluated (NE) if the analyte concentration of the diluted sample is less than 10 times the RDL

Rogers and Callcott Laboratory Services

Method Blank Quality Control Report
PCBs

Blank	11-12-21-22
Extraction Date	12/21/2011
Analysis Date	12/28/2011
Method	8082A
Instrument	610N0123103
Analyst	RKH

Compound	Result (ug/L)
PCB-1016	< 0.5
PCB-1221	< 0.5
PCB-1232	< 0.5
PCB-1242	< 0.5
PCB-1248	< 0.5
PCB-1254	< 0.5
PCB-1260	< 0.5

Rogers and Callcott Laboratory Services

PCBs by Method EPA 8082A
Laboratory Control Sample

Analysis Date:	12/28/2011
Extraction Date:	12/21/2011
Matrix:	water
LCS ID:	11-12-21-32

Instrument:	610N0123103
Primary Column:	RTX-1701
Confirmation Column:	CLP2
Analyst:	RKH

Primary Column:

Compound	LCS Conc. (ug/L)	LCS On-Column Result (ug/L)	LCS Recovery, %	LCS Recovery Limits, %
PCB-1248	0.5000	0.4419	88.4	70-130

Confirmation Column:

Compound	LCS Conc. (ug/L)	LCS On-Column Result (ug/L)	LCS Recovery, %	LCS Recovery Limits, %
PCB-1248	0.5000	0.4786	95.7	70-130

Rogers and Callcott Laboratory Services

PCBs by Method EPA 8082A
Matrix Spike Recovery Report

Sample #	AD15638
Client:	Schlumberger - TMC
Analysis Date:	12/29/2011
Extraction Date:	12/21/2011
Matrix:	water

Instrument:	610N0123103
Primary Column:	RTX-1701
Confirmation Column:	CLP2
Analyst:	RKH
Spike ID:	11-12-21-36 / 11-12-21-37

Primary Column:

Compound	Spike Conc. (ug/L)	Sample On-Column Result (ug/L)	MS On-Column Result (ug/L)	Spike Recovery, %	MSD On-Column Result (ug/L)	MSD Recovery, %	RPD	Spike Recovery Limits, %	RPD Limits
PCB-1248	0.5000	0.0000	0.4340	86.8	0.4695	93.9	7.86	60-130	20

Confirmation Column:

Compound	Spike Conc. (ug/L)	Sample On-Column Result (ug/L)	MS On-Column Result (ug/L)	Spike Recovery, %	MSD On-Column Result (ug/L)	MSD Recovery, %	RPD	Spike Recovery Limits, %	RPD Limits
PCB-1248	0.5000	0.0000	0.4820	96.4	0.5091	101.8	5.47	60-130	20

Rogers and Callcott Laboratory Services

Method Blank Quality Control Report
PCBs

Blank	11-12-22-24
Extraction Date	12/22/2011
Analysis Date	12/29/2011
Method	8082A
Instrument	610N0123103
Analyst	RKH

Compound	Result (ug/L)
PCB-1016	< 0.5
PCB-1221	< 0.5
PCB-1232	< 0.5
PCB-1242	< 0.5
PCB-1248	< 0.5
PCB-1254	< 0.5
PCB-1260	< 0.5

Rogers and Callcott Laboratory Services

PCBs by Method EPA 8082A
Laboratory Control Sample

Analysis Date:	12/29/2011
Extraction Date:	12/22/2011
Matrix:	water
LCS ID:	11-12-22-34
LCS Dup ID:	11-12-22-35

Instrument:	610N0123103
Primary Column:	RTX-1701
Confirmation Column:	CLP2
Analyst:	RKH

Primary Column:

Compound	LCS Conc. (ug/L)	LCS On-Column Result (ug/L)	LCS Recovery, %	LCS Dup On-Column Result (ug/L)	LCS Dup Recovery, %	RPD		LCS Recovery Limits, %	RPD Limits
PCB-1248	0.5000	0.4618	92.4	0.4847	96.9	4.8		70-130	20

Confirmation Column:

Compound	LCS Conc. (ug/L)	LCS On-Column Result (ug/L)	LCS Recovery, %	LCS Dup On-Column Result (ug/L)	LCS Dup Recovery, %	RPD		LCS Recovery Limits, %	RPD Limits
PCB-1248	0.5000	0.5148	103	0.5417	108	5.1		70-130	20

APPENDIX C

APPENDIX C

MW-4 WELL DEVELOPMENT FORM

FIELD DATA LOG FOR GROUND WATER SAMPLING

ROGERS & CALLCOTT ENGINEERS, INC.

Well Number: MW-4 ☒ Development ☐ Purging

Date: 12-1-11 Field Personnel: JHF/BCS

Site Name/Location: Schlumberger - TMC

Page 1 of ___

For Low Flow Sampling: Page NA

Method of Well Evacuation

Pump	Bailer
☐ Grundfos	☐ Non Disposable Teflon
☒ Submersible	☐ Disposable Teflon
☐ Peristaltic	☐ Disposable Poly
☐ Bladder	☐ Dedicated Teflon
☐ Waterra	☐ Dedicated PVC
☐ Continuous (Recovery Well)	
☐ ___	

One Volume Multiplier (gal/ft) = $\pi r^2 h$ (7.48) (r in feet)
Well Diameter (gal/ft.) 1"= 0.041; 2"= 0.163; 3"= 0.367
4"= 0.653; 6"= 1.470

Water Volume Calculations

Initial Depth to Ground Water (a): 80.55 @ 1147
Total Depth of Well (b): 92.35
Length of Water Column in Well (b-a): 11.80
Well Casing Diameter (inches): 2"
Depth to Immiscible Layer: NA

# of Casings	Gallons to be Removed	Gallons / mLs Removed
1 Casing Vol = (b-a) x Multiplier	1.9	
3 Casing Vol	5.7	

Circle One that Applies

Measuring Point: TOC / Ground Surface
Riser Material: PVC / Steel / Teflon
Steel Protective Casing? Yes / No
Bollards? Yes / No
Flush Mount? Yes / No
Well Locked? Yes / No
Well Pad Condition? Okay / ___
Well Integrity Satisfactory? Okay / ___
Vegetation: Overgrown/ Moderate/ Light/ None

Water Removal / Field Analysis Data

Date	Time	Increment	Removal Rate (gal/m) or (ml/m)	Water Level, (feet)	Water Volume Removed (gal) or (ml)	pH (units) ± 0.1-Stable	Temp (°C)	Conductivity (uS/cm) 10%-Stable	Dissolved Oxygen (mg/L)	Hydrogen Sulfide (ppm)	ORP (mVolts)	Odor (Subj*)	Turbidity (NTU)	Comments
12-1-11	1246	NA	0.5		0.0	5.86	16.6	29.54	NA	NA	NA	1	>1000	
12-1-11	~~12~~1301	1	0.5	88.50	7.5	5.69	16.5	23.93	NA	NA	NA	1	175	
12-1-11	1316	2	0.5	88.55	15.0	5.63	16.5	22.35	NA	NA	NA	1	225	
12-1-11	1331	3	0.5	Below pump	22.5	5.56	16.6	22.49	NA	NA	NA	1	83.0	
12-1-11	1346	4	0.5	Below pump	29.0	5.56	17.0	22.17	NA	NA	NA	1	7.55	
12-1-11	1434	5	0.5	Below pump	36.5	5.64	16.6	22.88	NA	NA	NA	1	12.8	
12-1-11	1514	6	0.5	NA	46.0	5.53	16.6	22.86	NA	NA	NA	1	40.4	
12-1-11	1543	7	0.5	NA	55.0	5.45	16.3	23.02	NA	NA	NA	1	30.4	

Weather Conditions/~Temp: Sunny / 45 °F

** Subjective (1) None (2) Slight (3) Moderate (4) Strong*

Well Yield: (Low/ Moderate/ High) Sample Clarity: ___ Precipitate: ___ Fe^{+2} mg/L= NA

Sample Collection Time ___

Comments ___

Reviewed by: ___ Date: ___

Revised 2/3/09

Rogers and Callcott Engineers

Field Meter Calibration Record

Client: Schlumberger - TMC **Date:** 12-1-11

Conductivity Calibration - EPA 9050A

Meter Make / Model: Orion 4 Star SN: A12882 Probe: PT1-11328

Time: 1017 Analyst: JHF Cell Constant 0.477

Chemical Inventory	Conc. of Standard, µmhos/cm @25°C		Actual Reading of Standard, µmhos/cm	Actual Reading of Standard, @ Temperature, °C
11-08-27	10.35		10.41	22.7
11-08-32	99.4		100.5	23.1
11-08-34	998		1011	22.7
11-08-27	SSS conc:	447	459	23.0

Temperature compensation for pH / conductivity meter : -0.1

pH Calibration - EPA 9040C

Meter Make / Model: Orion 4 Star Probe: 605377 09J

Time: 1015 Analyst: JHF Slope: 97.8

Chemical Inventory	Conc. of Buffer, units		Actual Reading of Buffer, units
11-10-67	4.0		4.04
11-08-69	7.0		7.04
11-08-70	10.0		10.03
11-09-47	SSS conc:	7.0	6.99

Turbidity Meter Calibration Field Screen Method

Meter Make / Model: Hach 2100P SN: 9807 000/8869 Date of most recent calibration: 12-1-11

Time: 1000 Analyst: JHF

Chemical Inventory	Assigned Conc. of Standard, NTU	Actual Reading of Standard, NTU
11-02-01	4.56	4.51
11-02-02	44.7	44.5
11-02-03	467	467

Reviewed by: _____ Date: _____

Revised 07/21/11

APPENDIX D

APPENDIX D

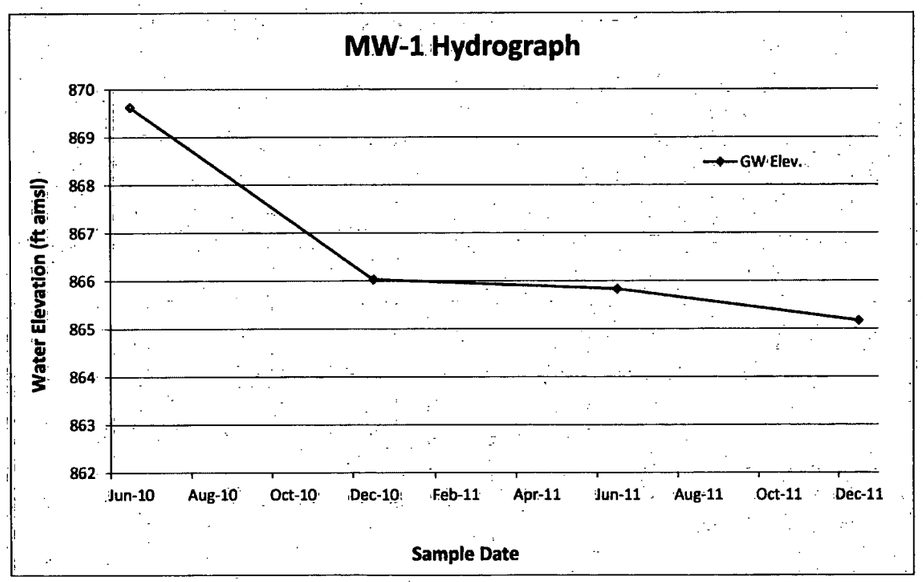
GROUNDWATER DATABASE

TWELVEMILE CREEK SMU
Pickens County, South Carolina
Schlumberger Technology Corporation

MW-1
Measuring Pt. Elev.: 931.35 ft msl

Date	Depth to Water (ft. BTOC)	Water Elev. (ft. msl)	pH (SU)	ORP (mv)	Specific Conductivity (umhos/cm)	Temp. (C)	Turbidity (ntu)	Antimony (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Beryllium (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Cobalt (mg/l)	Copper (mg/l)	Lead (mg/l)	Nickel (mg/l)	Selenium (mg/l)	Silver (mg/l)	Thallium (mg/l)	Vanadium (mg/l)	Zinc (mg/l)	PCB 1016 (µg/l)	PCB 1221 (µg/l)	PCB 1232 (µg/l)	PCB 1242 (µg/l)	PCB 1248 (µg/l)	PCB 1254 (µg/l)	PCB 1260 (µg/l)
Jun-10	61.73	869.62	6.0	112	75	24.6	8.8	< 0.005	< 0.005	**0.02**	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	**0.03**	< 0.05	< 0.02	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-10	65.32	866.03	6.2	183	107	13.0	< 5.0	< 0.005	< 0.005	**0.02**	< 0.004	< 0.005	< 0.02	**0.01**	< 0.01	< 0.002	**0.11**	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Jun-11	65.52	865.83	6.4	180	103	22.7	< 5.0	< 0.005	< 0.005	**0.05**	< 0.004	< 0.005	< 0.02	**0.01**	< 0.01	< 0.002	**0.06**	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-11	66.18	865.17	7.3	82	162	14.4	< 5.0	< 0.005	< 0.005	**0.01**	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MCL*	–	–	NE	NE	NE	NE	NE	0.006	0.010	2.0	0.004	0.005	0.1	NE	1.3[1]/1.0[2]	0.015[1]	NE	0.05	0.1[2]	0.002	NE	5[2]	0.5	0.5	0.5	0.5	0.5	0.5	0.5

*MCL = EPA's Drinking Water Maximum Contaminant Level (NE = Not Established).
[1] Action Level for drinking water systems requiring corrosion control.
[2] Secondary MCL.

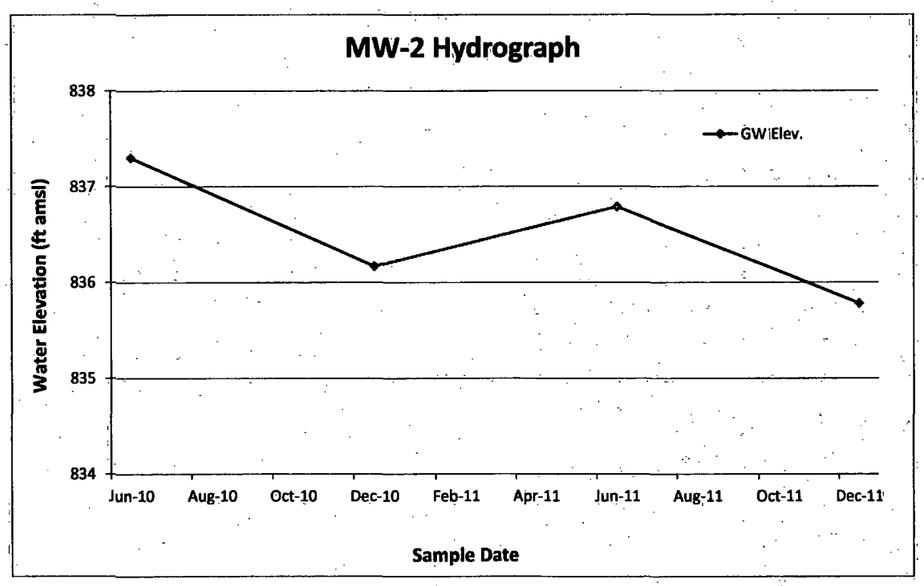


TWELVEMILE CREEK SMU
Pickens County, South Carolina
Schlumberger Technology Corporation

MW-2
Measuring Pt. Elev. 893.71 ft msl

Date	Depth to Water (ft. BTOC)	Water Elev. (ft. msl)	pH (SU)	ORP (mv)	Specific Conductivity (umhos/cm)	Temp. (C)	Turbidity (ntu)	Antimony (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Beryllium (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Cobalt (mg/l)	Copper (mg/l)	Lead (mg/l)	Nickel (mg/l)	Selenium (mg/l)	Silver (mg/l)	Thallium (mg/l)	Vanadium (mg/l)	Zinc (mg/l)	PCB 1016 (µg/l)	PCB 1221 (µg/l)	PCB 1232 (µg/l)	PCB 1242 (µg/l)	PCB 1248 (µg/l)	PCB 1254 (µg/l)	PCB 1260 (µg/l)
Jun-10	56.41	837.30	6.2	36	873	20.0	< 5.0	< 0.005	< 0.005	**0.03**	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.02	< 0.002	< 0.01	< 0.05	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dec-10	57.54	836.17	6.9	-3.4	577	17.8	10	< 0.005	< 0.005	**0.01**	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Jun-11	56.92	836.79	6.6	-11	313	23.1	39	< 0.005	< 0.005	< 0.01	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-11	57.93	835.78	7.1	-58	264	13.9	6.9	< 0.005	< 0.005	**0.01**	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MCL*	–	–	NE	NE	NE	NE	NE	0.006	0.010	2.0	0.004	0.005	0.1	NE	1.3[1]/1.0[2]	0.015[1]	NE	0.05	0.1[2]	0.002	NE	5[2]	0.5	0.5	0.5	0.5	0.5	0.5	0.5

*MCL = EPA's Drinking Water Maximum Contaminant Level (NE = Not Established)
[1] Action Level for drinking water systems requiring corrosion control.
[2] Secondary MCL

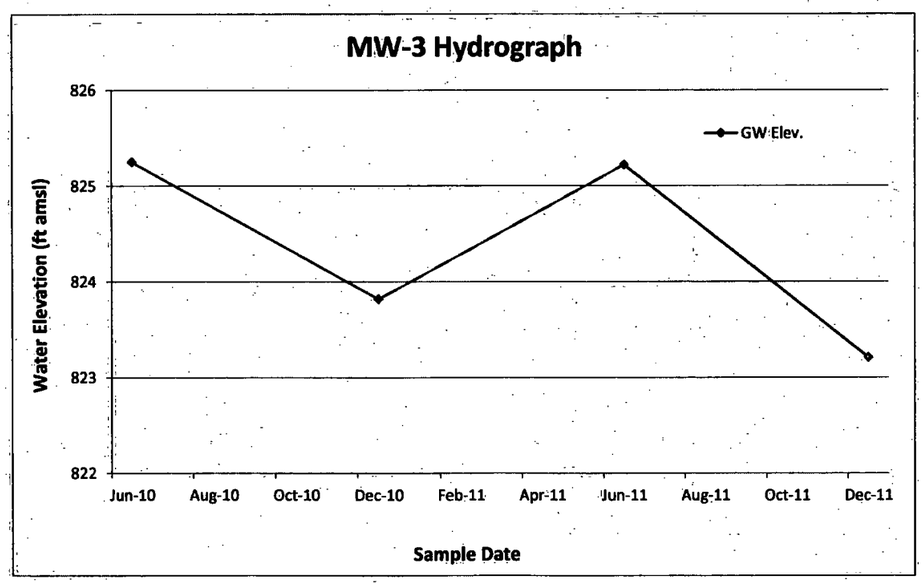


TWELVEMILE CREEK SMU
Pickens County, South Carolina
Schlumberger Technology Corporation

MW-3
Measuring Pt. Elev. 893.10 ft msl

Date	Depth to Water (ft. BTOC)	Water Elev. (ft. msl)	pH (SU)	ORP (mv)	Specific Conductivity (umhos/cm)	Temp. (C)	Turbidity (ntu)	Antimony (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Beryllium (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Cobalt (mg/l)	Copper (mg/l)	Lead (mg/l)	Nickel (mg/l)	Selenium (mg/l)	Silver (mg/l)	Thallium (mg/l)	Vanadium (mg/l)	Zinc (mg/l)	PCB 1016 (µg/l)	PCB 1221 (µg/l)	PCB 1232 (µg/l)	PCB 1242 (µg/l)	PCB 1248 (µg/l)	PCB 1254 (µg/l)	PCB 1260 (µg/l)
Jun-10	67.85	825.25	6.5	150	122	21.4	6.6	< 0.005	< 0.005	< 0.01	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	**0.03**	< 0.05	< 0.02	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-10	69.28	823.82	6.8	104	109	16.8	6.4	< 0.005	< 0.005	< 0.01	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Jun-11	67.88	825.22	6.8	144	119	21.1	11	< 0.005	< 0.005	< 0.01	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-11	69.89	823.21	7.1	61	124	13.7	7.6	< 0.005	< 0.005	< 0.01	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MCL*	–	–	NE	NE	NE	NE	NE	0.006	0.010	2.0	0.004	0.005	0.1	NE	1.3[1]/1.0[2]	0.015[1]	NE	0.05	0.1[2]	0.002	NE	5[2]	0.5	0.5	0.5	0.5	0.5	0.5	0.5

*MCL = EPA's Drinking Water Maximum Contaminant Level (NE = Not Established)
[1] Action Level for drinking water systems requiring corrosion control.
[2] Secondary MCL

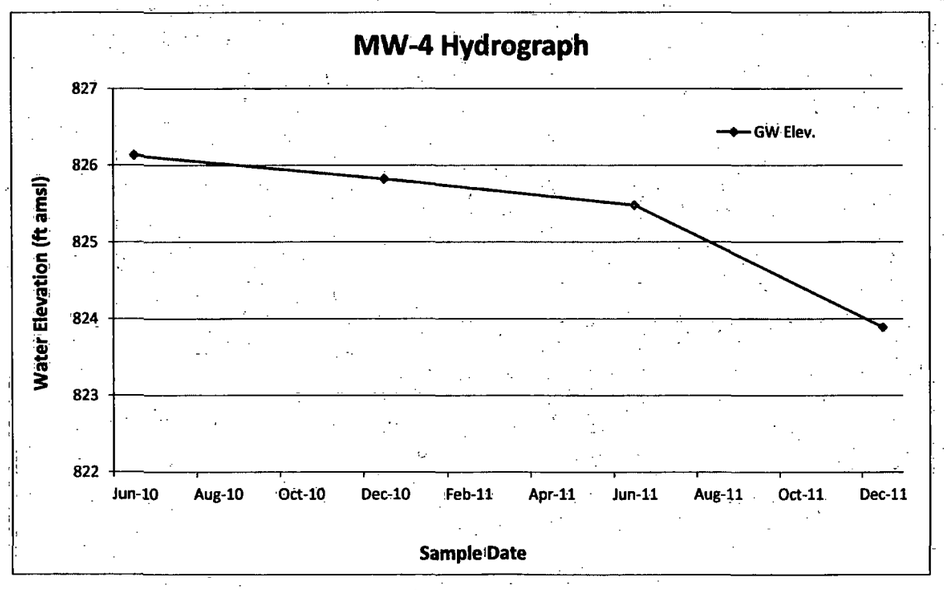


TWELVEMILE CREEK SMU
Pickens County, South Carolina
Schlumberger Technology Corporation

MW-4
Measuring Pt. Elev. 904.30 ft msl

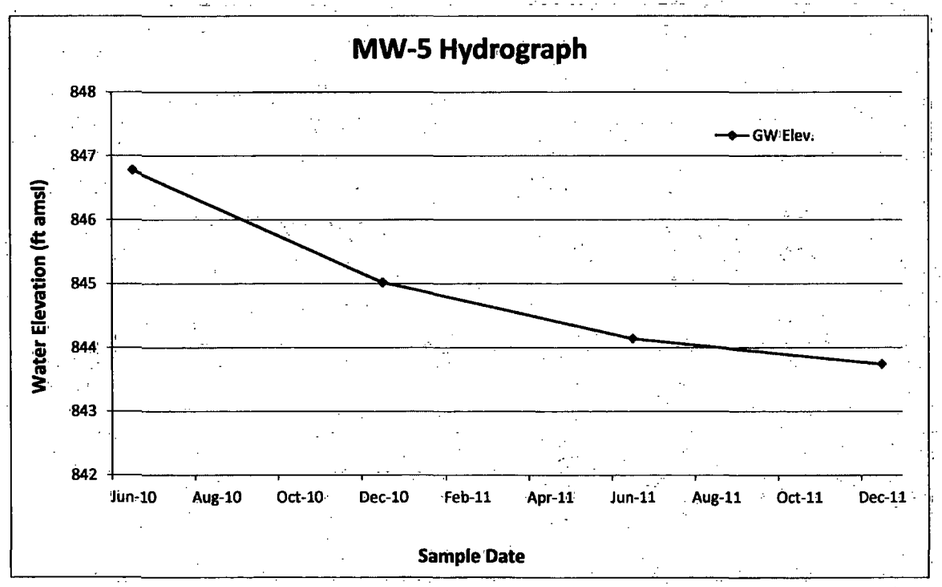
Date	Depth to Water (ft. BTOC)	Water Elev. (ft. msl)	pH (SU)	ORP (mv)	Specific Conductivity (umhos/cm)	Temp. (C)	Turbidity (ntu)	Antimony (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Beryllium (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Cobalt (mg/l)	Copper (mg/l)	Lead (mg/l)	Nickel (mg/l)	Selenium (mg/l)	Silver (mg/l)	Thallium (mg/l)	Vanadium (mg/l)	Zinc (mg/l)	PCB 1016 (µg/l)	PCB 1221 (µg/l)	PCB 1232 (µg/l)	PCB 1242 (µg/l)	PCB 1248 (µg/l)	PCB 1254 (µg/l)	PCB 1260 (µg/l)
Jun-10	78.17	826.13	5.4	336	22	20.4	9.0	< 0.005	< 0.005	< 0.01	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.02	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-10	78.48	825.82	5.6	239	22	14.2	< 5.0	< 0.005	< 0.005	< 0.01	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Jun-11	78.82	825.48	5.6	269	26	20.3	145	< 0.005	**0.008**	**0.03**	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	**0.003**	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-11	80.41	823.89	5.7	234	23	13.5	46	< 0.005	< 0.005	**0.01**	< 0.004	< 0.005	< 0.02	< 0.01	< 0.01	< 0.002	< 0.02	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MCL*	--	--	NE	NE	NE	NE	NE	0.006	0.010	2.0	0.004	0.005	0.1	NE	1.3[1]/1.0[2]	0.015[1]	NE	0.05	0.1[2]	0.002	NE	5[2]	0.5	0.5	0.5	0.5	0.5	0.5	0.5

*MCL = EPA's Drinking Water Maximum Contaminant Level (NE = Not Established)
[1] Action Level for drinking water systems requiring corrosion control.
[2] Secondary MCL



TWELVEMILE CREEK SMU
Pickens County, South Carolina
Schlumberger Technology Corporation

MW-5
Measuring Pt. Elev. 906.94 ft msl

Date	Depth to Water (ft. BTOC)	Water Elev. (ft. msl)	pH (SU)	ORP (mv)	Specific Conductivity (umhos/cm)	Temp. (C)	Turbidity (ntu)	Antimony (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Beryllium (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Cobalt (mg/l)	Copper (mg/l)	Lead (mg/l)	Nickel (mg/l)	Selenium (mg/l)	Silver (mg/l)	Thallium (mg/l)	Vanadium (mg/l)	Zinc (mg/l)	PCB 1016 (µg/l)	PCB 1221 (µg/l)	PCB 1232 (µg/l)	PCB 1242 (µg/l)	PCB 1248 (µg/l)	PCB 1254 (µg/l)	PCB 1260 (µg/l)
Jun-10	60.16	846.78	5.3	301	154	23.9	< 5.0	< 0.005	< 0.005	**0.06**	< 0.004	< 0.005	< 0.02	**0.09**	< 0.01	< 0.002	**0.19**	< 0.05	< 0.02	< 0.002	< 0.01	**0.08**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-10	61.92	845.02	5.4	286	170	12.6	7.7	< 0.005	< 0.005	**0.05**	< 0.004	< 0.005	< 0.02	**0.05**	< 0.01	< 0.002	**0.08**	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Jun-11	62.80	844.14	5.5	248	163	19.0	8.0	< 0.005	< 0.005	**0.04**	< 0.004	< 0.005	< 0.02	**0.05**	< 0.01	< 0.002	**0.09**	< 0.05	< 0.01	< 0.002	< 0.01	**0.05**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Dec-11	63.20	843.74	5.5	242	175	14.7	13	< 0.005	< 0.005	**0.04**	< 0.004	< 0.005	< 0.02	**0.04**	< 0.01	< 0.002	**0.08**	< 0.05	< 0.01	< 0.002	< 0.01	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MCL*	–	–	NE	NE	NE	NE	NE	0.006	0.010	2.0	0.004	0.005	0.1	NE	1.3[1]/1.0[2]	0.015[1]	NE	0.05	0.1[2]	0.002	NE	5[2]	0.5	0.5	0.5	0.5	0.5	0.5	0.5

*MCL = EPA's Drinking Water Maximum Contaminant Level (NE = Not Established)
[1] Action Level for drinking water systems requiring corrosion control.
[2] Secondary MCL