SEMI-ANNUAL GROUNDWATER MONITORING REPORT

July 2012

Environmental Waste Solutions Camden Class II Landfill
TDSWM Permit Number IDL 03-0212
Camden, Tennessee

Prepared for:
House Engineering, LLC.
7308 River Park Drive
Nashville, Tennessee 37221

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Prepared for:
House Engineering, LLC
7308 River Park Drive
Nashville, Tennessee 37221

Prepared by:
Civil & Environmental Consultants, Inc.
405 Duke Drive, Suite 270
Franklin, Tennessee 37067
CEC Project No. 101-301
September 12, 2012

Michael Johnson, P.G.
Project Manager

Greg Kugler
Vice President

EXECUTIVE SUMMARY:

This report documents the second semi-annual monitoring event of 2012 for the Environmental Waste Solutions, LLC (EWS) Class II Landfill. The Class II landfill is registered with the Tennessee Division of Solid Waste Management (TDSWM) with permit number IDL 03-0212. The EWS Camden Class II Landfill is located in Benton County at 200 Omar Circle, Camden, Tennessee (latitude 36°03'16" N/ longitude 88°05'16" W). The groundwater monitoring event was performed on July 31 and August 1, 2012.

Representative groundwater samples were collected from monitor wells MW-1, MW-2 and MW-3. The groundwater samples were analyzed for Appendix I inorganics, Chloride, Nitrate, Sulfate, Ammonia (NH3), and a short list of ions.

Laboratory analytical results for the groundwater samples collected from the facility monitor wells for the Class II Landfill indicated that Arsenic (MW-1) and Nitrate (MW-2) were detected above their respective maximum contaminant levels (MCL). Arsenic was detected in MW-1 at a concentration of (0.089 mg/l). The MCL for Arsenic is (0.01 mg/l). Concentrations of Arsenic observed in monitor well MW-1 have historically been above the MCL and are likely naturally occurring since there is no immediate development up-gradient of the well. Nitrate was detected at MW-2 at a concentration of (22 mg/L). The MCL for Nitrate is (10 mg/L).

Review of the statistical analysis performed on the available data indicated that there were five statistically significant increases (SSI's) over background data. The SSI's over background data included Zinc (MW-1), Barium (MW-2 and MW-3), and Chloride (MW-2 and MW-3). The Barium and Chloride detections at MW-2 and MW-3 are below their associated MCL's. Concentrations of Zinc detected in MW-1 are likely naturally occurring as there is no immediate development up-gradient of the "background" well.

Trend analysis utilizing the limited data available from the monitoring events showed no distinct trends for the site monitoring wells. Chloride concentrations detected at MW-2 continue to show a decrease from previous observations in which the Chloride values appeared to be trending upward and attributable to recent documented overflows of the nearby Camden sewer system manhole.

The next semi-annual monitoring event is tentatively scheduled for February, 2013.

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I Introduction

A. Site Location

EWS, LLC. manages the Camden Class II landfill located just off highway US 70 at 200 Omar Circle, Camden, Tennessee. The site can be located on the Camden, Tennessee USGS quadrangle at north latitude 36° 3' 16" and west longitude 88° 05' 16" at an average elevation of 400 feet above mean sea level datum (MSL). The location of the facility is indicated in **Figure 1 - Site Vicinity Map, Appendix A**. The landfill footprint can be viewed in **Figure 2 - Site Map, Appendix A**.

B. Current Activities

The EWS Camden Class II Landfill currently receives secondary aluminum smelter waste for disposal including aluminum dross and salt cakes.

The original Class IV Landfill Permit issued to the site was canceled by the EWS prior to acceptance of waste.

II Aquifer Characteristics

A. Geologic and Aquifer Characteristics

The extensive reworking of the site as a result of the excavation of chert for local road and fill projects has significantly impacted the original site geology. However, the large cuts within the site boundaries have exposed the underlying geologic formations. Based upon a review of the Tennessee Division of Geology (TDOG) Geologic Map and site observations it appears that the site is within the Camden and Harriman Formations. It is reported by the TDOG that the Camden and Harriman Formations are lithologically identical, and not enough fossils are present to form a convenient basis for subdivision.

Camden and Harriman Formations

The Camden and Harriman Formations are described as follows:
Chert, gray with specks and mottlings of very light-gray and yellowish-gray (surfaces stained pale to dark yellowish-orange), bedded and blocky (beds 2 to 8 inches thick), dense, conchoidal fracture, contains pods of white to light gray tripolitic clay, locally stained yellow and brown, fossiliferous. Locally, especially near the top, fragments of chert are cemented into large masses and beds of breccia by dark-brown to moderate-red limonite.

Groundwater potentiometric data collected from the uppermost water bearing zone across the entire proposed waste area footprint during the 1999 and 2006 hydrogeological investigations indicate that the uppermost aquifer is sloped to the southwest. Comparisons of the water bearing zone elevations to static groundwater elevations for both indicate an unconfined aquifer.

B. Monitor Well Integrity & Static Water Levels

The groundwater monitoring network for the Class II Landfill consists of monitor wells MW-1, MW-2, and MW-3. Monitor well MW-1 serves as an up-gradient monitoring point while monitor wells MW-2 and MW-3 serve as down-gradient monitoring points.

The integrity of each monitor well is checked during each sampling event prior to groundwater collection. The physical condition of each wellhead is observed and noted along with the condition and ability of any and all locking mechanisms for each monitor well. Once the watertight seal is removed from the top of each monitor well's casing, the well is allowed to de-pressurize. A decontaminated electronic probe is slowly lowered into the monitor well to establish the distance between the established top of casing and the elevation of free groundwater. The distance is then re-checked to ensure that the measurement is of actual static water level and the groundwater is not rising or falling in the monitor well. The electronic probe is capable of determining this distance to within one, one-hundredth of one foot (0.01 foot). This distance is written in the site-specific field book as depth-to-water. Upon collection of this data, the electronic water level probe is removed from the monitor well and decontaminated from contact with the well casing / screen and groundwater.

The following equation is used to determine the elevation of groundwater at each well:

Established Top of Casing Elevation – Depth to Water = Groundwater Elevation

Top of casing elevation has been determined by a licensed land surveyor and is referenced to Mean Sea Level Datum of the World Geodetic Survey of 1984. Groundwater elevations are listed in **Table 1 - Field Parameters & Potentiometric Data, Appendix A**.

C. Groundwater Flow Direction

Groundwater flow at the landfill appears to flow in a southwesterly direction towards Charlie Creek. Groundwater flow in the vicinity of the

Class II Landfill appears to flow from a topographic high north, northeast of the landfill toward the southwest where monitor wells MW-2 and MW-3 are positioned to intercept any possible groundwater contaminants leaching from the landfill.

D. Potentiometric Gradient

The Potentiometric surface of the first aquifer occurring beneath the Class II Landfill occurs at approximately twenty-two (23) feet below ground surface at the up-gradient monitor well MW-1 to approximately six (8) feet below ground surface at monitor well MW-2. The groundwater potentiometric data interpreted from the 1999 and 2006 hydrogeolgical investigations conducted at the site for the uppermost aquifer indicate that the uppermost water bearing zone is sloped to the southwest. Comparisons of water bearing zone elevations to static groundwater elevations for both investigations indicate an unconfined aquifer. The potentiometric gradient calculated from groundwater elevation data collected on July 31, 2012 is approximately 1.96 % slope.

The potentiometric gradient is calculated according to the following formula:

$$\frac{\text{Highest GW. Elev.} - \text{Lowest GW. Elev.}}{\text{Horizontal Distance Between the Potentiometric Contours}} * 100 = \text{Pot. Grad.}$$

$$\frac{(391.69\text{' at MW-1}) - (372.12\text{' at MW-2})}{1{,}000\text{'}} * 100 = 1.96\%$$

The above calculation assumes a perpendicular gradient between the potentiometric contours drawn between MW-1 to MW-2. These assumptions may provide an artificially higher potentiometric gradient than is likely occurring at the site.

E. Hydraulic Conductivity

Hydraulic conductivity estimations within the first aquifer occurring beneath either landfill have not been determined at this time.

III Groundwater Sampling Procedures

A. Instrumentation

Depth to groundwater measurements are collected using a Solinst® electronic water level indicator, model # 122. A YSI 556 Multi-parameter probe is used to record pH, specific conductance, temperature, dissolved oxygen and ORP during groundwater sampling events at the landfill. A LaMotte model 2020 turbidity meter or equivalent is used to collect turbidity readings. Each instrument is either checked against known standards or calibrated as per manufacturers' specifications prior to the commencement of sampling activities.

B. Purging and Collection of Field Parameter Values

The total volume of groundwater residing in each monitor well is calculated by subtracting the depth to water from the total depth of each well. This linear distance is next multiplied by 0.163 gallons per foot in a 2 inch (I.D.) monitor well. For purging, a disposable polyethylene bailer with sufficient nylon twine is slowly lowered into the water column. The bailer is allowed to completely submerse into the water column prior to extracting the bailer from the monitor well. The first bailer of purged groundwater is collected in a clean, high-density polyethylene (HDPE) reservoir where it is observed for Temperature, pH, specific conductance, dissolved oxygen, oxidation-reduction potential (ORP) and turbidity. These values are noted in the site specific field book as V_0 and then the collected groundwater is discarded onto the ground, away from the monitor well. Groundwater shall be purged using either a decontaminated down-well pump using new tubing or using new tubing connected to a peristaltic pump or in the case of a pump malfunction, a new disposable bailer.

Presently, bailers are not used at the EWS Camden Class II Landfill. However, if bailers are used due to pump malfunction, bailers shall be constructed of either polyethylene or Teflon. Bailers shall be factory decontaminated and sealed as to allow no environmental contaminants to interact with the bailer. New nylon twine shall be fixed to each bailer via a tied knot.

The collected groundwater will be decanted into a flow-through cell where it will be observed for pH, specific conductance, temperature, and turbidity. These values will be noted in the site specific field book as V_0 and then the collected groundwater will be poured onto the ground, down-gradient from the monitor well.

Groundwater shall be purged from the monitor well for a specific period of time that allows for a new volume of water to have passed into the flow-through cell. Once this volume of water has been purged, the field chemistry parameters will again be observed and recorded in the field book as V_1. This procedure for purging groundwater continues for an additional well volume, if sufficient groundwater is available. After the second purged well volume has been observed for field parameter values, the values are checked against values for V_1. If the pH and specific conductance values for each volume purged vary no more than 10% from V_1 to V_2 and the temperature has stabilized to within one degree Celsius, preparations are made to collect a groundwater sample for submittal to an analytical laboratory. If the field parameters have not stabilized, the purging procedure shall continue until either one of the following conditions are met:

1. Field stabilization occurs,
2. Well is purged dry, or
3. Five well volumes have been purged.

If the monitor well is purged dry, then the recharging groundwater shall be collected within twenty-four hours.

Field parameter values are presented in **Table 1 – Groundwater Field Data, Appendix A.** A detailed account of each purge and sample procedure conducted at each monitor well is presented in **Appendix B.**

C. Sample Collection & Preservation

Groundwater samples are collected from monitor wells once field parameter data indicates that stagnant water has been purged from the well. Groundwater is placed in laboratory supplied sample vessels in the following order if analyzed: Appendix I inorganics – one (1), five-hundred (500) ml preserved with nitric (HNO3) acid; Chloride, Nitrate, Sulfate – one (1), two-hundred fifty (250) ml unpreserved HDPE jar; Ammonia – one (1), two-hundred fifty (250) ml HDPE jar preserved with sulfuric (H2SO4) acid.

D. Quality Assurance & Quality Control

A field blank was collected in the vicinity of the operating Class II Landfill next to monitoring well MW-3. The field blank was collected by pouring deionized water, created in the CEC office by a series of ion exchange cartridges, into a duplicate set of sample bottles. Thereby, allowing any airborne contaminants a chance to enter the field blank sample. The results of the field blank indicated that Ammonia Nitrogen was detected at (0.11 mg/L). Additionally, several dissolved concentrations of inorganic constituents were also reported in the field blank including Aluminum, Barium, Calcium, Iron, Magnesium, Manganese, Potassium, and Sodium. None of these constituents, however, had reported "total" concentrations above the detection limits of the laboratory. ESC Lab Sciences' internal Quality Control indicated that the reported dissolved concentrations were valid. However, in theory, "dissolved" concentrations cannot be greater than the reported "total" concentrations for a given constituent.

In addition, a duplicate sample was collected from MW-1 for laboratory quality control purposes. The reported values for the duplicate sample are similar to the original MW-1 sample.

E. Sample Chain-of-Custody

A sample Chain-of-Custody (COC) traveled along with each sample kit from ESC to EWS and finally back to ESC for the sampling events. The CEC SOP for Chain of Custody 07-01-01 may be found in **Appendix F**.

IV Laboratory Analytical Procedures

A. Analytical Methods

All laboratory analyses for the July 31 and August 1, 2012 monitoring event were completed by Environmental Science Corporation in Mt. Juliet, Tennessee. The analytical methods chosen for this monitoring event are the most appropriate procedures as directed by the Tennessee Division of Solid Waste Management (TN-DSWM) and the United States Environmental Protection Agency's publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (3rd Edition)*.

The SW-846 methods used for the analysis of groundwater (if necessary) were as follows:

Method 6010b	Inductively Coupled Plasma (ICP) – Atomic Emission Spectrometry
Method 6020	ICP – Mass Spectrometry
Method 7470A	Mercury in Liquid Waste – Manual Cold Vapor Technique
Method 8011	1,2-dibromoethane & 1,2 dibromo-3-chloropropane by Micro-extraction and Gas Chromatography

Method 8260B	Volatile Organic Compounds by Gas Chromatograph / Mass Spectrometry
Method 9056	Determination of Inorganic Anions by Ion Chromatography (Fluoride)
Method 9222D	Fecal Coliform Membrane Filter Procedure

B. Analytical Results

Laboratory reports from the analysis of groundwater samples collected from the EWS Camden Class II Landfill during the semi-annual monitoring event were prepared by ESC and reported to CEC on August 13, 2012. Copies of the laboratory reports are located in **Appendix C – Laboratory Analytical Reports**. Constituent values from all laboratory analysis along with applicable maximum contaminant levels (MCLs) are presented in **Table 2 – Analytical Results, Appendix A**.

C. Quality Control Qualifier Codes

The EPA Contract Laboratory Program states that sample and result qualifiers should be utilized as part of a total quality control process. ESC complies with this directive and reports all qualifiers along with explanations of QC qualifier codes. One QC qualifier code was indicated during the laboratory analysis of groundwater samples during this monitoring event and can be viewed along with the **Laboratory Analytical Reports, Appendix C**.

V Statistical Analysis

A. Applicable Methods

The Rules of Tennessee Department of Environment and Conservation, Division of Solid Waste Management Chapter 1200-1-7-.04 states, in part, that each landfill must conduct and report statistical analysis as part of the evaluation of groundwater monitoring data. Several methods may be employed for this endeavor. EWS Camden Class II Landfill has chosen to use Inter-well and intra-well non-parametric prediction limit analysis (NPPL) at this time.

First, the distribution of the data was evaluated for normality. For all wells, the data was not normally distributed; therefore, non-parametric statistical methods were chosen. Inter-well and intra-well non-parametric prediction limit analyses (NPPL) were deemed appropriate for this data set. Inter-well analyses compared the concentrations observed at the down-gradient monitoring locations to the concentrations observed at the up-gradient monitoring location during this monitoring event. For the

Class II Landfill, monitor well MW-1 was considered as background. Intra-well analysis was also utilized at MW-1 to compare the concentrations observed during the July 2012 groundwater sampling event to the established background data set.

The percentage of inter-well background non-detects for each parameter determines the primary statistical method utilized for each parameter. If the percentage of non-detects in the background samples is less than 50%, Shewart-CUSUM control charts are utilized. If more than 50% background non-detects exist for the given parameter, non-parametric inter-well prediction limit analysis is conducted on the data.

The computer program ChemStat was used for all statistical computations. Worksheets indicating inter-well and intra-well statistical analysis sheets and time versus concentration charts may be viewed in **Appendix D, Statistical and Trend Analysis**.

B. Results

Review of the statistical analysis performed on the available data indicated that there were five statistically significant increases (SSI's) over background data. The SSI's over background data included Zinc (MW-1), Barium (MW-2 and MW-3), and Chloride (MW-2 and MW-3). The Barium and Chloride detections at MW-2 and MW-3 are below their associated MCL's. Concentrations of Zinc detected in MW-1 are likely naturally occurring as there is no immediate development up-gradient of the "background" well.

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VI Conclusions and Recommendations

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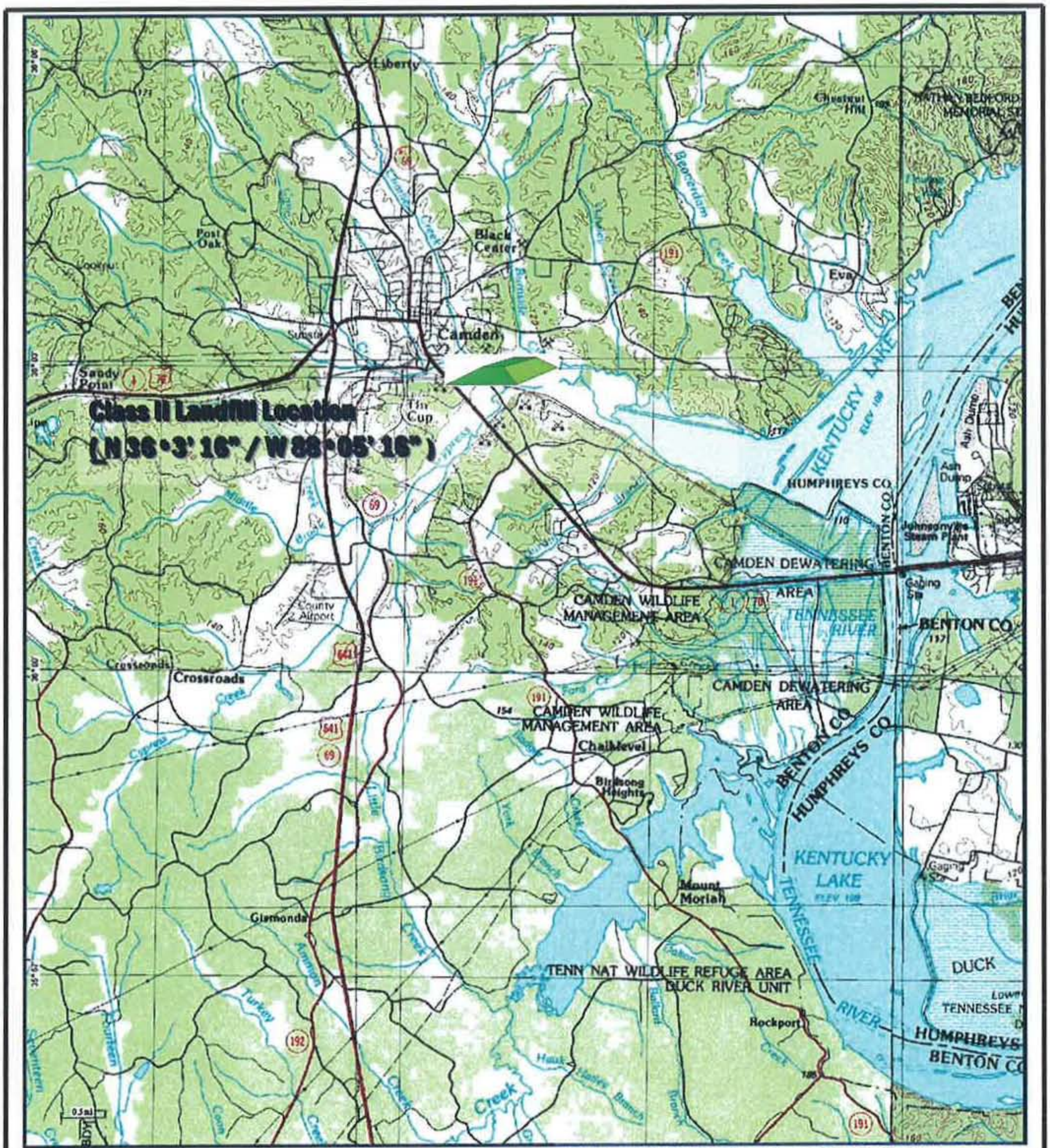
The next semi-annual monitoring event is tentatively scheduled for February, 2013.

Appendix A
Maps & Tables



Source: USGS Camden Quadrangle

NORTH

FIGURE 1: SITE LOCATION MAP

CEC PROJECT 101-301	DATE 7/16/10 DWN. BY: JKH	**Civil & Environmental Consultants, Inc.** 405 Duke Drive, Suite 270 Franklin, TN 37067 (615) 333-7797 (800) 763- Pittsburgh, PA Cincinnati, OH Columbus, Indianapolis, IN Chicago, IL Export, PA St. Louis, MO, Detroit, MI
SHEET 1 OF 1	CHKD. BY: MKH SCALE: Not To Scale	

P:\2010\101-301\-CADD\DWG\101-301 GROUNDWATER MAP JULYT-31-2012.DWG{LAYOUT1}LS:(LMCCULLOUGH - 9/12/2012) - LP: 9/12/2012_1:43:13_PM

GROUNDWATER CONDITIONS

THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.

POTENTIOMETRIC CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOWN STATIC WATER LEVEL ELEVATIONS AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. ACTUAL STATIC WATER LEVELS AT LOCATIONS BETWEEN THE MONITORING POINTS MAY DIFFER FROM THOSE DEPICTED.

SCALE IN FEET
0 300' 600'

CEC
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ENVIRONMENTAL WASTE SOLUTIONS
CAMDEN CLASS II LANDFILL
CAMDEN, TENNESSEE

GROUNDWATER MAP

DRAWN BY: LM	CHECKED BY: MJ	APPROVED BY: GK	FIGURE NO.:
DATE: JULY 31, 2012	DWG SCALE: 1"=300'	PROJECT NO: 101-301	2

Table 1
Environmental Waste Solutions Camden Class II Landfill IDL 03-0212
Groundwater Field Data - July 2012

Boring/Monitoring Well/ Piezometric Well	Date	Sample Time	Top of Casing Elevation Feet MSL	Purge Method	Bottom of Well Elevation Feet	Well Diameter Feet	Well Volume Gallons	Depth to Water Feet MSL	Potentiometric Surface	Temperature Degrees C	Specific Conductance micromhos/cm	pH SU	Dissolved Oxygen mg/l	Oxidation Reduction Potential Millivolts	Turbidity NTU
B11/MW-1	7/31/2012	10:37	415.363	Grundfos	382.263	0.17	1.6	23.67	391.69	16.52	116	5.96	3.14	-17.1	16.8
B12/MW-2	8/1/2012	10:27	380.146	Peristaltic	367.696	0.17	0.8	8.03	372.12	15.57	17	7.45	8.29	59.7	70.2
B13/MW-3	7/31/2012	12:27	392.49	Peristaltic	369.66	0.17	0.8	17.86	374.63	25.90	271	5.79	2.21	115	34.8

Table 2
Environmental Waste Solutions Camden Class II Landfill IDL 03-0212
Analytical Data Summary July 2012

		MW-1		MW-2		MW-3	
		7/31/2012		8/1/2012		7/31/2012	
Parameter	**MCL (mg/l)**	**Value (mg/l)**	**Qual**	**Value (mg/l)**	**Qual**	**Value (mg/l)**	**Qual**
Chloride	250[2]	**2.2**		**16**		**25**	
Nitrate	10	<0.10		**22**		**6.6**	
Sulfate	250[2]	<5.0		**30**		**23**	
Ammonia Nitrogen	-	**0.13**		**0.68**		**2.5**	
Antimony	0.006	<0.0010		<0.0010		<0.0010	
Arsenic	0.01	**0.089**		<0.0010		**0.001**	
Arsenic, Dissolved	0.01	**0.072**		NA		<0.0010	
Beryllium	0.004	<0.0010		<0.0010		<0.0010	
Cadmium	0.005	<0.00050		<0.00050		<0.00050	
Copper	1.3	<0.0020		<0.00020		**0.0021**	
Lead	0.015	<0.0010		<0.0010		**0.001**	
Selenium	0.05	<0.0010		<0.0010		<0.0010	
Thallium	0.002	<0.0010		<0.0010		<0.0010	
Zinc	5[2]	**0.023**		**0.011**		**0.016**	
Mercury	0.002	**0.00063**		<0.00020		<0.00020	
Aluminum	0.2[2]	**0.24**		**0.16**		**0.33**	
Aluminum, Dissolved		**0.18**		NA		<0.10	
Barium	2	**0.019**		**0.3**		**0.091**	
Barium, Dissolved		**0.023**		NA		**0.079**	
Boron	-	<0.20		<0.20		<0.20	
Calcium	-	**3.6**		**40**		**16**	
Chromium	0.1	<0.010		<0.010		<0.010	
Cobalt	-	**0.028**		<0.010		<0.010	
Iron	0.3[2]	**17**		**0.29**		**0.33**	
Magnesium	-	**2.9**		**9.6**		**5.2**	
Manganese	0.05[2]	**0.81**		**0.21**		**0.2**	
Nickel	-	<0.020		<0.020		<0.020	
Potassium	-	**1.2**		**6.2**		**5.2**	
Silver	0.10[2]	<0.010		<0.010		<0.010	
Sodium	-	**3**		**21**		**9.8**	
Vanadium	-	<0.010		<0.010		<0.010	

Notes:

MCL: Maximum Contaminant Level Enforceable National Primary Drinking Water Standards

[2]: Non-Enforceable National Secondary Drinking Water Standard

Bold text indicates laboratory analytical detections above the practical quantitation level

Greyed text indicates detection above respective MCL

NA: Not Analyzed -insufficient volume to collect sample.

Appendix B
Field Reports

7/31/12 EWS CAMDEN 90°-SUNNY/HUMID
D. MIHALEK

MW-1: TD= 30.50 DTW= 23.67 V= 1.09-gal

V	°C	Cond	pH	DO	ORP	NTU
0	16.22	107	8.45	6.28	-85.1	64.3
1	16.54	109	7.22	4.98	-49.2	61.1
2	16.42	116	6.25	3.66	-24.4	23.9
3	16.52	116	5.96	3.14	-17.1	16.8

COLLECTED MW-1 AND DUPLICATE @ 1037

MW-2 ~~MW-3:~~ TD= ~~27.0~~ 12.40 DTW=8.03 V= ~~3.03-gal~~ 0.69-gal

V	°C	Cond	pH	DO	ORP	NTU
0	23.58	456* ✓				
1						
2						
3						

NO SAMPLE

*PURGED WELL DRY AT LESS THAN 0.5-gal. WILL LET RE-CHARGE AND RETURN TO SAMPLE.

✓ RETURNED TO SAMPLE @ 1322 NO RECHARGE, WELL DRY @ 12.40 FT

MW-3: TD: 27.0 DTW = 17.86 V= 1.46-gal

V	°C	Cond	pH	DO	ORP	NTU
0	24.77	281	7.07	6.40	32.0	592
1	25.92	277	6.29	3.62	65.0	195
2	25.93	272	5.97	2.63	97.7	56.6
3	25.90	271	5.79	2.21	115.0	34.8

COLLECTED MW-3, FIELD BLANK ~~, EQUIPMENT~~
D.M ~~BLANK~~ - 1227 NO BOTTLES FOR EQ.

8/1/12 - DJM   CAMDEN EWS

• 1000 - RETURN TO SITE TO COLLECT MW-2 SAMPLE

MW-2 DTW = 9.09

COLLECTED SAMPLE @ 1027, NO GW PARAMETERS MEASURED DUE TO INSUFFICIENT WATER.

• 1300 - CEC LAB. MEASURE GW PARAMATERS USING WATER FROM 500mL UNPRESERVED BOTTLE

°C	Cond	pH	ORP	DO	NTU
15.57	17	7.45	59.7	8.29	70.2

Appendix C
Laboratory Analytical Reports

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Mr. Michael Johnson
Civil & Environmental Consultants - TN
405 Duke Drive, Suite 270
Franklin, TN 37067

Report Summary

Monday August 13, 2012

Report Number: L587772
Samples Received: 08/01/12
Client Project: 101-301

Description: EWS - Camden

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: Jimmy Hunt

Jimmy Hunt , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197,
FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016,
NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002,
SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612,
MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1,
TX - T104704245-11-3, OK - 9915, PA - 68-02979

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Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

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Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-01

Date Received : August 01, 2012
Description : EWS - Camden

Site ID : CAMDEN, TN

Sample ID : MW-1

Project # : 101-301

Collected By : Dennis Mihalek
Collection Date : 07/31/12 10:37

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	2.2	1.0	mg/l	9056	08/01/12	1
Nitrate	BDL	0.10	mg/l	9056	08/01/12	1
Sulfate	BDL	5.0	mg/l	9056	08/02/12	1
Ammonia Nitrogen	0.13	0.10	mg/l	350.1	08/08/12	1
Antimony	BDL	0.0010	mg/l	6020	08/03/12	1
Antimony,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Arsenic	0.089	0.0010	mg/l	6020	08/03/12	1
Arsenic,Dissolved	0.072	0.0010	mg/l	6020	08/11/12	1
Beryllium	BDL	0.0010	mg/l	6020	08/03/12	1
Beryllium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Cadmium	BDL	0.00050	mg/l	6020	08/03/12	1
Cadmium,Dissolved	BDL	0.00050	mg/l	6020	08/11/12	1
Copper	BDL	0.0020	mg/l	6020	08/03/12	1
Copper,Dissolved	BDL	0.0020	mg/l	6020	08/11/12	1
Lead	BDL	0.0010	mg/l	6020	08/03/12	1
Lead,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Selenium	BDL	0.0010	mg/l	6020	08/03/12	1
Selenium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Thallium	BDL	0.0010	mg/l	6020	08/03/12	1
Thallium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Zinc	0.023	0.010	mg/l	6020	08/03/12	1
Zinc,Dissolved	0.017	0.010	mg/l	6020	08/11/12	1
Mercury	0.00063	0.00020	mg/l	7470A	08/03/12	1
Mercury,Dissolved	BDL	0.00020	mg/l	7470A	08/04/12	1
Aluminum	0.24	0.10	mg/l	6010B	08/09/12	1
Aluminum,Dissolved	0.18	0.10	mg/l	6010B	08/04/12	1
Barium	0.019	0.0050	mg/l	6010B	08/09/12	1
Barium,Dissolved	0.023	0.0050	mg/l	6010B	08/04/12	1
Boron	BDL	0.20	mg/l	6010B	08/09/12	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	08/04/12	1
Calcium	3.6	0.50	mg/l	6010B	08/09/12	1
Calcium,Dissolved	3.3	0.50	mg/l	6010B	08/04/12	1
Chromium	BDL	0.010	mg/l	6010B	08/09/12	1
Chromium,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Cobalt	0.028	0.010	mg/l	6010B	08/09/12	1
Cobalt,Dissolved	0.026	0.010	mg/l	6010B	08/04/12	1
Iron	17.	0.10	mg/l	6010B	08/09/12	1
Iron,Dissolved	15.	0.10	mg/l	6010B	08/04/12	1
Magnesium	2.9	0.10	mg/l	6010B	08/09/12	1
Magnesium,Dissolved	2.9	0.10	mg/l	6010B	08/04/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-01

Date Received : August 01, 2012
Description : EWS - Camden

Site ID : CAMDEN, TN

Sample ID : MW-1

Project # : 101-301

Collected By : Dennis Mihalek
Collection Date : 07/31/12 10:37

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Manganese	0.81	0.010	mg/l	6010B	08/09/12	1
Manganese,Dissolved	0.79	0.010	mg/l	6010B	08/04/12	1
Nickel	BDL	0.020	mg/l	6010B	08/09/12	1
Nickel,Dissolved	BDL	0.020	mg/l	6010B	08/04/12	1
Potassium	1.2	0.50	mg/l	6010B	08/09/12	1
Potassium,Dissolved	0.92	0.50	mg/l	6010B	08/06/12	1
Silver	BDL	0.010	mg/l	6010B	08/09/12	1
Silver,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Sodium	3.0	0.50	mg/l	6010B	08/09/12	1
Sodium,Dissolved	3.2	0.50	mg/l	6010B	08/04/12	1
Vanadium	BDL	0.010	mg/l	6010B	08/09/12	1
Vanadium,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-02

Date Received : August 01, 2012
Description : EWS - Camden

Site ID : CAMDEN, TN

Sample ID : MW-2

Project # : 101-301

Collected By : Dennis Mihalek
Collection Date : 08/01/12 10:27

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	16.	1.0	mg/l	9056	08/01/12	1
Nitrate	22.	0.50	mg/l	9056	08/02/12	5
Sulfate	30.	5.0	mg/l	9056	08/01/12	1
Ammonia Nitrogen	0.68	0.10	mg/l	350.1	08/08/12	1
Antimony	BDL	0.0010	mg/l	6020	08/03/12	1
Arsenic	BDL	0.0010	mg/l	6020	08/03/12	1
Beryllium	BDL	0.0010	mg/l	6020	08/03/12	1
Cadmium	BDL	0.00050	mg/l	6020	08/03/12	1
Copper	BDL	0.0020	mg/l	6020	08/03/12	1
Lead	BDL	0.0010	mg/l	6020	08/03/12	1
Selenium	BDL	0.0010	mg/l	6020	08/03/12	1
Thallium	BDL	0.0010	mg/l	6020	08/03/12	1
Zinc	0.011	0.010	mg/l	6020	08/03/12	1
Mercury	BDL	0.00020	mg/l	7470A	08/03/12	1
Aluminum	0.16	0.10	mg/l	6010B	08/09/12	1
Barium	0.30	0.0050	mg/l	6010B	08/09/12	1
Boron	BDL	0.20	mg/l	6010B	08/09/12	1
Calcium	40.	0.50	mg/l	6010B	08/09/12	1
Chromium	BDL	0.010	mg/l	6010B	08/09/12	1
Cobalt	BDL	0.010	mg/l	6010B	08/09/12	1
Iron	0.29	0.10	mg/l	6010B	08/09/12	1
Magnesium	9.6	0.10	mg/l	6010B	08/09/12	1
Manganese	0.21	0.010	mg/l	6010B	08/09/12	1
Nickel	BDL	0.020	mg/l	6010B	08/09/12	1
Potassium	6.2	0.50	mg/l	6010B	08/09/12	1
Silver	BDL	0.010	mg/l	6010B	08/09/12	1
Sodium	21.	0.50	mg/l	6010B	08/09/12	1
Vanadium	BDL	0.010	mg/l	6010B	08/09/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
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REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-03

Date Received : August 01, 2012
Description : EWS - Camden

Site ID : CAMDEN, TN

Sample ID : MW-3

Project # : 101-301

Collected By : Dennis Mihalek
Collection Date : 07/31/12 12:27

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	25.	1.0	mg/l	9056	08/01/12	1
Nitrate	6.6	0.10	mg/l	9056	08/01/12	1
Sulfate	23.	5.0	mg/l	9056	08/01/12	1
Ammonia Nitrogen	2.5	0.10	mg/l	350.1	08/08/12	1
Antimony	BDL	0.0010	mg/l	6020	08/03/12	1
Antimony,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Arsenic	0.0010	0.0010	mg/l	6020	08/03/12	1
Arsenic,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Beryllium	BDL	0.0010	mg/l	6020	08/03/12	1
Beryllium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Cadmium	BDL	0.00050	mg/l	6020	08/03/12	1
Cadmium,Dissolved	BDL	0.00050	mg/l	6020	08/11/12	1
Copper	0.0021	0.0020	mg/l	6020	08/03/12	1
Copper,Dissolved	BDL	0.0020	mg/l	6020	08/11/12	1
Lead	0.0010	0.0010	mg/l	6020	08/03/12	1
Lead,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Selenium	BDL	0.0010	mg/l	6020	08/03/12	1
Selenium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Thallium	BDL	0.0010	mg/l	6020	08/03/12	1
Thallium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Zinc	0.016	0.010	mg/l	6020	08/03/12	1
Zinc,Dissolved	0.020	0.010	mg/l	6020	08/11/12	1
Mercury	BDL	0.00020	mg/l	7470A	08/03/12	1
Mercury,Dissolved	BDL	0.00020	mg/l	7470A	08/04/12	1
Aluminum	0.33	0.10	mg/l	6010B	08/09/12	1
Aluminum,Dissolved	BDL	0.10	mg/l	6010B	08/04/12	1
Barium	0.091	0.0050	mg/l	6010B	08/09/12	1
Barium,Dissolved	0.079	0.0050	mg/l	6010B	08/04/12	1
Boron	BDL	0.20	mg/l	6010B	08/09/12	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	08/04/12	1
Calcium	16.	0.50	mg/l	6010B	08/09/12	1
Calcium,Dissolved	15.	0.50	mg/l	6010B	08/04/12	1
Chromium	BDL	0.010	mg/l	6010B	08/09/12	1
Chromium,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Cobalt	BDL	0.010	mg/l	6010B	08/09/12	1
Cobalt,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Iron	0.33	0.10	mg/l	6010B	08/09/12	1
Iron,Dissolved	BDL	0.10	mg/l	6010B	08/04/12	1
Magnesium	5.2	0.10	mg/l	6010B	08/09/12	1
Magnesium,Dissolved	4.9	0.10	mg/l	6010B	08/04/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-03

Date Received : August 01, 2012
Description : EWS - Camden

Site ID : CAMDEN, TN

Sample ID : MW-3

Project # : 101-301

Collected By : Dennis Mihalek
Collection Date : 07/31/12 12:27

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Manganese	0.20	0.010	mg/l	6010B	08/09/12	1
Manganese,Dissolved	0.17	0.010	mg/l	6010B	08/04/12	1
Nickel	BDL	0.020	mg/l	6010B	08/09/12	1
Nickel,Dissolved	BDL	0.020	mg/l	6010B	08/04/12	1
Potassium	5.2	0.50	mg/l	6010B	08/09/12	1
Potassium,Dissolved	4.5	0.50	mg/l	6010B	08/06/12	1
Silver	BDL	0.010	mg/l	6010B	08/09/12	1
Silver,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Sodium	9.8	0.50	mg/l	6010B	08/09/12	1
Sodium,Dissolved	9.9	0.50	mg/l	6010B	08/04/12	1
Vanadium	BDL	0.010	mg/l	6010B	08/09/12	1
Vanadium,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
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REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-04

Date Received : August 01, 2012
Description : EWS - Camden

Site ID : CAMDEN, TN

Sample ID : DUPLICATE

Project # : 101-301

Collected By : Dennis Mihalek
Collection Date : 07/31/12 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	2.2	1.0	mg/l	9056	08/01/12	1
Nitrate	BDL	0.10	mg/l	9056	08/01/12	1
Sulfate	BDL	5.0	mg/l	9056	08/01/12	1
Ammonia Nitrogen	0.22	0.10	mg/l	350.1	08/08/12	1
Antimony	BDL	0.0010	mg/l	6020	08/03/12	1
Antimony,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Arsenic	0.090	0.0010	mg/l	6020	08/03/12	1
Arsenic,Dissolved	0.075	0.0010	mg/l	6020	08/11/12	1
Beryllium	BDL	0.0010	mg/l	6020	08/03/12	1
Beryllium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Cadmium	BDL	0.00050	mg/l	6020	08/03/12	1
Cadmium,Dissolved	BDL	0.00050	mg/l	6020	08/11/12	1
Copper	BDL	0.0020	mg/l	6020	08/03/12	1
Copper,Dissolved	BDL	0.0020	mg/l	6020	08/11/12	1
Lead	BDL	0.0010	mg/l	6020	08/03/12	1
Lead,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Selenium	BDL	0.0010	mg/l	6020	08/03/12	1
Selenium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Thallium	BDL	0.0010	mg/l	6020	08/03/12	1
Thallium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Zinc	0.022	0.010	mg/l	6020	08/03/12	1
Zinc,Dissolved	0.018	0.010	mg/l	6020	08/11/12	1
Mercury	0.00052	0.00020	mg/l	7470A	08/03/12	1
Mercury,Dissolved	BDL	0.00020	mg/l	7470A	08/04/12	1
Aluminum	0.27	0.10	mg/l	6010B	08/09/12	1
Aluminum,Dissolved	BDL	0.10	mg/l	6010B	08/04/12	1
Barium	0.020	0.0050	mg/l	6010B	08/09/12	1
Barium,Dissolved	0.017	0.0050	mg/l	6010B	08/04/12	1
Boron	BDL	0.20	mg/l	6010B	08/09/12	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	08/04/12	1
Calcium	3.6	0.50	mg/l	6010B	08/09/12	1
Calcium,Dissolved	3.2	0.50	mg/l	6010B	08/04/12	1
Chromium	BDL	0.010	mg/l	6010B	08/09/12	1
Chromium,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Cobalt	0.030	0.010	mg/l	6010B	08/09/12	1
Cobalt,Dissolved	0.025	0.010	mg/l	6010B	08/04/12	1
Iron	17.	0.10	mg/l	6010B	08/09/12	1
Iron,Dissolved	15.	0.10	mg/l	6010B	08/04/12	1
Magnesium	2.9	0.10	mg/l	6010B	08/09/12	1
Magnesium,Dissolved	2.8	0.10	mg/l	6010B	08/04/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

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REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-04

Date Received : August 01, 2012
Description : EWS - Camden

Site ID : CAMDEN, TN

Sample ID : DUPLICATE

Project # : 101-301

Collected By : Dennis Mihalek
Collection Date : 07/31/12 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Manganese	0.85	0.010	mg/l	6010B	08/09/12	1
Manganese,Dissolved	0.76	0.010	mg/l	6010B	08/04/12	1
Nickel	BDL	0.020	mg/l	6010B	08/09/12	1
Nickel,Dissolved	BDL	0.020	mg/l	6010B	08/04/12	1
Potassium	1.2	0.50	mg/l	6010B	08/09/12	1
Potassium,Dissolved	0.84	0.50	mg/l	6010B	08/06/12	1
Silver	BDL	0.010	mg/l	6010B	08/09/12	1
Silver,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Sodium	3.2	0.50	mg/l	6010B	08/09/12	1
Sodium,Dissolved	3.3	0.50	mg/l	6010B	08/04/12	1
Vanadium	BDL	0.010	mg/l	6010B	08/09/12	1
Vanadium,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
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REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-05

Site ID : CAMDEN, TN

Project # : 101-301

Date Received : August 01, 2012
Description : EWS - Camden

Sample ID : FIELD BLANK

Collected By : Dennis Mihalek
Collection Date : 07/31/12 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	BDL	1.0	mg/l	9056	08/01/12	1
Nitrate	BDL	0.10	mg/l	9056	08/01/12	1
Sulfate	BDL	5.0	mg/l	9056	08/01/12	1
Ammonia Nitrogen	0.11	0.10	mg/l	350.1	08/08/12	1
Antimony	BDL	0.0010	mg/l	6020	08/05/12	1
Antimony,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Arsenic	BDL	0.0010	mg/l	6020	08/05/12	1
Arsenic,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Beryllium	BDL	0.0010	mg/l	6020	08/08/12	1
Beryllium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Cadmium	BDL	0.00050	mg/l	6020	08/05/12	1
Cadmium,Dissolved	BDL	0.00050	mg/l	6020	08/11/12	1
Copper	BDL	0.0020	mg/l	6020	08/05/12	1
Copper,Dissolved	BDL	0.0020	mg/l	6020	08/11/12	1
Lead	BDL	0.0010	mg/l	6020	08/05/12	1
Lead,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Selenium	BDL	0.0010	mg/l	6020	08/08/12	1
Selenium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Thallium	BDL	0.0010	mg/l	6020	08/05/12	1
Thallium,Dissolved	BDL	0.0010	mg/l	6020	08/11/12	1
Zinc	BDL	0.010	mg/l	6020	08/05/12	1
Zinc,Dissolved	BDL	0.010	mg/l	6020	08/11/12	1
Mercury	BDL	0.00020	mg/l	7470A	08/03/12	1
Mercury,Dissolved	BDL	0.00020	mg/l	7470A	08/04/12	1
Aluminum	BDL	0.10	mg/l	6010B	08/09/12	1
Aluminum,Dissolved	2.8	0.10	mg/l	6010B	08/04/12	1
Barium	BDL	0.0050	mg/l	6010B	08/09/12	1
Barium,Dissolved	0.13	0.0050	mg/l	6010B	08/04/12	1
Boron	BDL	0.20	mg/l	6010B	08/09/12	1
Boron,Dissolved	BDL	0.20	mg/l	6010B	08/04/12	1
Calcium	BDL	0.50	mg/l	6010B	08/09/12	1
Calcium,Dissolved	140	0.50	mg/l	6010B	08/04/12	1
Chromium	BDL	0.010	mg/l	6010B	08/09/12	1
Chromium,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Cobalt	BDL	0.010	mg/l	6010B	08/09/12	1
Cobalt,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Iron	BDL	0.10	mg/l	6010B	08/09/12	1
Iron,Dissolved	2.3	0.10	mg/l	6010B	08/04/12	1
Magnesium	BDL	0.10	mg/l	6010B	08/09/12	1
Magnesium,Dissolved	40.	0.10	mg/l	6010B	08/04/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)

REPORT OF ANALYSIS

Mr. Michael Johnson
Civil & Environmental Consultants -
405 Duke Drive, Suite 270
Franklin, TN 37067

August 13, 2012

ESC Sample # : L587772-05

Date Received : August 01, 2012
Description : EWS - Camden

Site ID : CAMDEN, TN

Sample ID : FIELD BLANK

Project # : 101-301

Collected By : Dennis Mihalek
Collection Date : 07/31/12 00:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Manganese	BDL	0.010	mg/l	6010B	08/09/12	1
Manganese,Dissolved	0.42	0.010	mg/l	6010B	08/04/12	1
Nickel	BDL	0.020	mg/l	6010B	08/09/12	1
Nickel,Dissolved	BDL	0.020	mg/l	6010B	08/04/12	1
Potassium	BDL	0.50	mg/l	6010B	08/09/12	1
Potassium,Dissolved	3.0	0.50	mg/l	6010B	08/06/12	1
Silver	BDL	0.010	mg/l	6010B	08/09/12	1
Silver,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1
Sodium	BDL	0.50	mg/l	6010B	08/09/12	1
Sodium,Dissolved	27.	0.50	mg/l	6010B	08/04/12	1
Vanadium	BDL	0.010	mg/l	6010B	08/09/12	1
Vanadium,Dissolved	BDL	0.010	mg/l	6010B	08/04/12	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
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Reported: 08/13/12 08:38 Printed: 08/13/12 08:39

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L587772-04	WG605748	SAMP	Copper	R2288973	P1
	WG605748	SAMP	Selenium	R2288973	P1
L587772-05	WG606572	SAMP	Ammonia Nitrogen	R2295373	P1

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC.
Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
08/13/12 at 08:39:14

TSR Signing Reports: 350
R5 - Desired TAT

Run ASG, not ASICP on GW; Charge $6 for additional metals when metals list is run.

Sample: L587772-01 Account: CEC Received: 08/01/12 15:20 Due Date: 08/08/12 00:00 RPT Date: 08/13/12 08:38

Sample: L587772-02 Account: CEC Received: 08/01/12 15:20 Due Date: 08/08/12 00:00 RPT Date: 08/13/12 08:38

Sample: L587772-03 Account: CEC Received: 08/01/12 15:20 Due Date: 08/08/12 00:00 RPT Date: 08/13/12 08:38

Sample: L587772-04 Account: CEC Received: 08/01/12 15:20 Due Date: 08/08/12 00:00 RPT Date: 08/13/12 08:38

Sample: L587772-05 Account: CEC Received: 08/01/12 15:20 Due Date: 08/08/12 00:00 RPT Date: 08/13/12 08:38

Civil & Environmental Consultants - TN
Mr. Michael Johnson
405 Duke Drive, Suite 270

Franklin, TN 37067

Quality Assurance Report
Level II

L587772

August 13, 2012

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Chloride	< 1	mg/l			WG605546	08/01/12 07:06
Nitrate	< .1	mg/l			WG605546	08/01/12 07:06
Sulfate	< 5	mg/l			WG605546	08/01/12 07:06
Nitrate	< .1	mg/l			WG605778	08/02/12 06:58
Sulfate	< 5	mg/l			WG605778	08/02/12 06:58
Nitrate	< .1	mg/l			WG605778	08/02/12 06:58
Sulfate	< 5	mg/l			WG605778	08/02/12 06:58
Mercury	< .0002	mg/l			WG605888	08/03/12 13:06
Antimony	< .001	mg/l			WG605748	08/03/12 14:32
Arsenic	< .001	mg/l			WG605748	08/03/12 14:32
Beryllium	< .001	mg/l			WG605748	08/03/12 14:32
Cadmium	< .0005	mg/l			WG605748	08/03/12 14:32
Copper	< .002	mg/l			WG605748	08/03/12 14:32
Lead	< .001	mg/l			WG605748	08/03/12 14:32
Selenium	< .001	mg/l			WG605748	08/03/12 14:32
Thallium	< .001	mg/l			WG605748	08/03/12 14:32
Zinc	< .01	mg/l			WG605748	08/03/12 14:32
Aluminum,Dissolved	< .1	mg/l			WG605973	08/04/12 02:15
Barium,Dissolved	< .005	mg/l			WG605973	08/04/12 02:15
Boron,Dissolved	< .2	mg/l			WG605973	08/04/12 02:15
Calcium,Dissolved	< .5	mg/l			WG605973	08/04/12 02:15
Chromium,Dissolved	< .01	mg/l			WG605973	08/04/12 02:15
Cobalt,Dissolved	< .01	mg/l			WG605973	08/04/12 02:15
Iron,Dissolved	< .1	mg/l			WG605973	08/04/12 02:15
Magnesium,Dissolved	< .1	mg/l			WG605973	08/04/12 02:15
Manganese,Dissolved	< .01	mg/l			WG605973	08/04/12 02:15
Nickel,Dissolved	< .02	mg/l			WG605973	08/04/12 02:15
Silver,Dissolved	< .01	mg/l			WG605973	08/04/12 02:15
Sodium,Dissolved	< .5	mg/l			WG605973	08/04/12 02:15
Vanadium,Dissolved	< .01	mg/l			WG605973	08/04/12 02:15
Mercury,Dissolved	< .0002	mg/l			WG605658	08/04/12 11:20
Antimony	< .001	mg/l			WG605894	08/05/12 15:37
Arsenic	< .001	mg/l			WG605894	08/05/12 15:37
Cadmium	< .0005	mg/l			WG605894	08/05/12 15:37
Copper	< .002	mg/l			WG605894	08/05/12 15:37
Lead	< .001	mg/l			WG605894	08/05/12 15:37
Thallium	< .001	mg/l			WG605894	08/05/12 15:37
Zinc	< .01	mg/l			WG605894	08/05/12 15:37
Potassium,Dissolved	< .5	mg/l			WG605973	08/06/12 23:10
Ammonia Nitrogen	< .1	mg/l			WG606572	08/08/12 14:19
Beryllium	< .001	mg/l			WG605894	08/08/12 10:55

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

Civil & Environmental Consultants - TN
Mr. Michael Johnson
405 Duke Drive, Suite 270

Franklin, TN 37067

Quality Assurance Report
Level II

L587772

August 13, 2012

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Selenium	< .001	mg/l			WG605894	08/08/12 10:55
Aluminum	< .1	mg/l			WG605817	08/09/12 11:37
Barium	< .005	mg/l			WG605817	08/09/12 11:37
Boron	< .2	mg/l			WG605817	08/09/12 11:37
Calcium	< .5	mg/l			WG605817	08/09/12 11:37
Chromium	< .01	mg/l			WG605817	08/09/12 11:37
Cobalt	< .01	mg/l			WG605817	08/09/12 11:37
Iron	< .1	mg/l			WG605817	08/09/12 11:37
Magnesium	< .1	mg/l			WG605817	08/09/12 11:37
Manganese	< .01	mg/l			WG605817	08/09/12 11:37
Nickel	< .02	mg/l			WG605817	08/09/12 11:37
Potassium	< .5	mg/l			WG605817	08/09/12 11:37
Silver	< .01	mg/l			WG605817	08/09/12 11:37
Sodium	< .5	mg/l			WG605817	08/09/12 11:37
Vanadium	< .01	mg/l			WG605817	08/09/12 11:37
Antimony,Dissolved	< .001	mg/l			WG606003	08/11/12 10:41
Arsenic,Dissolved	< .001	mg/l			WG606003	08/11/12 10:41
Beryllium,Dissolved	< .001	mg/l			WG606003	08/11/12 10:41
Cadmium,Dissolved	< .0005	mg/l			WG606003	08/11/12 10:41
Copper,Dissolved	< .002	mg/l			WG606003	08/11/12 10:41
Lead,Dissolved	< .001	mg/l			WG606003	08/11/12 10:41
Selenium,Dissolved	< .001	mg/l			WG606003	08/11/12 10:41
Thallium,Dissolved	< .001	mg/l			WG606003	08/11/12 10:41
Zinc,Dissolved	< .01	mg/l			WG606003	08/11/12 10:41

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Nitrate	mg/l	0	0	0	20	L587609-01	WG605546
Nitrate	mg/l	19.0	18.0	4.35	20	L587773-02	WG605546
Nitrate	mg/l	22.0	22.0	1.35	20	L587772-02	WG605778
Nitrate	mg/l	0	0	0	20	L587772-01	WG605778
Sulfate	mg/l	0	0	0	20	L587772-01	WG605778
Sulfate	mg/l	100.	100.	0.995	20	L587736-01	WG605778
Mercury	mg/l	0.000550	0.000630	13.6	20	L587772-01	WG605888
Antimony	mg/l	0	0	0	20	L587772-04	WG605748
Arsenic	mg/l	0.0980	0.0900	8.41	20	L587772-04	WG605748
Beryllium	mg/l	0	0	0	20	L587772-04	WG605748
Cadmium	mg/l	0	0	0	20	L587772-04	WG605748
Copper	mg/l	0.00270	0	NA	20	L587772-04	WG605748
Lead	mg/l	0	0	0	20	L587772-04	WG605748
Selenium	mg/l	0.0240	0	NA	20	L587772-04	WG605748
Thallium	mg/l	0	0	0	20	L587772-04	WG605748
Zinc	mg/l	0.0220	0.0220	1.80	20	L587772-04	WG605748
Aluminum,Dissolved	mg/l	0.630	0.700	11.0	20	L587519-04	WG605973
Barium,Dissolved	mg/l	0.160	0.160	1.26	20	L587519-04	WG605973
Boron,Dissolved	mg/l	0.460	0.471	1.71*	0	L587519-04	WG605973

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

Civil & Environmental Consultants - TN
Mr. Michael Johnson
405 Duke Drive, Suite 270

Franklin, TN 37067

Quality Assurance Report
Level II

L587772

August 13, 2012

			Duplicate				
Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Calcium,Dissolved	mg/l	53.0	53.0	0.568	20	L587519-04	WG605973
Chromium,Dissolved	mg/l	0	0.000900	NA	20	L587519-04	WG605973
Cobalt,Dissolved	mg/l	0	0.00100	NA	20	L587519-04	WG605973
Iron,Dissolved	mg/l	0.870	0.943	7.59	20	L587519-04	WG605973
Magnesium,Dissolved	mg/l	16.0	17.0	5.44	20	L587519-04	WG605973
Manganese,Dissolved	mg/l	0.500	0.505	1.80	20	L587519-04	WG605973
Nickel,Dissolved	mg/l	0	0	0	20	L587519-04	WG605973
Silver,Dissolved	mg/l	0	0.00200	NA	20	L587519-04	WG605973
Sodium,Dissolved	mg/l	59.0	60.0	1.68	20	L587519-04	WG605973
Vanadium,Dissolved	mg/l	0	0.000600	NA	20	L587519-04	WG605973
Mercury,Dissolved	mg/l	0	0	0	20	L587772-01	WG605658
Antimony	mg/l	0	0	0	20	L587772-05	WG605894
Arsenic	mg/l	0	0	0	20	L587772-05	WG605894
Cadmium	mg/l	0	0	0	20	L587772-05	WG605894
Copper	mg/l	0	0	0	20	L587772-05	WG605894
Lead	mg/l	0	0	0	20	L587772-05	WG605894
Thallium	mg/l	0	0	0	20	L587772-05	WG605894
Zinc	mg/l	0	0	0	20	L587772-05	WG605894
Potassium,Dissolved	mg/l	1.20	1.40	12.9	20	L587519-04	WG605973
Ammonia Nitrogen	mg/l	0.380	0.450	16.3	20	L587655-09	WG606572
Ammonia Nitrogen	mg/l	0	0.110	NA	20	L587772-05	WG606572
Beryllium	mg/l	0	0	0	20	L587772-05	WG605894
Selenium	mg/l	0	0	0	20	L587772-05	WG605894
Aluminum	mg/l	0.160	0.150	5.83	20	L587839-09	WG605817
Barium	mg/l	0.0890	0.0860	3.32	20	L587839-09	WG605817
Boron	mg/l	0	0.0662	NA	20	L587839-09	WG605817
Calcium	mg/l	32.0	31.3	0.637	20	L587839-09	WG605817
Chromium	mg/l	0	0	0	20	L587839-09	WG605817
Cobalt	mg/l	0	0	0	20	L587839-09	WG605817
Iron	mg/l	0.220	0.210	3.74	20	L587839-09	WG605817
Magnesium	mg/l	7.10	6.85	3.30	20	L587839-09	WG605817
Manganese	mg/l	0.0100	0.00940	6.19	20	L587839-09	WG605817
Nickel	mg/l	0	0	0	20	L587839-09	WG605817
Potassium	mg/l	0.840	0.834	0.717	20	L587839-09	WG605817
Silver	mg/l	0	0	0	20	L587839-09	WG605817
Sodium	mg/l	24.0	23.2	2.97	20	L587839-09	WG605817
Vanadium	mg/l	0	0	0	20	L587839-09	WG605817
Antimony,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003
Arsenic,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003
Beryllium,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003
Cadmium,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003
Copper,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003
Lead,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003
Selenium,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003
Thallium,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

Civil & Environmental Consultants - TN
Mr. Michael Johnson
405 Duke Drive, Suite 270

Franklin, TN 37067

Quality Assurance Report
Level II

L587772

August 13, 2012

Analyte	Units	Result	Duplicate Duplicate	RPD	Limit	Ref Samp	Batch
Zinc,Dissolved	mg/l	0	0	0	20	L587772-05	WG606003

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
Chloride	mg/l	40	39.8	99.5	90-110	WG605546
Nitrate	mg/l	8	8.17	102.	90-110	WG605546
Sulfate	mg/l	40	39.7	99.3	90-110	WG605546
Nitrate	mg/l	8	8.10	101.	90-110	WG605778
Sulfate	mg/l	40	38.9	97.3	90-110	WG605778
Mercury	mg/l	.003	0.00285	95.0	85-115	WG605888
Antimony	mg/l	.0567	0.0614	108.	85-115	WG605748
Arsenic	mg/l	.0567	0.0579	102.	85-115	WG605748
Beryllium	mg/l	.0567	0.0578	102.	85-115	WG605748
Cadmium	mg/l	.0567	0.0587	104.	85-115	WG605748
Copper	mg/l	.0567	0.0569	100.	85-115	WG605748
Lead	mg/l	.0567	0.0595	105.	85-115	WG605748
Selenium	mg/l	.0567	0.0553	97.5	85-115	WG605748
Thallium	mg/l	.0567	0.0594	105.	85-115	WG605748
Zinc	mg/l	.0567	0.0614	108.	85-115	WG605748
Aluminum,Dissolved	mg/l	1.13	1.07	94.7	85-115	WG605973
Barium,Dissolved	mg/l	1.13	1.09	96.5	85-115	WG605973
Boron,Dissolved	mg/l	1.13	0.995	88.1	85-115	WG605973
Calcium,Dissolved	mg/l	11.3	11.0	97.3	85-115	WG605973
Chromium,Dissolved	mg/l	1.13	1.09	96.5	85-115	WG605973
Cobalt,Dissolved	mg/l	1.13	1.14	101.	85-115	WG605973
Iron,Dissolved	mg/l	1.13	1.02	90.3	85-115	WG605973
Magnesium,Dissolved	mg/l	11.3	11.3	100.	85-115	WG605973
Manganese,Dissolved	mg/l	1.13	1.09	96.5	85-115	WG605973
Nickel,Dissolved	mg/l	1.13	1.06	93.8	85-115	WG605973
Silver,Dissolved	mg/l	1.13	1.05	92.9	85-115	WG605973
Sodium,Dissolved	mg/l	11.3	11.1	98.2	85-115	WG605973
Vanadium,Dissolved	mg/l	1.13	1.06	93.8	85-115	WG605973
Mercury,Dissolved	mg/l	.003	0.00291	97.0	85-115	WG605658
Antimony	mg/l	.0567	0.0534	94.2	85-115	WG605894
Arsenic	mg/l	.0567	0.0490	86.4	85-115	WG605894
Cadmium	mg/l	.0567	0.0507	89.4	85-115	WG605894
Copper	mg/l	.0567	0.0515	90.8	85-115	WG605894
Lead	mg/l	.0567	0.0495	87.3	85-115	WG605894
Thallium	mg/l	.0567	0.0507	89.4	85-115	WG605894
Zinc	mg/l	.0567	0.0525	92.6	85-115	WG605894
Potassium,Dissolved	mg/l	11.3	10.5	92.9	85-115	WG605973
Ammonia Nitrogen	mg/l	7.5	7.91	105.	90-110	WG606572

* Performance of this Analyte is outside of established criteria.
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Civil & Environmental Consultants - TN
Mr. Michael Johnson
405 Duke Drive, Suite 270

Franklin, TN 37067

Quality Assurance Report
Level II

L587772

August 13, 2012

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Beryllium	mg/l	.0567	0.0543	95.8	85-115	WG605894
Selenium	mg/l	.0567	0.0520	91.7	85-115	WG605894
Aluminum	mg/l	1.13	1.22	108.	85-115	WG605817
Barium	mg/l	1.13	1.16	103.	85-115	WG605817
Boron	mg/l	1.13	1.03	91.2	85-115	WG605817
Calcium	mg/l	11.3	11.8	104.	85-115	WG605817
Chromium	mg/l	1.13	1.16	103.	85-115	WG605817
Cobalt	mg/l	1.13	1.30	115.*	85-115	WG605817
Iron	mg/l	1.13	1.23	109.	85-115	WG605817
Magnesium	mg/l	11.3	11.8	104.	85-115	WG605817
Manganese	mg/l	1.13	1.19	105.	85-115	WG605817
Nickel	mg/l	1.13	1.12	99.1	85-115	WG605817
Potassium	mg/l	11.3	11.3	100.	85-115	WG605817
Silver	mg/l	1.13	1.22	108.	85-115	WG605817
Sodium	mg/l	11.3	11.5	102.	85-115	WG605817
Vanadium	mg/l	1.13	1.15	102.	85-115	WG605817
Antimony,Dissolved	mg/l	.0567	0.0626	110.	85-115	WG606003
Arsenic,Dissolved	mg/l	.0567	0.0574	101.	85-115	WG606003
Beryllium,Dissolved	mg/l	.0567	0.0589	104.	85-115	WG606003
Cadmium,Dissolved	mg/l	.0567	0.0572	101.	85-115	WG606003
Copper,Dissolved	mg/l	.0567	0.0594	105.	85-115	WG606003
Lead,Dissolved	mg/l	.0567	0.0574	101.	85-115	WG606003
Selenium,Dissolved	mg/l	.0567	0.0537	94.7	85-115	WG606003
Thallium,Dissolved	mg/l	.0567	0.0574	101.	85-115	WG606003
Zinc,Dissolved	mg/l	.0567	0.0605	107.	85-115	WG606003

Laboratory Control Sample Duplicate

Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
Chloride	mg/l	39.9	39.8	100.	90-110	0.251	20	WG605546
Nitrate	mg/l	8.18	8.17	102.	90-110	0.122	20	WG605546
Sulfate	mg/l	39.9	39.7	100.	90-110	0.503	20	WG605546
Nitrate	mg/l	8.09	8.10	101.	90-110	0.124	20	WG605778
Sulfate	mg/l	38.7	38.9	97.0	90-110	0.515	20	WG605778
Ammonia Nitrogen	mg/l	7.59	7.91	101.	90-110	4.13	20	WG606572

Matrix Spike

Analyte	Units	MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Nitrate	mg/l	4.87	0	5	97.4	80-120	L587606-01	WG605546
Nitrate	mg/l	5.03	0.110	5	98.4	80-120	L587851-01	WG605778
Mercury	mg/l	0.00355	0.000630	.003	97.3	80-120	L587772-01	WG605888
Antimony	mg/l	0.0600	0	.0567	106.	75-125	L587772-04	WG605748
Arsenic	mg/l	0.147	0.0900	.0567	100.	75-125	L587772-04	WG605748
Beryllium	mg/l	0.0604	0	.0567	106.	75-125	L587772-04	WG605748

* Performance of this Analyte is outside of established criteria.
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Matrix Spike

Analyte	Units	MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Cadmium	mg/l	0.0577	0	.0567	102.	75-125	L587772-04	WG605748
Copper	mg/l	0.0557	0	.0567	98.2	75-125	L587772-04	WG605748
Lead	mg/l	0.0593	0	.0567	104.	75-125	L587772-04	WG605748
Selenium	mg/l	0.0575	0	.0567	101.	75-125	L587772-04	WG605748
Thallium	mg/l	0.0591	0	.0567	104.	75-125	L587772-04	WG605748
Zinc	mg/l	0.0778	0.0220	.0567	98.4	75-125	L587772-04	WG605748
Aluminum,Dissolved	mg/l	1.74	0.700	1.13	92.0	75-125	L587519-04	WG605973
Barium,Dissolved	mg/l	1.24	0.160	1.13	95.6	75-125	L587519-04	WG605973
Boron,Dissolved	mg/l	1.48	0.471	1.13	89.3	75-125	L587519-04	WG605973
Calcium,Dissolved	mg/l	66.4	53.0	11.3	118.	75-125	L587519-04	WG605973
Chromium,Dissolved	mg/l	1.07	0.000900	1.13	94.6	75-125	L587519-04	WG605973
Cobalt,Dissolved	mg/l	1.12	0.00100	1.13	99.0	75-125	L587519-04	WG605973
Iron,Dissolved	mg/l	1.94	0.943	1.13	88.2	75-125	L587519-04	WG605973
Magnesium,Dissolved	mg/l	27.4	17.0	11.3	92.0	75-125	L587519-04	WG605973
Manganese,Dissolved	mg/l	1.63	0.505	1.13	99.6	75-125	L587519-04	WG605973
Nickel,Dissolved	mg/l	1.05	0	1.13	92.9	75-125	L587519-04	WG605973
Silver,Dissolved	mg/l	0.428	0.00200	1.13	37.7*	75-125	L587519-04	WG605973
Sodium,Dissolved	mg/l	72.0	60.0	11.3	106.	75-125	L587519-04	WG605973
Vanadium,Dissolved	mg/l	1.07	0.000600	1.13	94.6	75-125	L587519-04	WG605973
Mercury,Dissolved	mg/l	0.00286	0	.003	95.3	80-120	L587772-01	WG605658
Antimony	mg/l	0.0520	0	.0567	91.7	75-125	L587772-05	WG605894
Arsenic	mg/l	0.0504	0	.0567	88.9	75-125	L587772-05	WG605894
Cadmium	mg/l	0.0506	0	.0567	89.2	75-125	L587772-05	WG605894
Copper	mg/l	0.0518	0	.0567	91.4	75-125	L587772-05	WG605894
Lead	mg/l	0.0501	0	.0567	88.4	75-125	L587772-05	WG605894
Thallium	mg/l	0.0510	0	.0567	89.9	75-125	L587772-05	WG605894
Zinc	mg/l	0.0532	0	.0567	93.8	75-125	L587772-05	WG605894
Potassium,Dissolved	mg/l	12.0	1.40	11.3	93.8	75-125	L587519-04	WG605973
Beryllium	mg/l	0.0533	0	.0567	94.0	75-125	L587772-05	WG605894
Selenium	mg/l	0.0531	0	.0567	93.6	75-125	L587772-05	WG605894
Aluminum	mg/l	1.51	0.150	1.13	120.	75-125	L587839-09	WG605817
Barium	mg/l	1.30	0.0860	1.13	107.	75-125	L587839-09	WG605817
Boron	mg/l	1.16	0.0662	1.13	96.8	75-125	L587839-09	WG605817
Calcium	mg/l	44.4	31.3	11.3	116.	75-125	L587839-09	WG605817
Chromium	mg/l	1.21	0	1.13	107.	75-125	L587839-09	WG605817
Cobalt	mg/l	1.34	0	1.13	118.	75-125	L587839-09	WG605817
Iron	mg/l	1.50	0.210	1.13	114.	75-125	L587839-09	WG605817
Magnesium	mg/l	19.2	6.85	11.3	109.	75-125	L587839-09	WG605817
Manganese	mg/l	1.25	0.00940	1.13	110.	75-125	L587839-09	WG605817
Nickel	mg/l	1.20	0	1.13	106.	75-125	L587839-09	WG605817
Potassium	mg/l	12.8	0.834	11.3	106.	75-125	L587839-09	WG605817
Silver	mg/l	0.0965	0	1.13	8.54*	75-125	L587839-09	WG605817
Sodium	mg/l	35.8	23.2	11.3	112.	75-125	L587839-09	WG605817
Vanadium	mg/l	1.20	0	1.13	106.	75-125	L587839-09	WG605817
Antimony,Dissolved	mg/l	0.0669	0	.0567	118.	75-125	L587772-05	WG606003

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		Matrix Spike						
Analyte	**Units**	**MS Res**	**Ref Res**	**TV**	**% Rec**	**Limit**	**Ref Samp**	**Batch**
Arsenic,Dissolved	mg/l	0.0618	0	.0567	109.	75-125	L587772-05	WG606003
Beryllium,Dissolved	mg/l	0.0642	0	.0567	113.	75-125	L587772-05	WG606003
Cadmium,Dissolved	mg/l	0.0619	0	.0567	109.	75-125	L587772-05	WG606003
Copper,Dissolved	mg/l	0.0632	0	.0567	111.	75-125	L587772-05	WG606003
Lead,Dissolved	mg/l	0.0628	0	.0567	111.	75-125	L587772-05	WG606003
Selenium,Dissolved	mg/l	0.0599	0	.0567	106.	75-125	L587772-05	WG606003
Thallium,Dissolved	mg/l	0.0621	0	.0567	110.	75-125	L587772-05	WG606003
Zinc,Dissolved	mg/l	0.0636	0	.0567	112.	75-125	L587772-05	WG606003

		Matrix Spike Duplicate							
Analyte	**Units**	**MSD**	**Ref**	**%Rec**	**Limit**	**RPD**	**Limit**	**Ref Samp**	**Batch**
Nitrate	mg/l	5.08	4.87	102.	80-120	4.22	20	L587606-01	WG605546
Nitrate	mg/l	4.99	5.03	97.6	80-120	0.798	20	L587851-01	WG605778
Mercury	mg/l	0.00364	0.00355	100.	80-120	2.50	20	L587772-01	WG605888
Antimony	mg/l	0.0606	0.0600	107.	75-125	0.995	20	L587772-04	WG605748
Arsenic	mg/l	0.145	0.147	97.0	75-125	1.37	20	L587772-04	WG605748
Beryllium	mg/l	0.0598	0.0604	105.	75-125	0.998	20	L587772-04	WG605748
Cadmium	mg/l	0.0577	0.0577	102.	75-125	0	20	L587772-04	WG605748
Copper	mg/l	0.0551	0.0557	97.2	75-125	1.08	20	L587772-04	WG605748
Lead	mg/l	0.0594	0.0593	105.	75-125	0.168	20	L587772-04	WG605748
Selenium	mg/l	0.0535	0.0575	94.4	75-125	7.21	20	L587772-04	WG605748
Thallium	mg/l	0.0592	0.0591	104.	75-125	0.169	20	L587772-04	WG605748
Zinc	mg/l	0.0779	0.0778	98.6	75-125	0.128	20	L587772-04	WG605748
Aluminum,Dissolved	mg/l	1.75	1.74	92.9	75-125	0.573	20	L587519-04	WG605973
Barium,Dissolved	mg/l	1.26	1.24	97.3	75-125	1.60	20	L587519-04	WG605973
Boron,Dissolved	mg/l	1.50	1.48	91.1	75-125	1.34	20	L587519-04	WG605973
Calcium,Dissolved	mg/l	65.1	66.4	107.	75-125	1.98	20	L587519-04	WG605973
Chromium,Dissolved	mg/l	1.10	1.07	97.3	75-125	2.76	20	L587519-04	WG605973
Cobalt,Dissolved	mg/l	1.14	1.12	101.	75-125	1.77	20	L587519-04	WG605973
Iron,Dissolved	mg/l	1.94	1.94	88.2	75-125	0	20	L587519-04	WG605973
Magnesium,Dissolved	mg/l	27.5	27.4	92.9	75-125	0.364	20	L587519-04	WG605973
Manganese,Dissolved	mg/l	1.60	1.63	96.9	75-125	1.86	20	L587519-04	WG605973
Nickel,Dissolved	mg/l	1.07	1.05	94.7	75-125	1.89	20	L587519-04	WG605973
Silver,Dissolved	mg/l	0.0571	0.428	4.88*	75-125	153.*	20	L587519-04	WG605973
Sodium,Dissolved	mg/l	71.6	72.0	103.	75-125	0.557	20	L587519-04	WG605973
Vanadium,Dissolved	mg/l	1.08	1.07	95.5	75-125	0.930	20	L587519-04	WG605973
Mercury,Dissolved	mg/l	0.00286	0.00286	95.3	80-120	0	20	L587772-01	WG605658
Antimony	mg/l	0.0533	0.0520	94.0	75-125	2.47	20	L587772-05	WG605894
Arsenic	mg/l	0.0512	0.0504	90.3	75-125	1.57	20	L587772-05	WG605894
Cadmium	mg/l	0.0508	0.0506	89.6	75-125	0.394	20	L587772-05	WG605894
Copper	mg/l	0.0519	0.0518	91.5	75-125	0.193	20	L587772-05	WG605894
Lead	mg/l	0.0504	0.0501	88.9	75-125	0.597	20	L587772-05	WG605894
Thallium	mg/l	0.0512	0.0510	90.3	75-125	0.391	20	L587772-05	WG605894
Zinc	mg/l	0.0538	0.0532	94.9	75-125	1.12	20	L587772-05	WG605894

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Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Potassium,Dissolved	mg/l	11.9	12.0	92.9	75-125	0.837	20	L587519-04	WG605973
Beryllium	mg/l	0.0539	0.0533	95.1	75-125	1.12	20	L587772-05	WG605894
Selenium	mg/l	0.0516	0.0531	91.0	75-125	2.87	20	L587772-05	WG605894
Aluminum	mg/l	1.47	1.51	117.	75-125	2.68	20	L587839-09	WG605817
Barium	mg/l	1.29	1.30	106.	75-125	0.772	20	L587839-09	WG605817
Boron	mg/l	1.15	1.16	95.9	75-125	0.866	20	L587839-09	WG605817
Calcium	mg/l	44.2	44.4	114.	75-125	0.451	20	L587839-09	WG605817
Chromium	mg/l	1.20	1.21	106.	75-125	0.830	20	L587839-09	WG605817
Cobalt	mg/l	1.31	1.34	116.	75-125	2.26	20	L587839-09	WG605817
Iron	mg/l	1.49	1.50	113.	75-125	0.669	20	L587839-09	WG605817
Magnesium	mg/l	19.0	19.2	108.	75-125	1.05	20	L587839-09	WG605817
Manganese	mg/l	1.25	1.25	110.	75-125	0	20	L587839-09	WG605817
Nickel	mg/l	1.17	1.20	104.	75-125	2.53	20	L587839-09	WG605817
Potassium	mg/l	12.6	12.8	104.	75-125	1.57	20	L587839-09	WG605817
Silver	mg/l	0.0926	0.0965	8.20*	75-125	4.12	20	L587839-09	WG605817
Sodium	mg/l	35.6	35.8	110.	75-125	0.560	20	L587839-09	WG605817
Vanadium	mg/l	1.19	1.20	105.	75-125	0.837	20	L587839-09	WG605817
Antimony,Dissolved	mg/l	0.0591	0.0669	104.	75-125	12.4	20	L587772-05	WG606003
Arsenic,Dissolved	mg/l	0.0542	0.0618	95.6	75-125	13.1	20	L587772-05	WG606003
Beryllium,Dissolved	mg/l	0.0555	0.0642	97.9	75-125	14.5	20	L587772-05	WG606003
Cadmium,Dissolved	mg/l	0.0539	0.0619	95.1	75-125	13.8	20	L587772-05	WG606003
Copper,Dissolved	mg/l	0.0566	0.0632	99.8	75-125	11.0	20	L587772-05	WG606003
Lead,Dissolved	mg/l	0.0550	0.0628	97.0	75-125	13.2	20	L587772-05	WG606003
Selenium,Dissolved	mg/l	0.0533	0.0599	94.0	75-125	11.7	20	L587772-05	WG606003
Thallium,Dissolved	mg/l	0.0551	0.0621	97.2	75-125	11.9	20	L587772-05	WG606003
Zinc,Dissolved	mg/l	0.0560	0.0636	98.8	75-125	12.7	20	L587772-05	WG606003

Batch number /Run number / Sample number cross reference

WG605546: R2284313: L587772-01 02 03 04 05
WG605778: R2285753: L587772-01 02
WG605888: R2288533: L587772-01 02 03 04 05
WG605748: R2288973: L587772-01 02 03 04
WG605973: R2289414: L587772-01 03 04 05
WG605658: R2289776: L587772-01 03 04 05
WG605894: R2290173: L587772-05
WG606572: R2295373: L587772-01 02 03 04 05
WG605817: R2297153: L587772-01 02 03 04 05
WG606003: R2299054: L587772-01 03 04 05

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

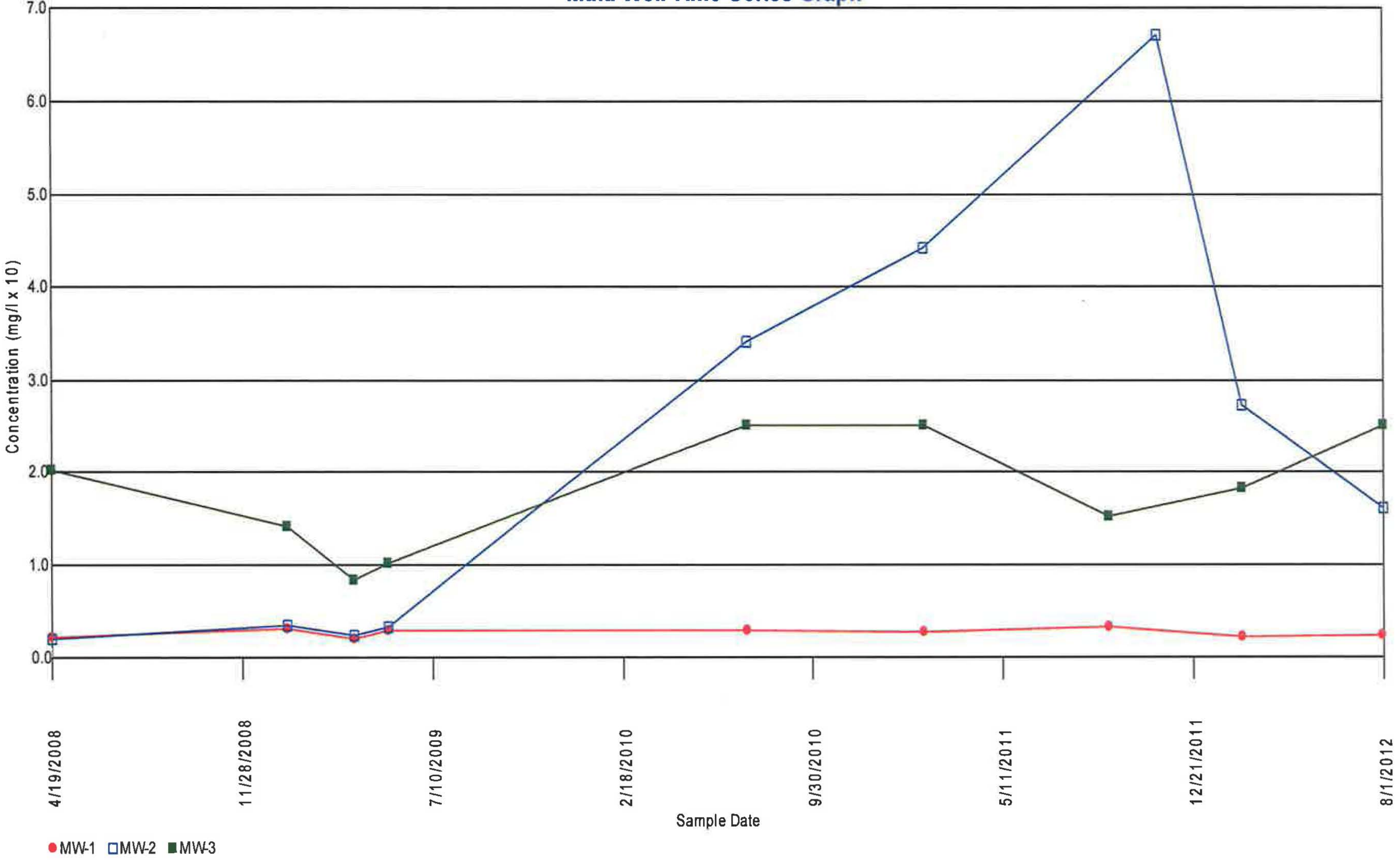
Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

Appendix D
Statistical & Trend Analysis

Chloride

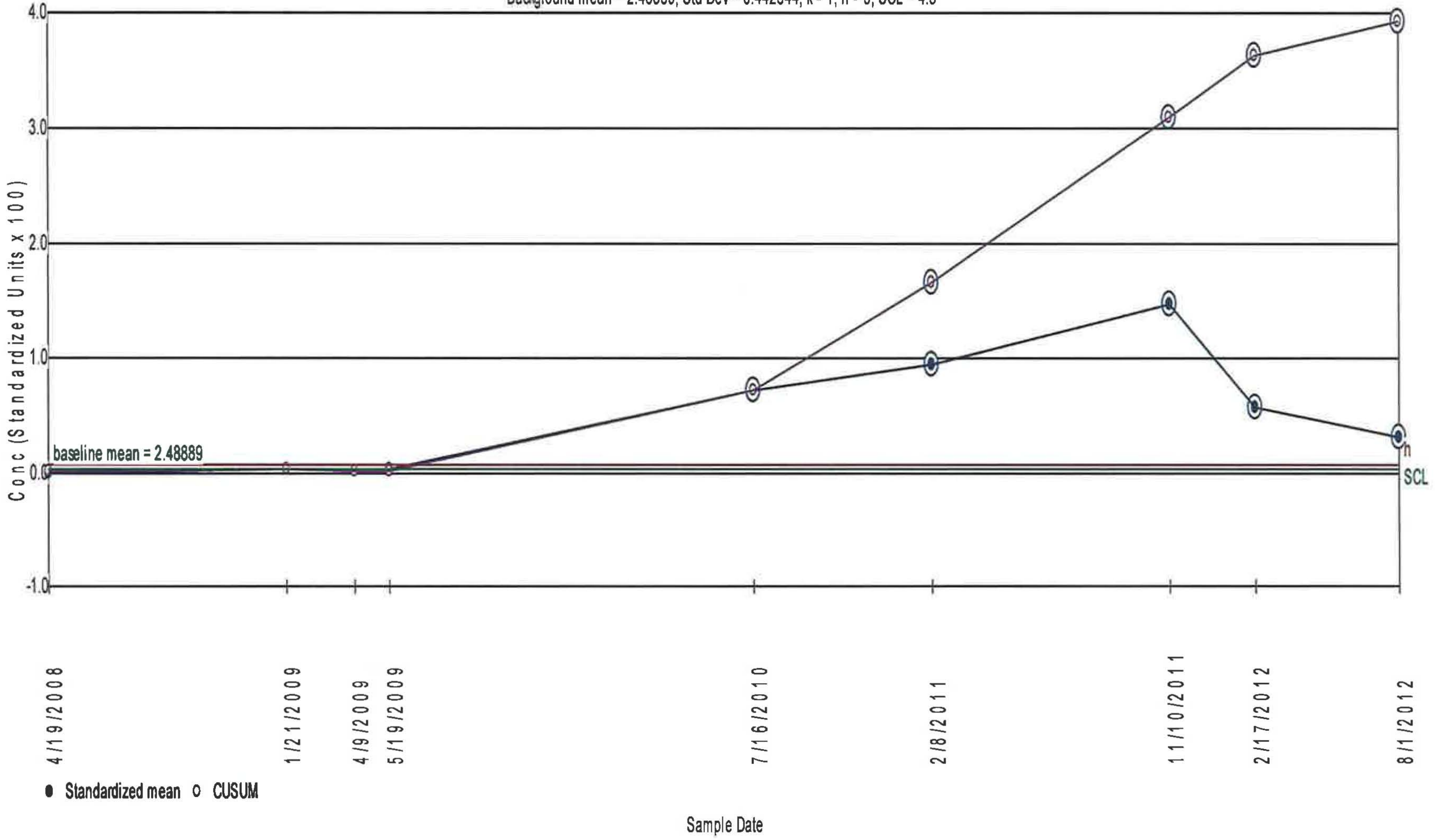
Multi-Well Time-Series Graph



Chloride

Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-2

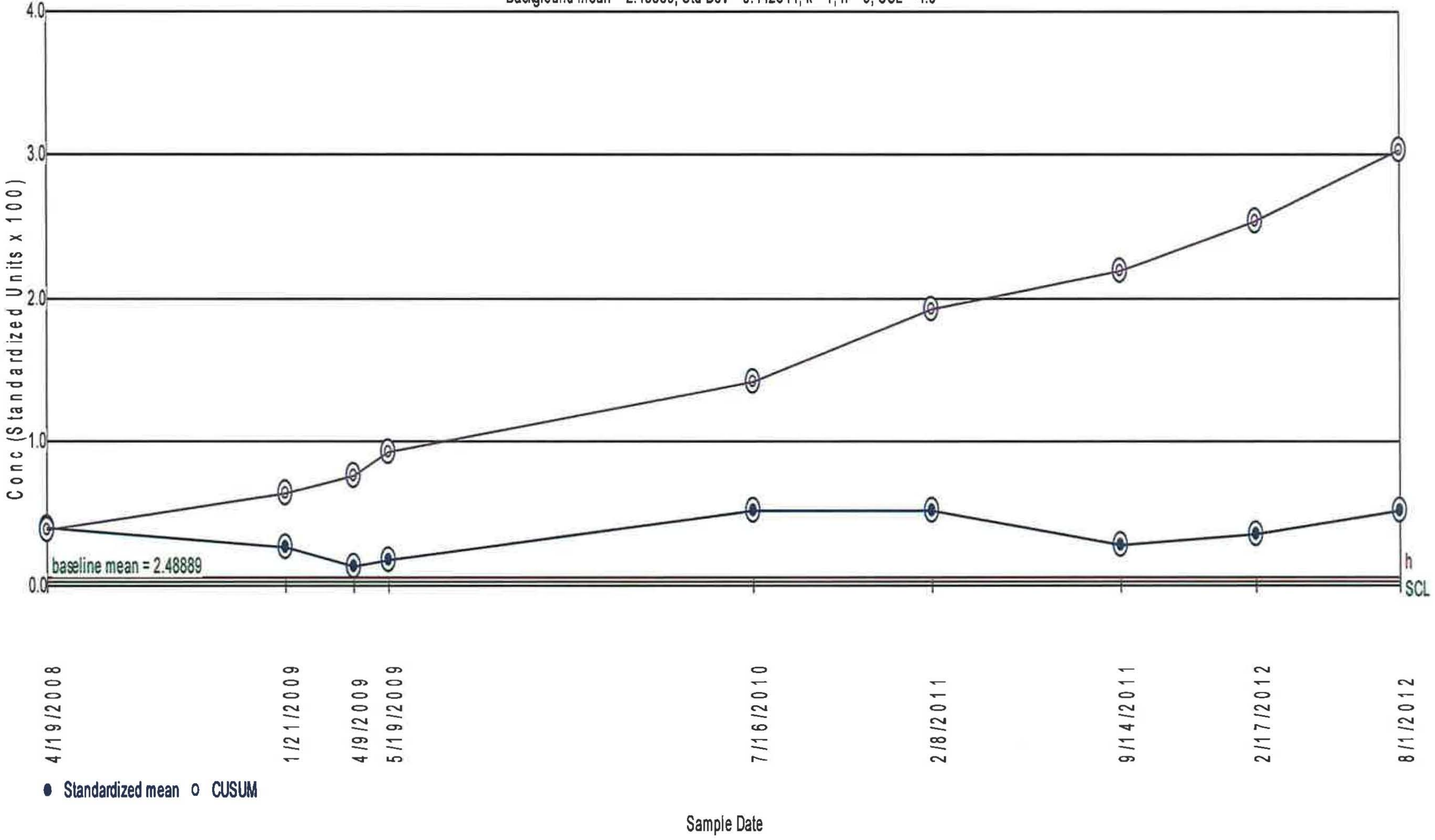
Background mean = 2.48889; Std Dev = 0.442844; k = 1; h = 5; SCL = 4.5



Chloride

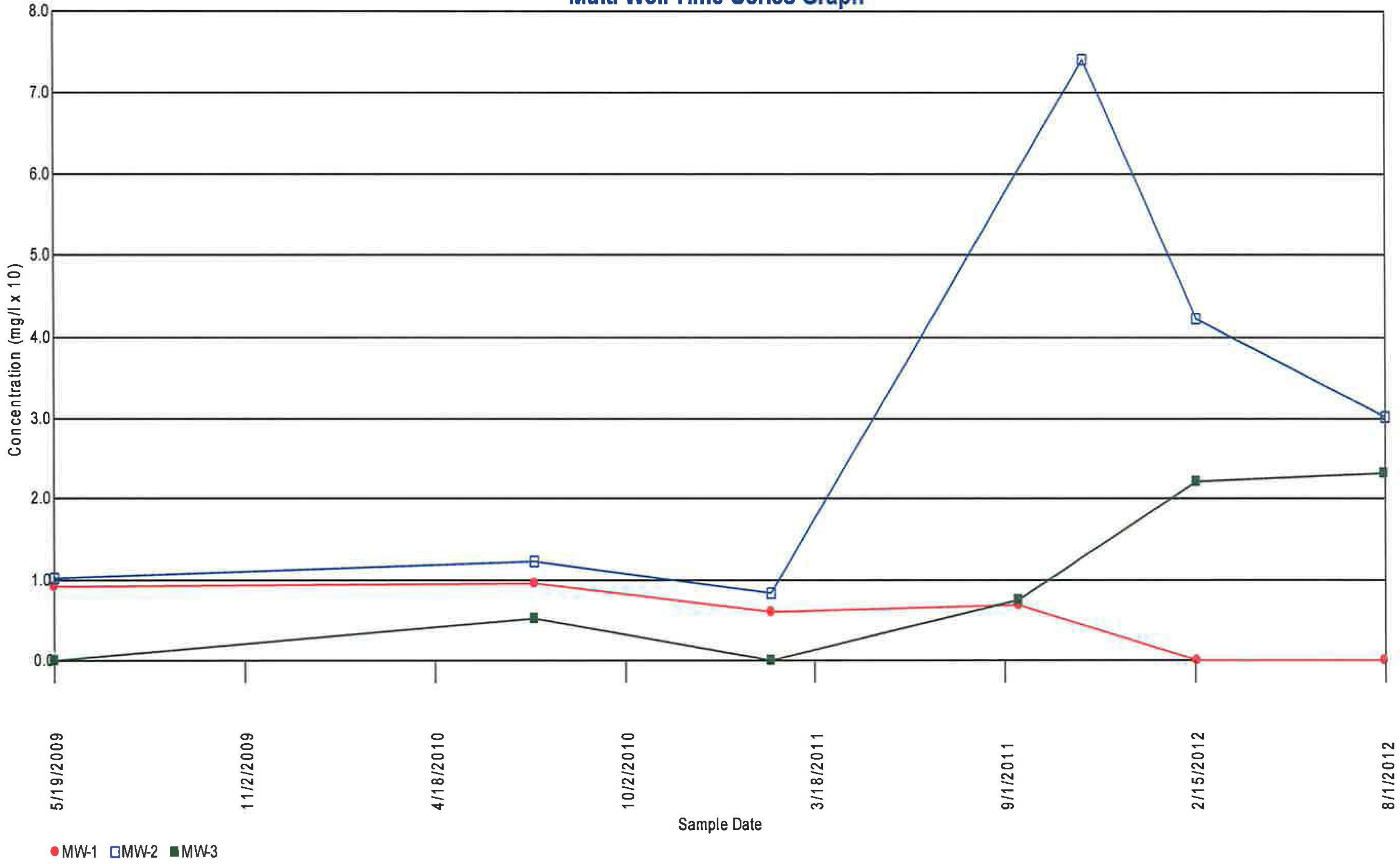
Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-3

Background mean = 2.48889; Std Dev = 0.442844; k = 1; h = 5; SCL = 4.5



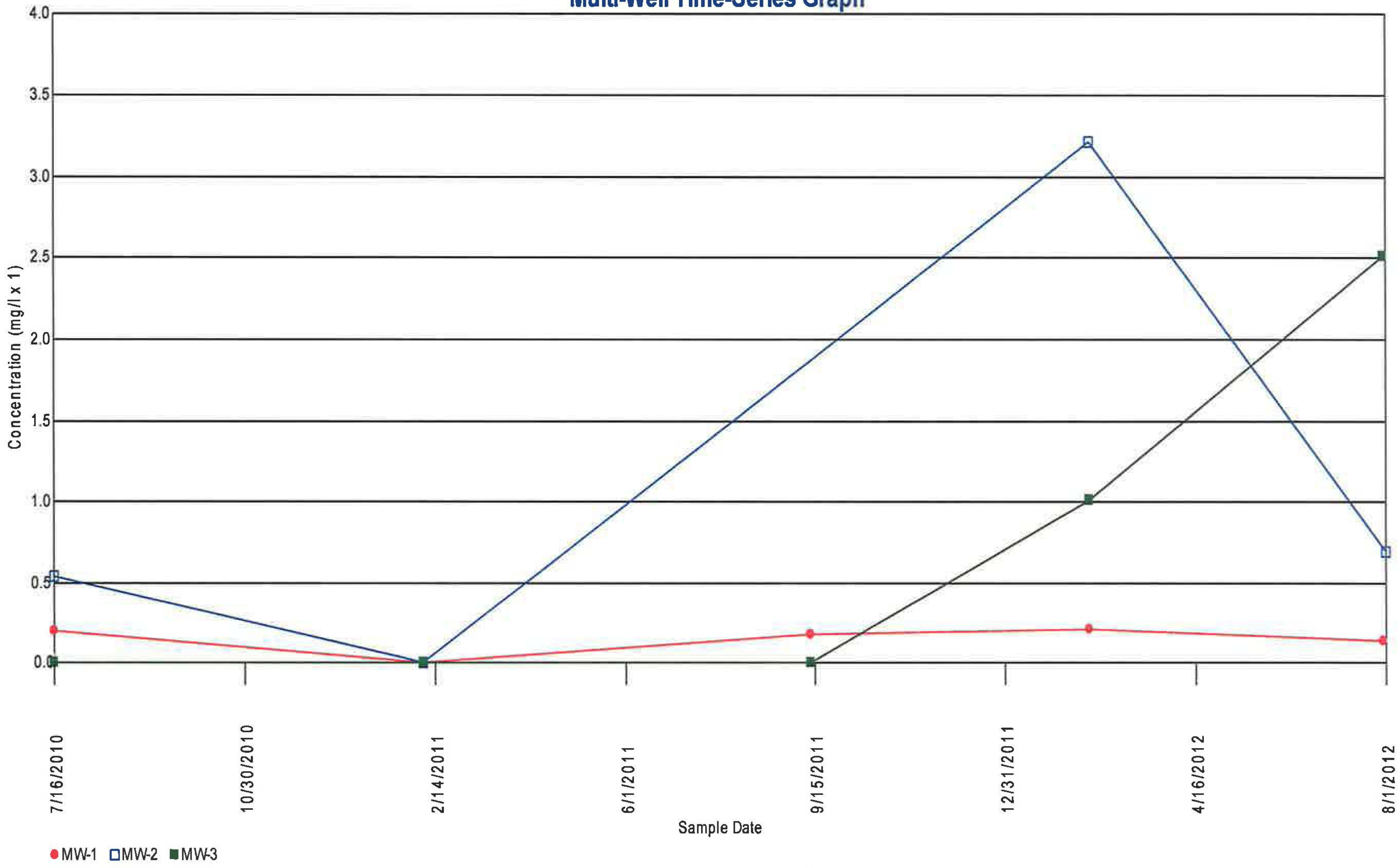
Sulfate

Multi-Well Time-Series Graph



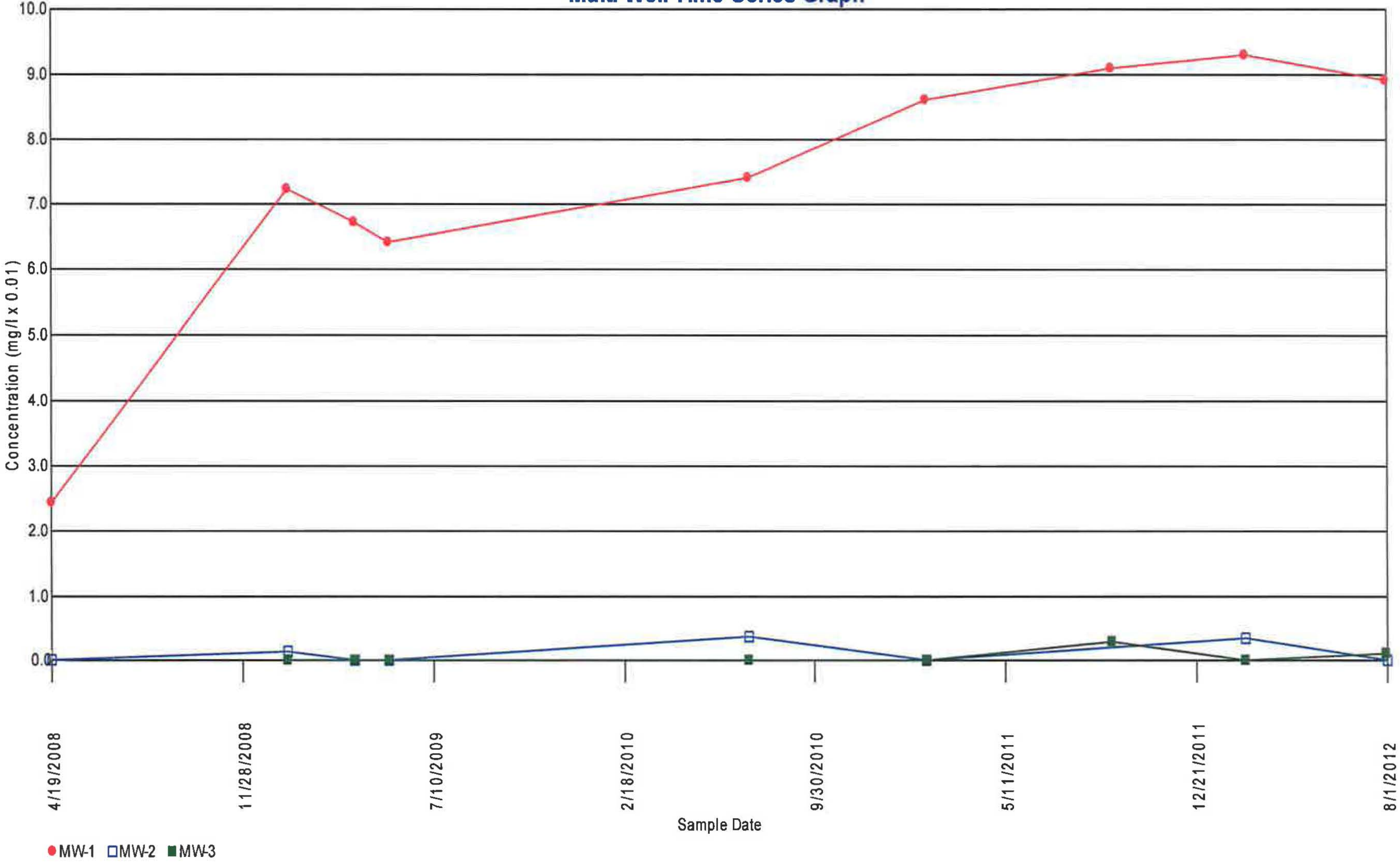
Ammonia Nitrogen

Multi-Well Time-Series Graph



Arsenic

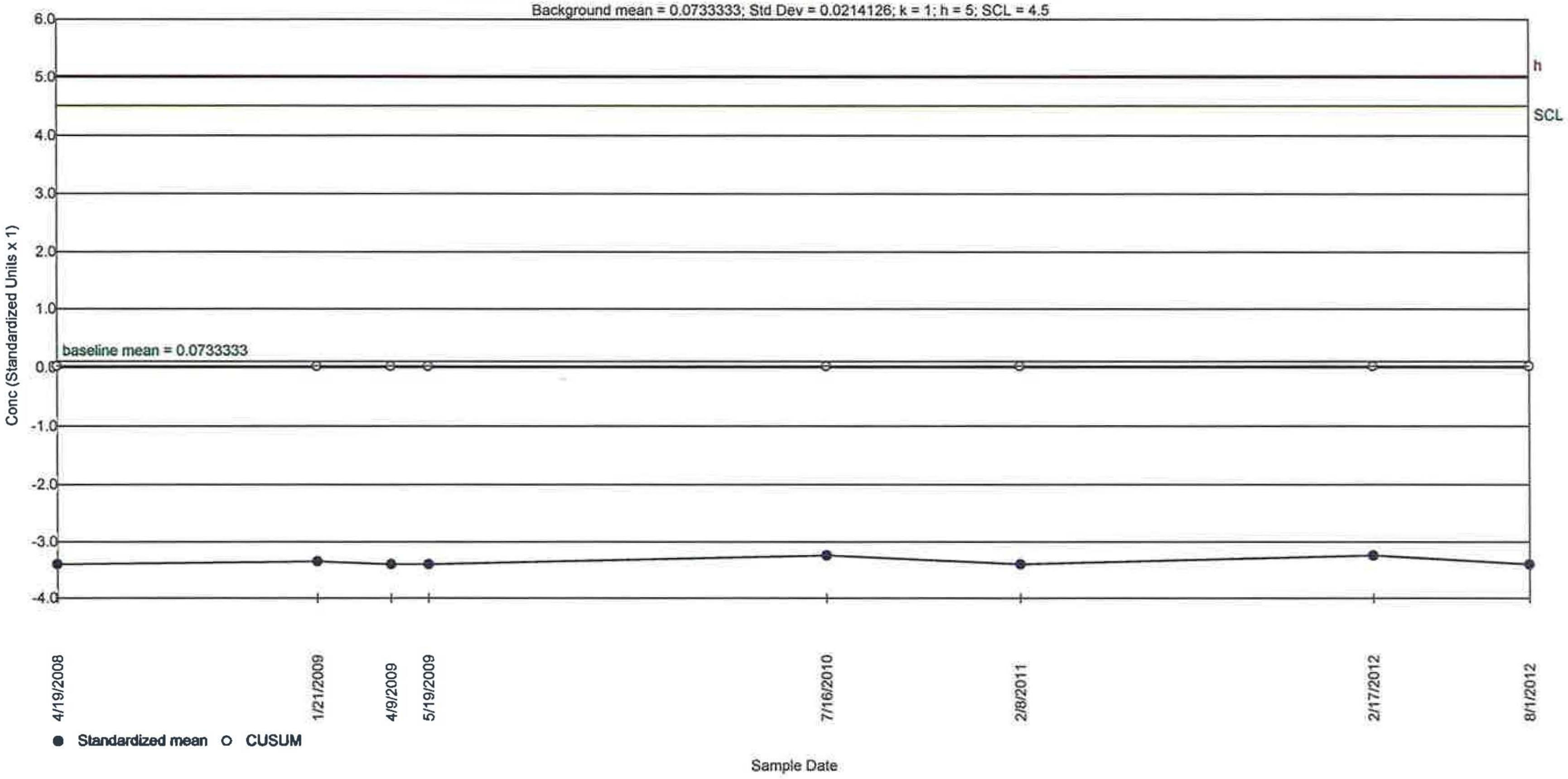
Multi-Well Time-Series Graph



Arsenic

Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-2

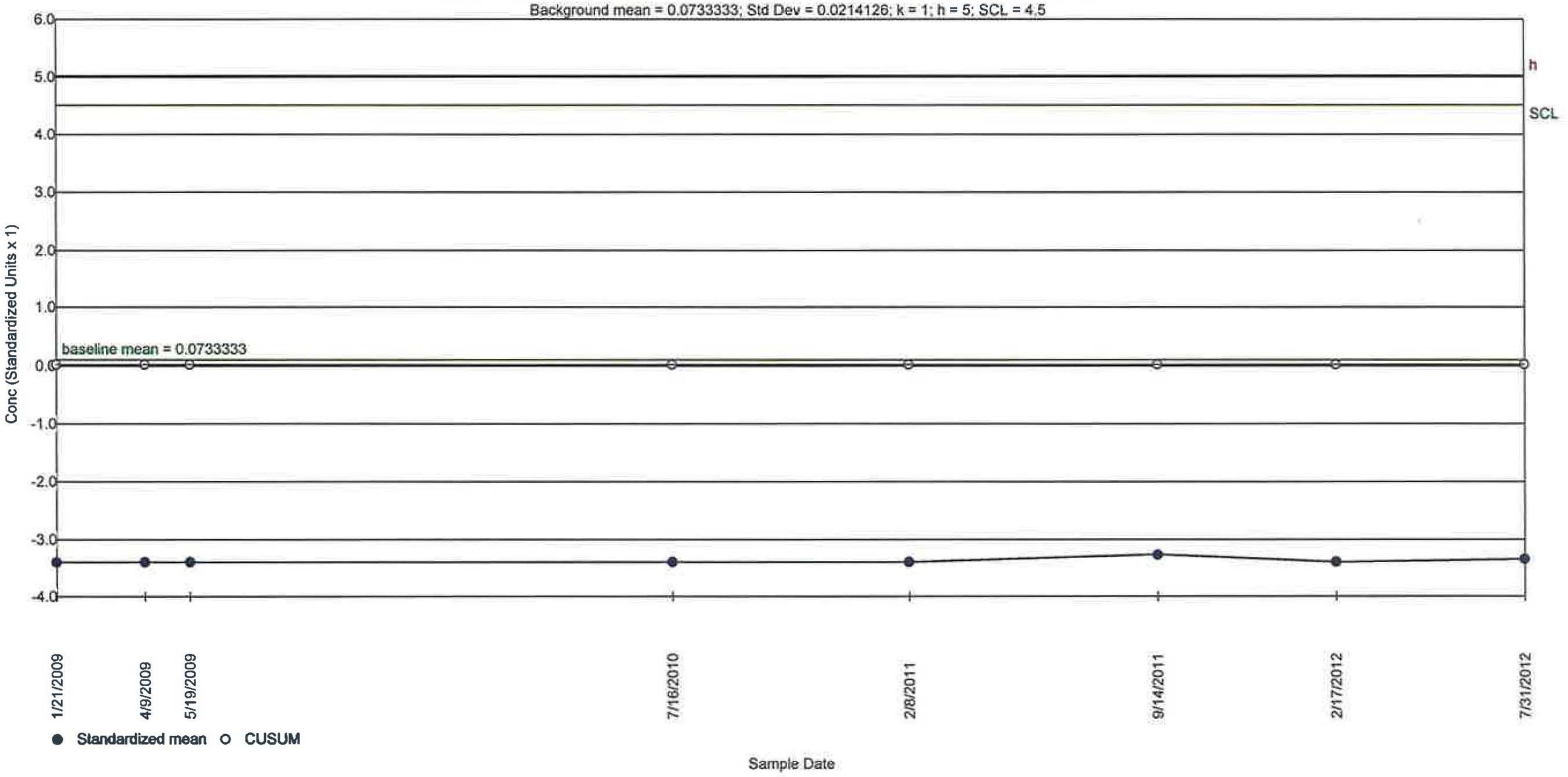
Background mean = 0.0733333; Std Dev = 0.0214126; k = 1; h = 5; SCL = 4.5



Arsenic

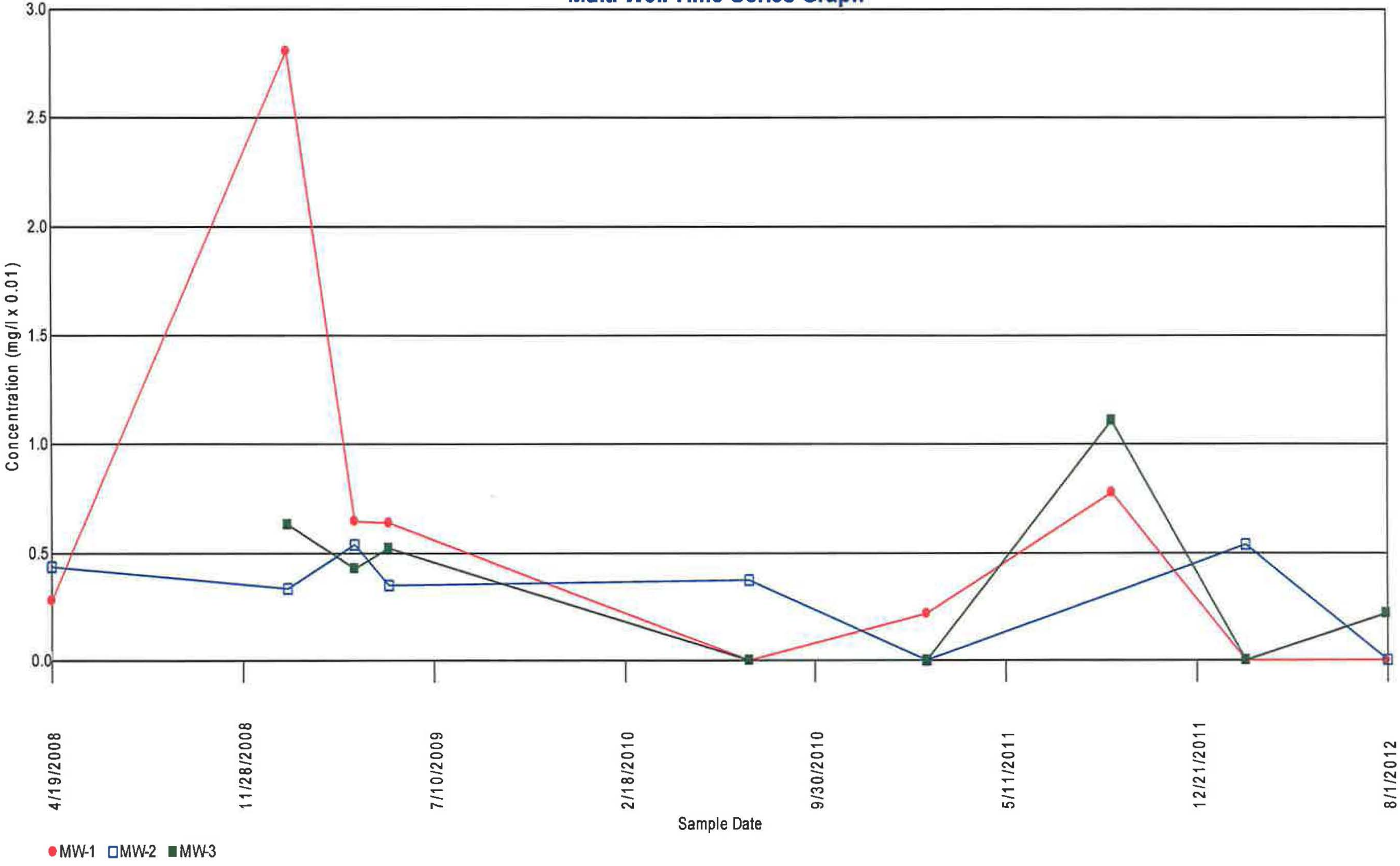
Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-3

Background mean = 0.0733333; Std Dev = 0.0214126; k = 1; h = 5; SCL = 4.5



Copper

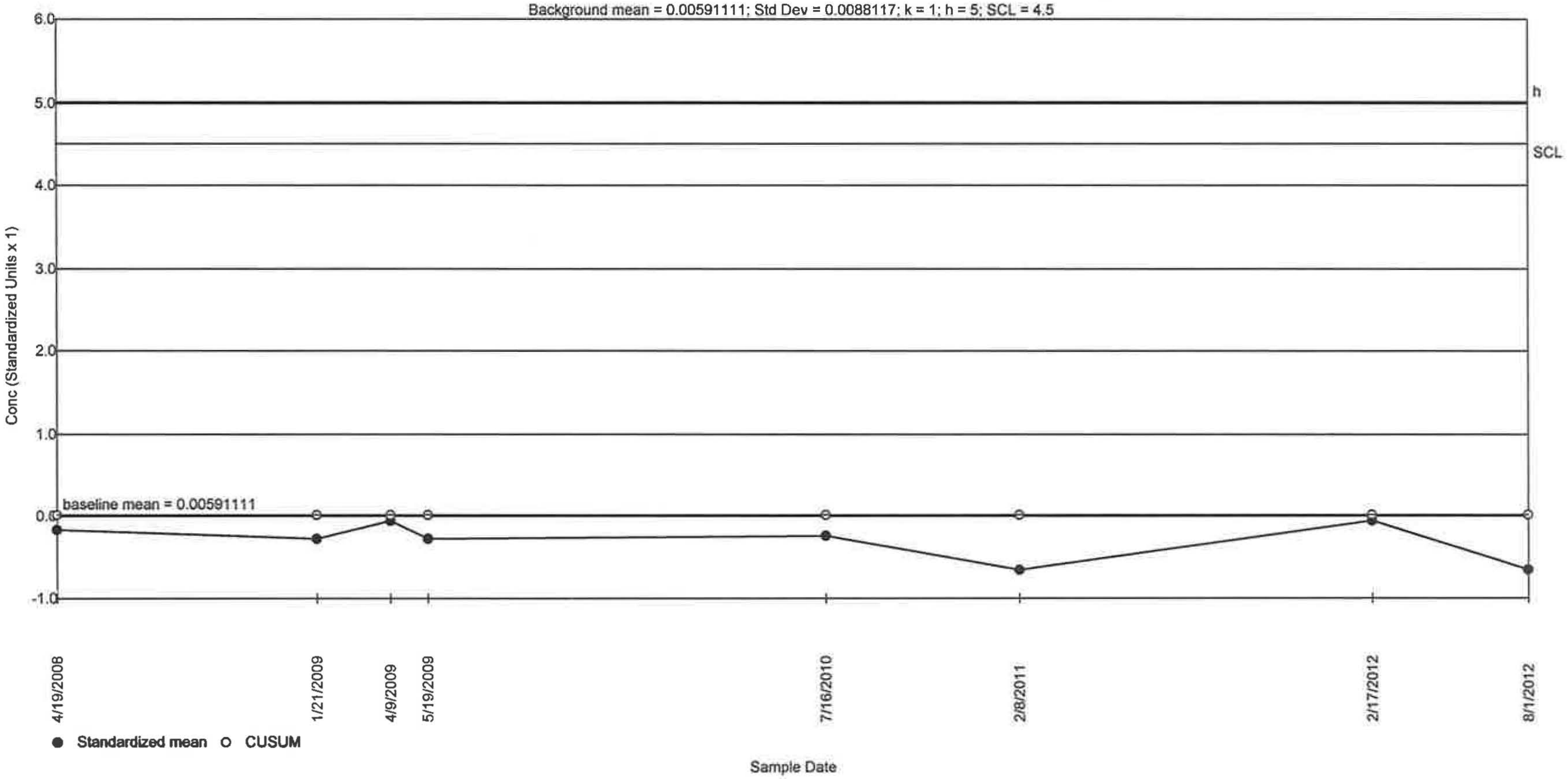
Multi-Well Time-Series Graph



Copper

Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-2

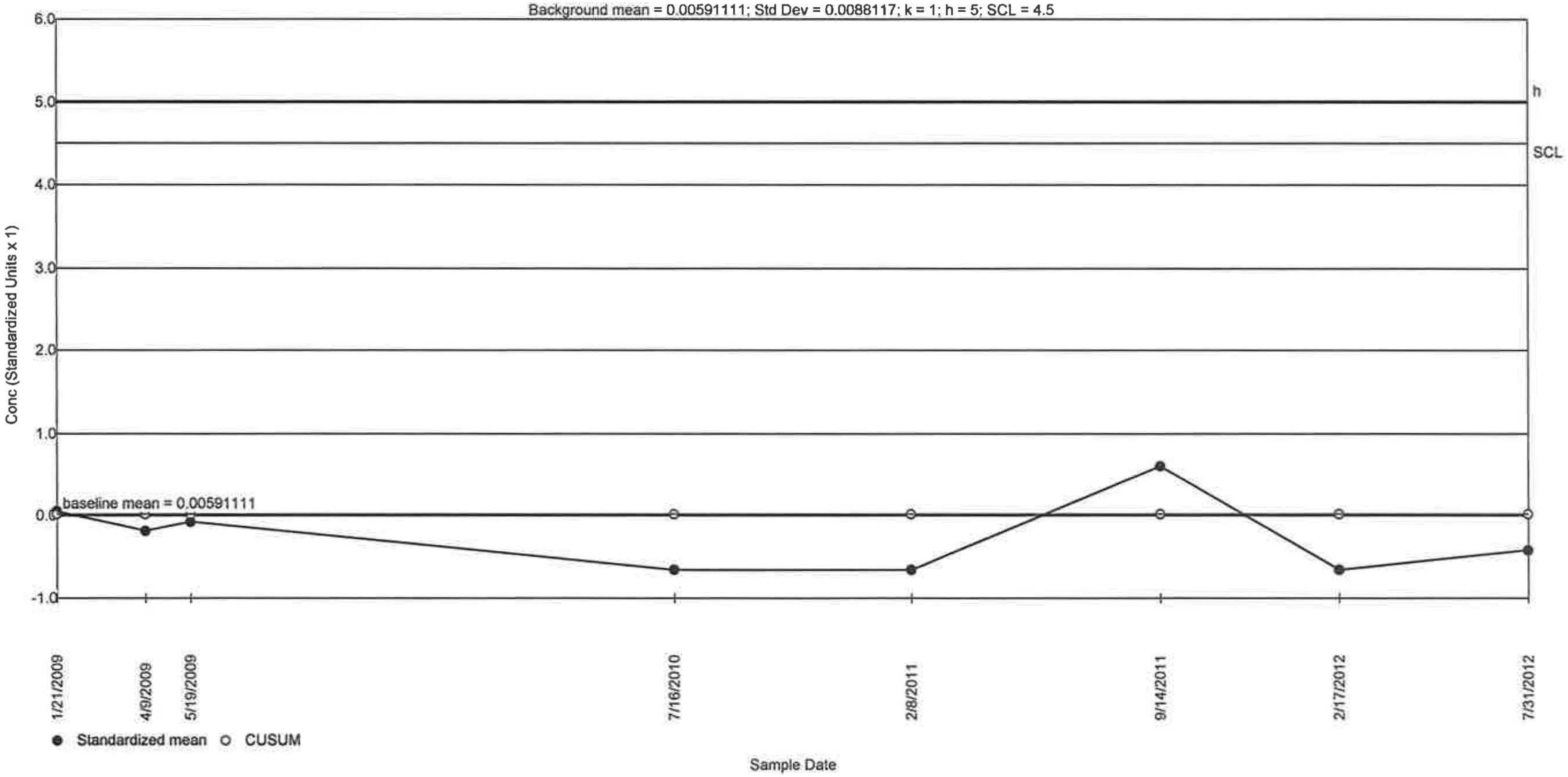
Background mean = 0.00591111; Std Dev = 0.0088117; k = 1; h = 5; SCL = 4.5



Copper

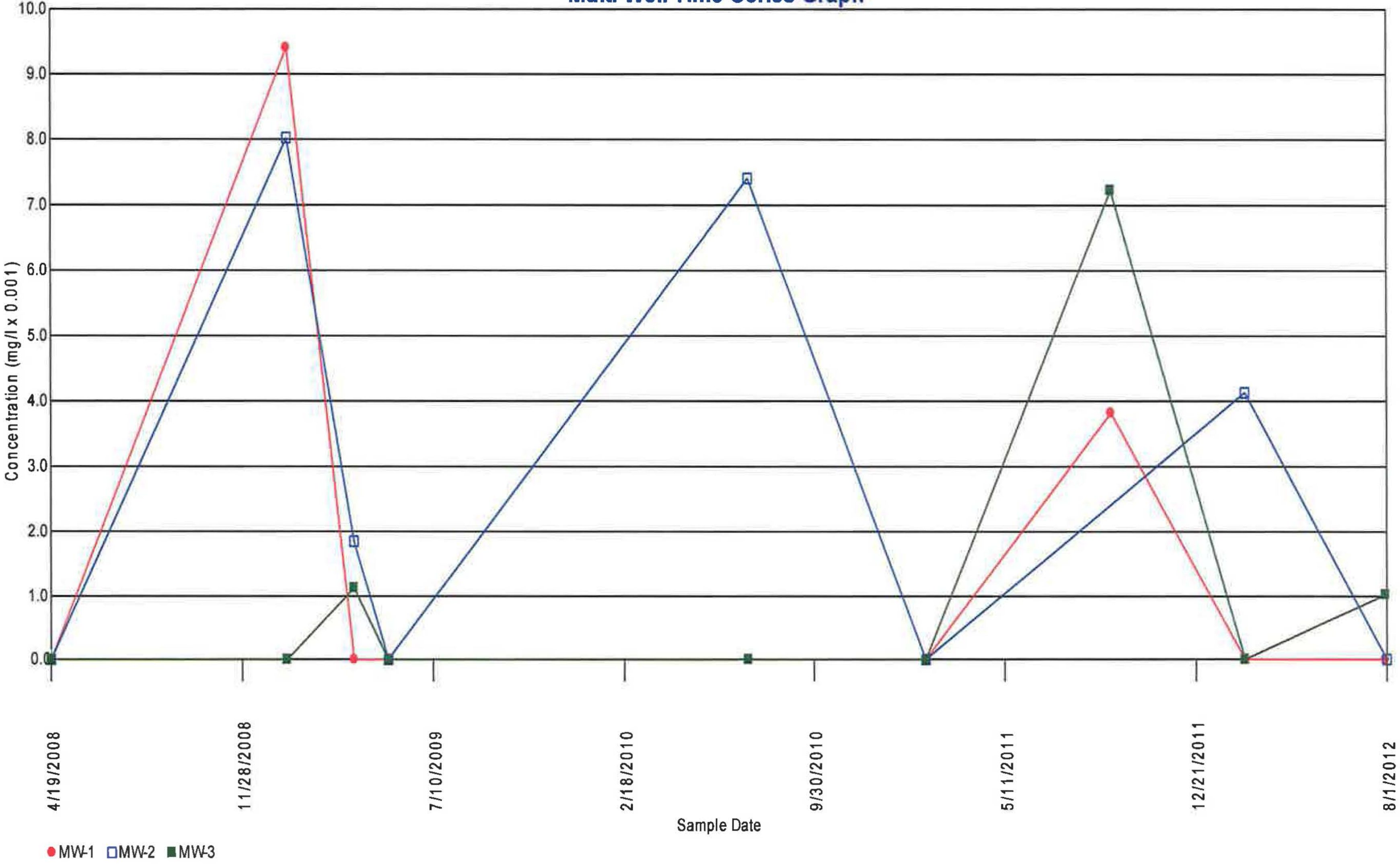
Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-3

Background mean = 0.00591111; Std Dev = 0.0088117; k = 1; h = 5; SCL = 4.5



Lead

Multi-Well Time-Series Graph



Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Lead

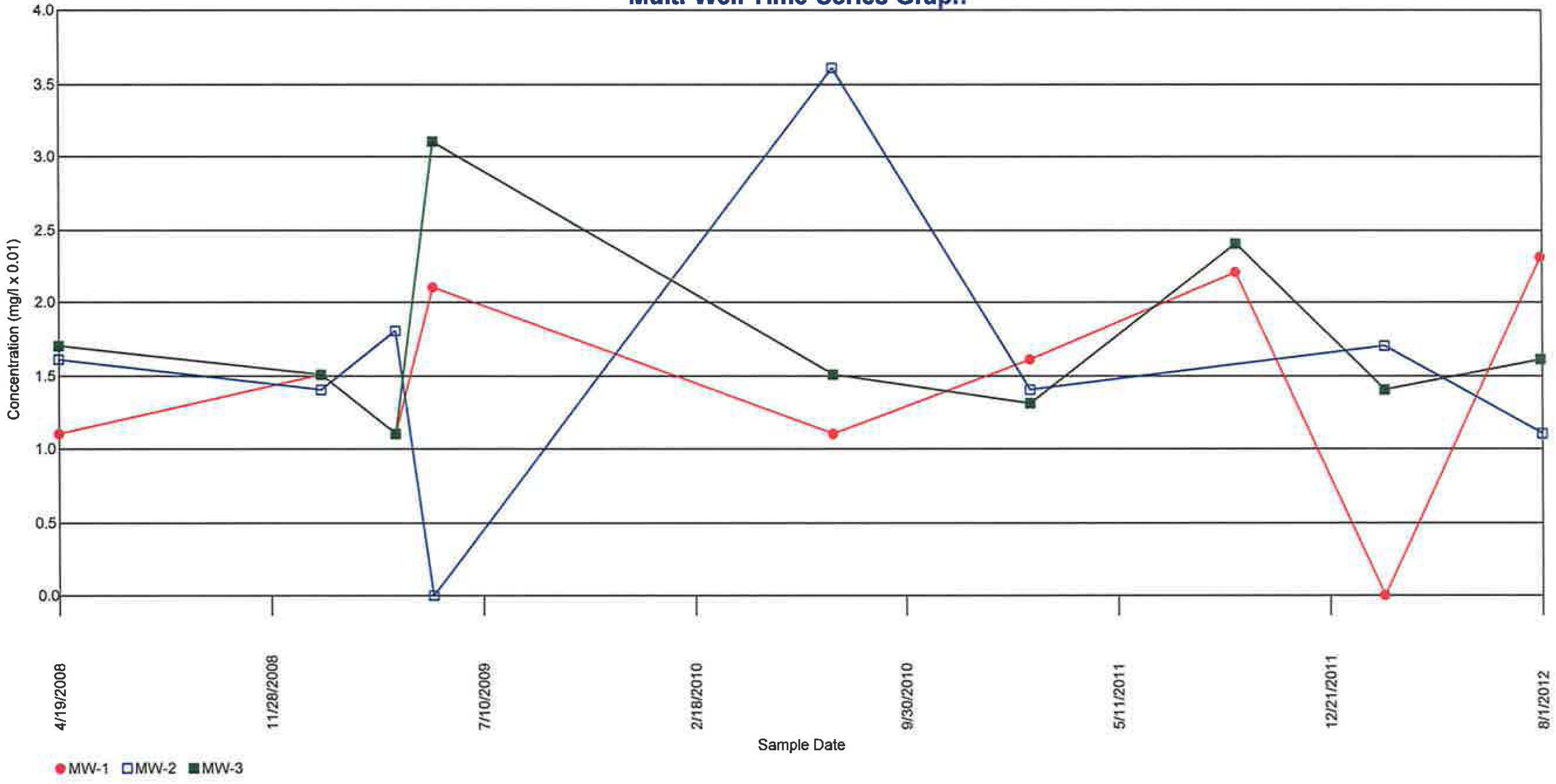
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 65.3846%
Number of comparisons = 2
Future Samples (k) = 2
Recent Dates = 1
Background Samples (n) = 9
Maximum Background Concentration = 0.0094
Confidence Level = 81.8%
False Positive Rate = 18.2%

Well	Date	Samples	Mean	Impacted
MW-2	8/1/2012	1	0	FALSE
MW-3	7/31/2012	1	0.001	FALSE

Zinc

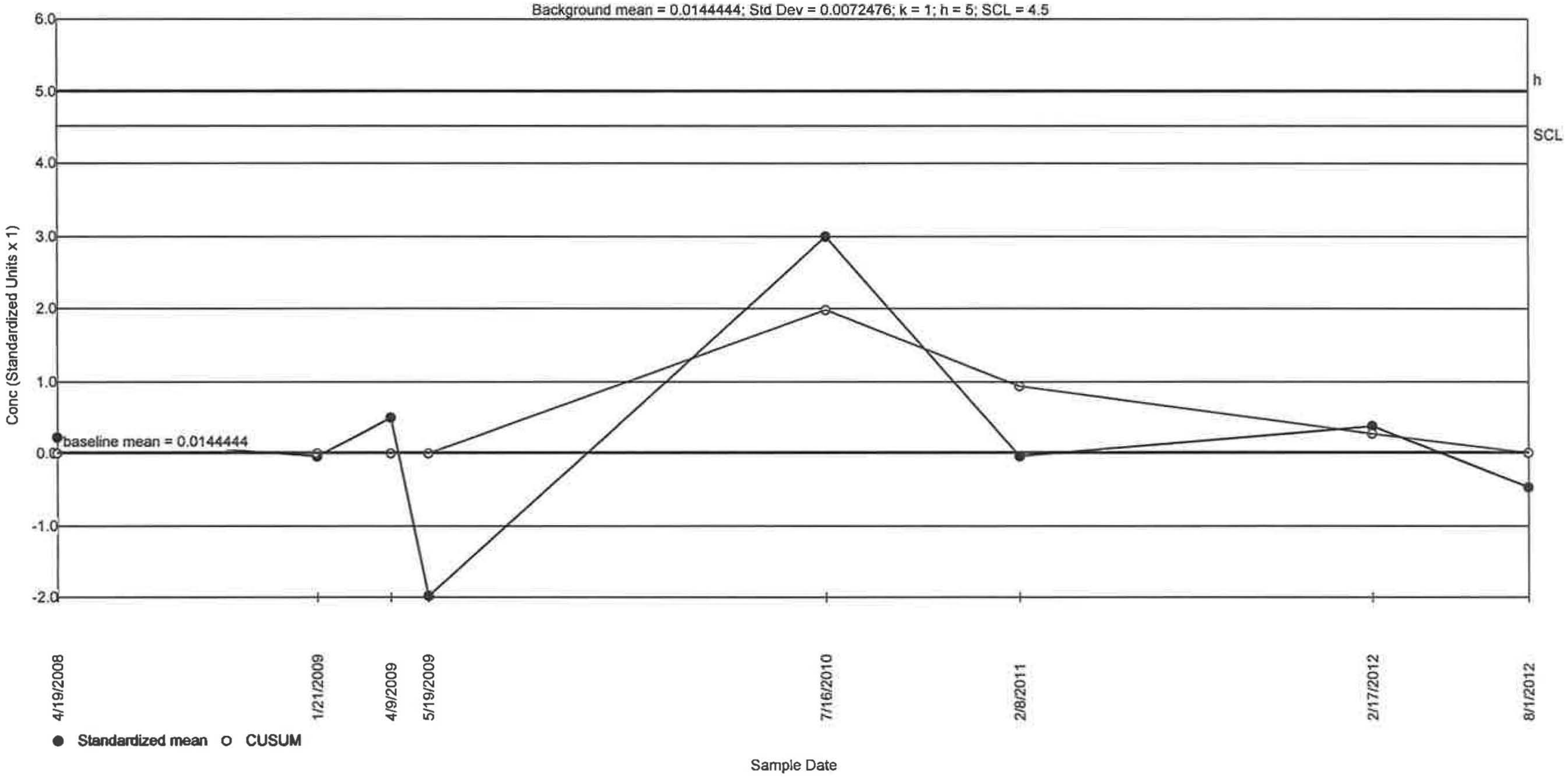
Multi-Well Time-Series Graph



Zinc

Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-2

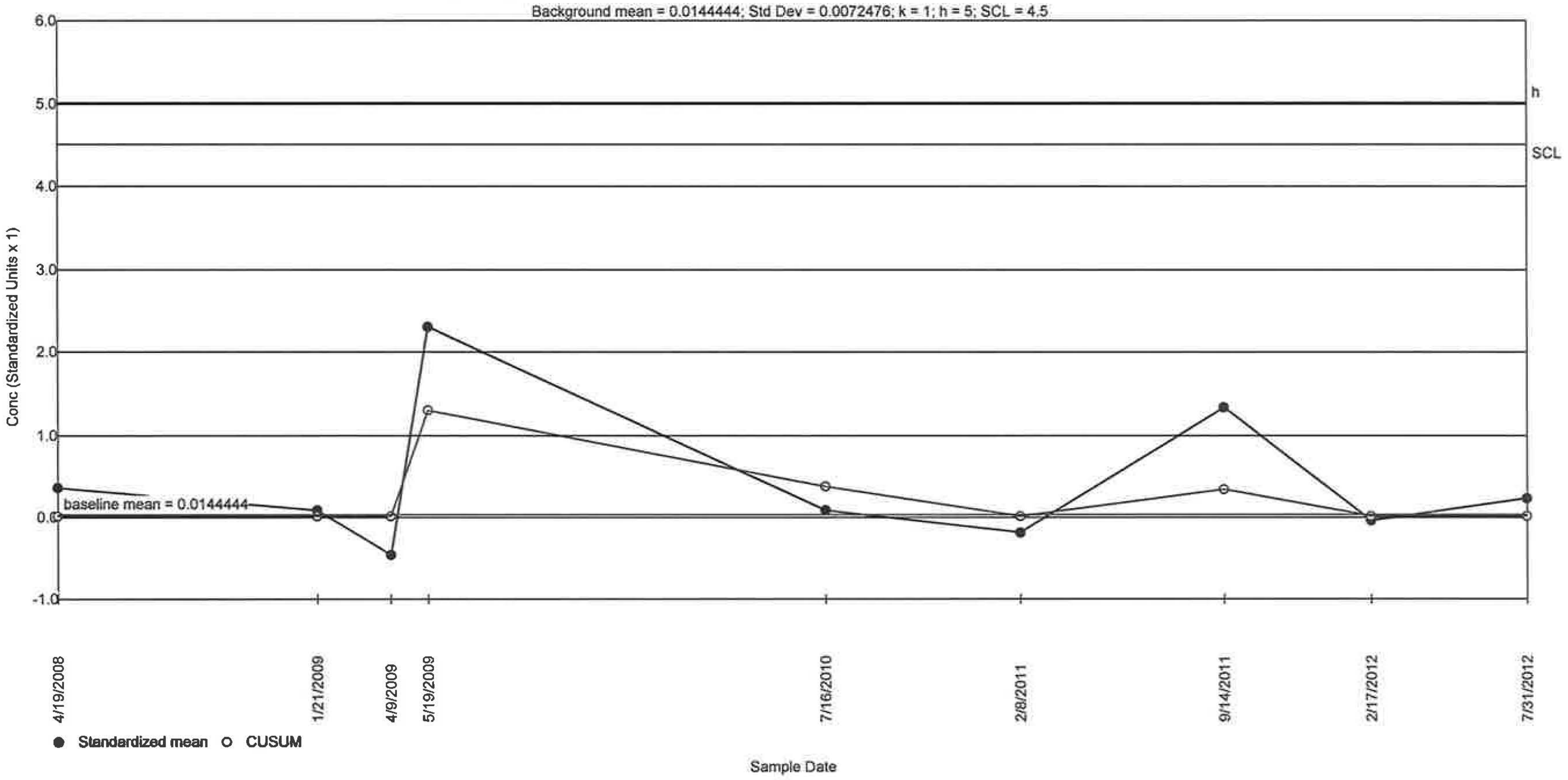
Background mean = 0.0144444; Std Dev = 0.0072476; k = 1; h = 5; SCL = 4.5



Zinc

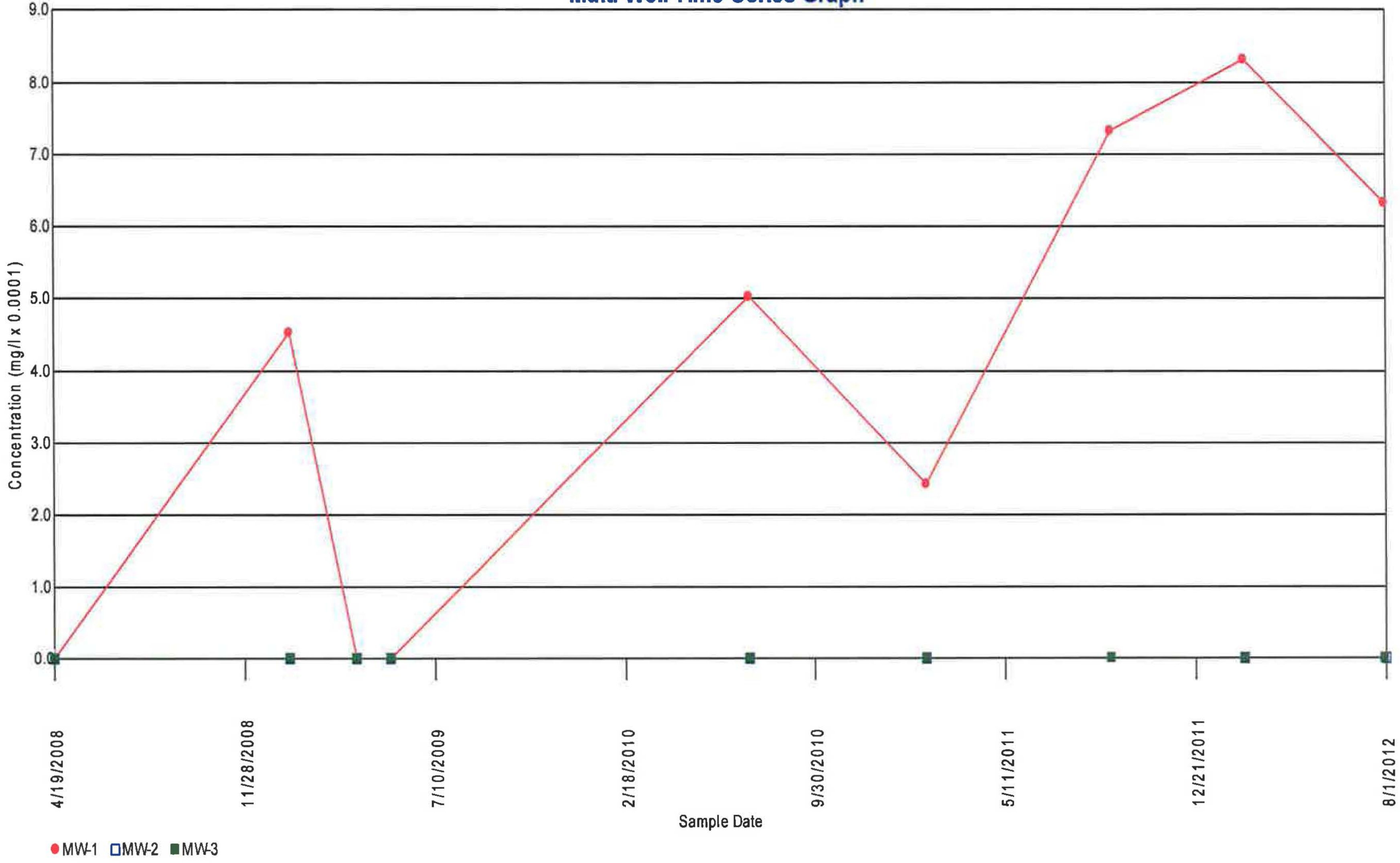
Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-3

Background mean = 0.0144444; Std Dev = 0.0072476; k = 1; h = 5; SCL = 4.5



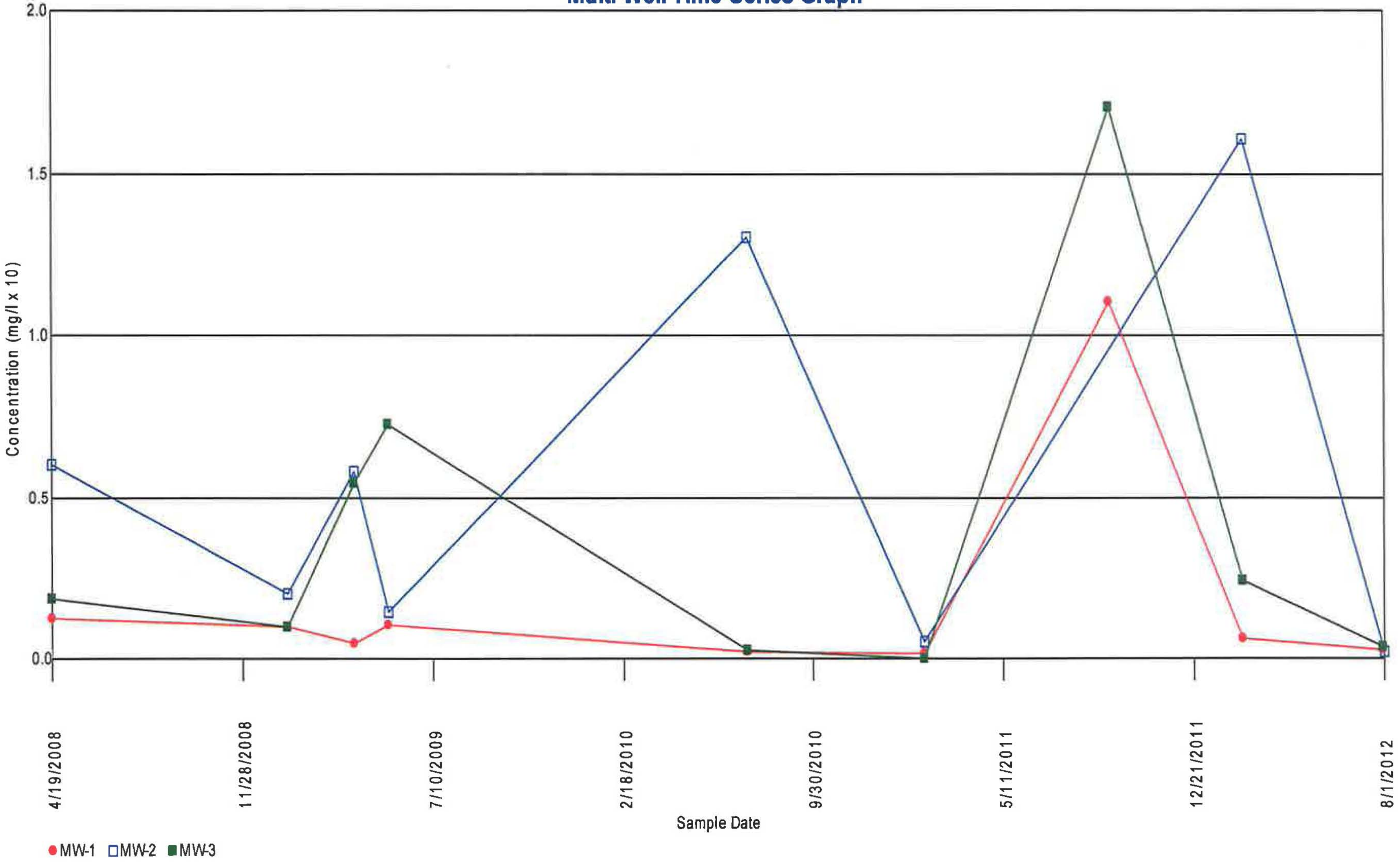
Mercury

Multi-Well Time-Series Graph



Aluminum

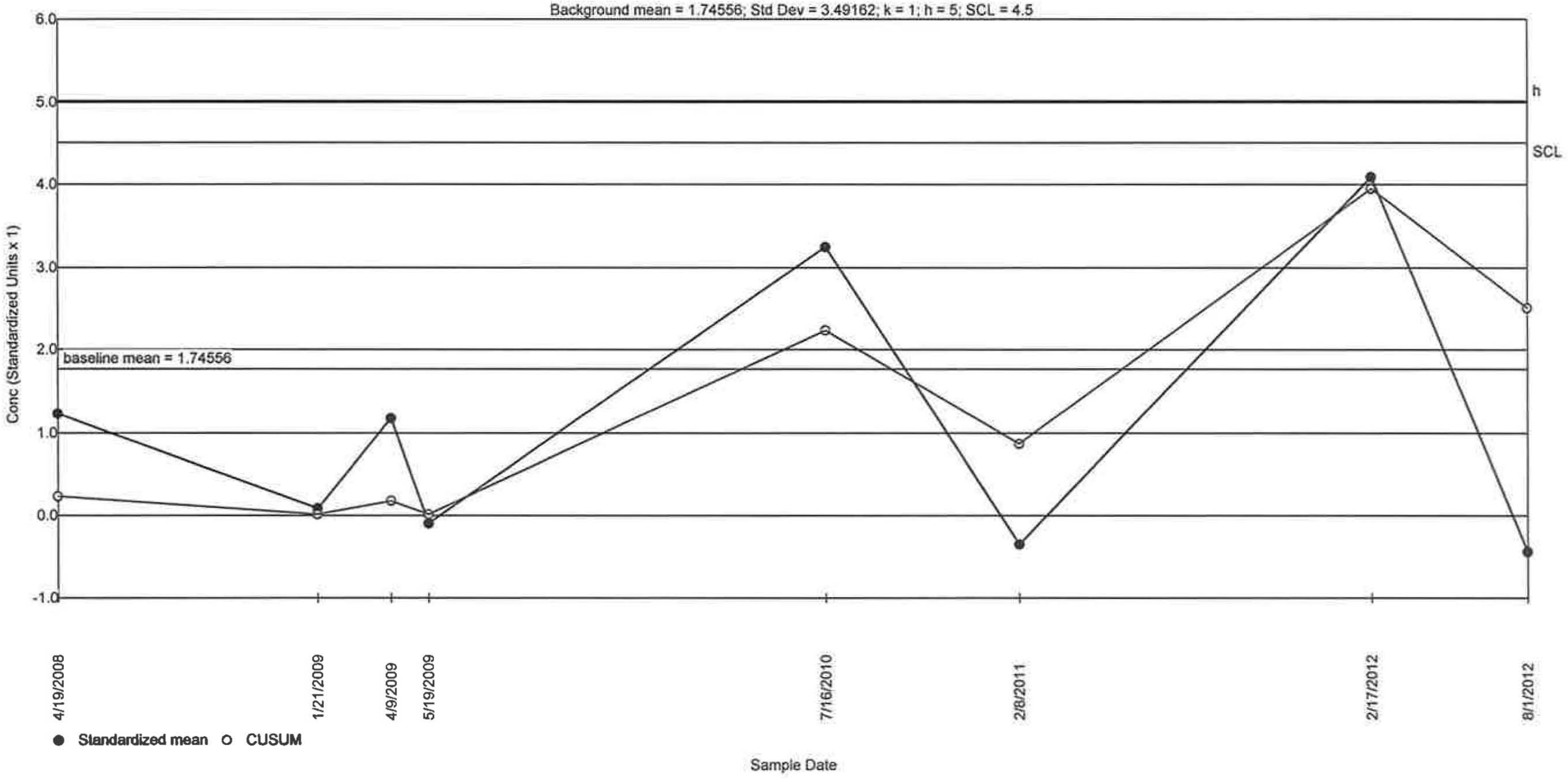
Multi-Well Time-Series Graph



Aluminum

Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-2

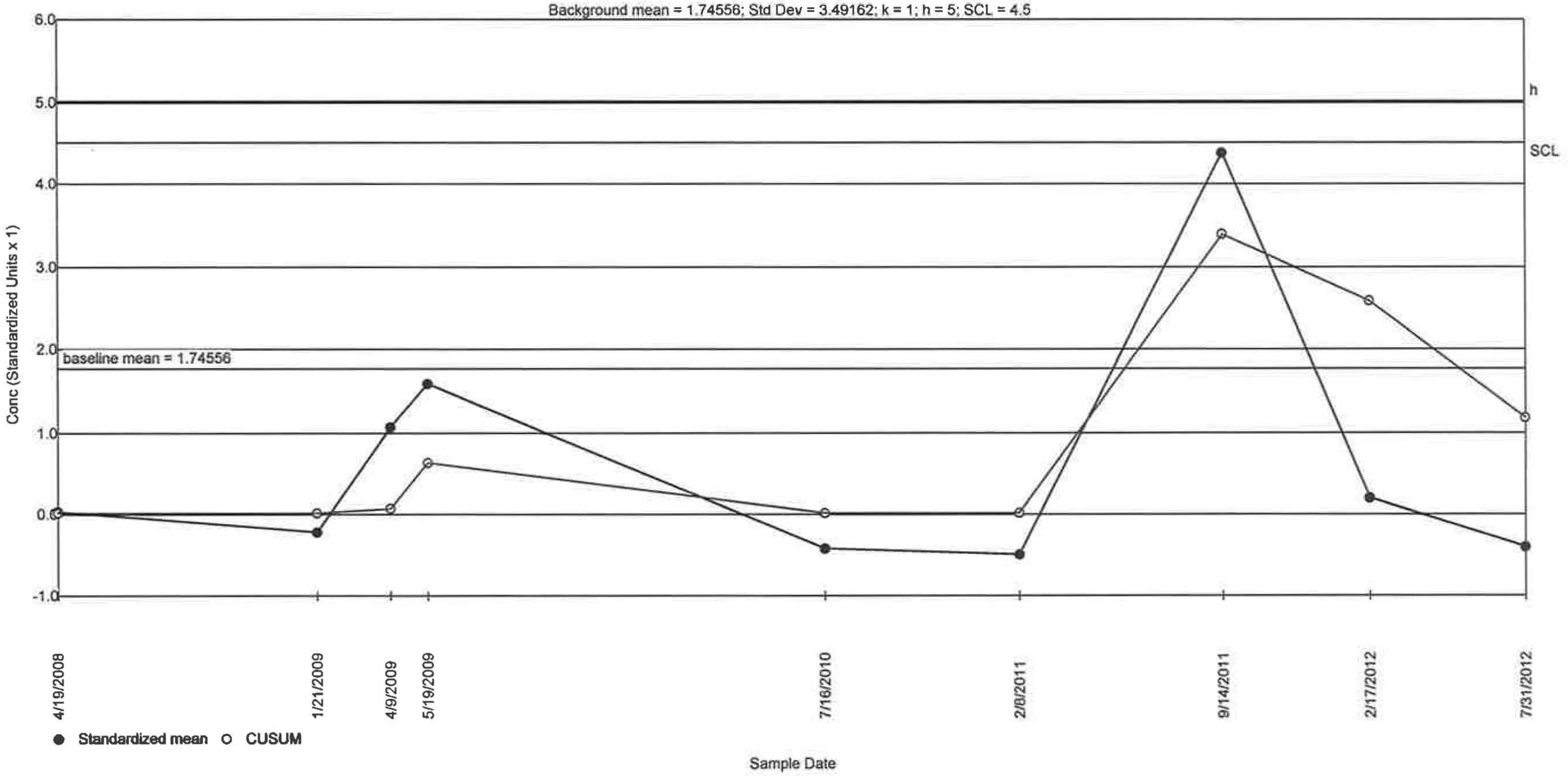
Background mean = 1.74556; Std Dev = 3.49162; k = 1; h = 5; SCL = 4.5



Aluminum

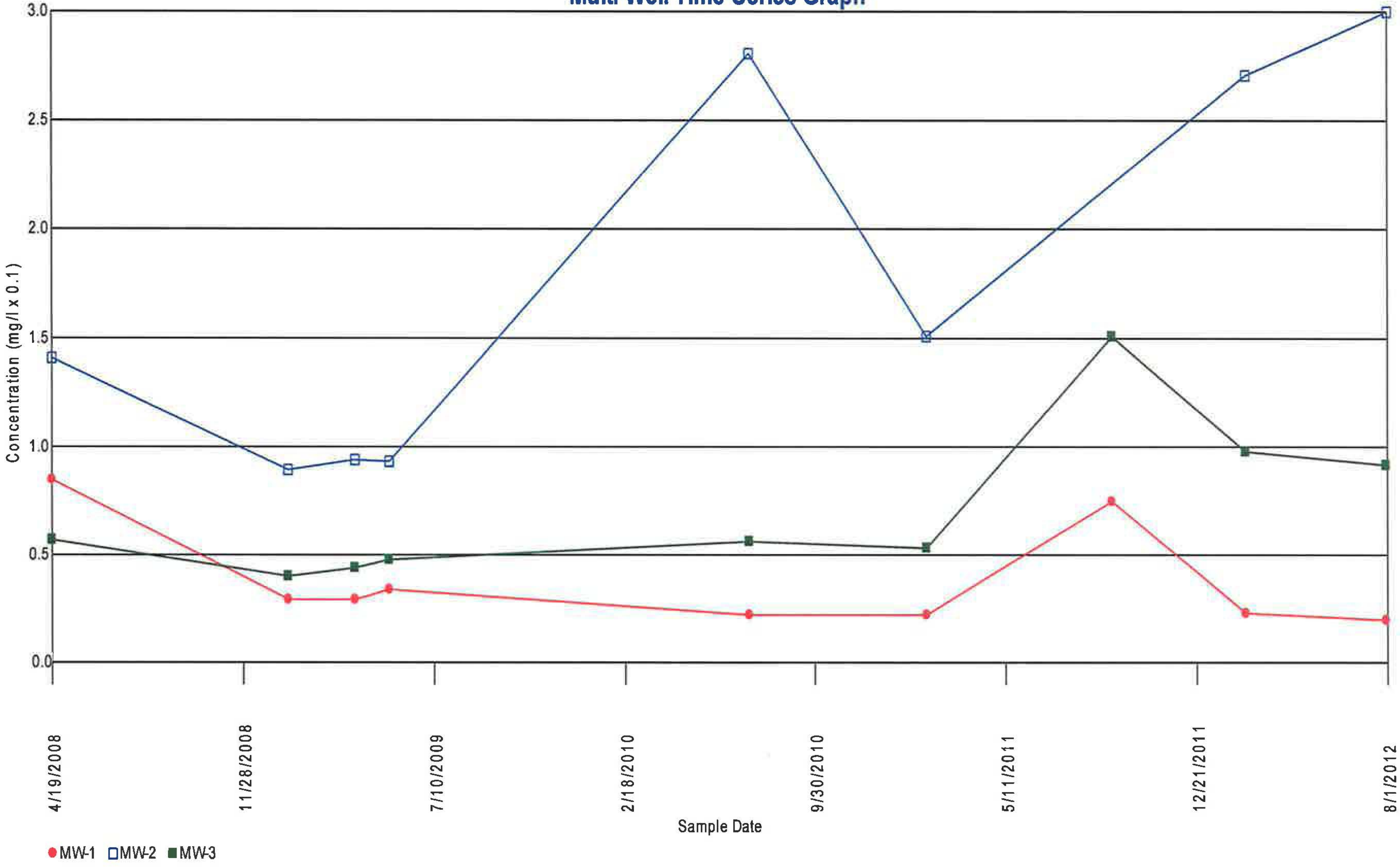
Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-3

Background mean = 1.74556; Std Dev = 3.49162; k = 1; h = 5; SCL = 4.5



Barium

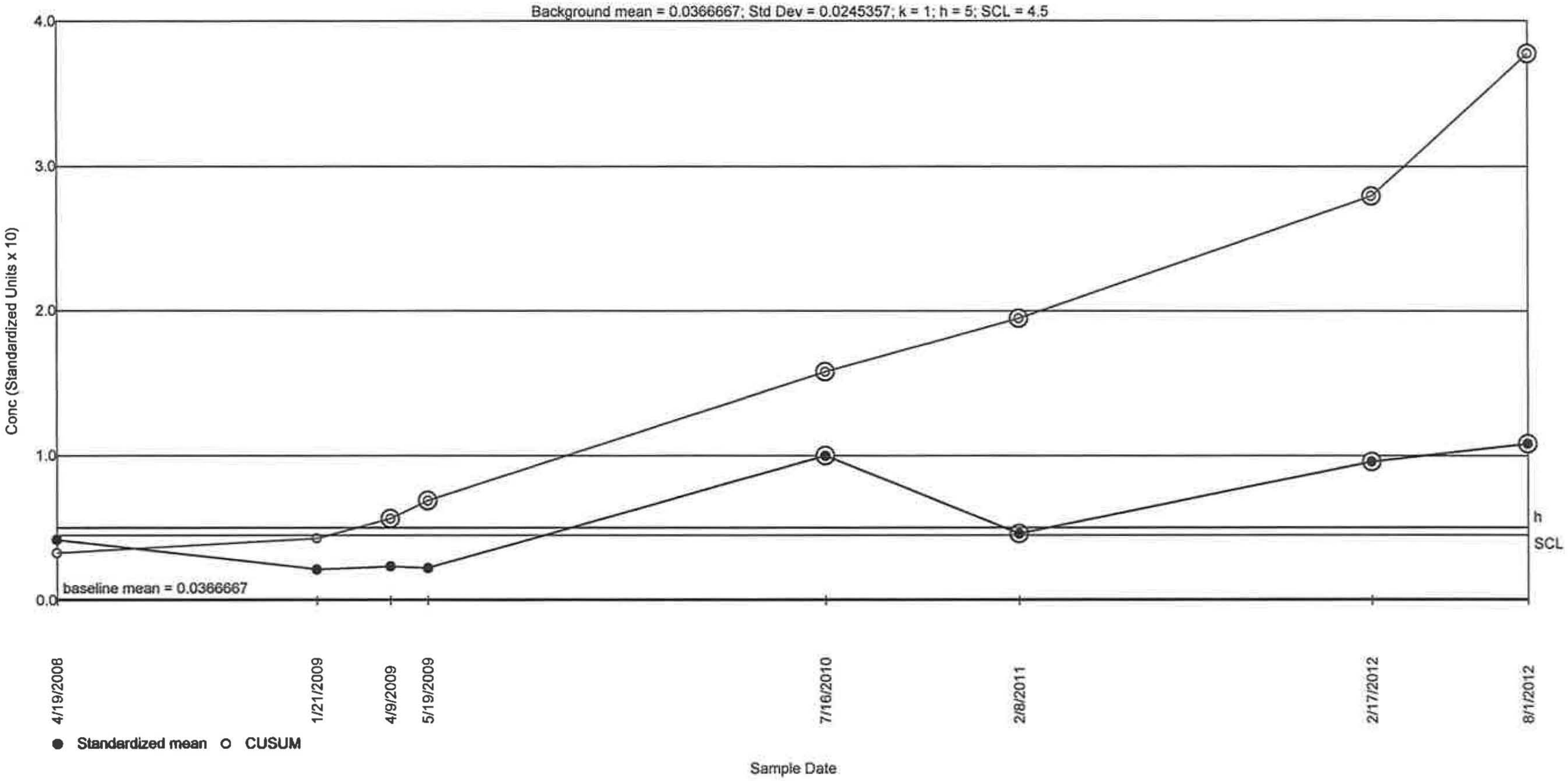
Multi-Well Time-Series Graph



Barium

Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-2

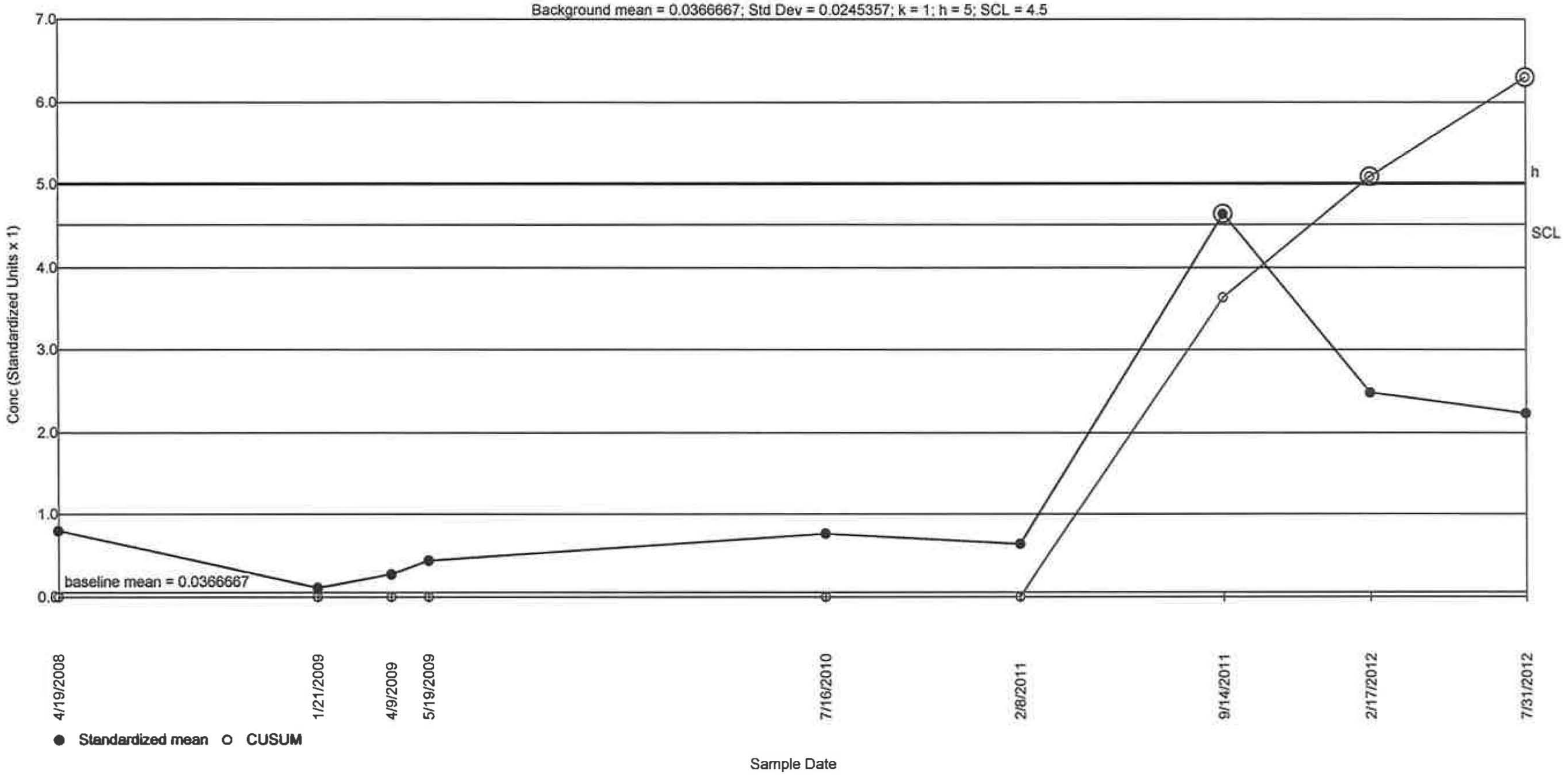
Background mean = 0.0366667; Std Dev = 0.0245357; k = 1; h = 5; SCL = 4.5



Barium

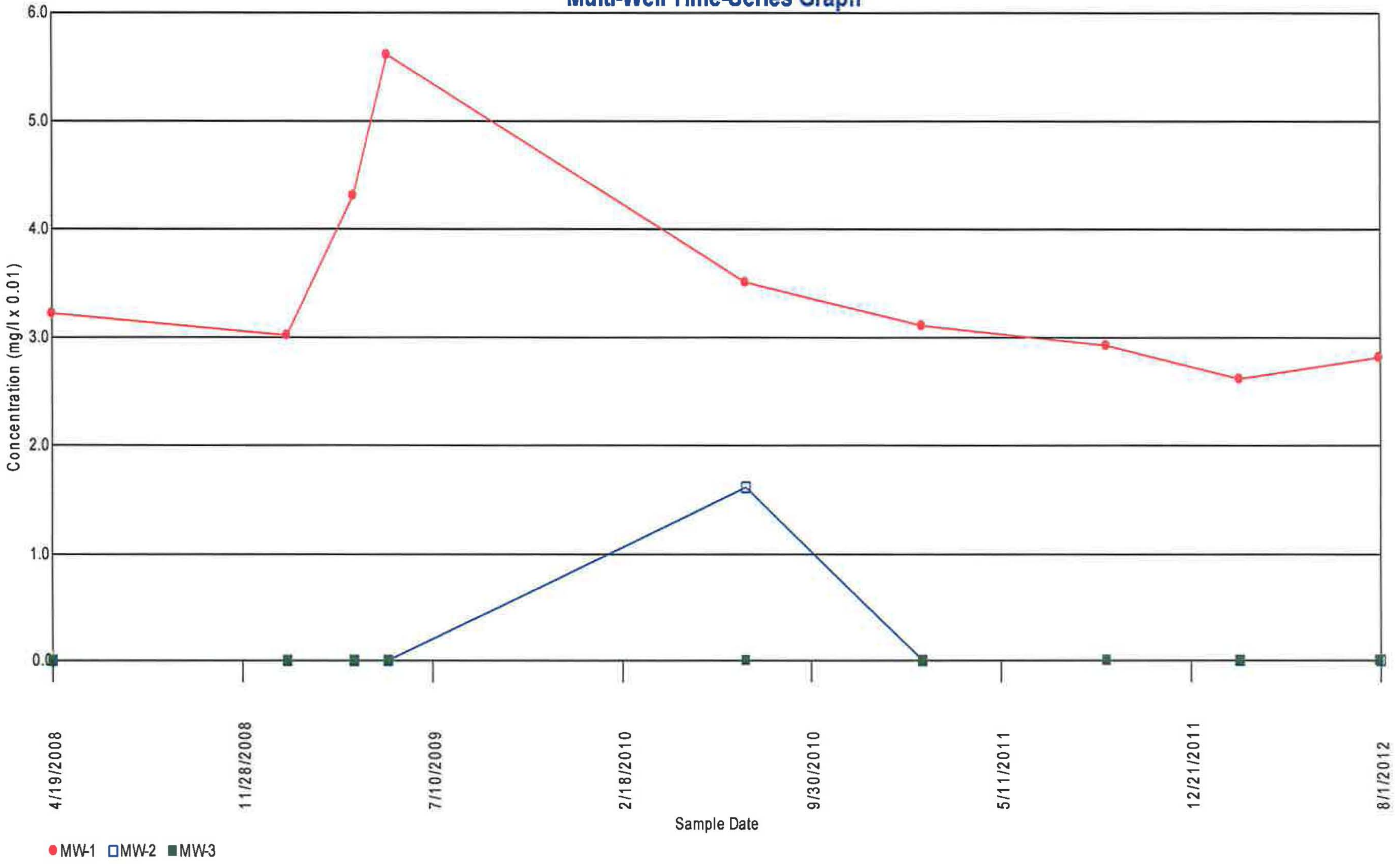
Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-3

Background mean = 0.0366667; Std Dev = 0.0245357; k = 1; h = 5; SCL = 4.5



Cobalt

Multi-Well Time-Series Graph



Non-Parametric Prediction Interval

Inter-Well Comparison

Parameter: Cobalt

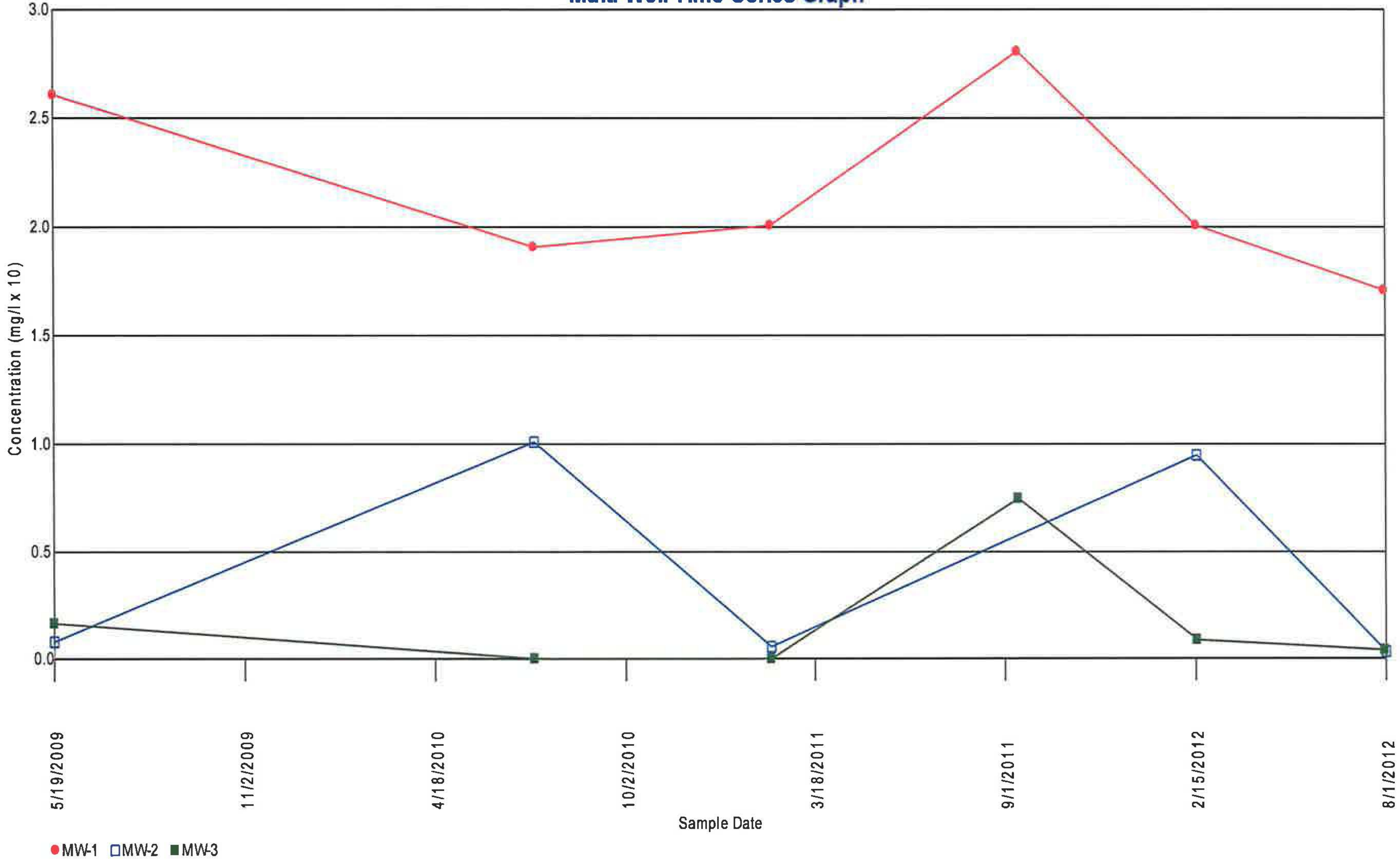
Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 61.5385%
Number of comparisons = 2
Future Samples (k) = 2
Recent Dates = 1
Background Samples (n) = 9
Maximum Background Concentration = 0.056
Confidence Level = 81.8%
False Positive Rate = 18.2%

Well	Date	Samples	Mean	Impacted
MW-2	8/1/2012	1	0	FALSE
MW-3	7/31/2012	1	0	FALSE

Iron

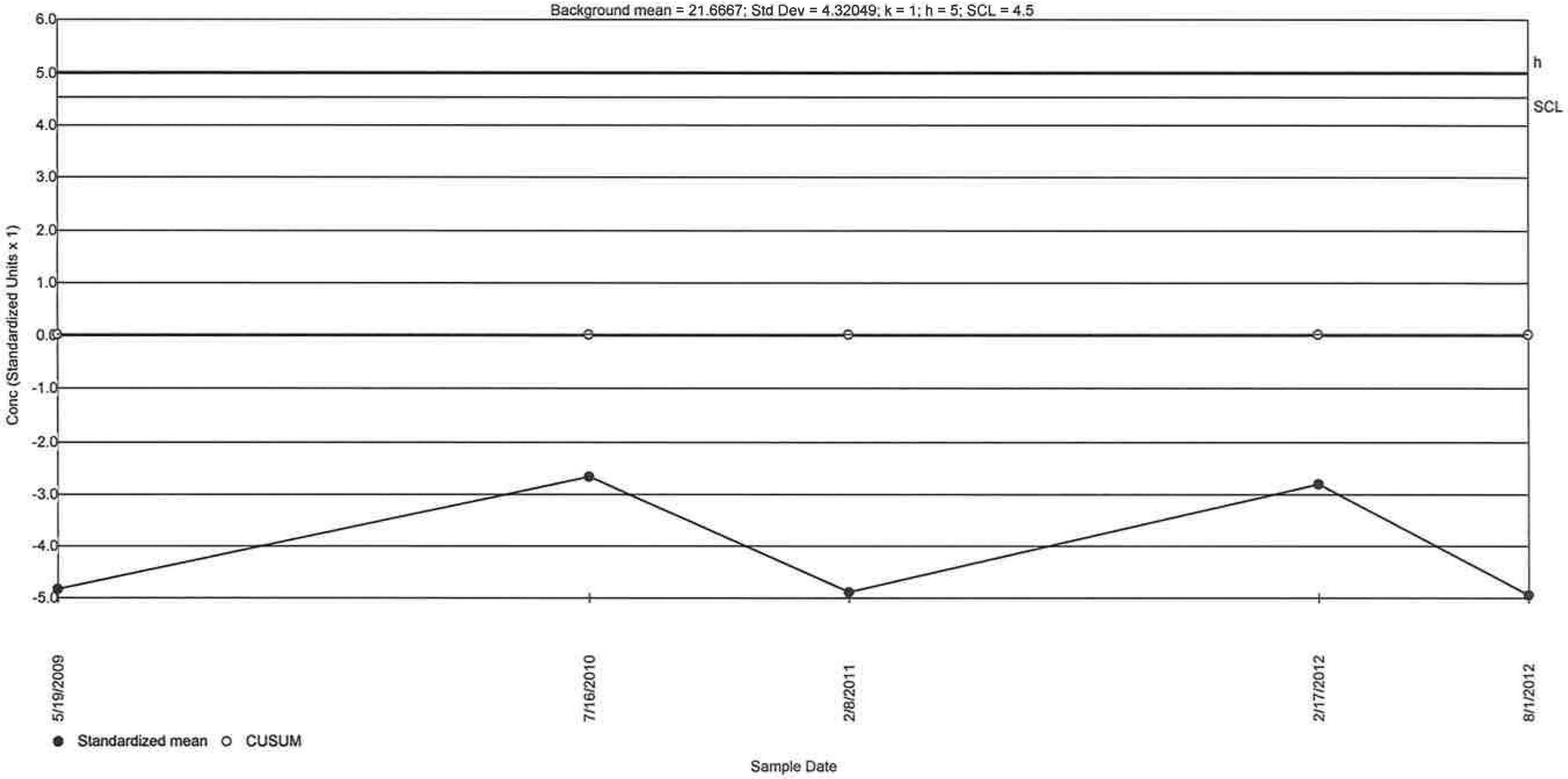
Multi-Well Time-Series Graph



Iron

Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-2

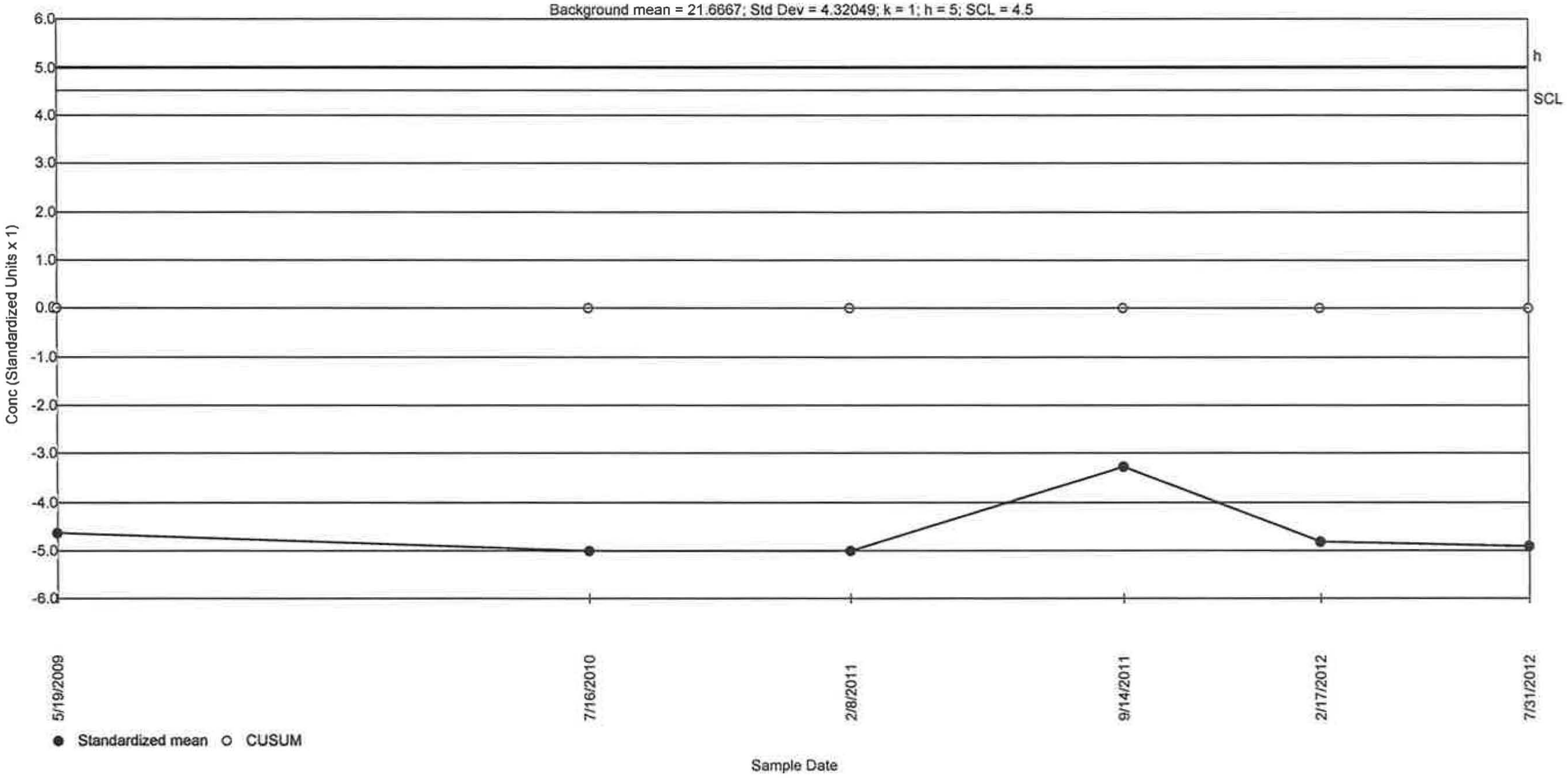
Background mean = 21.6667; Std Dev = 4.32049; k = 1; h = 5; SCL = 4.5



Iron

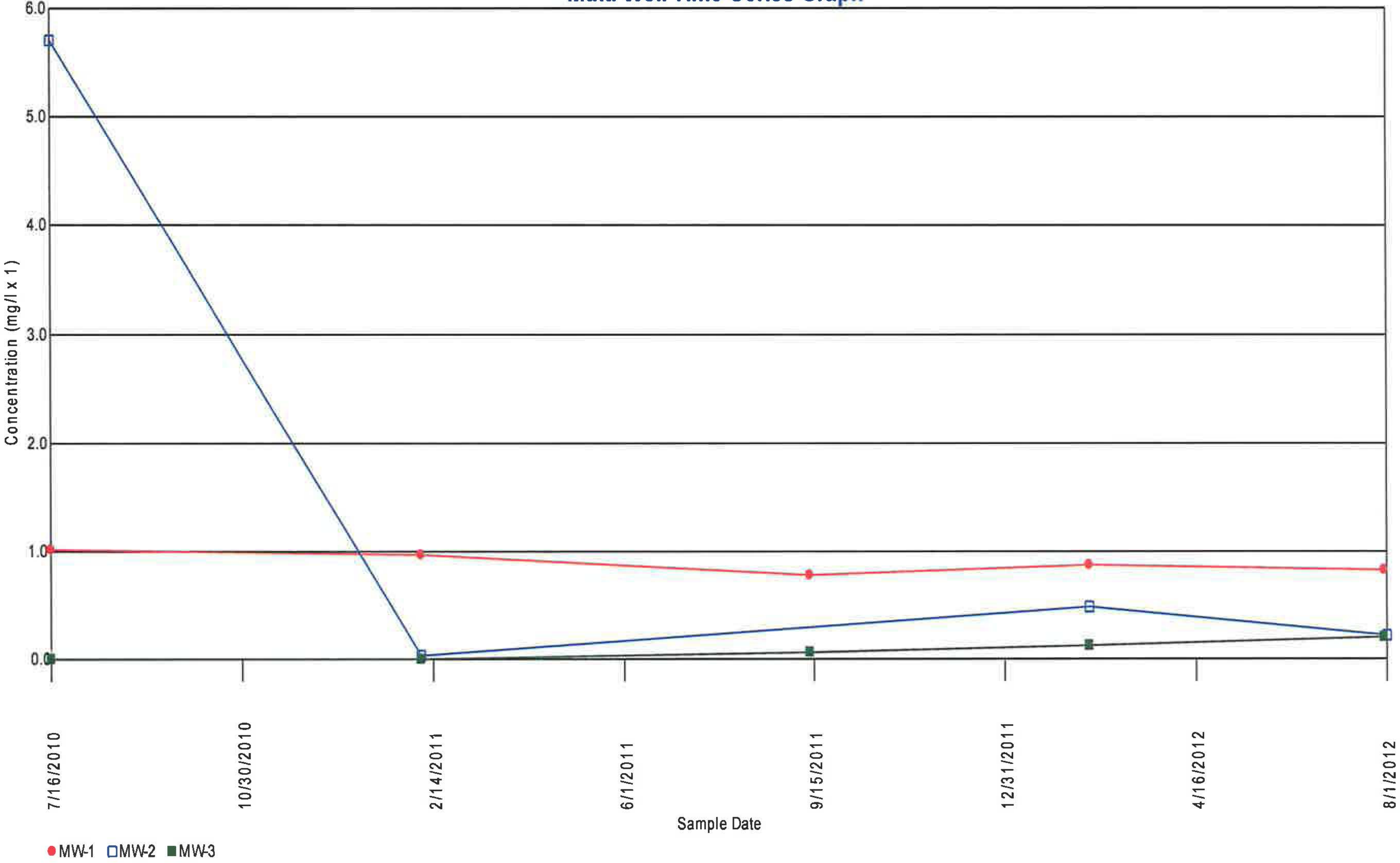
Inter-Well Shewhart-CUSUM Inter-Well Control Chart of MW-3

Background mean = 21.6667; Std Dev = 4.32049; k = 1; h = 5; SCL = 4.5



Manganese

Multi-Well Time-Series Graph



Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Aluminum

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 11
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	Date	Result
	4/19/2008	1.2
	1/21/2009	0.94
	4/9/2009	0.44
	5/19/2009	1
	7/16/2010	0.2
	2/8/2011	0.12
	9/14/2011	11
	2/17/2012	0.57

Date	Samples	Mean	Impacted
7/31/2012	1	0.24	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Arsenic

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 0.093
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	**Date**	**Result**
	4/19/2008	0.024
	1/21/2009	0.072
	4/9/2009	0.067
	5/19/2009	0.064
	7/16/2010	0.074
	2/8/2011	0.086
	9/14/2011	0.091
	2/17/2012	0.093

Date	**Samples**	**Mean**	**Impacted**
7/31/2012	1	0.089	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Barium

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 0.084
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	Date	Result
	4/19/2008	0.084
	1/21/2009	0.028
	4/9/2009	0.028
	5/19/2009	0.033
	7/16/2010	0.021
	2/8/2011	0.021
	9/14/2011	0.074
	2/17/2012	0.022

Date	Samples	Mean	Impacted
7/31/2012	1	0.019	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Chloride

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 3.1
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	Date	Result
	4/19/2008	2
	1/21/2009	2.9
	4/9/2009	1.9
	5/19/2009	2.8
	7/16/2010	2.8
	2/8/2011	2.6
	9/14/2011	3.1
	2/17/2012	2.1

Date	Samples	Mean	Impacted
7/31/2012	1	2.2	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Cobalt

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 0.056
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	Date	Result
	4/19/2008	0.032
	1/21/2009	0.03
	4/9/2009	0.043
	5/19/2009	0.056
	7/16/2010	0.035
	2/8/2011	0.031
	9/14/2011	0.029
	2/17/2012	0.026

Date	Samples	Mean	Impacted
7/31/2012	1	0.028	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Copper

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 25%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 0.028
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	Date	Result
	4/19/2008	0.0027
	1/21/2009	0.028
	4/9/2009	0.0064
	5/19/2009	0.0063
	7/16/2010	ND<0
	2/8/2011	0.0021
	9/14/2011	0.0077
	2/17/2012	ND<0

Date	Samples	Mean	Impacted
7/31/2012	1	0	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Iron

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 28
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	**Date**	**Result**
	5/19/2009	26
	7/16/2010	19
	2/8/2011	20
	9/14/2011	28
	2/17/2012	20
	7/31/2012	17

Date	**Samples**	**Mean**	**Impacted**
7/31/2012	1	17	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Lead

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 75%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 0.0094
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	Date	Result
	4/19/2008	ND<0
	1/21/2009	0.0094
	4/9/2009	ND<0
	5/19/2009	ND<0
	7/16/2010	ND<0
	2/8/2011	ND<0
	9/14/2011	0.0038
	2/17/2012	ND<0

Date	Samples	Mean	Impacted
7/31/2012	1	0	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Mercury

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 37.5%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 0.00083
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	Date	Result
	4/19/2008	ND<0
	1/21/2009	0.00045
	4/9/2009	ND<0
	5/19/2009	ND<0
	7/16/2010	0.0005
	2/8/2011	0.00024
	9/14/2011	0.00073
	2/17/2012	0.00083

Date	Samples	Mean	Impacted
7/31/2012	1	0.00063	FALSE

Non-Parametric Prediction Interval

Intra-Well Comparison for MW-1

Parameter: Zinc

Original Data (Not Transformed)
Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 12.5%
Future Samples (k) = 1
Recent Dates = 1
Baseline Samples (n) = 8
Maximum Baseline Concentration = 0.022
Confidence Level = 88.9%
False Positive Rate = 11.1%

Baseline Samples	Date	Result
	4/19/2008	0.011
	1/21/2009	0.015
	4/9/2009	0.011
	5/19/2009	0.021
	7/16/2010	0.011
	2/8/2011	0.016
	9/14/2011	0.022
	2/17/2012	ND<0

Date	Samples	Mean	Impacted
7/31/2012	1	0.023	TRUE

Appendix E
CEC SOP's

03-02-01 MONITORING WELLS USING CONVENTIONAL PURGING

I. **SCOPE AND APPLICABILITY:** This procedure is applicable to the sampling of monitoring wells which do not contain free product using conventional purge methodology.

II. PROJECT-SPECIFIC REQUIREMENTS

A. SAMPLE LOCATIONS AND NUMBERING SYSTEM:

B. ANALYTICAL PARAMETERS AND SAMPLE FREQUENCY:

C. FIELD SCREENING AND ANALYSES: *Reference appropriate SOPs.*

D. QUALITY ASSURANCE SAMPLES: *Number and type of blanks and duplicates. Reference SOPs 04-01-01, 04-01-02, and 04-02-01 as appropriate.*

E. FILTRATION:

F. PURGE CRITERION AND DISPOSAL OF PURGE WATER:

G. WELL KEYS: *Indicate whether wells use CEC's standard key*

H. DEDICATED EQUIPMENT: *Indicate whether dedicated pumps or bailers have been installed.*

I. OTHER REQUIREMENTS:

III. **METHODOLOGY:** Monitoring wells should be sampled progressing from least contaminated to most contaminated to reduce the chances of cross contamination between samples. If a bailer is employed, use new rope for each well.

A. PURGING: Purging is performed to remove static water standing in the well bore, thereby allowing collection of a sample representative of water in the aquifer. Unless otherwise specified in Section II.F., well development may suffice for the purge, so long as the sample is collected immediately following development.

1. Measure the water level from the top of the riser pipe at the pre-marked reference point (SOP 06-01-01).

2. Calculate the purge volume using the data presented in Exhibit 03-02-01 and the criterion presented in Section II.F.

3. Remove the required volume of water using one of the following methods. If the well goes dry, the purge can be considered complete unless otherwise specified in Section II.F. However, attempts should be made to prevent the well from going dry during purging, drying the well disrupts the flow regime and can result in the loss of volatile compounds. Therefore:

≅ If a well is known to have a low yield, it should be purged by bailing.

≅ If a pump is used for purging, adjust the pumping rate to maintain a water column in the well, if possible.

≅ Do not attempt to purge a well to dryness unless it is infeasible to maintain water in the well at a reasonable purge rate.

METHOD A: If the purge criterion is specified on volume of water to be removed:

a. Remove the required volume of water using a submersible pump or bailer. If a pump is used, a check valve must be installed on the pump to prevent pumped water from returning to the well. Begin purging at the top of the water column. Minimize aeration of the water during purging by pumping at a low rate or lowering the bailer gently into the water.

b. Lower the pump or bailer as necessary to continue purging until the well volume criterion is met.

METHOD B: If the purge criteria are specified on stabilization of field analyses:

a. Measure initial water quality by retrieving a sample from the top of the water column using a bailer. Conduct the field analyses specified in Section II.F. Record these results on the Groundwater Monitoring Data Sheet (SOP 07-02-01).

b. Remove one well volume of water by submersible pump or bailer. If a pump is used, a check valve must be installed to prevent water from returning to the well. Begin purging at the top of the water column. Minimize aeration of the water during purging by pumping at a low rate or lowering the bailer gently into the water.

c. After one well volume has been removed, conduct field analyses on the groundwater being discharged. Record results on the Monitoring Sampling Data Sheet.

d. Repeat steps b and c until the purge criteria have been met.

B. SAMPLE COLLECTION: Groundwater samples should be collected immediately after purging , if the well will yield sufficiently. Some low-yielding wells may require time to recover prior to sampling. If the well will not yield a sample immediately after purging, a maximum of 24 hours between purging and sampling is permitted.

1. Collect water from the well by slowly lowering a decontaminated bailer into the water column.

2. Transfer the samples which do not require filtering directly into sample bottles in the following order:

Volatile Organic Compounds
Semi-Volatile Organic Compounds
Pesticides and PCBs
Cations and Anions
Radionuclides
Bacteria.

3. If indicated in Section II.E., filter the required aliquots (SOP 05-03-02 or 05-03-03) and fill those sample bottles.

4. Preserve the samples immediately in accordance with SOP 07-01-02.

5. Conduct field analyses: pH (SOP 05-04-01 or 05-04-04), temperature, specific conductance (SOP 05-04-02), dissolved oxygen (SOP 05-04-03), Eh (SOP 05-04-08), and any other parameters listed in Section II.C.

6. If a dedicated sample bailer was used, return it to the well head. Otherwise, decontaminate the bailer as specified in SOP 01-01-00.

7. Replace the well cap and lock the protective casing.

8. Collect quality-assurance samples specified in Section II.D in accordance with SOP 04-01-01, 04-01-02, and 04-02-01.

9. Decontaminate samples in accordance with SOP 01-01-00.

10. Pack and ship the samples in accordance with SOP 07-01-03. Samples should be shipped on a daily basis and such that holding time requirements (SOP 07-01-02) can be met.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. When using a bailer, do not allow the rope to drag on the ground. If necessary, lay out plastic sheeting to catch the rope.

B. When using a pump, exercise caution to prevent cross-contaminating samples with the hose. Do not sample from the pump discharge for trace organic compounds. Always use a check valve if not using a dedicated hose. Discard hose if there is a question about whether it can be adequately decontaminated.

C. Check the holding times on the analyses to be conducted. The holding time for some parameters is 24 hours. Plan sampling and shipping of these samples accordingly.

D. Preserve samples immediately after collection, including keeping them cool. Do not let samples sit in a hot vehicle until the end of the day.

V. DOCUMENTATION

A. Record information on a Groundwater Monitoring Data Sheet (SOP 07-02-01).

B. Prepare a Trip Report (SOP 07-02-04) and include:

≅ Time, date, and method of sample shipment
≅ Preservation methods and sample handling
≅ Description of purge and sampling methods
≅ The Groundwater Monitoring Data Sheet.

VII. REFERENCES

None

03-02-01 MONITORING WELLS USING CONVENTIONAL PURGING

I. **SCOPE AND APPLICABILITY:** This procedure is applicable to the sampling of monitoring wells which do not contain free product using conventional purge methodology.

II. PROJECT-SPECIFIC REQUIREMENTS

A. SAMPLE LOCATIONS AND NUMBERING SYSTEM:

B. ANALYTICAL PARAMETERS AND SAMPLE FREQUENCY:

C. FIELD SCREENING AND ANALYSES: *Reference appropriate SOPs.*

D. QUALITY ASSURANCE SAMPLES: *Number and type of blanks and duplicates. Reference SOPs 04-01-01, 04-01-02, and 04-02-01 as appropriate.*

E. FILTRATION:

F. PURGE CRITERION AND DISPOSAL OF PURGE WATER:

G. WELL KEYS: *Indicate whether wells use CEC's standard key*

H. DEDICATED EQUIPMENT: *Indicate whether dedicated pumps or bailers have been installed.*

I. OTHER REQUIREMENTS:

III. **METHODOLOGY:** Monitoring wells should be sampled progressing from least contaminated to most contaminated to reduce the chances of cross contamination between samples. If a bailer is employed, use new rope for each well.

A. PURGING: Purging is performed to remove static water standing in the well bore, thereby allowing collection of a sample representative of water in the aquifer. Unless otherwise specified in Section II.F., well development may suffice for the purge, so long as the sample is collected immediately following development.

1. Measure the water level from the top of the riser pipe at the pre-marked reference point (SOP 06-01-01).

2. Calculate the purge volume using the data presented in Exhibit 03-02-01 and the criterion presented in Section II.F.

3. Remove the required volume of water using one of the following methods. If the well goes dry, the purge can be considered complete unless otherwise specified in Section II.F. However, attempts should be made to prevent the well from going dry during purging, drying the well disrupts the flow regime and can result in the loss of volatile compounds. Therefore:

≅ If a well is known to have a low yield, it should be purged by bailing.

≅ If a pump is used for purging, adjust the pumping rate to maintain a water column in the well, if possible.

≅ Do not attempt to purge a well to dryness unless it is infeasible to maintain water in the well at a reasonable purge rate.

METHOD A: If the purge criterion is specified on volume of water to be removed:

a. Remove the required volume of water using a submersible pump or bailer. If a pump is used, a check valve must be installed on the pump to prevent pumped water from returning to the well. Begin purging at the top of the water column. Minimize aeration of the water during purging by pumping at a low rate or lowering the bailer gently into the water.

b. Lower the pump or bailer as necessary to continue purging until the well volume criterion is met.

METHOD B: If the purge criteria are specified on stabilization of field analyses:

a. Measure initial water quality by retrieving a sample from the top of the water column using a bailer. Conduct the field analyses specified in Section II.F. Record these results on the Groundwater Monitoring Data Sheet (SOP 07-02-01).

b. Remove one well volume of water by submersible pump or bailer. If a pump is used, a check valve must be installed to prevent water from returning to the well. Begin purging at the top of the water column. Minimize aeration of the water during purging by pumping at a low rate or lowering the bailer gently into the water.

c. After one well volume has been removed, conduct field analyses on the groundwater being discharged. Record results on the Monitoring Sampling Data Sheet.

d. Repeat steps b and c until the purge criteria have been met.

B. SAMPLE COLLECTION: Groundwater samples should be collected immediately after purging , if the well will yield sufficiently. Some low-yielding wells may require time to recover prior to sampling. If the well will not yield a sample immediately after purging, a maximum of 24 hours between purging and sampling is permitted.

1. Collect water from the well by slowly lowering a decontaminated bailer into the water column.

2. Transfer the samples which do not require filtering directly into sample bottles in the following order:

Volatile Organic Compounds
Semi-Volatile Organic Compounds
Pesticides and PCBs
Cations and Anions
Radionuclides
Bacteria.

3. If indicated in Section II.E., filter the required aliquots (SOP 05-03-02 or 05-03-03) and fill those sample bottles.

4. Preserve the samples immediately in accordance with SOP 07-01-02.

5. Conduct field analyses: pH (SOP 05-04-01 or 05-04-04), temperature, specific conductance (SOP 05-04-02), dissolved oxygen (SOP 05-04-03), Eh (SOP 05-04-08), and any other parameters listed in Section II.C.

6. If a dedicated sample bailer was used, return it to the well head. Otherwise, decontaminate the bailer as specified in SOP 01-01-00.

7. Replace the well cap and lock the protective casing.

8. Collect quality-assurance samples specified in Section II.D in accordance with SOP 04-01-01, 04-01-02, and 04-02-01.

9. Decontaminate samples in accordance with SOP 01-01-00.

10. Pack and ship the samples in accordance with SOP 07-01-03. Samples should be shipped on a daily basis and such that holding time requirements (SOP 07-01-02) can be met.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. When using a bailer, do not allow the rope to drag on the ground. If necessary, lay out plastic sheeting to catch the rope.

B. When using a pump, exercise caution to prevent cross-contaminating samples with the hose. Do not sample from the pump discharge for trace organic compounds. Always use a check valve if not using a dedicated hose. Discard hose if there is a question about whether it can be adequately decontaminated.

C. Check the holding times on the analyses to be conducted. The holding time for some parameters is 24 hours. Plan sampling and shipping of these samples accordingly.

D. Preserve samples immediately after collection, including keeping them cool. Do not let samples sit in a hot vehicle until the end of the day.

V. DOCUMENTATION

A. Record information on a Groundwater Monitoring Data Sheet (SOP 07-02-01).

B. Prepare a Trip Report (SOP 07-02-04) and include:

≅ Time, date, and method of sample shipment
≅ Preservation methods and sample handling
≅ Description of purge and sampling methods
≅ The Groundwater Monitoring Data Sheet.

VII. REFERENCES

None

04-01-01 EQUIPMENT BLANKS

I. **SCOPE AND APPLICABILITY:** Equipment blanks are collected to assess the adequacy of decontamination procedures and to determine whether sampling equipment and methods are contributing contaminants to samples.

II. PROJECT-SPECIFIC REQUIREMENTS:

WATER TYPES TO BE USED FOR BLANKS: *[distilled water, deionized water, HPLC-grade water, etc.]*

III. METHODOLOGY

A. Review the SOP for the medium sampled to establish the frequency for collection of blanks.

B. Assemble a complete set of decontaminated sampling equipment for the subject sampling effort.

C. Rinse the blank water across the sampling equipment, catching it in a decontaminated stainless-steel bucket. Handle the water in the same manner as the samples. For example, if samples for metals analysis are to be filtered with a disposable filter, the blank aliquot for metals analysis should be processed through a new disposable filter. Blanks for soil sampling may be run across the split-spoon sampler, trowel, and bucket.

D. Fill a complete set of sample bottles.

E. Assign the blank a sample number of the same format as the other samples in the series.

F. Store, handle, and ship the blanks in the same manner as the samples.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. The selection of stock solution depends upon the requirements of the project. Analyses for trace contaminants will require a purer blank solution than analyses for major constituents. Stringent analytical requirements will necessitate the use of laboratory-supplied blank water.

B. Include ALL sampling equipment in the rinsing procedure.

V. **DOCUMENTATION:** Record the following information in the field logbook:

- ≅ Source of blank water
- ≅ Time and sequence within the sampling event when the blanks were prepared
- ≅ Description of the procedure for preparing the blanks
- ≅ Sample numbers assigned to blanks.

Incorporate this information into the Trip Report (SOP 07-02-04).

VI. REFERENCES

EPA, 1986. Test Methods for Evaluating Solid Waste: SW-846; Volume II. Washington, DC.

04-01-02 TRIP BLANKS

I. **SCOPE AND APPLICABILITY:** Trip blanks are prepared to evaluate whether volatile constituents have migrated into samples from the air on-site, during shipping, or at the laboratory.

II. PROJECT-SPECIFIC REQUIREMENTS:

A. Frequency:

B. Other Criteria:

III. METHODOLOGY

A. When ordering bottles from the laboratory for the sampling event, request that trip blanks be sent also.

B. Keep the supplied blanks with the samples being collected throughout the sampling event. Handle the blanks in the same manner as the filled sample vials.

C. Assign the trip blank a sample number of the format used for the sampling event.

D. Return the trip blanks to the laboratory with the samples. Include the samples on the Chain-of-Custody form (SOP 07-02-02). Analysis is typically performed for volatile organic compounds only.

IV. **PRECAUTIONS AND COMMON PROBLEMS:** None.

V. **DOCUMENTATION:** Describe handling on the trip blanks in the Trip Report (SOP 07-02-04). Include the sample numbers assigned.

VI. REFERENCES

EPA, 1986. Test Methods for Evaluating Solid Waste: SW-846; Volume II. Washington, DC.

04-02-01 LIQUID DUPLICATES

I. SCOPE AND APPLICABILITY:

Duplicate samples are collected to evaluate the precision involved in the sampling effort. Duplicate samples must be collected to be as similar as possible to the original sample. This procedure is applicable of collection of duplicate samples of all liquids and flowable sludges.

II. PROJECT-SPECIFIC REQUIREMENTS:

NUMBER/FREQUENCY OF DUPLICATE SAMPLING:

DUPLICATE NUMBERING SYSTEM: *[Indicate how sample numbers are to be assigned to duplicates, and whether "blind" numbers should be assigned.]*

III. METHODOLOGY

A. Prepare sample bottles for the target sample and its duplicate.

B. Collect the liquid sample in accordance with the appropriate SOP.

C. When filling sample bottles, fill each type of bottle for the sample and duplicate in sequence. Fill both VOA vials, then both metals bottles, etc. This will assure that the duplicate is as similar to the original sample as possible.

D. Preserve the sample and duplicate identically.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. Failure to fill bottles alternately between the sample and duplicate may result in poor reproducibility between analyses.

B. Samples with free product or multiple phases present special problems. The phase distribution must be the same in both aliquots.

V. DOCUMENTATION:

List the sample and duplicate on the Groundwater Monitoring Data Sheet as separate samples, describing the duplicate in the "Comments" column. If a Groundwater Monitoring Data Sheet is not appropriate, incorporate this information into the Trip Report (SOP 07-02-04).

VI. REFERENCES:

None.

05-03-05 BAILER

I. EQUIPMENT SPECIFICATION: This procedure is applicable to the use of all bottom-fill bailers.

II. INSPECTION AND CALIBRATION

A. DAILY INSPECTION AND CHECKS: Make sure fittings at both ends of the bailer are secure. Assure that the check valve opens and closes freely.

B. CALIBRATION: There is no calibration applicable to this equipment.

C. ROUTINE MAINTENANCE: There is no maintenance applicable to this equipment. Bailers are typically replaced if damaged.

III. USE

A. Select a rope or cable for suspension of the bailer which is appropriate to project requirements. Typically, small gauge nylon rope is used, although stainless-steel cable may be used when samples will be analyzed to very low detection limits. The rope or cable should be new and clean. Do not use materials which have been used on another project, as this may result in cross contamination.

B. Consult the Project Manager to select a bailer composition which is compatible with the anticipated groundwater quality. For most applications, PVC bailers are adequate. Stainless-steel may be used where very low levels of organic compounds are of interest. Teflon bailers are available and may be requested on some projects.

C. Using a strong, non-slipping knot, such as a bowline, tie the rope or cable to the top of the bailer.

D. Lower the bailer into the well. Do not let the bailer free-fall down the well, as the device may shatter or the ball valve may become dislodged upon striking the water or the bottom of the well.

E. Raise the bailer by pulling the rope with a smooth, uniform motion. A jerky motion may open the check valve, resulting in water loss. Check the knot periodically.

Do not allow the bailer rope to drag on the ground. Place plastic sheeting on the ground to keep the rope clean if conditions are muddy, the ground surface is contaminated, or very low levels of contaminants are of interest.

IV. DECONTAMINATION: The equipment should be decontaminated in accordance with SOP 01-01-00.

Typically, the bailer is washed with a potable water and non-phosphate soap solution. The bailer is then rinsed with distilled water and wrapped in plastic or foil until used.

V. TROUBLESHOOTING

A. If the knot should come undone or the rope breaks, the bailer typically can be recovered using a weighted fishing hook tied to monofilament line.

B. When bailing turbid water, it may be necessary to rinse the ball-valve at the bottom of the bailer with distilled water if it clogs.

06-01-01 WATER-LEVEL MEASUREMENT IN MONITORING WELLS

I. **SCOPE AND APPLICABILITY:** This procedure is applicable to the measurement of water levels in monitoring wells and open boreholes.

II. PROJECT-SPECIFIC REQUIREMENTS

A. REQUIRED READINGS:

B. APPLICABLE METHODS:

III. **METHODOLOGY:** Water levels should always be recorded to ±0.01 foot. Measurements should be made from a marked point on the inner casing for monitoring wells, and from the ground surface for open boreholes. Equipment should be decontaminated in accordance with SOP 01-01-00 after each measurement. The following methods may be used:

A. CHALKED-TAPE METHOD

1. Check records for historic water levels in the well, if available.

2. Rub the first five feet of a steel surveyor's chain or fiberglass tape with carpenter's chalk.

3. Lower the tape into the well until the end of the tape enters the water.

4. Record the tape footing at the wellhead to within 0.01 feet.

5. Pull the tape out of the well and read the tape footage of the water mark to within 0.01 feet. The difference between the readings is the water level.

B. SOUNDING

1. Attach a small float or hollow-bottom weight or sounder to the end of a tape measure.

2. Lower the sounder into the well and listen for the sound of the weight hitting the water surface.

3. When this is heard, pull the sounder back a few inches and redrop it by 1/4-inch increments until the sound is heard again.

4. Subsequent smaller increments of lowering the sounder will allow water-level measurements to within 0.01 feet.

5. Measure the length from the zero mark on the tape measure to the bottom of the weight. Add this value to all field measurements made with the sounder.

C. ELECTRIC-WATER LEVEL METER (Solinst)

1. Turn the Solinst on by turning the knob clockwise. This knob is also the volume control. Test the Solinst to see if the battery is dead by pushing the button next to the volume knob.If the battery is charged the Solinst will emit an audible tone and the red indicator light will illuminate.
2. Lower the end of the probe into the well or borehole. The probe will cause the unit to emit the tone and illuminate the light when it contacts water.

3. Pull the probe back a few inches and lower the probe in smaller increments until the water level is measured to within 0.01 feet.

4. The water level is read directly from the Solinst tape, and already includes a correction for the length of the probe on the bottom of the tape.

D. INTERFACE PROBE: This is the only reliable method for wells with floating free product.

1. Push the On/Off button to turn unit on. Lower the probe into the liquid. The horn will sound a steady tone and the yellow light will illuminate when the probe contacts an oil product. Slowly raise probe until sound stops, lower until sound is heard again to refine the oil level.

2. Read the tape marking and note as the surface level of product.

3. Slowly lower the probe through the oil product, searching for the oil-water interface. When the probe reaches water the tone will switch from steady to a beeping tone and the red light will illuminate. Slowly move probe up and down to refine the oil/water interface to within 0.01 feet. Read the water level directly from the tape. The length of the probe is already considered.

NOTE: Auto Shutoff Feature: After approximately five minutes of power on, the unit will auto-shut off. A chirping sound will be heard, warning impending shut off. Press

<POWER ON/RENEW> to continue operation. During five minute interval, short "alive" beep is heard.

IV. PRECAUTIONS AND COMMON PROBLEMS:

1. Be sure to allow sufficient time after development, purging or pumping to allow the well to recover to static conditions.

2. Sounding may be difficult with very deep water levels or in noisy conditions because the sound is hard to hear.

3. Measurement of water levels in pumping wells or wells/boreholes with cascading water can be difficult. Installing a narrow PVC access tube inside the well casing can make obtaining accurate readings easier.

4. Free product floating on the water table depresses the natural water level. If a true water level is required, the product of the oil thickness and the oil specific gravity must be added to the oil/water interface elevation.

5. If there is no measurement mark on the well riser, add one in indelible ink.

V. DOCUMENTATION

1. Record water levels in a field notebook or Groundwater Monitoring Data Sheet (SOP 07-02-01). Be sure to record the date and time of the measurement.

2. Data should be incorporated into the Trip Report (SOP 07-02-04). Method of measurement should be reported.

VI. REFERENCES: None

07-01-01 MAINTAINING SAMPLE CHAIN OF CUSTODY

I. **SCOPE AND APPLICABILITY:** This procedure is to be employed whenever samples are collected for laboratory analysis, and is designed to ensure that sample integrity is maintained. These procedures are necessary to assure that samples are defensible.

II. **PROJECT-SPECIFIC REQUIREMENTS:** None.

III. METHODOLOGY

A. **SAMPLE CUSTODY:** The sampling personnel must maintain custody of the samples until they are delivered to the laboratory, at which time the laboratory takes over the custody record. A sample is considered to be in custody if:

- it is in the investigator's actual possession
- it is in view of the investigator
- it has been placed in a secure area
- a signed custody seal has been placed on the sample container such that the seal would be destroyed if the container was opened.

B. CUSTODY RECORD

1. Complete a Chain-of-Custody Form for each shipping container of samples as described in SOP 07-02-02. Place the white copy of the completed form in the shipping container with the samples, as discussed in SOP 07-01-03.

2. Affix a signed custody seal to secure all samples. Seals may be placed across the lids of individual sample bottles, or on each shipping container of samples. If seals are placed on shipping containers, at least two seals must be used, and they must be placed such that the container cannot be opened without breaking the seals.

IV. PRECAUTIONS AND COMMON PROBLEMS

A. It may be necessary to cover custody seals with clear postal tape to prevent them from falling off.

B. Deliver or fax a copy of the custody form to the Project Manager within 24 hours of shipping the samples so that any errors can be corrected before the laboratory begins processing the samples.

V. DOCUMENTATION

A. The pink copy of the Chain-of-Custody Form should be submitted to the Project Manager as soon as possible after the samples are shipped.

B. The Project Manager or a designee must review the form for completeness and correctness. Any errors should be flagged, and the laboratory should be contacted if errors could affect analysis. The reviewer should initial and date the form, then place it in the Project File.

C. Compliance or problems with custody procedures should be documented in the Trip Report (SOP 07-02-04).

VI. REFERENCES

EPA Region IV; 1991. Environmental Compliance Branch, Standard Operating Procedures and Quality Assurance Manual. Athens, Georgia.

07-02-01 GROUNDWATER MONITORING DATA SHEET

I. **SCOPE AND APPLICABILITY:** A Groundwater Monitoring Data Sheet is completed each time water samples are collected to document field data and sampling methodology.

II. **PROJECT-SPECIFIC REQUIREMENTS:** None.

III. **METHODOLOGY:** Complete the form (Exhibit 07-02-01) as samples are collected, as follows:

a. Self explanatory
b. CEC project number
c. Names or initials of all members of the sampling team
d. Complete well designation
e. Depth to water level, reported to ±0.01 ft. (Check measurement datum at the top of the column.)
f. Date and time well purging is started
g. Volume of water removed, in gallons
h. Check if well was purged to dryness
i. Indicate method of purging, such as submersible pump or bailer
j. Date and time that the actual sample was withdrawn. If sample bottles were filled at multiple, separate times, these should all be indicated.
k. Self explanatory (Check units for temperature.)
l. Unusual odors or other observations
m. Other atypical information, such as special handling of purge water or field problems

IV. **PRECAUTIONS AND COMMON PROBLEMS:** All information required by the form must be provided.

V. **DOCUMENTATION:** Attach the form to the Trip Report (SOP 07-02-04).

VI. **REFERENCES:** None.