Geosyntec consultants

1255 Roberts Blvd.., Suite 200
Kennesaw, Georgia 30144
Tel (678) 202-9500 Fax (678) 202-9501

July 11, 2017

Mr. David Brownlee
Georgia Department of Natural Resources
2 Martin Luther King Jr. Drive S.E., Suite 1054
Atlanta, GA 30334-9000

Subject: **Transmittal of Semi-annual Groundwater Monitoring Report #18**
January 2017 through June 2017
Chemtrade Site, HSI#10498,
East Point, GA

Dear Mr. Brownlee:

On behalf of Chemtrade Solutions LLC, we are pleased to provide you with a paper copy and an electronic copy of the Semi-annual Groundwater Monitoring Report #18, January 2017 through June 2017 for the above referenced site.

If you have any questions regarding this report, please feel free to give me a call at (678) 202-9500.

Sincerely,
Geosyntec Consultants, Inc.

Brian D. Jacobson, P.E.
Senior Engineer

Prepared for

Chemtrade Solutions LLC
90 East Halsey Road
Parsippany, New Jersey 07054

SEMI-ANNUAL GROUNDWATER MONITORING REPORT NO. 18 JANUARY THROUGH JUNE 2017

CHEMTRADE SITE
EAST POINT, GEORGIA
HSI# 10498

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1255 Roberts Boulevard, Suite 200
Kennesaw, Georgia 30144

Project Number GR5060

July 2017

PROFESSIONAL ENGINEER CERTIFICATION

I certify that I am a qualified engineer who has received a baccalaureate or post-graduate degree in the natural science or engineering, and have sufficient training and experience in environmental assessment and corrective measures, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgments. I further certify that this report was prepared by myself or by a subordinate working under my direction.

7/10/2017

Brian D. Jacobson, P.E.
Registered Professional Engineer
Georgia Registration #23332

GEORGIA
REGISTERED
NO. 23332
PROFESSIONAL
ENGINEER
BRIAN D. JACOBSON

Geosyntec consultants

TABLE OF CONTENTS

1. INTRODUCTION 4
   1.1 Background 4
      1.1.1 Site Location and Description 4
      1.1.2 Summary of Recent Regulatory Activities 4
   1.2 Objectives and Scope 5
   1.3 Overview 5

2 SITE CHARACTERIZATION 7
   2.1 Site Geology and Hydrogeology 7
   2.2 Summary of Previous Site Investigations 8

3. GROUNDWATER AND STORM DRAIN SAMPLING 9
   3.1 Groundwater Potentiometric Conditions 9
   3.2 Groundwater Sampling 9
      3.2.1 Introduction 9
      3.2.2 Groundwater Constituent Summary 10
      3.2.3 Comparison to Previous Results for Groundwater 11
   3.3 Storm Drain Sampling 13
      3.3.1 Introduction 13
      3.3.2 Storm Drain Constituent Summary 13
      3.3.3 Comparison to Previous Results for Storm Drains 14

4. SAMPLE COLLECTION PROCEDURES 16
   4.1 Summary 16
   4.2 Monitoring Well Sampling Procedure 16
   4.3 Groundwater Sampling Decontamination Procedure 17
   4.4 Storm Drain Sampling Procedure 17
   4.5 Storm Drain Sampling Decontamination Procedure 18

5. QUALITY ASSURANCE/QUALITY CONTROL 19
   5.1 Documentation 19
   5.2 Holding Times 19

5.3 Reporting Limits 19
5.4 Accuracy 20
5.5 Representativeness 20
5.6 Comparability 20
5.7 Completeness 21

6. CONCLUSIONS 22
6.1 Groundwater 22
6.2 Storm Drains 23

7. REFERENCES 25

LIST OF TABLES

Table 3-1 Groundwater Elevations
Table 3-2 Groundwater Sampling Results
Table 3-3 Summary of Statistical Trend Analysis in Groundwater Samples
Table 3-4 Storm Drain Sampling Results
Table 3-5 Summary of Statistical Trend Analysis in Storm Drain Samples

LIST OF FIGURES

Figure 1-1 Site Vicinity Map
Figure 1-2 Monitoring Well Locations Map
Figure 1-3 Storm Drain Sample Location Map
Figure 2-1 Hydrogeologic Cross-Section A-A'
Figure 2-2 Hydrogeologic Cross-Section B-B'
Figure 2-3 Hydrogeologic Cross-Section C-C'
Figure 3-1 Potentiometric Surface Map
Figure 3-2 Groundwater Sulfate, Aluminum, and pH Trends
Figure 3-3 Storm Drain Sulfate, Aluminum, and pH Trends
Figure 3-4 April 2017 Sulfate Concentration Isopleth above the Type 4 RRS
Figure 3-5 April 2017 Aluminum Concentration Isopleth above the Type 4 RRS
Figure 3-6 Sulfate Concentration in Storm Drain
Figure 6-1 Aluminum Results Analysis

LIST OF APPENDICES

Appendix A Groundwater and Storm Drain Laboratory Results
Appendix B Groundwater and Storm Drain Sampling Forms
Appendix C Mann-Kendall Trend Analysis Data

1. INTRODUCTION

1.1 Background

1.1.1 Site Location and Description

The Chemtrade Solutions LLC (Chemtrade), formerly General Chemical LCC facility (Site) is located on Central Avenue in the City of East Point, Fulton County, Georgia (**Figure 1-1**). The approximate Site location corresponds to latitude of 33.67 and longitude of 84.44. The Site property is bounded by North Martin Street and the John D. Milner Sports Complex on the north side, Randall and Bayard Streets on the east side, Central Avenue and an industrial (metal recycling) facility on the south side, and Central Avenue on the west side. The general area surrounding the Site consists of industrial land uses bordered by some residential properties toward the north and northeast directions. Another industrial site is located on the adjacent property to the northwest of the Site.

The Site, as shown in an aerial view on **Figure 1-1**, consists of a process building, a warehouse structure, and an office building. During operation, there were four Hi-Clay Alumina (HCA) storage cells (herein referred to as HCA cells) located on the Site. These cells were removed during the period of 2003 to 2005, and the area was returned to beneficial use in 2006.

1.1.2 Summary of Recent Regulatory Activities

Subsequent to the issue of the 2002 Corrective Action Plan (CAP), General Chemical voluntarily elected to remove the HCA material from the on-site cells.

Following excavation and removal of the HCA, a revised CAP was issued by General Chemical on 2 October 2006. A Georgia Environmental Protection Division (GaEPD) letter dated 16 January 2007 provided comments and a request for additional work followed by resubmission of the revised CAP.

General Chemical submitted a revised CAP incorporating GaEPD comments on 30 March 2007.

GaEPD completed review and issued a conditional approval of the revised CAP on 4 September 2007. Pursuant to the revised CAP, groundwater and surface water samples were collected for aluminum and sulfate analysis.

General Chemical submitted a voluntary remediation plan application (VRPA) in January 2013. The VRPA proposed: (i) delineation of the horizontal extent of sulfate contamination in groundwater; (ii) continued semi-annual sampling of monitoring wells screened in the partially weathered rock (PWR) and surface water sampling locations; (iii) conduct a storm water drain assessment and implement any necessary repairs to prevent groundwater from entering the storm drain system; and (iv) institutional controls on affected properties through the placement of unified environmental covenants.

In a letter dated 10 April 2013, GaEPD approved the VRPA. GaEPD issued comments on the VRPA on 12 April 2013.

General Chemical LLC was acquired by Chemtrade Solutions LLC on 24 January 2014. The General Chemical LLC name will be used when historically accurate and Chemtrade Solutions will be used for activities after the acquisition date.

1.2 Objectives and Scope

The objective of this report is to present the results for the semi-annual groundwater monitoring activities conducted at the Site in April 2017. This is the eighth semi-annual report submitted to Georgia EPD following approval of the VRPA in April 2013. However, this report is issued as "Semi-Annual Groundwater Monitoring Report No. 18" to avoid confusion with previous reports issued under the CAP. This report provides a summary of the activities performed and the results of the field and laboratory measurements that were obtained during this monitoring period.

This report presents the results of the following activities:

- Sampling of 6 on-site wells (**Figure 1-2**);
- Sampling of 3 off-site wells (**Figure 1-2**); and
- Sampling of surface water at one on-site and three off-site locations (**Figure 1-3**).

1.3 Overview

This semi-annual groundwater monitoring report summarizes the results of field sampling activities performed by Geosyntec in April 2017. The report is organized as follows:

- Section 2 presents a summary of site characterization information including site geology and hydrogeology, field investigations, nature and extent of environmental impact, and site-specific groundwater and contaminant transport conceptual modeling.

- Section 3 presents the results from sampling of monitoring wells and stormwater from the Site.

- Section 4 discusses the sampling procedures used to obtain groundwater and stormwater samples from the Site

- Section 5 summarizes the results of quality assurance/quality control (QA/QC) evaluation of the data obtained during this monitoring period.

- Section 6 presents conclusions that are based on the data and provide recommendations for future activities.

- Data from this monitoring period are presented in the Appendices. Analytical laboratory reports for water samples are presented in **Appendix A**. Field Forms used during well sampling are presented in **Appendix B**.

2 SITE CHARACTERIZATION

2.1 Site Geology and Hydrogeology

This section presents an overview of the Site hydrogeologic conditions. Information on the Site hydrogeology was obtained during the Site investigation activities, conducted in May 1998 in support of the Compliance Status Report (CSR) [Geosyntec, 1999].

The occurrence and movement of groundwater in the Piedmont formation is generally within two hydrogeologic units. A shallow hydrogeologic unit typically occurs within the soils and saprolite (weathered residuum which mantles bedrock). A layer of partially weathered rock (PWR) typically forms a transition between the saprolite and the fractured bedrock. A deeper hydrogeologic unit generally occurs within the fractured bedrock.

Groundwater in the shallow hydrogeologic unit usually occurs under water table (i.e., unconfined) conditions. Groundwater flow is controlled by local topographic features, where recharge occurs in upland areas and discharge occurs in drainage features such as streams, rivers, or lakes. Recharge to the shallow hydrogeologic unit is primarily the result of infiltrating precipitation. Groundwater in the deeper water-bearing zone is associated with secondary porosity (fractures or open spaces) within the crystalline bedrock and flow is controlled by the distribution and degree of interconnection of these openings in the rock. The deeper hydrogeologic unit is fully saturated.

Based on the results of the field investigation, the shallow hydrogeologic unit is conceptualized as an unconfined, homogeneous, and isotropic deposit of sandy clay with a hydraulic conductivity of approximately 4×10^{-5} to 2×10^{-4} cm/s, a hydraulic gradient of approximately 0.003 to 0.03, and an effective porosity of about 20 percent. Groundwater is believed to generally flow at about 16.4 ft per year from west to east across the Site and advection is believed to be the dominant contaminant transport mechanism.

The Site is in an area of relatively steep topography adjacent to a small intermittent stream that discharges to the South River. As can be seen on the aerial photograph of the Site presented in **Figure 1.2**, industrial operations at the Site have resulted in regrading and leveling of a significant portion of the Site (i.e., vegetated areas east of the process buildings). Groundwater flow at the Site is generally west to east.

The lithology of the Site consists primarily of clayey fill material overlying saprolite as depicted on **Figures 2-1 through 2-3**, which illustrate hydrogeologic cross-sections that show the Site features and geology. The fill material, which varies in thickness, covers most of the Site and consists of sandy to gravelly red micaceous clay. The saprolite, encountered in all fourteen of the monitoring wells drilled at the Site, consists of highly weathered schist consisting of orange to red clay with kaolinite and mica. Foliation and other relict rock texture are still well preserved and were visible in samples, but the material comprises mostly clay and mica which is formed by the deep weathering of the feldspar minerals. Competent bedrock, as defined by auger refusal, was generally encountered between 20 to 60 feet below ground surface (bgs).

2.2 Summary of Previous Site Investigations

The aluminum concentrations observed in the Site soil during the course of the CSR investigation are within the range typically seen in Piedmont soils (i.e., 70,000 to 100,000 mg/kg). The samples, in which the aluminum concentrations were elevated, were limited to locations of accumulation of more strongly weathered material. Therefore, based on detected concentrations of aluminum in soil samples, industrial activities at the Site have not resulted in a significant increase in aluminum concentrations in the soil [Geosyntec, 1999].

The HCA was removed between 2003 and 2006. Sulfate concentrations vary according to the nature of the material analyzed and were related to the proximity to former HCA cells. In places where the undisturbed soils directly underlie former HCA cells, sulfate concentrations in these soils were typically higher than those of other undisturbed soils. Following removal of the HCA, underlying soils were sampled and analyzed for sulfate, and soils exhibiting sulfate concentrations over 10,300 mg/kg (95% Upper Confidence Limit for all samples was 3,143 mg/kg) were removed.

3. GROUNDWATER AND STORM DRAIN SAMPLING

This section presents the details of the sampling of eight on-site wells, and three off-site groundwater wells and one on-site and three off-site stormwater storm drains.

3.1 Groundwater Potentiometric Conditions

Groundwater elevations were measured prior to sampling wells during the October sampling event. The measurements were performed on 12 April 2017. All monitoring wells were gauged. The results of the groundwater elevation measurements are provided in **Table 3-1**.

The potentiometric map for April 2017 readings is shown in **Figure 3-1**. This map shows the typical Piedmont pattern of flow following topography towards surface water features, which act as collectors and discharge points for the groundwater. Since there are no streams at the Site, the groundwater is flowing towards the local topographic low which is aligned parallel with North Martin Street and the storm drain system. The general potentiometric pattern is consistent with the overall drainage flow pattern to the east-southeast towards the South River.

Water level measurements were recorded in wells screened in saprolite and shallow competent rock. In preparing the potentiometric map from water level measurements, generally no distinction was made as to whether the wells were shallow or deep, in saprolite or bedrock. Such distinctions were not appropriate for two reasons: (i) the Piedmont is characterized by a single saturated zone consisting of saprolite and bedrock that are hydraulically connected; and (ii) the vertical components of the head gradient are similar or small compared to the horizontal components.

3.2 Groundwater Sampling

3.2.1 Introduction

Groundwater samples were collected on 12-13 April 2017. Groundwater samples were submitted for analysis for sulfate using EPA Method 9056A and aluminum using EPA Method 6010C. The pH was measured in the field using EPA Method 150.1. The groundwater sampling results are presented in **Table 3-2**. Laboratory results are presented in **Appendix A** and field forms are presented in **Appendix B**.

3.2.2 Groundwater Constituent Summary

Sulfate was detected at eight of the nine monitoring wells sampled during the April 2017 sampling event. The sulfate concentrations were lower in the off-site wells, 93 mg/l at EPW-01 at the northwestern boundary of the Site, and <5.0 mg/l at EPW-02 to the east of the Site. Sulfate concentration in off-site well EPW-03D was 25 mg/l. On-site well OW-1A at the western boundary was measured at 44 mg/l. The background monitoring well GCW-01D at the upgradient edge of the Site had 380 mg/l of sulfate. The results indicate groundwater entering the Site contains background concentrations of sulfate between 44 and 93 mg/l as measured at OW-1A and EPW-01. These values are also consistent with the upgradient storm drain location SW-09 where sulfate has been measured between <0.1 to 81 mg/l. The sulfate concentration along the northern property boundary at GCW-04D was 4,600 mg/L in October 2016 and 2,800 mg/L in April 2017. GCW-4D well is located outside the former impoundment areas. Sulfate at the eastern boundary at GCW-02D and GCW-03D were 1,800 and 3,400 mg/l, respectively. The source area monitoring well (GCW-05) sulfate concentration was 900 mg/l.

The April 2017 sampling result sulfate concentrations generally showed a return to previous concentration trends observed since the HCA removal. The October 2016 sampling results' deviation from previous trends can be attributed to a return to normal rainfall. The rainfall deficit between the May and October 2016 sampling events was 7.4 inches. At the time of the April sampling event the site was 3 inches short of rainfall since the October sampling event. However, the site experienced above normal rainfall in 2017 prior to the sampling event. This sampling event is confirms the October event was an outlier and trends are returning to normal as rainfall returns to closer to historic averages.

Aluminum was detected at six of the nine monitoring wells sampled during the April 2017 sampling event. The concentrations were low at the off-site wells, 12.9 mg/l at EPW-01 at the northwestern boundary of the Site and <0.1 at EPW-02 and EPW-03D, located to the east and northeast of the Site, respectively. On-site well OW-1A at the western boundary had 0.587 mg/l of aluminum. The background monitoring well GCW-01D at the upgradient edge of the Site contained 4.2 mg/l. The results indicate groundwater entering the Site contains background concentrations of aluminum between 0.587 to 12.9 as measured at OW-1A and EPW-01. These values are also consistent with the upgradient storm drain location SW-09 where aluminum has been measured between <0.1 to 5.6 mg/l. The aluminum concentration along the northern property boundary at

GCW-04D was 420 mg/l. Aluminum concentrations at GCW-04D have been low since it was measured at 0.1 mg/l in March 2015 through May 2016 when it was measured at 0.6 mg/L. Aluminum concentration is directly related to pH. The pH at GCW-04D increased to background levels between March 2015 and May 2016, resulting in the decrease in aluminum concentration. During the October 2016 sampling event, the pH dropped to 3.6, resulting in an increase in the aluminum concentration. In April 2017, the pH was measured to be 3.4, resulting in an aluminum concentration of 420, which is consistent with the concentration in October 2016. Aluminum concentrations at the eastern boundary at GCW-02D and GCW-03D were 162 and 319 mg/l, respectively. The source area monitoring well (GCW-05) aluminum concentration was <0.1 mg/l.

The pH measurements were generally consistent with past measurements. The off-site wells EPW-01, -02, and -03 ranged from 4.2 to 6.0 standard units (s.u.). The upgradient wells GCW-01D and OW-1A were 4.2 and 4.4 s.u. respectively. The pH along the northern property boundary at well GCW-04D was 3.4 s.u. The northern and eastern wells GCW-02D and GCW-03D were similar and measured at 3.5 and 3.2 s.u. The pH for source area monitoring well (GCW-05) was measured at 6.9 s.u.

3.2.3 Comparison to Previous Results for Groundwater

Table 3-3 summarizes statistical trend analysis of both aluminum and sulfate data in groundwater. Mann-Kendall trend analysis was performed using available data for each monitoring well at a 95% confidence level. The data used for the Mann-Kendall trend analysis calculations is presented in Appendix C. The procedure and methodologies employed in the analysis of the data are consistent with Georgia EPD and United States Environmental Protection Agency (EPA) recommended procedures. These methods meet the performance criteria specified in the rules of the Georgia EPD, Chapter 391-3-4-.14(19) and the technical standards described in the EPA "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Unified Guidance," dated March 2009.

Historical trend graphs for sulfate and pH are shown in **Figure 3-2**. Sulfate concentrations generally decreased or were stable in off-site and on-site wells in groundwater. The sulfate concentrations in monitoring wells GCW-01D, GCW-03D, GCW-04D, GCW-05, EPW-03D and OW-1A showed a statistically significant decreasing trend. EPW-01 is the only well that shows an increasing trend. This is consistent with the previous semi-annual report and EPW-01 is generally stable between 100 and 150 mg/l. Neither decreasing nor increasing trends were calculated for sulfate concentrations in monitoring wells

GCW-02D and EPW-02. Similarly, aluminum concentrations also decreased or were stable in groundwater. A statistically significant decreasing trend was calculated for aluminum in monitoring wells GCW-01D, GCW-04D, EPW-02 and OW-01A. Neither decreasing nor increasing trends were calculated for aluminum in the remainder of the wells. The pH measurements were generally stable. The pH measured at on-site wells was generally lower than the pH measured at the off-site wells except for the source area well which had a pH similar to background.

Several conditions not related to the Site may slow the return of the Site to background concentrations of site constituents, following removal of source materials. These include the following:

- The pH of the groundwater in upgradient wells (OW-1A and GCW-01D) is low. Measured pH values 4.4 and 4.2 s.u. respectively. The low pH condition of groundwater entering the Site will slow a return to background conditions for pH and aluminum.

- The pH of rainwater at the Site was measured at less than 5 during the HCA removal, therefore infiltrating rainfall will not have a significant effect in terms of raising the groundwater pH in the short-term.

- The area surrounding the Site has a number of other sources of sulfate in groundwater resulting from previous operations. Potential sulfate sources include a former battery cracking plant, a former fertilizer manufacturer, two off-site HCA disposal areas operated by others, and a former agricultural chemical manufacturer.

- The former fertilizer manufacturer (Furman Fertilizer, now MGA Holdings) operated an acid pit (Sanborn, 1925). Downgradient of the acid pits at delineation boring DB-05 sulfate was observed at a concentration of 1,000 mg/l. The delineation boring location is upgradient and side gradient to the former HCA impoundments shown in Figure 1-2.

It is encouraging that no significant impacts have been detected at downgradient wells EPW-02 or EPW-03D. The sulfate concentrations at EPW-02 appear stable and are similar or lower than regional background conditions of 46 to 140 mg/l as observed at well EPW-01. EPW-03D is located approximately 200 feet from the Site boundary.

Sulfate concentrations at EPW-03D are similar to the regional background, and trends are decreasing. The pH trend at the EPW-03D is stable and typical for the Piedmont with measurements generally between 5 and 7 s.u. The decreasing sulfate concentrations and stable pH indicate impacts from the Site, if they ever existed, are minimal and decreasing with time. The concentration of constituents of concern from both on-site and off-site sources appear to have attenuated to background levels prior to reaching EPW-02 or EPW-03D.

The removal of the HCA source material appears to be resulting in the Site returning to background conditions over time. The sulfate concentrations are in decline at downgradient wells. However, it will take time for residuals to mix with infiltration and incoming groundwater and for geochemical conditions to stabilize.

The groundwater measurements were compared to Type 4 Risk Reduction Standards (RRS) of 1,200 mg/l for sulfate and 102 mg/l for aluminum. The measured concentrations were interpolated to develop limits of area in excess of the Type 4 RRs. Comparisons of the Site groundwater to Type 4 RRS for sulfate and aluminum are presented in **Figures 3-4 and 3-5**.

3.3 Storm Drain Sampling

3.3.1 Introduction

Storm drain water samples were collected from one on-site and three off-site storm drains in April 2017. Surface water flows in the storm drain system in the following sequence: SW-09, SW-06, SW-02, SW-07 from upstream to downstream. The purpose of the storm drain sampling program was to evaluate potential impacts to the storm drain system as requested by GaEPD. Stormwater samples were submitted for analysis for sulfate using EPA Method 9056A and aluminum using EPA Method 6010C. The pH was measured in the field using EPA Method 150.1. The stormwater sampling locations are shown on **Figure 1-3**. The stormwater sampling results are presented in **Table 3-4**. Laboratory results are presented in **Appendix A** and field forms are presented in **Appendix B**.

3.3.2 Storm Drain Constituent Summary

Sulfate was detected in the four storm drain samples during the April 2017 sampling event. The upgradient (SW-09) sulfate concentration was measured at 450 mg/l. A sample was collected cross-gradient (SW-06) at a location in the John D. Milner Sports

Complex. Sulfate was measured at 1,500 mg/l. At the on-site location (SW-02), sulfate was measured at 780 mg/l. The sulfate concentration at the discharge of the storm drain to surface water at SW-07 was measured at 450 mg/l.

Aluminum was detected in three of the four storm drain water monitoring locations during the April 2017 sampling event. The upgradient (SW-09) aluminum concentration was <0.1 mg/l. The sample for aluminum collected cross-gradient (SW-06) was measured at 158 mg/l. At the on-site location (SW-02) aluminum was measured at 80.8 mg/l. The aluminum concentration at the discharge of the storm drain to surface water at SW-07 was measured at 42.4 mg/l.

3.3.3 Comparison to Previous Results for Storm Drains

Table 3-5 summarizes statistical trend analysis of both aluminum and sulfate data in storm drains. Mann-Kendall trend analysis was performed using available data for each storm drain at a 95% confidence level. The data used for the Mann-Kendall trend analysis calculations is presented in Appendix C. The procedure and methodologies employed in the analysis of the data are consistent with Georgia EPD and United States Environmental Protection Agency (EPA) recommended procedures. These methods meet the performance criteria specified in the rules of the Georgia EPD, Chapter 391-3-4-.14(19) and the technical standards described in the EPA "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Unified Guidance," dated March 2009.

Historical trend graphs for sulfate, aluminum, and pH are shown in **Figure 3-3**. Sulfate concentrations were generally stable or slowly increasing. A statistically significant increasing trend was calculated for sulfate in SW-02 (on-site storm drain) and SW-06 (cross-gradient storm drain). Neither decreasing nor increasing trends were calculated for sulfate in the remainder of the wells. Aluminum concentrations were generally stable or slowly increasing between sampling events. The pH measurements were relatively stable showing minor changes between sampling events at the same location. A statistically significant increasing trend was calculated for aluminum in the on-site storm drain SW-02. Neither decreasing nor increasing trends were calculated for aluminum in the remainder of the wells. The pH measurements were generally stable The pH measured upgradient was generally higher than the pH measured at the on-site, cross-gradient, and downgradient storm drains.

Several conditions not related to the Site may slow the return of the Site to background concentrations of site constituents, following removal of source materials. These include the following: • The pH of rainwater at the Site was measured at less than 5 during the HCA removal, therefore infiltrating rainfall will not have a significant effect in terms of raising the stormwater pH.

- The area surrounding the Site has a number of other sources of sulfate in groundwater resulting from previous operations. Potential sulfate sources include a former battery cracking plant, a former fertilizer manufacturer, two off-site HCA disposal areas operated by others, and a former agricultural chemical manufacturer.

- The former fertilizer manufacturer (Furman Fertilizer, now MGA Holdings) operated an acid pit (Sanborn, 1925). Downgradient of the acid pits at delineation boring DB-05 sulfate was observed at a concentration of 1,000 mg/l. The delineation boring location is upgradient and side gradient to the former HCA impoundments.

4. SAMPLE COLLECTION PROCEDURES

4.1 Summary

In April 2017, samples were collected from nine monitoring wells. Samples from monitoring wells were collected using dedicated tubing and low-flow purging techniques. Dedicated 1/8" polyethylene sampling tubing has been installed in each well. The end of the tubing is set in the middle of the screened interval. The end of tubing for EPW-01, EPW-02, and OW-01A is approximately 5 feet off the bottom of the well. Samples were placed in 250 ml polyethylene containers. The containers for aluminum were acidified with approximately 2 ml of nitric acid. Sulfate samples were preserved by refrigeration. The sampling containers and preservatives were provided by Pace Analytical Services Inc. located in Norcross, Georgia. The containers were labeled and stored on ice in a cooler until time for shipment to the laboratory. The samples were packed in ice in a cooler and hand delivered by a courier to the laboratory. Chain-of-custody documents were completed and included with each shipment.

4.2 Monitoring Well Sampling Procedure

Monitoring wells were sampled using peristaltic pumps. The samples were collected in general accordance with EPA's Field Branches Quality System and Technical Procedures (FBQSTP) Operating Procedure for "Groundwater Sampling", SESDPROC-301-R3 using the MicroPurge procedures for the “Tubing-in-Screened-Interval” Method. Peristaltic pumps were used since the depth to water was less than 29 ft bgs, which is the maximum practical lift a peristaltic pump can achieve. The advantages of peristaltic pumps are that they produce low rates of flow with minimal surging and can be decontaminated more thoroughly when compared to bailers or other types of pumps by simply replacing the tubing in the pump head. The pump-head tubing is silicone, while the down-hole tubing is polyethylene. The sample tubing is polyethylene instead of Teflon lined since the constituent concentrations are high (i.e., ppm not ppb) and sulfate and aluminum do not bind to polyethylene tubing.

Low flow purging was conducted by purging groundwater from the well at a low, constant rate for an extended period of time with the pump intake (i.e., the end of the dedicated tubing) set directly opposite the middle of the well screen. This method creates a localized flow system in the well directly between the screen and pump intake, eliminating the need to remove large volumes of casing storage while ensuring that the

sample collected is representative of the surrounding ground water. For this project, a purge rate of approximately 300 mL/min was extracted until the turbidity was stable at less than 20 NTUs or until other field parameters were stable. Additionally, a purge volume of at least five gallons was removed, when possible, to represent at least three pore volumes of the screened zone of the well.

To ensure that the samples collected are representative of the ground water in the formation, field parameters are measured throughout the purging process at least every 10 minutes. Temperature (ºC), conductivity (mS/cm), pH (s.u.), redox potential (mV), and turbidity (NTU) are measured using a Horiba U-52 or equivalent water quality meter. Measurements were taken in an enclosed flow-through cell to minimize the effects of contact with air.

After the field parameters have stabilized, the flow-through cell was disconnected and the sample is collected directly from the pump discharge tubing without adjusting the flow rate. This method ensures that the sample is representative of the groundwater at the respective location.

4.3 Groundwater Sampling Decontamination Procedure

Down well tubing was dedicated to each monitoring well by securing to the well cap and placing the tubing completely in the well when not in use. Pump-head tubing for the peristaltic pump was discarded after each use.

4.4 Storm Drain Sampling Procedure

Storm drain water was sampled using peristaltic pumps or by hand. The pump-head tubing is silicone, while the down-hole tubing is polyethylene. Four locations were sampled for sulfate in April 2017.

Storm drain water sampling was performed at the upgradient (SW-09), on-site (SW-02) and cross-gradient (SW-06) locations by lowering tubing into storm drain manholes and placing the end of the tube near the outlet for the manhole. This ensured water from multiple inlets was mixed prior to sample collection. The downgradient (SW-07) sample was collected by hand at the outlet to the storm drain at the discharge to the stream.

For peristaltic pump samples, a purge rate of approximately 500 mL/min was maintained until the turbidity was stable at less than 20 NTUs or until other field parameters were

stable. At SW-09, the turbidity was measured above 20 NTUs during purging, but due to the limited amount of water in the storm drain, SW-09 was sampled after two consistent measurements of field parameters. To ensure that the samples collected are representative of the storm drain water, field parameters are measured throughout the purging process. Temperature (ºC), conductivity (mS/cm), pH (s.u.), redox potential (mV), and turbidity (NTU) are measured using a Horiba U-52 or equivalent water quality meter. Measurements were taken in an enclosed flow-through cell to minimize the effects of contact with air.

After the field parameters have stabilized, the flow-through cell was disconnected and the sample is collected directly from the pump discharge tubing without adjusting the flow rate. This method ensures that the sample is representative of the storm drain water surrounding the respective location.

For hand samples, a location near the center of the flow and free of surface debris was selected. The sample was collected from beneath the surface by inserting the container opening down into the water then inverting underwater. The field parameters were measured by inserting the water quality instrument in the flow at the sampling location.

4.5 Storm Drain Sampling Decontamination Procedure

Drop tubing and pump-head tubing for the peristaltic pump were discarded after each use.

5. QUALITY ASSURANCE/QUALITY CONTROL

The field and analytical data from this semi-annual groundwater monitoring period was reviewed by Mr. Brian Jacobson with Geosyntec. The data review included evaluation of the field and laboratory quality assurance/quality control (QA/QC) parameters in order to assess the integrity of the data obtained for this project including: documentation, holding times, laboratory control samples, and laboratory matrix spike analyses. The documentation and results of the QA/QC analyses are found in the laboratory reports provided in **Appendix A**. Evaluation of these parameters was used to assess the precision, accuracy, representativeness, comparability, and completeness of the data.

Based on the review of the field and laboratory data, the data obtained from this field investigation are considered to be of acceptable quality and are fully usable with the qualifications as designated by the data validation process. Details of the QA/QC review of the data are presented in the following sections.

5.1 Documentation

Field sampling forms and chain-of-custody forms were evaluated for completeness. Field records were considered to be usable and to provide a reasonable record of field activities and samples collected. This review indicated that field sampling and custody transfer procedures were adequately documented and the integrity of the samples was not compromised.

5.2 Holding Times

All samples were processed and analyzed by the laboratory using the correct analytical methods and within the prescribed holding times.

5.3 Reporting Limits

The laboratory reporting limits for sulfate by Method 9056A varied from 5 to 500 mg/l depending on the required dilution to measure a result. The laboratory reporting limits for aluminum by Method 6010C was 0.1 mg/l. The required quantitation limits for this project were met for all data, except in cases where sample dilution was required because of high concentrations of target analytes or matrix interference.

5.4 Accuracy

The accuracy of the data was evaluated by examining the percent recovery (%R) of matrix spikes and matrix spike duplicate (MS and MSD), and laboratory control samples (LCS). A post digestion spike was also performed for aluminum analysis to evaluate possible matrix effects of the digestate. The %Rs met the laboratory-specific QC limits for the laboratory QC LCS samples. The MS samples for sulfate and aluminum were outside the %R limits for MS and MSD samples as well as for the post digestion spike. The low recoveries were due to the low spike concentration in relation to the actual sample concentration of aluminum and sulfate (sample concentration much greater than the spiked amount). The data were judged acceptable for use based on the acceptable %R for the LCS samples.

5.5 Representativeness

Representativeness was evaluated to assess the degree to which sample results represent the actual concentrations of constituents in groundwater. Representativeness was evaluated qualitatively by reviewing sampling procedures and laboratory analytical procedures. Based on this review, the samples yielded results that provided a good qualitative representation of constituent concentrations in groundwater.

A qualitative evaluation of representativeness was also performed by examining the analysis of laboratory method blanks. Constituents were not detected above the reporting limit in any of the method blanks. This evaluation further demonstrates that the analytical data are representative of actual conditions.

5.6 Comparability

The current field and laboratory methods were compared to methods used during past monitoring periods in order to evaluate the comparability of data obtained during the current monitoring period to data previously obtained. The recommended reporting limits were used for all constituents. The data presented in this report are consistent with the data presented in previous reports.

5.7 Completeness

Completeness was measured by determining the percentage of usable data obtained from samples for this project. The project sample results were found to be 100 percent complete and usable without qualification.

6. CONCLUSIONS

6.1 Groundwater

The results of the nine years of data collection indicate concentrations of constituents of concern are generally showing significant decreasing trends or stability for on-site monitoring wells. The HCA source material has been removed for over nine years. While many factors can influence concentrations at any given point in time, (e.g., time since removal of the source, hydrogeologic conditions, and precipitation patterns) it is encouraging to see that the general trend of concentrations of monitored constituents is decreasing. Groundwater levels (elevations) have been generally stable since 2008.

Sulfate concentrations show a statistically significant decreasing trend in five of six on-site groundwater wells. The decreasing trends are consistent with source removal followed by natural attenuation of the remaining pore water.

Aluminum concentrations did not vary in a consistent direction between sampling events. Total aluminum concentration is pH dependent and since Piedmont soils contain high levels of naturally occurring aluminum, this phenomenon is not unexpected. Additionally, aluminum hydroxide can migrate as a colloid in groundwater. As shown in **Figure 6-1**, on-site wells consistently had aluminum concentrations above solubility limits indicating solid colloidal aluminum was likely being measured in the groundwater samples. Elimination of the colloidal aluminum would result in at least an order of magnitude reduction in total aluminum measured. For example, as shown on **Figure 6-1**, the measured total aluminum concentration was 26 mg/l, whereas the maximum soluble concentration at pH 4.0 is 0.6 mg/l, a 98 percent decrease from the reported value. The natural filtering of the aluminum floc particles by the soil as the water migrates off site may explain the rapid reduction in observed aluminum concentrations with increasing distance from the former source area.

The pH measurements were generally stable between the sampling events. While this is encouraging, we believe that local precipitation which has been measured with a pH less than 5 standard units will limit recovery of groundwater pH. The depressed pH will continue to allow naturally occurring aluminum to be mobilized from site soils. However, the aluminum does not appear to be migrating off site.

6.2 Storm Drains

Storm drains at the Site have been sampled during 22 sampling events. Storm drain water and groundwater are related due to leaks in the storm drains that allow the infiltration/exfiltration of stormwater and groundwater depending on the relative water levels. The stormwater constituent concentrations and pH will vary slowly due to the low groundwater flow velocity across the Site (previously estimated at 16.4 ft. per year). The potential presence of off-site sources may slow the return of the stormwater to background conditions. Factors that may slow a return to background include the following:

- The pH of the groundwater in upgradient wells (OW-1A and GCW-01D) is low. Measured pH values were 4.4 and 4.2 s.u., respectively. The low pH values of groundwater entering the Site will slow a return to background conditions of stormwater mixed with groundwater exiting the Site. The pH of stormwater in the cross-gradient sampling location (SW-06) was measured at 4.0 s.u. This water mixes with on-site stormwater lowering the pH.

- The pH of rainwater at the Site was measured at less than 5 during the HCA removal, therefore infiltrated rainfall and stormwater will not have a significant effect in terms of raising the stormwater pH in the short-term.

- The area surrounding the Site has a number of other sources of sulfate in groundwater resulting from previous operations. These sources may be contributing the elevated sulfate concentrations noted at SW-02 that were measured at 780 mg/l. Potential sulfate sources include a former battery cracking plant, a former fertilizer manufacturer, two off-site HCA disposal areas operated by others, and a former agricultural chemical manufacturer.

The sulfate concentrations at the upgradient monitoring point (SW-09) were lower than on-site (SW-02) or cross-gradient (SW-06) monitoring points. Downgradient (SW-07) sulfate concentration at the exit to the storm drain and the start of open channel flow was measured at 450 mg/l which is greater than the background concentration of 44 to 93 mg/l.

The cross-gradient (SW-06) concentrations of sulfate and aluminum were higher than the on-site (SW-02) concentrations during the last sampling event. Since the on-site source

has been removed and potential off-site sources likely remain the relative contribution from the Site would be expected to continue to decrease with time. As presented in **Figure 3-3**, the time trend analysis shows a continued impact from the cross-gradient SW-06, which is consistent with source removal on site and active potential impacts by a residual plume.

6.2 East Point Storm Drain Negotiations

The City of East Point requested a series of meetings during the period of February to March 2017 to discuss storm drain concerns related to the Newell Recycling property and the adjacent Chemtrade site. The meetings participants included representatives from The City of East Point, Newell Recycling, Chemtrade, and GaEPD.

During the meetings Chemtrade explained a potential approach to line a portion of the the storm drains under Milner Sports Complex. The selected portion of storm drain was selected to minimize the infiltration of sulfate containing and low pH groundwater into the storm drain. The City of East Point requested additional work be performed at the corner of the Chemtrade site at SW-02. Chemtrade and the City of East Point are planning negotiations to determine the extent of the additional work to be performed. Chemtrade plans to execute the work under the Milner Sports Complex shortly after successfully completing the negotiations with the City of East Point.

7. REFERENCES

Geosyntec (1999), "*Compliance Status Report*", General Chemical Corporation, East Point, Georgia", prepared by Geosyntec Consultants, February 1999

Geosyntec (2002), "*Revised Corrective Action Plan, General Chemical Corporation, East Point, Georgia"*, prepared by Geosyntec Consultants, February 2002

Geosyntec (2006), "*Site restoration Report, General Chemical Corporation, East Point, Georgia"*, prepared by Geosyntec Consultants, February 2006

Geosyntec (2007), "*Revised Corrective Action Plan, General Chemical Corporation, East Point, Georgia"*, prepared by Geosyntec Consultants, February 2007

Geosyntec (2013), "*Voluntary Remediation Plan Application, General Chemical Corporation, East Point, Georgia"*, prepared by Geosyntec Consultants, January 2013

TABLES

Table 3-1
Well Construction Data and Groundwater Elevations
Chemtrade Solutions Site
East Point, Georgia

Location	Well Casing Elevation	Adjacent Soil Elevation	Screen Interval (ft bgs)	Depth to Water (ft)	Groundwater Elevation (ft msl)
				Apr-17	Apr-17
GCW-01S	1023.6	1024	182	12.9	1010.8
GCW-01M	1023.8	1024	34-44	13.0	1010.8
GCW-01D	1023.9	1024	58-68	12.1	1011.8
GCW-02S	983.6	984	16-26	4.0	979.6
GCW-02D	983.4	984	34-44	3.5	980.0
GCW-02V	984.7	985.0	85.5-95.5	3.7	981.0
GCW-03S	981.3	981.6	11-21	4.5	976.7
GCW-03D	981.2	982	28-38	4.2	977.0
GCW-04S	996.6	997.0	13-23	8.3	988.3
GCW-04M	997.0	997.4	30-40	8.7	988.3
GCW-04D	996.8	997.1	50-60	8.4	988.4
GCW-04V	996.7	997.0	114-124	9.3	987.4
GCW-05	995.1	994.9	80-90	8.5	986.6
EPW-01	1017.5	1017.7	24.51(1)	16.8	1000.7
EPW-02	980.0	980.3	19.41(1)	10.2	969.8
EPW-03S	984.5	984.8	12-22	9.7	974.8
EPW-03M	984.3	984.6	29-39	9.5	974.8
EPW-03D	984.6	984.9	46-56	9.5	975.1
OW-1A(2)	1030.6	1027.9	23.5-33.5(3)	15.0	1015.6

Notes:

(1): Screen length is unknown. Total depth of the well is indicated in the table.

(2): Well OW-1A has a casing extending above ground surface 2.7 ft.

(3): Screen interval measured 7 November 2012.

NA: Not available

Table 3-2
Groundwater Sampling Results
Chemtrade Solutions Site
East Point, Georgia

Location	pH (-) EPA 150.1	Sulfate (mg/l) EPA 9056A	Aluminum (mg/l) EPA6010C	Type 4 RRS Exceeded	
				Sulfate 1200 mg/l	Aluminum 102 mg/l
GCW-01D	4.2	380	4.2	No	No
GCW-02D	3.5	1800	162	Yes	Yes
GCW-03D	3.2	3400	319	Yes	Yes
GCW-04D	3.4	2800	420	Yes	Yes
GCW-05	6.9	900	<0.1	No	No
EPW-01	4.2	93	12.9	No	No
EPW-02	5.2	<5.0	<0.1	No	No
EPW-03D	6.0	25	<0.1	No	No
OW-1A	4.4	44	0.587	No	No
Duplicates	--	3400[1]	308[1]		

Notes:
[1]: Duplicate was taken from GCW-03D

Table 3-3
Summary of Statistical Trend Analysis
Groundwater Samples
Chemtrade Solutions Site
East Point, Georgia

Well ID	Parameter	Mann-Kendall Trend Analysis at 95% Confidence Level
GCW-01D	Alumimum	Decreasing
GCW-02D		No trend
GCW-03D		No trend
GCW-04D		Decreasing
GCW-05		No trend
EPW-01		No trend
EPW-02		Decreasing
EPW-03D		No trend
OW-1A		Decreasing
GCW-01D	Sulfate	Decreasing
GCW-02D		No trend
GCW-03D		Decreasing
GCW-04D		Decreasing
GCW-05		Decreasing
EPW-01		Increasing
EPW-02		No trend
EPW-03D		Decreasing
OW-1A		Decreasing

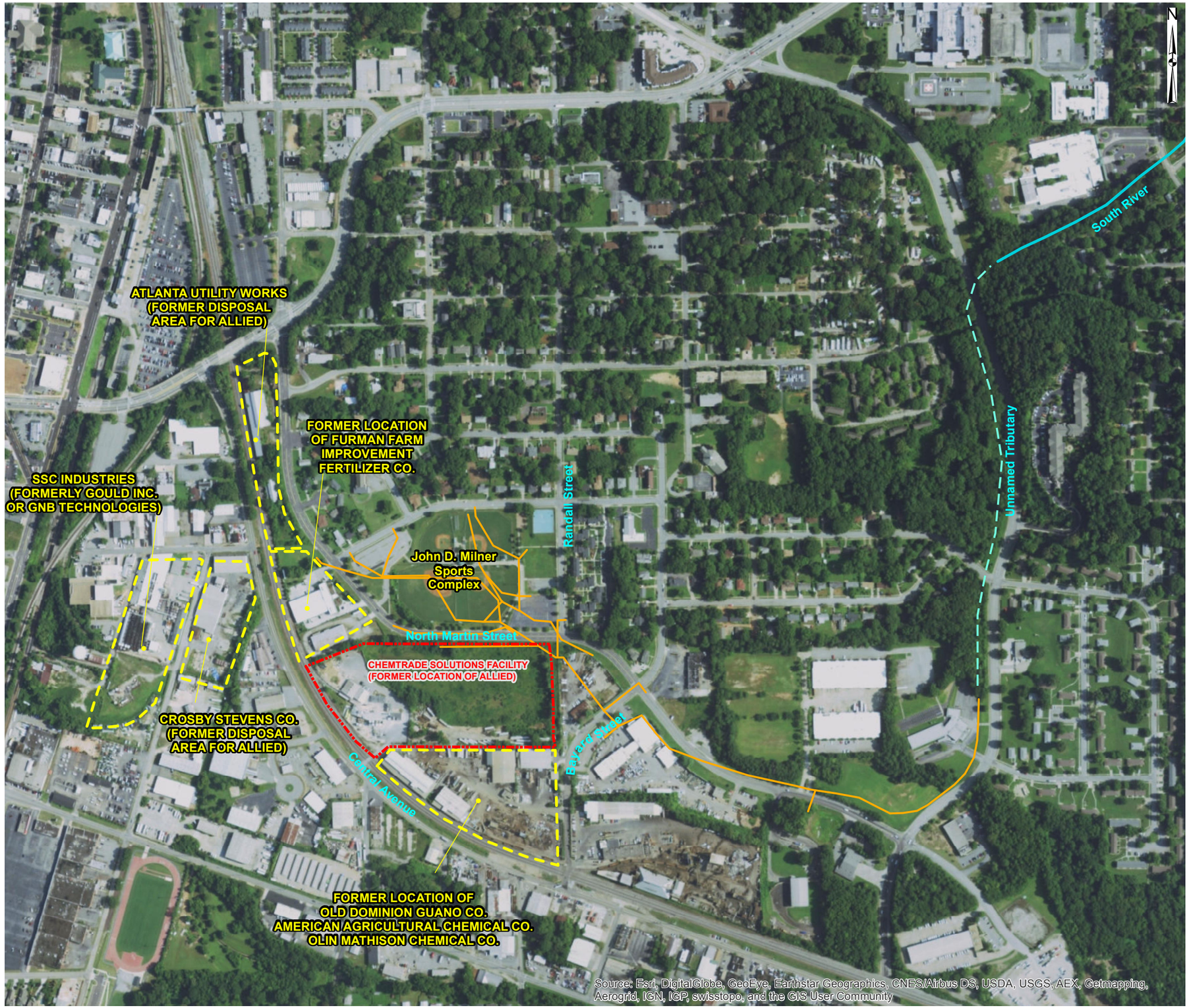
Table 3-4
Storm Drain Sampling Results
January 2017
Chemtrade Solutions Site
East Point, Georgia

Location	Description	pH (-) EPA 150.1	Sulfate (mg/l) EPA 9056A	Aluminum (mg/l) EPA6010C
SW-02	On-site	4.1	780	80.8
SW-06	Cross-Gradient	4.0	1500	158
SW-07	Downgradient	4.4	450	42.4
SW-09	Upgradient	7.0	81	<0.1
Duplicate	Duplicate SW-02	--	840	79.2

Table 3-5
Summary of Statistical Trend Analysis
Storm Drain Samples
Chemtrade Solutions Site
East Point, Georgia

Sample Location	Parameter	Mann-Kendall Trend Analysis at 95% Confidence Level
SW-02	Alumimum	Increasing
SW-06		No trend
SW-07		No trend
SW-09		No trend
SW-02	Sulfate	Increasing
SW-06		Increasing
SW-07		No trend
SW-09		No trend

FIGURES



N:\genchem\GIS\MXDs\Figure 1-1.mxd
/SColsky 5/24/2017

SITE VICINITY MAP

Chemtrade Solutions
EAST POINT, GEORGIA

Legend

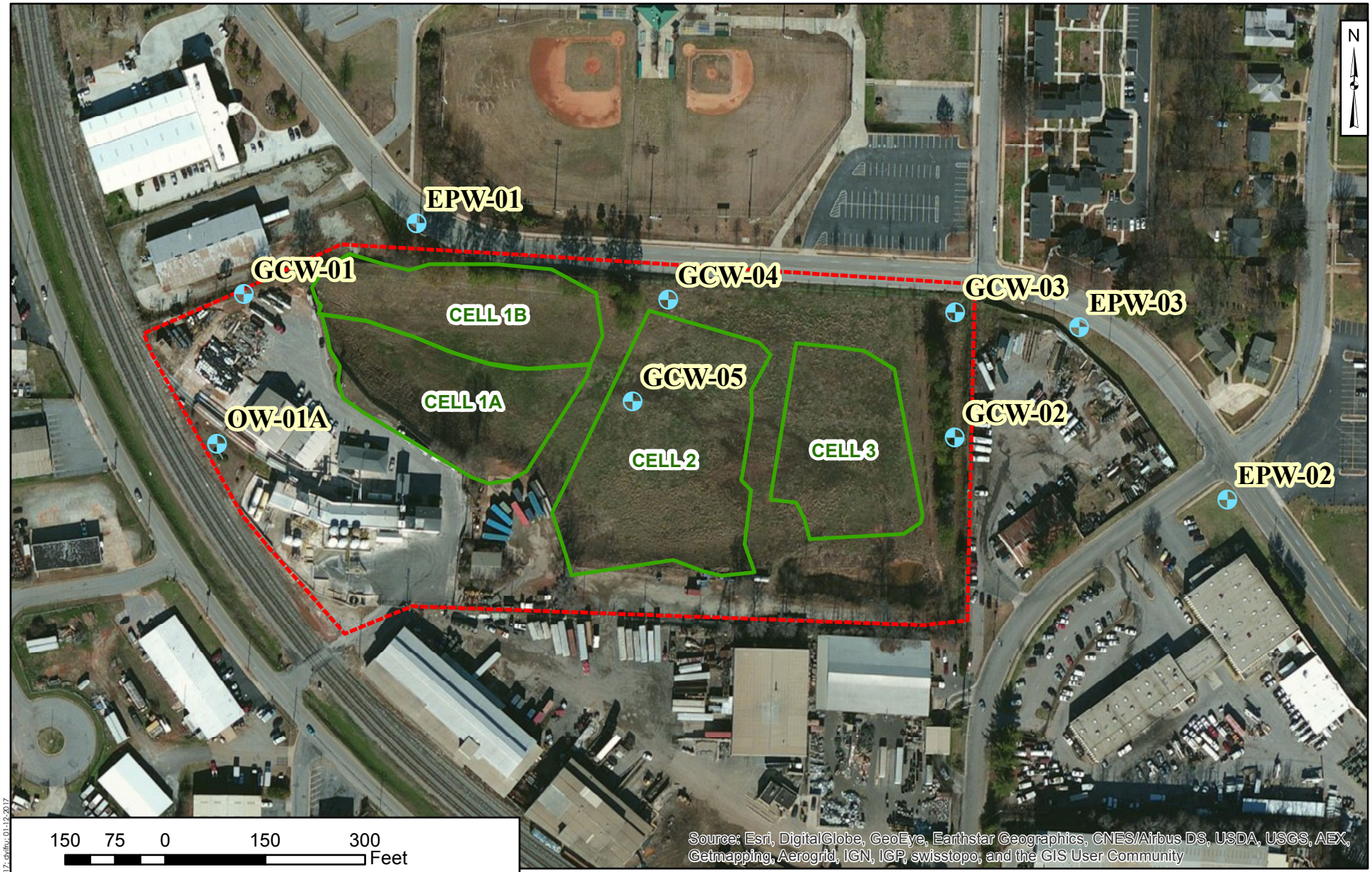
- Approximate Property Line
- Approximate Site Property
- Storm Drain
- Unnamed Tributary
- SouthRiver

500 250 0 500 1,000
Feet

Geosyntec consultants

ATLANTA, GEORGIA

June 2017	SCALE: 1" = 500'
PROJECT NO. GR5060	FIGURE NO. 1-1
DOCUMENT NO.	FILE NO. Figure 1-1.mxd



Legend
- Monitoring Well selection
- Excavation Cell
- Approximate Property Boundary

Geosyntec consultants
Kennesaw, GA

June 2017

MONITORING WELLS LOCATION MAP

Chemtrade Solutions, East Point, GA

Figure **1-2**

N:\genchem\gis\MXDs\January 2017; dylitu - 01-12-2017

Legend

Surface Water Sample Location

Approximate Property Boundary

Geosyntec consultants
Kennesaw, GA

June 2017

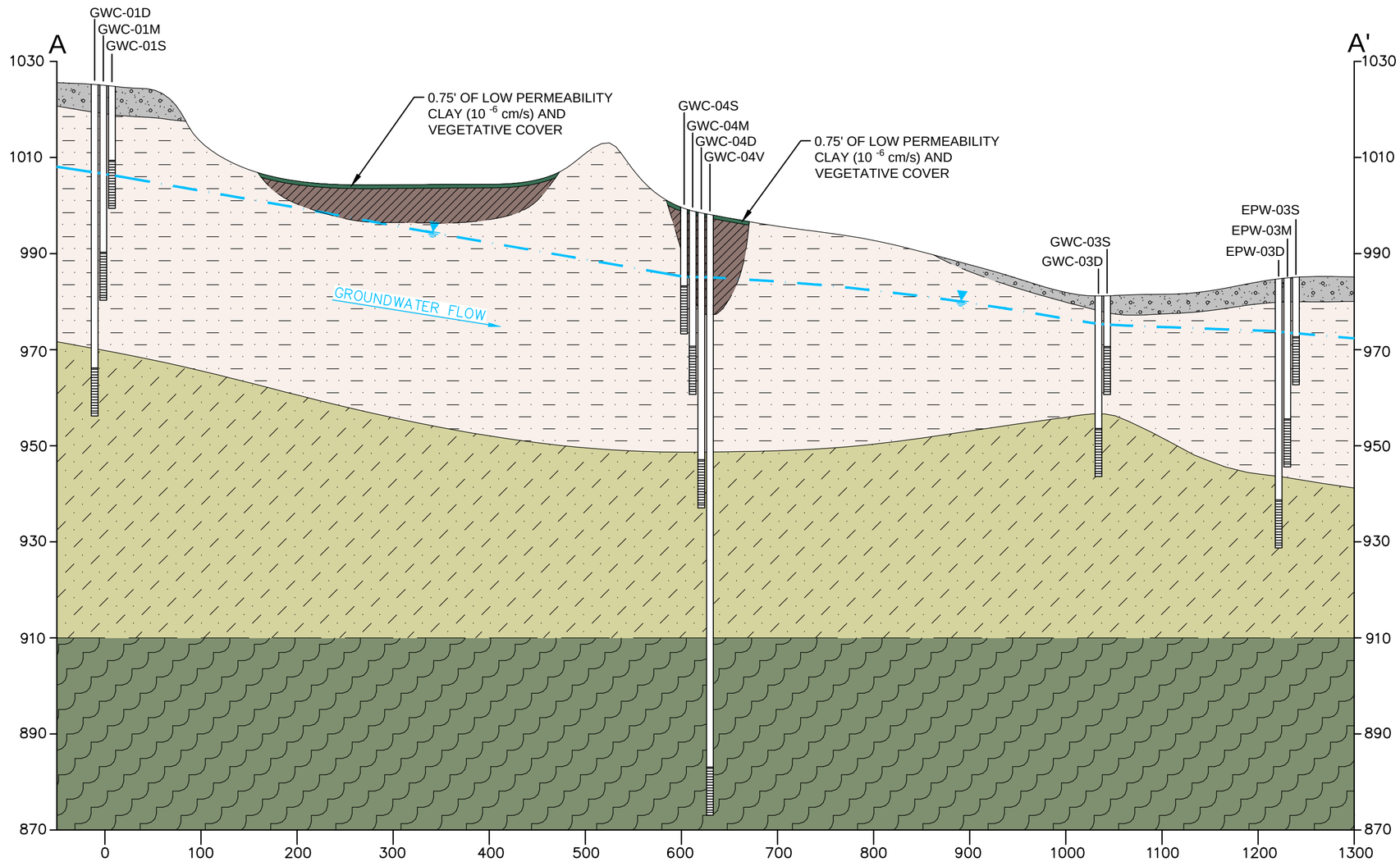
STORM DRAIN SAMPLE LOCATION MAP

Chemtrade Solutions, Atlanta, GA

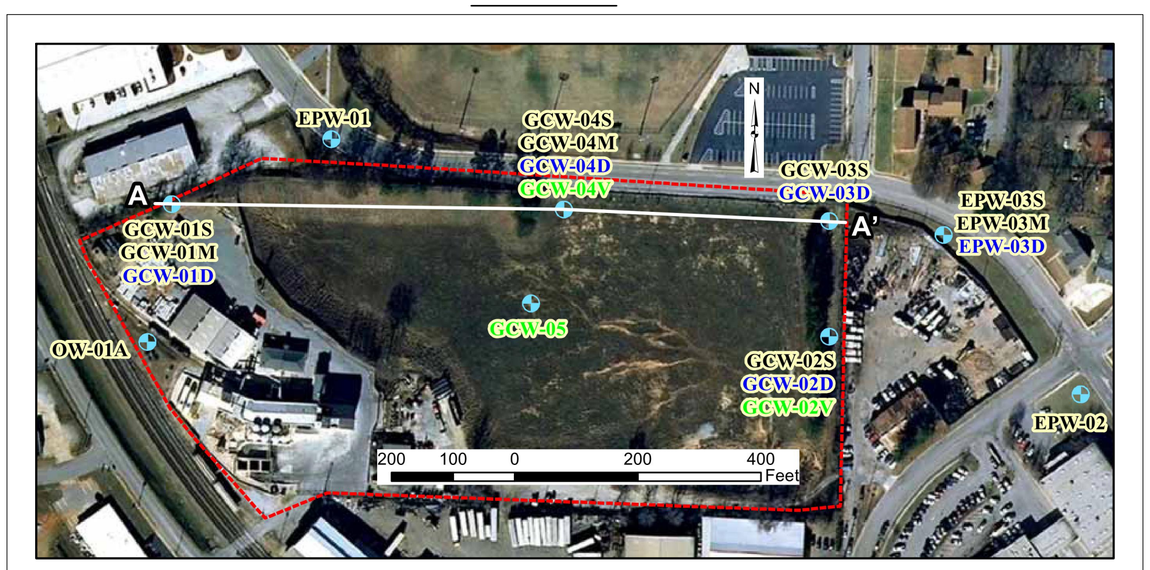
Figure
1-3

N:\genchem\gis\MXDs\January 2017: DYfrui: 01/11/2017: GR5060

GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION ALONG A-A'



KEY MAP



LEGEND

- 0.75' THICK LOW PERMEABILITY CLAY (10 $^{-6}$ cm/s) AND VEGETATIVE COVER
- GRAVELLEY CLAY, FILL
- CLAY, FILL AFTER EXCAVATION
- SILTY SAND, RELICT SCHISTOCITY, MICACEOUS (SAPROLITE)
- PARTRIALLY WEATHERED SCHIST
- BEDROCK (SCHIST)
- LITHOLOGIC CONTACT, DASHED WHERE INFERRED
- MONITORING WELL SCREEN ZONE WITH WATER ELEVATION (FEET MSL), NOVEMBER, 2012

0 100' 200'

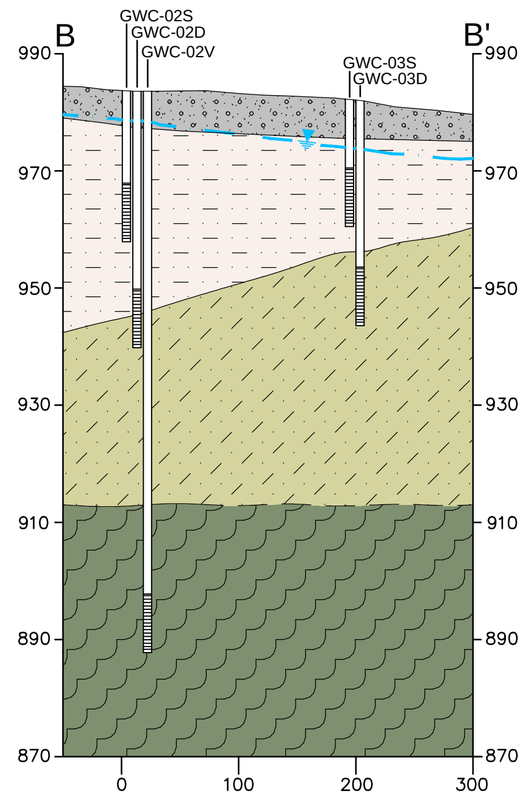
HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION = 5X

Geosyntec consultants

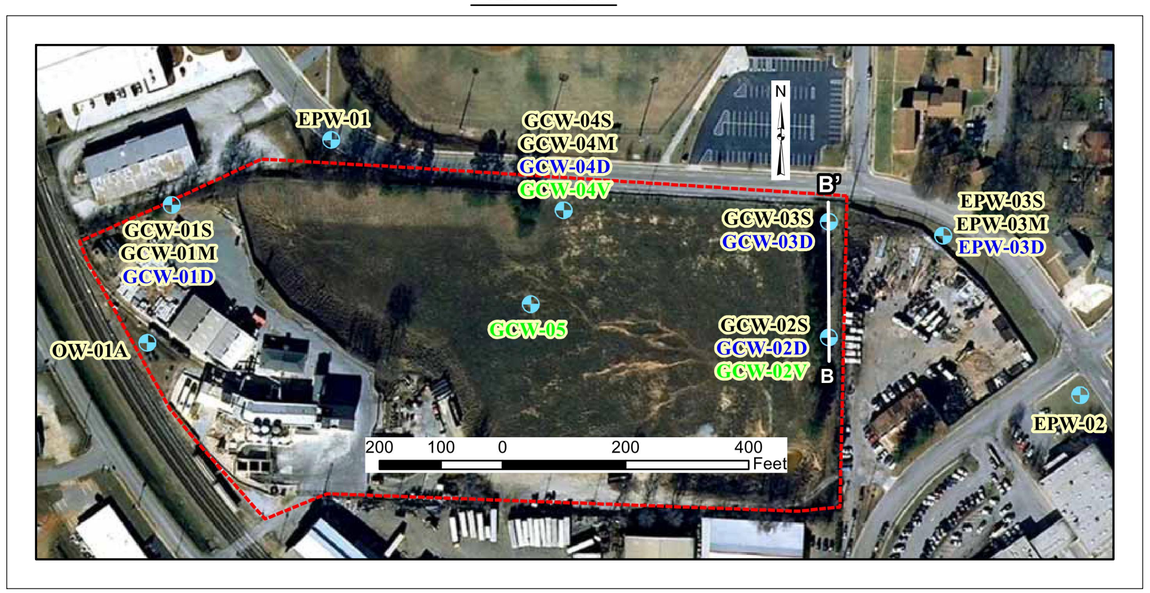
DATE:	JUN-13	SCALE:	AS SHOWN
PROJECT NO.	GR5060/12	FILE NO.	5060F001
DOCUMENT NO.	GA 130020	FIGURE NO.	2-1

L:\CADD\G\GENERAL CHEMICAL\MODIFICATION\HYDROGEOLOGIC CROSS SECTION GR3712.08.03\FIGURES\5060F001

GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION ALONG B-B'



KEY MAP



LEGEND

- GRAVELLEY CLAY, FILL
- SILTY SAND, RELICT SCHISTOCITY, MICACEOUS (SAPROLITE)
- PARTRIALLY WEATHERED SCHIST
- BEDROCK (SCHIST)
- LITHOLOGIC CONTACT, DASHED WHERE INFERRED
- MONITORING WELL SCREEN ZONE WITH WATER ELEVATION (FEET MSL), NOVEMBER, 2012

0 100' 200'

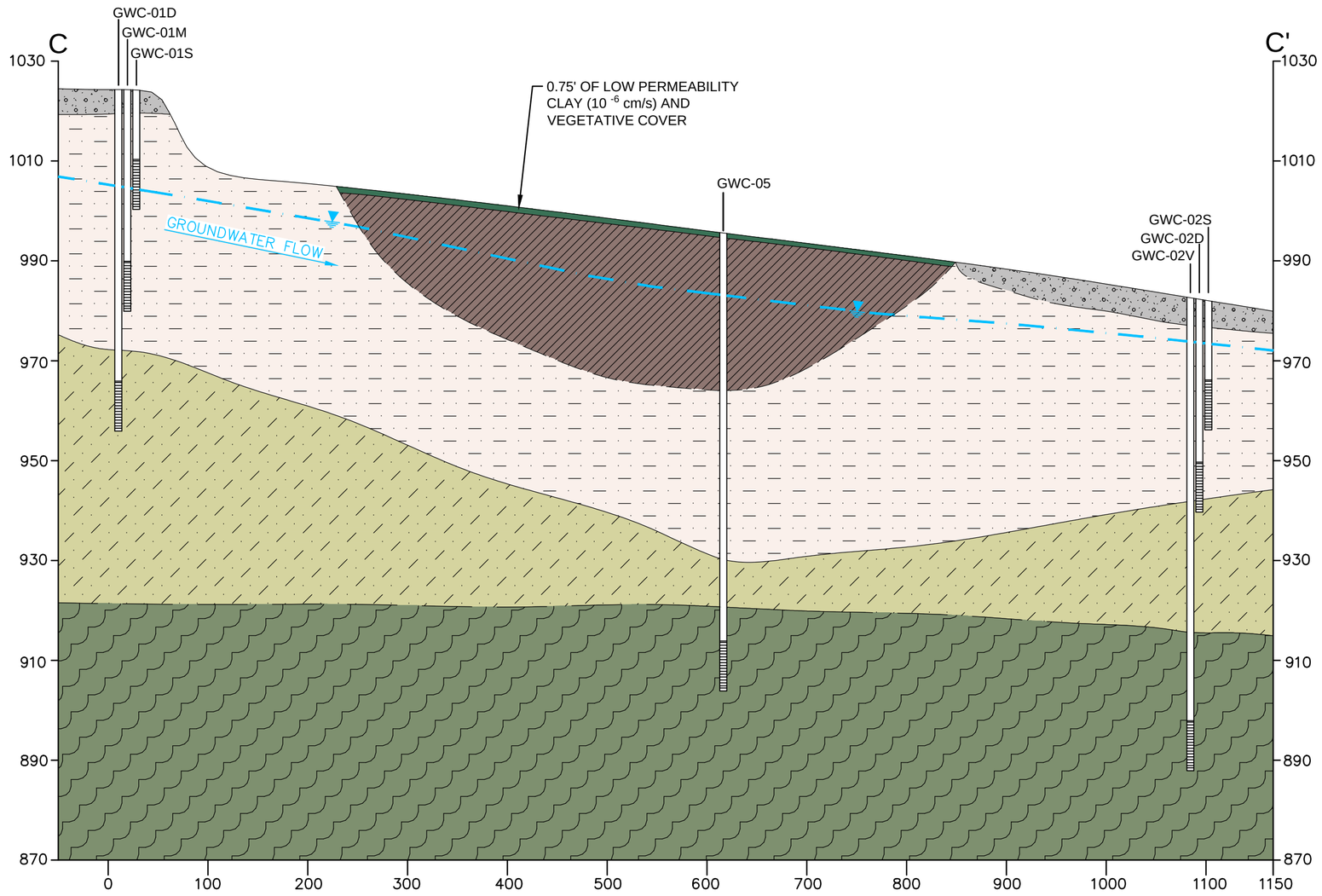
HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION = 5X

Geosyntec consultants

DATE:	JUN–13	SCALE:	AS SHOWN
PROJECT NO.	GR5060/12	FILE NO.	5060F001
DOCUMENT NO.	GA 130020	FIGURE NO.	2-2

L:\CADD\G\GENERAL CHEMICAL\MODIFICATION\HYDROGEOLOGIC CROSS SECTION GR3712.08.03\FIGURES\5060F001

GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION ALONG C-C'



KEY MAP

LEGEND

- 0.75' THICK LOW PERMEABILITY CLAY (10 $^{-6}$ cm/s) AND VEGETATIVE COVER
- GRAVELLEY CLAY, FILL
- CLAY, FILL AFTER EXCAVATION
- SILTY SAND, RELICT SCHISTOCITY, MICACEOUS (SAPROLITE)
- PARTRIALLY WEATHERED SCHIST
- BEDROCK (SCHIST)
- LITHOLOGIC CONTACT, DASHED WHERE INFERRED
- MONITORING WELL SCREEN ZONE WITH WATER ELEVATION (FEET MSL), NOVEMBER, 2012

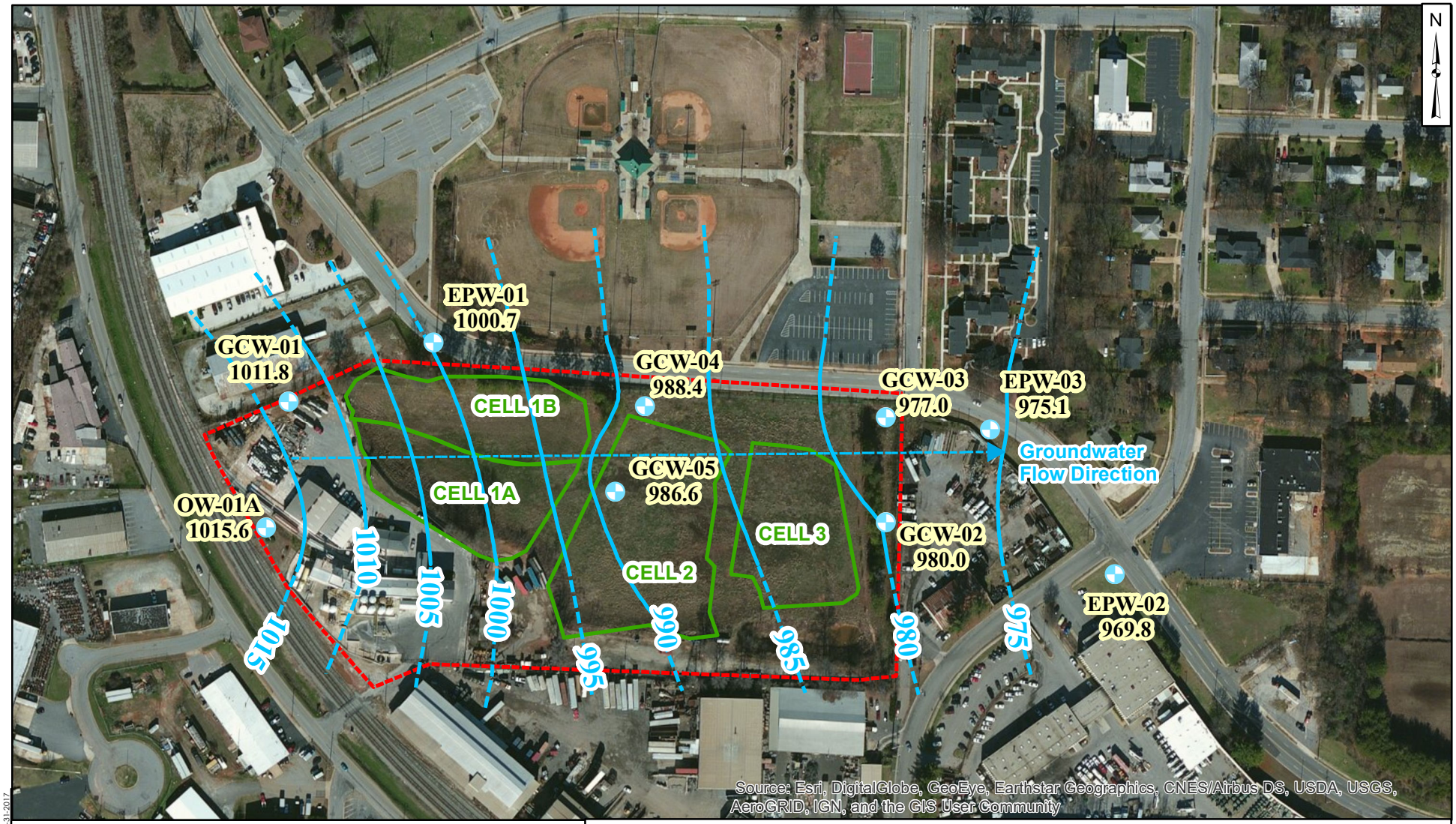
0 100' 200'

HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION = 5X

Geosyntec consultants

DATE:	JUN-13	SCALE:	AS SHOWN
PROJECT NO.	GR5060/12	FILE NO.	5060F001
DOCUMENT NO.	GA 130020	FIGURE NO.	2-3

L:\CADD\G\GENERAL CHEMICAL\MODIFICATION\HYDROGEOLOGIC CROSS SECTION GR3712.08.03\FIGURES\5060F001



Legend

- Monitoring Well (Groundwater Elevation in ft MSL)
- April 2017 Groundwater Contours (Dashed where Inferred)
- Excavation Cell
- Approximate Property Boundary

200 100 0 200 400 Feet

Geosyntec consultants

Kennesaw, GA

June 2017

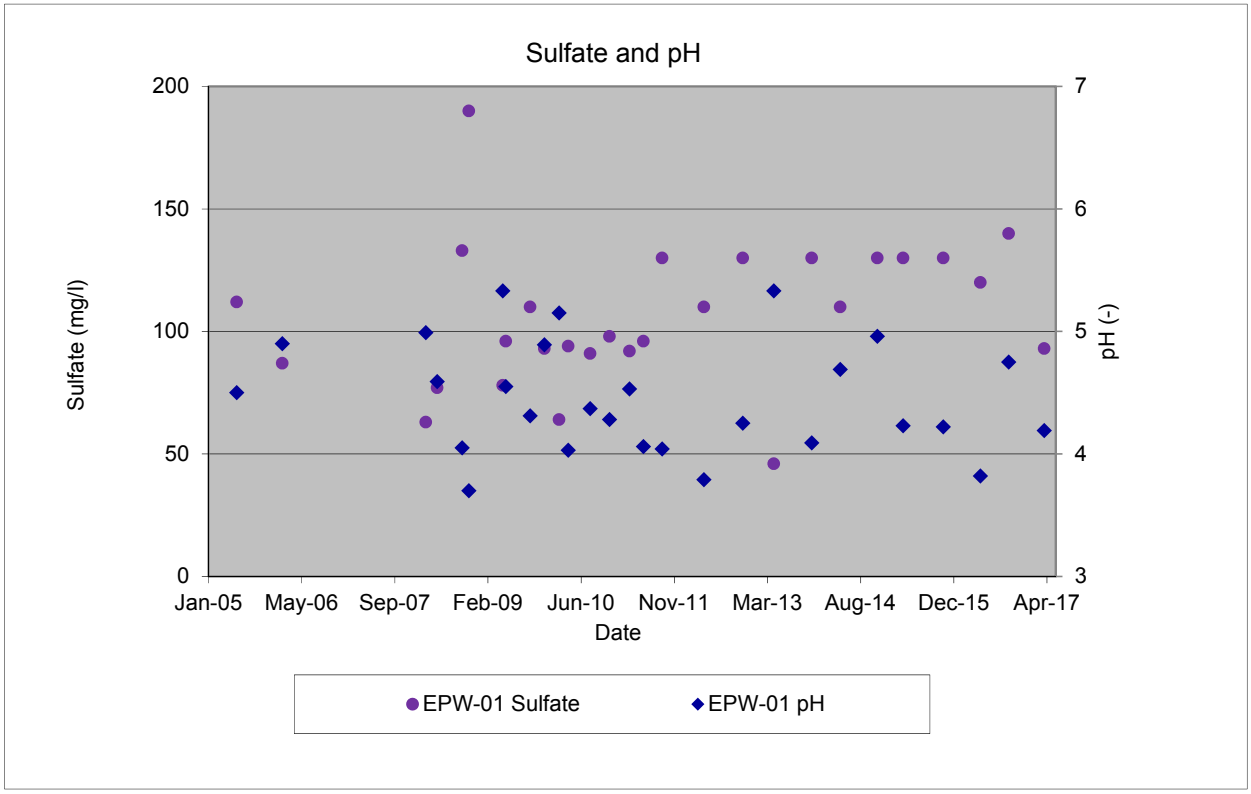
POTENTIOMETRIC SURFACE MAP

Chemtrade Solutions, East Point, GA

Figure 3-1

\\ceo-01\gri1$\genchem\GIS\MXDs\April 2017\DXfs\05-31-2017

Figure 3-2
EPW-01 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



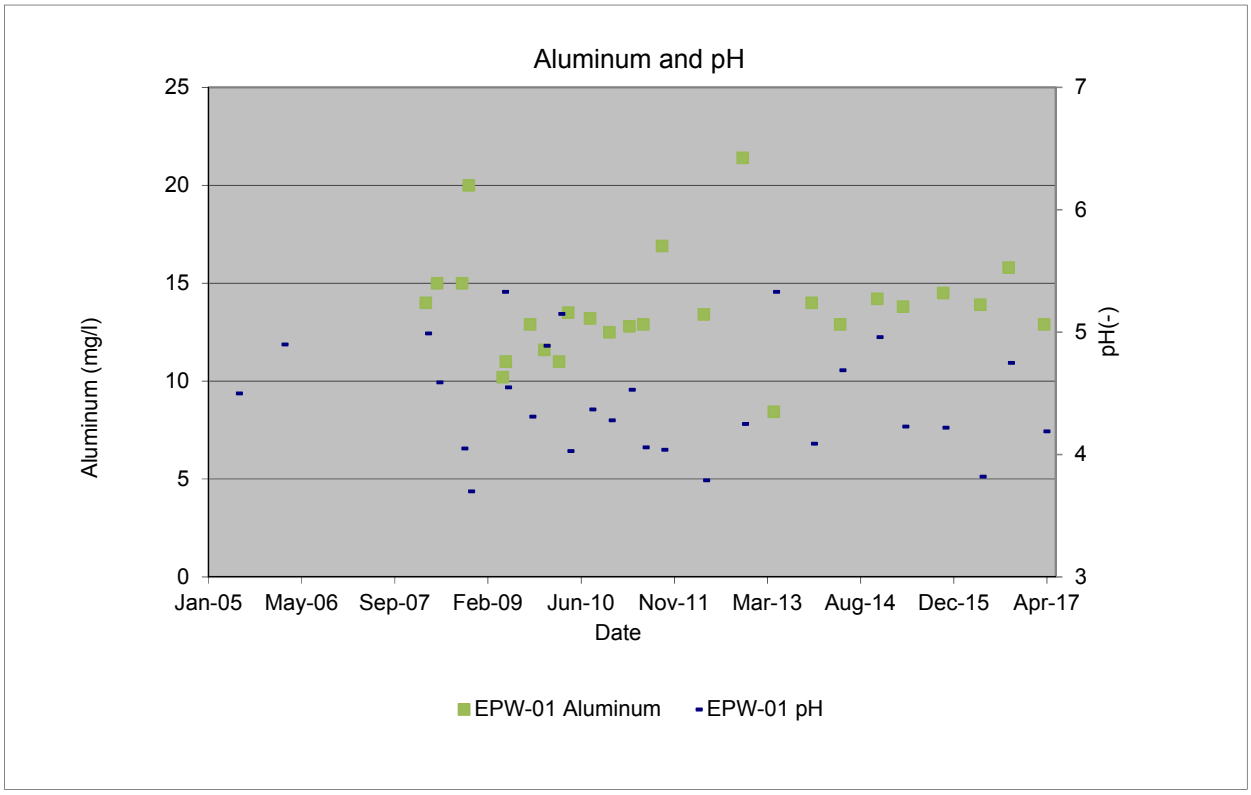
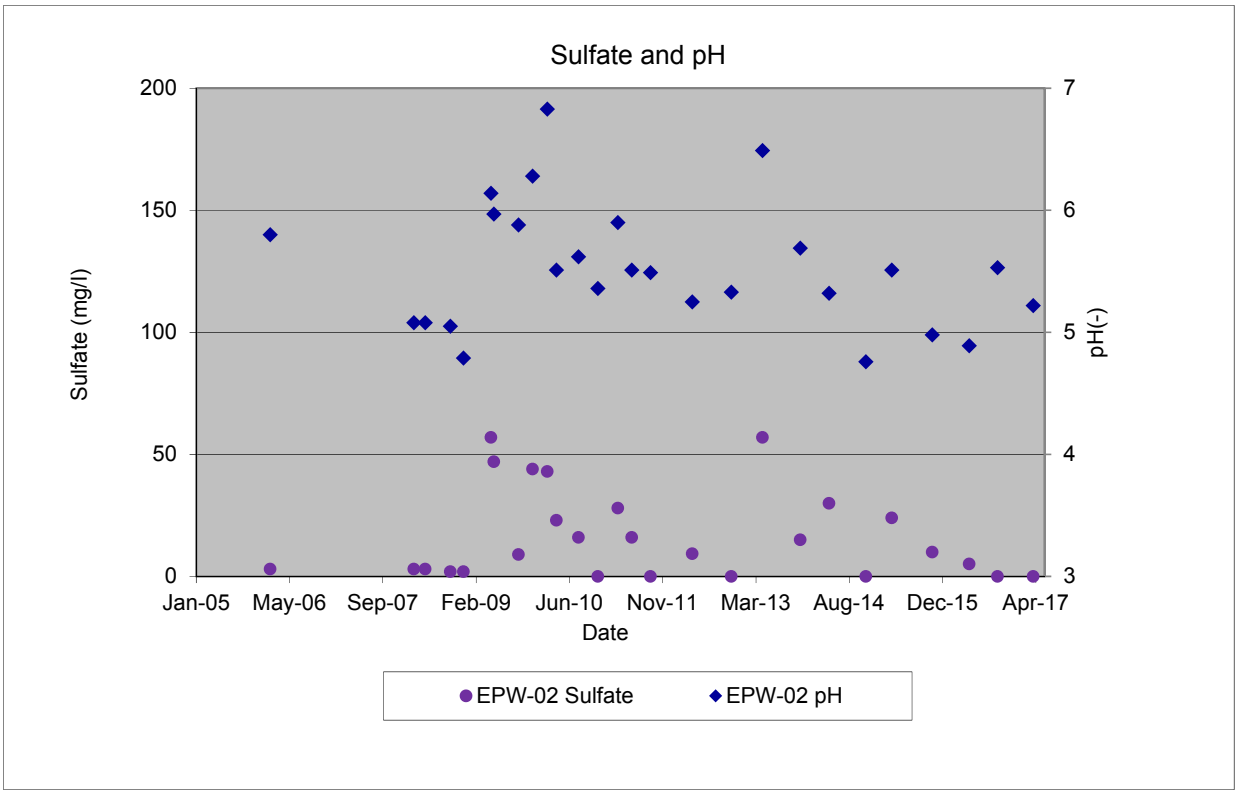


Figure 3-2 (Cont)
EPW-02 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



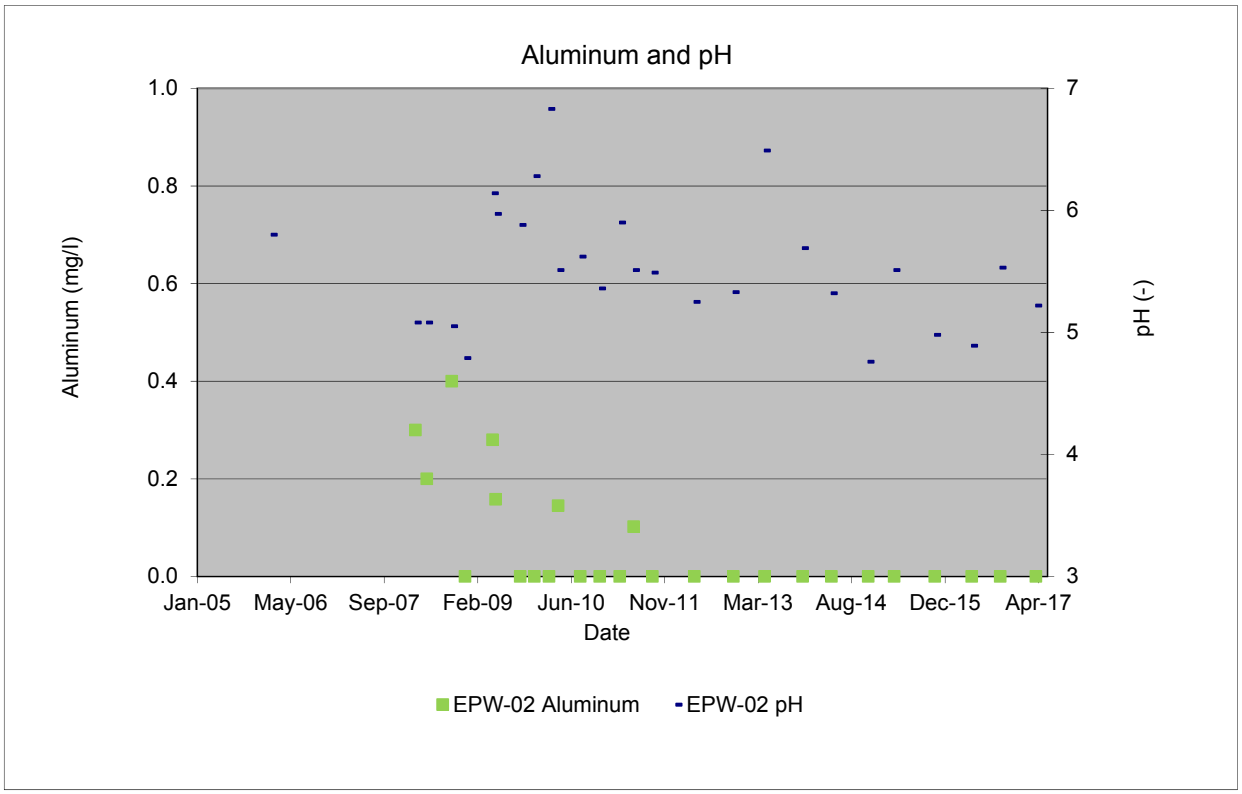
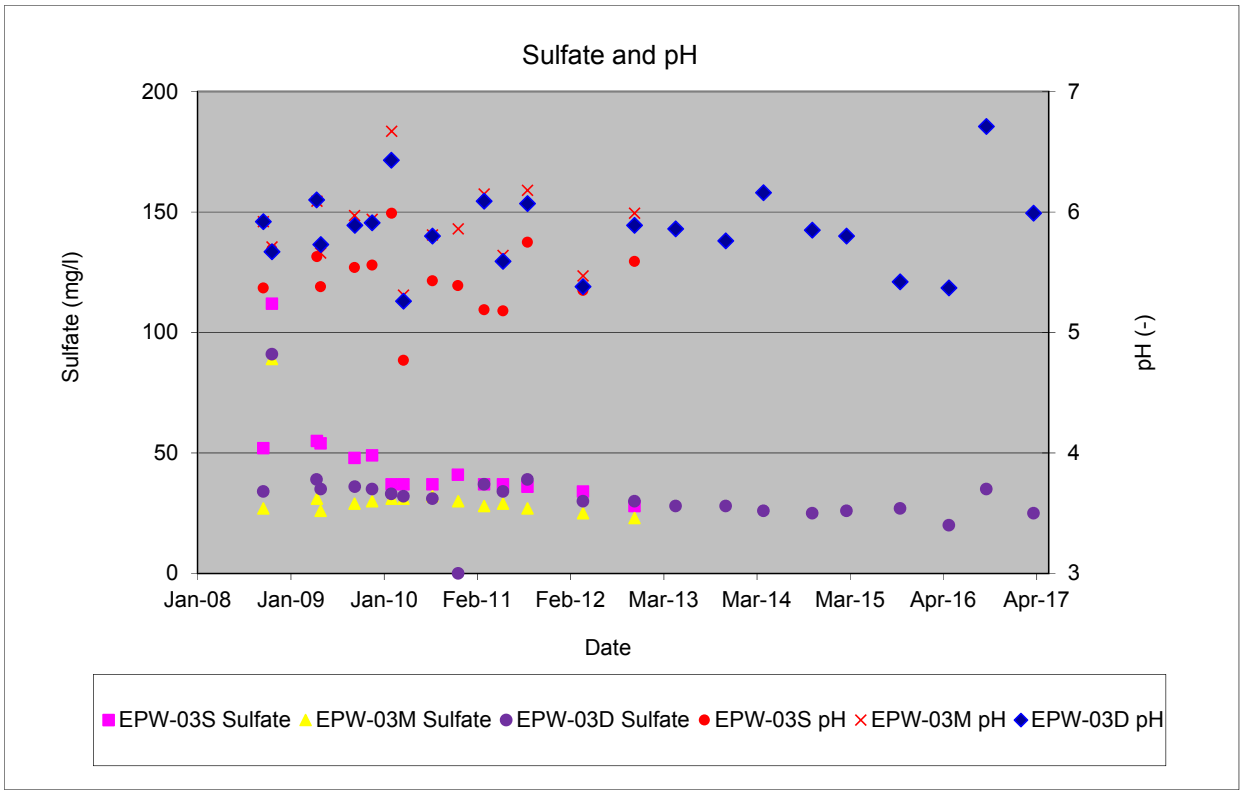


Figure 3-2 (Cont)
EPW-03S -M -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



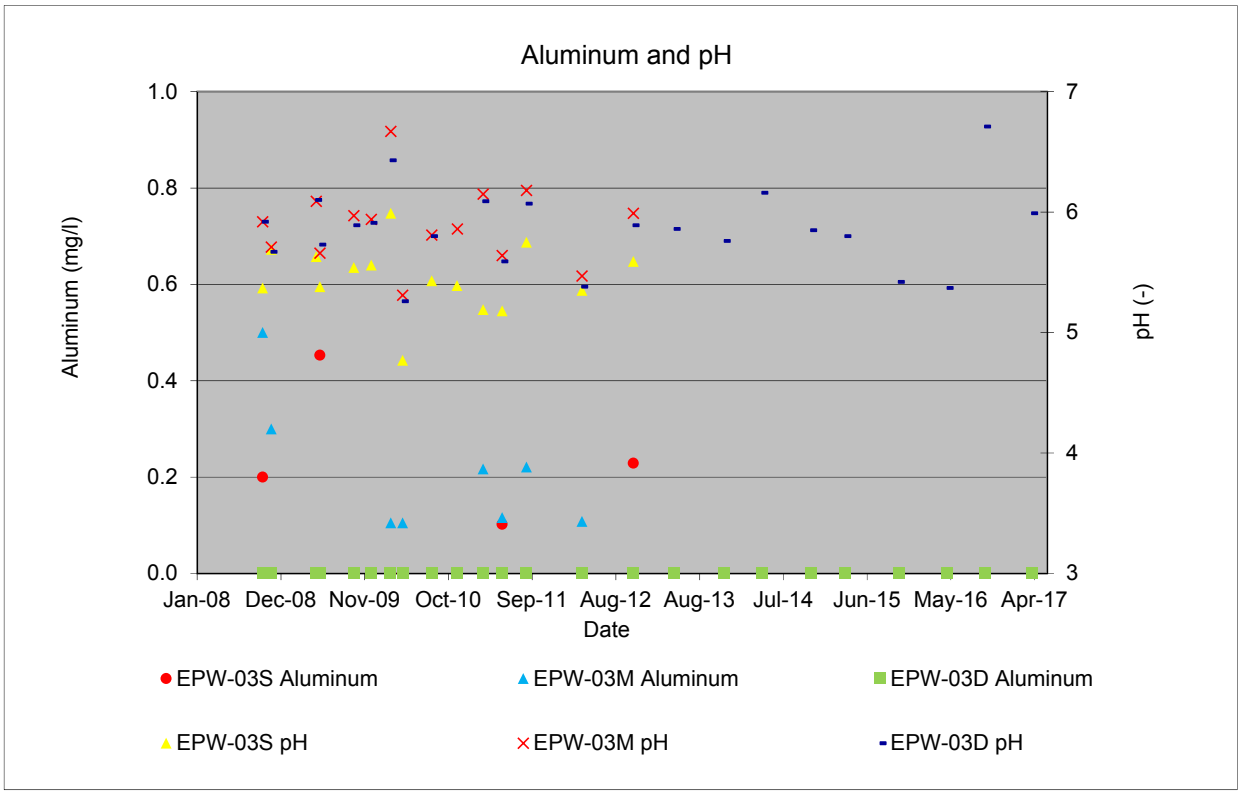
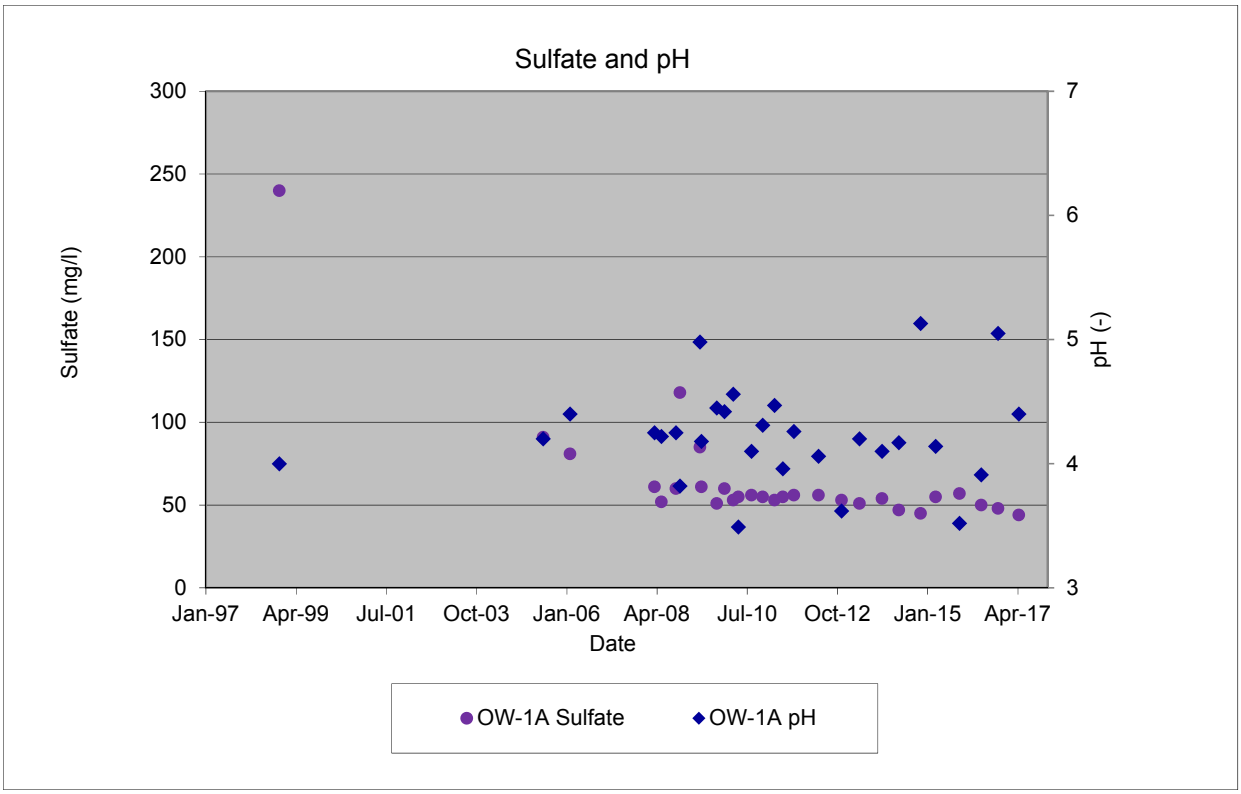


Figure 3-2 (Cont)
OW-1A Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



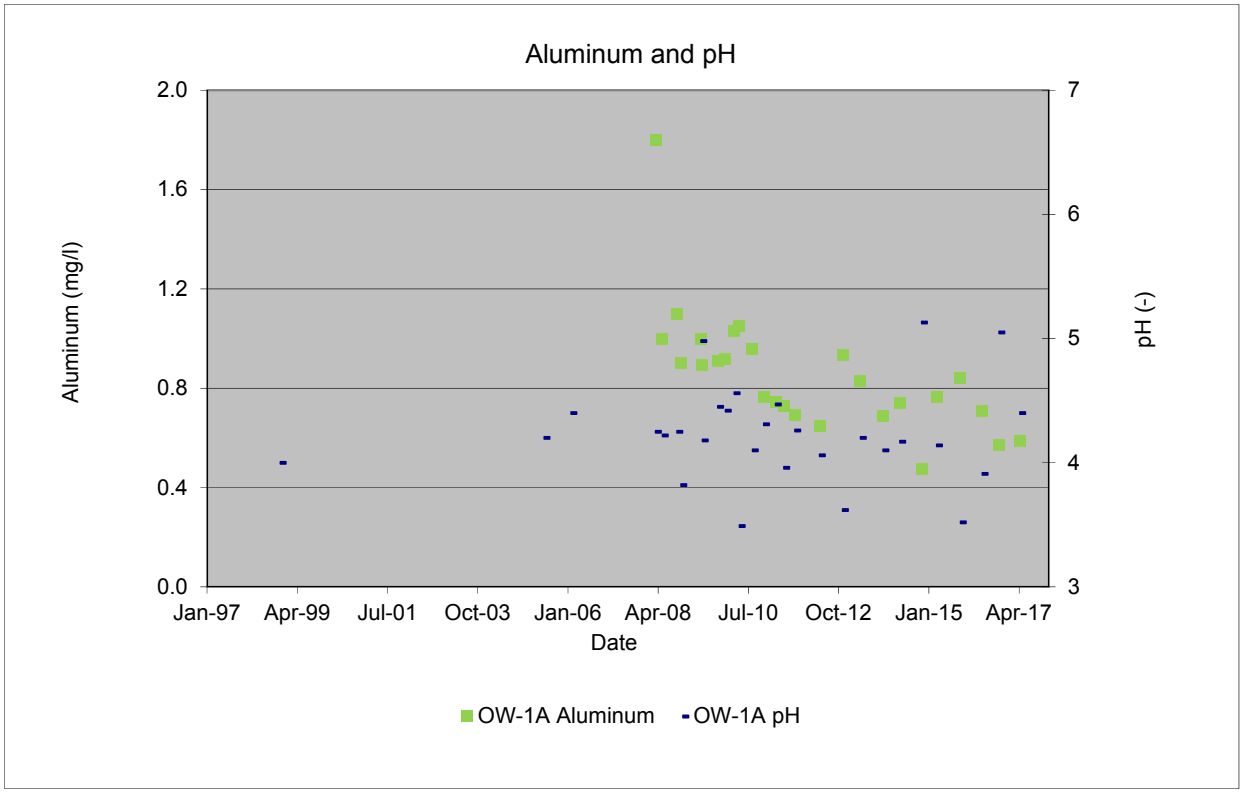
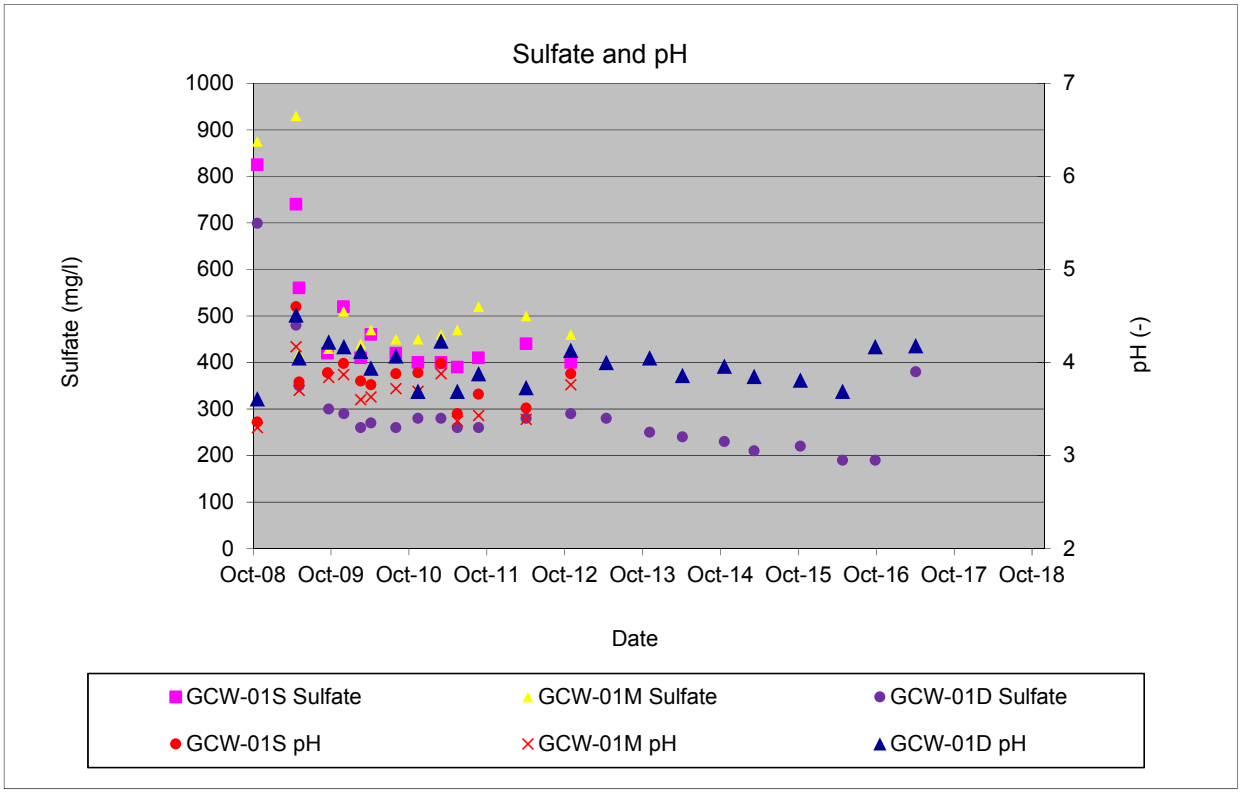


Figure 3-2 (Cont)
GCW-01S -M -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



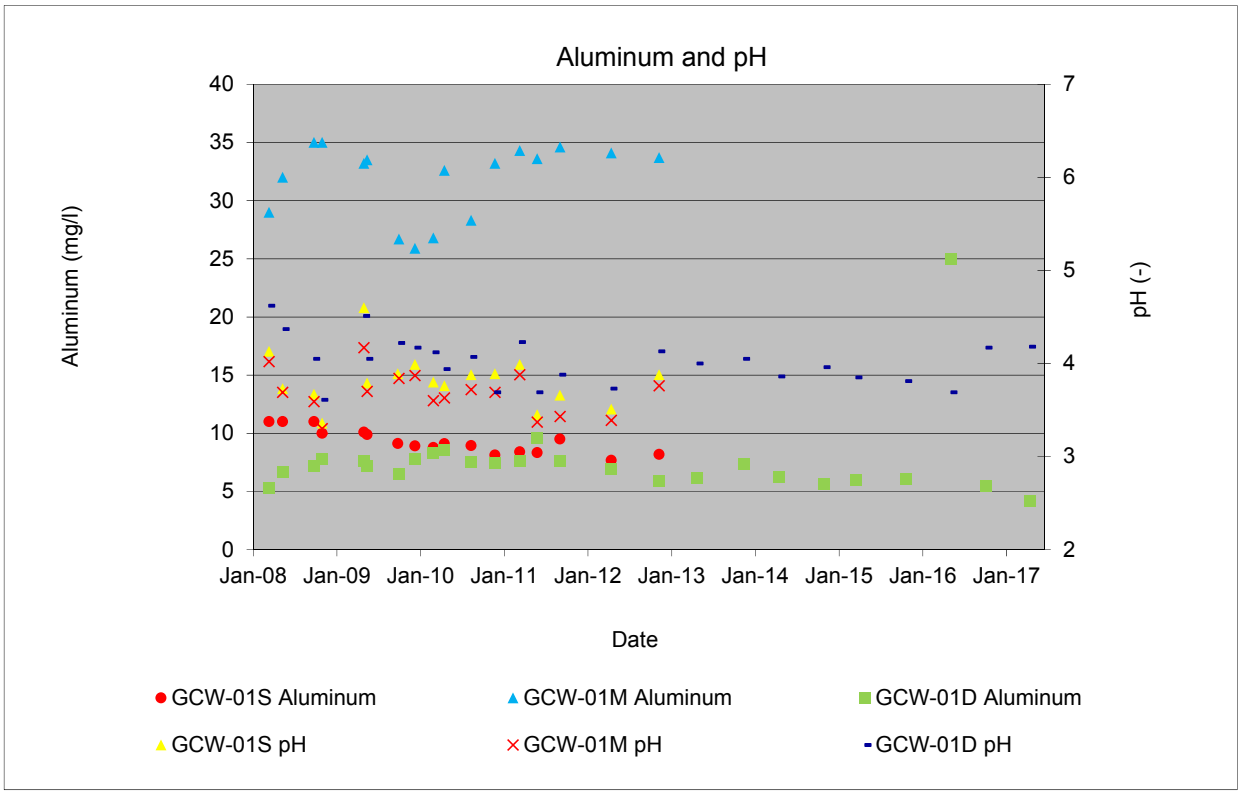
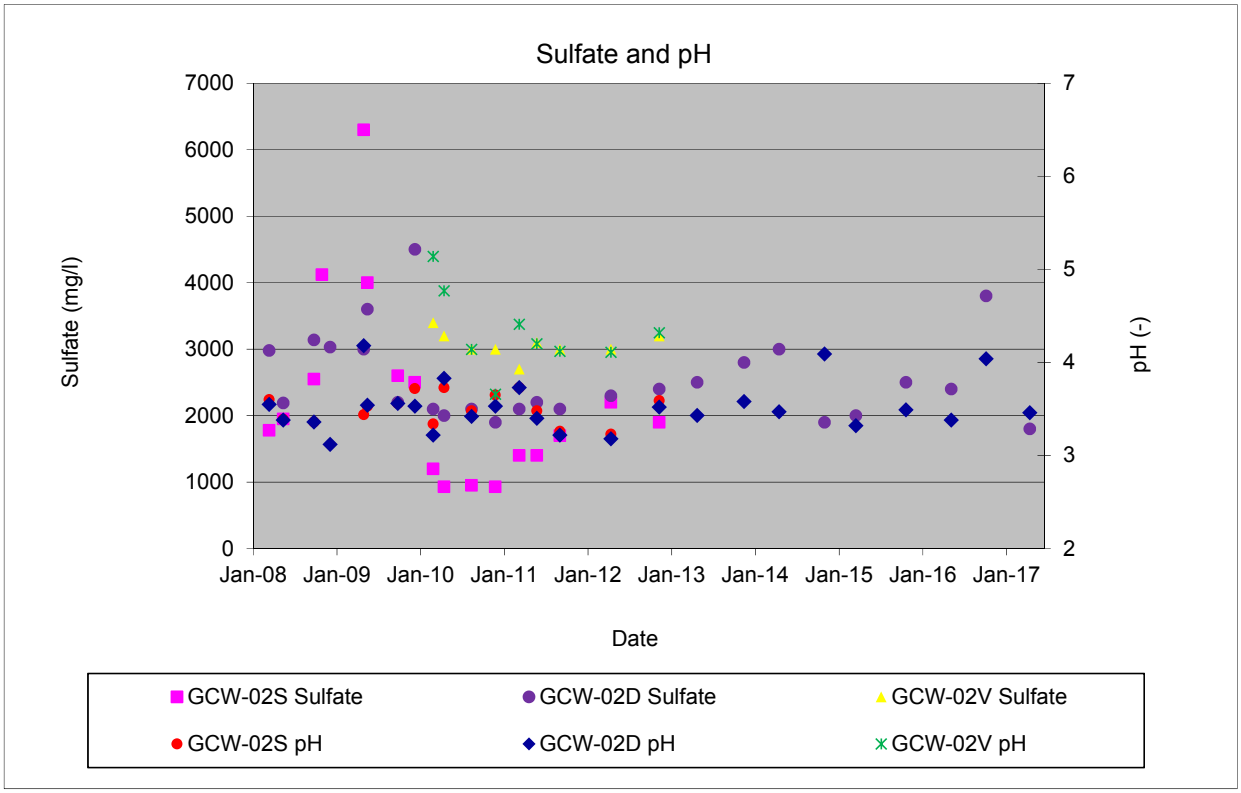


Figure 3-2 (Cont)
GCW-02S -D-V Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



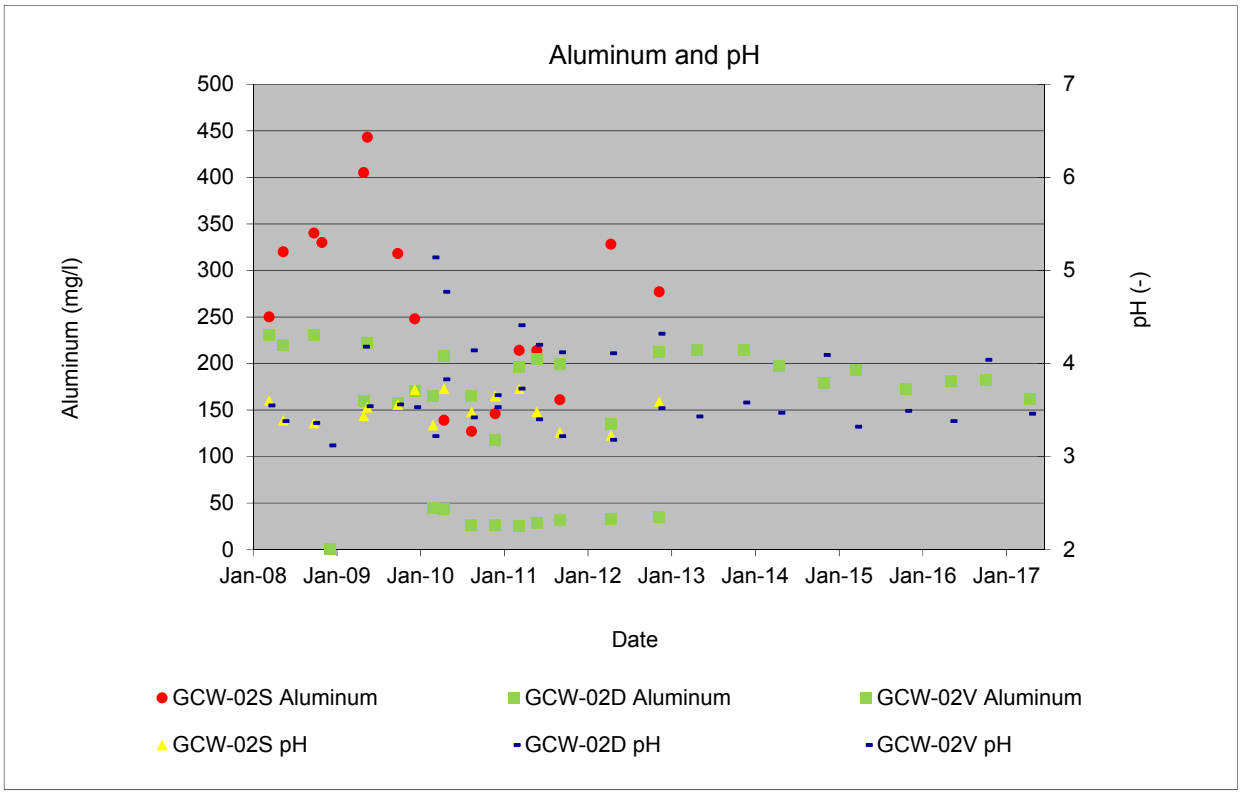
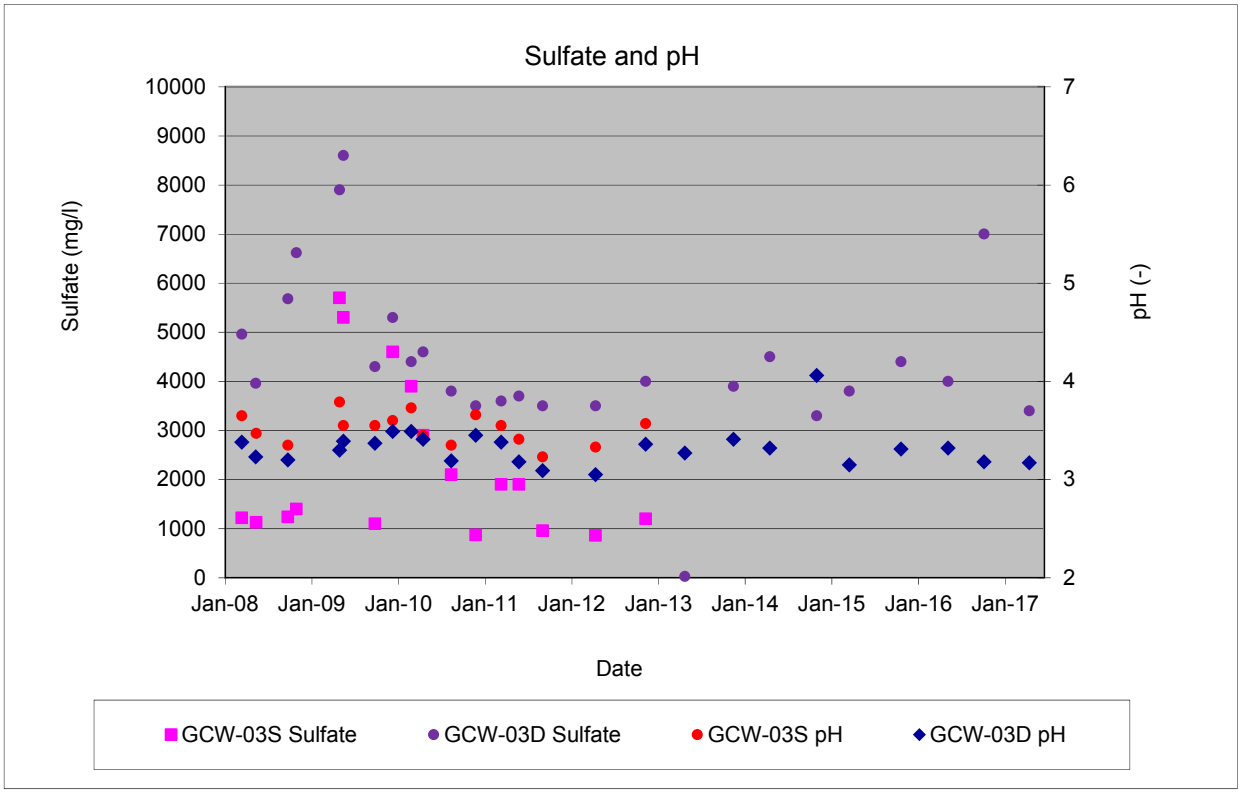


Figure 3-2 (Cont)
GCW-03S -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



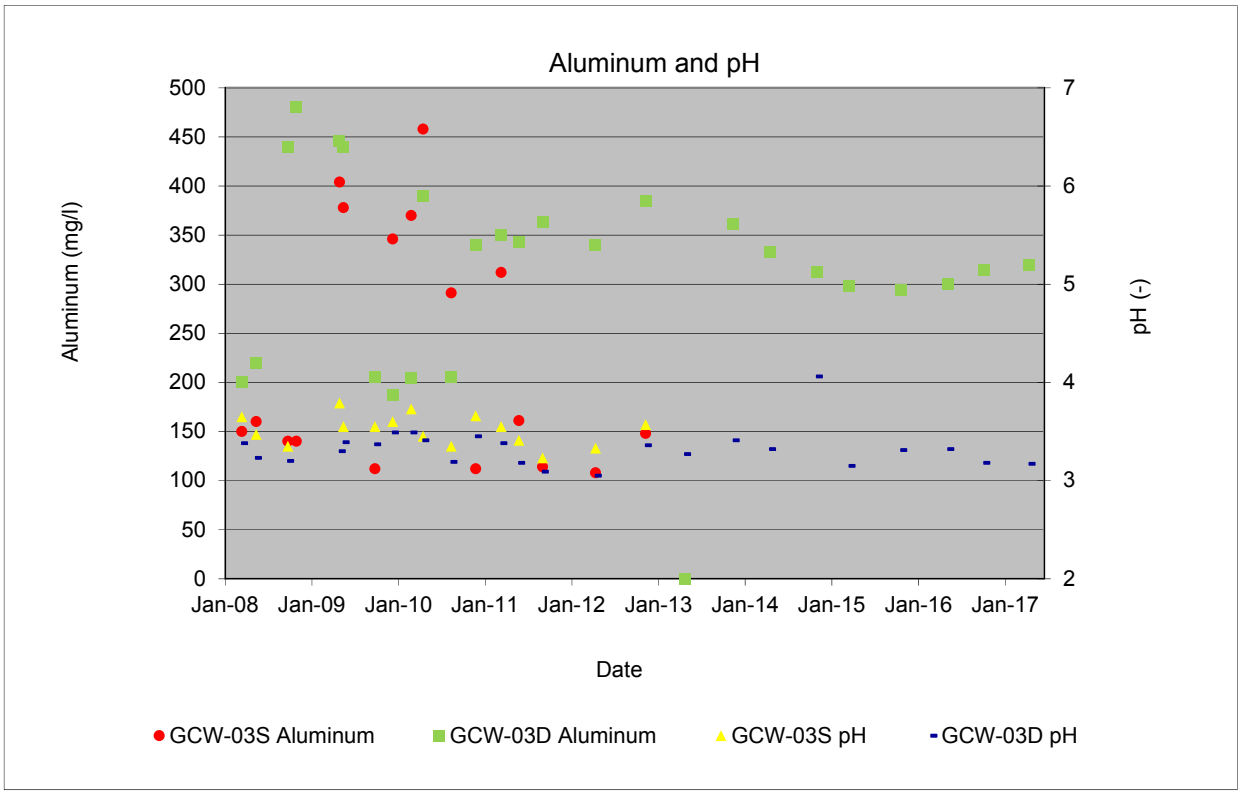
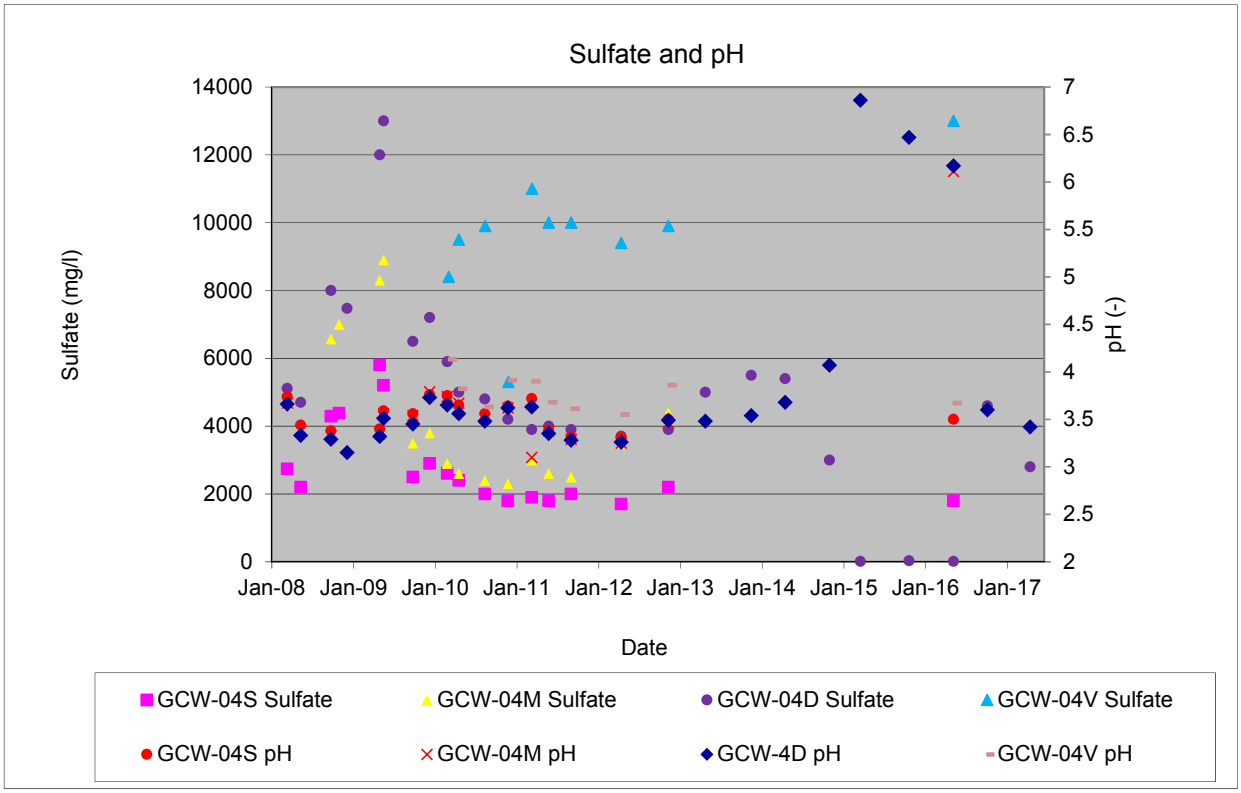


Figure 3-2 (Cont)
GCW-04S -M -D -V Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



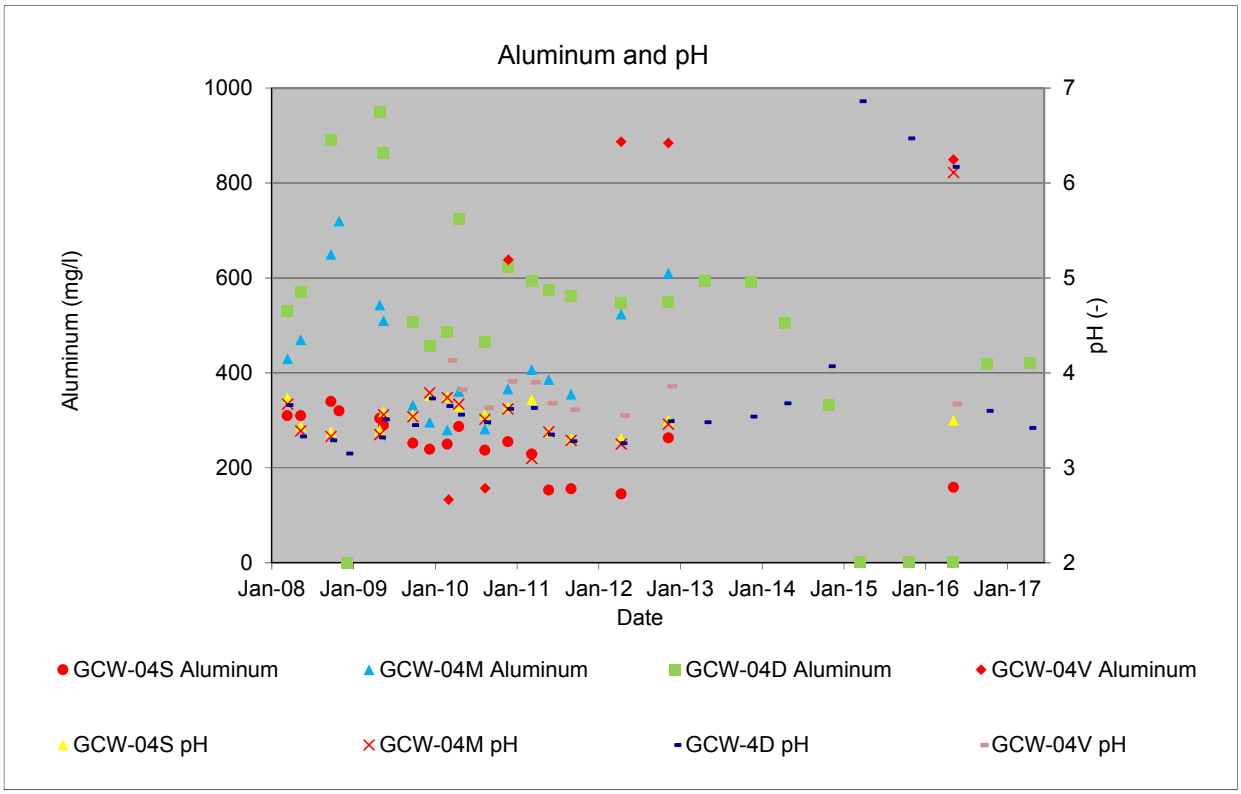
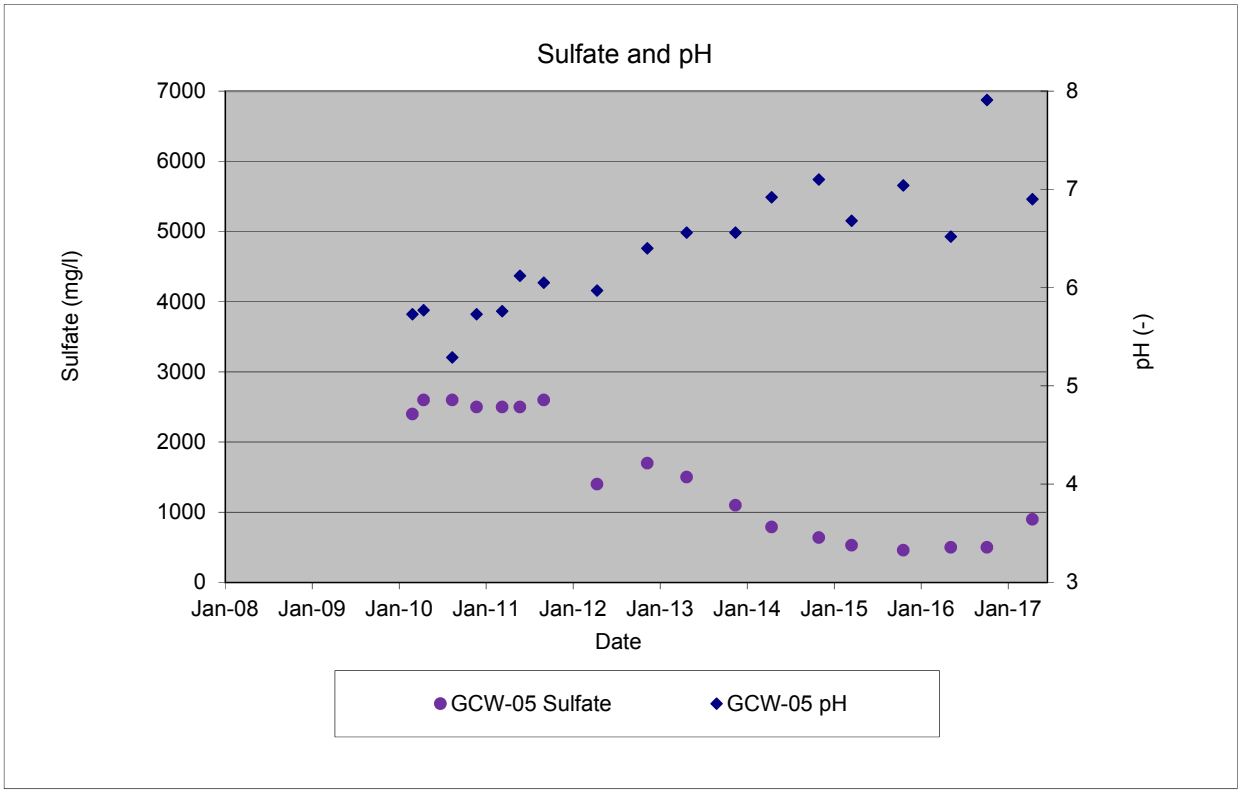


Figure 3-2 (Cont)
GCW-05 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



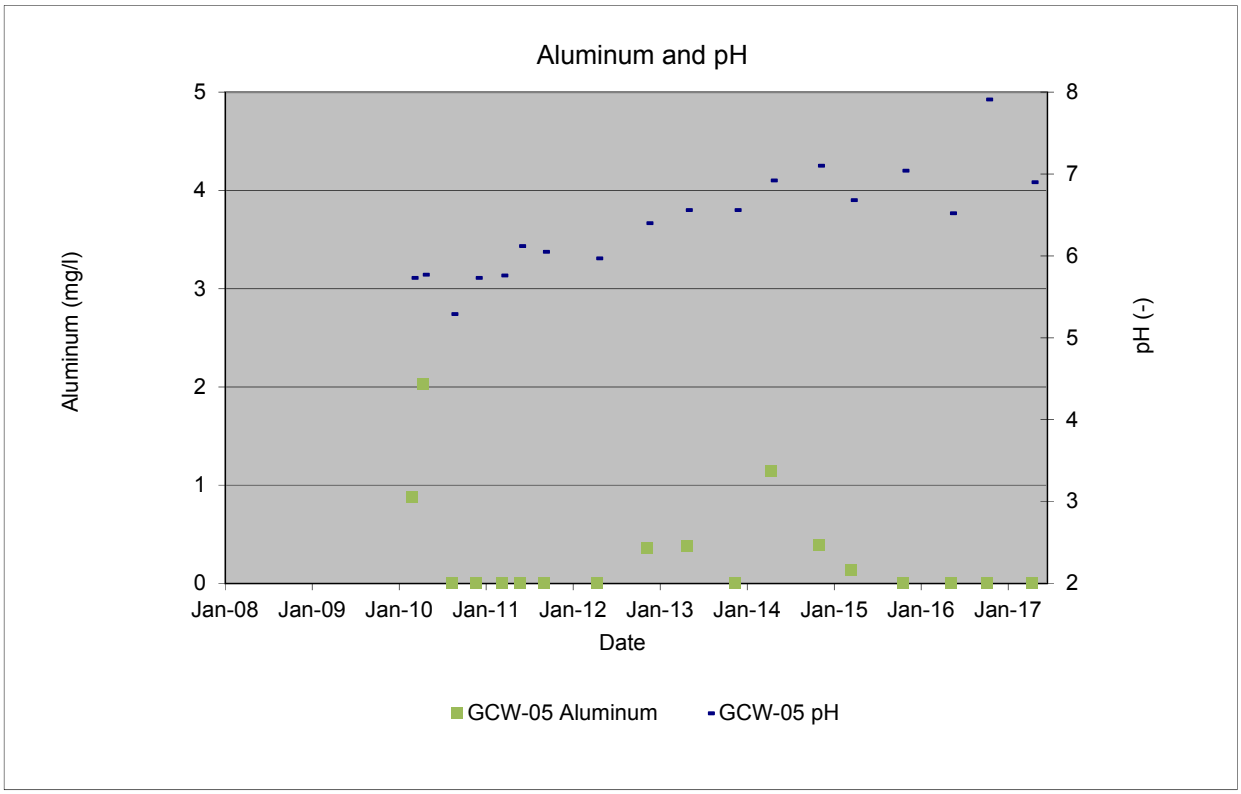
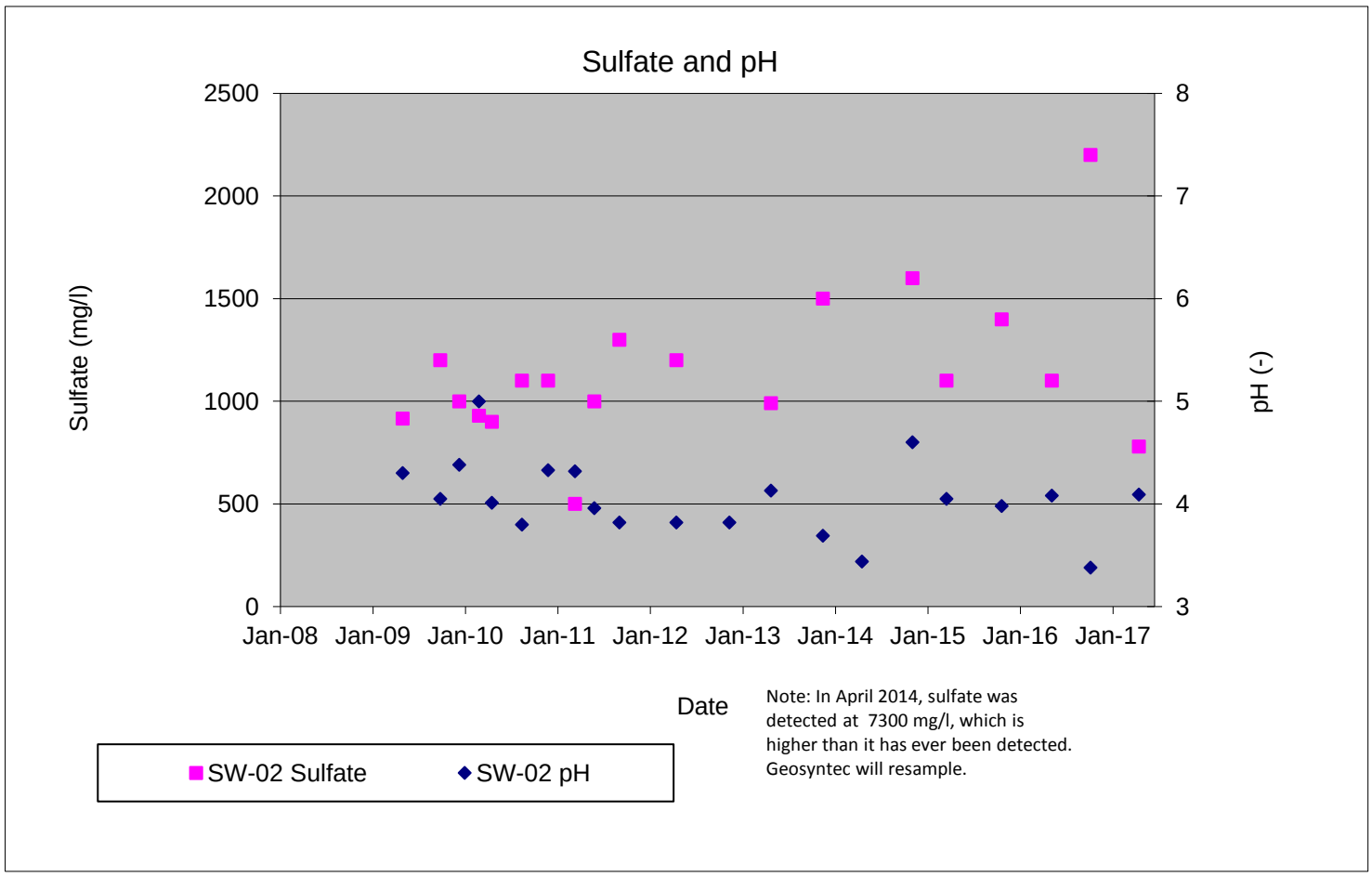


Figure 3-3
SW-02 (On-site) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



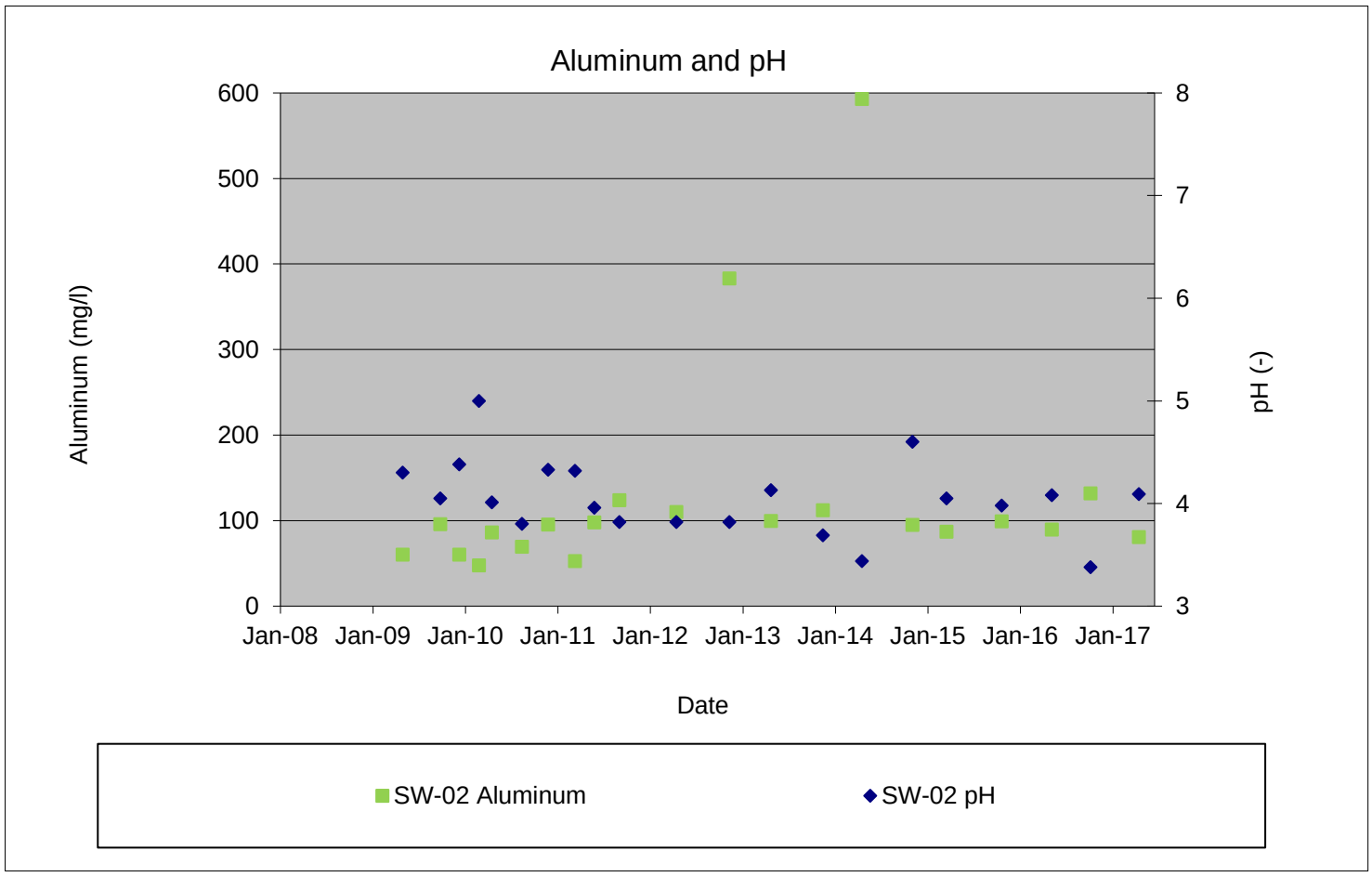
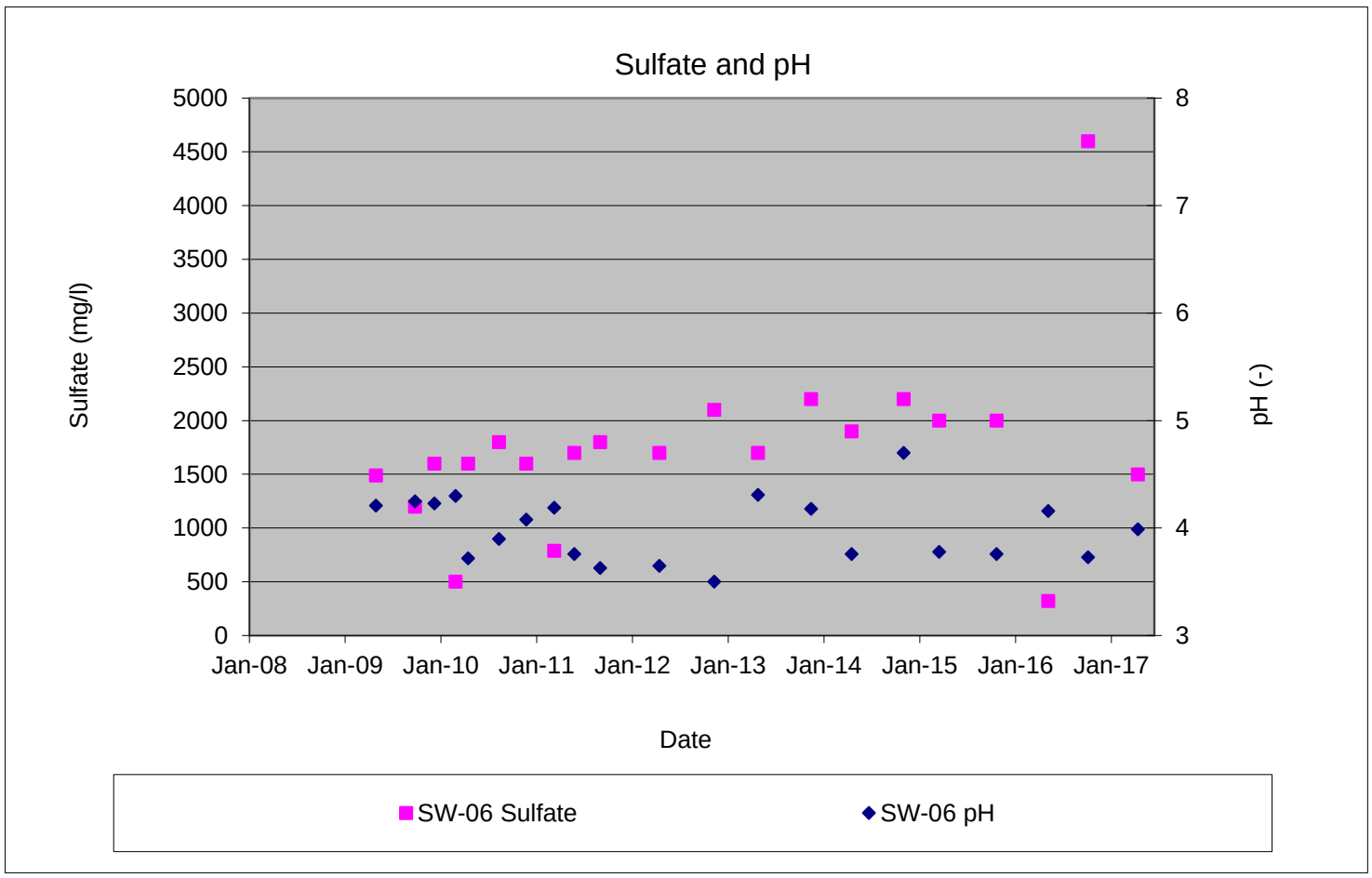


Figure 3-3 (Cont)
SW-06 (John D Milner Sports Complex) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



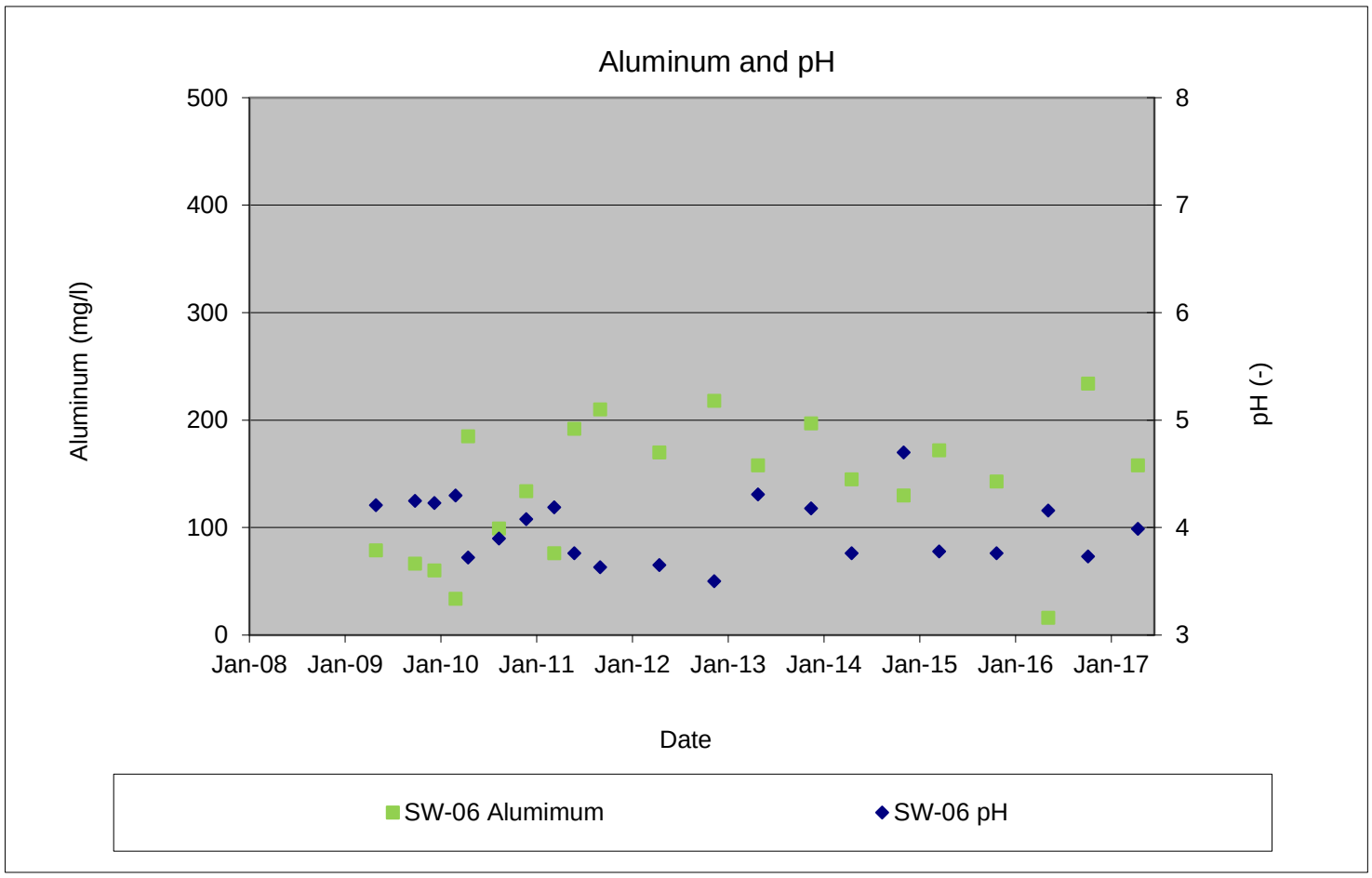
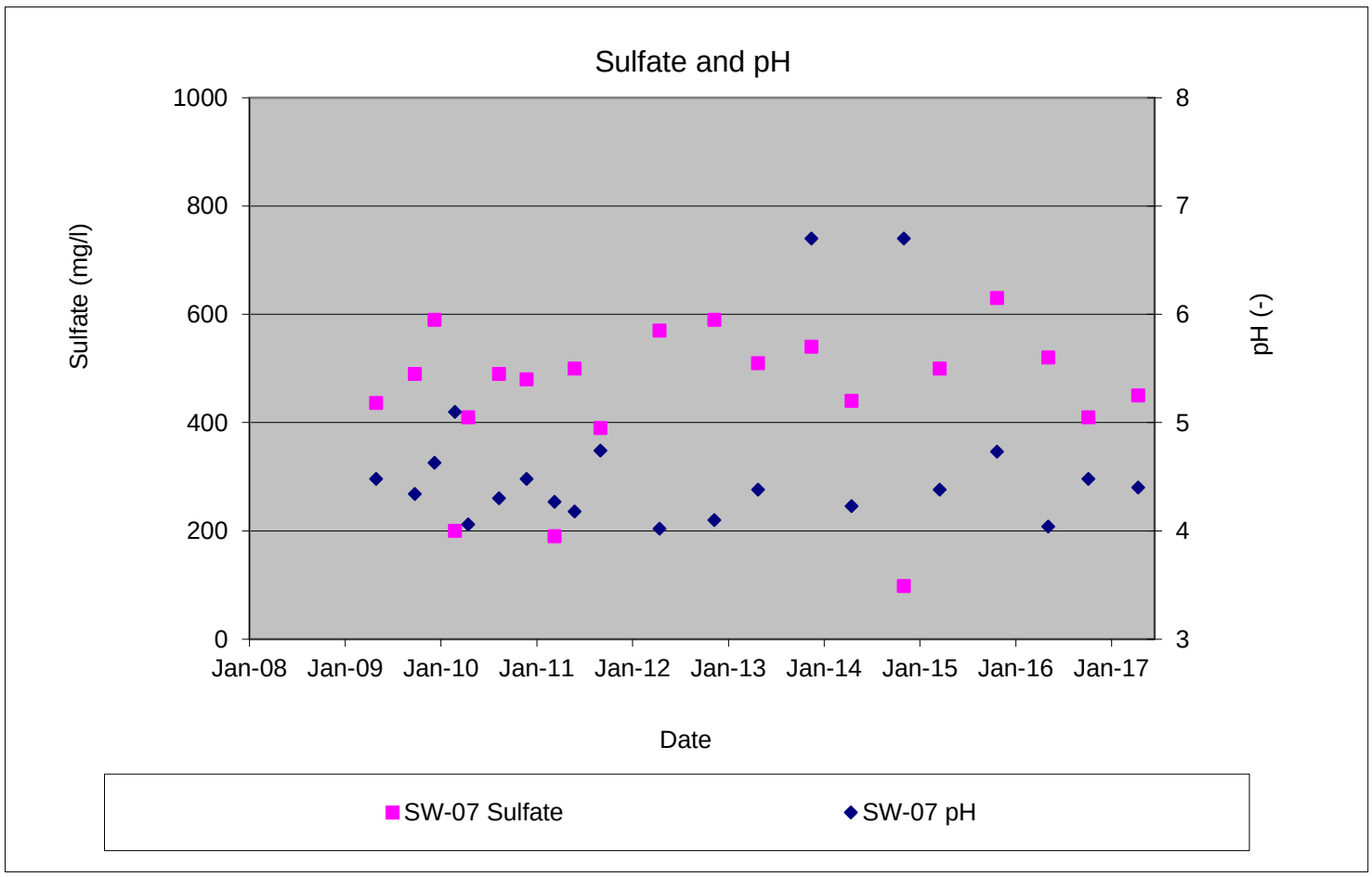


Figure 3-3 (Cont)
SW-07 (Unnamed Tributary) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia



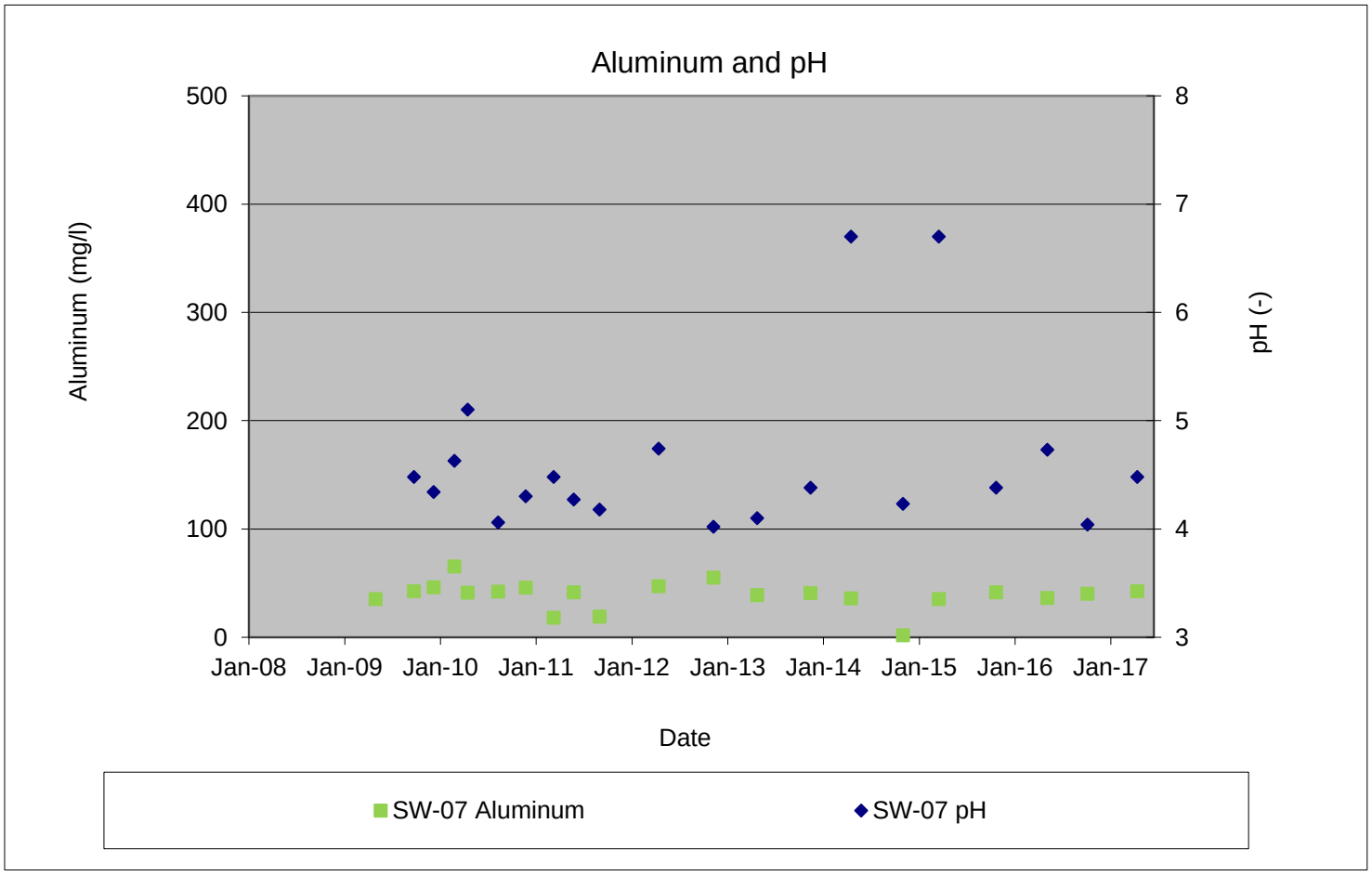
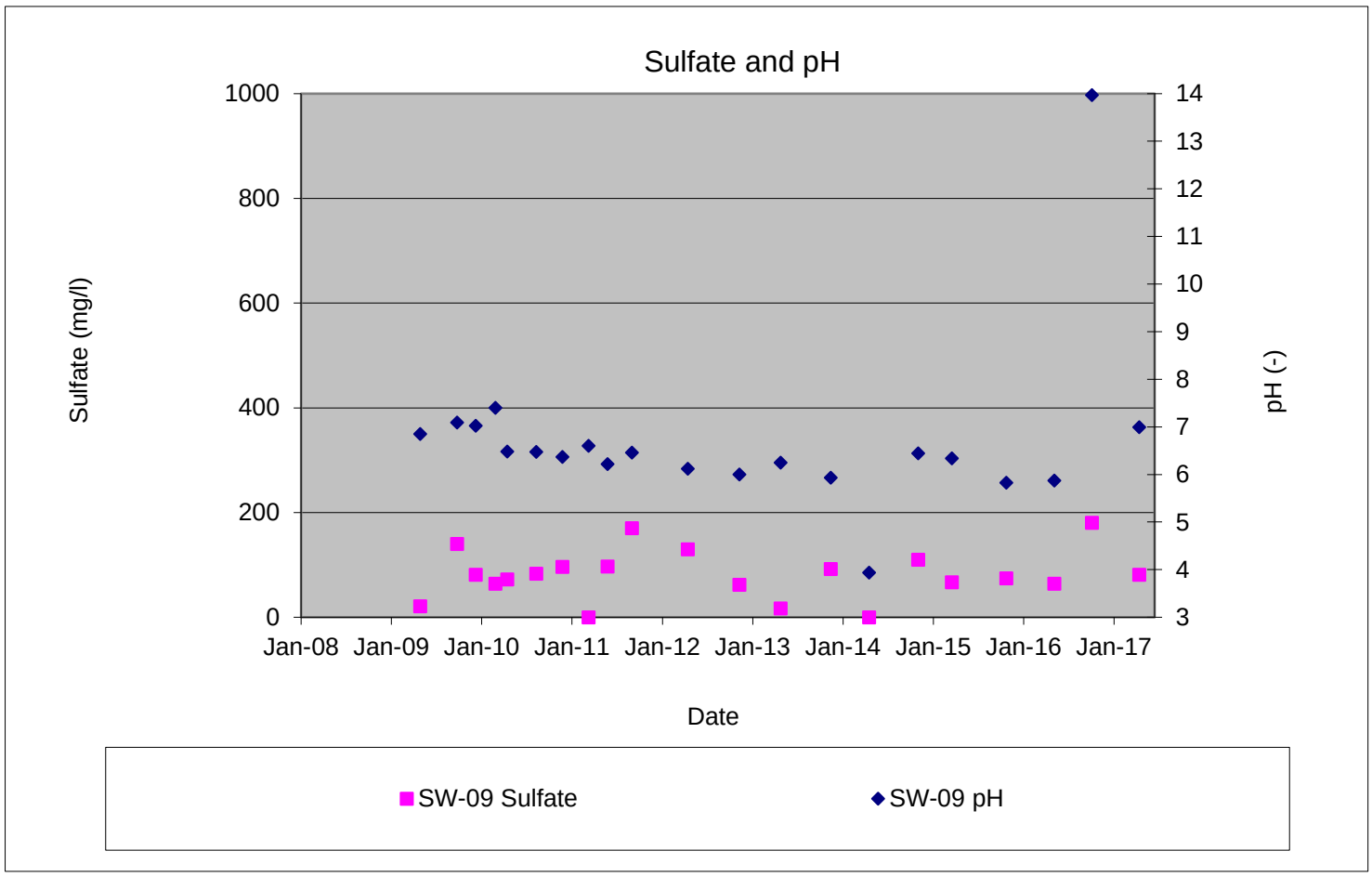
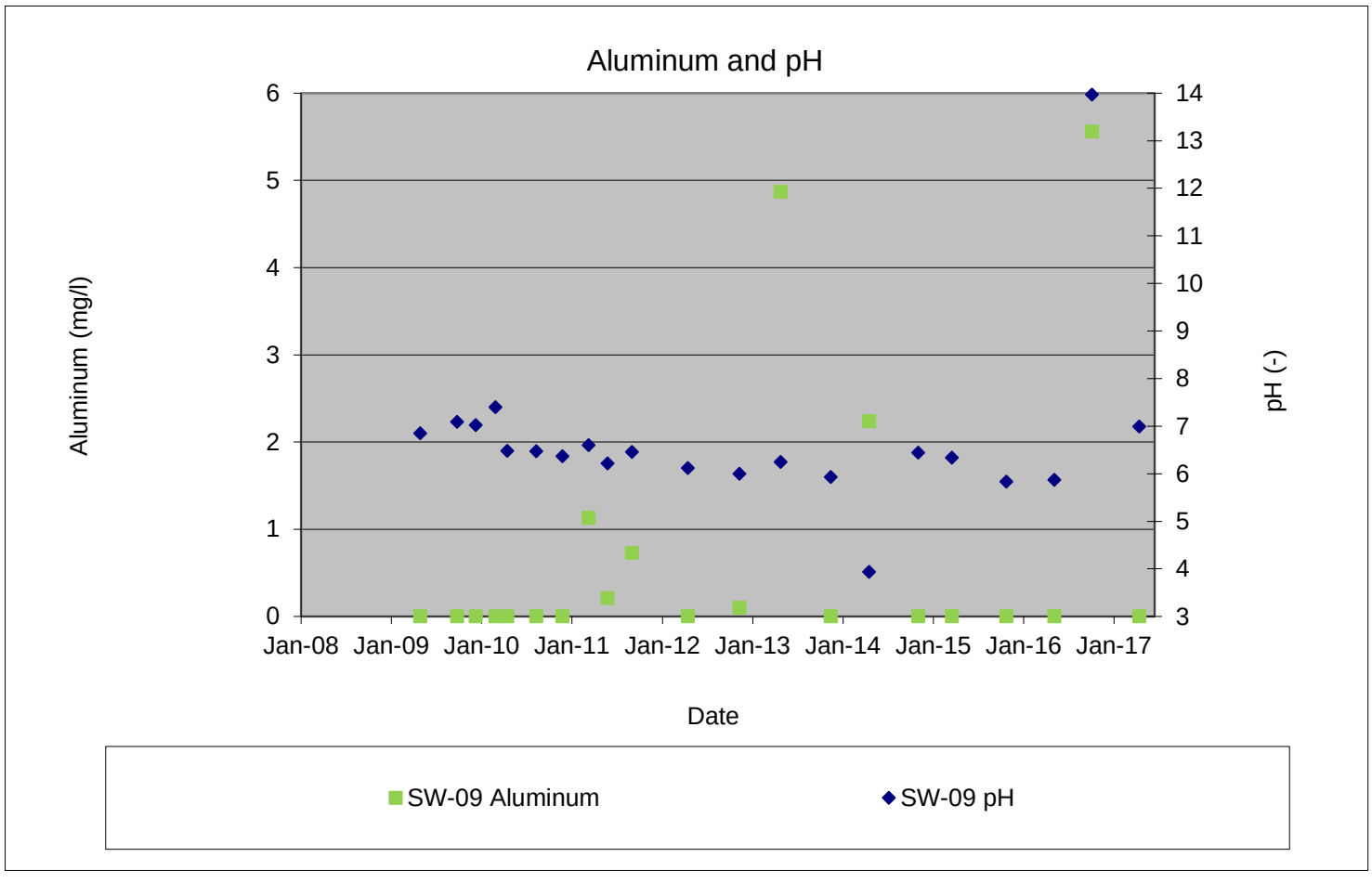


Figure 3-3 (Cont)
SW-09 (Upgradient) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia





Legend

- Monitoring Well
- Sulfate Concentration (mg/L)
- Sulfate Concentration (Inferred)
- Approximate Property Boundary

Geosyntec consultants
Kennesaw, GA

June 2017

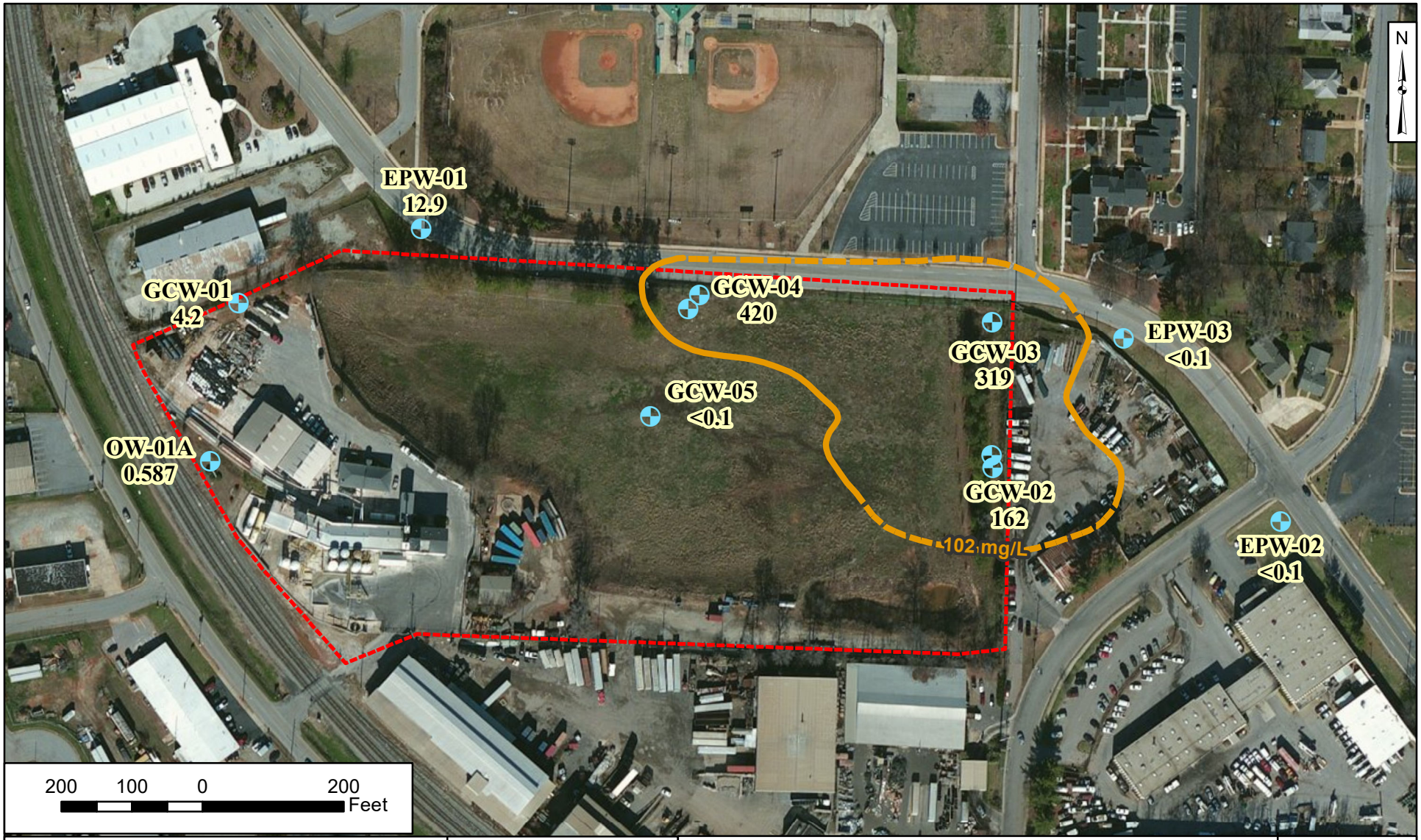
APRIL 2017 SULFATE CONCENTRATION ABOVE THE TYPE 4 RRS

Chemtrade Solutions, East Point, GA

Figure

3-4

N:\genchem\GIS\MXDs\April 2017, d\fig\ 05-31-2017



Legend

- Monitoring Well
- Aluminum Concentration (mg/L)
- Aluminum Concentration (inferred)
- Approximate Property Boundary

Geosyntec consultants
Kennesaw, GA

June 2017

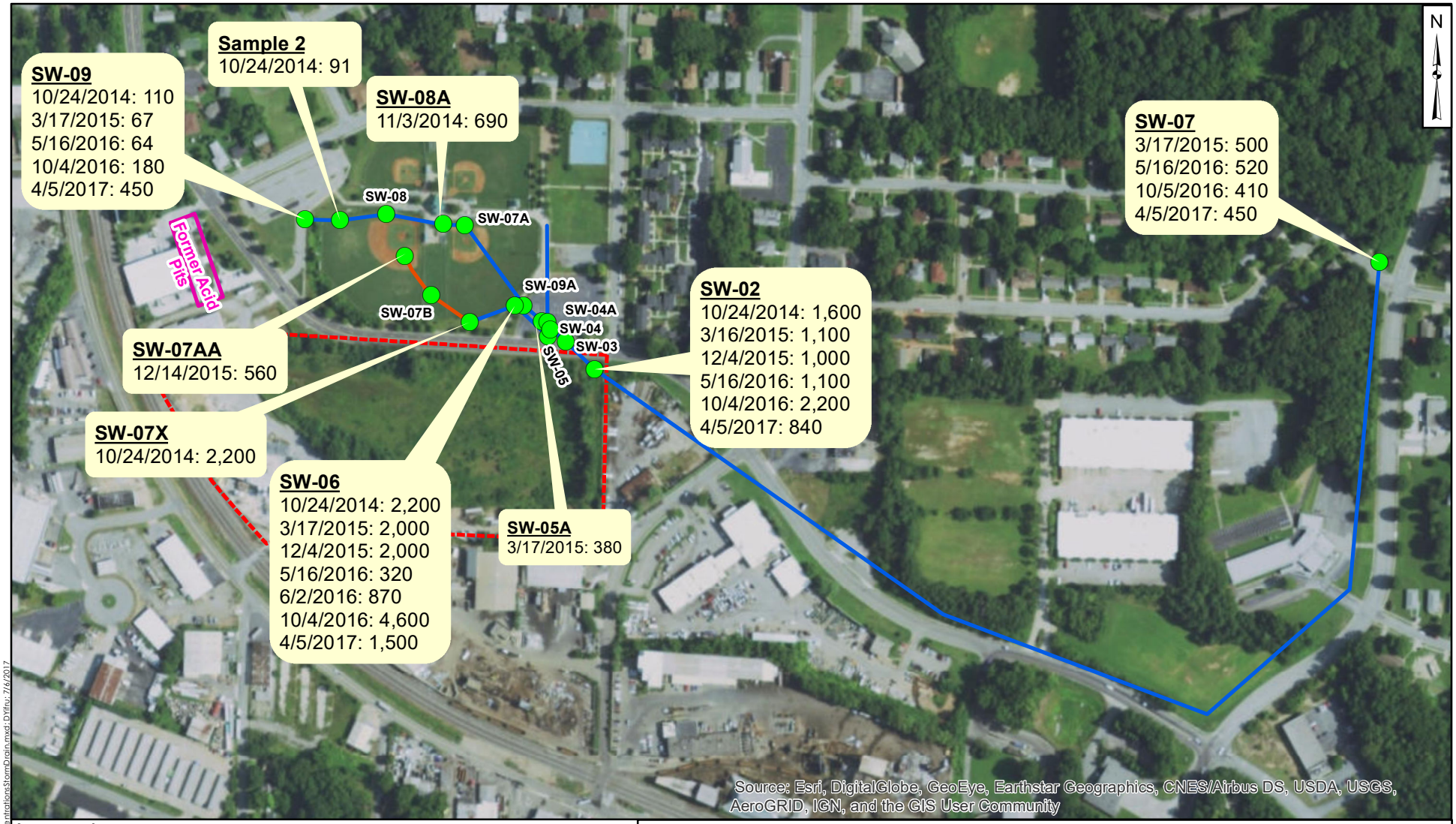
APRIL 2017 ALUMINUM CONCENTRATION ABOVE THE TYPE 4 RRS

Chemtrade Solutions, East Point, GA

Figure

3-5

N:\geochem\GIS\MXDs\May 2017\ dylfur 05-31-2017



Legend

- Former Acid Pits
- Approximate Property Boundary
- Storm Drain Sample (Sulfate Concentration in mg/L)
- Storm Drain
- High Sulfate Storm Drain

400 200 0 400 800 Feet

Geosyntec consultants
Kennesaw, GA

July 2017

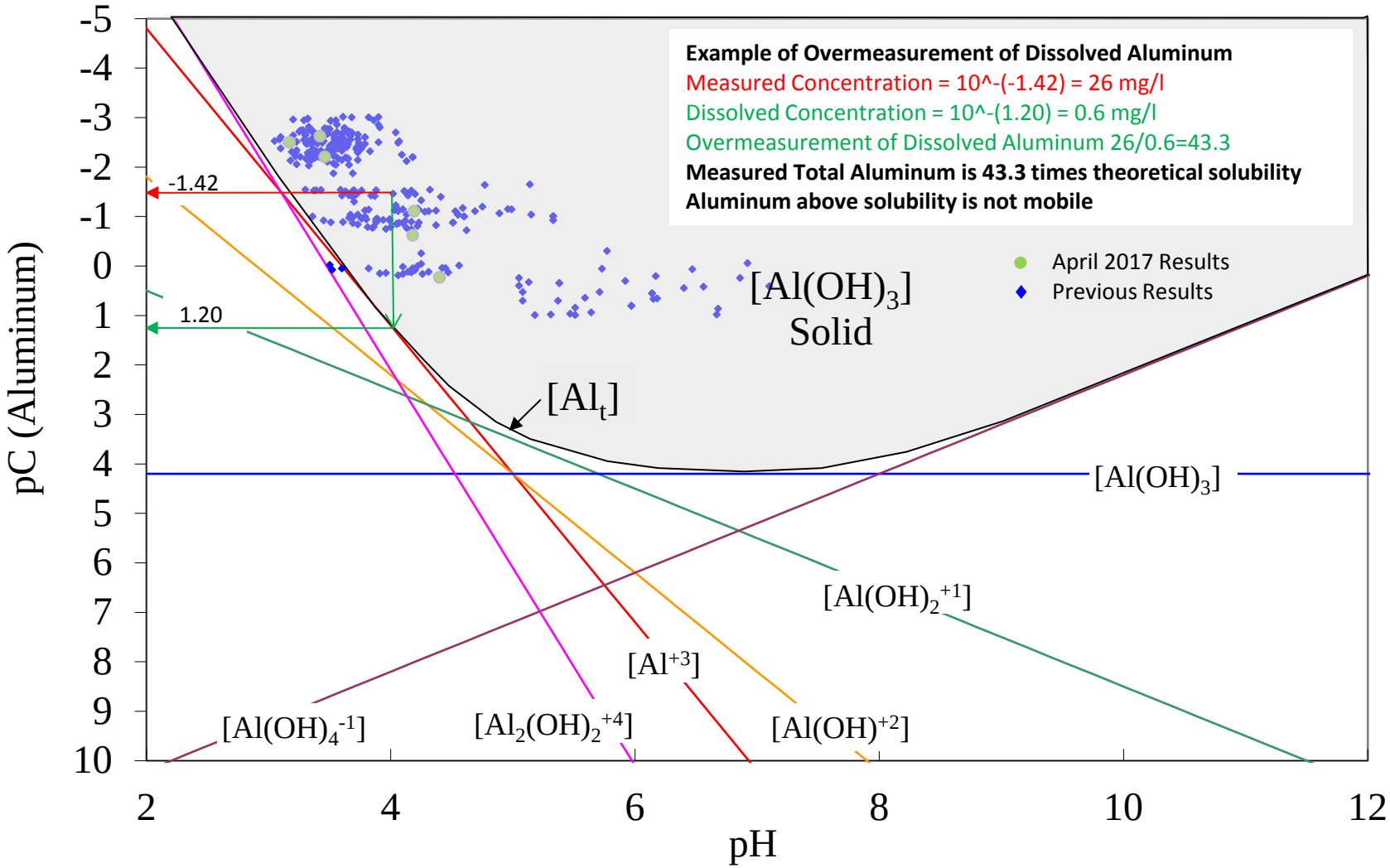
SULFATE CONCENTRATION IN STORM DRAIN

Chemtrade Solutions, East Point, GA

Figure **3-6**

N:\geochem\GIS\MXDs\Oct 2016\Oct 2016\SulfateConcentrationsStormDrain.mxd: DVitu: 7/6/2017

Figure 6-1
Chemtrade Solutions
Groundwater Sampling
June 2017
Aluminum Results Analysis



APPENDIX A

GROUNDWATER AND STORM DRAIN LABORATORY RESULTS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Laboratory Report

Prepared For:

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw, GA 30144

Attention: Mr. Brian Jacobson

Report Number: AAD0558
April 27, 2017
Project: Chemtrade
Project #:GR5060.2017

We appreciate the opportunity to provide the analytical support for your project. 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.

Approved:

Project Manager

This report may not be reproduced, except in full, without written approval from Pace Analytical Services, LLC.
Pace Analytical Services, LLC. certifies that the following analytical results meet all requirements of the National Environmental Laboratory Accreditation Conference (NELAC).
All test results relate only to the samples analyzed.

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GCW-03D-0417	AAD0558-01	Ground Water	04/12/17 10:30	04/14/17 16:30
Dup-01-0417	AAD0558-02	Ground Water	04/12/17 00:00	04/14/17 16:30
SW-02-0417	AAD0558-03	Storm Water	04/12/17 10:45	04/14/17 16:30
Dup-02-0417	AAD0558-04	Storm Water	04/12/17 00:00	04/14/17 16:30
GCW-02D-0417	AAD0558-05	Ground Water	04/12/17 12:10	04/14/17 16:30
GCW-04D-0417	AAD0558-06	Ground Water	04/12/17 15:30	04/14/17 16:30
GCW-05-0417	AAD0558-07	Ground Water	04/12/17 16:15	04/14/17 16:30
EPW-02-0417	AAD0558-08	Ground Water	04/13/17 09:10	04/14/17 16:30
EPW-03D-0417	AAD0558-09	Ground Water	04/13/17 09:28	04/14/17 16:30
SW-06-0417	AAD0558-10	Storm Water	04/13/17 10:15	04/14/17 16:30
SW-09-0417	AAD0558-11	Storm Water	04/13/17 10:35	04/14/17 16:30
SW-07-0417	AAD0558-12	Storm Water	04/13/17 10:50	04/14/17 16:30
EPW-01-0417	AAD0558-13	Ground Water	04/13/17 11:50	04/14/17 16:30
OW-01A-0417	AAD0558-14	Ground Water	04/13/17 12:55	04/14/17 16:30
GCW-01-0417	AAD0558-15	Ground Water	04/13/17 13:00	04/14/17 16:30

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: GCW-03D-0417
Date/Time Sampled: 4/12/2017 10:30:00AM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-01
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	3400	1000	mg/L	EPA 9056A		200	4/18/17 8:17	4/18/17 22:24	7040504	RLC
Metals, Total										
Aluminum	319	2.00	mg/L	EPA 6010D		20	4/18/17 14:20	4/19/17 17:48	7040526	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: Dup-01-0417
Date/Time Sampled: 4/12/2017 12:00:00AM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-02
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	3400	500	mg/L	EPA 9056A		100	4/18/17 8:17	4/25/17 22:49	7040504	rlc
Metals, Total										
Aluminum	308	1.00	mg/L	EPA 6010D		10	4/18/17 8:40	4/21/17 10:38	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: SW-02-0417
Date/Time Sampled: 4/12/2017 10:45:00AM
Matrix: Storm Water

Project: Chemtrade
Lab Number ID: AAD0558-03
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	780	120	mg/L	EPA 9056A		25	4/18/17 8:17	4/21/17 14:05	7040504	RLC
Metals, Total										
Aluminum	80.8	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 18:49	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: Dup-02-0417
Date/Time Sampled: 4/12/2017 12:00:00AM
Matrix: Storm Water

Project: Chemtrade
Lab Number ID: AAD0558-04
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	840	250	mg/L	EPA 9056A		50	4/18/17 8:17	4/21/17 14:25	7040504	RLC
Metals, Total										
Aluminum	79.2	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 18:53	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: GCW-02D-0417
Date/Time Sampled: 4/12/2017 12:10:00PM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-05
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	1800	1000	mg/L	EPA 9056A		200	4/18/17 8:17	4/19/17 0:27	7040504	RLC
Metals, Total										
Aluminum	162	1.00	mg/L	EPA 6010D		10	4/18/17 8:40	4/21/17 10:41	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: GCW-04D-0417
Date/Time Sampled: 4/12/2017 3:30:00PM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-06
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	2800	500	mg/L	EPA 9056A		100	4/18/17 8:17	4/25/17 23:31	7040504	rlc
Metals, Total										
Aluminum	420	1.00	mg/L	EPA 6010D		10	4/18/17 8:40	4/21/17 10:45	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: GCW-05-0417
Date/Time Sampled: 4/12/2017 4:15:00PM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-07
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	900	100	mg/L	EPA 9056A		20	4/18/17 8:17	4/19/17 1:29	7040504	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 19:04	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: EPW-02-0417
Date/Time Sampled: 4/13/2017 9:10:00AM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-08
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	ND	5.0	mg/L	EPA 9056A		1	4/18/17 8:17	4/19/17 3:13	7040504	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 19:08	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: EPW-03D-0417
Date/Time Sampled: 4/13/2017 9:28:00AM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-09
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	25	5.0	mg/L	EPA 9056A		1	4/18/17 8:17	4/19/17 3:33	7040504	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 19:20	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: SW-06-0417
Date/Time Sampled: 4/13/2017 10:15:00AM
Matrix: Storm Water

Project: Chemtrade
Lab Number ID: AAD0558-10
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	1500	500	mg/L	EPA 9056A		100	4/18/17 8:17	4/25/17 23:10	7040504	rlc
Metals, Total										
Aluminum	158	1.00	mg/L	EPA 6010D		10	4/18/17 8:40	4/21/17 10:49	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: SW-09-0417
Date/Time Sampled: 4/13/2017 10:35:00AM
Matrix: Storm Water

Project: Chemtrade
Lab Number ID: AAD0558-11
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	81	25	mg/L	EPA 9056A		5	4/18/17 8:17	4/19/17 4:15	7040504	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 19:27	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: SW-07-0417
Date/Time Sampled: 4/13/2017 10:50:00AM
Matrix: Storm Water

Project: Chemtrade
Lab Number ID: AAD0558-12
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	450	250	mg/L	EPA 9056A		50	4/18/17 8:17	4/19/17 4:37	7040504	RLC
Metals, Total										
Aluminum	42.4	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 19:31	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: EPW-01-0417
Date/Time Sampled: 4/13/2017 11:50:00AM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-13
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	93	50	mg/L	EPA 9056A		10	4/18/17 8:17	4/19/17 4:58	7040504	RLC
Metals, Total										
Aluminum	12.9	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 19:35	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: OW-01A-0417
Date/Time Sampled: 4/13/2017 12:55:00PM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-14
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	44	10	mg/L	EPA 9056A		2	4/18/17 8:17	4/19/17 5:19	7040504	RLC
Metals, Total										
Aluminum	0.587	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 19:39	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558
Client ID: GCW-01-0417
Date/Time Sampled: 4/13/2017 1:00:00PM
Matrix: Ground Water

Project: Chemtrade
Lab Number ID: AAD0558-15
Date/Time Received: 4/14/2017 4:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	380	100	mg/L	EPA 9056A		20	4/18/17 8:17	4/19/17 6:23	7040504	RLC
Metals, Total										
Aluminum	4.20	0.100	mg/L	EPA 6010D		1	4/18/17 8:40	4/20/17 19:42	7040496	FBS

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558

Inorganic Anions - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 7040504 - EPA 300.0										
Blank (7040504-BLK1)					Prepared & Analyzed: 04/18/17					
Sulfate	ND	5.0	mg/L							
LCS (7040504-BS1)					Prepared & Analyzed: 04/18/17					
Sulfate	10.7	5.0	mg/L	10.020		107	90-110			
Matrix Spike (7040504-MS1)		**Source: AAD0558-03**			Prepared & Analyzed: 04/18/17					
Sulfate	400	5.0	mg/L	10.020	423	0	90-110			QM-05
Matrix Spike (7040504-MS2)		**Source: AAD0558-06**			Prepared: 04/18/17 Analyzed: 04/19/17					
Sulfate	791	5.0	mg/L	10.020	836	0	90-110			QM-05
Matrix Spike Dup (7040504-MSD1)		**Source: AAD0558-03**			Prepared & Analyzed: 04/18/17					
Sulfate	399	5.0	mg/L	10.020	423	0	90-110	0.3	15	

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558

Metals, Total - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 7040496 - EPA 3010A										
Blank (7040496-BLK1)					Prepared: 04/18/17 Analyzed: 04/20/17					
Aluminum	ND	0.100	mg/L							
LCS (7040496-BS1)					Prepared: 04/18/17 Analyzed: 04/20/17					
Aluminum	1.01	0.100	mg/L	1.0000		101	80-120			
Matrix Spike (7040496-MS1)		**Source: AAD0557-01**			Prepared: 04/18/17 Analyzed: 04/20/17					
Aluminum	1.18	0.100	mg/L	1.0000	0.093	109	75-125			
Matrix Spike Dup (7040496-MSD1)		**Source: AAD0557-01**			Prepared: 04/18/17 Analyzed: 04/20/17					
Aluminum	1.19	0.100	mg/L	1.0000	0.093	109	75-125	0.08	20	
Post Spike (7040496-PS1)		**Source: AAD0557-01**			Prepared: 04/18/17 Analyzed: 04/20/17					
Aluminum	1.18		mg/L	1.0000	0.093	109	80-120			
Batch 7040526 - EPA 3010A										
Blank (7040526-BLK1)					Prepared: 04/18/17 Analyzed: 04/19/17					
Aluminum	ND	0.100	mg/L							
LCS (7040526-BS1)					Prepared: 04/18/17 Analyzed: 04/19/17					
Aluminum	1.04	0.100	mg/L	1.0000		104	80-120			
Matrix Spike (7040526-MS1)		**Source: AAD0558-01**			Prepared: 04/18/17 Analyzed: 04/19/17					
Aluminum	311	2.00	mg/L	1.0000	319	0	75-125			QM-02
Matrix Spike Dup (7040526-MSD1)		**Source: AAD0558-01**			Prepared: 04/18/17 Analyzed: 04/19/17					
Aluminum	307	2.00	mg/L	1.0000	319	0	75-125	1	20	QM-02

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Report No.: AAD0558

Metals, Total - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 7040526 - EPA 3010A										
Post Spike (7040526-PS1)		**Source: AAD0558-01**			Prepared: 04/18/17 Analyzed: 04/19/17					
Aluminum	313		mg/L	1.0000	319	0	80-120			QM-02

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Laboratory Certifications

Code	Description	Number	Expires
GADW	Georgia DW Inorganics Eff: 07/01/2016	812	06/30/2017
GADWM	Georgia DW Microbiology Eff: 07/01/2015	812	05/09/2017
NC	North Carolina	381	12/31/2017
NELAC	FL DOH (Non-Pot. Water, Solids) Eff:: 07/01/2016	E87315	06/30/2017
NELDW	FL DOH NELAC (Drinking Water) Eff: 07/01/2016	E87315	06/30/2017
SC	South Carolina	98011001	06/30/2017
TX	Texas	T104704397-08-TX	03/31/2018
VA	Virginia	460204	12/14/2017

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

April 27, 2017

Legend

Definition of Laboratory Terms

ND - None Detected at the Reporting Limit
TIC - Tentatively Identified Compound
CFU - Colony Forming Units
SOP - Method run per Pace Standard Operating Procedure
RL - Reporting Limit
DF - Dilution Factor
***** - Analyte not included in the NELAC list of certified analytes.

Sample Information

N-Nitrosodiphenylamine breaks down to diphenylamine in the GCMS; both analytes are reported as N-Nitrososdiphenylamine. Pace is not NELAC certified for diphenylamine.

Phthalic acid and phthalic anhydride are reported as dimethyl phthalate

Maleic acid and maleic anhydride are reported as dimethyl malate

1,2-Diphenylhydrazine breaks down to azobenzene in the GCMS; both analytes are reported as azobenzene

Drinking Water Records will be available for at least 5 years and are subject to disposal after the 5 years have elapsed.

Definition of Qualifiers

QM-05 The spike recovery was outside acceptance limits for the MS and/or MSD and/or PDS due to suspected matrix interference. Sample results for the QC batch were accepted based on acceptable LCS recoveries.

QM-02 The spike recovery is outside acceptance limits due to insignificant spike amount as compared to sample concentration.

Note: Unless otherwise noted, all results are reported on an as received basis.

CHAIN OF CUSTODY RECORD

Pace Analytical® www.pacelabs.com

Pace Analytical Services, LLC - Atlanta GA
110 TECHNOLOGY PARKWAY, PEACHTREE CORNERS, GA 30092
(770) 734-4200 : FAX (770) 734-4201

CLIENT NAME: GEOSYNTEC

CLIENT ADDRESS/PHONE NUMBER/FAX NUMBER:
1255 ROBERTS BLVD, SUITE 200
KENNESAW, GA 30144

REPORT TO: BRIAN JACOBSON

CC: SCOLSKY@GEOSYNTEC.COM

REQUESTED COMPLETION DATE:

PO #:

PROJECT NAME/STATE: CHEMTRADE, GA

PROJECT #: GR5060.2017

ANALYSIS REQUESTED

Collection DATE	Collection TIME	MATRIX CODE*	COMP	GRAB	SAMPLE IDENTIFICATION	# of CONTAINERS		6010 Al ONLY	SULFATE	LAB ID NUMBER
CONTAINER TYPE:								P	P	
PRESERVATION:								3,7	7	
4/12/2017	10:30	GW		✓	GCW-03D-0417	2		1	1	1
—	—	GW		✓	DUP-01-0417	2		1	1	2
4/12/2017	10:45	ST		✓	SW-02-0417	2		1	1	3
—	—	ST		✓	DUP-02-0417	2		1	1	4
4/12/2017	12:10	GW		✓	GCW-02D-0417	2		1	1	5
4/12/2017	15:30	GW		✓	GCW-04D-0417	2		1	1	6
4/12/2017	16:15	GW		✓	GCW-05-0417	2		1	1	7
4/13/2017	9:10	GW		✓	EPW-02-0417	2		1	1	8
4/13/2017	9:28	GW		✓	EPW-03D-0417	2		1	1	9
4/13/2017	10:15	ST		✓	SW-06-0417	2		1	1	10
4/13/2017	10:35	ST		✓	SW-09-0417	2		1	1	11
4/13/2017	10:50	ST		✓	SW-07-0417	2		1	1	12

CONTAINER TYPE: P - PLASTIC; A - AMBER GLASS; G - CLEAR GLASS; V - VOA VIAL; S - STERILE; O - OTHER

PRESERVATION: 1 - HCl, ≤6°C; 2 - H_2SO_4, ≤6°C; 3 - HNO_3; 4 - NaOH, ≤6°C; 5 - NaOH/ZnAc, ≤6°C; 6 - $Na_2S_2O_3$, ≤6°C; 7 - ≤6°C not frozen

*MATRIX CODES:
DW - DRINKING WATER; WW - WASTEWATER; GW - GROUNDWATER; SW - SURFACE WATER; ST - STORM WATER; W - WATER; S - SOIL; SL - SLUDGE; SD - SOLID; A - AIR; L - LIQUID; P - PRODUCT

REMARKS/ADDITIONAL INFORMATION

SAMPLED BY AND TITLE: SHILA CASKEY - SSF 4/13/17 @ 10AM

DATE/TIME: 4/14/17 @ 10AM

RELINQUISHED BY: [signature]

DATE/TIME: 4/14/17 @ 10AM

RECEIVED BY: Mike Noyen

DATE/TIME: 4/14/17 1209

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY LAB: [signature]

DATE/TIME: 04/14/17 1630

SAMPLE SHIPPED VIA: UPS FED-EX USPS COURIER CLIENT OTHER FS

Pace

Seals Intact: Yes No NA

Ice: Yes No NA

Temperature: 1°C Min: 1°C Max:

Custody Seal: Intact Broken Not Present N/A

# of Coolers:

Cooler ID:

FOR LAB USE ONLY

LAB #: AAD0558

Entered into LIMS: [illegible]

Tracking #:

Rev. 12/15/2016

CHAIN OF CUSTODY RECORD

Pace Analytical® www.pacelabs.com

Pace Analytical Services, Inc
110 TECHNOLOGY PARKWAY, PEACHTREE CORNERS, GA 30092
(770) 734-4200 : FAX (770) 734-4201

CLIENT NAME: GEOSYNTEC

CLIENT ADDRESS/PHONE NUMBER/FAX NUMBER: 1255 ROBERTS BLVD, SUITE 200 KENNESAW, GA 30144

REPORT TO: BRIAN JACOBSON

CC: scolsky@geosyntec.com

REQUESTED COMPLETION DATE:

PO #:

PROJECT NAME/STATE: CHEMTRADE, GA

PROJECT #: GR5000.2017

ANALYSIS REQUESTED

Collection DATE	Collection TIME	MATRIX CODE*	COMP	GRAB	SAMPLE IDENTIFICATION	# of CONTAINERS		6010 AL ONLY	SULFATE							LAB ID NUMBER
CONTAINER TYPE:								P	P							
PRESERVATION:								3,7	7							
4/13/2017	11:50	GW		✓	EPW-01-0417	2		1	1							13
4/13/2017	12:55	GW		✓	OW-01A-0417	2		1	1							14
4/13/2017	1300	GW		✓	GCW-01-0417	2		1	1							15

CONTAINER TYPE: P - PLASTIC; A - AMBER GLASS; G - CLEAR GLASS; V - VOA VIAL; S - STERILE; O - OTHER

PRESERVATION: 1 - HCl, ≤6°C; 2 - H_2SO_4, ≤6°C; 3 - HNO_3; 4 - NaOH, ≤6°C; 5 - NaOH/ZnAc, ≤6°C; 6 - $Na_2S_2O_3$, ≤6°C; 7 - ≤6°C not frozen

*MATRIX CODES: DW - DRINKING WATER; WW - WASTEWATER; GW - GROUNDWATER; SW - SURFACE WATER; ST - STORM WATER; W - WATER; S - SOIL; SL - SLUDGE; SD - SOLID; A - AIR; L - LIQUID; P - PRODUCT

REMARKS/ADDITIONAL INFORMATION

SAMPLED BY AND TITLE: SHIRA OLSKY JSF — DATE/TIME: 4/13/17

RELINQUISHED BY: [signature] — DATE/TIME: 4/14/17 10AM

RECEIVED BY: Mike Nguyen — DATE/TIME: 4/14/17 1209

RELINQUISHED BY: — DATE/TIME:

RECEIVED BY LAB: [signature] — DATE/TIME: 04/14/17 1630

SAMPLE SHIPPED VIA: UPS FED-EX USPS COURIER CLIENT OTHER FS Pace

Custody Seal: Intact Broken Not Present NA — # of Coolers — Cooler ID:

Iced: Yes No NA — Temperature: 1°C Min: 1°C Max:

FOR LAB USE ONLY — LAB #: AAD0558 — Entered Into LIMS: MR — Tracking #:

PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
(770) 734-4200 FAX (770) 734-4201

LOG-IN CHECKLIST

Printed: 4/18/2017 9:22:03AM

Attn: Mr. Brian Jacobson

Client: Geosyntec Consultants Inc.
Project: Chemtrade
Date Received: 04/14/17 16:30

Work Order: AAD0558
Logged In By: Mohammad M. Rahman

OBSERVATIONS

#Samples: 15 **#Containers:** 30

Minimum Temp(C): 1.0 **Maximum Temp(C):** 1.0 **Custody Seal(s) Used:** N/A

CHECKLIST ITEMS

COC included with Samples	YES
Sample Container(s) Intact	YES
Chain of Custody Complete	YES
Sample Container(s) Match COC	YES
Custody seal Intact	NO
Temperature in Compliance	YES
Sufficient Sample Volume for Analysis	YES
Zero Headspace Maintained for VOA Analyses	YES
Samples labeled preserved (If Applicable)	YES
Samples received within Allowable Hold Times	YES
Samples Received on Ice	YES
Preservation Confirmed	YES

Comments:

APPENDIX B

GROUNDWATER AND STORM DRAIN SAMPLING FORM

Geosyntec consultants

Water Level Measurements

Project.: Chemtrade, East Point; Date: 4/12/17

Project No.: GR5060 ; Measured By: SC/HP

Well	Time	DTW (ft BTOC)	Screen Interval	Notes
GCW-01S	08:04	12.86	15-25	Missing 1 bolt
GCW-01M	08:00	13.03	34-44	Missing 2 bolts
GCW-01D	08:09	12.06	58-68	Covered by metal debris, so to have that moved
GCW-02S	SC ~~8:34~~ 9:12	SC ~~9.72~~ 3.99	16-26	
GCW-02D	SC ~~8:34~~ 9:11	SC ~~9.46~~ 3.49	34-44	
GCW-02V	SC ~~8:35~~ 9:07	SC ~~9.52~~ 3.68	85.5-95.5	
GCW-03S	9:20 SC ~~8:35~~ ~~9:12~~	SC ~~9.72~~ ~~3.77~~	SC 4.53' 11-21	Missing 1 bolt.
GCW-03D	9:21 SC ~~8:34~~ ~~9:11~~	SC ~~9.46~~ ~~3.77~~	SC 4.22' 38-28	missing 1 bolt.
GCW-04S	~~SC 8:35~~ 13:46	8.32	13-23	
GCW-04M	SC 13:48	8.69	30-40	
GCW-04D	13:45	8.40	50-60	
GCW-04V	13:47	9.28	114-124	
GCW-05	14:30	8.48	80-90	black ants inside well.
EPW-01	8:22AM	16.84	24.51(1)	Missing metal lid and well cap.
EPW-02	8:45	10.19	19.41(1)	fire ants inside well
EPW-03S	8:34	9.72	12-22	
EPW-03M	8:35	9.46	29-39	
EPW-03D	8:35	9.52	46-56	
OW-1A	08:08	14.98	34.5(1)	

Notes:

1. "Screen Interval" measurements indicate total well depth below ground surface.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: GCW-03D
Sample ID: GCW-03D-04~~12~~17 SC

Project No.: GR5060.2016
Sampling Date: 4/12/17
Sampler: SC/HP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
9:42	X										clear
9:49		X			18.77	3.10	467	3.68	1.96	0.00	"
9:59		X			18.71	3.13	462	3.70	1.03	0.00	"
10:09		X			18.94	3.16	457	3.67	1.04	0.00	"
10:19		X			19.08	3.15	455	3.66	0.76	0.00	"
10:29		X			19.39	3.17	455	3.63	0.81	0.00	"
10:30			X								

Meter Calibration

Meter Number: 12525037

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH	4/11/17 by AIP	±0.2 SU	pH 4: 4 ; pH 7: 7 ; pH 10: MA
Conductivity	4/11/17 by AIP	±0.2 mS	4.49 mS/cm fluid reads 4.49
Turbidity	4/11/17 by AIP	±2 NTU	0 NTU solution reads 0

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description
DUP-01-0417	GW Field Duplicate

Miscellaneous

Depth to Water (after sample): 4.19 ft
Total Purge Volume ~4.9 gal
Purge should be approximately 5 gallons
Pump Rate: 300mL in
1 min, 0 sec.

Weather: Cloudy, 65°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)
large boulder blocking entrance to alleyway where GCW03 & GCW02 clusters are. Had Newell Recycling move boulder.

We purged and sampled GCW-03D in compliance with the EPA SESD operating procedures. took measurement every 10 minutes until stabilization

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

~~Monitoring Well:~~ SW-02 (Surface Water Location)

Sample ID: SW-02-0417

Project No.: GR5060.2016

Sampling Date: 4/12/17

Sampler: SC/HP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
10:42	X				~~20.52~~ SC						
10:43		X			20.31	3.88	375	~~3.7~~ SC 1.64	16.2	5.96	clear
10:45		X	X	X	19.63	4.09	302	1.29	18.4	6.17	"

Meter Calibration

Meter Number: 12SR5031

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH		±0.2 SU	pH 4:_____; pH 7:_____; pH 10:_____
Conductivity		±0.2 mS	4.48 mS/cm fluid reads _____
Turbidity		±2 NTU	0 NTU solution reads _____

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description
DUP-02-0417	SW Field Duplicate

Miscellaneous

Depth to Water (after sample): _____ ft

Total Purge Volume _____ gal

Purge should be approximately 5 gallons

Pump Rate: _____ in

_____ min, _____ sec.

Weather: Cloudy, 60s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: GCW-02D
Sample ID: GCW-02D-0417

Project No.: GR5060.2016
Sampling Date: 4/12/17
Sampler: HP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
11:23	X										
11:30		X			18.25	3.47	432	2.66	5.04	0.00	clear
11:40		X			18.29	3.47	443	2.53	3.72	0.00	"
11:50		X			17.66	3.46	445	2.48	2.57	0.00	"
12:00		X			17.74	3.46	447	2.44	2.89	0.00	"
12:10		X	X	X	17.90	3.46	448	2.40	2.97	0.00	"

Meter Calibration

Meter Number: XC1RSE5B

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH	4/10/17 by AIR	±0.2 SU	pH 4: 4 ; pH 7: 7 ; pH 10: —
Conductivity	4/10/17 by AIR	±0.2 mS	4.49 mS/cm fluid reads 4.49
Turbidity	4/10/17 by AIR	±2 NTU	0 NTU solution reads 0

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

Miscellaneous

Depth to Water (after sample): 4.48 ft
Total Purge Volume ~4.8 gal
Purge should be approximately 5 gallons
Pump Rate: 300 ml in
1 min, 0 sec.

Weather: Cloudy, 65°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan. etc.)

PURGED AND SAMPLED GW-02D IN COMPLIANCE WITH EPA SESD OPERATING PROCEDURES. TOOK Measurements every 10 min until stabilization

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: GCW-04D
Sample ID: GCW-04D-0417

Project No.: GR5060.2016
Sampling Date: 4/12/2017
Sampler: HP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
14:05	X										
14:10		X			19.65	3.51	429	2.40	20.6	0.87	clear
14:20		X			18.98	3.45	422	2.54	13.6	0.27	clear
14:30		X			18.98	3.43	420	2.68	20.3	0.00	"
14:40		X			19.15	3.42	418	2.70	7.16	0.00	"
14:50		X			19.39	3.42	418	2.70	14.5	0.00	"
15:00		X			19.02	3.41	417	2.71	17.7	0.00	"
15:10		X			19.02	3.41	417	2.71	6.04	0.00	"
15:20		X			20.23	3.43	411	2.64	7.22	0.00	"
15:30		X	X	X	19.52	3.42	408	2.67	6.94	0.00	"

HP

HP

Meter Calibration

Meter Number: XCIRSE5B

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH	4/10/17 by AIR	±0.2 SU	pH 4: 4; pH 7: 7; pH 10: –
Conductivity	4/10/17 by AIR	±0.2 mS	4.49 mS/cm fluid reads 4.49
Turbidity	4/10/17 by AIR	±2 NTU	0 NTU solution reads 0

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

Miscellaneous

Depth to Water (after sample): 9.42 ft
Total Purge Volume ~1 gal
Purge should be approximately 5 gallons
Pump Rate: 300 ml in
1 min, 0 sec.

Weather: Sunny 60s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Purged and sampled GCW-04D in compliance with EPA SESD Operating procedures Took Measurements every 10 mins until stabilization

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: GCW-05
Sample ID: GCW-05-0417

Project No.: GR5060.2016
Sampling Date: 4/12/17
Sampler: SC

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
1430	X										
1440		X			25.42	6.70	-5	1.35	153	0.00	Clear
1450		X			25.34	6.88	-4	1.33	145	0.00	"
1500		X			24.96	6.92	4	1.30	129	0.00	"
1510		X			24.80	6.96	2	1.31	103	0.00	"
1520		X			24.84	6.98	2	1.31	89.8	0.00	"
1530		X			24.84	6.92	10	1.39	81.3	0.00	"
1540		X			24.73	6.94	7	1.42	75.8	0.00	"
1550		X			23.86	6.89	9	1.64	61.0	0.00	"
1600		X			24.05	6.90	9	1.64	64.0	0.00	"
1610		X			24.05	6.90	10	1.64	59.2	0.00	
1615		X	X	X	24.06	6.90	10	1.64	59.1	0.00	

Meter Calibration

Meter Number: Y25K03T

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH	See GCW03D for calibration results	±0.2 SU	pH 4:____; pH 7:____; pH 10:____
Conductivity		±0.2 mS	4.48 mS/cm fluid reads ____
Turbidity		±2 NTU	0 NTU solution reads ____

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

Miscellaneous

Depth to Water (after sample): 27.91 ft
Total Purge Volume 5 gal
Purge should be approximately 5 gallons
Pump Rate: 300mL in
1 min, 0 sec.

Weather: Sunny 60s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Purged + sampled GCW-05 in compliance with EPA SOP operating procedures. Took measurements every 10 min until stabilization.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: EPW 02
Sample ID: EPW-02-0417

Project No.: GR5060.2016
Sampling Date: 4/13/17
Sampler: SC

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
8:18	X										
8:28		X			18.44	4.93	318	0.087	3.50	1.94	clear
8:38		X			18.71	5.24	305	0.085	1.82	2.29	"
8:48		X			18.97	5.18	323	0.085	0.33	2.34	"
8:58		X			19.28	5.18	334	0.085	0.33	2.38	"
9:08		X			19.42	5.22	3.33	0.086	0.00	2.29	"
9:10			X	X							
											SC
											SC
											SC
											SC

Meter Calibration

Meter Number: _____

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH	4/13/17 by SC	±0.2 SU	pH 4: 3.98 ; pH 7: — ; pH 10: 10.00
Conductivity	4/13/17 by SC	±0.2 mS	4.48 mS/cm fluid reads 4.50
Turbidity	4/13/17 by SC	±2 NTU	0 NTU solution reads 0.00

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

Miscellaneous

Depth to Water (after sample): 13.0 ft
Total Purge Volume 4.5 gal
Purge should be approximately 5 gallons
Pump Rate: 300 mL in
1 min, _____ sec.

Weather: Sunny, 70s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)
purged + sampled well EPW-02 in compliance with ERA SESD operating procedures. SC took measurements every 10 mins. until stabilization.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: EPW-03D
Sample ID: EPW-03D-0417

Project No.: GR5060.2016
Sampling Date: 4/13/17
Sampler: HP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
08:33	X										
08:38		X			19.17	5.88	331	0.145	0	5.36	clear
08:48		X			19.35	5.97	349	0.282	0	5.39	"
08:58		X			19.56	5.98	358	0.279	6.23	5.41	"
09:08		X			19.75	5.99	364	0.276	0	5.38	"
09:18		X			19.87	5.99	367	0.274	2.01	5.33	"
09:28		X	X	X	19.92	5.99	370	0.273	4.20	5.33	"

Meter Calibration

Meter Number: XC1RSE5B

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH	4	±0.2 SU	pH 4: 4; pH 7: —; pH 10: —
Conductivity	4.49	±0.2 mS	4.489 mS/cm fluid reads 4.49
Turbidity	0	±2 NTU	0 NTU solution reads 0

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

Miscellaneous

Depth to Water (after sample): 9.49 ft
Total Purge Volume 4.9 gal
Purge should be approximately 5 gallons
Pump Rate: 300 ml in
1 min, 0 sec.

Weather: SUNNY, 70s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

EPW-03D WAS PURGED AND SAMPLED IN COMPLIANCE WITH EPA SESD OPERATING PROCEDURES. MEASUREMENTS WERE TAKEN EVERY 10 MINUTES.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: SW-06
Sample ID: SW-06-0417

Project No.: GR5060.2016
Sampling Date: 4/13/17
Sampler: SC/HP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
10:07	X										
10:08		X			19.18	4.07	411	1.69	4.83	9.91	Clear
10:13		X			18.22	3.99	416	1.72	3.97	9.43	"
10:15			X	X							
—											JC
—											JC
—											SC
—											SC
—											SC
—											SC
—											SC
—											SC

Meter Calibration

Meter Number: Y25K5037

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH		±0.2 SU	pH 4:_____; pH 7:_____; pH 10:_____
Conductivity		±0.2 mS	4.48 mS/cm fluid reads _____
Turbidity		±2 NTU	0 NTU solution reads _____

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

Miscellaneous

Depth to Water (after sample): — ft
Total Purge Volume — gal
Purge should be approximately 5 gallons
Pump Rate: — in
____ min, ____ sec.

Weather: Sunny, 70s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: SW-09
Sample ID: SW-09-0417

Project No.: GR5060.2016
Sampling Date: 4/13/17
Sampler: SC/HP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temper-ature (°C)	pH	Redox Potential (± mv)	Conduc-tivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
10:29	X										
10:30		X			18.96	6.54	79	0.260	61.6	7.60	clear
10:35		X	X	X	18.41	6.99	48	0.256	61.5	7.28	"

HP

Meter Calibration

Meter Number: Y25K503T

Parameter	*Date & Time Calibrated & Acceptance*		*Calibration Results*
pH		±0.2 SU	pH 4:_____; pH 7:_____; pH 10:_____
Conductivity		±0.2 mS	4.48 mS/cm fluid reads _____
Turbidity		±2 NTU	0 NTU solution reads _____

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

HP

Miscellaneous

Depth to Water (after sample): — ft
Total Purge Volume — gal
Purge should be approximately 5 gallons
Pump Rate: — in
— min, — sec.

Weather: Sunny 70s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: SW-07
Sample ID: SW-07-0417

Project No.: GR5060.2016
Sampling Date: 4/13/17
Sampler: SC

	Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
SC	~~1045~~	~~X~~	~~X~~									
1045	~~1050~~		X	~~X~~ SC		17.97	4.41	304	0.476	2.97	9.41	cloudy, slight brown green
	1050		X			17.80	4.40	315	0.624	3.81	8.15	"

Meter Calibration

Meter Number: Y2SK503T

Parameter Date & Time Calibrated & Acceptance			Calibration Results
pH		±0.2 SU	pH 4:_____; pH 7:_____; pH 10:_____
Conductivity		±0.2 mS	4.48 mS/cm fluid reads _____
Turbidity		±2 NTU	0 NTU solution reads _____

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

Miscellaneous

Depth to Water (after sample): — ft
Total Purge Volume — gal
Purge should be approximately 5 gallons
Pump Rate: — in
____ min, ____ sec.

Weather: Sunny, 70s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)
Creek has white foam on left side outlet. Total measurements & sampled from right-side outlet.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: EPW-01
Sample ID: EPW-01-0417

Project No.: GR5060.2016
Sampling Date: 4/13/17
Sampler: MP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
11:05	X										
11:10		X			18.05	4.35	587	0.188	6.20	0.00	Clear
11:20		X			17.73	4.16	424	0.185	9.14	0.00	"
11:30		X			17.71	4.16	413	0.182	4.87	0.00	"
11:40		X			17.74	4.17	372	0.172	5.35	0.00	"
11:50		X	X	X	17.74	4.19	358	0.169	4.23	0.00	"
											MP

Meter Calibration

Meter Number: Y25K503T

(see EPW-02)

Parameter Date & Time Calibrated & Acceptance			Calibration Results
pH		±0.2 SU	pH 4:____; pH 7:____; pH 10:____
Conductivity		±0.2 mS	4.48 mS/cm fluid reads ____
Turbidity		±2 NTU	0 NTU solution reads ____

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description
	MP

Miscellaneous

Depth to Water (after sample): 18.97 ft
Total Purge Volume 4.5 gal
Purge should be approximately 5 gallons
Pump Rate: 300 ml in
1 min, 0 sec.

Weather: Sunny, 70s

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

EPW-01 PURGED & SAMPLED IN COMPLIANCE WITH EPA SESD OPERATING PROCEDURES. READINGS WERE MEASURED EVERY 10 MINUTES.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: OW-01A
Sample ID: OW-01A - 0417

Project No.: GR5060.2016
Sampling Date: 4/13/17
Sampler: SC

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
1210	X										
1215		X			20.24	4.32	401	~~7~~ 0.122	~~0.0070~~	7.19	Clear
1225		X			19.95	4.27	432	0.120	16.8	6.97	"
1235		X			20.26	4.31	431	0.119	16.7	6.88	"
1245		X	X	X	20.43	4.35	430	0.118	16.8	6.98	"
1255		X	X	X	20.64	4.40	429	0.116	16.9	6.85	"
											SC
											SC
											SC
											SC
											SC
											SC

Meter Calibration

Calibrated @ 7:40AM on 4/13/17 Meter Number: Y2SK503T

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH	4/13/17 by SC	±0.2 SU	pH 4:____; pH 7:____; pH 10:____
Conductivity	4/13/17 by SC	±0.2 mS	4.48 mS/cm fluid reads ____
Turbidity	4/13/17 by SC	±2 NTU	0 NTU solution reads ____

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

Miscellaneous

Depth to Water (after sample): - ft
Total Purge Volume ~9.5 gal
Purge should be approximately 5 gallons
Pump Rate: 300 ml/min
1 min, 0 sec.

Weather: Sunny, 70°C

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Stickup well. No cap.
Purged & sampled OW-01A in compliance with EPA SESD operating procedures
Took measurements every 10 mins until stabilization.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade
Monitoring Well: GCW-01D
Sample ID: GCW-01D 0417

Project No.: GR5060.2016
Sampling Date: 4/13/17
Sampler: HP

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH	Redox Potential (± mv)	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
12:08	X										
12:10		X			22.54	4.24	417	0.377	27.3	7.14	clear
12:20		X			22.16	4.18	443	0.379	8.81	8.76	clear
12:30		X			22.17	4.17	447	0.377	5.12	7.39	"
12:40		X			22.62	4.18	448	0.375	3.11	7.24	"
12:50		X			22.72	4.18	449	0.372	3.30	7.47	"
13:00		X	X	X	22.72	4.18	449	0.373	3.93	7.40	

HP

Meter Calibration

Meter Number: XCTRSE58

Parameter	Date & Time Calibrated & Acceptance		Calibration Results
pH	See EPW-03	±0.2 SU	pH 4:____; pH 7:____; pH 10:____
Conductivity		±0.2 mS	4.48 mS/cm fluid reads ____
Turbidity		±2 NTU	0 NTU solution reads ____

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description

HP

Miscellaneous

Depth to Water (after sample): 12.06 ft
Total Purge Volume 4.9 gal
Purge should be approximately 5 gallons
Pump Rate: 300 ml in
1 min, 0 sec.

Weather: sunny, 70°C

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)
GCW-01D was purged & sampled per EPA SESD operating procedures. Measurements taken every 10 mins until stabilization.

APPENDIX C

MANN-KENDALL TREND ANALYSIS DATA
(provided in electronic submittal only)

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: EPW-01

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
15	14	1	1	0
15	14	1	2	0
20	14	6	3	0
10.2	14	-3.8	3	1
11	14	-3	3	2
12.9	14	-1.1	3	3
11.6	14	-2.4	3	4
11	14	-3	3	5
13.5	14	-0.5	3	6
13.2	14	-0.8	3	7
12.5	14	-1.5	3	8
12.8	14	-1.2	3	9
12.9	14	-1.1	3	10
16.9	14	2.9	4	10
13.4	14	-0.6	4	11
21.4	14	7.4	5	11
8.44	14	-5.56	5	12
14	14	0	5	12
12.9	14	-1.1	5	13
14.2	14	0.2	6	13
13.8	14	-0.2	6	14
14.5	14	0.5	7	14
13.9	14	-0.1	7	15
15.8	14	1.8	8	15
12.9	14	-1.1	8	16
15	15	0	8	16
20	15	5	9	16
10.2	15	-4.8	9	17
11	15	-4	9	18
12.9	15	-2.1	9	19
11.6	15	-3.4	9	20
11	15	-4	9	21
13.5	15	-1.5	9	22
13.2	15	-1.8	9	23
12.5	15	-2.5	9	24
12.8	15	-2.2	9	25
12.9	15	-2.1	9	26
16.9	15	1.9	10	26
13.4	15	-1.6	10	27
21.4	15	6.4	11	27
8.44	15	-6.56	11	28
14	15	-1	11	29
12.9	15	-2.1	11	30
14.2	15	-0.8	11	31
13.8	15	-1.2	11	32
14.5	15	-0.5	11	33
13.9	15	-1.1	11	34
15.8	15	0.8	12	34
12.9	15	-2.1	12	35
20	15	5	13	35
10.2	15	-4.8	13	36
11	15	-4	13	37
12.9	15	-2.1	13	38

11.6	15	-3.4	13	39
11	15	-4	13	40
13.5	15	-1.5	13	41
13.2	15	-1.8	13	42
12.5	15	-2.5	13	43
12.8	15	-2.2	13	44
12.9	15	-2.1	13	45
16.9	15	1.9	14	45
13.4	15	-1.6	14	46
21.4	15	6.4	15	46
8.44	15	-6.56	15	47
14	15	-1	15	48
12.9	15	-2.1	15	49
14.2	15	-0.8	15	50
13.8	15	-1.2	15	51
14.5	15	-0.5	15	52
13.9	15	-1.1	15	53
15.8	15	0.8	16	53
12.9	15	-2.1	16	54
10.2	20	-9.8	16	55
11	20	-9	16	56
12.9	20	-7.1	16	57
11.6	20	-8.4	16	58
11	20	-9	16	59
13.5	20	-6.5	16	60
13.2	20	-6.8	16	61
12.5	20	-7.5	16	62
12.8	20	-7.2	16	63
12.9	20	-7.1	16	64
16.9	20	-3.1	16	65
13.4	20	-6.6	16	66
21.4	20	1.4	17	66
8.44	20	-11.56	17	67
14	20	-6	17	68
12.9	20	-7.1	17	69
14.2	20	-5.8	17	70
13.8	20	-6.2	17	71
14.5	20	-5.5	17	72
13.9	20	-6.1	17	73
15.8	20	-4.2	17	74
12.9	20	-7.1	17	75
11	10.2	0.8	18	75
12.9	10.2	2.7	19	75
11.6	10.2	1.4	20	75
11	10.2	0.8	21	75
13.5	10.2	3.3	22	75
13.2	10.2	3	23	75
12.5	10.2	2.3	24	75
12.8	10.2	2.6	25	75
12.9	10.2	2.7	26	75
16.9	10.2	6.7	27	75
13.4	10.2	3.2	28	75
21.4	10.2	11.2	29	75
8.44	10.2	-1.76	29	76
14	10.2	3.8	30	76
12.9	10.2	2.7	31	76
14.2	10.2	4	32	76
13.8	10.2	3.6	33	76
14.5	10.2	4.3	34	76
13.9	10.2	3.7	35	76
15.8	10.2	5.6	36	76
12.9	10.2	2.7	37	76
12.9	11	1.9	38	76
11.6	11	0.6	39	76

11	11	0	39	76
13.5	11	2.5	40	76
13.2	11	2.2	41	76
12.5	11	1.5	42	76
12.8	11	1.8	43	76
12.9	11	1.9	44	76
16.9	11	5.9	45	76
13.4	11	2.4	46	76
21.4	11	10.4	47	76
8.44	11	-2.56	47	77
14	11	3	48	77
12.9	11	1.9	49	77
14.2	11	3.2	50	77
13.8	11	2.8	51	77
14.5	11	3.5	52	77
13.9	11	2.9	53	77
15.8	11	4.8	54	77
12.9	11	1.9	55	77
11.6	12.9	-1.3	55	78
11	12.9	-1.9	55	79
13.5	12.9	0.6	56	79
13.2	12.9	0.3	57	79
12.5	12.9	-0.4	57	80
12.8	12.9	-0.1	57	81
12.9	12.9	0	57	81
16.9	12.9	4	58	81
13.4	12.9	0.5	59	81
21.4	12.9	8.5	60	81
8.44	12.9	-4.46	60	82
14	12.9	1.1	61	82
12.9	12.9	0	61	82
14.2	12.9	1.3	62	82
13.8	12.9	0.9	63	82
14.5	12.9	1.6	64	82
13.9	12.9	1	65	82
15.8	12.9	2.9	66	82
12.9	12.9	0	66	82
11	11.6	-0.6	66	83
13.5	11.6	1.9	67	83
13.2	11.6	1.6	68	83
12.5	11.6	0.9	69	83
12.8	11.6	1.2	70	83
12.9	11.6	1.3	71	83
16.9	11.6	5.3	72	83
13.4	11.6	1.8	73	83
21.4	11.6	9.8	74	83
8.44	11.6	-3.16	74	84
14	11.6	2.4	75	84
12.9	11.6	1.3	76	84
14.2	11.6	2.6	77	84
13.8	11.6	2.2	78	84
14.5	11.6	2.9	79	84
13.9	11.6	2.3	80	84
15.8	11.6	4.2	81	84
12.9	11.6	1.3	82	84
13.5	11	2.5	83	84
13.2	11	2.2	84	84
12.5	11	1.5	85	84
12.8	11	1.8	86	84
12.9	11	1.9	87	84
16.9	11	5.9	88	84
13.4	11	2.4	89	84
21.4	11	10.4	90	84
8.44	11	-2.56	90	85

14	11	3	91	85
12.9	11	1.9	92	85
14.2	11	3.2	93	85
13.8	11	2.8	94	85
14.5	11	3.5	95	85
13.9	11	2.9	96	85
15.8	11	4.8	97	85
12.9	11	1.9	98	85
13.2	13.5	-0.3	98	86
12.5	13.5	-1	98	87
12.8	13.5	-0.7	98	88
12.9	13.5	-0.6	98	89
16.9	13.5	3.4	99	89
13.4	13.5	-0.1	99	90
21.4	13.5	7.9	100	90
8.44	13.5	-5.06	100	91
14	13.5	0.5	101	91
12.9	13.5	-0.6	101	92
14.2	13.5	0.7	102	92
13.8	13.5	0.3	103	92
14.5	13.5	1	104	92
13.9	13.5	0.4	105	92
15.8	13.5	2.3	106	92
12.9	13.5	-0.6	106	93
12.5	13.2	-0.7	106	94
12.8	13.2	-0.4	106	95
12.9	13.2	-0.3	106	96
16.9	13.2	3.7	107	96
13.4	13.2	0.2	108	96
21.4	13.2	8.2	109	96
8.44	13.2	-4.76	109	97
14	13.2	0.8	110	97
12.9	13.2	-0.3	110	98
14.2	13.2	1	111	98
13.8	13.2	0.6	112	98
14.5	13.2	1.3	113	98
13.9	13.2	0.7	114	98
15.8	13.2	2.6	115	98
12.9	13.2	-0.3	115	99
12.8	12.5	0.3	116	99
12.9	12.5	0.4	117	99
16.9	12.5	4.4	118	99
13.4	12.5	0.9	119	99
21.4	12.5	8.9	120	99
8.44	12.5	-4.06	120	100
14	12.5	1.5	121	100
12.9	12.5	0.4	122	100
14.2	12.5	1.7	123	100
13.8	12.5	1.3	124	100
14.5	12.5	2	125	100
13.9	12.5	1.4	126	100
15.8	12.5	3.3	127	100
12.9	12.5	0.4	128	100
12.9	12.8	0.1	129	100
16.9	12.8	4.1	130	100
13.4	12.8	0.6	131	100
21.4	12.8	8.6	132	100
8.44	12.8	-4.36	132	101
14	12.8	1.2	133	101
12.9	12.8	0.1	134	101
14.2	12.8	1.4	135	101
13.8	12.8	1	136	101
14.5	12.8	1.7	137	101

13.9	12.8	1.1	138	101
15.8	12.8	3	139	101
12.9	12.8	0.1	140	101
16.9	12.9	4	141	101
13.4	12.9	0.5	142	101
21.4	12.9	8.5	143	101
8.44	12.9	-4.46	143	102
14	12.9	1.1	144	102
12.9	12.9	0	144	102
14.2	12.9	1.3	145	102
13.8	12.9	0.9	146	102
14.5	12.9	1.6	147	102
13.9	12.9	1	148	102
15.8	12.9	2.9	149	102
12.9	12.9	0	149	102
13.4	16.9	-3.5	149	103
21.4	16.9	4.5	150	103
8.44	16.9	-8.46	150	104
14	16.9	-2.9	150	105
12.9	16.9	-4	150	106
14.2	16.9	-2.7	150	107
13.8	16.9	-3.1	150	108
14.5	16.9	-2.4	150	109
13.9	16.9	-3	150	110
15.8	16.9	-1.1	150	111
12.9	16.9	-4	150	112
21.4	13.4	8	151	112
8.44	13.4	-4.96	151	113
14	13.4	0.6	152	113
12.9	13.4	-0.5	152	114
14.2	13.4	0.8	153	114
13.8	13.4	0.4	154	114
14.5	13.4	1.1	155	114
13.9	13.4	0.5	156	114
15.8	13.4	2.4	157	114
12.9	13.4	-0.5	157	115
8.44	21.4	-12.96	157	116
14	21.4	-7.4	157	117
12.9	21.4	-8.5	157	118
14.2	21.4	-7.2	157	119
13.8	21.4	-7.6	157	120
14.5	21.4	-6.9	157	121
13.9	21.4	-7.5	157	122
15.8	21.4	-5.6	157	123
12.9	21.4	-8.5	157	124
14	8.44	5.56	158	124
12.9	8.44	4.46	159	124
14.2	8.44	5.76	160	124
13.8	8.44	5.36	161	124
14.5	8.44	6.06	162	124
13.9	8.44	5.46	163	124
15.8	8.44	7.36	164	124
12.9	8.44	4.46	165	124
12.9	14	-1.1	165	125
14.2	14	0.2	166	125
13.8	14	-0.2	166	126
14.5	14	0.5	167	126
13.9	14	-0.1	167	127
15.8	14	1.8	168	127
12.9	14	-1.1	168	128

14.2	12.9	1.3	169	128
13.8	12.9	0.9	170	128
14.5	12.9	1.6	171	128
13.9	12.9	1	172	128
15.8	12.9	2.9	173	128
12.9	12.9	0	173	128
13.8	14.2	-0.4	173	129
14.5	14.2	0.3	174	129
13.9	14.2	-0.3	174	130
15.8	14.2	1.6	175	130
12.9	14.2	-1.3	175	131
14.5	13.8	0.7	176	131
13.9	13.8	0.1	177	131
15.8	13.8	2	178	131
12.9	13.8	-0.9	178	132
13.9	14.5	-0.6	178	133
15.8	14.5	1.3	179	133
12.9	14.5	-1.6	179	134
15.8	13.9	1.9	180	134
12.9	13.9	-1	180	135
12.9	15.8	-2.9	180	136

S Statistic = 180 - 136 = 44

Tied Group	Value	Members
1	14	2
2	15	2
3	11	2
4	12.9	4

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/15/2009	1
9/23/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 210

B = 0
C = 24
D = 0
E = 18
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2046.67
Z-Score = 0.950484
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.950484 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: EPW-01

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
15	14	1	1	0
15	14	1	2	0
20	14	6	3	0
10.2	14	-3.8	3	1
11	14	-3	3	2
12.9	14	-1.1	3	3
11.6	14	-2.4	3	4
11	14	-3	3	5
13.5	14	-0.5	3	6
13.2	14	-0.8	3	7
12.5	14	-1.5	3	8
12.8	14	-1.2	3	9
12.9	14	-1.1	3	10
16.9	14	2.9	4	10
13.4	14	-0.6	4	11
21.4	14	7.4	5	11
8.44	14	-5.56	5	12
14	14	0	5	12
12.9	14	-1.1	5	13
14.2	14	0.2	6	13
13.8	14	-0.2	6	14
14.5	14	0.5	7	14
13.9	14	-0.1	7	15
15.8	14	1.8	8	15
12.9	14	-1.1	8	16
15	15	0	8	16
20	15	5	9	16
10.2	15	-4.8	9	17
11	15	-4	9	18
12.9	15	-2.1	9	19
11.6	15	-3.4	9	20
11	15	-4	9	21
13.5	15	-1.5	9	22
13.2	15	-1.8	9	23
12.5	15	-2.5	9	24
12.8	15	-2.2	9	25
12.9	15	-2.1	9	26
16.9	15	1.9	10	26
13.4	15	-1.6	10	27
21.4	15	6.4	11	27
8.44	15	-6.56	11	28
14	15	-1	11	29
12.9	15	-2.1	11	30
14.2	15	-0.8	11	31
13.8	15	-1.2	11	32
14.5	15	-0.5	11	33
13.9	15	-1.1	11	34
15.8	15	0.8	12	34
12.9	15	-2.1	12	35
20	15	5	13	35
10.2	15	-4.8	13	36
11	15	-4	13	37
12.9	15	-2.1	13	38

11.6	15	-3.4	13	39
11	15	-4	13	40
13.5	15	-1.5	13	41
13.2	15	-1.8	13	42
12.5	15	-2.5	13	43
12.8	15	-2.2	13	44
12.9	15	-2.1	13	45
16.9	15	1.9	14	45
13.4	15	-1.6	14	46
21.4	15	6.4	15	46
8.44	15	-6.56	15	47
14	15	-1	15	48
12.9	15	-2.1	15	49
14.2	15	-0.8	15	50
13.8	15	-1.2	15	51
14.5	15	-0.5	15	52
13.9	15	-1.1	15	53
15.8	15	0.8	16	53
12.9	15	-2.1	16	54
10.2	20	-9.8	16	55
11	20	-9	16	56
12.9	20	-7.1	16	57
11.6	20	-8.4	16	58
11	20	-9	16	59
13.5	20	-6.5	16	60
13.2	20	-6.8	16	61
12.5	20	-7.5	16	62
12.8	20	-7.2	16	63
12.9	20	-7.1	16	64
16.9	20	-3.1	16	65
13.4	20	-6.6	16	66
21.4	20	1.4	17	66
8.44	20	-11.56	17	67
14	20	-6	17	68
12.9	20	-7.1	17	69
14.2	20	-5.8	17	70
13.8	20	-6.2	17	71
14.5	20	-5.5	17	72
13.9	20	-6.1	17	73
15.8	20	-4.2	17	74
12.9	20	-7.1	17	75
11	10.2	0.8	18	75
12.9	10.2	2.7	19	75
11.6	10.2	1.4	20	75
11	10.2	0.8	21	75
13.5	10.2	3.3	22	75
13.2	10.2	3	23	75
12.5	10.2	2.3	24	75
12.8	10.2	2.6	25	75
12.9	10.2	2.7	26	75
16.9	10.2	6.7	27	75
13.4	10.2	3.2	28	75
21.4	10.2	11.2	29	75
8.44	10.2	-1.76	29	76
14	10.2	3.8	30	76
12.9	10.2	2.7	31	76
14.2	10.2	4	32	76
13.8	10.2	3.6	33	76
14.5	10.2	4.3	34	76
13.9	10.2	3.7	35	76
15.8	10.2	5.6	36	76
12.9	10.2	2.7	37	76
12.9	11	1.9	38	76
11.6	11	0.6	39	76

11	11	0	39	76
13.5	11	2.5	40	76
13.2	11	2.2	41	76
12.5	11	1.5	42	76
12.8	11	1.8	43	76
12.9	11	1.9	44	76
16.9	11	5.9	45	76
13.4	11	2.4	46	76
21.4	11	10.4	47	76
8.44	11	-2.56	47	77
14	11	3	48	77
12.9	11	1.9	49	77
14.2	11	3.2	50	77
13.8	11	2.8	51	77
14.5	11	3.5	52	77
13.9	11	2.9	53	77
15.8	11	4.8	54	77
12.9	11	1.9	55	77
11.6	12.9	-1.3	55	78
11	12.9	-1.9	55	79
13.5	12.9	0.6	56	79
13.2	12.9	0.3	57	79
12.5	12.9	-0.4	57	80
12.8	12.9	-0.1	57	81
12.9	12.9	0	57	81
16.9	12.9	4	58	81
13.4	12.9	0.5	59	81
21.4	12.9	8.5	60	81
8.44	12.9	-4.46	60	82
14	12.9	1.1	61	82
12.9	12.9	0	61	82
14.2	12.9	1.3	62	82
13.8	12.9	0.9	63	82
14.5	12.9	1.6	64	82
13.9	12.9	1	65	82
15.8	12.9	2.9	66	82
12.9	12.9	0	66	82
11	11.6	-0.6	66	83
13.5	11.6	1.9	67	83
13.2	11.6	1.6	68	83
12.5	11.6	0.9	69	83
12.8	11.6	1.2	70	83
12.9	11.6	1.3	71	83
16.9	11.6	5.3	72	83
13.4	11.6	1.8	73	83
21.4	11.6	9.8	74	83
8.44	11.6	-3.16	74	84
14	11.6	2.4	75	84
12.9	11.6	1.3	76	84
14.2	11.6	2.6	77	84
13.8	11.6	2.2	78	84
14.5	11.6	2.9	79	84
13.9	11.6	2.3	80	84
15.8	11.6	4.2	81	84
12.9	11.6	1.3	82	84
13.5	11	2.5	83	84
13.2	11	2.2	84	84
12.5	11	1.5	85	84
12.8	11	1.8	86	84
12.9	11	1.9	87	84
16.9	11	5.9	88	84
13.4	11	2.4	89	84
21.4	11	10.4	90	84
8.44	11	-2.56	90	85

14	11	3	91	85
12.9	11	1.9	92	85
14.2	11	3.2	93	85
13.8	11	2.8	94	85
14.5	11	3.5	95	85
13.9	11	2.9	96	85
15.8	11	4.8	97	85
12.9	11	1.9	98	85
13.2	13.5	-0.3	98	86
12.5	13.5	-1	98	87
12.8	13.5	-0.7	98	88
12.9	13.5	-0.6	98	89
16.9	13.5	3.4	99	89
13.4	13.5	-0.1	99	90
21.4	13.5	7.9	100	90
8.44	13.5	-5.06	100	91
14	13.5	0.5	101	91
12.9	13.5	-0.6	101	92
14.2	13.5	0.7	102	92
13.8	13.5	0.3	103	92
14.5	13.5	1	104	92
13.9	13.5	0.4	105	92
15.8	13.5	2.3	106	92
12.9	13.5	-0.6	106	93
12.5	13.2	-0.7	106	94
12.8	13.2	-0.4	106	95
12.9	13.2	-0.3	106	96
16.9	13.2	3.7	107	96
13.4	13.2	0.2	108	96
21.4	13.2	8.2	109	96
8.44	13.2	-4.76	109	97
14	13.2	0.8	110	97
12.9	13.2	-0.3	110	98
14.2	13.2	1	111	98
13.8	13.2	0.6	112	98
14.5	13.2	1.3	113	98
13.9	13.2	0.7	114	98
15.8	13.2	2.6	115	98
12.9	13.2	-0.3	115	99
12.8	12.5	0.3	116	99
12.9	12.5	0.4	117	99
16.9	12.5	4.4	118	99
13.4	12.5	0.9	119	99
21.4	12.5	8.9	120	99
8.44	12.5	-4.06	120	100
14	12.5	1.5	121	100
12.9	12.5	0.4	122	100
14.2	12.5	1.7	123	100
13.8	12.5	1.3	124	100
14.5	12.5	2	125	100
13.9	12.5	1.4	126	100
15.8	12.5	3.3	127	100
12.9	12.5	0.4	128	100
12.9	12.8	0.1	129	100
16.9	12.8	4.1	130	100
13.4	12.8	0.6	131	100
21.4	12.8	8.6	132	100
8.44	12.8	-4.36	132	101
14	12.8	1.2	133	101
12.9	12.8	0.1	134	101
14.2	12.8	1.4	135	101
13.8	12.8	1	136	101
14.5	12.8	1.7	137	101

13.9	12.8	1.1	138	101
15.8	12.8	3	139	101
12.9	12.8	0.1	140	101
16.9	12.9	4	141	101
13.4	12.9	0.5	142	101
21.4	12.9	8.5	143	101
8.44	12.9	-4.46	143	102
14	12.9	1.1	144	102
12.9	12.9	0	144	102
14.2	12.9	1.3	145	102
13.8	12.9	0.9	146	102
14.5	12.9	1.6	147	102
13.9	12.9	1	148	102
15.8	12.9	2.9	149	102
12.9	12.9	0	149	102
13.4	16.9	-3.5	149	103
21.4	16.9	4.5	150	103
8.44	16.9	-8.46	150	104
14	16.9	-2.9	150	105
12.9	16.9	-4	150	106
14.2	16.9	-2.7	150	107
13.8	16.9	-3.1	150	108
14.5	16.9	-2.4	150	109
13.9	16.9	-3	150	110
15.8	16.9	-1.1	150	111
12.9	16.9	-4	150	112
21.4	13.4	8	151	112
8.44	13.4	-4.96	151	113
14	13.4	0.6	152	113
12.9	13.4	-0.5	152	114
14.2	13.4	0.8	153	114
13.8	13.4	0.4	154	114
14.5	13.4	1.1	155	114
13.9	13.4	0.5	156	114
15.8	13.4	2.4	157	114
12.9	13.4	-0.5	157	115
8.44	21.4	-12.96	157	116
14	21.4	-7.4	157	117
12.9	21.4	-8.5	157	118
14.2	21.4	-7.2	157	119
13.8	21.4	-7.6	157	120
14.5	21.4	-6.9	157	121
13.9	21.4	-7.5	157	122
15.8	21.4	-5.6	157	123
12.9	21.4	-8.5	157	124
14	8.44	5.56	158	124
12.9	8.44	4.46	159	124
14.2	8.44	5.76	160	124
13.8	8.44	5.36	161	124
14.5	8.44	6.06	162	124
13.9	8.44	5.46	163	124
15.8	8.44	7.36	164	124
12.9	8.44	4.46	165	124
12.9	14	-1.1	165	125
14.2	14	0.2	166	125
13.8	14	-0.2	166	126
14.5	14	0.5	167	126
13.9	14	-0.1	167	127
15.8	14	1.8	168	127
12.9	14	-1.1	168	128

14.2	12.9	1.3	169	128
13.8	12.9	0.9	170	128
14.5	12.9	1.6	171	128
13.9	12.9	1	172	128
15.8	12.9	2.9	173	128
12.9	12.9	0	173	128
13.8	14.2	-0.4	173	129
14.5	14.2	0.3	174	129
13.9	14.2	-0.3	174	130
15.8	14.2	1.6	175	130
12.9	14.2	-1.3	175	131
14.5	13.8	0.7	176	131
13.9	13.8	0.1	177	131
15.8	13.8	2	178	131
12.9	13.8	-0.9	178	132
13.9	14.5	-0.6	178	133
15.8	14.5	1.3	179	133
12.9	14.5	-1.6	179	134
15.8	13.9	1.9	180	134
12.9	13.9	-1	180	135
12.9	15.8	-2.9	180	136

S Statistic = 180 - 136 = 44

Tied Group	Value	Members
1	14	2
2	15	2
3	11	2
4	12.9	4

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/15/2009	1
9/23/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 210

B = 0
C = 24
D = 0
E = 18
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2046.67
Z-Score = 0.950484
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.950484 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: EPW-01

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
87	112	-25	0	1
63	112	-49	0	2
77	112	-35	0	3
133	112	21	1	3
190	112	78	2	3
78	112	-34	2	4
96	112	-16	2	5
110	112	-2	2	6
93	112	-19	2	7
64	112	-48	2	8
94	112	-18	2	9
91	112	-21	2	10
98	112	-14	2	11
92	112	-20	2	12
96	112	-16	2	13
130	112	18	3	13
110	112	-2	3	14
130	112	18	4	14
46	112	-66	4	15
130	112	18	5	15
110	112	-2	5	16
130	112	18	6	16
130	112	18	7	16
130	112	18	8	16
120	112	8	9	16
140	112	28	10	16
93	112	-19	10	17
63	87	-24	10	18
77	87	-10	10	19
133	87	46	11	19
190	87	103	12	19
78	87	-9	12	20
96	87	9	13	20
110	87	23	14	20
93	87	6	15	20
64	87	-23	15	21
94	87	7	16	21
91	87	4	17	21
98	87	11	18	21
92	87	5	19	21
96	87	9	20	21
130	87	43	21	21
110	87	23	22	21
130	87	43	23	21
46	87	-41	23	22
130	87	43	24	22
110	87	23	25	22
130	87	43	26	22
130	87	43	27	22
130	87	43	28	22
120	87	33	29	22
140	87	53	30	22
93	87	6	31	22

77	63	14	32	22
133	63	70	33	22
190	63	127	34	22
78	63	15	35	22
96	63	33	36	22
110	63	47	37	22
93	63	30	38	22
64	63	1	39	22
94	63	31	40	22
91	63	28	41	22
98	63	35	42	22
92	63	29	43	22
96	63	33	44	22
130	63	67	45	22
110	63	47	46	22
130	63	67	47	22
46	63	-17	47	23
130	63	67	48	23
110	63	47	49	23
130	63	67	50	23
130	63	67	51	23
130	63	67	52	23
120	63	57	53	23
140	63	77	54	23
93	63	30	55	23
133	77	56	56	23
190	77	113	57	23
78	77	1	58	23
96	77	19	59	23
110	77	33	60	23
93	77	16	61	23
64	77	-13	61	24
94	77	17	62	24
91	77	14	63	24
98	77	21	64	24
92	77	15	65	24
96	77	19	66	24
130	77	53	67	24
110	77	33	68	24
130	77	53	69	24
46	77	-31	69	25
130	77	53	70	25
110	77	33	71	25
130	77	53	72	25
130	77	53	73	25
130	77	53	74	25
120	77	43	75	25
140	77	63	76	25
93	77	16	77	25
190	133	57	78	25
78	133	-55	78	26
96	133	-37	78	27
110	133	-23	78	28
93	133	-40	78	29
64	133	-69	78	30
94	133	-39	78	31
91	133	-42	78	32
98	133	-35	78	33
92	133	-41	78	34
96	133	-37	78	35
130	133	-3	78	36
110	133	-23	78	37
130	133	-3	78	38
46	133	-87	78	39
130	133	-3	78	40

110	133	-23	78	41
130	133	-3	78	42
130	133	-3	78	43
130	133	-3	78	44
120	133	-13	78	45
140	133	7	79	45
93	133	-40	79	46
78	190	-112	79	47
96	190	-94	79	48
110	190	-80	79	49
93	190	-97	79	50
64	190	-126	79	51
94	190	-96	79	52
91	190	-99	79	53
98	190	-92	79	54
92	190	-98	79	55
96	190	-94	79	56
130	190	-60	79	57
110	190	-80	79	58
130	190	-60	79	59
46	190	-144	79	60
130	190	-60	79	61
110	190	-80	79	62
130	190	-60	79	63
130	190	-60	79	64
130	190	-60	79	65
120	190	-70	79	66
140	190	-50	79	67
93	190	-97	79	68
96	78	18	80	68
110	78	32	81	68
93	78	15	82	68
64	78	-14	82	69
94	78	16	83	69
91	78	13	84	69
98	78	20	85	69
92	78	14	86	69
96	78	18	87	69
130	78	52	88	69
110	78	32	89	69
130	78	52	90	69
46	78	-32	90	70
130	78	52	91	70
110	78	32	92	70
130	78	52	93	70
130	78	52	94	70
130	78	52	95	70
120	78	42	96	70
140	78	62	97	70
93	78	15	98	70
110	96	14	99	70
93	96	-3	99	71
64	96	-32	99	72
94	96	-2	99	73
91	96	-5	99	74
98	96	2	100	74
92	96	-4	100	75
96	96	0	100	75
130	96	34	101	75
110	96	14	102	75
130	96	34	103	75
46	96	-50	103	76
130	96	34	104	76
110	96	14	105	76

130	96	34	106	76
130	96	34	107	76
130	96	34	108	76
120	96	24	109	76
140	96	44	110	76
93	96	-3	110	77
93	110	-17	110	78
64	110	-46	110	79
94	110	-16	110	80
91	110	-19	110	81
98	110	-12	110	82
92	110	-18	110	83
96	110	-14	110	84
130	110	20	111	84
110	110	0	111	84
130	110	20	112	84
46	110	-64	112	85
130	110	20	113	85
110	110	0	113	85
130	110	20	114	85
130	110	20	115	85
130	110	20	116	85
120	110	10	117	85
140	110	30	118	85
93	110	-17	118	86
64	93	-29	118	87
94	93	1	119	87
91	93	-2	119	88
98	93	5	120	88
92	93	-1	120	89
96	93	3	121	89
130	93	37	122	89
110	93	17	123	89
130	93	37	124	89
46	93	-47	124	90
130	93	37	125	90
110	93	17	126	90
130	93	37	127	90
130	93	37	128	90
130	93	37	129	90
120	93	27	130	90
140	93	47	131	90
93	93	0	131	90
94	64	30	132	90
91	64	27	133	90
98	64	34	134	90
92	64	28	135	90
96	64	32	136	90
130	64	66	137	90
110	64	46	138	90
130	64	66	139	90
46	64	-18	139	91
130	64	66	140	91
110	64	46	141	91
130	64	66	142	91
130	64	66	143	91
130	64	66	144	91
120	64	56	145	91
140	64	76	146	91
93	64	29	147	91
91	94	-3	147	92
98	94	4	148	92
92	94	-2	148	93

96	94	2	149	93
130	94	36	150	93
110	94	16	151	93
130	94	36	152	93
46	94	-48	152	94
130	94	36	153	94
110	94	16	154	94
130	94	36	155	94
130	94	36	156	94
130	94	36	157	94
120	94	26	158	94
140	94	46	159	94
93	94	-1	159	95
98	91	7	160	95
92	91	1	161	95
96	91	5	162	95
130	91	39	163	95
110	91	19	164	95
130	91	39	165	95
46	91	-45	165	96
130	91	39	166	96
110	91	19	167	96
130	91	39	168	96
130	91	39	169	96
130	91	39	170	96
120	91	29	171	96
140	91	49	172	96
93	91	2	173	96
92	98	-6	173	97
96	98	-2	173	98
130	98	32	174	98
110	98	12	175	98
130	98	32	176	98
46	98	-52	176	99
130	98	32	177	99
110	98	12	178	99
130	98	32	179	99
130	98	32	180	99
130	98	32	181	99
120	98	22	182	99
140	98	42	183	99
93	98	-5	183	100
96	92	4	184	100
130	92	38	185	100
110	92	18	186	100
130	92	38	187	100
46	92	-46	187	101
130	92	38	188	101
110	92	18	189	101
130	92	38	190	101
130	92	38	191	101
130	92	38	192	101
120	92	28	193	101
140	92	48	194	101
93	92	1	195	101
130	96	34	196	101
110	96	14	197	101
130	96	34	198	101
46	96	-50	198	102
130	96	34	199	102
110	96	14	200	102
130	96	34	201	102
130	96	34	202	102

130	96	34	203	102
120	96	24	204	102
140	96	44	205	102
93	96	-3	205	103
110	130	-20	205	104
130	130	0	205	104
46	130	-84	205	105
130	130	0	205	105
110	130	-20	205	106
130	130	0	205	106
130	130	0	205	106
130	130	0	205	106
120	130	-10	205	107
140	130	10	206	107
93	130	-37	206	108
130	110	20	207	108
46	110	-64	207	109
130	110	20	208	109
110	110	0	208	109
130	110	20	209	109
130	110	20	210	109
130	110	20	211	109
120	110	10	212	109
140	110	30	213	109
93	110	-17	213	110
46	130	-84	213	111
130	130	0	213	111
110	130	-20	213	112
130	130	0	213	112
130	130	0	213	112
130	130	0	213	112
120	130	-10	213	113
140	130	10	214	113
93	130	-37	214	114
130	46	84	215	114
110	46	64	216	114
130	46	84	217	114
130	46	84	218	114
130	46	84	219	114
120	46	74	220	114
140	46	94	221	114
93	46	47	222	114
110	130	-20	222	115
130	130	0	222	115
130	130	0	222	115
130	130	0	222	115
120	130	-10	222	116
140	130	10	223	116
93	130	-37	223	117
130	110	20	224	117
130	110	20	225	117
130	110	20	226	117
120	110	10	227	117
140	110	30	228	117
93	110	-17	228	118
130	130	0	228	118
130	130	0	228	118
120	130	-10	228	119
140	130	10	229	119
93	130	-37	229	120

130	130	0	229	120
120	130	-10	229	121
140	130	10	230	121
93	130	-37	230	122
120	130	-10	230	123
140	130	10	231	123
93	130	-37	231	124
140	120	20	232	124
93	120	-27	232	125
93	140	-47	232	126

S Statistic = 232 - 126 = 106

Tied Group	Value	Members
1	96	2
2	110	3
3	93	2
4	130	6

Time Period	Observations
6/1/2005	1
2/1/2006	1
3/12/2008	1
5/12/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/15/2009	1
9/23/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 612
B = 0
C = 126
D = 0
E = 40
F = 0
a = 46116
b = 176904
c = 1512
Group Variance = 2528
Z-Score = 2.08834

Comparison Level at 95% confidence level = 1.65463 (upward trend)
2.08834 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: EPW-02

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
0.2	0.3	-0.1	0	1
0.4	0.3	0.1	1	1
ND<0	0.3	-0.3	1	2
0.3	0.3	0	1	2
0.2	0.3	-0.1	1	3
ND<0	0.3	-0.3	1	4
ND<0	0.3	-0.3	1	5
ND<0	0.3	-0.3	1	6
0.1	0.3	-0.2	1	7
ND<0	0.3	-0.3	1	8
ND<0	0.3	-0.3	1	9
ND<0	0.3	-0.3	1	10
0.1	0.3	-0.2	1	11
ND<0	0.3	-0.3	1	12
ND<0	0.3	-0.3	1	13
ND<0	0.3	-0.3	1	14
ND<0	0.3	-0.3	1	15
ND<0	0.3	-0.3	1	16
ND<0	0.3	-0.3	1	17
ND<0	0.3	-0.3	1	18
ND<0	0.3	-0.3	1	19
ND<0	0.3	-0.3	1	20
ND<0	0.3	-0.3	1	21
ND<0	0.3	-0.3	1	22
ND<0	0.3	-0.3	1	23
0.4	0.2	0.2	2	23
ND<0	0.2	-0.2	2	24
0.3	0.2	0.1	3	24
0.2	0.2	0	3	24
ND<0	0.2	-0.2	3	25
ND<0	0.2	-0.2	3	26
ND<0	0.2	-0.2	3	27
0.1	0.2	-0.1	3	28
ND<0	0.2	-0.2	3	29
ND<0	0.2	-0.2	3	30
ND<0	0.2	-0.2	3	31
0.1	0.2	-0.1	3	32
ND<0	0.2	-0.2	3	33
ND<0	0.2	-0.2	3	34
ND<0	0.2	-0.2	3	35
ND<0	0.2	-0.2	3	36
ND<0	0.2	-0.2	3	37
ND<0	0.2	-0.2	3	38
ND<0	0.2	-0.2	3	39
ND<0	0.2	-0.2	3	40
ND<0	0.2	-0.2	3	41
ND<0	0.2	-0.2	3	42
ND<0	0.2	-0.2	3	43
ND<0	0.2	-0.2	3	44
ND<0	0.4	-0.4	3	45
0.3	0.4	-0.1	3	46
0.2	0.4	-0.2	3	47
ND<0	0.4	-0.4	3	48

ND<0	0.4	-0.4	3	49
ND<0	0.4	-0.4	3	50
0.1	0.4	-0.3	3	51
ND<0	0.4	-0.4	3	52
ND<0	0.4	-0.4	3	53
ND<0	0.4	-0.4	3	54
0.1	0.4	-0.3	3	55
ND<0	0.4	-0.4	3	56
ND<0	0.4	-0.4	3	57
ND<0	0.4	-0.4	3	58
ND<0	0.4	-0.4	3	59
ND<0	0.4	-0.4	3	60
ND<0	0.4	-0.4	3	61
ND<0	0.4	-0.4	3	62
ND<0	0.4	-0.4	3	63
ND<0	0.4	-0.4	3	64
ND<0	0.4	-0.4	3	65
ND<0	0.4	-0.4	3	66
ND<0	0.4	-0.4	3	67
0.3	ND<0	0.3	4	67
0.2	ND<0	0.2	5	67
ND<0	ND<0	0	5	67
ND<0	ND<0	0	5	67
ND<0	ND<0	0	5	67
0.1	ND<0	0.1	6	67
ND<0	ND<0	0	6	67
ND<0	ND<0	0	6	67
ND<0	ND<0	0	6	67
0.1	ND<0	0.1	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
ND<0	ND<0	0	7	67
0.2	0.3	-0.1	7	68
ND<0	0.3	-0.3	7	69
ND<0	0.3	-0.3	7	70
ND<0	0.3	-0.3	7	71
0.1	0.3	-0.2	7	72
ND<0	0.3	-0.3	7	73
ND<0	0.3	-0.3	7	74
ND<0	0.3	-0.3	7	75
0.1	0.3	-0.2	7	76
ND<0	0.3	-0.3	7	77
ND<0	0.3	-0.3	7	78
ND<0	0.3	-0.3	7	79
ND<0	0.3	-0.3	7	80
ND<0	0.3	-0.3	7	81
ND<0	0.3	-0.3	7	82
ND<0	0.3	-0.3	7	83
ND<0	0.3	-0.3	7	84
ND<0	0.3	-0.3	7	85
ND<0	0.3	-0.3	7	86
ND<0	0.3	-0.3	7	87
ND<0	0.3	-0.3	7	88
ND<0	0.2	-0.2	7	89
ND<0	0.2	-0.2	7	90

ND<0	0.2	-0.2	7	91
0.1	0.2	-0.1	7	92
ND<0	0.2	-0.2	7	93
ND<0	0.2	-0.2	7	94
ND<0	0.2	-0.2	7	95
0.1	0.2	-0.1	7	96
ND<0	0.2	-0.2	7	97
ND<0	0.2	-0.2	7	98
ND<0	0.2	-0.2	7	99
ND<0	0.2	-0.2	7	100
ND<0	0.2	-0.2	7	101
ND<0	0.2	-0.2	7	102
ND<0	0.2	-0.2	7	103
ND<0	0.2	-0.2	7	104
ND<0	0.2	-0.2	7	105
ND<0	0.2	-0.2	7	106
ND<0	0.2	-0.2	7	107
ND<0	0.2	-0.2	7	108
ND<0	ND<0	0	7	108
ND<0	ND<0	0	7	108
0.1	ND<0	0.1	8	108
ND<0	ND<0	0	8	108
ND<0	ND<0	0	8	108
ND<0	ND<0	0	8	108
0.1	ND<0	0.1	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
ND<0	ND<0	0	9	108
0.1	ND<0	0.1	10	108
ND<0	ND<0	0	10	108
ND<0	ND<0	0	10	108
ND<0	ND<0	0	10	108
0.1	ND<0	0.1	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
ND<0	ND<0	0	11	108
0.1	ND<0	0.1	12	108
ND<0	ND<0	0	12	108
ND<0	ND<0	0	12	108
ND<0	ND<0	0	12	108
0.1	ND<0	0.1	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108

ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	ND<0	0	13	108
ND<0	0.1	-0.1	13	109
ND<0	0.1	-0.1	13	110
ND<0	0.1	-0.1	13	111
0.1	0.1	0	13	111
ND<0	0.1	-0.1	13	112
ND<0	0.1	-0.1	13	113
ND<0	0.1	-0.1	13	114
ND<0	0.1	-0.1	13	115
ND<0	0.1	-0.1	13	116
ND<0	0.1	-0.1	13	117
ND<0	0.1	-0.1	13	118
ND<0	0.1	-0.1	13	119
ND<0	0.1	-0.1	13	120
ND<0	0.1	-0.1	13	121
ND<0	0.1	-0.1	13	122
ND<0	0.1	-0.1	13	123
ND<0	ND<0	0	13	123
ND<0	ND<0	0	13	123
0.1	ND<0	0.1	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
ND<0	ND<0	0	14	123
0.1	ND<0	0.1	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
ND<0	ND<0	0	15	123
0.1	ND<0	0.1	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123

ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	ND<0	0	16	123
ND<0	0.1	-0.1	16	124
ND<0	0.1	-0.1	16	125
ND<0	0.1	-0.1	16	126
ND<0	0.1	-0.1	16	127
ND<0	0.1	-0.1	16	128
ND<0	0.1	-0.1	16	129
ND<0	0.1	-0.1	16	130
ND<0	0.1	-0.1	16	131
ND<0	0.1	-0.1	16	132
ND<0	0.1	-0.1	16	133
ND<0	0.1	-0.1	16	134
ND<0	0.1	-0.1	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135

ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135
ND<0	ND<0	0	16	135

S Statistic = 16 - 135 = -119

Tied Group	Value	Members
1	0.3	2
2	0.2	2
3	0	19
4	0.1	2

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/29/2009	1
5/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 14760

B = 0
C = 5814
D = 0
E = 348
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 1238.33
Z-Score = -3.35323
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-3.35323 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: EPW-02

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
3	3	0	0	0
3	3	0	0	0
2	3	-1	0	1
2	3	-1	0	2
57	3	54	1	2
47	3	44	2	2
9	3	6	3	2
44	3	41	4	2
43	3	40	5	2
23	3	20	6	2
16	3	13	7	2
ND<0	3	-3	7	3
28	3	25	8	3
16	3	13	9	3
ND<0	3	-3	9	4
9.3	3	6.3	10	4
ND<0	3	-3	10	5
57	3	54	11	5
15	3	12	12	5
30	3	27	13	5
ND<0	3	-3	13	6
24	3	21	14	6
10	3	7	15	6
5.1	3	2.1	16	6
ND<0	3	-3	16	7
ND<0	3	-3	16	8
3	3	0	16	8
2	3	-1	16	9
2	3	-1	16	10
57	3	54	17	10
47	3	44	18	10
9	3	6	19	10
44	3	41	20	10
43	3	40	21	10
23	3	20	22	10
16	3	13	23	10
ND<0	3	-3	23	11
28	3	25	24	11
16	3	13	25	11
ND<0	3	-3	25	12
9.3	3	6.3	26	12
ND<0	3	-3	26	13
57	3	54	27	13
15	3	12	28	13
30	3	27	29	13
ND<0	3	-3	29	14
24	3	21	30	14
10	3	7	31	14
5.1	3	2.1	32	14
ND<0	3	-3	32	15
ND<0	3	-3	32	16
2	3	-1	32	17
2	3	-1	32	18

57	3	54	33	18
47	3	44	34	18
9	3	6	35	18
44	3	41	36	18
43	3	40	37	18
23	3	20	38	18
16	3	13	39	18
ND<0	3	-3	39	19
28	3	25	40	19
16	3	13	41	19
ND<0	3	-3	41	20
9.3	3	6.3	42	20
ND<0	3	-3	42	21
57	3	54	43	21
15	3	12	44	21
30	3	27	45	21
ND<0	3	-3	45	22
24	3	21	46	22
10	3	7	47	22
5.1	3	2.1	48	22
ND<0	3	-3	48	23
ND<0	3	-3	48	24
2	2	0	48	24
57	2	55	49	24
47	2	45	50	24
9	2	7	51	24
44	2	42	52	24
43	2	41	53	24
23	2	21	54	24
16	2	14	55	24
ND<0	2	-2	55	25
28	2	26	56	25
16	2	14	57	25
ND<0	2	-2	57	26
9.3	2	7.3	58	26
ND<0	2	-2	58	27
57	2	55	59	27
15	2	13	60	27
30	2	28	61	27
ND<0	2	-2	61	28
24	2	22	62	28
10	2	8	63	28
5.1	2	3.1	64	28
ND<0	2	-2	64	29
ND<0	2	-2	64	30
57	2	55	65	30
47	2	45	66	30
9	2	7	67	30
44	2	42	68	30
43	2	41	69	30
23	2	21	70	30
16	2	14	71	30
ND<0	2	-2	71	31
28	2	26	72	31
16	2	14	73	31
ND<0	2	-2	73	32
9.3	2	7.3	74	32
ND<0	2	-2	74	33
57	2	55	75	33
15	2	13	76	33
30	2	28	77	33
ND<0	2	-2	77	34
24	2	22	78	34
10	2	8	79	34
5.1	2	3.1	80	34

ND<0	2	-2	80	35
ND<0	2	-2	80	36
47	57	-10	80	37
9	57	-48	80	38
44	57	-13	80	39
43	57	-14	80	40
23	57	-34	80	41
16	57	-41	80	42
ND<0	57	-57	80	43
28	57	-29	80	44
16	57	-41	80	45
ND<0	57	-57	80	46
9.3	57	-47.7	80	47
ND<0	57	-57	80	48
57	57	0	80	48
15	57	-42	80	49
30	57	-27	80	50
ND<0	57	-57	80	51
24	57	-33	80	52
10	57	-47	80	53
5.1	57	-51.9	80	54
ND<0	57	-57	80	55
ND<0	57	-57	80	56
9	47	-38	80	57
44	47	-3	80	58
43	47	-4	80	59
23	47	-24	80	60
16	47	-31	80	61
ND<0	47	-47	80	62
28	47	-19	80	63
16	47	-31	80	64
ND<0	47	-47	80	65
9.3	47	-37.7	80	66
ND<0	47	-47	80	67
57	47	10	81	67
15	47	-32	81	68
30	47	-17	81	69
ND<0	47	-47	81	70
24	47	-23	81	71
10	47	-37	81	72
5.1	47	-41.9	81	73
ND<0	47	-47	81	74
ND<0	47	-47	81	75
44	9	35	82	75
43	9	34	83	75
23	9	14	84	75
16	9	7	85	75
ND<0	9	-9	85	76
28	9	19	86	76
16	9	7	87	76
ND<0	9	-9	87	77
9.3	9	0.3	88	77
ND<0	9	-9	88	78
57	9	48	89	78
15	9	6	90	78
30	9	21	91	78
ND<0	9	-9	91	79
24	9	15	92	79
10	9	1	93	79
5.1	9	-3.9	93	80
ND<0	9	-9	93	81
ND<0	9	-9	93	82
43	44	-1	93	83

23	44	-21	93	84
16	44	-28	93	85
ND<0	44	-44	93	86
28	44	-16	93	87
16	44	-28	93	88
ND<0	44	-44	93	89
9.3	44	-34.7	93	90
ND<0	44	-44	93	91
57	44	13	94	91
15	44	-29	94	92
30	44	-14	94	93
ND<0	44	-44	94	94
24	44	-20	94	95
10	44	-34	94	96
5.1	44	-38.9	94	97
ND<0	44	-44	94	98
ND<0	44	-44	94	99
23	43	-20	94	100
16	43	-27	94	101
ND<0	43	-43	94	102
28	43	-15	94	103
16	43	-27	94	104
ND<0	43	-43	94	105
9.3	43	-33.7	94	106
ND<0	43	-43	94	107
57	43	14	95	107
15	43	-28	95	108
30	43	-13	95	109
ND<0	43	-43	95	110
24	43	-19	95	111
10	43	-33	95	112
5.1	43	-37.9	95	113
ND<0	43	-43	95	114
ND<0	43	-43	95	115
16	23	-7	95	116
ND<0	23	-23	95	117
28	23	5	96	117
16	23	-7	96	118
ND<0	23	-23	96	119
9.3	23	-13.7	96	120
ND<0	23	-23	96	121
57	23	34	97	121
15	23	-8	97	122
30	23	7	98	122
ND<0	23	-23	98	123
24	23	1	99	123
10	23	-13	99	124
5.1	23	-17.9	99	125
ND<0	23	-23	99	126
ND<0	23	-23	99	127
ND<0	16	-16	99	128
28	16	12	100	128
16	16	0	100	128
ND<0	16	-16	100	129
9.3	16	-6.7	100	130
ND<0	16	-16	100	131
57	16	41	101	131
15	16	-1	101	132
30	16	14	102	132
ND<0	16	-16	102	133
24	16	8	103	133
10	16	-6	103	134
5.1	16	-10.9	103	135
ND<0	16	-16	103	136

ND<0	16	-16	103	137
28	ND<0	28	104	137
16	ND<0	16	105	137
ND<0	ND<0	0	105	137
9.3	ND<0	9.3	106	137
ND<0	ND<0	0	106	137
57	ND<0	57	107	137
15	ND<0	15	108	137
30	ND<0	30	109	137
ND<0	ND<0	0	109	137
24	ND<0	24	110	137
10	ND<0	10	111	137
5.1	ND<0	5.1	112	137
ND<0	ND<0	0	112	137
ND<0	ND<0	0	112	137
16	28	-12	112	138
ND<0	28	-28	112	139
9.3	28	-18.7	112	140
ND<0	28	-28	112	141
57	28	29	113	141
15	28	-13	113	142
30	28	2	114	142
ND<0	28	-28	114	143
24	28	-4	114	144
10	28	-18	114	145
5.1	28	-22.9	114	146
ND<0	28	-28	114	147
ND<0	28	-28	114	148
ND<0	16	-16	114	149
9.3	16	-6.7	114	150
ND<0	16	-16	114	151
57	16	41	115	151
15	16	-1	115	152
30	16	14	116	152
ND<0	16	-16	116	153
24	16	8	117	153
10	16	-6	117	154
5.1	16	-10.9	117	155
ND<0	16	-16	117	156
ND<0	16	-16	117	157
9.3	ND<0	9.3	118	157
ND<0	ND<0	0	118	157
57	ND<0	57	119	157
15	ND<0	15	120	157
30	ND<0	30	121	157
ND<0	ND<0	0	121	157
24	ND<0	24	122	157
10	ND<0	10	123	157
5.1	ND<0	5.1	124	157
ND<0	ND<0	0	124	157
ND<0	ND<0	0	124	157
ND<0	9.3	-9.3	124	158
57	9.3	47.7	125	158
15	9.3	5.7	126	158
30	9.3	20.7	127	158
ND<0	9.3	-9.3	127	159
24	9.3	14.7	128	159
10	9.3	0.7	129	159
5.1	9.3	-4.2	129	160
ND<0	9.3	-9.3	129	161
ND<0	9.3	-9.3	129	162

57	ND<0	57	130	162
15	ND<0	15	131	162
30	ND<0	30	132	162
ND<0	ND<0	0	132	162
24	ND<0	24	133	162
10	ND<0	10	134	162
5.1	ND<0	5.1	135	162
ND<0	ND<0	0	135	162
ND<0	ND<0	0	135	162
15	57	-42	135	163
30	57	-27	135	164
ND<0	57	-57	135	165
24	57	-33	135	166
10	57	-47	135	167
5.1	57	-51.9	135	168
ND<0	57	-57	135	169
ND<0	57	-57	135	170
30	15	15	136	170
ND<0	15	-15	136	171
24	15	9	137	171
10	15	-5	137	172
5.1	15	-9.9	137	173
ND<0	15	-15	137	174
ND<0	15	-15	137	175
ND<0	30	-30	137	176
24	30	-6	137	177
10	30	-20	137	178
5.1	30	-24.9	137	179
ND<0	30	-30	137	180
ND<0	30	-30	137	181
24	ND<0	24	138	181
10	ND<0	10	139	181
5.1	ND<0	5.1	140	181
ND<0	ND<0	0	140	181
ND<0	ND<0	0	140	181
10	24	-14	140	182
5.1	24	-18.9	140	183
ND<0	24	-24	140	184
ND<0	24	-24	140	185
5.1	10	-4.9	140	186
ND<0	10	-10	140	187
ND<0	10	-10	140	188
ND<0	5.1	-5.1	140	189
ND<0	5.1	-5.1	140	190
ND<0	ND<0	0	140	190

S Statistic = 140 - 190 = -50

Tied Group	Value	Members
1	3	3
2	2	2
3	57	2
4	16	2
5	0	6

Time Period	Observations
2/1/2006	1

3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/29/2009	1
5/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 630
B = 0
C = 126
D = 0
E = 42
F = 0
a = 41418
b = 157950
c = 1404
Group Variance = 2266
Z-Score = -1.02936
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.02936 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: EPW-02

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
3	3	0	0	0
3	3	0	0	0
2	3	-1	0	1
2	3	-1	0	2
57	3	54	1	2
47	3	44	2	2
9	3	6	3	2
44	3	41	4	2
43	3	40	5	2
23	3	20	6	2
16	3	13	7	2
ND<0	3	-3	7	3
28	3	25	8	3
16	3	13	9	3
ND<0	3	-3	9	4
9.3	3	6.3	10	4
ND<0	3	-3	10	5
57	3	54	11	5
15	3	12	12	5
30	3	27	13	5
ND<0	3	-3	13	6
24	3	21	14	6
10	3	7	15	6
5.1	3	2.1	16	6
ND<0	3	-3	16	7
ND<0	3	-3	16	8
3	3	0	16	8
2	3	-1	16	9
2	3	-1	16	10
57	3	54	17	10
47	3	44	18	10
9	3	6	19	10
44	3	41	20	10
43	3	40	21	10
23	3	20	22	10
16	3	13	23	10
ND<0	3	-3	23	11
28	3	25	24	11
16	3	13	25	11
ND<0	3	-3	25	12
9.3	3	6.3	26	12
ND<0	3	-3	26	13
57	3	54	27	13
15	3	12	28	13
30	3	27	29	13
ND<0	3	-3	29	14
24	3	21	30	14
10	3	7	31	14
5.1	3	2.1	32	14
ND<0	3	-3	32	15
ND<0	3	-3	32	16
2	3	-1	32	17
2	3	-1	32	18

57	3	54	33	18
47	3	44	34	18
9	3	6	35	18
44	3	41	36	18
43	3	40	37	18
23	3	20	38	18
16	3	13	39	18
ND<0	3	-3	39	19
28	3	25	40	19
16	3	13	41	19
ND<0	3	-3	41	20
9.3	3	6.3	42	20
ND<0	3	-3	42	21
57	3	54	43	21
15	3	12	44	21
30	3	27	45	21
ND<0	3	-3	45	22
24	3	21	46	22
10	3	7	47	22
5.1	3	2.1	48	22
ND<0	3	-3	48	23
ND<0	3	-3	48	24
2	2	0	48	24
57	2	55	49	24
47	2	45	50	24
9	2	7	51	24
44	2	42	52	24
43	2	41	53	24
23	2	21	54	24
16	2	14	55	24
ND<0	2	-2	55	25
28	2	26	56	25
16	2	14	57	25
ND<0	2	-2	57	26
9.3	2	7.3	58	26
ND<0	2	-2	58	27
57	2	55	59	27
15	2	13	60	27
30	2	28	61	27
ND<0	2	-2	61	28
24	2	22	62	28
10	2	8	63	28
5.1	2	3.1	64	28
ND<0	2	-2	64	29
ND<0	2	-2	64	30
57	2	55	65	30
47	2	45	66	30
9	2	7	67	30
44	2	42	68	30
43	2	41	69	30
23	2	21	70	30
16	2	14	71	30
ND<0	2	-2	71	31
28	2	26	72	31
16	2	14	73	31
ND<0	2	-2	73	32
9.3	2	7.3	74	32
ND<0	2	-2	74	33
57	2	55	75	33
15	2	13	76	33
30	2	28	77	33
ND<0	2	-2	77	34
24	2	22	78	34
10	2	8	79	34
5.1	2	3.1	80	34

ND<0	2	-2	80	35
ND<0	2	-2	80	36
47	57	-10	80	37
9	57	-48	80	38
44	57	-13	80	39
43	57	-14	80	40
23	57	-34	80	41
16	57	-41	80	42
ND<0	57	-57	80	43
28	57	-29	80	44
16	57	-41	80	45
ND<0	57	-57	80	46
9.3	57	-47.7	80	47
ND<0	57	-57	80	48
57	57	0	80	48
15	57	-42	80	49
30	57	-27	80	50
ND<0	57	-57	80	51
24	57	-33	80	52
10	57	-47	80	53
5.1	57	-51.9	80	54
ND<0	57	-57	80	55
ND<0	57	-57	80	56
9	47	-38	80	57
44	47	-3	80	58
43	47	-4	80	59
23	47	-24	80	60
16	47	-31	80	61
ND<0	47	-47	80	62
28	47	-19	80	63
16	47	-31	80	64
ND<0	47	-47	80	65
9.3	47	-37.7	80	66
ND<0	47	-47	80	67
57	47	10	81	67
15	47	-32	81	68
30	47	-17	81	69
ND<0	47	-47	81	70
24	47	-23	81	71
10	47	-37	81	72
5.1	47	-41.9	81	73
ND<0	47	-47	81	74
ND<0	47	-47	81	75
44	9	35	82	75
43	9	34	83	75
23	9	14	84	75
16	9	7	85	75
ND<0	9	-9	85	76
28	9	19	86	76
16	9	7	87	76
ND<0	9	-9	87	77
9.3	9	0.3	88	77
ND<0	9	-9	88	78
57	9	48	89	78
15	9	6	90	78
30	9	21	91	78
ND<0	9	-9	91	79
24	9	15	92	79
10	9	1	93	79
5.1	9	-3.9	93	80
ND<0	9	-9	93	81
ND<0	9	-9	93	82
43	44	-1	93	83

23	44	-21	93	84
16	44	-28	93	85
ND<0	44	-44	93	86
28	44	-16	93	87
16	44	-28	93	88
ND<0	44	-44	93	89
9.3	44	-34.7	93	90
ND<0	44	-44	93	91
57	44	13	94	91
15	44	-29	94	92
30	44	-14	94	93
ND<0	44	-44	94	94
24	44	-20	94	95
10	44	-34	94	96
5.1	44	-38.9	94	97
ND<0	44	-44	94	98
ND<0	44	-44	94	99
23	43	-20	94	100
16	43	-27	94	101
ND<0	43	-43	94	102
28	43	-15	94	103
16	43	-27	94	104
ND<0	43	-43	94	105
9.3	43	-33.7	94	106
ND<0	43	-43	94	107
57	43	14	95	107
15	43	-28	95	108
30	43	-13	95	109
ND<0	43	-43	95	110
24	43	-19	95	111
10	43	-33	95	112
5.1	43	-37.9	95	113
ND<0	43	-43	95	114
ND<0	43	-43	95	115
16	23	-7	95	116
ND<0	23	-23	95	117
28	23	5	96	117
16	23	-7	96	118
ND<0	23	-23	96	119
9.3	23	-13.7	96	120
ND<0	23	-23	96	121
57	23	34	97	121
15	23	-8	97	122
30	23	7	98	122
ND<0	23	-23	98	123
24	23	1	99	123
10	23	-13	99	124
5.1	23	-17.9	99	125
ND<0	23	-23	99	126
ND<0	23	-23	99	127
ND<0	16	-16	99	128
28	16	12	100	128
16	16	0	100	128
ND<0	16	-16	100	129
9.3	16	-6.7	100	130
ND<0	16	-16	100	131
57	16	41	101	131
15	16	-1	101	132
30	16	14	102	132
ND<0	16	-16	102	133
24	16	8	103	133
10	16	-6	103	134
5.1	16	-10.9	103	135
ND<0	16	-16	103	136

ND<0	16	-16	103	137
28	ND<0	28	104	137
16	ND<0	16	105	137
ND<0	ND<0	0	105	137
9.3	ND<0	9.3	106	137
ND<0	ND<0	0	106	137
57	ND<0	57	107	137
15	ND<0	15	108	137
30	ND<0	30	109	137
ND<0	ND<0	0	109	137
24	ND<0	24	110	137
10	ND<0	10	111	137
5.1	ND<0	5.1	112	137
ND<0	ND<0	0	112	137
ND<0	ND<0	0	112	137
16	28	-12	112	138
ND<0	28	-28	112	139
9.3	28	-18.7	112	140
ND<0	28	-28	112	141
57	28	29	113	141
15	28	-13	113	142
30	28	2	114	142
ND<0	28	-28	114	143
24	28	-4	114	144
10	28	-18	114	145
5.1	28	-22.9	114	146
ND<0	28	-28	114	147
ND<0	28	-28	114	148
ND<0	16	-16	114	149
9.3	16	-6.7	114	150
ND<0	16	-16	114	151
57	16	41	115	151
15	16	-1	115	152
30	16	14	116	152
ND<0	16	-16	116	153
24	16	8	117	153
10	16	-6	117	154
5.1	16	-10.9	117	155
ND<0	16	-16	117	156
ND<0	16	-16	117	157
9.3	ND<0	9.3	118	157
ND<0	ND<0	0	118	157
57	ND<0	57	119	157
15	ND<0	15	120	157
30	ND<0	30	121	157
ND<0	ND<0	0	121	157
24	ND<0	24	122	157
10	ND<0	10	123	157
5.1	ND<0	5.1	124	157
ND<0	ND<0	0	124	157
ND<0	ND<0	0	124	157
ND<0	9.3	-9.3	124	158
57	9.3	47.7	125	158
15	9.3	5.7	126	158
30	9.3	20.7	127	158
ND<0	9.3	-9.3	127	159
24	9.3	14.7	128	159
10	9.3	0.7	129	159
5.1	9.3	-4.2	129	160
ND<0	9.3	-9.3	129	161
ND<0	9.3	-9.3	129	162

57	ND<0	57	130	162
15	ND<0	15	131	162
30	ND<0	30	132	162
ND<0	ND<0	0	132	162
24	ND<0	24	133	162
10	ND<0	10	134	162
5.1	ND<0	5.1	135	162
ND<0	ND<0	0	135	162
ND<0	ND<0	0	135	162
15	57	-42	135	163
30	57	-27	135	164
ND<0	57	-57	135	165
24	57	-33	135	166
10	57	-47	135	167
5.1	57	-51.9	135	168
ND<0	57	-57	135	169
ND<0	57	-57	135	170
30	15	15	136	170
ND<0	15	-15	136	171
24	15	9	137	171
10	15	-5	137	172
5.1	15	-9.9	137	173
ND<0	15	-15	137	174
ND<0	15	-15	137	175
ND<0	30	-30	137	176
24	30	-6	137	177
10	30	-20	137	178
5.1	30	-24.9	137	179
ND<0	30	-30	137	180
ND<0	30	-30	137	181
24	ND<0	24	138	181
10	ND<0	10	139	181
5.1	ND<0	5.1	140	181
ND<0	ND<0	0	140	181
ND<0	ND<0	0	140	181
10	24	-14	140	182
5.1	24	-18.9	140	183
ND<0	24	-24	140	184
ND<0	24	-24	140	185
5.1	10	-4.9	140	186
ND<0	10	-10	140	187
ND<0	10	-10	140	188
ND<0	5.1	-5.1	140	189
ND<0	5.1	-5.1	140	190
ND<0	ND<0	0	140	190

S Statistic = 140 - 190 = -50

Tied Group	Value	Members
1	3	3
2	2	2
3	57	2
4	16	2
5	0	6

Time Period	Observations
2/1/2006	1

3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/29/2009	1
5/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 630
B = 0
C = 126
D = 0
E = 42
F = 0
a = 41418
b = 157950
c = 1404
Group Variance = 2266
Z-Score = -1.02936
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.02936 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: EPW-03D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

S Statistic = 0 - 0 = 0

Tied Group	Value	Members
1	0	23

Time Period	Observations
9/24/2008	1
10/29/2008	1
4/28/2009	1
5/15/2009	1
9/30/2009	1
12/9/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
3/8/2011	1
5/24/2011	1
8/31/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 25806
B = 0
C = 10626
D = 0
E = 506
F = 0
a = 25806
b = 95634
c = 1012
Group Variance = 0
Z-Score = 0
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: EPW-03D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0

S Statistic = 0 - 0 = 0

Tied Group	Value	Members
1	0	23

Time Period	Observations
9/24/2008	1
10/29/2008	1
4/28/2009	1
5/15/2009	1
9/30/2009	1
12/9/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
3/8/2011	1
5/24/2011	1
8/31/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 25806
B = 0
C = 10626
D = 0
E = 506
F = 0
a = 25806
b = 95634
c = 1012
Group Variance = 0
Z-Score = 0
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: EPW-03D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
91	34	57	1	0
39	34	5	2	0
35	34	1	3	0
36	34	2	4	0
35	34	1	5	0
33	34	-1	5	1
32	34	-2	5	2
31	34	-3	5	3
37	34	3	6	3
34	34	0	6	3
39	34	5	7	3
30	34	-4	7	4
30	34	-4	7	5
28	34	-6	7	6
28	34	-6	7	7
26	34	-8	7	8
25	34	-9	7	9
26	34	-8	7	10
27	34	-7	7	11
20	34	-14	7	12
35	34	1	8	12
25	34	-9	8	13
39	91	-52	8	14
35	91	-56	8	15
36	91	-55	8	16
35	91	-56	8	17
33	91	-58	8	18
32	91	-59	8	19
31	91	-60	8	20
37	91	-54	8	21
34	91	-57	8	22
39	91	-52	8	23
30	91	-61	8	24
30	91	-61	8	25
28	91	-63	8	26
28	91	-63	8	27
26	91	-65	8	28
25	91	-66	8	29
26	91	-65	8	30
27	91	-64	8	31
20	91	-71	8	32
35	91	-56	8	33
25	91	-66	8	34
35	39	-4	8	35
36	39	-3	8	36
35	39	-4	8	37
33	39	-6	8	38
32	39	-7	8	39
31	39	-8	8	40
37	39	-2	8	41
34	39	-5	8	42
39	39	0	8	42
30	39	-9	8	43

30	39	-9	8	44
28	39	-11	8	45
28	39	-11	8	46
26	39	-13	8	47
25	39	-14	8	48
26	39	-13	8	49
27	39	-12	8	50
20	39	-19	8	51
35	39	-4	8	52
25	39	-14	8	53
36	35	1	9	53
35	35	0	9	53
33	35	-2	9	54
32	35	-3	9	55
31	35	-4	9	56
37	35	2	10	56
34	35	-1	10	57
39	35	4	11	57
30	35	-5	11	58
30	35	-5	11	59
28	35	-7	11	60
28	35	-7	11	61
26	35	-9	11	62
25	35	-10	11	63
26	35	-9	11	64
27	35	-8	11	65
20	35	-15	11	66
35	35	0	11	66
25	35	-10	11	67
35	36	-1	11	68
33	36	-3	11	69
32	36	-4	11	70
31	36	-5	11	71
37	36	1	12	71
34	36	-2	12	72
39	36	3	13	72
30	36	-6	13	73
30	36	-6	13	74
28	36	-8	13	75
28	36	-8	13	76
26	36	-10	13	77
25	36	-11	13	78
26	36	-10	13	79
27	36	-9	13	80
20	36	-16	13	81
35	36	-1	13	82
25	36	-11	13	83
33	35	-2	13	84
32	35	-3	13	85
31	35	-4	13	86
37	35	2	14	86
34	35	-1	14	87
39	35	4	15	87
30	35	-5	15	88
30	35	-5	15	89
28	35	-7	15	90
28	35	-7	15	91
26	35	-9	15	92
25	35	-10	15	93
26	35	-9	15	94
27	35	-8	15	95
20	35	-15	15	96
35	35	0	15	96
25	35	-10	15	97

32	33	-1	15	98
31	33	-2	15	99
37	33	4	16	99
34	33	1	17	99
39	33	6	18	99
30	33	-3	18	100
30	33	-3	18	101
28	33	-5	18	102
28	33	-5	18	103
26	33	-7	18	104
25	33	-8	18	105
26	33	-7	18	106
27	33	-6	18	107
20	33	-13	18	108
35	33	2	19	108
25	33	-8	19	109
31	32	-1	19	110
37	32	5	20	110
34	32	2	21	110
39	32	7	22	110
30	32	-2	22	111
30	32	-2	22	112
28	32	-4	22	113
28	32	-4	22	114
26	32	-6	22	115
25	32	-7	22	116
26	32	-6	22	117
27	32	-5	22	118
20	32	-12	22	119
35	32	3	23	119
25	32	-7	23	120
37	31	6	24	120
34	31	3	25	120
39	31	8	26	120
30	31	-1	26	121
30	31	-1	26	122
28	31	-3	26	123
28	31	-3	26	124
26	31	-5	26	125
25	31	-6	26	126
26	31	-5	26	127
27	31	-4	26	128
20	31	-11	26	129
35	31	4	27	129
25	31	-6	27	130
34	37	-3	27	131
39	37	2	28	131
30	37	-7	28	132
30	37	-7	28	133
28	37	-9	28	134
28	37	-9	28	135
26	37	-11	28	136
25	37	-12	28	137
26	37	-11	28	138
27	37	-10	28	139
20	37	-17	28	140
35	37	-2	28	141
25	37	-12	28	142
39	34	5	29	142
30	34	-4	29	143
30	34	-4	29	144
28	34	-6	29	145

28	34	-6	29	146
26	34	-8	29	147
25	34	-9	29	148
26	34	-8	29	149
27	34	-7	29	150
20	34	-14	29	151
35	34	1	30	151
25	34	-9	30	152
30	39	-9	30	153
30	39	-9	30	154
28	39	-11	30	155
28	39	-11	30	156
26	39	-13	30	157
25	39	-14	30	158
26	39	-13	30	159
27	39	-12	30	160
20	39	-19	30	161
35	39	-4	30	162
25	39	-14	30	163
30	30	0	30	163
28	30	-2	30	164
28	30	-2	30	165
26	30	-4	30	166
25	30	-5	30	167
26	30	-4	30	168
27	30	-3	30	169
20	30	-10	30	170
35	30	5	31	170
25	30	-5	31	171
28	30	-2	31	172
28	30	-2	31	173
26	30	-4	31	174
25	30	-5	31	175
26	30	-4	31	176
27	30	-3	31	177
20	30	-10	31	178
35	30	5	32	178
25	30	-5	32	179
28	28	0	32	179
26	28	-2	32	180
25	28	-3	32	181
26	28	-2	32	182
27	28	-1	32	183
20	28	-8	32	184
35	28	7	33	184
25	28	-3	33	185
26	28	-2	33	186
25	28	-3	33	187
26	28	-2	33	188
27	28	-1	33	189
20	28	-8	33	190
35	28	7	34	190
25	28	-3	34	191
25	26	-1	34	192
26	26	0	34	192
27	26	1	35	192
20	26	-6	35	193
35	26	9	36	193
25	26	-1	36	194
26	25	1	37	194

27	25	2	38	194
20	25	-5	38	195
35	25	10	39	195
25	25	0	39	195
27	26	1	40	195
20	26	-6	40	196
35	26	9	41	196
25	26	-1	41	197
20	27	-7	41	198
35	27	8	42	198
25	27	-2	42	199
35	20	15	43	199
25	20	5	44	199
25	35	-10	44	200

S Statistic = 44 - 200 = -156

Tied Group	Value	Members
1	34	2
2	39	2
3	35	3
4	30	2
5	28	2
6	26	2
7	25	2

Time Period	Observations
9/24/2008	1
10/29/2008	1
4/28/2009	1
5/15/2009	1
9/30/2009	1
12/9/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
3/8/2011	1
5/24/2011	1
8/31/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 174
B = 0
C = 6
D = 0
E = 18
F = 0
a = 25806
b = 95634
c = 1012

Group Variance = 1424
Z-Score = -4.10749
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-4.10749 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-01D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
6.7	5.3	1.4	1	0
7.2	5.3	1.9	2	0
7.8	5.3	2.5	3	0
7.6	5.3	2.3	4	0
7.2	5.3	1.9	5	0
6.5	5.3	1.2	6	0
7.8	5.3	2.5	7	0
8.3	5.3	3	8	0
8.5	5.3	3.2	9	0
7.5	5.3	2.2	10	0
7.4	5.3	2.1	11	0
7.6	5.3	2.3	12	0
9.6	5.3	4.3	13	0
7.6	5.3	2.3	14	0
6.9	5.3	1.6	15	0
5.9	5.3	0.6	16	0
6.1	5.3	0.8	17	0
7.4	5.3	2.1	18	0
6.2	5.3	0.9	19	0
5.7	5.3	0.4	20	0
6	5.3	0.7	21	0
6.1	5.3	0.8	22	0
25	5.3	19.7	23	0
5.49	5.3	0.19	24	0
4.2	5.3	-1.1	24	1
7.2	6.7	0.5	25	1
7.8	6.7	1.1	26	1
7.6	6.7	0.9	27	1
7.2	6.7	0.5	28	1
6.5	6.7	-0.2	28	2
7.8	6.7	1.1	29	2
8.3	6.7	1.6	30	2
8.5	6.7	1.8	31	2
7.5	6.7	0.8	32	2
7.4	6.7	0.7	33	2
7.6	6.7	0.9	34	2
9.6	6.7	2.9	35	2
7.6	6.7	0.9	36	2
6.9	6.7	0.2	37	2
5.9	6.7	-0.8	37	3
6.1	6.7	-0.6	37	4
7.4	6.7	0.7	38	4
6.2	6.7	-0.5	38	5
5.7	6.7	-1	38	6
6	6.7	-0.7	38	7
6.1	6.7	-0.6	38	8
25	6.7	18.3	39	8
5.49	6.7	-1.21	39	9
4.2	6.7	-2.5	39	10
7.8	7.2	0.6	40	10
7.6	7.2	0.4	41	10
7.2	7.2	0	41	10
6.5	7.2	-0.7	41	11

7.8	7.2	0.6	42	11
8.3	7.2	1.1	43	11
8.5	7.2	1.3	44	11
7.5	7.2	0.3	45	11
7.4	7.2	0.2	46	11
7.6	7.2	0.4	47	11
9.6	7.2	2.4	48	11
7.6	7.2	0.4	49	11
6.9	7.2	-0.3	49	12
5.9	7.2	-1.3	49	13
6.1	7.2	-1.1	49	14
7.4	7.2	0.2	50	14
6.2	7.2	-1	50	15
5.7	7.2	-1.5	50	16
6	7.2	-1.2	50	17
6.1	7.2	-1.1	50	18
25	7.2	17.8	51	18
5.49	7.2	-1.71	51	19
4.2	7.2	-3	51	20
7.6	7.8	-0.2	51	21
7.2	7.8	-0.6	51	22
6.5	7.8	-1.3	51	23
7.8	7.8	0	51	23
8.3	7.8	0.5	52	23
8.5	7.8	0.7	53	23
7.5	7.8	-0.3	53	24
7.4	7.8	-0.4	53	25
7.6	7.8	-0.2	53	26
9.6	7.8	1.8	54	26
7.6	7.8	-0.2	54	27
6.9	7.8	-0.9	54	28
5.9	7.8	-1.9	54	29
6.1	7.8	-1.7	54	30
7.4	7.8	-0.4	54	31
6.2	7.8	-1.6	54	32
5.7	7.8	-2.1	54	33
6	7.8	-1.8	54	34
6.1	7.8	-1.7	54	35
25	7.8	17.2	55	35
5.49	7.8	-2.31	55	36
4.2	7.8	-3.6	55	37
7.2	7.6	-0.4	55	38
6.5	7.6	-1.1	55	39
7.8	7.6	0.2	56	39
8.3	7.6	0.7	57	39
8.5	7.6	0.9	58	39
7.5	7.6	-0.1	58	40
7.4	7.6	-0.2	58	41
7.6	7.6	0	58	41
9.6	7.6	2	59	41
7.6	7.6	0	59	41
6.9	7.6	-0.7	59	42
5.9	7.6	-1.7	59	43
6.1	7.6	-1.5	59	44
7.4	7.6	-0.2	59	45
6.2	7.6	-1.4	59	46
5.7	7.6	-1.9	59	47
6	7.6	-1.6	59	48
6.1	7.6	-1.5	59	49
25	7.6	17.4	60	49
5.49	7.6	-2.11	60	50
4.2	7.6	-3.4	60	51
6.5	7.2	-0.7	60	52
7.8	7.2	0.6	61	52

8.3	7.2	1.1	62	52
8.5	7.2	1.3	63	52
7.5	7.2	0.3	64	52
7.4	7.2	0.2	65	52
7.6	7.2	0.4	66	52
9.6	7.2	2.4	67	52
7.6	7.2	0.4	68	52
6.9	7.2	-0.3	68	53
5.9	7.2	-1.3	68	54
6.1	7.2	-1.1	68	55
7.4	7.2	0.2	69	55
6.2	7.2	-1	69	56
5.7	7.2	-1.5	69	57
6	7.2	-1.2	69	58
6.1	7.2	-1.1	69	59
25	7.2	17.8	70	59
5.49	7.2	-1.71	70	60
4.2	7.2	-3	70	61
7.8	6.5	1.3	71	61
8.3	6.5	1.8	72	61
8.5	6.5	2	73	61
7.5	6.5	1	74	61
7.4	6.5	0.9	75	61
7.6	6.5	1.1	76	61
9.6	6.5	3.1	77	61
7.6	6.5	1.1	78	61
6.9	6.5	0.4	79	61
5.9	6.5	-0.6	79	62
6.1	6.5	-0.4	79	63
7.4	6.5	0.9	80	63
6.2	6.5	-0.3	80	64
5.7	6.5	-0.8	80	65
6	6.5	-0.5	80	66
6.1	6.5	-0.4	80	67
25	6.5	18.5	81	67
5.49	6.5	-1.01	81	68
4.2	6.5	-2.3	81	69
8.3	7.8	0.5	82	69
8.5	7.8	0.7	83	69
7.5	7.8	-0.3	83	70
7.4	7.8	-0.4	83	71
7.6	7.8	-0.2	83	72
9.6	7.8	1.8	84	72
7.6	7.8	-0.2	84	73
6.9	7.8	-0.9	84	74
5.9	7.8	-1.9	84	75
6.1	7.8	-1.7	84	76
7.4	7.8	-0.4	84	77
6.2	7.8	-1.6	84	78
5.7	7.8	-2.1	84	79
6	7.8	-1.8	84	80
6.1	7.8	-1.7	84	81
25	7.8	17.2	85	81
5.49	7.8	-2.31	85	82
4.2	7.8	-3.6	85	83
8.5	8.3	0.2	86	83
7.5	8.3	-0.8	86	84
7.4	8.3	-0.9	86	85
7.6	8.3	-0.7	86	86
9.6	8.3	1.3	87	86
7.6	8.3	-0.7	87	87
6.9	8.3	-1.4	87	88
5.9	8.3	-2.4	87	89
6.1	8.3	-2.2	87	90

7.4	8.3	-0.9	87	91
6.2	8.3	-2.1	87	92
5.7	8.3	-2.6	87	93
6	8.3	-2.3	87	94
6.1	8.3	-2.2	87	95
25	8.3	16.7	88	95
5.49	8.3	-2.81	88	96
4.2	8.3	-4.1	88	97
7.5	8.5	-1	88	98
7.4	8.5	-1.1	88	99
7.6	8.5	-0.9	88	100
9.6	8.5	1.1	89	100
7.6	8.5	-0.9	89	101
6.9	8.5	-1.6	89	102
5.9	8.5	-2.6	89	103
6.1	8.5	-2.4	89	104
7.4	8.5	-1.1	89	105
6.2	8.5	-2.3	89	106
5.7	8.5	-2.8	89	107
6	8.5	-2.5	89	108
6.1	8.5	-2.4	89	109
25	8.5	16.5	90	109
5.49	8.5	-3.01	90	110
4.2	8.5	-4.3	90	111
7.4	7.5	-0.1	90	112
7.6	7.5	0.1	91	112
9.6	7.5	2.1	92	112
7.6	7.5	0.1	93	112
6.9	7.5	-0.6	93	113
5.9	7.5	-1.6	93	114
6.1	7.5	-1.4	93	115
7.4	7.5	-0.1	93	116
6.2	7.5	-1.3	93	117
5.7	7.5	-1.8	93	118
6	7.5	-1.5	93	119
6.1	7.5	-1.4	93	120
25	7.5	17.5	94	120
5.49	7.5	-2.01	94	121
4.2	7.5	-3.3	94	122
7.6	7.4	0.2	95	122
9.6	7.4	2.2	96	122
7.6	7.4	0.2	97	122
6.9	7.4	-0.5	97	123
5.9	7.4	-1.5	97	124
6.1	7.4	-1.3	97	125
7.4	7.4	0	97	125
6.2	7.4	-1.2	97	126
5.7	7.4	-1.7	97	127
6	7.4	-1.4	97	128
6.1	7.4	-1.3	97	129
25	7.4	17.6	98	129
5.49	7.4	-1.91	98	130
4.2	7.4	-3.2	98	131
9.6	7.6	2	99	131
7.6	7.6	0	99	131
6.9	7.6	-0.7	99	132
5.9	7.6	-1.7	99	133
6.1	7.6	-1.5	99	134
7.4	7.6	-0.2	99	135
6.2	7.6	-1.4	99	136
5.7	7.6	-1.9	99	137
6	7.6	-1.6	99	138
6.1	7.6	-1.5	99	139

25	7.6	17.4	100	139
5.49	7.6	-2.11	100	140
4.2	7.6	-3.4	100	141
7.6	9.6	-2	100	142
6.9	9.6	-2.7	100	143
5.9	9.6	-3.7	100	144
6.1	9.6	-3.5	100	145
7.4	9.6	-2.2	100	146
6.2	9.6	-3.4	100	147
5.7	9.6	-3.9	100	148
6	9.6	-3.6	100	149
6.1	9.6	-3.5	100	150
25	9.6	15.4	101	150
5.49	9.6	-4.11	101	151
4.2	9.6	-5.4	101	152
6.9	7.6	-0.7	101	153
5.9	7.6	-1.7	101	154
6.1	7.6	-1.5	101	155
7.4	7.6	-0.2	101	156
6.2	7.6	-1.4	101	157
5.7	7.6	-1.9	101	158
6	7.6	-1.6	101	159
6.1	7.6	-1.5	101	160
25	7.6	17.4	102	160
5.49	7.6	-2.11	102	161
4.2	7.6	-3.4	102	162
5.9	6.9	-1	102	163
6.1	6.9	-0.8	102	164
7.4	6.9	0.5	103	164
6.2	6.9	-0.7	103	165
5.7	6.9	-1.2	103	166
6	6.9	-0.9	103	167
6.1	6.9	-0.8	103	168
25	6.9	18.1	104	168
5.49	6.9	-1.41	104	169
4.2	6.9	-2.7	104	170
6.1	5.9	0.2	105	170
7.4	5.9	1.5	106	170
6.2	5.9	0.3	107	170
5.7	5.9	-0.2	107	171
6	5.9	0.1	108	171
6.1	5.9	0.2	109	171
25	5.9	19.1	110	171
5.49	5.9	-0.41	110	172
4.2	5.9	-1.7	110	173
7.4	6.1	1.3	111	173
6.2	6.1	0.1	112	173
5.7	6.1	-0.4	112	174
6	6.1	-0.1	112	175
6.1	6.1	0	112	175
25	6.1	18.9	113	175
5.49	6.1	-0.61	113	176
4.2	6.1	-1.9	113	177
6.2	7.4	-1.2	113	178
5.7	7.4	-1.7	113	179
6	7.4	-1.4	113	180
6.1	7.4	-1.3	113	181
25	7.4	17.6	114	181
5.49	7.4	-1.91	114	182
4.2	7.4	-3.2	114	183

5.7	6.2	-0.5	114	184
6	6.2	-0.2	114	185
6.1	6.2	-0.1	114	186
25	6.2	18.8	115	186
5.49	6.2	-0.71	115	187
4.2	6.2	-2	115	188
6	5.7	0.3	116	188
6.1	5.7	0.4	117	188
25	5.7	19.3	118	188
5.49	5.7	-0.21	118	189
4.2	5.7	-1.5	118	190
6.1	6	0.1	119	190
25	6	19	120	190
5.49	6	-0.51	120	191
4.2	6	-1.8	120	192
25	6.1	18.9	121	192
5.49	6.1	-0.61	121	193
4.2	6.1	-1.9	121	194
5.49	25	-19.51	121	195
4.2	25	-20.8	121	196
4.2	5.49	-1.29	121	197

S Statistic = 121 - 197 = -76

Tied Group	Value	Members
1	7.2	2
2	7.8	2
3	7.6	3
4	7.4	2
5	6.1	2

Time Period	Observations
3/11/2008	1
5/13/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/13/2009	1
9/29/2009	1
12/9/2009	1
2/26/2010	1
4/15/2010	1
8/10/2010	1
11/22/2010	1
3/10/2011	1
5/25/2011	1
9/2/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 138
B = 0
C = 6
D = 0
E = 14
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2050.67
Z-Score = -1.6562
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.6562 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-01D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
290	328	-38	0	1
358	328	30	1	1
699	328	371	2	1
480	328	152	3	1
350	328	22	4	1
300	328	-28	4	2
290	328	-38	4	3
260	328	-68	4	4
270	328	-58	4	5
260	328	-68	4	6
280	328	-48	4	7
280	328	-48	4	8
260	328	-68	4	9
260	328	-68	4	10
280	328	-48	4	11
290	328	-38	4	12
280	328	-48	4	13
250	328	-78	4	14
240	328	-88	4	15
230	328	-98	4	16
210	328	-118	4	17
220	328	-108	4	18
190	328	-138	4	19
190	328	-138	4	20
380	328	52	5	20
358	290	68	6	20
699	290	409	7	20
480	290	190	8	20
350	290	60	9	20
300	290	10	10	20
290	290	0	10	20
260	290	-30	10	21
270	290	-20	10	22
260	290	-30	10	23
280	290	-10	10	24
280	290	-10	10	25
260	290	-30	10	26
260	290	-30	10	27
280	290	-10	10	28
290	290	0	10	28
280	290	-10	10	29
250	290	-40	10	30
240	290	-50	10	31
230	290	-60	10	32
210	290	-80	10	33
220	290	-70	10	34
190	290	-100	10	35
190	290	-100	10	36
380	290	90	11	36
699	358	341	12	36
480	358	122	13	36
350	358	-8	13	37
300	358	-58	13	38

290	358	-68	13	39
260	358	-98	13	40
270	358	-88	13	41
260	358	-98	13	42
280	358	-78	13	43
280	358	-78	13	44
260	358	-98	13	45
260	358	-98	13	46
280	358	-78	13	47
290	358	-68	13	48
280	358	-78	13	49
250	358	-108	13	50
240	358	-118	13	51
230	358	-128	13	52
210	358	-148	13	53
220	358	-138	13	54
190	358	-168	13	55
190	358	-168	13	56
380	358	22	14	56
480	699	-219	14	57
350	699	-349	14	58
300	699	-399	14	59
290	699	-409	14	60
260	699	-439	14	61
270	699	-429	14	62
260	699	-439	14	63
280	699	-419	14	64
280	699	-419	14	65
260	699	-439	14	66
260	699	-439	14	67
280	699	-419	14	68
290	699	-409	14	69
280	699	-419	14	70
250	699	-449	14	71
240	699	-459	14	72
230	699	-469	14	73
210	699	-489	14	74
220	699	-479	14	75
190	699	-509	14	76
190	699	-509	14	77
380	699	-319	14	78
350	480	-130	14	79
300	480	-180	14	80
290	480	-190	14	81
260	480	-220	14	82
270	480	-210	14	83
260	480	-220	14	84
280	480	-200	14	85
280	480	-200	14	86
260	480	-220	14	87
260	480	-220	14	88
280	480	-200	14	89
290	480	-190	14	90
280	480	-200	14	91
250	480	-230	14	92
240	480	-240	14	93
230	480	-250	14	94
210	480	-270	14	95
220	480	-260	14	96
190	480	-290	14	97
190	480	-290	14	98
380	480	-100	14	99
300	350	-50	14	100
290	350	-60	14	101

260	350	-90	14	102
270	350	-80	14	103
260	350	-90	14	104
280	350	-70	14	105
280	350	-70	14	106
260	350	-90	14	107
260	350	-90	14	108
280	350	-70	14	109
290	350	-60	14	110
280	350	-70	14	111
250	350	-100	14	112
240	350	-110	14	113
230	350	-120	14	114
210	350	-140	14	115
220	350	-130	14	116
190	350	-160	14	117
190	350	-160	14	118
380	350	30	15	118
290	300	-10	15	119
260	300	-40	15	120
270	300	-30	15	121
260	300	-40	15	122
280	300	-20	15	123
280	300	-20	15	124
260	300	-40	15	125
260	300	-40	15	126
280	300	-20	15	127
290	300	-10	15	128
280	300	-20	15	129
250	300	-50	15	130
240	300	-60	15	131
230	300	-70	15	132
210	300	-90	15	133
220	300	-80	15	134
190	300	-110	15	135
190	300	-110	15	136
380	300	80	16	136
260	290	-30	16	137
270	290	-20	16	138
260	290	-30	16	139
280	290	-10	16	140
280	290	-10	16	141
260	290	-30	16	142
260	290	-30	16	143
280	290	-10	16	144
290	290	0	16	144
280	290	-10	16	145
250	290	-40	16	146
240	290	-50	16	147
230	290	-60	16	148
210	290	-80	16	149
220	290	-70	16	150
190	290	-100	16	151
190	290	-100	16	152
380	290	90	17	152
270	260	10	18	152
260	260	0	18	152
280	260	20	19	152
280	260	20	20	152
260	260	0	20	152
260	260	0	20	152
280	260	20	21	152
290	260	30	22	152
280	260	20	23	152

250	260	-10	23	153
240	260	-20	23	154
230	260	-30	23	155
210	260	-50	23	156
220	260	-40	23	157
190	260	-70	23	158
190	260	-70	23	159
380	260	120	24	159
260	270	-10	24	160
280	270	10	25	160
280	270	10	26	160
260	270	-10	26	161
260	270	-10	26	162
280	270	10	27	162
290	270	20	28	162
280	270	10	29	162
250	270	-20	29	163
240	270	-30	29	164
230	270	-40	29	165
210	270	-60	29	166
220	270	-50	29	167
190	270	-80	29	168
190	270	-80	29	169
380	270	110	30	169
280	260	20	31	169
280	260	20	32	169
260	260	0	32	169
260	260	0	32	169
280	260	20	33	169
290	260	30	34	169
280	260	20	35	169
250	260	-10	35	170
240	260	-20	35	171
230	260	-30	35	172
210	260	-50	35	173
220	260	-40	35	174
190	260	-70	35	175
190	260	-70	35	176
380	260	120	36	176
280	280	0	36	176
260	280	-20	36	177
260	280	-20	36	178
280	280	0	36	178
290	280	10	37	178
280	280	0	37	178
250	280	-30	37	179
240	280	-40	37	180
230	280	-50	37	181
210	280	-70	37	182
220	280	-60	37	183
190	280	-90	37	184
190	280	-90	37	185
380	280	100	38	185
260	280	-20	38	186
260	280	-20	38	187
280	280	0	38	187
290	280	10	39	187
280	280	0	39	187
250	280	-30	39	188
240	280	-40	39	189
230	280	-50	39	190
210	280	-70	39	191
220	280	-60	39	192

190	280	-90	39	193
190	280	-90	39	194
380	280	100	40	194
260	260	0	40	194
280	260	20	41	194
290	260	30	42	194
280	260	20	43	194
250	260	-10	43	195
240	260	-20	43	196
230	260	-30	43	197
210	260	-50	43	198
220	260	-40	43	199
190	260	-70	43	200
190	260	-70	43	201
380	260	120	44	201
280	260	20	45	201
290	260	30	46	201
280	260	20	47	201
250	260	-10	47	202
240	260	-20	47	203
230	260	-30	47	204
210	260	-50	47	205
220	260	-40	47	206
190	260	-70	47	207
190	260	-70	47	208
380	260	120	48	208
290	280	10	49	208
280	280	0	49	208
250	280	-30	49	209
240	280	-40	49	210
230	280	-50	49	211
210	280	-70	49	212
220	280	-60	49	213
190	280	-90	49	214
190	280	-90	49	215
380	280	100	50	215
280	290	-10	50	216
250	290	-40	50	217
240	290	-50	50	218
230	290	-60	50	219
210	290	-80	50	220
220	290	-70	50	221
190	290	-100	50	222
190	290	-100	50	223
380	290	90	51	223
250	280	-30	51	224
240	280	-40	51	225
230	280	-50	51	226
210	280	-70	51	227
220	280	-60	51	228
190	280	-90	51	229
190	280	-90	51	230
380	280	100	52	230
240	250	-10	52	231
230	250	-20	52	232
210	250	-40	52	233
220	250	-30	52	234
190	250	-60	52	235
190	250	-60	52	236
380	250	130	53	236

230	240	-10	53	237
210	240	-30	53	238
220	240	-20	53	239
190	240	-50	53	240
190	240	-50	53	241
380	240	140	54	241
210	230	-20	54	242
220	230	-10	54	243
190	230	-40	54	244
190	230	-40	54	245
380	230	150	55	245
220	210	10	56	245
190	210	-20	56	246
190	210	-20	56	247
380	210	170	57	247
190	220	-30	57	248
190	220	-30	57	249
380	220	160	58	249
190	190	0	58	249
380	190	190	59	249
380	190	190	60	249

S Statistic = 60 - 249 = -189

Tied Group	Value	Members
1	290	3
2	260	4
3	280	4
4	190	2

Time Period	Observations
3/11/2008	1
5/13/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/13/2009	1
9/29/2009	1
12/9/2009	1
2/26/2010	1
4/15/2010	1
8/10/2010	1
11/22/2010	1
3/10/2011	1
5/25/2011	1
9/2/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 396

B = 0
C = 54
D = 0
E = 32
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2036.33
Z-Score = -4.16614
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-4.16614 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-02D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
220	230	-10	0	1
230	230	0	0	1
240	230	10	1	1
160	230	-70	1	2
222	230	-8	1	3
157	230	-73	1	4
170	230	-60	1	5
165	230	-65	1	6
208	230	-22	1	7
165	230	-65	1	8
118	230	-112	1	9
196	230	-34	1	10
205	230	-25	1	11
199	230	-31	1	12
135	230	-95	1	13
212	230	-18	1	14
214	230	-16	1	15
214	230	-16	1	16
197	230	-33	1	17
179	230	-51	1	18
193	230	-37	1	19
173	230	-57	1	20
181	230	-49	1	21
500	230	270	2	21
162	230	-68	2	22
230	220	10	3	22
240	220	20	4	22
160	220	-60	4	23
222	220	2	5	23
157	220	-63	5	24
170	220	-50	5	25
165	220	-55	5	26
208	220	-12	5	27
165	220	-55	5	28
118	220	-102	5	29
196	220	-24	5	30
205	220	-15	5	31
199	220	-21	5	32
135	220	-85	5	33
212	220	-8	5	34
214	220	-6	5	35
214	220	-6	5	36
197	220	-23	5	37
179	220	-41	5	38
193	220	-27	5	39
173	220	-47	5	40
181	220	-39	5	41
500	220	280	6	41
162	220	-58	6	42
240	230	10	7	42
160	230	-70	7	43
222	230	-8	7	44
157	230	-73	7	45

170	230	-60	7	46
165	230	-65	7	47
208	230	-22	7	48
165	230	-65	7	49
118	230	-112	7	50
196	230	-34	7	51
205	230	-25	7	52
199	230	-31	7	53
135	230	-95	7	54
212	230	-18	7	55
214	230	-16	7	56
214	230	-16	7	57
197	230	-33	7	58
179	230	-51	7	59
193	230	-37	7	60
173	230	-57	7	61
181	230	-49	7	62
500	230	270	8	62
162	230	-68	8	63
160	240	-80	8	64
222	240	-18	8	65
157	240	-83	8	66
170	240	-70	8	67
165	240	-75	8	68
208	240	-32	8	69
165	240	-75	8	70
118	240	-122	8	71
196	240	-44	8	72
205	240	-35	8	73
199	240	-41	8	74
135	240	-105	8	75
212	240	-28	8	76
214	240	-26	8	77
214	240	-26	8	78
197	240	-43	8	79
179	240	-61	8	80
193	240	-47	8	81
173	240	-67	8	82
181	240	-59	8	83
500	240	260	9	83
162	240	-78	9	84
222	160	62	10	84
157	160	-3	10	85
170	160	10	11	85
165	160	5	12	85
208	160	48	13	85
165	160	5	14	85
118	160	-42	14	86
196	160	36	15	86
205	160	45	16	86
199	160	39	17	86
135	160	-25	17	87
212	160	52	18	87
214	160	54	19	87
214	160	54	20	87
197	160	37	21	87
179	160	19	22	87
193	160	33	23	87
173	160	13	24	87
181	160	21	25	87
500	160	340	26	87
162	160	2	27	87
157	222	-65	27	88
170	222	-52	27	89

165	222	-57	27	90
208	222	-14	27	91
165	222	-57	27	92
118	222	-104	27	93
196	222	-26	27	94
205	222	-17	27	95
199	222	-23	27	96
135	222	-87	27	97
212	222	-10	27	98
214	222	-8	27	99
214	222	-8	27	100
197	222	-25	27	101
179	222	-43	27	102
193	222	-29	27	103
173	222	-49	27	104
181	222	-41	27	105
500	222	278	28	105
162	222	-60	28	106
170	157	13	29	106
165	157	8	30	106
208	157	51	31	106
165	157	8	32	106
118	157	-39	32	107
196	157	39	33	107
205	157	48	34	107
199	157	42	35	107
135	157	-22	35	108
212	157	55	36	108
214	157	57	37	108
214	157	57	38	108
197	157	40	39	108
179	157	22	40	108
193	157	36	41	108
173	157	16	42	108
181	157	24	43	108
500	157	343	44	108
162	157	5	45	108
165	170	-5	45	109
208	170	38	46	109
165	170	-5	46	110
118	170	-52	46	111
196	170	26	47	111
205	170	35	48	111
199	170	29	49	111
135	170	-35	49	112
212	170	42	50	112
214	170	44	51	112
214	170	44	52	112
197	170	27	53	112
179	170	9	54	112
193	170	23	55	112
173	170	3	56	112
181	170	11	57	112
500	170	330	58	112
162	170	-8	58	113
208	165	43	59	113
165	165	0	59	113
118	165	-47	59	114
196	165	31	60	114
205	165	40	61	114
199	165	34	62	114
135	165	-30	62	115
212	165	47	63	115
214	165	49	64	115

214	165	49	65	115
197	165	32	66	115
179	165	14	67	115
193	165	28	68	115
173	165	8	69	115
181	165	16	70	115
500	165	335	71	115
162	165	-3	71	116
165	208	-43	71	117
118	208	-90	71	118
196	208	-12	71	119
205	208	-3	71	120
199	208	-9	71	121
135	208	-73	71	122
212	208	4	72	122
214	208	6	73	122
214	208	6	74	122
197	208	-11	74	123
179	208	-29	74	124
193	208	-15	74	125
173	208	-35	74	126
181	208	-27	74	127
500	208	292	75	127
162	208	-46	75	128
118	165	-47	75	129
196	165	31	76	129
205	165	40	77	129
199	165	34	78	129
135	165	-30	78	130
212	165	47	79	130
214	165	49	80	130
214	165	49	81	130
197	165	32	82	130
179	165	14	83	130
193	165	28	84	130
173	165	8	85	130
181	165	16	86	130
500	165	335	87	130
162	165	-3	87	131
196	118	78	88	131
205	118	87	89	131
199	118	81	90	131
135	118	17	91	131
212	118	94	92	131
214	118	96	93	131
214	118	96	94	131
197	118	79	95	131
179	118	61	96	131
193	118	75	97	131
173	118	55	98	131
181	118	63	99	131
500	118	382	100	131
162	118	44	101	131
205	196	9	102	131
199	196	3	103	131
135	196	-61	103	132
212	196	16	104	132
214	196	18	105	132
214	196	18	106	132
197	196	1	107	132
179	196	-17	107	133
193	196	-3	107	134
173	196	-23	107	135

181	196	-15	107	136
500	196	304	108	136
162	196	-34	108	137
199	205	-6	108	138
135	205	-70	108	139
212	205	7	109	139
214	205	9	110	139
214	205	9	111	139
197	205	-8	111	140
179	205	-26	111	141
193	205	-12	111	142
173	205	-32	111	143
181	205	-24	111	144
500	205	295	112	144
162	205	-43	112	145
135	199	-64	112	146
212	199	13	113	146
214	199	15	114	146
214	199	15	115	146
197	199	-2	115	147
179	199	-20	115	148
193	199	-6	115	149
173	199	-26	115	150
181	199	-18	115	151
500	199	301	116	151
162	199	-37	116	152
212	135	77	117	152
214	135	79	118	152
214	135	79	119	152
197	135	62	120	152
179	135	44	121	152
193	135	58	122	152
173	135	38	123	152
181	135	46	124	152
500	135	365	125	152
162	135	27	126	152
214	212	2	127	152
214	212	2	128	152
197	212	-15	128	153
179	212	-33	128	154
193	212	-19	128	155
173	212	-39	128	156
181	212	-31	128	157
500	212	288	129	157
162	212	-50	129	158
214	214	0	129	158
197	214	-17	129	159
179	214	-35	129	160
193	214	-21	129	161
173	214	-41	129	162
181	214	-33	129	163
500	214	286	130	163
162	214	-52	130	164
197	214	-17	130	165
179	214	-35	130	166
193	214	-21	130	167
173	214	-41	130	168
181	214	-33	130	169
500	214	286	131	169
162	214	-52	131	170

179	197	-18	131	171
193	197	-4	131	172
173	197	-24	131	173
181	197	-16	131	174
500	197	303	132	174
162	197	-35	132	175
193	179	14	133	175
173	179	-6	133	176
181	179	2	134	176
500	179	321	135	176
162	179	-17	135	177
173	193	-20	135	178
181	193	-12	135	179
500	193	307	136	179
162	193	-31	136	180
181	173	8	137	180
500	173	327	138	180
162	173	-11	138	181
500	181	319	139	181
162	181	-19	139	182
162	500	-338	139	183

S Statistic = 139 - 183 = -44

Tied Group	Value	Members
1	230	2
2	165	2
3	214	2

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/14/2010	1
8/12/2010	1
11/24/2010	1
3/8/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 54
B = 0

C = 0
D = 0
E = 6
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2055.33
Z-Score = -0.948478
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.948478 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-02D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
220	230	-10	0	1
230	230	0	0	1
240	230	10	1	1
160	230	-70	1	2
222	230	-8	1	3
157	230	-73	1	4
170	230	-60	1	5
165	230	-65	1	6
208	230	-22	1	7
165	230	-65	1	8
118	230	-112	1	9
196	230	-34	1	10
205	230	-25	1	11
199	230	-31	1	12
135	230	-95	1	13
212	230	-18	1	14
214	230	-16	1	15
214	230	-16	1	16
197	230	-33	1	17
179	230	-51	1	18
193	230	-37	1	19
173	230	-57	1	20
181	230	-49	1	21
500	230	270	2	21
162	230	-68	2	22
230	220	10	3	22
240	220	20	4	22
160	220	-60	4	23
222	220	2	5	23
157	220	-63	5	24
170	220	-50	5	25
165	220	-55	5	26
208	220	-12	5	27
165	220	-55	5	28
118	220	-102	5	29
196	220	-24	5	30
205	220	-15	5	31
199	220	-21	5	32
135	220	-85	5	33
212	220	-8	5	34
214	220	-6	5	35
214	220	-6	5	36
197	220	-23	5	37
179	220	-41	5	38
193	220	-27	5	39
173	220	-47	5	40
181	220	-39	5	41
500	220	280	6	41
162	220	-58	6	42
240	230	10	7	42
160	230	-70	7	43
222	230	-8	7	44
157	230	-73	7	45

170	230	-60	7	46
165	230	-65	7	47
208	230	-22	7	48
165	230	-65	7	49
118	230	-112	7	50
196	230	-34	7	51
205	230	-25	7	52
199	230	-31	7	53
135	230	-95	7	54
212	230	-18	7	55
214	230	-16	7	56
214	230	-16	7	57
197	230	-33	7	58
179	230	-51	7	59
193	230	-37	7	60
173	230	-57	7	61
181	230	-49	7	62
500	230	270	8	62
162	230	-68	8	63
160	240	-80	8	64
222	240	-18	8	65
157	240	-83	8	66
170	240	-70	8	67
165	240	-75	8	68
208	240	-32	8	69
165	240	-75	8	70
118	240	-122	8	71
196	240	-44	8	72
205	240	-35	8	73
199	240	-41	8	74
135	240	-105	8	75
212	240	-28	8	76
214	240	-26	8	77
214	240	-26	8	78
197	240	-43	8	79
179	240	-61	8	80
193	240	-47	8	81
173	240	-67	8	82
181	240	-59	8	83
500	240	260	9	83
162	240	-78	9	84
222	160	62	10	84
157	160	-3	10	85
170	160	10	11	85
165	160	5	12	85
208	160	48	13	85
165	160	5	14	85
118	160	-42	14	86
196	160	36	15	86
205	160	45	16	86
199	160	39	17	86
135	160	-25	17	87
212	160	52	18	87
214	160	54	19	87
214	160	54	20	87
197	160	37	21	87
179	160	19	22	87
193	160	33	23	87
173	160	13	24	87
181	160	21	25	87
500	160	340	26	87
162	160	2	27	87
157	222	-65	27	88
170	222	-52	27	89

165	222	-57	27	90
208	222	-14	27	91
165	222	-57	27	92
118	222	-104	27	93
196	222	-26	27	94
205	222	-17	27	95
199	222	-23	27	96
135	222	-87	27	97
212	222	-10	27	98
214	222	-8	27	99
214	222	-8	27	100
197	222	-25	27	101
179	222	-43	27	102
193	222	-29	27	103
173	222	-49	27	104
181	222	-41	27	105
500	222	278	28	105
162	222	-60	28	106
170	157	13	29	106
165	157	8	30	106
208	157	51	31	106
165	157	8	32	106
118	157	-39	32	107
196	157	39	33	107
205	157	48	34	107
199	157	42	35	107
135	157	-22	35	108
212	157	55	36	108
214	157	57	37	108
214	157	57	38	108
197	157	40	39	108
179	157	22	40	108
193	157	36	41	108
173	157	16	42	108
181	157	24	43	108
500	157	343	44	108
162	157	5	45	108
165	170	-5	45	109
208	170	38	46	109
165	170	-5	46	110
118	170	-52	46	111
196	170	26	47	111
205	170	35	48	111
199	170	29	49	111
135	170	-35	49	112
212	170	42	50	112
214	170	44	51	112
214	170	44	52	112
197	170	27	53	112
179	170	9	54	112
193	170	23	55	112
173	170	3	56	112
181	170	11	57	112
500	170	330	58	112
162	170	-8	58	113
208	165	43	59	113
165	165	0	59	113
118	165	-47	59	114
196	165	31	60	114
205	165	40	61	114
199	165	34	62	114
135	165	-30	62	115
212	165	47	63	115
214	165	49	64	115

214	165	49	65	115
197	165	32	66	115
179	165	14	67	115
193	165	28	68	115
173	165	8	69	115
181	165	16	70	115
500	165	335	71	115
162	165	-3	71	116
165	208	-43	71	117
118	208	-90	71	118
196	208	-12	71	119
205	208	-3	71	120
199	208	-9	71	121
135	208	-73	71	122
212	208	4	72	122
214	208	6	73	122
214	208	6	74	122
197	208	-11	74	123
179	208	-29	74	124
193	208	-15	74	125
173	208	-35	74	126
181	208	-27	74	127
500	208	292	75	127
162	208	-46	75	128
118	165	-47	75	129
196	165	31	76	129
205	165	40	77	129
199	165	34	78	129
135	165	-30	78	130
212	165	47	79	130
214	165	49	80	130
214	165	49	81	130
197	165	32	82	130
179	165	14	83	130
193	165	28	84	130
173	165	8	85	130
181	165	16	86	130
500	165	335	87	130
162	165	-3	87	131
196	118	78	88	131
205	118	87	89	131
199	118	81	90	131
135	118	17	91	131
212	118	94	92	131
214	118	96	93	131
214	118	96	94	131
197	118	79	95	131
179	118	61	96	131
193	118	75	97	131
173	118	55	98	131
181	118	63	99	131
500	118	382	100	131
162	118	44	101	131
205	196	9	102	131
199	196	3	103	131
135	196	-61	103	132
212	196	16	104	132
214	196	18	105	132
214	196	18	106	132
197	196	1	107	132
179	196	-17	107	133
193	196	-3	107	134
173	196	-23	107	135

181	196	-15	107	136
500	196	304	108	136
162	196	-34	108	137
199	205	-6	108	138
135	205	-70	108	139
212	205	7	109	139
214	205	9	110	139
214	205	9	111	139
197	205	-8	111	140
179	205	-26	111	141
193	205	-12	111	142
173	205	-32	111	143
181	205	-24	111	144
500	205	295	112	144
162	205	-43	112	145
135	199	-64	112	146
212	199	13	113	146
214	199	15	114	146
214	199	15	115	146
197	199	-2	115	147
179	199	-20	115	148
193	199	-6	115	149
173	199	-26	115	150
181	199	-18	115	151
500	199	301	116	151
162	199	-37	116	152
212	135	77	117	152
214	135	79	118	152
214	135	79	119	152
197	135	62	120	152
179	135	44	121	152
193	135	58	122	152
173	135	38	123	152
181	135	46	124	152
500	135	365	125	152
162	135	27	126	152
214	212	2	127	152
214	212	2	128	152
197	212	-15	128	153
179	212	-33	128	154
193	212	-19	128	155
173	212	-39	128	156
181	212	-31	128	157
500	212	288	129	157
162	212	-50	129	158
214	214	0	129	158
197	214	-17	129	159
179	214	-35	129	160
193	214	-21	129	161
173	214	-41	129	162
181	214	-33	129	163
500	214	286	130	163
162	214	-52	130	164
197	214	-17	130	165
179	214	-35	130	166
193	214	-21	130	167
173	214	-41	130	168
181	214	-33	130	169
500	214	286	131	169
162	214	-52	131	170

179	197	-18	131	171
193	197	-4	131	172
173	197	-24	131	173
181	197	-16	131	174
500	197	303	132	174
162	197	-35	132	175
193	179	14	133	175
173	179	-6	133	176
181	179	2	134	176
500	179	321	135	176
162	179	-17	135	177
173	193	-20	135	178
181	193	-12	135	179
500	193	307	136	179
162	193	-31	136	180
181	173	8	137	180
500	173	327	138	180
162	173	-11	138	181
500	181	319	139	181
162	181	-19	139	182
162	500	-338	139	183

S Statistic = 139 - 183 = -44

Tied Group	Value	Members
1	230	2
2	165	2
3	214	2

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/14/2010	1
8/12/2010	1
11/24/2010	1
3/8/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 54
B = 0

C = 0
D = 0
E = 6
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2055.33
Z-Score = -0.948478
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.948478 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-02D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2190	2980	-790	0	1
3140	2980	160	1	1
3030	2980	50	2	1
3000	2980	20	3	1
3600	2980	620	4	1
2200	2980	-780	4	2
4500	2980	1520	5	2
2100	2980	-880	5	3
2000	2980	-980	5	4
2100	2980	-880	5	5
1900	2980	-1080	5	6
2100	2980	-880	5	7
2200	2980	-780	5	8
2100	2980	-880	5	9
2300	2980	-680	5	10
2400	2980	-580	5	11
2500	2980	-480	5	12
2800	2980	-180	5	13
3000	2980	20	6	13
1900	2980	-1080	6	14
2000	2980	-980	6	15
2500	2980	-480	6	16
2400	2980	-580	6	17
3800	2980	820	7	17
1800	2980	-1180	7	18
3140	2190	950	8	18
3030	2190	840	9	18
3000	2190	810	10	18
3600	2190	1410	11	18
2200	2190	10	12	18
4500	2190	2310	13	18
2100	2190	-90	13	19
2000	2190	-190	13	20
2100	2190	-90	13	21
1900	2190	-290	13	22
2100	2190	-90	13	23
2200	2190	10	14	23
2100	2190	-90	14	24
2300	2190	110	15	24
2400	2190	210	16	24
2500	2190	310	17	24
2800	2190	610	18	24
3000	2190	810	19	24
1900	2190	-290	19	25
2000	2190	-190	19	26
2500	2190	310	20	26
2400	2190	210	21	26
3800	2190	1610	22	26
1800	2190	-390	22	27
3030	3140	-110	22	28
3000	3140	-140	22	29
3600	3140	460	23	29
2200	3140	-940	23	30

4500	3140	1360	24	30
2100	3140	-1040	24	31
2000	3140	-1140	24	32
2100	3140	-1040	24	33
1900	3140	-1240	24	34
2100	3140	-1040	24	35
2200	3140	-940	24	36
2100	3140	-1040	24	37
2300	3140	-840	24	38
2400	3140	-740	24	39
2500	3140	-640	24	40
2800	3140	-340	24	41
3000	3140	-140	24	42
1900	3140	-1240	24	43
2000	3140	-1140	24	44
2500	3140	-640	24	45
2400	3140	-740	24	46
3800	3140	660	25	46
1800	3140	-1340	25	47
3000	3030	-30	25	48
3600	3030	570	26	48
2200	3030	-830	26	49
4500	3030	1470	27	49
2100	3030	-930	27	50
2000	3030	-1030	27	51
2100	3030	-930	27	52
1900	3030	-1130	27	53
2100	3030	-930	27	54
2200	3030	-830	27	55
2100	3030	-930	27	56
2300	3030	-730	27	57
2400	3030	-630	27	58
2500	3030	-530	27	59
2800	3030	-230	27	60
3000	3030	-30	27	61
1900	3030	-1130	27	62
2000	3030	-1030	27	63
2500	3030	-530	27	64
2400	3030	-630	27	65
3800	3030	770	28	65
1800	3030	-1230	28	66
3600	3000	600	29	66
2200	3000	-800	29	67
4500	3000	1500	30	67
2100	3000	-900	30	68
2000	3000	-1000	30	69
2100	3000	-900	30	70
1900	3000	-1100	30	71
2100	3000	-900	30	72
2200	3000	-800	30	73
2100	3000	-900	30	74
2300	3000	-700	30	75
2400	3000	-600	30	76
2500	3000	-500	30	77
2800	3000	-200	30	78
3000	3000	0	30	78
1900	3000	-1100	30	79
2000	3000	-1000	30	80
2500	3000	-500	30	81
2400	3000	-600	30	82
3800	3000	800	31	82
1800	3000	-1200	31	83
2200	3600	-1400	31	84
4500	3600	900	32	84

2100	3600	-1500	32	85
2000	3600	-1600	32	86
2100	3600	-1500	32	87
1900	3600	-1700	32	88
2100	3600	-1500	32	89
2200	3600	-1400	32	90
2100	3600	-1500	32	91
2300	3600	-1300	32	92
2400	3600	-1200	32	93
2500	3600	-1100	32	94
2800	3600	-800	32	95
3000	3600	-600	32	96
1900	3600	-1700	32	97
2000	3600	-1600	32	98
2500	3600	-1100	32	99
2400	3600	-1200	32	100
3800	3600	200	33	100
1800	3600	-1800	33	101
4500	2200	2300	34	101
2100	2200	-100	34	102
2000	2200	-200	34	103
2100	2200	-100	34	104
1900	2200	-300	34	105
2100	2200	-100	34	106
2200	2200	0	34	106
2100	2200	-100	34	107
2300	2200	100	35	107
2400	2200	200	36	107
2500	2200	300	37	107
2800	2200	600	38	107
3000	2200	800	39	107
1900	2200	-300	39	108
2000	2200	-200	39	109
2500	2200	300	40	109
2400	2200	200	41	109
3800	2200	1600	42	109
1800	2200	-400	42	110
2100	4500	-2400	42	111
2000	4500	-2500	42	112
2100	4500	-2400	42	113
1900	4500	-2600	42	114
2100	4500	-2400	42	115
2200	4500	-2300	42	116
2100	4500	-2400	42	117
2300	4500	-2200	42	118
2400	4500	-2100	42	119
2500	4500	-2000	42	120
2800	4500	-1700	42	121
3000	4500	-1500	42	122
1900	4500	-2600	42	123
2000	4500	-2500	42	124
2500	4500	-2000	42	125
2400	4500	-2100	42	126
3800	4500	-700	42	127
1800	4500	-2700	42	128
2000	2100	-100	42	129
2100	2100	0	42	129
1900	2100	-200	42	130
2100	2100	0	42	130
2200	2100	100	43	130
2100	2100	0	43	130
2300	2100	200	44	130
2400	2100	300	45	130
2500	2100	400	46	130

2800	2100	700	47	130
3000	2100	900	48	130
1900	2100	-200	48	131
2000	2100	-100	48	132
2500	2100	400	49	132
2400	2100	300	50	132
3800	2100	1700	51	132
1800	2100	-300	51	133
2100	2000	100	52	133
1900	2000	-100	52	134
2100	2000	100	53	134
2200	2000	200	54	134
2100	2000	100	55	134
2300	2000	300	56	134
2400	2000	400	57	134
2500	2000	500	58	134
2800	2000	800	59	134
3000	2000	1000	60	134
1900	2000	-100	60	135
2000	2000	0	60	135
2500	2000	500	61	135
2400	2000	400	62	135
3800	2000	1800	63	135
1800	2000	-200	63	136
1900	2100	-200	63	137
2100	2100	0	63	137
2200	2100	100	64	137
2100	2100	0	64	137
2300	2100	200	65	137
2400	2100	300	66	137
2500	2100	400	67	137
2800	2100	700	68	137
3000	2100	900	69	137
1900	2100	-200	69	138
2000	2100	-100	69	139
2500	2100	400	70	139
2400	2100	300	71	139
3800	2100	1700	72	139
1800	2100	-300	72	140
2100	1900	200	73	140
2200	1900	300	74	140
2100	1900	200	75	140
2300	1900	400	76	140
2400	1900	500	77	140
2500	1900	600	78	140
2800	1900	900	79	140
3000	1900	1100	80	140
1900	1900	0	80	140
2000	1900	100	81	140
2500	1900	600	82	140
2400	1900	500	83	140
3800	1900	1900	84	140
1800	1900	-100	84	141
2200	2100	100	85	141
2100	2100	0	85	141
2300	2100	200	86	141
2400	2100	300	87	141
2500	2100	400	88	141
2800	2100	700	89	141
3000	2100	900	90	141
1900	2100	-200	90	142
2000	2100	-100	90	143
2500	2100	400	91	143

2400	2100	300	92	143
3800	2100	1700	93	143
1800	2100	-300	93	144
2100	2200	-100	93	145
2300	2200	100	94	145
2400	2200	200	95	145
2500	2200	300	96	145
2800	2200	600	97	145
3000	2200	800	98	145
1900	2200	-300	98	146
2000	2200	-200	98	147
2500	2200	300	99	147
2400	2200	200	100	147
3800	2200	1600	101	147
1800	2200	-400	101	148
2300	2100	200	102	148
2400	2100	300	103	148
2500	2100	400	104	148
2800	2100	700	105	148
3000	2100	900	106	148
1900	2100	-200	106	149
2000	2100	-100	106	150
2500	2100	400	107	150
2400	2100	300	108	150
3800	2100	1700	109	150
1800	2100	-300	109	151
2400	2300	100	110	151
2500	2300	200	111	151
2800	2300	500	112	151
3000	2300	700	113	151
1900	2300	-400	113	152
2000	2300	-300	113	153
2500	2300	200	114	153
2400	2300	100	115	153
3800	2300	1500	116	153
1800	2300	-500	116	154
2500	2400	100	117	154
2800	2400	400	118	154
3000	2400	600	119	154
1900	2400	-500	119	155
2000	2400	-400	119	156
2500	2400	100	120	156
2400	2400	0	120	156
3800	2400	1400	121	156
1800	2400	-600	121	157
2800	2500	300	122	157
3000	2500	500	123	157
1900	2500	-600	123	158
2000	2500	-500	123	159
2500	2500	0	123	159
2400	2500	-100	123	160
3800	2500	1300	124	160
1800	2500	-700	124	161
3000	2800	200	125	161
1900	2800	-900	125	162
2000	2800	-800	125	163
2500	2800	-300	125	164
2400	2800	-400	125	165
3800	2800	1000	126	165
1800	2800	-1000	126	166

1900	3000	-1100	126	167
2000	3000	-1000	126	168
2500	3000	-500	126	169
2400	3000	-600	126	170
3800	3000	800	127	170
1800	3000	-1200	127	171
2000	1900	100	128	171
2500	1900	600	129	171
2400	1900	500	130	171
3800	1900	1900	131	171
1800	1900	-100	131	172
2500	2000	500	132	172
2400	2000	400	133	172
3800	2000	1800	134	172
1800	2000	-200	134	173
2400	2500	-100	134	174
3800	2500	1300	135	174
1800	2500	-700	135	175
3800	2400	1400	136	175
1800	2400	-600	136	176
1800	3800	-2000	136	177

S Statistic = 136 - 177 = -41

Tied Group	Value	Members
1	3000	2
2	2200	2
3	2100	4
4	2000	2
5	1900	2
6	2400	2
7	2500	2

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/14/2010	1
8/12/2010	1
11/24/2010	1
3/8/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 264
B = 0
C = 24
D = 0
E = 24
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2043.67
Z-Score = -0.88482
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.88482 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-02D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2190	2980	-790	0	1
3140	2980	160	1	1
3030	2980	50	2	1
3000	2980	20	3	1
3600	2980	620	4	1
2200	2980	-780	4	2
4500	2980	1520	5	2
2100	2980	-880	5	3
2000	2980	-980	5	4
2100	2980	-880	5	5
1900	2980	-1080	5	6
2100	2980	-880	5	7
2200	2980	-780	5	8
2100	2980	-880	5	9
2300	2980	-680	5	10
2400	2980	-580	5	11
2500	2980	-480	5	12
2800	2980	-180	5	13
3000	2980	20	6	13
1900	2980	-1080	6	14
2000	2980	-980	6	15
2500	2980	-480	6	16
2400	2980	-580	6	17
3800	2980	820	7	17
1800	2980	-1180	7	18
3140	2190	950	8	18
3030	2190	840	9	18
3000	2190	810	10	18
3600	2190	1410	11	18
2200	2190	10	12	18
4500	2190	2310	13	18
2100	2190	-90	13	19
2000	2190	-190	13	20
2100	2190	-90	13	21
1900	2190	-290	13	22
2100	2190	-90	13	23
2200	2190	10	14	23
2100	2190	-90	14	24
2300	2190	110	15	24
2400	2190	210	16	24
2500	2190	310	17	24
2800	2190	610	18	24
3000	2190	810	19	24
1900	2190	-290	19	25
2000	2190	-190	19	26
2500	2190	310	20	26
2400	2190	210	21	26
3800	2190	1610	22	26
1800	2190	-390	22	27
3030	3140	-110	22	28
3000	3140	-140	22	29
3600	3140	460	23	29
2200	3140	-940	23	30

4500	3140	1360	24	30
2100	3140	-1040	24	31
2000	3140	-1140	24	32
2100	3140	-1040	24	33
1900	3140	-1240	24	34
2100	3140	-1040	24	35
2200	3140	-940	24	36
2100	3140	-1040	24	37
2300	3140	-840	24	38
2400	3140	-740	24	39
2500	3140	-640	24	40
2800	3140	-340	24	41
3000	3140	-140	24	42
1900	3140	-1240	24	43
2000	3140	-1140	24	44
2500	3140	-640	24	45
2400	3140	-740	24	46
3800	3140	660	25	46
1800	3140	-1340	25	47
3000	3030	-30	25	48
3600	3030	570	26	48
2200	3030	-830	26	49
4500	3030	1470	27	49
2100	3030	-930	27	50
2000	3030	-1030	27	51
2100	3030	-930	27	52
1900	3030	-1130	27	53
2100	3030	-930	27	54
2200	3030	-830	27	55
2100	3030	-930	27	56
2300	3030	-730	27	57
2400	3030	-630	27	58
2500	3030	-530	27	59
2800	3030	-230	27	60
3000	3030	-30	27	61
1900	3030	-1130	27	62
2000	3030	-1030	27	63
2500	3030	-530	27	64
2400	3030	-630	27	65
3800	3030	770	28	65
1800	3030	-1230	28	66
3600	3000	600	29	66
2200	3000	-800	29	67
4500	3000	1500	30	67
2100	3000	-900	30	68
2000	3000	-1000	30	69
2100	3000	-900	30	70
1900	3000	-1100	30	71
2100	3000	-900	30	72
2200	3000	-800	30	73
2100	3000	-900	30	74
2300	3000	-700	30	75
2400	3000	-600	30	76
2500	3000	-500	30	77
2800	3000	-200	30	78
3000	3000	0	30	78
1900	3000	-1100	30	79
2000	3000	-1000	30	80
2500	3000	-500	30	81
2400	3000	-600	30	82
3800	3000	800	31	82
1800	3000	-1200	31	83
2200	3600	-1400	31	84
4500	3600	900	32	84

2100	3600	-1500	32	85
2000	3600	-1600	32	86
2100	3600	-1500	32	87
1900	3600	-1700	32	88
2100	3600	-1500	32	89
2200	3600	-1400	32	90
2100	3600	-1500	32	91
2300	3600	-1300	32	92
2400	3600	-1200	32	93
2500	3600	-1100	32	94
2800	3600	-800	32	95
3000	3600	-600	32	96
1900	3600	-1700	32	97
2000	3600	-1600	32	98
2500	3600	-1100	32	99
2400	3600	-1200	32	100
3800	3600	200	33	100
1800	3600	-1800	33	101
4500	2200	2300	34	101
2100	2200	-100	34	102
2000	2200	-200	34	103
2100	2200	-100	34	104
1900	2200	-300	34	105
2100	2200	-100	34	106
2200	2200	0	34	106
2100	2200	-100	34	107
2300	2200	100	35	107
2400	2200	200	36	107
2500	2200	300	37	107
2800	2200	600	38	107
3000	2200	800	39	107
1900	2200	-300	39	108
2000	2200	-200	39	109
2500	2200	300	40	109
2400	2200	200	41	109
3800	2200	1600	42	109
1800	2200	-400	42	110
2100	4500	-2400	42	111
2000	4500	-2500	42	112
2100	4500	-2400	42	113
1900	4500	-2600	42	114
2100	4500	-2400	42	115
2200	4500	-2300	42	116
2100	4500	-2400	42	117
2300	4500	-2200	42	118
2400	4500	-2100	42	119
2500	4500	-2000	42	120
2800	4500	-1700	42	121
3000	4500	-1500	42	122
1900	4500	-2600	42	123
2000	4500	-2500	42	124
2500	4500	-2000	42	125
2400	4500	-2100	42	126
3800	4500	-700	42	127
1800	4500	-2700	42	128
2000	2100	-100	42	129
2100	2100	0	42	129
1900	2100	-200	42	130
2100	2100	0	42	130
2200	2100	100	43	130
2100	2100	0	43	130
2300	2100	200	44	130
2400	2100	300	45	130
2500	2100	400	46	130

2800	2100	700	47	130
3000	2100	900	48	130
1900	2100	-200	48	131
2000	2100	-100	48	132
2500	2100	400	49	132
2400	2100	300	50	132
3800	2100	1700	51	132
1800	2100	-300	51	133
2100	2000	100	52	133
1900	2000	-100	52	134
2100	2000	100	53	134
2200	2000	200	54	134
2100	2000	100	55	134
2300	2000	300	56	134
2400	2000	400	57	134
2500	2000	500	58	134
2800	2000	800	59	134
3000	2000	1000	60	134
1900	2000	-100	60	135
2000	2000	0	60	135
2500	2000	500	61	135
2400	2000	400	62	135
3800	2000	1800	63	135
1800	2000	-200	63	136
1900	2100	-200	63	137
2100	2100	0	63	137
2200	2100	100	64	137
2100	2100	0	64	137
2300	2100	200	65	137
2400	2100	300	66	137
2500	2100	400	67	137
2800	2100	700	68	137
3000	2100	900	69	137
1900	2100	-200	69	138
2000	2100	-100	69	139
2500	2100	400	70	139
2400	2100	300	71	139
3800	2100	1700	72	139
1800	2100	-300	72	140
2100	1900	200	73	140
2200	1900	300	74	140
2100	1900	200	75	140
2300	1900	400	76	140
2400	1900	500	77	140
2500	1900	600	78	140
2800	1900	900	79	140
3000	1900	1100	80	140
1900	1900	0	80	140
2000	1900	100	81	140
2500	1900	600	82	140
2400	1900	500	83	140
3800	1900	1900	84	140
1800	1900	-100	84	141
2200	2100	100	85	141
2100	2100	0	85	141
2300	2100	200	86	141
2400	2100	300	87	141
2500	2100	400	88	141
2800	2100	700	89	141
3000	2100	900	90	141
1900	2100	-200	90	142
2000	2100	-100	90	143
2500	2100	400	91	143

2400	2100	300	92	143
3800	2100	1700	93	143
1800	2100	-300	93	144
2100	2200	-100	93	145
2300	2200	100	94	145
2400	2200	200	95	145
2500	2200	300	96	145
2800	2200	600	97	145
3000	2200	800	98	145
1900	2200	-300	98	146
2000	2200	-200	98	147
2500	2200	300	99	147
2400	2200	200	100	147
3800	2200	1600	101	147
1800	2200	-400	101	148
2300	2100	200	102	148
2400	2100	300	103	148
2500	2100	400	104	148
2800	2100	700	105	148
3000	2100	900	106	148
1900	2100	-200	106	149
2000	2100	-100	106	150
2500	2100	400	107	150
2400	2100	300	108	150
3800	2100	1700	109	150
1800	2100	-300	109	151
2400	2300	100	110	151
2500	2300	200	111	151
2800	2300	500	112	151
3000	2300	700	113	151
1900	2300	-400	113	152
2000	2300	-300	113	153
2500	2300	200	114	153
2400	2300	100	115	153
3800	2300	1500	116	153
1800	2300	-500	116	154
2500	2400	100	117	154
2800	2400	400	118	154
3000	2400	600	119	154
1900	2400	-500	119	155
2000	2400	-400	119	156
2500	2400	100	120	156
2400	2400	0	120	156
3800	2400	1400	121	156
1800	2400	-600	121	157
2800	2500	300	122	157
3000	2500	500	123	157
1900	2500	-600	123	158
2000	2500	-500	123	159
2500	2500	0	123	159
2400	2500	-100	123	160
3800	2500	1300	124	160
1800	2500	-700	124	161
3000	2800	200	125	161
1900	2800	-900	125	162
2000	2800	-800	125	163
2500	2800	-300	125	164
2400	2800	-400	125	165
3800	2800	1000	126	165
1800	2800	-1000	126	166

1900	3000	-1100	126	167
2000	3000	-1000	126	168
2500	3000	-500	126	169
2400	3000	-600	126	170
3800	3000	800	127	170
1800	3000	-1200	127	171
2000	1900	100	128	171
2500	1900	600	129	171
2400	1900	500	130	171
3800	1900	1900	131	171
1800	1900	-100	131	172
2500	2000	500	132	172
2400	2000	400	133	172
3800	2000	1800	134	172
1800	2000	-200	134	173
2400	2500	-100	134	174
3800	2500	1300	135	174
1800	2500	-700	135	175
3800	2400	1400	136	175
1800	2400	-600	136	176
1800	3800	-2000	136	177

S Statistic = 136 - 177 = -41

Tied Group	Value	Members
1	3000	2
2	2200	2
3	2100	4
4	2000	2
5	1900	2
6	2400	2
7	2500	2

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/14/2010	1
8/12/2010	1
11/24/2010	1
3/8/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 264
B = 0
C = 24
D = 0
E = 24
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2043.67
Z-Score = -0.88482
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.88482 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-03D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
220	200	20	1	0
440	200	240	2	0
480	200	280	3	0
446	200	246	4	0
440	200	240	5	0
205	200	5	6	0
187	200	-13	6	1
204	200	4	7	1
390	200	190	8	1
205	200	5	9	1
340	200	140	10	1
350	200	150	11	1
343	200	143	12	1
363	200	163	13	1
340	200	140	14	1
385	200	185	15	1
331	200	131	16	1
361	200	161	17	1
333	200	133	18	1
312	200	112	19	1
298	200	98	20	1
294	200	94	21	1
300	200	100	22	1
314	200	114	23	1
319	200	119	24	1
440	220	220	25	1
480	220	260	26	1
446	220	226	27	1
440	220	220	28	1
205	220	-15	28	2
187	220	-33	28	3
204	220	-16	28	4
390	220	170	29	4
205	220	-15	29	5
340	220	120	30	5
350	220	130	31	5
343	220	123	32	5
363	220	143	33	5
340	220	120	34	5
385	220	165	35	5
331	220	111	36	5
361	220	141	37	5
333	220	113	38	5
312	220	92	39	5
298	220	78	40	5
294	220	74	41	5
300	220	80	42	5
314	220	94	43	5
319	220	99	44	5
480	440	40	45	5
446	440	6	46	5
440	440	0	46	5
205	440	-235	46	6

187	440	-253	46	7
204	440	-236	46	8
390	440	-50	46	9
205	440	-235	46	10
340	440	-100	46	11
350	440	-90	46	12
343	440	-97	46	13
363	440	-77	46	14
340	440	-100	46	15
385	440	-55	46	16
331	440	-109	46	17
361	440	-79	46	18
333	440	-107	46	19
312	440	-128	46	20
298	440	-142	46	21
294	440	-146	46	22
300	440	-140	46	23
314	440	-126	46	24
319	440	-121	46	25
446	480	-34	46	26
440	480	-40	46	27
205	480	-275	46	28
187	480	-293	46	29
204	480	-276	46	30
390	480	-90	46	31
205	480	-275	46	32
340	480	-140	46	33
350	480	-130	46	34
343	480	-137	46	35
363	480	-117	46	36
340	480	-140	46	37
385	480	-95	46	38
331	480	-149	46	39
361	480	-119	46	40
333	480	-147	46	41
312	480	-168	46	42
298	480	-182	46	43
294	480	-186	46	44
300	480	-180	46	45
314	480	-166	46	46
319	480	-161	46	47
440	446	-6	46	48
205	446	-241	46	49
187	446	-259	46	50
204	446	-242	46	51
390	446	-56	46	52
205	446	-241	46	53
340	446	-106	46	54
350	446	-96	46	55
343	446	-103	46	56
363	446	-83	46	57
340	446	-106	46	58
385	446	-61	46	59
331	446	-115	46	60
361	446	-85	46	61
333	446	-113	46	62
312	446	-134	46	63
298	446	-148	46	64
294	446	-152	46	65
300	446	-146	46	66
314	446	-132	46	67
319	446	-127	46	68
205	440	-235	46	69
187	440	-253	46	70

204	440	-236	46	71
390	440	-50	46	72
205	440	-235	46	73
340	440	-100	46	74
350	440	-90	46	75
343	440	-97	46	76
363	440	-77	46	77
340	440	-100	46	78
385	440	-55	46	79
331	440	-109	46	80
361	440	-79	46	81
333	440	-107	46	82
312	440	-128	46	83
298	440	-142	46	84
294	440	-146	46	85
300	440	-140	46	86
314	440	-126	46	87
319	440	-121	46	88
187	205	-18	46	89
204	205	-1	46	90
390	205	185	47	90
205	205	0	47	90
340	205	135	48	90
350	205	145	49	90
343	205	138	50	90
363	205	158	51	90
340	205	135	52	90
385	205	180	53	90
331	205	126	54	90
361	205	156	55	90
333	205	128	56	90
312	205	107	57	90
298	205	93	58	90
294	205	89	59	90
300	205	95	60	90
314	205	109	61	90
319	205	114	62	90
204	187	17	63	90
390	187	203	64	90
205	187	18	65	90
340	187	153	66	90
350	187	163	67	90
343	187	156	68	90
363	187	176	69	90
340	187	153	70	90
385	187	198	71	90
331	187	144	72	90
361	187	174	73	90
333	187	146	74	90
312	187	125	75	90
298	187	111	76	90
294	187	107	77	90
300	187	113	78	90
314	187	127	79	90
319	187	132	80	90
390	204	186	81	90
205	204	1	82	90
340	204	136	83	90
350	204	146	84	90
343	204	139	85	90
363	204	159	86	90
340	204	136	87	90
385	204	181	88	90
331	204	127	89	90

361	204	157	90	90
333	204	129	91	90
312	204	108	92	90
298	204	94	93	90
294	204	90	94	90
300	204	96	95	90
314	204	110	96	90
319	204	115	97	90
205	390	-185	97	91
340	390	-50	97	92
350	390	-40	97	93
343	390	-47	97	94
363	390	-27	97	95
340	390	-50	97	96
385	390	-5	97	97
331	390	-59	97	98
361	390	-29	97	99
333	390	-57	97	100
312	390	-78	97	101
298	390	-92	97	102
294	390	-96	97	103
300	390	-90	97	104
314	390	-76	97	105
319	390	-71	97	106
340	205	135	98	106
350	205	145	99	106
343	205	138	100	106
363	205	158	101	106
340	205	135	102	106
385	205	180	103	106
331	205	126	104	106
361	205	156	105	106
333	205	128	106	106
312	205	107	107	106
298	205	93	108	106
294	205	89	109	106
300	205	95	110	106
314	205	109	111	106
319	205	114	112	106
350	340	10	113	106
343	340	3	114	106
363	340	23	115	106
340	340	0	115	106
385	340	45	116	106
331	340	-9	116	107
361	340	21	117	107
333	340	-7	117	108
312	340	-28	117	109
298	340	-42	117	110
294	340	-46	117	111
300	340	-40	117	112
314	340	-26	117	113
319	340	-21	117	114
343	350	-7	117	115
363	350	13	118	115
340	350	-10	118	116
385	350	35	119	116
331	350	-19	119	117
361	350	11	120	117
333	350	-17	120	118
312	350	-38	120	119
298	350	-52	120	120
294	350	-56	120	121

300	350	-50	120	122
314	350	-36	120	123
319	350	-31	120	124
363	343	20	121	124
340	343	-3	121	125
385	343	42	122	125
331	343	-12	122	126
361	343	18	123	126
333	343	-10	123	127
312	343	-31	123	128
298	343	-45	123	129
294	343	-49	123	130
300	343	-43	123	131
314	343	-29	123	132
319	343	-24	123	133
340	363	-23	123	134
385	363	22	124	134
331	363	-32	124	135
361	363	-2	124	136
333	363	-30	124	137
312	363	-51	124	138
298	363	-65	124	139
294	363	-69	124	140
300	363	-63	124	141
314	363	-49	124	142
319	363	-44	124	143
385	340	45	125	143
331	340	-9	125	144
361	340	21	126	144
333	340	-7	126	145
312	340	-28	126	146
298	340	-42	126	147
294	340	-46	126	148
300	340	-40	126	149
314	340	-26	126	150
319	340	-21	126	151
331	385	-54	126	152
361	385	-24	126	153
333	385	-52	126	154
312	385	-73	126	155
298	385	-87	126	156
294	385	-91	126	157
300	385	-85	126	158
314	385	-71	126	159
319	385	-66	126	160
361	331	30	127	160
333	331	2	128	160
312	331	-19	128	161
298	331	-33	128	162
294	331	-37	128	163
300	331	-31	128	164
314	331	-17	128	165
319	331	-12	128	166
333	361	-28	128	167
312	361	-49	128	168
298	361	-63	128	169
294	361	-67	128	170
300	361	-61	128	171
314	361	-47	128	172
319	361	-42	128	173

312	333	-21	128	174
298	333	-35	128	175
294	333	-39	128	176
300	333	-33	128	177
314	333	-19	128	178
319	333	-14	128	179
298	312	-14	128	180
294	312	-18	128	181
300	312	-12	128	182
314	312	2	129	182
319	312	7	130	182
294	298	-4	130	183
300	298	2	131	183
314	298	16	132	183
319	298	21	133	183
300	294	6	134	183
314	294	20	135	183
319	294	25	136	183
314	300	14	137	183
319	300	19	138	183
319	314	5	139	183

S Statistic = 139 - 183 = -44

Tied Group	Value	Members
1	440	2
2	205	2
3	340	2

Time Period	Observations
3/12/2008	1
5/10/2008	1
9/22/2008	1
10/28/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 54
B = 0

C = 0
D = 0
E = 6
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2055.33
Z-Score = -0.948478
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.948478 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-03D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
220	200	20	1	0
440	200	240	2	0
480	200	280	3	0
446	200	246	4	0
440	200	240	5	0
205	200	5	6	0
187	200	-13	6	1
204	200	4	7	1
390	200	190	8	1
205	200	5	9	1
340	200	140	10	1
350	200	150	11	1
343	200	143	12	1
363	200	163	13	1
340	200	140	14	1
385	200	185	15	1
331	200	131	16	1
361	200	161	17	1
333	200	133	18	1
312	200	112	19	1
298	200	98	20	1
294	200	94	21	1
300	200	100	22	1
314	200	114	23	1
319	200	119	24	1
440	220	220	25	1
480	220	260	26	1
446	220	226	27	1
440	220	220	28	1
205	220	-15	28	2
187	220	-33	28	3
204	220	-16	28	4
390	220	170	29	4
205	220	-15	29	5
340	220	120	30	5
350	220	130	31	5
343	220	123	32	5
363	220	143	33	5
340	220	120	34	5
385	220	165	35	5
331	220	111	36	5
361	220	141	37	5
333	220	113	38	5
312	220	92	39	5
298	220	78	40	5
294	220	74	41	5
300	220	80	42	5
314	220	94	43	5
319	220	99	44	5
480	440	40	45	5
446	440	6	46	5
440	440	0	46	5
205	440	-235	46	6

187	440	-253	46	7
204	440	-236	46	8
390	440	-50	46	9
205	440	-235	46	10
340	440	-100	46	11
350	440	-90	46	12
343	440	-97	46	13
363	440	-77	46	14
340	440	-100	46	15
385	440	-55	46	16
331	440	-109	46	17
361	440	-79	46	18
333	440	-107	46	19
312	440	-128	46	20
298	440	-142	46	21
294	440	-146	46	22
300	440	-140	46	23
314	440	-126	46	24
319	440	-121	46	25
446	480	-34	46	26
440	480	-40	46	27
205	480	-275	46	28
187	480	-293	46	29
204	480	-276	46	30
390	480	-90	46	31
205	480	-275	46	32
340	480	-140	46	33
350	480	-130	46	34
343	480	-137	46	35
363	480	-117	46	36
340	480	-140	46	37
385	480	-95	46	38
331	480	-149	46	39
361	480	-119	46	40
333	480	-147	46	41
312	480	-168	46	42
298	480	-182	46	43
294	480	-186	46	44
300	480	-180	46	45
314	480	-166	46	46
319	480	-161	46	47
440	446	-6	46	48
205	446	-241	46	49
187	446	-259	46	50
204	446	-242	46	51
390	446	-56	46	52
205	446	-241	46	53
340	446	-106	46	54
350	446	-96	46	55
343	446	-103	46	56
363	446	-83	46	57
340	446	-106	46	58
385	446	-61	46	59
331	446	-115	46	60
361	446	-85	46	61
333	446	-113	46	62
312	446	-134	46	63
298	446	-148	46	64
294	446	-152	46	65
300	446	-146	46	66
314	446	-132	46	67
319	446	-127	46	68
205	440	-235	46	69
187	440	-253	46	70

204	440	-236	46	71
390	440	-50	46	72
205	440	-235	46	73
340	440	-100	46	74
350	440	-90	46	75
343	440	-97	46	76
363	440	-77	46	77
340	440	-100	46	78
385	440	-55	46	79
331	440	-109	46	80
361	440	-79	46	81
333	440	-107	46	82
312	440	-128	46	83
298	440	-142	46	84
294	440	-146	46	85
300	440	-140	46	86
314	440	-126	46	87
319	440	-121	46	88
187	205	-18	46	89
204	205	-1	46	90
390	205	185	47	90
205	205	0	47	90
340	205	135	48	90
350	205	145	49	90
343	205	138	50	90
363	205	158	51	90
340	205	135	52	90
385	205	180	53	90
331	205	126	54	90
361	205	156	55	90
333	205	128	56	90
312	205	107	57	90
298	205	93	58	90
294	205	89	59	90
300	205	95	60	90
314	205	109	61	90
319	205	114	62	90
204	187	17	63	90
390	187	203	64	90
205	187	18	65	90
340	187	153	66	90
350	187	163	67	90
343	187	156	68	90
363	187	176	69	90
340	187	153	70	90
385	187	198	71	90
331	187	144	72	90
361	187	174	73	90
333	187	146	74	90
312	187	125	75	90
298	187	111	76	90
294	187	107	77	90
300	187	113	78	90
314	187	127	79	90
319	187	132	80	90
390	204	186	81	90
205	204	1	82	90
340	204	136	83	90
350	204	146	84	90
343	204	139	85	90
363	204	159	86	90
340	204	136	87	90
385	204	181	88	90
331	204	127	89	90

361	204	157	90	90
333	204	129	91	90
312	204	108	92	90
298	204	94	93	90
294	204	90	94	90
300	204	96	95	90
314	204	110	96	90
319	204	115	97	90
205	390	-185	97	91
340	390	-50	97	92
350	390	-40	97	93
343	390	-47	97	94
363	390	-27	97	95
340	390	-50	97	96
385	390	-5	97	97
331	390	-59	97	98
361	390	-29	97	99
333	390	-57	97	100
312	390	-78	97	101
298	390	-92	97	102
294	390	-96	97	103
300	390	-90	97	104
314	390	-76	97	105
319	390	-71	97	106
340	205	135	98	106
350	205	145	99	106
343	205	138	100	106
363	205	158	101	106
340	205	135	102	106
385	205	180	103	106
331	205	126	104	106
361	205	156	105	106
333	205	128	106	106
312	205	107	107	106
298	205	93	108	106
294	205	89	109	106
300	205	95	110	106
314	205	109	111	106
319	205	114	112	106
350	340	10	113	106
343	340	3	114	106
363	340	23	115	106
340	340	0	115	106
385	340	45	116	106
331	340	-9	116	107
361	340	21	117	107
333	340	-7	117	108
312	340	-28	117	109
298	340	-42	117	110
294	340	-46	117	111
300	340	-40	117	112
314	340	-26	117	113
319	340	-21	117	114
343	350	-7	117	115
363	350	13	118	115
340	350	-10	118	116
385	350	35	119	116
331	350	-19	119	117
361	350	11	120	117
333	350	-17	120	118
312	350	-38	120	119
298	350	-52	120	120
294	350	-56	120	121

300	350	-50	120	122
314	350	-36	120	123
319	350	-31	120	124
363	343	20	121	124
340	343	-3	121	125
385	343	42	122	125
331	343	-12	122	126
361	343	18	123	126
333	343	-10	123	127
312	343	-31	123	128
298	343	-45	123	129
294	343	-49	123	130
300	343	-43	123	131
314	343	-29	123	132
319	343	-24	123	133
340	363	-23	123	134
385	363	22	124	134
331	363	-32	124	135
361	363	-2	124	136
333	363	-30	124	137
312	363	-51	124	138
298	363	-65	124	139
294	363	-69	124	140
300	363	-63	124	141
314	363	-49	124	142
319	363	-44	124	143
385	340	45	125	143
331	340	-9	125	144
361	340	21	126	144
333	340	-7	126	145
312	340	-28	126	146
298	340	-42	126	147
294	340	-46	126	148
300	340	-40	126	149
314	340	-26	126	150
319	340	-21	126	151
331	385	-54	126	152
361	385	-24	126	153
333	385	-52	126	154
312	385	-73	126	155
298	385	-87	126	156
294	385	-91	126	157
300	385	-85	126	158
314	385	-71	126	159
319	385	-66	126	160
361	331	30	127	160
333	331	2	128	160
312	331	-19	128	161
298	331	-33	128	162
294	331	-37	128	163
300	331	-31	128	164
314	331	-17	128	165
319	331	-12	128	166
333	361	-28	128	167
312	361	-49	128	168
298	361	-63	128	169
294	361	-67	128	170
300	361	-61	128	171
314	361	-47	128	172
319	361	-42	128	173

312	333	-21	128	174
298	333	-35	128	175
294	333	-39	128	176
300	333	-33	128	177
314	333	-19	128	178
319	333	-14	128	179
298	312	-14	128	180
294	312	-18	128	181
300	312	-12	128	182
314	312	2	129	182
319	312	7	130	182
294	298	-4	130	183
300	298	2	131	183
314	298	16	132	183
319	298	21	133	183
300	294	6	134	183
314	294	20	135	183
319	294	25	136	183
314	300	14	137	183
319	300	19	138	183
319	314	5	139	183

S Statistic = 139 - 183 = -44

Tied Group	Value	Members
1	440	2
2	205	2
3	340	2

Time Period	Observations
3/12/2008	1
5/10/2008	1
9/22/2008	1
10/28/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 54
B = 0

C = 0
D = 0
E = 6
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2055.33
Z-Score = -0.948478
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.948478 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-03D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
3960	4960	-1000	0	1
5680	4960	720	1	1
6620	4960	1660	2	1
7900	4960	2940	3	1
8600	4960	3640	4	1
4300	4960	-660	4	2
5300	4960	340	5	2
4400	4960	-560	5	3
4600	4960	-360	5	4
3800	4960	-1160	5	5
3500	4960	-1460	5	6
3600	4960	-1360	5	7
3700	4960	-1260	5	8
3500	4960	-1460	5	9
3500	4960	-1460	5	10
4000	4960	-960	5	11
3600	4960	-1360	5	12
3900	4960	-1060	5	13
4500	4960	-460	5	14
3300	4960	-1660	5	15
3800	4960	-1160	5	16
4400	4960	-560	5	17
4000	4960	-960	5	18
7000	4960	2040	6	18
3400	4960	-1560	6	19
5680	3960	1720	7	19
6620	3960	2660	8	19
7900	3960	3940	9	19
8600	3960	4640	10	19
4300	3960	340	11	19
5300	3960	1340	12	19
4400	3960	440	13	19
4600	3960	640	14	19
3800	3960	-160	14	20
3500	3960	-460	14	21
3600	3960	-360	14	22
3700	3960	-260	14	23
3500	3960	-460	14	24
3500	3960	-460	14	25
4000	3960	40	15	25
3600	3960	-360	15	26
3900	3960	-60	15	27
4500	3960	540	16	27
3300	3960	-660	16	28
3800	3960	-160	16	29
4400	3960	440	17	29
4000	3960	40	18	29
7000	3960	3040	19	29
3400	3960	-560	19	30
6620	5680	940	20	30
7900	5680	2220	21	30
8600	5680	2920	22	30
4300	5680	-1380	22	31

5300	5680	-380	22	32
4400	5680	-1280	22	33
4600	5680	-1080	22	34
3800	5680	-1880	22	35
3500	5680	-2180	22	36
3600	5680	-2080	22	37
3700	5680	-1980	22	38
3500	5680	-2180	22	39
3500	5680	-2180	22	40
4000	5680	-1680	22	41
3600	5680	-2080	22	42
3900	5680	-1780	22	43
4500	5680	-1180	22	44
3300	5680	-2380	22	45
3800	5680	-1880	22	46
4400	5680	-1280	22	47
4000	5680	-1680	22	48
7000	5680	1320	23	48
3400	5680	-2280	23	49
7900	6620	1280	24	49
8600	6620	1980	25	49
4300	6620	-2320	25	50
5300	6620	-1320	25	51
4400	6620	-2220	25	52
4600	6620	-2020	25	53
3800	6620	-2820	25	54
3500	6620	-3120	25	55
3600	6620	-3020	25	56
3700	6620	-2920	25	57
3500	6620	-3120	25	58
3500	6620	-3120	25	59
4000	6620	-2620	25	60
3600	6620	-3020	25	61
3900	6620	-2720	25	62
4500	6620	-2120	25	63
3300	6620	-3320	25	64
3800	6620	-2820	25	65
4400	6620	-2220	25	66
4000	6620	-2620	25	67
7000	6620	380	26	67
3400	6620	-3220	26	68
8600	7900	700	27	68
4300	7900	-3600	27	69
5300	7900	-2600	27	70
4400	7900	-3500	27	71
4600	7900	-3300	27	72
3800	7900	-4100	27	73
3500	7900	-4400	27	74
3600	7900	-4300	27	75
3700	7900	-4200	27	76
3500	7900	-4400	27	77
3500	7900	-4400	27	78
4000	7900	-3900	27	79
3600	7900	-4300	27	80
3900	7900	-4000	27	81
4500	7900	-3400	27	82
3300	7900	-4600	27	83
3800	7900	-4100	27	84
4400	7900	-3500	27	85
4000	7900	-3900	27	86
7000	7900	-900	27	87
3400	7900	-4500	27	88
4300	8600	-4300	27	89
5300	8600	-3300	27	90

4400	8600	-4200	27	91
4600	8600	-4000	27	92
3800	8600	-4800	27	93
3500	8600	-5100	27	94
3600	8600	-5000	27	95
3700	8600	-4900	27	96
3500	8600	-5100	27	97
3500	8600	-5100	27	98
4000	8600	-4600	27	99
3600	8600	-5000	27	100
3900	8600	-4700	27	101
4500	8600	-4100	27	102
3300	8600	-5300	27	103
3800	8600	-4800	27	104
4400	8600	-4200	27	105
4000	8600	-4600	27	106
7000	8600	-1600	27	107
3400	8600	-5200	27	108
5300	4300	1000	28	108
4400	4300	100	29	108
4600	4300	300	30	108
3800	4300	-500	30	109
3500	4300	-800	30	110
3600	4300	-700	30	111
3700	4300	-600	30	112
3500	4300	-800	30	113
3500	4300	-800	30	114
4000	4300	-300	30	115
3600	4300	-700	30	116
3900	4300	-400	30	117
4500	4300	200	31	117
3300	4300	-1000	31	118
3800	4300	-500	31	119
4400	4300	100	32	119
4000	4300	-300	32	120
7000	4300	2700	33	120
3400	4300	-900	33	121
4400	5300	-900	33	122
4600	5300	-700	33	123
3800	5300	-1500	33	124
3500	5300	-1800	33	125
3600	5300	-1700	33	126
3700	5300	-1600	33	127
3500	5300	-1800	33	128
3500	5300	-1800	33	129
4000	5300	-1300	33	130
3600	5300	-1700	33	131
3900	5300	-1400	33	132
4500	5300	-800	33	133
3300	5300	-2000	33	134
3800	5300	-1500	33	135
4400	5300	-900	33	136
4000	5300	-1300	33	137
7000	5300	1700	34	137
3400	5300	-1900	34	138
4600	4400	200	35	138
3800	4400	-600	35	139
3500	4400	-900	35	140
3600	4400	-800	35	141
3700	4400	-700	35	142
3500	4400	-900	35	143
3500	4400	-900	35	144
4000	4400	-400	35	145
3600	4400	-800	35	146

3900	4400	-500	35	147
4500	4400	100	36	147
3300	4400	-1100	36	148
3800	4400	-600	36	149
4400	4400	0	36	149
4000	4400	-400	36	150
7000	4400	2600	37	150
3400	4400	-1000	37	151
3800	4600	-800	37	152
3500	4600	-1100	37	153
3600	4600	-1000	37	154
3700	4600	-900	37	155
3500	4600	-1100	37	156
3500	4600	-1100	37	157
4000	4600	-600	37	158
3600	4600	-1000	37	159
3900	4600	-700	37	160
4500	4600	-100	37	161
3300	4600	-1300	37	162
3800	4600	-800	37	163
4400	4600	-200	37	164
4000	4600	-600	37	165
7000	4600	2400	38	165
3400	4600	-1200	38	166
3500	3800	-300	38	167
3600	3800	-200	38	168
3700	3800	-100	38	169
3500	3800	-300	38	170
3500	3800	-300	38	171
4000	3800	200	39	171
3600	3800	-200	39	172
3900	3800	100	40	172
4500	3800	700	41	172
3300	3800	-500	41	173
3800	3800	0	41	173
4400	3800	600	42	173
4000	3800	200	43	173
7000	3800	3200	44	173
3400	3800	-400	44	174
3600	3500	100	45	174
3700	3500	200	46	174
3500	3500	0	46	174
3500	3500	0	46	174
4000	3500	500	47	174
3600	3500	100	48	174
3900	3500	400	49	174
4500	3500	1000	50	174
3300	3500	-200	50	175
3800	3500	300	51	175
4400	3500	900	52	175
4000	3500	500	53	175
7000	3500	3500	54	175
3400	3500	-100	54	176
3700	3600	100	55	176
3500	3600	-100	55	177
3500	3600	-100	55	178
4000	3600	400	56	178
3600	3600	0	56	178
3900	3600	300	57	178
4500	3600	900	58	178
3300	3600	-300	58	179
3800	3600	200	59	179
4400	3600	800	60	179

4000	3600	400	61	179
7000	3600	3400	62	179
3400	3600	-200	62	180
3500	3700	-200	62	181
3500	3700	-200	62	182
4000	3700	300	63	182
3600	3700	-100	63	183
3900	3700	200	64	183
4500	3700	800	65	183
3300	3700	-400	65	184
3800	3700	100	66	184
4400	3700	700	67	184
4000	3700	300	68	184
7000	3700	3300	69	184
3400	3700	-300	69	185
3500	3500	0	69	185
4000	3500	500	70	185
3600	3500	100	71	185
3900	3500	400	72	185
4500	3500	1000	73	185
3300	3500	-200	73	186
3800	3500	300	74	186
4400	3500	900	75	186
4000	3500	500	76	186
7000	3500	3500	77	186
3400	3500	-100	77	187
4000	3500	500	78	187
3600	3500	100	79	187
3900	3500	400	80	187
4500	3500	1000	81	187
3300	3500	-200	81	188
3800	3500	300	82	188
4400	3500	900	83	188
4000	3500	500	84	188
7000	3500	3500	85	188
3400	3500	-100	85	189
3600	4000	-400	85	190
3900	4000	-100	85	191
4500	4000	500	86	191
3300	4000	-700	86	192
3800	4000	-200	86	193
4400	4000	400	87	193
4000	4000	0	87	193
7000	4000	3000	88	193
3400	4000	-600	88	194
3900	3600	300	89	194
4500	3600	900	90	194
3300	3600	-300	90	195
3800	3600	200	91	195
4400	3600	800	92	195
4000	3600	400	93	195
7000	3600	3400	94	195
3400	3600	-200	94	196
4500	3900	600	95	196
3300	3900	-600	95	197
3800	3900	-100	95	198
4400	3900	500	96	198
4000	3900	100	97	198
7000	3900	3100	98	198
3400	3900	-500	98	199

3300	4500	-1200	98	200
3800	4500	-700	98	201
4400	4500	-100	98	202
4000	4500	-500	98	203
7000	4500	2500	99	203
3400	4500	-1100	99	204
3800	3300	500	100	204
4400	3300	1100	101	204
4000	3300	700	102	204
7000	3300	3700	103	204
3400	3300	100	104	204
4400	3800	600	105	204
4000	3800	200	106	204
7000	3800	3200	107	204
3400	3800	-400	107	205
4000	4400	-400	107	206
7000	4400	2600	108	206
3400	4400	-1000	108	207
7000	4000	3000	109	207
3400	4000	-600	109	208
3400	7000	-3600	109	209

S Statistic = 109 - 209 = -100

Tied Group	Value	Members
1	4400	2
2	3800	2
3	3500	3
4	3600	2
5	4000	2

Time Period	Observations
3/12/2008	1
5/10/2008	1
9/22/2008	1
10/28/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 138
B = 0
C = 6
D = 0
E = 14
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2050.67
Z-Score = -2.18619
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-2.18619 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-04D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
570	530	40	1	0
890	530	360	2	0
920	530	390	3	0
950	530	420	4	0
864	530	334	5	0
506	530	-24	5	1
456	530	-74	5	2
486	530	-44	5	3
723	530	193	6	3
464	530	-66	6	4
622	530	92	7	4
593	530	63	8	4
575	530	45	9	4
561	530	31	10	4
546	530	16	11	4
550	530	20	12	4
593	530	63	13	4
592	530	62	14	4
505	530	-25	14	5
333	530	-197	14	6
0.6	530	-529.4	14	7
0.9	530	-529.1	14	8
0.6	530	-529.4	14	9
419	530	-111	14	10
420	530	-110	14	11
890	570	320	15	11
920	570	350	16	11
950	570	380	17	11
864	570	294	18	11
506	570	-64	18	12
456	570	-114	18	13
486	570	-84	18	14
723	570	153	19	14
464	570	-106	19	15
622	570	52	20	15
593	570	23	21	15
575	570	5	22	15
561	570	-9	22	16
546	570	-24	22	17
550	570	-20	22	18
593	570	23	23	18
592	570	22	24	18
505	570	-65	24	19
333	570	-237	24	20
0.6	570	-569.4	24	21
0.9	570	-569.1	24	22
0.6	570	-569.4	24	23
419	570	-151	24	24
420	570	-150	24	25
920	890	30	25	25
950	890	60	26	25
864	890	-26	26	26
506	890	-384	26	27

456	890	-434	26	28
486	890	-404	26	29
723	890	-167	26	30
464	890	-426	26	31
622	890	-268	26	32
593	890	-297	26	33
575	890	-315	26	34
561	890	-329	26	35
546	890	-344	26	36
550	890	-340	26	37
593	890	-297	26	38
592	890	-298	26	39
505	890	-385	26	40
333	890	-557	26	41
0.6	890	-889.4	26	42
0.9	890	-889.1	26	43
0.6	890	-889.4	26	44
419	890	-471	26	45
420	890	-470	26	46
950	920	30	27	46
864	920	-56	27	47
506	920	-414	27	48
456	920	-464	27	49
486	920	-434	27	50
723	920	-197	27	51
464	920	-456	27	52
622	920	-298	27	53
593	920	-327	27	54
575	920	-345	27	55
561	920	-359	27	56
546	920	-374	27	57
550	920	-370	27	58
593	920	-327	27	59
592	920	-328	27	60
505	920	-415	27	61
333	920	-587	27	62
0.6	920	-919.4	27	63
0.9	920	-919.1	27	64
0.6	920	-919.4	27	65
419	920	-501	27	66
420	920	-500	27	67
864	950	-86	27	68
506	950	-444	27	69
456	950	-494	27	70
486	950	-464	27	71
723	950	-227	27	72
464	950	-486	27	73
622	950	-328	27	74
593	950	-357	27	75
575	950	-375	27	76
561	950	-389	27	77
546	950	-404	27	78
550	950	-400	27	79
593	950	-357	27	80
592	950	-358	27	81
505	950	-445	27	82
333	950	-617	27	83
0.6	950	-949.4	27	84
0.9	950	-949.1	27	85
0.6	950	-949.4	27	86
419	950	-531	27	87
420	950	-530	27	88
506	864	-358	27	89
456	864	-408	27	90

486	864	-378	27	91
723	864	-141	27	92
464	864	-400	27	93
622	864	-242	27	94
593	864	-271	27	95
575	864	-289	27	96
561	864	-303	27	97
546	864	-318	27	98
550	864	-314	27	99
593	864	-271	27	100
592	864	-272	27	101
505	864	-359	27	102
333	864	-531	27	103
0.6	864	-863.4	27	104
0.9	864	-863.1	27	105
0.6	864	-863.4	27	106
419	864	-445	27	107
420	864	-444	27	108
456	506	-50	27	109
486	506	-20	27	110
723	506	217	28	110
464	506	-42	28	111
622	506	116	29	111
593	506	87	30	111
575	506	69	31	111
561	506	55	32	111
546	506	40	33	111
550	506	44	34	111
593	506	87	35	111
592	506	86	36	111
505	506	-1	36	112
333	506	-173	36	113
0.6	506	-505.4	36	114
0.9	506	-505.1	36	115
0.6	506	-505.4	36	116
419	506	-87	36	117
420	506	-86	36	118
486	456	30	37	118
723	456	267	38	118
464	456	8	39	118
622	456	166	40	118
593	456	137	41	118
575	456	119	42	118
561	456	105	43	118
546	456	90	44	118
550	456	94	45	118
593	456	137	46	118
592	456	136	47	118
505	456	49	48	118
333	456	-123	48	119
0.6	456	-455.4	48	120
0.9	456	-455.1	48	121
0.6	456	-455.4	48	122
419	456	-37	48	123
420	456	-36	48	124
723	486	237	49	124
464	486	-22	49	125
622	486	136	50	125
593	486	107	51	125
575	486	89	52	125
561	486	75	53	125
546	486	60	54	125
550	486	64	55	125
593	486	107	56	125

592	486	106	57	125
505	486	19	58	125
333	486	-153	58	126
0.6	486	-485.4	58	127
0.9	486	-485.1	58	128
0.6	486	-485.4	58	129
419	486	-67	58	130
420	486	-66	58	131
464	723	-259	58	132
622	723	-101	58	133
593	723	-130	58	134
575	723	-148	58	135
561	723	-162	58	136
546	723	-177	58	137
550	723	-173	58	138
593	723	-130	58	139
592	723	-131	58	140
505	723	-218	58	141
333	723	-390	58	142
0.6	723	-722.4	58	143
0.9	723	-722.1	58	144
0.6	723	-722.4	58	145
419	723	-304	58	146
420	723	-303	58	147
622	464	158	59	147
593	464	129	60	147
575	464	111	61	147
561	464	97	62	147
546	464	82	63	147
550	464	86	64	147
593	464	129	65	147
592	464	128	66	147
505	464	41	67	147
333	464	-131	67	148
0.6	464	-463.4	67	149
0.9	464	-463.1	67	150
0.6	464	-463.4	67	151
419	464	-45	67	152
420	464	-44	67	153
593	622	-29	67	154
575	622	-47	67	155
561	622	-61	67	156
546	622	-76	67	157
550	622	-72	67	158
593	622	-29	67	159
592	622	-30	67	160
505	622	-117	67	161
333	622	-289	67	162
0.6	622	-621.4	67	163
0.9	622	-621.1	67	164
0.6	622	-621.4	67	165
419	622	-203	67	166
420	622	-202	67	167
575	593	-18	67	168
561	593	-32	67	169
546	593	-47	67	170
550	593	-43	67	171
593	593	0	67	171
592	593	-1	67	172
505	593	-88	67	173
333	593	-260	67	174
0.6	593	-592.4	67	175
0.9	593	-592.1	67	176

0.6	593	-592.4	67	177
419	593	-174	67	178
420	593	-173	67	179
561	575	-14	67	180
546	575	-29	67	181
550	575	-25	67	182
593	575	18	68	182
592	575	17	69	182
505	575	-70	69	183
333	575	-242	69	184
0.6	575	-574.4	69	185
0.9	575	-574.1	69	186
0.6	575	-574.4	69	187
419	575	-156	69	188
420	575	-155	69	189
546	561	-15	69	190
550	561	-11	69	191
593	561	32	70	191
592	561	31	71	191
505	561	-56	71	192
333	561	-228	71	193
0.6	561	-560.4	71	194
0.9	561	-560.1	71	195
0.6	561	-560.4	71	196
419	561	-142	71	197
420	561	-141	71	198
550	546	4	72	198
593	546	47	73	198
592	546	46	74	198
505	546	-41	74	199
333	546	-213	74	200
0.6	546	-545.4	74	201
0.9	546	-545.1	74	202
0.6	546	-545.4	74	203
419	546	-127	74	204
420	546	-126	74	205
593	550	43	75	205
592	550	42	76	205
505	550	-45	76	206
333	550	-217	76	207
0.6	550	-549.4	76	208
0.9	550	-549.1	76	209
0.6	550	-549.4	76	210
419	550	-131	76	211
420	550	-130	76	212
592	593	-1	76	213
505	593	-88	76	214
333	593	-260	76	215
0.6	593	-592.4	76	216
0.9	593	-592.1	76	217
0.6	593	-592.4	76	218
419	593	-174	76	219
420	593	-173	76	220
505	592	-87	76	221
333	592	-259	76	222
0.6	592	-591.4	76	223
0.9	592	-591.1	76	224
0.6	592	-591.4	76	225
419	592	-173	76	226
420	592	-172	76	227

333	505	-172	76	228
0.6	505	-504.4	76	229
0.9	505	-504.1	76	230
0.6	505	-504.4	76	231
419	505	-86	76	232
420	505	-85	76	233
0.6	333	-332.4	76	234
0.9	333	-332.1	76	235
0.6	333	-332.4	76	236
419	333	86	77	236
420	333	87	78	236
0.9	0.6	0.3	79	236
0.6	0.6	0	79	236
419	0.6	418.4	80	236
420	0.6	419.4	81	236
0.6	0.9	-0.3	81	237
419	0.9	418.1	82	237
420	0.9	419.1	83	237
419	0.6	418.4	84	237
420	0.6	419.4	85	237
420	419	1	86	237

S Statistic = 86 - 237 = -151

Tied Group	Value	Members
1	593	2
2	0.6	2

Time Period	Observations
3/11/2008	1
5/10/2008	1
9/22/2008	1
12/3/2008	1
4/28/2009	1
5/15/2009	1
9/23/2009	1
12/7/2009	1
2/24/2010	1
4/16/2010	1
8/11/2010	1
11/22/2010	1
3/8/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 36
B = 0
C = 0

D = 0
E = 4
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2056.33
Z-Score = -3.30784
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-3.30784 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-04D

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
4700	5110	-410	0	1
8000	5110	2890	1	1
7470	5110	2360	2	1
12000	5110	6890	3	1
13000	5110	7890	4	1
6500	5110	1390	5	1
7200	5110	2090	6	1
5900	5110	790	7	1
5000	5110	-110	7	2
4800	5110	-310	7	3
4200	5110	-910	7	4
3900	5110	-1210	7	5
4000	5110	-1110	7	6
3900	5110	-1210	7	7
3700	5110	-1410	7	8
3900	5110	-1210	7	9
5000	5110	-110	7	10
5500	5110	390	8	10
5400	5110	290	9	10
3000	5110	-2110	9	11
9.8	5110	-5100.2	9	12
30	5110	-5080	9	13
12	5110	-5098	9	14
4600	5110	-510	9	15
2800	5110	-2310	9	16
8000	4700	3300	10	16
7470	4700	2770	11	16
12000	4700	7300	12	16
13000	4700	8300	13	16
6500	4700	1800	14	16
7200	4700	2500	15	16
5900	4700	1200	16	16
5000	4700	300	17	16
4800	4700	100	18	16
4200	4700	-500	18	17
3900	4700	-800	18	18
4000	4700	-700	18	19
3900	4700	-800	18	20
3700	4700	-1000	18	21
3900	4700	-800	18	22
5000	4700	300	19	22
5500	4700	800	20	22
5400	4700	700	21	22
3000	4700	-1700	21	23
9.8	4700	-4690.2	21	24
30	4700	-4670	21	25
12	4700	-4688	21	26
4600	4700	-100	21	27
2800	4700	-1900	21	28
7470	8000	-530	21	29
12000	8000	4000	22	29
13000	8000	5000	23	29
6500	8000	-1500	23	30

7200	8000	-800	23	31
5900	8000	-2100	23	32
5000	8000	-3000	23	33
4800	8000	-3200	23	34
4200	8000	-3800	23	35
3900	8000	-4100	23	36
4000	8000	-4000	23	37
3900	8000	-4100	23	38
3700	8000	-4300	23	39
3900	8000	-4100	23	40
5000	8000	-3000	23	41
5500	8000	-2500	23	42
5400	8000	-2600	23	43
3000	8000	-5000	23	44
9.8	8000	-7990.2	23	45
30	8000	-7970	23	46
12	8000	-7988	23	47
4600	8000	-3400	23	48
2800	8000	-5200	23	49
12000	7470	4530	24	49
13000	7470	5530	25	49
6500	7470	-970	25	50
7200	7470	-270	25	51
5900	7470	-1570	25	52
5000	7470	-2470	25	53
4800	7470	-2670	25	54
4200	7470	-3270	25	55
3900	7470	-3570	25	56
4000	7470	-3470	25	57
3900	7470	-3570	25	58
3700	7470	-3770	25	59
3900	7470	-3570	25	60
5000	7470	-2470	25	61
5500	7470	-1970	25	62
5400	7470	-2070	25	63
3000	7470	-4470	25	64
9.8	7470	-7460.2	25	65
30	7470	-7440	25	66
12	7470	-7458	25	67
4600	7470	-2870	25	68
2800	7470	-4670	25	69
13000	12000	1000	26	69
6500	12000	-5500	26	70
7200	12000	-4800	26	71
5900	12000	-6100	26	72
5000	12000	-7000	26	73
4800	12000	-7200	26	74
4200	12000	-7800	26	75
3900	12000	-8100	26	76
4000	12000	-8000	26	77
3900	12000	-8100	26	78
3700	12000	-8300	26	79
3900	12000	-8100	26	80
5000	12000	-7000	26	81
5500	12000	-6500	26	82
5400	12000	-6600	26	83
3000	12000	-9000	26	84
9.8	12000	-11990.2	26	85
30	12000	-11970	26	86
12	12000	-11988	26	87
4600	12000	-7400	26	88
2800	12000	-9200	26	89
6500	13000	-6500	26	90
7200	13000	-5800	26	91

5900	13000	-7100	26	92
5000	13000	-8000	26	93
4800	13000	-8200	26	94
4200	13000	-8800	26	95
3900	13000	-9100	26	96
4000	13000	-9000	26	97
3900	13000	-9100	26	98
3700	13000	-9300	26	99
3900	13000	-9100	26	100
5000	13000	-8000	26	101
5500	13000	-7500	26	102
5400	13000	-7600	26	103
3000	13000	-10000	26	104
9.8	13000	-12990.2	26	105
30	13000	-12970	26	106
12	13000	-12988	26	107
4600	13000	-8400	26	108
2800	13000	-10200	26	109
7200	6500	700	27	109
5900	6500	-600	27	110
5000	6500	-1500	27	111
4800	6500	-1700	27	112
4200	6500	-2300	27	113
3900	6500	-2600	27	114
4000	6500	-2500	27	115
3900	6500	-2600	27	116
3700	6500	-2800	27	117
3900	6500	-2600	27	118
5000	6500	-1500	27	119
5500	6500	-1000	27	120
5400	6500	-1100	27	121
3000	6500	-3500	27	122
9.8	6500	-6490.2	27	123
30	6500	-6470	27	124
12	6500	-6488	27	125
4600	6500	-1900	27	126
2800	6500	-3700	27	127
5900	7200	-1300	27	128
5000	7200	-2200	27	129
4800	7200	-2400	27	130
4200	7200	-3000	27	131
3900	7200	-3300	27	132
4000	7200	-3200	27	133
3900	7200	-3300	27	134
3700	7200	-3500	27	135
3900	7200	-3300	27	136
5000	7200	-2200	27	137
5500	7200	-1700	27	138
5400	7200	-1800	27	139
3000	7200	-4200	27	140
9.8	7200	-7190.2	27	141
30	7200	-7170	27	142
12	7200	-7188	27	143
4600	7200	-2600	27	144
2800	7200	-4400	27	145
5000	5900	-900	27	146
4800	5900	-1100	27	147
4200	5900	-1700	27	148
3900	5900	-2000	27	149
4000	5900	-1900	27	150
3900	5900	-2000	27	151
3700	5900	-2200	27	152
3900	5900	-2000	27	153
5000	5900	-900	27	154

5500	5900	-400	27	155
5400	5900	-500	27	156
3000	5900	-2900	27	157
9.8	5900	-5890.2	27	158
30	5900	-5870	27	159
12	5900	-5888	27	160
4600	5900	-1300	27	161
2800	5900	-3100	27	162
4800	5000	-200	27	163
4200	5000	-800	27	164
3900	5000	-1100	27	165
4000	5000	-1000	27	166
3900	5000	-1100	27	167
3700	5000	-1300	27	168
3900	5000	-1100	27	169
5000	5000	0	27	169
5500	5000	500	28	169
5400	5000	400	29	169
3000	5000	-2000	29	170
9.8	5000	-4990.2	29	171
30	5000	-4970	29	172
12	5000	-4988	29	173
4600	5000	-400	29	174
2800	5000	-2200	29	175
4200	4800	-600	29	176
3900	4800	-900	29	177
4000	4800	-800	29	178
3900	4800	-900	29	179
3700	4800	-1100	29	180
3900	4800	-900	29	181
5000	4800	200	30	181
5500	4800	700	31	181
5400	4800	600	32	181
3000	4800	-1800	32	182
9.8	4800	-4790.2	32	183
30	4800	-4770	32	184
12	4800	-4788	32	185
4600	4800	-200	32	186
2800	4800	-2000	32	187
3900	4200	-300	32	188
4000	4200	-200	32	189
3900	4200	-300	32	190
3700	4200	-500	32	191
3900	4200	-300	32	192
5000	4200	800	33	192
5500	4200	1300	34	192
5400	4200	1200	35	192
3000	4200	-1200	35	193
9.8	4200	-4190.2	35	194
30	4200	-4170	35	195
12	4200	-4188	35	196
4600	4200	400	36	196
2800	4200	-1400	36	197
4000	3900	100	37	197
3900	3900	0	37	197
3700	3900	-200	37	198
3900	3900	0	37	198
5000	3900	1100	38	198
5500	3900	1600	39	198
5400	3900	1500	40	198
3000	3900	-900	40	199
9.8	3900	-3890.2	40	200
30	3900	-3870	40	201

12	3900	-3888	40	202
4600	3900	700	41	202
2800	3900	-1100	41	203
3900	4000	-100	41	204
3700	4000	-300	41	205
3900	4000	-100	41	206
5000	4000	1000	42	206
5500	4000	1500	43	206
5400	4000	1400	44	206
3000	4000	-1000	44	207
9.8	4000	-3990.2	44	208
30	4000	-3970	44	209
12	4000	-3988	44	210
4600	4000	600	45	210
2800	4000	-1200	45	211
3700	3900	-200	45	212
3900	3900	0	45	212
5000	3900	1100	46	212
5500	3900	1600	47	212
5400	3900	1500	48	212
3000	3900	-900	48	213
9.8	3900	-3890.2	48	214
30	3900	-3870	48	215
12	3900	-3888	48	216
4600	3900	700	49	216
2800	3900	-1100	49	217
3900	3700	200	50	217
5000	3700	1300	51	217
5500	3700	1800	52	217
5400	3700	1700	53	217
3000	3700	-700	53	218
9.8	3700	-3690.2	53	219
30	3700	-3670	53	220
12	3700	-3688	53	221
4600	3700	900	54	221
2800	3700	-900	54	222
5000	3900	1100	55	222
5500	3900	1600	56	222
5400	3900	1500	57	222
3000	3900	-900	57	223
9.8	3900	-3890.2	57	224
30	3900	-3870	57	225
12	3900	-3888	57	226
4600	3900	700	58	226
2800	3900	-1100	58	227
5500	5000	500	59	227
5400	5000	400	60	227
3000	5000	-2000	60	228
9.8	5000	-4990.2	60	229
30	5000	-4970	60	230
12	5000	-4988	60	231
4600	5000	-400	60	232
2800	5000	-2200	60	233
5400	5500	-100	60	234
3000	5500	-2500	60	235
9.8	5500	-5490.2	60	236
30	5500	-5470	60	237
12	5500	-5488	60	238
4600	5500	-900	60	239
2800	5500	-2700	60	240

3000	5400	-2400	60	241
9.8	5400	-5390.2	60	242
30	5400	-5370	60	243
12	5400	-5388	60	244
4600	5400	-800	60	245
2800	5400	-2600	60	246
9.8	3000	-2990.2	60	247
30	3000	-2970	60	248
12	3000	-2988	60	249
4600	3000	1600	61	249
2800	3000	-200	61	250
30	9.8	20.2	62	250
12	9.8	2.2	63	250
4600	9.8	4590.2	64	250
2800	9.8	2790.2	65	250
12	30	-18	65	251
4600	30	4570	66	251
2800	30	2770	67	251
4600	12	4588	68	251
2800	12	2788	69	251
2800	4600	-1800	69	252

S Statistic = 69 - 252 = -183

Tied Group	Value	Members
1	5000	2
2	3900	3

Time Period	Observations
3/11/2008	1
5/10/2008	1
9/22/2008	1
12/3/2008	1
4/28/2009	1
5/15/2009	1
9/23/2009	1
12/7/2009	1
2/24/2010	1
4/16/2010	1
8/11/2010	1
11/22/2010	1
3/8/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 84
B = 0
C = 6

D = 0
E = 8
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2053.67
Z-Score = -4.01612
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-4.01612 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-05

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2.03	0.883	1.147	1	0
ND<0	0.883	-0.883	1	1
ND<0	0.883	-0.883	1	2
ND<0	0.883	-0.883	1	3
ND<0	0.883	-0.883	1	4
ND<0	0.883	-0.883	1	5
ND<0	0.883	-0.883	1	6
0.4	0.883	-0.483	1	7
0.4	0.883	-0.483	1	8
ND<0	0.883	-0.883	1	9
1.1	0.883	0.217	2	9
0.4	0.883	-0.483	2	10
0.1	0.883	-0.783	2	11
ND<0	0.883	-0.883	2	12
ND<0	0.883	-0.883	2	13
ND<0	0.883	-0.883	2	14
ND<0	0.883	-0.883	2	15
ND<0	2.03	-2.03	2	16
ND<0	2.03	-2.03	2	17
ND<0	2.03	-2.03	2	18
ND<0	2.03	-2.03	2	19
ND<0	2.03	-2.03	2	20
ND<0	2.03	-2.03	2	21
0.4	2.03	-1.63	2	22
0.4	2.03	-1.63	2	23
ND<0	2.03	-2.03	2	24
1.1	2.03	-0.93	2	25
0.4	2.03	-1.63	2	26
0.1	2.03	-1.93	2	27
ND<0	2.03	-2.03	2	28
ND<0	2.03	-2.03	2	29
ND<0	2.03	-2.03	2	30
ND<0	2.03	-2.03	2	31
ND<0	ND<0	0	2	31
ND<0	ND<0	0	2	31
ND<0	ND<0	0	2	31
ND<0	ND<0	0	2	31
ND<0	ND<0	0	2	31
0.4	ND<0	0.4	3	31
0.4	ND<0	0.4	4	31
ND<0	ND<0	0	4	31
1.1	ND<0	1.1	5	31
0.4	ND<0	0.4	6	31
0.1	ND<0	0.1	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31

0.4	ND<0	0.4	8	31
0.4	ND<0	0.4	9	31
ND<0	ND<0	0	9	31
1.1	ND<0	1.1	10	31
0.4	ND<0	0.4	11	31
0.1	ND<0	0.1	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
0.4	ND<0	0.4	13	31
0.4	ND<0	0.4	14	31
ND<0	ND<0	0	14	31
1.1	ND<0	1.1	15	31
0.4	ND<0	0.4	16	31
0.1	ND<0	0.1	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
0.4	ND<0	0.4	18	31
0.4	ND<0	0.4	19	31
ND<0	ND<0	0	19	31
1.1	ND<0	1.1	20	31
0.4	ND<0	0.4	21	31
0.1	ND<0	0.1	22	31
ND<0	ND<0	0	22	31
ND<0	ND<0	0	22	31
ND<0	ND<0	0	22	31
ND<0	ND<0	0	22	31
ND<0	ND<0	0	22	31
0.4	ND<0	0.4	23	31
0.4	ND<0	0.4	24	31
ND<0	ND<0	0	24	31
1.1	ND<0	1.1	25	31
0.4	ND<0	0.4	26	31
0.1	ND<0	0.1	27	31
ND<0	ND<0	0	27	31
ND<0	ND<0	0	27	31
ND<0	ND<0	0	27	31
ND<0	ND<0	0	27	31
0.4	ND<0	0.4	28	31
0.4	ND<0	0.4	29	31
ND<0	ND<0	0	29	31
1.1	ND<0	1.1	30	31
0.4	ND<0	0.4	31	31
0.1	ND<0	0.1	32	31
ND<0	ND<0	0	32	31
ND<0	ND<0	0	32	31
ND<0	ND<0	0	32	31
ND<0	ND<0	0	32	31
0.4	0.4	0	32	31
ND<0	0.4	-0.4	32	32
1.1	0.4	0.7	33	32
0.4	0.4	0	33	32
0.1	0.4	-0.3	33	33
ND<0	0.4	-0.4	33	34

ND<0	0.4	-0.4	33	35
ND<0	0.4	-0.4	33	36
ND<0	0.4	-0.4	33	37
ND<0	0.4	-0.4	33	38
1.1	0.4	0.7	34	38
0.4	0.4	0	34	38
0.1	0.4	-0.3	34	39
ND<0	0.4	-0.4	34	40
ND<0	0.4	-0.4	34	41
ND<0	0.4	-0.4	34	42
ND<0	0.4	-0.4	34	43
1.1	ND<0	1.1	35	43
0.4	ND<0	0.4	36	43
0.1	ND<0	0.1	37	43
ND<0	ND<0	0	37	43
ND<0	ND<0	0	37	43
ND<0	ND<0	0	37	43
ND<0	ND<0	0	37	43
0.4	1.1	-0.7	37	44
0.1	1.1	-1	37	45
ND<0	1.1	-1.1	37	46
ND<0	1.1	-1.1	37	47
ND<0	1.1	-1.1	37	48
ND<0	1.1	-1.1	37	49
0.1	0.4	-0.3	37	50
ND<0	0.4	-0.4	37	51
ND<0	0.4	-0.4	37	52
ND<0	0.4	-0.4	37	53
ND<0	0.4	-0.4	37	54
ND<0	0.1	-0.1	37	55
ND<0	0.1	-0.1	37	56
ND<0	0.1	-0.1	37	57
ND<0	0.1	-0.1	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58

S Statistic = 37 - 58 = -21

Tied Group	Value	Members
1	0	11
2	0.4	3

Time Period	Observations
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1

11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 3036
B = 0
C = 996
D = 0
E = 116
F = 0
a = 12546
b = 44064
c = 612
Group Variance = 528.333
Z-Score = -0.870114
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.870114 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-05

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2.03	0.883	1.147	1	0
ND<0	0.883	-0.883	1	1
ND<0	0.883	-0.883	1	2
ND<0	0.883	-0.883	1	3
ND<0	0.883	-0.883	1	4
ND<0	0.883	-0.883	1	5
ND<0	0.883	-0.883	1	6
0.4	0.883	-0.483	1	7
0.4	0.883	-0.483	1	8
ND<0	0.883	-0.883	1	9
1.1	0.883	0.217	2	9
0.4	0.883	-0.483	2	10
0.1	0.883	-0.783	2	11
ND<0	0.883	-0.883	2	12
ND<0	0.883	-0.883	2	13
ND<0	0.883	-0.883	2	14
ND<0	0.883	-0.883	2	15
ND<0	2.03	-2.03	2	16
ND<0	2.03	-2.03	2	17
ND<0	2.03	-2.03	2	18
ND<0	2.03	-2.03	2	19
ND<0	2.03	-2.03	2	20
ND<0	2.03	-2.03	2	21
0.4	2.03	-1.63	2	22
0.4	2.03	-1.63	2	23
ND<0	2.03	-2.03	2	24
1.1	2.03	-0.93	2	25
0.4	2.03	-1.63	2	26
0.1	2.03	-1.93	2	27
ND<0	2.03	-2.03	2	28
ND<0	2.03	-2.03	2	29
ND<0	2.03	-2.03	2	30
ND<0	2.03	-2.03	2	31
ND<0	ND<0	0	2	31
ND<0	ND<0	0	2	31
ND<0	ND<0	0	2	31
ND<0	ND<0	0	2	31
ND<0	ND<0	0	2	31
0.4	ND<0	0.4	3	31
0.4	ND<0	0.4	4	31
ND<0	ND<0	0	4	31
1.1	ND<0	1.1	5	31
0.4	ND<0	0.4	6	31
0.1	ND<0	0.1	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31
ND<0	ND<0	0	7	31

0.4	ND<0	0.4	8	31
0.4	ND<0	0.4	9	31
ND<0	ND<0	0	9	31
1.1	ND<0	1.1	10	31
0.4	ND<0	0.4	11	31
0.1	ND<0	0.1	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
ND<0	ND<0	0	12	31
0.4	ND<0	0.4	13	31
0.4	ND<0	0.4	14	31
ND<0	ND<0	0	14	31
1.1	ND<0	1.1	15	31
0.4	ND<0	0.4	16	31
0.1	ND<0	0.1	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
ND<0	ND<0	0	17	31
0.4	ND<0	0.4	18	31
0.4	ND<0	0.4	19	31
ND<0	ND<0	0	19	31
1.1	ND<0	1.1	20	31
0.4	ND<0	0.4	21	31
0.1	ND<0	0.1	22	31
ND<0	ND<0	0	22	31
ND<0	ND<0	0	22	31
ND<0	ND<0	0	22	31
ND<0	ND<0	0	22	31
ND<0	ND<0	0	22	31
0.4	ND<0	0.4	23	31
0.4	ND<0	0.4	24	31
ND<0	ND<0	0	24	31
1.1	ND<0	1.1	25	31
0.4	ND<0	0.4	26	31
0.1	ND<0	0.1	27	31
ND<0	ND<0	0	27	31
ND<0	ND<0	0	27	31
ND<0	ND<0	0	27	31
ND<0	ND<0	0	27	31
0.4	ND<0	0.4	28	31
0.4	ND<0	0.4	29	31
ND<0	ND<0	0	29	31
1.1	ND<0	1.1	30	31
0.4	ND<0	0.4	31	31
0.1	ND<0	0.1	32	31
ND<0	ND<0	0	32	31
ND<0	ND<0	0	32	31
ND<0	ND<0	0	32	31
ND<0	ND<0	0	32	31
0.4	0.4	0	32	31
ND<0	0.4	-0.4	32	32
1.1	0.4	0.7	33	32
0.4	0.4	0	33	32
0.1	0.4	-0.3	33	33
ND<0	0.4	-0.4	33	34

ND<0	0.4	-0.4	33	35
ND<0	0.4	-0.4	33	36
ND<0	0.4	-0.4	33	37
ND<0	0.4	-0.4	33	38
1.1	0.4	0.7	34	38
0.4	0.4	0	34	38
0.1	0.4	-0.3	34	39
ND<0	0.4	-0.4	34	40
ND<0	0.4	-0.4	34	41
ND<0	0.4	-0.4	34	42
ND<0	0.4	-0.4	34	43
1.1	ND<0	1.1	35	43
0.4	ND<0	0.4	36	43
0.1	ND<0	0.1	37	43
ND<0	ND<0	0	37	43
ND<0	ND<0	0	37	43
ND<0	ND<0	0	37	43
ND<0	ND<0	0	37	43
0.4	1.1	-0.7	37	44
0.1	1.1	-1	37	45
ND<0	1.1	-1.1	37	46
ND<0	1.1	-1.1	37	47
ND<0	1.1	-1.1	37	48
ND<0	1.1	-1.1	37	49
0.1	0.4	-0.3	37	50
ND<0	0.4	-0.4	37	51
ND<0	0.4	-0.4	37	52
ND<0	0.4	-0.4	37	53
ND<0	0.4	-0.4	37	54
ND<0	0.1	-0.1	37	55
ND<0	0.1	-0.1	37	56
ND<0	0.1	-0.1	37	57
ND<0	0.1	-0.1	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58
ND<0	ND<0	0	37	58

S Statistic = 37 - 58 = -21

Tied Group	Value	Members
1	0	11
2	0.4	3

Time Period	Observations
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1

11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 3036
B = 0
C = 996
D = 0
E = 116
F = 0
a = 12546
b = 44064
c = 612
Group Variance = 528.333
Z-Score = -0.870114
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.870114 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-05

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2600	2400	200	1	0
2600	2400	200	2	0
2500	2400	100	3	0
2500	2400	100	4	0
2500	2400	100	5	0
2600	2400	200	6	0
1400	2400	-1000	6	1
1700	2400	-700	6	2
1500	2400	-900	6	3
1100	2400	-1300	6	4
790	2400	-1610	6	5
640	2400	-1760	6	6
530	2400	-1870	6	7
460	2400	-1940	6	8
500	2400	-1900	6	9
500	2400	-1900	6	10
900	2400	-1500	6	11
2600	2600	0	6	11
2500	2600	-100	6	12
2500	2600	-100	6	13
2500	2600	-100	6	14
2600	2600	0	6	14
1400	2600	-1200	6	15
1700	2600	-900	6	16
1500	2600	-1100	6	17
1100	2600	-1500	6	18
790	2600	-1810	6	19
640	2600	-1960	6	20
530	2600	-2070	6	21
460	2600	-2140	6	22
500	2600	-2100	6	23
500	2600	-2100	6	24
900	2600	-1700	6	25
2500	2600	-100	6	26
2500	2600	-100	6	27
2500	2600	-100	6	28
2600	2600	0	6	28
1400	2600	-1200	6	29
1700	2600	-900	6	30
1500	2600	-1100	6	31
1100	2600	-1500	6	32
790	2600	-1810	6	33
640	2600	-1960	6	34
530	2600	-2070	6	35
460	2600	-2140	6	36
500	2600	-2100	6	37
500	2600	-2100	6	38
900	2600	-1700	6	39
2500	2500	0	6	39
2500	2500	0	6	39
2600	2500	100	7	39
1400	2500	-1100	7	40

1700	2500	-800	7	41
1500	2500	-1000	7	42
1100	2500	-1400	7	43
790	2500	-1710	7	44
640	2500	-1860	7	45
530	2500	-1970	7	46
460	2500	-2040	7	47
500	2500	-2000	7	48
500	2500	-2000	7	49
900	2500	-1600	7	50
2500	2500	0	7	50
2600	2500	100	8	50
1400	2500	-1100	8	51
1700	2500	-800	8	52
1500	2500	-1000	8	53
1100	2500	-1400	8	54
790	2500	-1710	8	55
640	2500	-1860	8	56
530	2500	-1970	8	57
460	2500	-2040	8	58
500	2500	-2000	8	59
500	2500	-2000	8	60
900	2500	-1600	8	61
2600	2500	100	9	61
1400	2500	-1100	9	62
1700	2500	-800	9	63
1500	2500	-1000	9	64
1100	2500	-1400	9	65
790	2500	-1710	9	66
640	2500	-1860	9	67
530	2500	-1970	9	68
460	2500	-2040	9	69
500	2500	-2000	9	70
500	2500	-2000	9	71
900	2500	-1600	9	72
1400	2600	-1200	9	73
1700	2600	-900	9	74
1500	2600	-1100	9	75
1100	2600	-1500	9	76
790	2600	-1810	9	77
640	2600	-1960	9	78
530	2600	-2070	9	79
460	2600	-2140	9	80
500	2600	-2100	9	81
500	2600	-2100	9	82
900	2600	-1700	9	83
1700	1400	300	10	83
1500	1400	100	11	83
1100	1400	-300	11	84
790	1400	-610	11	85
640	1400	-760	11	86
530	1400	-870	11	87
460	1400	-940	11	88
500	1400	-900	11	89
500	1400	-900	11	90
900	1400	-500	11	91
1500	1700	-200	11	92
1100	1700	-600	11	93
790	1700	-910	11	94
640	1700	-1060	11	95
530	1700	-1170	11	96
460	1700	-1240	11	97

500	1700	-1200	11	98
500	1700	-1200	11	99
900	1700	-800	11	100
1100	1500	-400	11	101
790	1500	-710	11	102
640	1500	-860	11	103
530	1500	-970	11	104
460	1500	-1040	11	105
500	1500	-1000	11	106
500	1500	-1000	11	107
900	1500	-600	11	108
790	1100	-310	11	109
640	1100	-460	11	110
530	1100	-570	11	111
460	1100	-640	11	112
500	1100	-600	11	113
500	1100	-600	11	114
900	1100	-200	11	115
640	790	-150	11	116
530	790	-260	11	117
460	790	-330	11	118
500	790	-290	11	119
500	790	-290	11	120
900	790	110	12	120
530	640	-110	12	121
460	640	-180	12	122
500	640	-140	12	123
500	640	-140	12	124
900	640	260	13	124
460	530	-70	13	125
500	530	-30	13	126
500	530	-30	13	127
900	530	370	14	127
500	460	40	15	127
500	460	40	16	127
900	460	440	17	127
500	500	0	17	127
900	500	400	18	127
900	500	400	19	127

S Statistic = 19 - 127 = -108

Tied Group	Value	Members
1	2600	3
2	2500	3
3	500	2

Time Period	Observations
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1

4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 150
B = 0
C = 12
D = 0
E = 14
F = 0
a = 12546
b = 44064
c = 612
Group Variance = 688.667
Z-Score = -4.07736
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-4.07736 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: OW-01A

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
1	1.8	-0.8	0	1
1.1	1.8	-0.7	0	2
0.9	1.8	-0.9	0	3
1	1.8	-0.8	0	4
0.9	1.8	-0.9	0	5
0.9	1.8	-0.9	0	6
0.9	1.8	-0.9	0	7
1	1.8	-0.8	0	8
1.1	1.8	-0.7	0	9
1	1.8	-0.8	0	10
0.8	1.8	-1	0	11
0.7	1.8	-1.1	0	12
0.7	1.8	-1.1	0	13
0.7	1.8	-1.1	0	14
0.6	1.8	-1.2	0	15
0.9	1.8	-0.9	0	16
0.8	1.8	-1	0	17
0.7	1.8	-1.1	0	18
0.7	1.8	-1.1	0	19
0.5	1.8	-1.3	0	20
0.8	1.8	-1	0	21
0.8	1.8	-1	0	22
0.7	1.8	-1.1	0	23
0.572	1.8	-1.228	0	24
0.587	1.8	-1.213	0	25
1.1	1	0.1	1	25
0.9	1	-0.1	1	26
1	1	0	1	26
0.9	1	-0.1	1	27
0.9	1	-0.1	1	28
0.9	1	-0.1	1	29
1	1	0	1	29
1.1	1	0.1	2	29
1	1	0	2	29
0.8	1	-0.2	2	30
0.7	1	-0.3	2	31
0.7	1	-0.3	2	32
0.7	1	-0.3	2	33
0.6	1	-0.4	2	34
0.9	1	-0.1	2	35
0.8	1	-0.2	2	36
0.7	1	-0.3	2	37
0.7	1	-0.3	2	38
0.5	1	-0.5	2	39
0.8	1	-0.2	2	40
0.8	1	-0.2	2	41
0.7	1	-0.3	2	42
0.572	1	-0.428	2	43
0.587	1	-0.413	2	44
0.9	1.1	-0.2	2	45
1	1.1	-0.1	2	46
0.9	1.1	-0.2	2	47
0.9	1.1	-0.2	2	48

0.9	1.1	-0.2	2	49
1	1.1	-0.1	2	50
1.1	1.1	0	2	50
1	1.1	-0.1	2	51
0.8	1.1	-0.3	2	52
0.7	1.1	-0.4	2	53
0.7	1.1	-0.4	2	54
0.7	1.1	-0.4	2	55
0.6	1.1	-0.5	2	56
0.9	1.1	-0.2	2	57
0.8	1.1	-0.3	2	58
0.7	1.1	-0.4	2	59
0.7	1.1	-0.4	2	60
0.5	1.1	-0.6	2	61
0.8	1.1	-0.3	2	62
0.8	1.1	-0.3	2	63
0.7	1.1	-0.4	2	64
0.572	1.1	-0.528	2	65
0.587	1.1	-0.513	2	66
1	0.9	0.1	3	66
0.9	0.9	0	3	66
0.9	0.9	0	3	66
0.9	0.9	0	3	66
1	0.9	0.1	4	66
1.1	0.9	0.2	5	66
1	0.9	0.1	6	66
0.8	0.9	-0.1	6	67
0.7	0.9	-0.2	6	68
0.7	0.9	-0.2	6	69
0.7	0.9	-0.2	6	70
0.6	0.9	-0.3	6	71
0.9	0.9	0	6	71
0.8	0.9	-0.1	6	72
0.7	0.9	-0.2	6	73
0.7	0.9	-0.2	6	74
0.5	0.9	-0.4	6	75
0.8	0.9	-0.1	6	76
0.8	0.9	-0.1	6	77
0.7	0.9	-0.2	6	78
0.572	0.9	-0.328	6	79
0.587	0.9	-0.313	6	80
0.9	1	-0.1	6	81
0.9	1	-0.1	6	82
0.9	1	-0.1	6	83
1	1	0	6	83
1.1	1	0.1	7	83
1	1	0	7	83
0.8	1	-0.2	7	84
0.7	1	-0.3	7	85
0.7	1	-0.3	7	86
0.7	1	-0.3	7	87
0.6	1	-0.4	7	88
0.9	1	-0.1	7	89
0.8	1	-0.2	7	90
0.7	1	-0.3	7	91
0.7	1	-0.3	7	92
0.5	1	-0.5	7	93
0.8	1	-0.2	7	94
0.8	1	-0.2	7	95
0.7	1	-0.3	7	96
0.572	1	-0.428	7	97
0.587	1	-0.413	7	98
0.9	0.9	0	7	98
0.9	0.9	0	7	98

1	0.9	0.1	8	98
1.1	0.9	0.2	9	98
1	0.9	0.1	10	98
0.8	0.9	-0.1	10	99
0.7	0.9	-0.2	10	100
0.7	0.9	-0.2	10	101
0.7	0.9	-0.2	10	102
0.6	0.9	-0.3	10	103
0.9	0.9	0	10	103
0.8	0.9	-0.1	10	104
0.7	0.9	-0.2	10	105
0.7	0.9	-0.2	10	106
0.5	0.9	-0.4	10	107
0.8	0.9	-0.1	10	108
0.8	0.9	-0.1	10	109
0.7	0.9	-0.2	10	110
0.572	0.9	-0.328	10	111
0.587	0.9	-0.313	10	112
0.9	0.9	0	10	112
1	0.9	0.1	11	112
1.1	0.9	0.2	12	112
1	0.9	0.1	13	112
0.8	0.9	-0.1	13	113
0.7	0.9	-0.2	13	114
0.7	0.9	-0.2	13	115
0.7	0.9	-0.2	13	116
0.6	0.9	-0.3	13	117
0.9	0.9	0	13	117
0.8	0.9	-0.1	13	118
0.7	0.9	-0.2	13	119
0.7	0.9	-0.2	13	120
0.5	0.9	-0.4	13	121
0.8	0.9	-0.1	13	122
0.8	0.9	-0.1	13	123
0.7	0.9	-0.2	13	124
0.572	0.9	-0.328	13	125
0.587	0.9	-0.313	13	126
1	0.9	0.1	14	126
1.1	0.9	0.2	15	126
1	0.9	0.1	16	126
0.8	0.9	-0.1	16	127
0.7	0.9	-0.2	16	128
0.7	0.9	-0.2	16	129
0.7	0.9	-0.2	16	130
0.6	0.9	-0.3	16	131
0.9	0.9	0	16	131
0.8	0.9	-0.1	16	132
0.7	0.9	-0.2	16	133
0.7	0.9	-0.2	16	134
0.5	0.9	-0.4	16	135
0.8	0.9	-0.1	16	136
0.8	0.9	-0.1	16	137
0.7	0.9	-0.2	16	138
0.572	0.9	-0.328	16	139
0.587	0.9	-0.313	16	140
1.1	1	0.1	17	140
1	1	0	17	140
0.8	1	-0.2	17	141
0.7	1	-0.3	17	142
0.7	1	-0.3	17	143
0.7	1	-0.3	17	144
0.6	1	-0.4	17	145
0.9	1	-0.1	17	146
0.8	1	-0.2	17	147

0.7	1	-0.3	17	148
0.7	1	-0.3	17	149
0.5	1	-0.5	17	150
0.8	1	-0.2	17	151
0.8	1	-0.2	17	152
0.7	1	-0.3	17	153
0.572	1	-0.428	17	154
0.587	1	-0.413	17	155
1	1.1	-0.1	17	156
0.8	1.1	-0.3	17	157
0.7	1.1	-0.4	17	158
0.7	1.1	-0.4	17	159
0.7	1.1	-0.4	17	160
0.6	1.1	-0.5	17	161
0.9	1.1	-0.2	17	162
0.8	1.1	-0.3	17	163
0.7	1.1	-0.4	17	164
0.7	1.1	-0.4	17	165
0.5	1.1	-0.6	17	166
0.8	1.1	-0.3	17	167
0.8	1.1	-0.3	17	168
0.7	1.1	-0.4	17	169
0.572	1.1	-0.528	17	170
0.587	1.1	-0.513	17	171
0.8	1	-0.2	17	172
0.7	1	-0.3	17	173
0.7	1	-0.3	17	174
0.7	1	-0.3	17	175
0.6	1	-0.4	17	176
0.9	1	-0.1	17	177
0.8	1	-0.2	17	178
0.7	1	-0.3	17	179
0.7	1	-0.3	17	180
0.5	1	-0.5	17	181
0.8	1	-0.2	17	182
0.8	1	-0.2	17	183
0.7	1	-0.3	17	184
0.572	1	-0.428	17	185
0.587	1	-0.413	17	186
0.7	0.8	-0.1	17	187
0.7	0.8	-0.1	17	188
0.7	0.8	-0.1	17	189
0.6	0.8	-0.2	17	190
0.9	0.8	0.1	18	190
0.8	0.8	0	18	190
0.7	0.8	-0.1	18	191
0.7	0.8	-0.1	18	192
0.5	0.8	-0.3	18	193
0.8	0.8	0	18	193
0.8	0.8	0	18	193
0.7	0.8	-0.1	18	194
0.572	0.8	-0.228	18	195
0.587	0.8	-0.213	18	196
0.7	0.7	0	18	196
0.7	0.7	0	18	196
0.6	0.7	-0.1	18	197
0.9	0.7	0.2	19	197
0.8	0.7	0.1	20	197
0.7	0.7	0	20	197
0.7	0.7	0	20	197
0.5	0.7	-0.2	20	198
0.8	0.7	0.1	21	198
0.8	0.7	0.1	22	198

0.7	0.7	0	22	198
0.572	0.7	-0.128	22	199
0.587	0.7	-0.113	22	200
0.7	0.7	0	22	200
0.6	0.7	-0.1	22	201
0.9	0.7	0.2	23	201
0.8	0.7	0.1	24	201
0.7	0.7	0	24	201
0.7	0.7	0	24	201
0.5	0.7	-0.2	24	202
0.8	0.7	0.1	25	202
0.8	0.7	0.1	26	202
0.7	0.7	0	26	202
0.572	0.7	-0.128	26	203
0.587	0.7	-0.113	26	204
0.6	0.7	-0.1	26	205
0.9	0.7	0.2	27	205
0.8	0.7	0.1	28	205
0.7	0.7	0	28	205
0.7	0.7	0	28	205
0.5	0.7	-0.2	28	206
0.8	0.7	0.1	29	206
0.8	0.7	0.1	30	206
0.7	0.7	0	30	206
0.572	0.7	-0.128	30	207
0.587	0.7	-0.113	30	208
0.9	0.6	0.3	31	208
0.8	0.6	0.2	32	208
0.7	0.6	0.1	33	208
0.7	0.6	0.1	34	208
0.5	0.6	-0.1	34	209
0.8	0.6	0.2	35	209
0.8	0.6	0.2	36	209
0.7	0.6	0.1	37	209
0.572	0.6	-0.028	37	210
0.587	0.6	-0.013	37	211
0.8	0.9	-0.1	37	212
0.7	0.9	-0.2	37	213
0.7	0.9	-0.2	37	214
0.5	0.9	-0.4	37	215
0.8	0.9	-0.1	37	216
0.8	0.9	-0.1	37	217
0.7	0.9	-0.2	37	218
0.572	0.9	-0.328	37	219
0.587	0.9	-0.313	37	220
0.7	0.8	-0.1	37	221
0.7	0.8	-0.1	37	222
0.5	0.8	-0.3	37	223
0.8	0.8	0	37	223
0.8	0.8	0	37	223
0.7	0.8	-0.1	37	224
0.572	0.8	-0.228	37	225
0.587	0.8	-0.213	37	226
0.7	0.7	0	37	226
0.5	0.7	-0.2	37	227
0.8	0.7	0.1	38	227
0.8	0.7	0.1	39	227
0.7	0.7	0	39	227
0.572	0.7	-0.128	39	228
0.587	0.7	-0.113	39	229

0.5	0.7	-0.2	39	230
0.8	0.7	0.1	40	230
0.8	0.7	0.1	41	230
0.7	0.7	0	41	230
0.572	0.7	-0.128	41	231
0.587	0.7	-0.113	41	232
0.8	0.5	0.3	42	232
0.8	0.5	0.3	43	232
0.7	0.5	0.2	44	232
0.572	0.5	0.072	45	232
0.587	0.5	0.087	46	232
0.8	0.8	0	46	232
0.7	0.8	-0.1	46	233
0.572	0.8	-0.228	46	234
0.587	0.8	-0.213	46	235
0.7	0.8	-0.1	46	236
0.572	0.8	-0.228	46	237
0.587	0.8	-0.213	46	238
0.572	0.7	-0.128	46	239
0.587	0.7	-0.113	46	240
0.587	0.572	0.015	47	240

S Statistic = 47 - 240 = -193

Tied Group	Value	Members
1	1	4
2	1.1	2
3	0.9	5
4	0.8	4
5	0.7	6

Time Period	Observations
3/12/2008	1
5/13/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/13/2009	1
9/29/2009	1
12/8/2009	1
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/25/2011	1
9/2/2011	1
4/13/2012	1
11/9/2012	1
4/22/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 1140
B = 0
C = 228
D = 0
E = 76
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 1995
Z-Score = -4.29863
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-4.29863 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: OW-01A

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
91	240	-149	0	1
81	240	-159	0	2
61	240	-179	0	3
52	240	-188	0	4
60	240	-180	0	5
118	240	-122	0	6
85	240	-155	0	7
61	240	-179	0	8
51	240	-189	0	9
60	240	-180	0	10
53	240	-187	0	11
55	240	-185	0	12
56	240	-184	0	13
55	240	-185	0	14
53	240	-187	0	15
55	240	-185	0	16
56	240	-184	0	17
56	240	-184	0	18
53	240	-187	0	19
51	240	-189	0	20
54	240	-186	0	21
47	240	-193	0	22
45	240	-195	0	23
55	240	-185	0	24
57	240	-183	0	25
50	240	-190	0	26
48	240	-192	0	27
44	240	-196	0	28
81	91	-10	0	29
61	91	-30	0	30
52	91	-39	0	31
60	91	-31	0	32
118	91	27	1	32
85	91	-6	1	33
61	91	-30	1	34
51	91	-40	1	35
60	91	-31	1	36
53	91	-38	1	37
55	91	-36	1	38
56	91	-35	1	39
55	91	-36	1	40
53	91	-38	1	41
55	91	-36	1	42
56	91	-35	1	43
56	91	-35	1	44
53	91	-38	1	45
51	91	-40	1	46
54	91	-37	1	47
47	91	-44	1	48
45	91	-46	1	49
55	91	-36	1	50
57	91	-34	1	51
50	91	-41	1	52
48	91	-43	1	53

44	91	-47	1	54
61	81	-20	1	55
52	81	-29	1	56
60	81	-21	1	57
118	81	37	2	57
85	81	4	3	57
61	81	-20	3	58
51	81	-30	3	59
60	81	-21	3	60
53	81	-28	3	61
55	81	-26	3	62
56	81	-25	3	63
55	81	-26	3	64
53	81	-28	3	65
55	81	-26	3	66
56	81	-25	3	67
56	81	-25	3	68
53	81	-28	3	69
51	81	-30	3	70
54	81	-27	3	71
47	81	-34	3	72
45	81	-36	3	73
55	81	-26	3	74
57	81	-24	3	75
50	81	-31	3	76
48	81	-33	3	77
44	81	-37	3	78
52	61	-9	3	79
60	61	-1	3	80
118	61	57	4	80
85	61	24	5	80
61	61	0	5	80
51	61	-10	5	81
60	61	-1	5	82
53	61	-8	5	83
55	61	-6	5	84
56	61	-5	5	85
55	61	-6	5	86
53	61	-8	5	87
55	61	-6	5	88
56	61	-5	5	89
56	61	-5	5	90
53	61	-8	5	91
51	61	-10	5	92
54	61	-7	5	93
47	61	-14	5	94
45	61	-16	5	95
55	61	-6	5	96
57	61	-4	5	97
50	61	-11	5	98
48	61	-13	5	99
44	61	-17	5	100
60	52	8	6	100
118	52	66	7	100
85	52	33	8	100
61	52	9	9	100
51	52	-1	9	101
60	52	8	10	101
53	52	1	11	101
55	52	3	12	101
56	52	4	13	101
55	52	3	14	101
53	52	1	15	101
55	52	3	16	101

56	52	4	17	101
56	52	4	18	101
53	52	1	19	101
51	52	-1	19	102
54	52	2	20	102
47	52	-5	20	103
45	52	-7	20	104
55	52	3	21	104
57	52	5	22	104
50	52	-2	22	105
48	52	-4	22	106
44	52	-8	22	107
118	60	58	23	107
85	60	25	24	107
61	60	1	25	107
51	60	-9	25	108
60	60	0	25	108
53	60	-7	25	109
55	60	-5	25	110
56	60	-4	25	111
55	60	-5	25	112
53	60	-7	25	113
55	60	-5	25	114
56	60	-4	25	115
56	60	-4	25	116
53	60	-7	25	117
51	60	-9	25	118
54	60	-6	25	119
47	60	-13	25	120
45	60	-15	25	121
55	60	-5	25	122
57	60	-3	25	123
50	60	-10	25	124
48	60	-12	25	125
44	60	-16	25	126
85	118	-33	25	127
61	118	-57	25	128
51	118	-67	25	129
60	118	-58	25	130
53	118	-65	25	131
55	118	-63	25	132
56	118	-62	25	133
55	118	-63	25	134
53	118	-65	25	135
55	118	-63	25	136
56	118	-62	25	137
56	118	-62	25	138
53	118	-65	25	139
51	118	-67	25	140
54	118	-64	25	141
47	118	-71	25	142
45	118	-73	25	143
55	118	-63	25	144
57	118	-61	25	145
50	118	-68	25	146
48	118	-70	25	147
44	118	-74	25	148
61	85	-24	25	149
51	85	-34	25	150
60	85	-25	25	151
53	85	-32	25	152
55	85	-30	25	153
56	85	-29	25	154
55	85	-30	25	155

53	85	-32	25	156
55	85	-30	25	157
56	85	-29	25	158
56	85	-29	25	159
53	85	-32	25	160
51	85	-34	25	161
54	85	-31	25	162
47	85	-38	25	163
45	85	-40	25	164
55	85	-30	25	165
57	85	-28	25	166
50	85	-35	25	167
48	85	-37	25	168
44	85	-41	25	169
51	61	-10	25	170
60	61	-1	25	171
53	61	-8	25	172
55	61	-6	25	173
56	61	-5	25	174
55	61	-6	25	175
53	61	-8	25	176
55	61	-6	25	177
56	61	-5	25	178
56	61	-5	25	179
53	61	-8	25	180
51	61	-10	25	181
54	61	-7	25	182
47	61	-14	25	183
45	61	-16	25	184
55	61	-6	25	185
57	61	-4	25	186
50	61	-11	25	187
48	61	-13	25	188
44	61	-17	25	189
60	51	9	26	189
53	51	2	27	189
55	51	4	28	189
56	51	5	29	189
55	51	4	30	189
53	51	2	31	189
55	51	4	32	189
56	51	5	33	189
56	51	5	34	189
53	51	2	35	189
51	51	0	35	189
54	51	3	36	189
47	51	-4	36	190
45	51	-6	36	191
55	51	4	37	191
57	51	6	38	191
50	51	-1	38	192
48	51	-3	38	193
44	51	-7	38	194
53	60	-7	38	195
55	60	-5	38	196
56	60	-4	38	197
55	60	-5	38	198
53	60	-7	38	199
55	60	-5	38	200
56	60	-4	38	201
56	60	-4	38	202
53	60	-7	38	203
51	60	-9	38	204
54	60	-6	38	205

47	60	-13	38	206
45	60	-15	38	207
55	60	-5	38	208
57	60	-3	38	209
50	60	-10	38	210
48	60	-12	38	211
44	60	-16	38	212
55	53	2	39	212
56	53	3	40	212
55	53	2	41	212
53	53	0	41	212
55	53	2	42	212
56	53	3	43	212
56	53	3	44	212
53	53	0	44	212
51	53	-2	44	213
54	53	1	45	213
47	53	-6	45	214
45	53	-8	45	215
55	53	2	46	215
57	53	4	47	215
50	53	-3	47	216
48	53	-5	47	217
44	53	-9	47	218
56	55	1	48	218
55	55	0	48	218
53	55	-2	48	219
55	55	0	48	219
56	55	1	49	219
56	55	1	50	219
53	55	-2	50	220
51	55	-4	50	221
54	55	-1	50	222
47	55	-8	50	223
45	55	-10	50	224
55	55	0	50	224
57	55	2	51	224
50	55	-5	51	225
48	55	-7	51	226
44	55	-11	51	227
55	56	-1	51	228
53	56	-3	51	229
55	56	-1	51	230
56	56	0	51	230
56	56	0	51	230
53	56	-3	51	231
51	56	-5	51	232
54	56	-2	51	233
47	56	-9	51	234
45	56	-11	51	235
55	56	-1	51	236
57	56	1	52	236
50	56	-6	52	237
48	56	-8	52	238
44	56	-12	52	239
53	55	-2	52	240
55	55	0	52	240
56	55	1	53	240
56	55	1	54	240
53	55	-2	54	241
51	55	-4	54	242
54	55	-1	54	243
47	55	-8	54	244

45	55	-10	54	245
55	55	0	54	245
57	55	2	55	245
50	55	-5	55	246
48	55	-7	55	247
44	55	-11	55	248
55	53	2	56	248
56	53	3	57	248
56	53	3	58	248
53	53	0	58	248
51	53	-2	58	249
54	53	1	59	249
47	53	-6	59	250
45	53	-8	59	251
55	53	2	60	251
57	53	4	61	251
50	53	-3	61	252
48	53	-5	61	253
44	53	-9	61	254
56	55	1	62	254
56	55	1	63	254
53	55	-2	63	255
51	55	-4	63	256
54	55	-1	63	257
47	55	-8	63	258
45	55	-10	63	259
55	55	0	63	259
57	55	2	64	259
50	55	-5	64	260
48	55	-7	64	261
44	55	-11	64	262
56	56	0	64	262
53	56	-3	64	263
51	56	-5	64	264
54	56	-2	64	265
47	56	-9	64	266
45	56	-11	64	267
55	56	-1	64	268
57	56	1	65	268
50	56	-6	65	269
48	56	-8	65	270
44	56	-12	65	271
53	56	-3	65	272
51	56	-5	65	273
54	56	-2	65	274
47	56	-9	65	275
45	56	-11	65	276
55	56	-1	65	277
57	56	1	66	277
50	56	-6	66	278
48	56	-8	66	279
44	56	-12	66	280
51	53	-2	66	281
54	53	1	67	281
47	53	-6	67	282
45	53	-8	67	283
55	53	2	68	283
57	53	4	69	283
50	53	-3	69	284
48	53	-5	69	285
44	53	-9	69	286

54	51	3	70	286
47	51	-4	70	287
45	51	-6	70	288
55	51	4	71	288
57	51	6	72	288
50	51	-1	72	289
48	51	-3	72	290
44	51	-7	72	291
47	54	-7	72	292
45	54	-9	72	293
55	54	1	73	293
57	54	3	74	293
50	54	-4	74	294
48	54	-6	74	295
44	54	-10	74	296
45	47	-2	74	297
55	47	8	75	297
57	47	10	76	297
50	47	3	77	297
48	47	1	78	297
44	47	-3	78	298
55	45	10	79	298
57	45	12	80	298
50	45	5	81	298
48	45	3	82	298
44	45	-1	82	299
57	55	2	83	299
50	55	-5	83	300
48	55	-7	83	301
44	55	-11	83	302
50	57	-7	83	303
48	57	-9	83	304
44	57	-13	83	305
48	50	-2	83	306
44	50	-6	83	307
44	48	-4	83	308

S Statistic = 83 - 308 = -225

Tied Group	Value	Members
1	61	2
2	60	2
3	51	2
4	53	3
5	55	4
6	56	3

Time Period	Observations
11/1/1998	1
6/1/2005	1
2/1/2006	1
3/12/2008	1
5/13/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/13/2009	1
9/29/2009	1

12/8/2009	1
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/25/2011	1
9/2/2011	1
4/13/2012	1
11/9/2012	1
4/22/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 342
B = 0
C = 36
D = 0
E = 30
F = 0
a = 51156
b = 197316
c = 1624
Group Variance = 2823
Z-Score = -4.21592
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-4.21592 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-02

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
95.6	60	35.6	1	0
60.2	60	0.2	2	0
47.7	60	-12.3	2	1
86	60	26	3	1
69.4	60	9.4	4	1
95.2	60	35.2	5	1
52.5	60	-7.5	5	2
97.8	60	37.8	6	2
124	60	64	7	2
110	60	50	8	2
383	60	323	9	2
99.4	60	39.4	10	2
112	60	52	11	2
593	60	533	12	2
94.8	60	34.8	13	2
87	60	27	14	2
99	60	39	15	2
89.7	60	29.7	16	2
132	60	72	17	2
80.8	60	20.8	18	2
60.2	95.6	-35.4	18	3
47.7	95.6	-47.9	18	4
86	95.6	-9.6	18	5
69.4	95.6	-26.2	18	6
95.2	95.6	-0.4	18	7
52.5	95.6	-43.1	18	8
97.8	95.6	2.2	19	8
124	95.6	28.4	20	8
110	95.6	14.4	21	8
383	95.6	287.4	22	8
99.4	95.6	3.8	23	8
112	95.6	16.4	24	8
593	95.6	497.4	25	8
94.8	95.6	-0.8	25	9
87	95.6	-8.6	25	10
99	95.6	3.4	26	10
89.7	95.6	-5.9	26	11
132	95.6	36.4	27	11
80.8	95.6	-14.8	27	12
47.7	60.2	-12.5	27	13
86	60.2	25.8	28	13
69.4	60.2	9.2	29	13
95.2	60.2	35	30	13
52.5	60.2	-7.7	30	14
97.8	60.2	37.6	31	14
124	60.2	63.8	32	14
110	60.2	49.8	33	14
383	60.2	322.8	34	14
99.4	60.2	39.2	35	14
112	60.2	51.8	36	14
593	60.2	532.8	37	14
94.8	60.2	34.6	38	14
87	60.2	26.8	39	14

99	60.2	38.8	40	14
89.7	60.2	29.5	41	14
132	60.2	71.8	42	14
80.8	60.2	20.6	43	14
86	47.7	38.3	44	14
69.4	47.7	21.7	45	14
95.2	47.7	47.5	46	14
52.5	47.7	4.8	47	14
97.8	47.7	50.1	48	14
124	47.7	76.3	49	14
110	47.7	62.3	50	14
383	47.7	335.3	51	14
99.4	47.7	51.7	52	14
112	47.7	64.3	53	14
593	47.7	545.3	54	14
94.8	47.7	47.1	55	14
87	47.7	39.3	56	14
99	47.7	51.3	57	14
89.7	47.7	42	58	14
132	47.7	84.3	59	14
80.8	47.7	33.1	60	14
69.4	86	-16.6	60	15
95.2	86	9.2	61	15
52.5	86	-33.5	61	16
97.8	86	11.8	62	16
124	86	38	63	16
110	86	24	64	16
383	86	297	65	16
99.4	86	13.4	66	16
112	86	26	67	16
593	86	507	68	16
94.8	86	8.8	69	16
87	86	1	70	16
99	86	13	71	16
89.7	86	3.7	72	16
132	86	46	73	16
80.8	86	-5.2	73	17
95.2	69.4	25.8	74	17
52.5	69.4	-16.9	74	18
97.8	69.4	28.4	75	18
124	69.4	54.6	76	18
110	69.4	40.6	77	18
383	69.4	313.6	78	18
99.4	69.4	30	79	18
112	69.4	42.6	80	18
593	69.4	523.6	81	18
94.8	69.4	25.4	82	18
87	69.4	17.6	83	18
99	69.4	29.6	84	18
89.7	69.4	20.3	85	18
132	69.4	62.6	86	18
80.8	69.4	11.4	87	18
52.5	95.2	-42.7	87	19
97.8	95.2	2.6	88	19
124	95.2	28.8	89	19
110	95.2	14.8	90	19
383	95.2	287.8	91	19
99.4	95.2	4.2	92	19
112	95.2	16.8	93	19
593	95.2	497.8	94	19
94.8	95.2	-0.4	94	20
87	95.2	-8.2	94	21
99	95.2	3.8	95	21

89.7	95.2	-5.5	95	22
132	95.2	36.8	96	22
80.8	95.2	-14.4	96	23
97.8	52.5	45.3	97	23
124	52.5	71.5	98	23
110	52.5	57.5	99	23
383	52.5	330.5	100	23
99.4	52.5	46.9	101	23
112	52.5	59.5	102	23
593	52.5	540.5	103	23
94.8	52.5	42.3	104	23
87	52.5	34.5	105	23
99	52.5	46.5	106	23
89.7	52.5	37.2	107	23
132	52.5	79.5	108	23
80.8	52.5	28.3	109	23
124	97.8	26.2	110	23
110	97.8	12.2	111	23
383	97.8	285.2	112	23
99.4	97.8	1.6	113	23
112	97.8	14.2	114	23
593	97.8	495.2	115	23
94.8	97.8	-3	115	24
87	97.8	-10.8	115	25
99	97.8	1.2	116	25
89.7	97.8	-8.1	116	26
132	97.8	34.2	117	26
80.8	97.8	-17	117	27
110	124	-14	117	28
383	124	259	118	28
99.4	124	-24.6	118	29
112	124	-12	118	30
593	124	469	119	30
94.8	124	-29.2	119	31
87	124	-37	119	32
99	124	-25	119	33
89.7	124	-34.3	119	34
132	124	8	120	34
80.8	124	-43.2	120	35
383	110	273	121	35
99.4	110	-10.6	121	36
112	110	2	122	36
593	110	483	123	36
94.8	110	-15.2	123	37
87	110	-23	123	38
99	110	-11	123	39
89.7	110	-20.3	123	40
132	110	22	124	40
80.8	110	-29.2	124	41
99.4	383	-283.6	124	42
112	383	-271	124	43
593	383	210	125	43
94.8	383	-288.2	125	44
87	383	-296	125	45
99	383	-284	125	46
89.7	383	-293.3	125	47
132	383	-251	125	48
80.8	383	-302.2	125	49
112	99.4	12.6	126	49
593	99.4	493.6	127	49
94.8	99.4	-4.6	127	50

87	99.4	-12.4	127	51
99	99.4	-0.4	127	52
89.7	99.4	-9.7	127	53
132	99.4	32.6	128	53
80.8	99.4	-18.6	128	54
593	112	481	129	54
94.8	112	-17.2	129	55
87	112	-25	129	56
99	112	-13	129	57
89.7	112	-22.3	129	58
132	112	20	130	58
80.8	112	-31.2	130	59
94.8	593	-498.2	130	60
87	593	-506	130	61
99	593	-494	130	62
89.7	593	-503.3	130	63
132	593	-461	130	64
80.8	593	-512.2	130	65
87	94.8	-7.8	130	66
99	94.8	4.2	131	66
89.7	94.8	-5.1	131	67
132	94.8	37.2	132	67
80.8	94.8	-14	132	68
99	87	12	133	68
89.7	87	2.7	134	68
132	87	45	135	68
80.8	87	-6.2	135	69
89.7	99	-9.3	135	70
132	99	33	136	70
80.8	99	-18.2	136	71
132	89.7	42.3	137	71
80.8	89.7	-8.9	137	72
80.8	132	-51.2	137	73

S Statistic = 137 - 73 = 64

Tied Group	Value	Members

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1
10/29/2014	1
3/16/2015	1
10/23/2015	1
5/4/2016	1

10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1096.67
Z-Score = 1.90241
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.90241 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-02

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
1200	915	285	1	0
1000	915	85	2	0
930	915	15	3	0
900	915	-15	3	1
1100	915	185	4	1
1100	915	185	5	1
500	915	-415	5	2
1000	915	85	6	2
1300	915	385	7	2
1200	915	285	8	2
3100	915	2185	9	2
990	915	75	10	2
1500	915	585	11	2
7300	915	6385	12	2
1600	915	685	13	2
1400	915	485	14	2
1100	915	185	15	2
2200	915	1285	16	2
1100	915	185	17	2
840	915	-75	17	3
1000	1200	-200	17	4
930	1200	-270	17	5
900	1200	-300	17	6
1100	1200	-100	17	7
1100	1200	-100	17	8
500	1200	-700	17	9
1000	1200	-200	17	10
1300	1200	100	18	10
1200	1200	0	18	10
3100	1200	1900	19	10
990	1200	-210	19	11
1500	1200	300	20	11
7300	1200	6100	21	11
1600	1200	400	22	11
1400	1200	200	23	11
1100	1200	-100	23	12
2200	1200	1000	24	12
1100	1200	-100	24	13
840	1200	-360	24	14
930	1000	-70	24	15
900	1000	-100	24	16
1100	1000	100	25	16
1100	1000	100	26	16
500	1000	-500	26	17
1000	1000	0	26	17
1300	1000	300	27	17
1200	1000	200	28	17
3100	1000	2100	29	17
990	1000	-10	29	18
1500	1000	500	30	18
7300	1000	6300	31	18
1600	1000	600	32	18
1400	1000	400	33	18

1100	1000	100	34	18
2200	1000	1200	35	18
1100	1000	100	36	18
840	1000	-160	36	19
900	930	-30	36	20
1100	930	170	37	20
1100	930	170	38	20
500	930	-430	38	21
1000	930	70	39	21
1300	930	370	40	21
1200	930	270	41	21
3100	930	2170	42	21
990	930	60	43	21
1500	930	570	44	21
7300	930	6370	45	21
1600	930	670	46	21
1400	930	470	47	21
1100	930	170	48	21
2200	930	1270	49	21
1100	930	170	50	21
840	930	-90	50	22
1100	900	200	51	22
1100	900	200	52	22
500	900	-400	52	23
1000	900	100	53	23
1300	900	400	54	23
1200	900	300	55	23
3100	900	2200	56	23
990	900	90	57	23
1500	900	600	58	23
7300	900	6400	59	23
1600	900	700	60	23
1400	900	500	61	23
1100	900	200	62	23
2200	900	1300	63	23
1100	900	200	64	23
840	900	-60	64	24
1100	1100	0	64	24
500	1100	-600	64	25
1000	1100	-100	64	26
1300	1100	200	65	26
1200	1100	100	66	26
3100	1100	2000	67	26
990	1100	-110	67	27
1500	1100	400	68	27
7300	1100	6200	69	27
1600	1100	500	70	27
1400	1100	300	71	27
1100	1100	0	71	27
2200	1100	1100	72	27
1100	1100	0	72	27
840	1100	-260	72	28
500	1100	-600	72	29
1000	1100	-100	72	30
1300	1100	200	73	30
1200	1100	100	74	30
3100	1100	2000	75	30
990	1100	-110	75	31
1500	1100	400	76	31
7300	1100	6200	77	31
1600	1100	500	78	31
1400	1100	300	79	31
1100	1100	0	79	31

2200	1100	1100	80	31
1100	1100	0	80	31
840	1100	-260	80	32
1000	500	500	81	32
1300	500	800	82	32
1200	500	700	83	32
3100	500	2600	84	32
990	500	490	85	32
1500	500	1000	86	32
7300	500	6800	87	32
1600	500	1100	88	32
1400	500	900	89	32
1100	500	600	90	32
2200	500	1700	91	32
1100	500	600	92	32
840	500	340	93	32
1300	1000	300	94	32
1200	1000	200	95	32
3100	1000	2100	96	32
990	1000	-10	96	33
1500	1000	500	97	33
7300	1000	6300	98	33
1600	1000	600	99	33
1400	1000	400	100	33
1100	1000	100	101	33
2200	1000	1200	102	33
1100	1000	100	103	33
840	1000	-160	103	34
1200	1300	-100	103	35
3100	1300	1800	104	35
990	1300	-310	104	36
1500	1300	200	105	36
7300	1300	6000	106	36
1600	1300	300	107	36
1400	1300	100	108	36
1100	1300	-200	108	37
2200	1300	900	109	37
1100	1300	-200	109	38
840	1300	-460	109	39
3100	1200	1900	110	39
990	1200	-210	110	40
1500	1200	300	111	40
7300	1200	6100	112	40
1600	1200	400	113	40
1400	1200	200	114	40
1100	1200	-100	114	41
2200	1200	1000	115	41
1100	1200	-100	115	42
840	1200	-360	115	43
990	3100	-2110	115	44
1500	3100	-1600	115	45
7300	3100	4200	116	45
1600	3100	-1500	116	46
1400	3100	-1700	116	47
1100	3100	-2000	116	48
2200	3100	-900	116	49
1100	3100	-2000	116	50
840	3100	-2260	116	51
1500	990	510	117	51
7300	990	6310	118	51
1600	990	610	119	51

1400	990	410	120	51
1100	990	110	121	51
2200	990	1210	122	51
1100	990	110	123	51
840	990	-150	123	52
7300	1500	5800	124	52
1600	1500	100	125	52
1400	1500	-100	125	53
1100	1500	-400	125	54
2200	1500	700	126	54
1100	1500	-400	126	55
840	1500	-660	126	56
1600	7300	-5700	126	57
1400	7300	-5900	126	58
1100	7300	-6200	126	59
2200	7300	-5100	126	60
1100	7300	-6200	126	61
840	7300	-6460	126	62
1400	1600	-200	126	63
1100	1600	-500	126	64
2200	1600	600	127	64
1100	1600	-500	127	65
840	1600	-760	127	66
1100	1400	-300	127	67
2200	1400	800	128	67
1100	1400	-300	128	68
840	1400	-560	128	69
2200	1100	1100	129	69
1100	1100	0	129	69
840	1100	-260	129	70
1100	2200	-1100	129	71
840	2200	-1360	129	72
840	1100	Same Date	129	72

S Statistic = 129 - 72 = 57

Tied Group	Value	Members
1	1200	2
2	1000	2
3	1100	4

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/17/2014	1
10/29/2014	1

10/23/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	2

There are 1 time periods with multiple data

A = 192
B = 18
C = 24
D = 0
E = 16
F = 2
a = 19740
b = 71820
c = 840
Group Variance = 1085.04
Z-Score = 1.70007
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.70007 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-06

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
66.6	79	-12.4	0	1
60	79	-19	0	2
33.8	79	-45.2	0	3
185	79	106	1	3
99.1	79	20.1	2	3
134	79	55	3	3
76.3	79	-2.7	3	4
192	79	113	4	4
210	79	131	5	4
170	79	91	6	4
218	79	139	7	4
158	79	79	8	4
197	79	118	9	4
145	79	66	10	4
130	79	51	11	4
172	79	93	12	4
143	79	64	13	4
16.1	79	-62.9	13	5
234	79	155	14	5
158	79	79	15	5
60	66.6	-6.6	15	6
33.8	66.6	-32.8	15	7
185	66.6	118.4	16	7
99.1	66.6	32.5	17	7
134	66.6	67.4	18	7
76.3	66.6	9.7	19	7
192	66.6	125.4	20	7
210	66.6	143.4	21	7
170	66.6	103.4	22	7
218	66.6	151.4	23	7
158	66.6	91.4	24	7
197	66.6	130.4	25	7
145	66.6	78.4	26	7
130	66.6	63.4	27	7
172	66.6	105.4	28	7
143	66.6	76.4	29	7
16.1	66.6	-50.5	29	8
234	66.6	167.4	30	8
158	66.6	91.4	31	8
33.8	60	-26.2	31	9
185	60	125	32	9
99.1	60	39.1	33	9
134	60	74	34	9
76.3	60	16.3	35	9
192	60	132	36	9
210	60	150	37	9
170	60	110	38	9
218	60	158	39	9
158	60	98	40	9
197	60	137	41	9
145	60	85	42	9
130	60	70	43	9
172	60	112	44	9

143	60	83	45	9
16.1	60	-43.9	45	10
234	60	174	46	10
158	60	98	47	10
185	33.8	151.2	48	10
99.1	33.8	65.3	49	10
134	33.8	100.2	50	10
76.3	33.8	42.5	51	10
192	33.8	158.2	52	10
210	33.8	176.2	53	10
170	33.8	136.2	54	10
218	33.8	184.2	55	10
158	33.8	124.2	56	10
197	33.8	163.2	57	10
145	33.8	111.2	58	10
130	33.8	96.2	59	10
172	33.8	138.2	60	10
143	33.8	109.2	61	10
16.1	33.8	-17.7	61	11
234	33.8	200.2	62	11
158	33.8	124.2	63	11
99.1	185	-85.9	63	12
134	185	-51	63	13
76.3	185	-108.7	63	14
192	185	7	64	14
210	185	25	65	14
170	185	-15	65	15
218	185	33	66	15
158	185	-27	66	16
197	185	12	67	16
145	185	-40	67	17
130	185	-55	67	18
172	185	-13	67	19
143	185	-42	67	20
16.1	185	-168.9	67	21
234	185	49	68	21
158	185	-27	68	22
134	99.1	34.9	69	22
76.3	99.1	-22.8	69	23
192	99.1	92.9	70	23
210	99.1	110.9	71	23
170	99.1	70.9	72	23
218	99.1	118.9	73	23
158	99.1	58.9	74	23
197	99.1	97.9	75	23
145	99.1	45.9	76	23
130	99.1	30.9	77	23
172	99.1	72.9	78	23
143	99.1	43.9	79	23
16.1	99.1	-83	79	24
234	99.1	134.9	80	24
158	99.1	58.9	81	24
76.3	134	-57.7	81	25
192	134	58	82	25
210	134	76	83	25
170	134	36	84	25
218	134	84	85	25
158	134	24	86	25
197	134	63	87	25
145	134	11	88	25
130	134	-4	88	26
172	134	38	89	26
143	134	9	90	26

16.1	134	-117.9	90	27
234	134	100	91	27
158	134	24	92	27
192	76.3	115.7	93	27
210	76.3	133.7	94	27
170	76.3	93.7	95	27
218	76.3	141.7	96	27
158	76.3	81.7	97	27
197	76.3	120.7	98	27
145	76.3	68.7	99	27
130	76.3	53.7	100	27
172	76.3	95.7	101	27
143	76.3	66.7	102	27
16.1	76.3	-60.2	102	28
234	76.3	157.7	103	28
158	76.3	81.7	104	28
210	192	18	105	28
170	192	-22	105	29
218	192	26	106	29
158	192	-34	106	30
197	192	5	107	30
145	192	-47	107	31
130	192	-62	107	32
172	192	-20	107	33
143	192	-49	107	34
16.1	192	-175.9	107	35
234	192	42	108	35
158	192	-34	108	36
170	210	-40	108	37
218	210	8	109	37
158	210	-52	109	38
197	210	-13	109	39
145	210	-65	109	40
130	210	-80	109	41
172	210	-38	109	42
143	210	-67	109	43
16.1	210	-193.9	109	44
234	210	24	110	44
158	210	-52	110	45
218	170	48	111	45
158	170	-12	111	46
197	170	27	112	46
145	170	-25	112	47
130	170	-40	112	48
172	170	2	113	48
143	170	-27	113	49
16.1	170	-153.9	113	50
234	170	64	114	50
158	170	-12	114	51
158	218	-60	114	52
197	218	-21	114	53
145	218	-73	114	54
130	218	-88	114	55
172	218	-46	114	56
143	218	-75	114	57
16.1	218	-201.9	114	58
234	218	16	115	58
158	218	-60	115	59
197	158	39	116	59
145	158	-13	116	60
130	158	-28	116	61

172	158	14	117	61
143	158	-15	117	62
16.1	158	-141.9	117	63
234	158	76	118	63
158	158	0	118	63
145	197	-52	118	64
130	197	-67	118	65
172	197	-25	118	66
143	197	-54	118	67
16.1	197	-180.9	118	68
234	197	37	119	68
158	197	-39	119	69
130	145	-15	119	70
172	145	27	120	70
143	145	-2	120	71
16.1	145	-128.9	120	72
234	145	89	121	72
158	145	13	122	72
172	130	42	123	72
143	130	13	124	72
16.1	130	-113.9	124	73
234	130	104	125	73
158	130	28	126	73
143	172	-29	126	74
16.1	172	-155.9	126	75
234	172	62	127	75
158	172	-14	127	76
16.1	143	-126.9	127	77
234	143	91	128	77
158	143	15	129	77
234	16.1	217.9	130	77
158	16.1	141.9	131	77
158	234	-76	131	78

S Statistic = 131 - 78 = 53

Tied Group	Value	Members
1	158	2

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1
10/29/2014	1
3/16/2015	1
10/22/2015	1

5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 18
B = 0
C = 0
D = 0
E = 2
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1095.67
Z-Score = 1.57096
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.57096 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-06

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
66.6	79	-12.4	0	1
60	79	-19	0	2
33.8	79	-45.2	0	3
185	79	106	1	3
99.1	79	20.1	2	3
134	79	55	3	3
76.3	79	-2.7	3	4
192	79	113	4	4
210	79	131	5	4
170	79	91	6	4
218	79	139	7	4
158	79	79	8	4
197	79	118	9	4
145	79	66	10	4
130	79	51	11	4
172	79	93	12	4
143	79	64	13	4
16.1	79	-62.9	13	5
234	79	155	14	5
158	79	79	15	5
60	66.6	-6.6	15	6
33.8	66.6	-32.8	15	7
185	66.6	118.4	16	7
99.1	66.6	32.5	17	7
134	66.6	67.4	18	7
76.3	66.6	9.7	19	7
192	66.6	125.4	20	7
210	66.6	143.4	21	7
170	66.6	103.4	22	7
218	66.6	151.4	23	7
158	66.6	91.4	24	7
197	66.6	130.4	25	7
145	66.6	78.4	26	7
130	66.6	63.4	27	7
172	66.6	105.4	28	7
143	66.6	76.4	29	7
16.1	66.6	-50.5	29	8
234	66.6	167.4	30	8
158	66.6	91.4	31	8
33.8	60	-26.2	31	9
185	60	125	32	9
99.1	60	39.1	33	9
134	60	74	34	9
76.3	60	16.3	35	9
192	60	132	36	9
210	60	150	37	9
170	60	110	38	9
218	60	158	39	9
158	60	98	40	9
197	60	137	41	9
145	60	85	42	9
130	60	70	43	9
172	60	112	44	9

143	60	83	45	9
16.1	60	-43.9	45	10
234	60	174	46	10
158	60	98	47	10
185	33.8	151.2	48	10
99.1	33.8	65.3	49	10
134	33.8	100.2	50	10
76.3	33.8	42.5	51	10
192	33.8	158.2	52	10
210	33.8	176.2	53	10
170	33.8	136.2	54	10
218	33.8	184.2	55	10
158	33.8	124.2	56	10
197	33.8	163.2	57	10
145	33.8	111.2	58	10
130	33.8	96.2	59	10
172	33.8	138.2	60	10
143	33.8	109.2	61	10
16.1	33.8	-17.7	61	11
234	33.8	200.2	62	11
158	33.8	124.2	63	11
99.1	185	-85.9	63	12
134	185	-51	63	13
76.3	185	-108.7	63	14
192	185	7	64	14
210	185	25	65	14
170	185	-15	65	15
218	185	33	66	15
158	185	-27	66	16
197	185	12	67	16
145	185	-40	67	17
130	185	-55	67	18
172	185	-13	67	19
143	185	-42	67	20
16.1	185	-168.9	67	21
234	185	49	68	21
158	185	-27	68	22
134	99.1	34.9	69	22
76.3	99.1	-22.8	69	23
192	99.1	92.9	70	23
210	99.1	110.9	71	23
170	99.1	70.9	72	23
218	99.1	118.9	73	23
158	99.1	58.9	74	23
197	99.1	97.9	75	23
145	99.1	45.9	76	23
130	99.1	30.9	77	23
172	99.1	72.9	78	23
143	99.1	43.9	79	23
16.1	99.1	-83	79	24
234	99.1	134.9	80	24
158	99.1	58.9	81	24
76.3	134	-57.7	81	25
192	134	58	82	25
210	134	76	83	25
170	134	36	84	25
218	134	84	85	25
158	134	24	86	25
197	134	63	87	25
145	134	11	88	25
130	134	-4	88	26
172	134	38	89	26
143	134	9	90	26

16.1	134	-117.9	90	27
234	134	100	91	27
158	134	24	92	27
192	76.3	115.7	93	27
210	76.3	133.7	94	27
170	76.3	93.7	95	27
218	76.3	141.7	96	27
158	76.3	81.7	97	27
197	76.3	120.7	98	27
145	76.3	68.7	99	27
130	76.3	53.7	100	27
172	76.3	95.7	101	27
143	76.3	66.7	102	27
16.1	76.3	-60.2	102	28
234	76.3	157.7	103	28
158	76.3	81.7	104	28
210	192	18	105	28
170	192	-22	105	29
218	192	26	106	29
158	192	-34	106	30
197	192	5	107	30
145	192	-47	107	31
130	192	-62	107	32
172	192	-20	107	33
143	192	-49	107	34
16.1	192	-175.9	107	35
234	192	42	108	35
158	192	-34	108	36
170	210	-40	108	37
218	210	8	109	37
158	210	-52	109	38
197	210	-13	109	39
145	210	-65	109	40
130	210	-80	109	41
172	210	-38	109	42
143	210	-67	109	43
16.1	210	-193.9	109	44
234	210	24	110	44
158	210	-52	110	45
218	170	48	111	45
158	170	-12	111	46
197	170	27	112	46
145	170	-25	112	47
130	170	-40	112	48
172	170	2	113	48
143	170	-27	113	49
16.1	170	-153.9	113	50
234	170	64	114	50
158	170	-12	114	51
158	218	-60	114	52
197	218	-21	114	53
145	218	-73	114	54
130	218	-88	114	55
172	218	-46	114	56
143	218	-75	114	57
16.1	218	-201.9	114	58
234	218	16	115	58
158	218	-60	115	59
197	158	39	116	59
145	158	-13	116	60
130	158	-28	116	61

172	158	14	117	61
143	158	-15	117	62
16.1	158	-141.9	117	63
234	158	76	118	63
158	158	0	118	63
145	197	-52	118	64
130	197	-67	118	65
172	197	-25	118	66
143	197	-54	118	67
16.1	197	-180.9	118	68
234	197	37	119	68
158	197	-39	119	69
130	145	-15	119	70
172	145	27	120	70
143	145	-2	120	71
16.1	145	-128.9	120	72
234	145	89	121	72
158	145	13	122	72
172	130	42	123	72
143	130	13	124	72
16.1	130	-113.9	124	73
234	130	104	125	73
158	130	28	126	73
143	172	-29	126	74
16.1	172	-155.9	126	75
234	172	62	127	75
158	172	-14	127	76
16.1	143	-126.9	127	77
234	143	91	128	77
158	143	15	129	77
234	16.1	217.9	130	77
158	16.1	141.9	131	77
158	234	-76	131	78

S Statistic = 131 - 78 = 53

Tied Group	Value	Members
1	158	2

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1
10/29/2014	1
3/16/2015	1
10/22/2015	1

5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 18
B = 0
C = 0
D = 0
E = 2
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1095.67
Z-Score = 1.57096
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.57096 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-06

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
1200	1490	-290	0	1
1600	1490	110	1	1
500	1490	-990	1	2
1600	1490	110	2	2
1800	1490	310	3	2
1600	1490	110	4	2
790	1490	-700	4	3
1700	1490	210	5	3
1800	1490	310	6	3
1700	1490	210	7	3
2100	1490	610	8	3
1700	1490	210	9	3
2200	1490	710	10	3
1900	1490	410	11	3
2200	1490	710	12	3
2000	1490	510	13	3
2000	1490	510	14	3
320	1490	-1170	14	4
4600	1490	3110	15	4
1500	1490	10	16	4
1600	1200	400	17	4
500	1200	-700	17	5
1600	1200	400	18	5
1800	1200	600	19	5
1600	1200	400	20	5
790	1200	-410	20	6
1700	1200	500	21	6
1800	1200	600	22	6
1700	1200	500	23	6
2100	1200	900	24	6
1700	1200	500	25	6
2200	1200	1000	26	6
1900	1200	700	27	6
2200	1200	1000	28	6
2000	1200	800	29	6
2000	1200	800	30	6
320	1200	-880	30	7
4600	1200	3400	31	7
1500	1200	300	32	7
500	1600	-1100	32	8
1600	1600	0	32	8
1800	1600	200	33	8
1600	1600	0	33	8
790	1600	-810	33	9
1700	1600	100	34	9
1800	1600	200	35	9
1700	1600	100	36	9
2100	1600	500	37	9
1700	1600	100	38	9
2200	1600	600	39	9
1900	1600	300	40	9
2200	1600	600	41	9
2000	1600	400	42	9

2000	1600	400	43	9
320	1600	-1280	43	10
4600	1600	3000	44	10
1500	1600	-100	44	11
1600	500	1100	45	11
1800	500	1300	46	11
1600	500	1100	47	11
790	500	290	48	11
1700	500	1200	49	11
1800	500	1300	50	11
1700	500	1200	51	11
2100	500	1600	52	11
1700	500	1200	53	11
2200	500	1700	54	11
1900	500	1400	55	11
2200	500	1700	56	11
2000	500	1500	57	11
2000	500	1500	58	11
320	500	-180	58	12
4600	500	4100	59	12
1500	500	1000	60	12
1800	1600	200	61	12
1600	1600	0	61	12
790	1600	-810	61	13
1700	1600	100	62	13
1800	1600	200	63	13
1700	1600	100	64	13
2100	1600	500	65	13
1700	1600	100	66	13
2200	1600	600	67	13
1900	1600	300	68	13
2200	1600	600	69	13
2000	1600	400	70	13
2000	1600	400	71	13
320	1600	-1280	71	14
4600	1600	3000	72	14
1500	1600	-100	72	15
1600	1800	-200	72	16
790	1800	-1010	72	17
1700	1800	-100	72	18
1800	1800	0	72	18
1700	1800	-100	72	19
2100	1800	300	73	19
1700	1800	-100	73	20
2200	1800	400	74	20
1900	1800	100	75	20
2200	1800	400	76	20
2000	1800	200	77	20
2000	1800	200	78	20
320	1800	-1480	78	21
4600	1800	2800	79	21
1500	1800	-300	79	22
790	1600	-810	79	23
1700	1600	100	80	23
1800	1600	200	81	23
1700	1600	100	82	23
2100	1600	500	83	23
1700	1600	100	84	23
2200	1600	600	85	23
1900	1600	300	86	23
2200	1600	600	87	23
2000	1600	400	88	23
2000	1600	400	89	23

320	1600	-1280	89	24
4600	1600	3000	90	24
1500	1600	-100	90	25
1700	790	910	91	25
1800	790	1010	92	25
1700	790	910	93	25
2100	790	1310	94	25
1700	790	910	95	25
2200	790	1410	96	25
1900	790	1110	97	25
2200	790	1410	98	25
2000	790	1210	99	25
2000	790	1210	100	25
320	790	-470	100	26
4600	790	3810	101	26
1500	790	710	102	26
1800	1700	100	103	26
1700	1700	0	103	26
2100	1700	400	104	26
1700	1700	0	104	26
2200	1700	500	105	26
1900	1700	200	106	26
2200	1700	500	107	26
2000	1700	300	108	26
2000	1700	300	109	26
320	1700	-1380	109	27
4600	1700	2900	110	27
1500	1700	-200	110	28
1700	1800	-100	110	29
2100	1800	300	111	29
1700	1800	-100	111	30
2200	1800	400	112	30
1900	1800	100	113	30
2200	1800	400	114	30
2000	1800	200	115	30
2000	1800	200	116	30
320	1800	-1480	116	31
4600	1800	2800	117	31
1500	1800	-300	117	32
2100	1700	400	118	32
1700	1700	0	118	32
2200	1700	500	119	32
1900	1700	200	120	32
2200	1700	500	121	32
2000	1700	300	122	32
2000	1700	300	123	32
320	1700	-1380	123	33
4600	1700	2900	124	33
1500	1700	-200	124	34
1700	2100	-400	124	35
2200	2100	100	125	35
1900	2100	-200	125	36
2200	2100	100	126	36
2000	2100	-100	126	37
2000	2100	-100	126	38
320	2100	-1780	126	39
4600	2100	2500	127	39
1500	2100	-600	127	40
2200	1700	500	128	40
1900	1700	200	129	40
2200	1700	500	130	40

2000	1700	300	131	40
2000	1700	300	132	40
320	1700	-1380	132	41
4600	1700	2900	133	41
1500	1700	-200	133	42
1900	2200	-300	133	43
2200	2200	0	133	43
2000	2200	-200	133	44
2000	2200	-200	133	45
320	2200	-1880	133	46
4600	2200	2400	134	46
1500	2200	-700	134	47
2200	1900	300	135	47
2000	1900	100	136	47
2000	1900	100	137	47
320	1900	-1580	137	48
4600	1900	2700	138	48
1500	1900	-400	138	49
2000	2200	-200	138	50
2000	2200	-200	138	51
320	2200	-1880	138	52
4600	2200	2400	139	52
1500	2200	-700	139	53
2000	2000	0	139	53
320	2000	-1680	139	54
4600	2000	2600	140	54
1500	2000	-500	140	55
320	2000	-1680	140	56
4600	2000	2600	141	56
1500	2000	-500	141	57
4600	320	4280	142	57
1500	320	1180	143	57
1500	4600	-3100	143	58

S Statistic = 143 - 58 = 85

Tied Group	Value	Members
1	1600	3
2	1800	2
3	1700	3
4	2200	2
5	2000	2

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/26/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/24/2013	1
11/13/2013	1

4/16/2014	1
10/29/2014	1
3/16/2015	1
10/22/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 186
B = 0
C = 12
D = 0
E = 18
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1086.33
Z-Score = 2.54858
Comparison Level at 95% confidence level = 1.65463 (upward trend)
2.54858 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-07

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
42.5	35	7.5	1	0
46.1	35	11.1	2	0
65.2	35	30.2	3	0
41.1	35	6.1	4	0
42.2	35	7.2	5	0
45.8	35	10.8	6	0
17.9	35	-17.1	6	1
41.5	35	6.5	7	1
18.8	35	-16.2	7	2
47.1	35	12.1	8	2
55	35	20	9	2
38.9	35	3.9	10	2
40.8	35	5.8	11	2
35.8	35	0.8	12	2
1.8	35	-33.2	12	3
87	35	52	13	3
41.6	35	6.6	14	3
36	35	1	15	3
40	35	5	16	3
42.4	35	7.4	17	3
46.1	42.5	3.6	18	3
65.2	42.5	22.7	19	3
41.1	42.5	-1.4	19	4
42.2	42.5	-0.3	19	5
45.8	42.5	3.3	20	5
17.9	42.5	-24.6	20	6
41.5	42.5	-1	20	7
18.8	42.5	-23.7	20	8
47.1	42.5	4.6	21	8
55	42.5	12.5	22	8
38.9	42.5	-3.6	22	9
40.8	42.5	-1.7	22	10
35.8	42.5	-6.7	22	11
1.8	42.5	-40.7	22	12
87	42.5	44.5	23	12
41.6	42.5	-0.9	23	13
36	42.5	-6.5	23	14
40	42.5	-2.5	23	15
42.4	42.5	-0.1	23	16
65.2	46.1	19.1	24	16
41.1	46.1	-5	24	17
42.2	46.1	-3.9	24	18
45.8	46.1	-0.3	24	19
17.9	46.1	-28.2	24	20
41.5	46.1	-4.6	24	21
18.8	46.1	-27.3	24	22
47.1	46.1	1	25	22
55	46.1	8.9	26	22
38.9	46.1	-7.2	26	23
40.8	46.1	-5.3	26	24
35.8	46.1	-10.3	26	25
1.8	46.1	-44.3	26	26
87	46.1	40.9	27	26

41.6	46.1	-4.5	27	27
36	46.1	-10.1	27	28
40	46.1	-6.1	27	29
42.4	46.1	-3.7	27	30
41.1	65.2	-24.1	27	31
42.2	65.2	-23	27	32
45.8	65.2	-19.4	27	33
17.9	65.2	-47.3	27	34
41.5	65.2	-23.7	27	35
18.8	65.2	-46.4	27	36
47.1	65.2	-18.1	27	37
55	65.2	-10.2	27	38
38.9	65.2	-26.3	27	39
40.8	65.2	-24.4	27	40
35.8	65.2	-29.4	27	41
1.8	65.2	-63.4	27	42
87	65.2	21.8	28	42
41.6	65.2	-23.6	28	43
36	65.2	-29.2	28	44
40	65.2	-25.2	28	45
42.4	65.2	-22.8	28	46
42.2	41.1	1.1	29	46
45.8	41.1	4.7	30	46
17.9	41.1	-23.2	30	47
41.5	41.1	0.4	31	47
18.8	41.1	-22.3	31	48
47.1	41.1	6	32	48
55	41.1	13.9	33	48
38.9	41.1	-2.2	33	49
40.8	41.1	-0.3	33	50
35.8	41.1	-5.3	33	51
1.8	41.1	-39.3	33	52
87	41.1	45.9	34	52
41.6	41.1	0.5	35	52
36	41.1	-5.1	35	53
40	41.1	-1.1	35	54
42.4	41.1	1.3	36	54
45.8	42.2	3.6	37	54
17.9	42.2	-24.3	37	55
41.5	42.2	-0.7	37	56
18.8	42.2	-23.4	37	57
47.1	42.2	4.9	38	57
55	42.2	12.8	39	57
38.9	42.2	-3.3	39	58
40.8	42.2	-1.4	39	59
35.8	42.2	-6.4	39	60
1.8	42.2	-40.4	39	61
87	42.2	44.8	40	61
41.6	42.2	-0.6	40	62
36	42.2	-6.2	40	63
40	42.2	-2.2	40	64
42.4	42.2	0.2	41	64
17.9	45.8	-27.9	41	65
41.5	45.8	-4.3	41	66
18.8	45.8	-27	41	67
47.1	45.8	1.3	42	67
55	45.8	9.2	43	67
38.9	45.8	-6.9	43	68
40.8	45.8	-5	43	69
35.8	45.8	-10	43	70
1.8	45.8	-44	43	71
87	45.8	41.2	44	71
41.6	45.8	-4.2	44	72

36	45.8	-9.8	44	73
40	45.8	-5.8	44	74
42.4	45.8	-3.4	44	75
41.5	17.9	23.6	45	75
18.8	17.9	0.9	46	75
47.1	17.9	29.2	47	75
55	17.9	37.1	48	75
38.9	17.9	21	49	75
40.8	17.9	22.9	50	75
35.8	17.9	17.9	51	75
1.8	17.9	-16.1	51	76
87	17.9	69.1	52	76
41.6	17.9	23.7	53	76
36	17.9	18.1	54	76
40	17.9	22.1	55	76
42.4	17.9	24.5	56	76
18.8	41.5	-22.7	56	77
47.1	41.5	5.6	57	77
55	41.5	13.5	58	77
38.9	41.5	-2.6	58	78
40.8	41.5	-0.7	58	79
35.8	41.5	-5.7	58	80
1.8	41.5	-39.7	58	81
87	41.5	45.5	59	81
41.6	41.5	0.1	60	81
36	41.5	-5.5	60	82
40	41.5	-1.5	60	83
42.4	41.5	0.9	61	83
47.1	18.8	28.3	62	83
55	18.8	36.2	63	83
38.9	18.8	20.1	64	83
40.8	18.8	22	65	83
35.8	18.8	17	66	83
1.8	18.8	-17	66	84
87	18.8	68.2	67	84
41.6	18.8	22.8	68	84
36	18.8	17.2	69	84
40	18.8	21.2	70	84
42.4	18.8	23.6	71	84
55	47.1	7.9	72	84
38.9	47.1	-8.2	72	85
40.8	47.1	-6.3	72	86
35.8	47.1	-11.3	72	87
1.8	47.1	-45.3	72	88
87	47.1	39.9	73	88
41.6	47.1	-5.5	73	89
36	47.1	-11.1	73	90
40	47.1	-7.1	73	91
42.4	47.1	-4.7	73	92
38.9	55	-16.1	73	93
40.8	55	-14.2	73	94
35.8	55	-19.2	73	95
1.8	55	-53.2	73	96
87	55	32	74	96
41.6	55	-13.4	74	97
36	55	-19	74	98
40	55	-15	74	99
42.4	55	-12.6	74	100
40.8	38.9	1.9	75	100
35.8	38.9	-3.1	75	101
1.8	38.9	-37.1	75	102

87	38.9	48.1	76	102
41.6	38.9	2.7	77	102
36	38.9	-2.9	77	103
40	38.9	1.1	78	103
42.4	38.9	3.5	79	103
35.8	40.8	-5	79	104
1.8	40.8	-39	79	105
87	40.8	46.2	80	105
41.6	40.8	0.8	81	105
36	40.8	-4.8	81	106
40	40.8	-0.8	81	107
42.4	40.8	1.6	82	107
1.8	35.8	-34	82	108
87	35.8	51.2	83	108
41.6	35.8	5.8	84	108
36	35.8	0.2	85	108
40	35.8	4.2	86	108
42.4	35.8	6.6	87	108
87	1.8	85.2	88	108
41.6	1.8	39.8	89	108
36	1.8	34.2	90	108
40	1.8	38.2	91	108
42.4	1.8	40.6	92	108
41.6	87	-45.4	92	109
36	87	-51	92	110
40	87	-47	92	111
42.4	87	-44.6	92	112
36	41.6	-5.6	92	113
40	41.6	-1.6	92	114
42.4	41.6	0.8	93	114
40	36	4	94	114
42.4	36	6.4	95	114
42.4	40	2.4	96	114

S Statistic = 96 - 114 = -18

Tied Group	Value	Members

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/12/2013	1
4/16/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1

10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1096.67
Z-Score = -0.513348
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.513348 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-07

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
42.5	35	7.5	1	0
46.1	35	11.1	2	0
65.2	35	30.2	3	0
41.1	35	6.1	4	0
42.2	35	7.2	5	0
45.8	35	10.8	6	0
17.9	35	-17.1	6	1
41.5	35	6.5	7	1
18.8	35	-16.2	7	2
47.1	35	12.1	8	2
55	35	20	9	2
38.9	35	3.9	10	2
40.8	35	5.8	11	2
35.8	35	0.8	12	2
1.8	35	-33.2	12	3
87	35	52	13	3
41.6	35	6.6	14	3
36	35	1	15	3
40	35	5	16	3
42.4	35	7.4	17	3
46.1	42.5	3.6	18	3
65.2	42.5	22.7	19	3
41.1	42.5	-1.4	19	4
42.2	42.5	-0.3	19	5
45.8	42.5	3.3	20	5
17.9	42.5	-24.6	20	6
41.5	42.5	-1	20	7
18.8	42.5	-23.7	20	8
47.1	42.5	4.6	21	8
55	42.5	12.5	22	8
38.9	42.5	-3.6	22	9
40.8	42.5	-1.7	22	10
35.8	42.5	-6.7	22	11
1.8	42.5	-40.7	22	12
87	42.5	44.5	23	12
41.6	42.5	-0.9	23	13
36	42.5	-6.5	23	14
40	42.5	-2.5	23	15
42.4	42.5	-0.1	23	16
65.2	46.1	19.1	24	16
41.1	46.1	-5	24	17
42.2	46.1	-3.9	24	18
45.8	46.1	-0.3	24	19
17.9	46.1	-28.2	24	20
41.5	46.1	-4.6	24	21
18.8	46.1	-27.3	24	22
47.1	46.1	1	25	22
55	46.1	8.9	26	22
38.9	46.1	-7.2	26	23
40.8	46.1	-5.3	26	24
35.8	46.1	-10.3	26	25
1.8	46.1	-44.3	26	26
87	46.1	40.9	27	26

41.6	46.1	-4.5	27	27
36	46.1	-10.1	27	28
40	46.1	-6.1	27	29
42.4	46.1	-3.7	27	30
41.1	65.2	-24.1	27	31
42.2	65.2	-23	27	32
45.8	65.2	-19.4	27	33
17.9	65.2	-47.3	27	34
41.5	65.2	-23.7	27	35
18.8	65.2	-46.4	27	36
47.1	65.2	-18.1	27	37
55	65.2	-10.2	27	38
38.9	65.2	-26.3	27	39
40.8	65.2	-24.4	27	40
35.8	65.2	-29.4	27	41
1.8	65.2	-63.4	27	42
87	65.2	21.8	28	42
41.6	65.2	-23.6	28	43
36	65.2	-29.2	28	44
40	65.2	-25.2	28	45
42.4	65.2	-22.8	28	46
42.2	41.1	1.1	29	46
45.8	41.1	4.7	30	46
17.9	41.1	-23.2	30	47
41.5	41.1	0.4	31	47
18.8	41.1	-22.3	31	48
47.1	41.1	6	32	48
55	41.1	13.9	33	48
38.9	41.1	-2.2	33	49
40.8	41.1	-0.3	33	50
35.8	41.1	-5.3	33	51
1.8	41.1	-39.3	33	52
87	41.1	45.9	34	52
41.6	41.1	0.5	35	52
36	41.1	-5.1	35	53
40	41.1	-1.1	35	54
42.4	41.1	1.3	36	54
45.8	42.2	3.6	37	54
17.9	42.2	-24.3	37	55
41.5	42.2	-0.7	37	56
18.8	42.2	-23.4	37	57
47.1	42.2	4.9	38	57
55	42.2	12.8	39	57
38.9	42.2	-3.3	39	58
40.8	42.2	-1.4	39	59
35.8	42.2	-6.4	39	60
1.8	42.2	-40.4	39	61
87	42.2	44.8	40	61
41.6	42.2	-0.6	40	62
36	42.2	-6.2	40	63
40	42.2	-2.2	40	64
42.4	42.2	0.2	41	64
17.9	45.8	-27.9	41	65
41.5	45.8	-4.3	41	66
18.8	45.8	-27	41	67
47.1	45.8	1.3	42	67
55	45.8	9.2	43	67
38.9	45.8	-6.9	43	68
40.8	45.8	-5	43	69
35.8	45.8	-10	43	70
1.8	45.8	-44	43	71
87	45.8	41.2	44	71
41.6	45.8	-4.2	44	72

36	45.8	-9.8	44	73
40	45.8	-5.8	44	74
42.4	45.8	-3.4	44	75
41.5	17.9	23.6	45	75
18.8	17.9	0.9	46	75
47.1	17.9	29.2	47	75
55	17.9	37.1	48	75
38.9	17.9	21	49	75
40.8	17.9	22.9	50	75
35.8	17.9	17.9	51	75
1.8	17.9	-16.1	51	76
87	17.9	69.1	52	76
41.6	17.9	23.7	53	76
36	17.9	18.1	54	76
40	17.9	22.1	55	76
42.4	17.9	24.5	56	76
18.8	41.5	-22.7	56	77
47.1	41.5	5.6	57	77
55	41.5	13.5	58	77
38.9	41.5	-2.6	58	78
40.8	41.5	-0.7	58	79
35.8	41.5	-5.7	58	80
1.8	41.5	-39.7	58	81
87	41.5	45.5	59	81
41.6	41.5	0.1	60	81
36	41.5	-5.5	60	82
40	41.5	-1.5	60	83
42.4	41.5	0.9	61	83
47.1	18.8	28.3	62	83
55	18.8	36.2	63	83
38.9	18.8	20.1	64	83
40.8	18.8	22	65	83
35.8	18.8	17	66	83
1.8	18.8	-17	66	84
87	18.8	68.2	67	84
41.6	18.8	22.8	68	84
36	18.8	17.2	69	84
40	18.8	21.2	70	84
42.4	18.8	23.6	71	84
55	47.1	7.9	72	84
38.9	47.1	-8.2	72	85
40.8	47.1	-6.3	72	86
35.8	47.1	-11.3	72	87
1.8	47.1	-45.3	72	88
87	47.1	39.9	73	88
41.6	47.1	-5.5	73	89
36	47.1	-11.1	73	90
40	47.1	-7.1	73	91
42.4	47.1	-4.7	73	92
38.9	55	-16.1	73	93
40.8	55	-14.2	73	94
35.8	55	-19.2	73	95
1.8	55	-53.2	73	96
87	55	32	74	96
41.6	55	-13.4	74	97
36	55	-19	74	98
40	55	-15	74	99
42.4	55	-12.6	74	100
40.8	38.9	1.9	75	100
35.8	38.9	-3.1	75	101
1.8	38.9	-37.1	75	102

87	38.9	48.1	76	102
41.6	38.9	2.7	77	102
36	38.9	-2.9	77	103
40	38.9	1.1	78	103
42.4	38.9	3.5	79	103
35.8	40.8	-5	79	104
1.8	40.8	-39	79	105
87	40.8	46.2	80	105
41.6	40.8	0.8	81	105
36	40.8	-4.8	81	106
40	40.8	-0.8	81	107
42.4	40.8	1.6	82	107
1.8	35.8	-34	82	108
87	35.8	51.2	83	108
41.6	35.8	5.8	84	108
36	35.8	0.2	85	108
40	35.8	4.2	86	108
42.4	35.8	6.6	87	108
87	1.8	85.2	88	108
41.6	1.8	39.8	89	108
36	1.8	34.2	90	108
40	1.8	38.2	91	108
42.4	1.8	40.6	92	108
41.6	87	-45.4	92	109
36	87	-51	92	110
40	87	-47	92	111
42.4	87	-44.6	92	112
36	41.6	-5.6	92	113
40	41.6	-1.6	92	114
42.4	41.6	0.8	93	114
40	36	4	94	114
42.4	36	6.4	95	114
42.4	40	2.4	96	114

S Statistic = 96 - 114 = -18

Tied Group	Value	Members

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/12/2013	1
4/16/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1

10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1096.67
Z-Score = -0.513348
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.513348 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-07

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
490	436	54	1	0
590	436	154	2	0
200	436	-236	2	1
410	436	-26	2	2
490	436	54	3	2
480	436	44	4	2
190	436	-246	4	3
500	436	64	5	3
390	436	-46	5	4
570	436	134	6	4
590	436	154	7	4
510	436	74	8	4
540	436	104	9	4
440	436	4	10	4
98	436	-338	10	5
500	436	64	11	5
630	436	194	12	5
520	436	84	13	5
410	436	-26	13	6
450	436	14	14	6
590	490	100	15	6
200	490	-290	15	7
410	490	-80	15	8
490	490	0	15	8
480	490	-10	15	9
190	490	-300	15	10
500	490	10	16	10
390	490	-100	16	11
570	490	80	17	11
590	490	100	18	11
510	490	20	19	11
540	490	50	20	11
440	490	-50	20	12
98	490	-392	20	13
500	490	10	21	13
630	490	140	22	13
520	490	30	23	13
410	490	-80	23	14
450	490	-40	23	15
200	590	-390	23	16
410	590	-180	23	17
490	590	-100	23	18
480	590	-110	23	19
190	590	-400	23	20
500	590	-90	23	21
390	590	-200	23	22
570	590	-20	23	23
590	590	0	23	23
510	590	-80	23	24
540	590	-50	23	25
440	590	-150	23	26
98	590	-492	23	27
500	590	-90	23	28

630	590	40	24	28
520	590	-70	24	29
410	590	-180	24	30
450	590	-140	24	31
410	200	210	25	31
490	200	290	26	31
480	200	280	27	31
190	200	-10	27	32
500	200	300	28	32
390	200	190	29	32
570	200	370	30	32
590	200	390	31	32
510	200	310	32	32
540	200	340	33	32
440	200	240	34	32
98	200	-102	34	33
500	200	300	35	33
630	200	430	36	33
520	200	320	37	33
410	200	210	38	33
450	200	250	39	33
490	410	80	40	33
480	410	70	41	33
190	410	-220	41	34
500	410	90	42	34
390	410	-20	42	35
570	410	160	43	35
590	410	180	44	35
510	410	100	45	35
540	410	130	46	35
440	410	30	47	35
98	410	-312	47	36
500	410	90	48	36
630	410	220	49	36
520	410	110	50	36
410	410	0	50	36
450	410	40	51	36
480	490	-10	51	37
190	490	-300	51	38
500	490	10	52	38
390	490	-100	52	39
570	490	80	53	39
590	490	100	54	39
510	490	20	55	39
540	490	50	56	39
440	490	-50	56	40
98	490	-392	56	41
500	490	10	57	41
630	490	140	58	41
520	490	30	59	41
410	490	-80	59	42
450	490	-40	59	43
190	480	-290	59	44
500	480	20	60	44
390	480	-90	60	45
570	480	90	61	45
590	480	110	62	45
510	480	30	63	45
540	480	60	64	45
440	480	-40	64	46
98	480	-382	64	47
500	480	20	65	47
630	480	150	66	47

520	480	40	67	47
410	480	-70	67	48
450	480	-30	67	49
500	190	310	68	49
390	190	200	69	49
570	190	380	70	49
590	190	400	71	49
510	190	320	72	49
540	190	350	73	49
440	190	250	74	49
98	190	-92	74	50
500	190	310	75	50
630	190	440	76	50
520	190	330	77	50
410	190	220	78	50
450	190	260	79	50
390	500	-110	79	51
570	500	70	80	51
590	500	90	81	51
510	500	10	82	51
540	500	40	83	51
440	500	-60	83	52
98	500	-402	83	53
500	500	0	83	53
630	500	130	84	53
520	500	20	85	53
410	500	-90	85	54
450	500	-50	85	55
570	390	180	86	55
590	390	200	87	55
510	390	120	88	55
540	390	150	89	55
440	390	50	90	55
98	390	-292	90	56
500	390	110	91	56
630	390	240	92	56
520	390	130	93	56
410	390	20	94	56
450	390	60	95	56
590	570	20	96	56
510	570	-60	96	57
540	570	-30	96	58
440	570	-130	96	59
98	570	-472	96	60
500	570	-70	96	61
630	570	60	97	61
520	570	-50	97	62
410	570	-160	97	63
450	570	-120	97	64
510	590	-80	97	65
540	590	-50	97	66
440	590	-150	97	67
98	590	-492	97	68
500	590	-90	97	69
630	590	40	98	69
520	590	-70	98	70
410	590	-180	98	71
450	590	-140	98	72
540	510	30	99	72
440	510	-70	99	73
98	510	-412	99	74

500	510	-10	99	75
630	510	120	100	75
520	510	10	101	75
410	510	-100	101	76
450	510	-60	101	77
440	540	-100	101	78
98	540	-442	101	79
500	540	-40	101	80
630	540	90	102	80
520	540	-20	102	81
410	540	-130	102	82
450	540	-90	102	83
98	440	-342	102	84
500	440	60	103	84
630	440	190	104	84
520	440	80	105	84
410	440	-30	105	85
450	440	10	106	85
500	98	402	107	85
630	98	532	108	85
520	98	422	109	85
410	98	312	110	85
450	98	352	111	85
630	500	130	112	85
520	500	20	113	85
410	500	-90	113	86
450	500	-50	113	87
520	630	-110	113	88
410	630	-220	113	89
450	630	-180	113	90
410	520	-110	113	91
450	520	-70	113	92
450	410	40	114	92

S Statistic = 114 - 92 = 22

Tied Group	Value	Members
1	490	2
2	590	2
3	410	2
4	500	2

Time Period	Observations
2/15/2009	1
9/23/2009	1
12/7/2009	1
2/24/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/24/2013	1
11/12/2013	1
4/14/2014	1

10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 72
B = 0
C = 0
D = 0
E = 8
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1092.67
Z-Score = 0.635295
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.635295 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-07

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
490	436	54	1	0
590	436	154	2	0
200	436	-236	2	1
410	436	-26	2	2
490	436	54	3	2
480	436	44	4	2
190	436	-246	4	3
500	436	64	5	3
390	436	-46	5	4
570	436	134	6	4
590	436	154	7	4
510	436	74	8	4
540	436	104	9	4
440	436	4	10	4
98	436	-338	10	5
500	436	64	11	5
630	436	194	12	5
520	436	84	13	5
410	436	-26	13	6
450	436	14	14	6
590	490	100	15	6
200	490	-290	15	7
410	490	-80	15	8
490	490	0	15	8
480	490	-10	15	9
190	490	-300	15	10
500	490	10	16	10
390	490	-100	16	11
570	490	80	17	11
590	490	100	18	11
510	490	20	19	11
540	490	50	20	11
440	490	-50	20	12
98	490	-392	20	13
500	490	10	21	13
630	490	140	22	13
520	490	30	23	13
410	490	-80	23	14
450	490	-40	23	15
200	590	-390	23	16
410	590	-180	23	17
490	590	-100	23	18
480	590	-110	23	19
190	590	-400	23	20
500	590	-90	23	21
390	590	-200	23	22
570	590	-20	23	23
590	590	0	23	23
510	590	-80	23	24
540	590	-50	23	25
440	590	-150	23	26
98	590	-492	23	27
500	590	-90	23	28

630	590	40	24	28
520	590	-70	24	29
410	590	-180	24	30
450	590	-140	24	31
410	200	210	25	31
490	200	290	26	31
480	200	280	27	31
190	200	-10	27	32
500	200	300	28	32
390	200	190	29	32
570	200	370	30	32
590	200	390	31	32
510	200	310	32	32
540	200	340	33	32
440	200	240	34	32
98	200	-102	34	33
500	200	300	35	33
630	200	430	36	33
520	200	320	37	33
410	200	210	38	33
450	200	250	39	33
490	410	80	40	33
480	410	70	41	33
190	410	-220	41	34
500	410	90	42	34
390	410	-20	42	35
570	410	160	43	35
590	410	180	44	35
510	410	100	45	35
540	410	130	46	35
440	410	30	47	35
98	410	-312	47	36
500	410	90	48	36
630	410	220	49	36
520	410	110	50	36
410	410	0	50	36
450	410	40	51	36
480	490	-10	51	37
190	490	-300	51	38
500	490	10	52	38
390	490	-100	52	39
570	490	80	53	39
590	490	100	54	39
510	490	20	55	39
540	490	50	56	39
440	490	-50	56	40
98	490	-392	56	41
500	490	10	57	41
630	490	140	58	41
520	490	30	59	41
410	490	-80	59	42
450	490	-40	59	43
190	480	-290	59	44
500	480	20	60	44
390	480	-90	60	45
570	480	90	61	45
590	480	110	62	45
510	480	30	63	45
540	480	60	64	45
440	480	-40	64	46
98	480	-382	64	47
500	480	20	65	47
630	480	150	66	47

520	480	40	67	47
410	480	-70	67	48
450	480	-30	67	49
500	190	310	68	49
390	190	200	69	49
570	190	380	70	49
590	190	400	71	49
510	190	320	72	49
540	190	350	73	49
440	190	250	74	49
98	190	-92	74	50
500	190	310	75	50
630	190	440	76	50
520	190	330	77	50
410	190	220	78	50
450	190	260	79	50
390	500	-110	79	51
570	500	70	80	51
590	500	90	81	51
510	500	10	82	51
540	500	40	83	51
440	500	-60	83	52
98	500	-402	83	53
500	500	0	83	53
630	500	130	84	53
520	500	20	85	53
410	500	-90	85	54
450	500	-50	85	55
570	390	180	86	55
590	390	200	87	55
510	390	120	88	55
540	390	150	89	55
440	390	50	90	55
98	390	-292	90	56
500	390	110	91	56
630	390	240	92	56
520	390	130	93	56
410	390	20	94	56
450	390	60	95	56
590	570	20	96	56
510	570	-60	96	57
540	570	-30	96	58
440	570	-130	96	59
98	570	-472	96	60
500	570	-70	96	61
630	570	60	97	61
520	570	-50	97	62
410	570	-160	97	63
450	570	-120	97	64
510	590	-80	97	65
540	590	-50	97	66
440	590	-150	97	67
98	590	-492	97	68
500	590	-90	97	69
630	590	40	98	69
520	590	-70	98	70
410	590	-180	98	71
450	590	-140	98	72
540	510	30	99	72
440	510	-70	99	73
98	510	-412	99	74

500	510	-10	99	75
630	510	120	100	75
520	510	10	101	75
410	510	-100	101	76
450	510	-60	101	77
440	540	-100	101	78
98	540	-442	101	79
500	540	-40	101	80
630	540	90	102	80
520	540	-20	102	81
410	540	-130	102	82
450	540	-90	102	83
98	440	-342	102	84
500	440	60	103	84
630	440	190	104	84
520	440	80	105	84
410	440	-30	105	85
450	440	10	106	85
500	98	402	107	85
630	98	532	108	85
520	98	422	109	85
410	98	312	110	85
450	98	352	111	85
630	500	130	112	85
520	500	20	113	85
410	500	-90	113	86
450	500	-50	113	87
520	630	-110	113	88
410	630	-220	113	89
450	630	-180	113	90
410	520	-110	113	91
450	520	-70	113	92
450	410	40	114	92

S Statistic = 114 - 92 = 22

Tied Group	Value	Members
1	490	2
2	590	2
3	410	2
4	500	2

Time Period	Observations
2/15/2009	1
9/23/2009	1
12/7/2009	1
2/24/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/24/2013	1
11/12/2013	1
4/14/2014	1

10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 72
B = 0
C = 0
D = 0
E = 8
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1092.67
Z-Score = 0.635295
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.635295 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-09

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
1.13	ND<0	1.13	1	0
0.212	ND<0	0.212	2	0
0.728	ND<0	0.728	3	0
ND<0	ND<0	0	3	0
0.1	ND<0	0.1	4	0
4.87	ND<0	4.87	5	0
ND<0	ND<0	0	5	0
2.24	ND<0	2.24	6	0
ND<0	ND<0	0	6	0
ND<0	ND<0	0	6	0
ND<0	ND<0	0	6	0
ND<0	ND<0	0	6	0
5.56	ND<0	5.56	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
1.13	ND<0	1.13	8	0
0.212	ND<0	0.212	9	0
0.728	ND<0	0.728	10	0
ND<0	ND<0	0	10	0
0.1	ND<0	0.1	11	0
4.87	ND<0	4.87	12	0
ND<0	ND<0	0	12	0
2.24	ND<0	2.24	13	0
ND<0	ND<0	0	13	0
ND<0	ND<0	0	13	0
ND<0	ND<0	0	13	0
ND<0	ND<0	0	13	0
5.56	ND<0	5.56	14	0
ND<0	ND<0	0	14	0
ND<0	ND<0	0	14	0
ND<0	ND<0	0	14	0
ND<0	ND<0	0	14	0
ND<0	ND<0	0	14	0
1.13	ND<0	1.13	15	0
0.212	ND<0	0.212	16	0
0.728	ND<0	0.728	17	0
ND<0	ND<0	0	17	0
0.1	ND<0	0.1	18	0
4.87	ND<0	4.87	19	0
ND<0	ND<0	0	19	0
2.24	ND<0	2.24	20	0
ND<0	ND<0	0	20	0
ND<0	ND<0	0	20	0

ND<0	ND<0	0	20	0
ND<0	ND<0	0	20	0
5.56	ND<0	5.56	21	0
ND<0	ND<0	0	21	0
ND<0	ND<0	0	21	0
ND<0	ND<0	0	21	0
ND<0	ND<0	0	21	0
1.13	ND<0	1.13	22	0
0.212	ND<0	0.212	23	0
0.728	ND<0	0.728	24	0
ND<0	ND<0	0	24	0
0.1	ND<0	0.1	25	0
4.87	ND<0	4.87	26	0
ND<0	ND<0	0	26	0
2.24	ND<0	2.24	27	0
ND<0	ND<0	0	27	0
ND<0	ND<0	0	27	0
ND<0	ND<0	0	27	0
ND<0	ND<0	0	27	0
5.56	ND<0	5.56	28	0
ND<0	ND<0	0	28	0
ND<0	ND<0	0	28	0
ND<0	ND<0	0	28	0
1.13	ND<0	1.13	29	0
0.212	ND<0	0.212	30	0
0.728	ND<0	0.728	31	0
ND<0	ND<0	0	31	0
0.1	ND<0	0.1	32	0
4.87	ND<0	4.87	33	0
ND<0	ND<0	0	33	0
2.24	ND<0	2.24	34	0
ND<0	ND<0	0	34	0
ND<0	ND<0	0	34	0
ND<0	ND<0	0	34	0
ND<0	ND<0	0	34	0
5.56	ND<0	5.56	35	0
ND<0	ND<0	0	35	0
ND<0	ND<0	0	35	0
1.13	ND<0	1.13	36	0
0.212	ND<0	0.212	37	0
0.728	ND<0	0.728	38	0
ND<0	ND<0	0	38	0
0.1	ND<0	0.1	39	0
4.87	ND<0	4.87	40	0
ND<0	ND<0	0	40	0
2.24	ND<0	2.24	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
5.56	ND<0	5.56	42	0
ND<0	ND<0	0	42	0
1.13	ND<0	1.13	43	0
0.212	ND<0	0.212	44	0
0.728	ND<0	0.728	45	0
ND<0	ND<0	0	45	0
0.1	ND<0	0.1	46	0
4.87	ND<0	4.87	47	0
ND<0	ND<0	0	47	0
2.24	ND<0	2.24	48	0
ND<0	ND<0	0	48	0
ND<0	ND<0	0	48	0
ND<0	ND<0	0	48	0

ND<0	ND<0	0	48	0
5.56	ND<0	5.56	49	0
ND<0	ND<0	0	49	0
0.212	1.13	-0.918	49	1
0.728	1.13	-0.402	49	2
ND<0	1.13	-1.13	49	3
0.1	1.13	-1.03	49	4
4.87	1.13	3.74	50	4
ND<0	1.13	-1.13	50	5
2.24	1.13	1.11	51	5
ND<0	1.13	-1.13	51	6
ND<0	1.13	-1.13	51	7
ND<0	1.13	-1.13	51	8
ND<0	1.13	-1.13	51	9
5.56	1.13	4.43	52	9
ND<0	1.13	-1.13	52	10
0.728	0.212	0.516	53	10
ND<0	0.212	-0.212	53	11
0.1	0.212	-0.112	53	12
4.87	0.212	4.658	54	12
ND<0	0.212	-0.212	54	13
2.24	0.212	2.028	55	13
ND<0	0.212	-0.212	55	14
ND<0	0.212	-0.212	55	15
ND<0	0.212	-0.212	55	16
ND<0	0.212	-0.212	55	17
5.56	0.212	5.348	56	17
ND<0	0.212	-0.212	56	18
ND<0	0.728	-0.728	56	19
0.1	0.728	-0.628	56	20
4.87	0.728	4.142	57	20
ND<0	0.728	-0.728	57	21
2.24	0.728	1.512	58	21
ND<0	0.728	-0.728	58	22
ND<0	0.728	-0.728	58	23
ND<0	0.728	-0.728	58	24
ND<0	0.728	-0.728	58	25
5.56	0.728	4.832	59	25
ND<0	0.728	-0.728	59	26
0.1	ND<0	0.1	60	26
4.87	ND<0	4.87	61	26
ND<0	ND<0	0	61	26
2.24	ND<0	2.24	62	26
ND<0	ND<0	0	62	26
ND<0	ND<0	0	62	26
ND<0	ND<0	0	62	26
ND<0	ND<0	0	62	26
5.56	ND<0	5.56	63	26
ND<0	ND<0	0	63	26
4.87	0.1	4.77	64	26
ND<0	0.1	-0.1	64	27
2.24	0.1	2.14	65	27
ND<0	0.1	-0.1	65	28
ND<0	0.1	-0.1	65	29
ND<0	0.1	-0.1	65	30
ND<0	0.1	-0.1	65	31
5.56	0.1	5.46	66	31
ND<0	0.1	-0.1	66	32
ND<0	4.87	-4.87	66	33
2.24	4.87	-2.63	66	34
ND<0	4.87	-4.87	66	35

ND<0	4.87	-4.87	66	36
ND<0	4.87	-4.87	66	37
ND<0	4.87	-4.87	66	38
5.56	4.87	0.69	67	38
ND<0	4.87	-4.87	67	39
2.24	ND<0	2.24	68	39
ND<0	ND<0	0	68	39
ND<0	ND<0	0	68	39
ND<0	ND<0	0	68	39
ND<0	ND<0	0	68	39
5.56	ND<0	5.56	69	39
ND<0	ND<0	0	69	39
ND<0	2.24	-2.24	69	40
ND<0	2.24	-2.24	69	41
ND<0	2.24	-2.24	69	42
ND<0	2.24	-2.24	69	43
5.56	2.24	3.32	70	43
ND<0	2.24	-2.24	70	44
ND<0	ND<0	0	70	44
ND<0	ND<0	0	70	44
ND<0	ND<0	0	70	44
5.56	ND<0	5.56	71	44
ND<0	ND<0	0	71	44
ND<0	ND<0	0	71	44
ND<0	ND<0	0	71	44
5.56	ND<0	5.56	72	44
ND<0	ND<0	0	72	44
ND<0	ND<0	0	72	44
5.56	ND<0	5.56	73	44
ND<0	ND<0	0	73	44
5.56	ND<0	5.56	74	44
ND<0	ND<0	0	74	44
ND<0	5.56	-5.56	74	45

S Statistic = 74 - 45 = 29

Tied Group	Value	Members
1	0	14

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1
10/29/2014	1
3/16/2015	1
10/21/2015	1

5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 6006
B = 0
C = 2184
D = 0
E = 182
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 763
Z-Score = 1.01367
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.01367 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-09

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
1.13	ND<0	1.13	1	0
0.212	ND<0	0.212	2	0
0.728	ND<0	0.728	3	0
ND<0	ND<0	0	3	0
0.1	ND<0	0.1	4	0
4.87	ND<0	4.87	5	0
ND<0	ND<0	0	5	0
2.24	ND<0	2.24	6	0
ND<0	ND<0	0	6	0
ND<0	ND<0	0	6	0
ND<0	ND<0	0	6	0
ND<0	ND<0	0	6	0
5.56	ND<0	5.56	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
ND<0	ND<0	0	7	0
1.13	ND<0	1.13	8	0
0.212	ND<0	0.212	9	0
0.728	ND<0	0.728	10	0
ND<0	ND<0	0	10	0
0.1	ND<0	0.1	11	0
4.87	ND<0	4.87	12	0
ND<0	ND<0	0	12	0
2.24	ND<0	2.24	13	0
ND<0	ND<0	0	13	0
ND<0	ND<0	0	13	0
ND<0	ND<0	0	13	0
ND<0	ND<0	0	13	0
5.56	ND<0	5.56	14	0
ND<0	ND<0	0	14	0
ND<0	ND<0	0	14	0
ND<0	ND<0	0	14	0
ND<0	ND<0	0	14	0
ND<0	ND<0	0	14	0
1.13	ND<0	1.13	15	0
0.212	ND<0	0.212	16	0
0.728	ND<0	0.728	17	0
ND<0	ND<0	0	17	0
0.1	ND<0	0.1	18	0
4.87	ND<0	4.87	19	0
ND<0	ND<0	0	19	0
2.24	ND<0	2.24	20	0
ND<0	ND<0	0	20	0
ND<0	ND<0	0	20	0

ND<0	ND<0	0	20	0
ND<0	ND<0	0	20	0
5.56	ND<0	5.56	21	0
ND<0	ND<0	0	21	0
ND<0	ND<0	0	21	0
ND<0	ND<0	0	21	0
ND<0	ND<0	0	21	0
1.13	ND<0	1.13	22	0
0.212	ND<0	0.212	23	0
0.728	ND<0	0.728	24	0
ND<0	ND<0	0	24	0
0.1	ND<0	0.1	25	0
4.87	ND<0	4.87	26	0
ND<0	ND<0	0	26	0
2.24	ND<0	2.24	27	0
ND<0	ND<0	0	27	0
ND<0	ND<0	0	27	0
ND<0	ND<0	0	27	0
ND<0	ND<0	0	27	0
5.56	ND<0	5.56	28	0
ND<0	ND<0	0	28	0
ND<0	ND<0	0	28	0
ND<0	ND<0	0	28	0
1.13	ND<0	1.13	29	0
0.212	ND<0	0.212	30	0
0.728	ND<0	0.728	31	0
ND<0	ND<0	0	31	0
0.1	ND<0	0.1	32	0
4.87	ND<0	4.87	33	0
ND<0	ND<0	0	33	0
2.24	ND<0	2.24	34	0
ND<0	ND<0	0	34	0
ND<0	ND<0	0	34	0
ND<0	ND<0	0	34	0
ND<0	ND<0	0	34	0
5.56	ND<0	5.56	35	0
ND<0	ND<0	0	35	0
ND<0	ND<0	0	35	0
1.13	ND<0	1.13	36	0
0.212	ND<0	0.212	37	0
0.728	ND<0	0.728	38	0
ND<0	ND<0	0	38	0
0.1	ND<0	0.1	39	0
4.87	ND<0	4.87	40	0
ND<0	ND<0	0	40	0
2.24	ND<0	2.24	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
5.56	ND<0	5.56	42	0
ND<0	ND<0	0	42	0
1.13	ND<0	1.13	43	0
0.212	ND<0	0.212	44	0
0.728	ND<0	0.728	45	0
ND<0	ND<0	0	45	0
0.1	ND<0	0.1	46	0
4.87	ND<0	4.87	47	0
ND<0	ND<0	0	47	0
2.24	ND<0	2.24	48	0
ND<0	ND<0	0	48	0
ND<0	ND<0	0	48	0
ND<0	ND<0	0	48	0

ND<0	ND<0	0	48	0
5.56	ND<0	5.56	49	0
ND<0	ND<0	0	49	0
0.212	1.13	-0.918	49	1
0.728	1.13	-0.402	49	2
ND<0	1.13	-1.13	49	3
0.1	1.13	-1.03	49	4
4.87	1.13	3.74	50	4
ND<0	1.13	-1.13	50	5
2.24	1.13	1.11	51	5
ND<0	1.13	-1.13	51	6
ND<0	1.13	-1.13	51	7
ND<0	1.13	-1.13	51	8
ND<0	1.13	-1.13	51	9
5.56	1.13	4.43	52	9
ND<0	1.13	-1.13	52	10
0.728	0.212	0.516	53	10
ND<0	0.212	-0.212	53	11
0.1	0.212	-0.112	53	12
4.87	0.212	4.658	54	12
ND<0	0.212	-0.212	54	13
2.24	0.212	2.028	55	13
ND<0	0.212	-0.212	55	14
ND<0	0.212	-0.212	55	15
ND<0	0.212	-0.212	55	16
ND<0	0.212	-0.212	55	17
5.56	0.212	5.348	56	17
ND<0	0.212	-0.212	56	18
ND<0	0.728	-0.728	56	19
0.1	0.728	-0.628	56	20
4.87	0.728	4.142	57	20
ND<0	0.728	-0.728	57	21
2.24	0.728	1.512	58	21
ND<0	0.728	-0.728	58	22
ND<0	0.728	-0.728	58	23
ND<0	0.728	-0.728	58	24
ND<0	0.728	-0.728	58	25
5.56	0.728	4.832	59	25
ND<0	0.728	-0.728	59	26
0.1	ND<0	0.1	60	26
4.87	ND<0	4.87	61	26
ND<0	ND<0	0	61	26
2.24	ND<0	2.24	62	26
ND<0	ND<0	0	62	26
ND<0	ND<0	0	62	26
ND<0	ND<0	0	62	26
ND<0	ND<0	0	62	26
5.56	ND<0	5.56	63	26
ND<0	ND<0	0	63	26
4.87	0.1	4.77	64	26
ND<0	0.1	-0.1	64	27
2.24	0.1	2.14	65	27
ND<0	0.1	-0.1	65	28
ND<0	0.1	-0.1	65	29
ND<0	0.1	-0.1	65	30
ND<0	0.1	-0.1	65	31
5.56	0.1	5.46	66	31
ND<0	0.1	-0.1	66	32
ND<0	4.87	-4.87	66	33
2.24	4.87	-2.63	66	34
ND<0	4.87	-4.87	66	35

ND<0	4.87	-4.87	66	36
ND<0	4.87	-4.87	66	37
ND<0	4.87	-4.87	66	38
5.56	4.87	0.69	67	38
ND<0	4.87	-4.87	67	39
2.24	ND<0	2.24	68	39
ND<0	ND<0	0	68	39
ND<0	ND<0	0	68	39
ND<0	ND<0	0	68	39
ND<0	ND<0	0	68	39
5.56	ND<0	5.56	69	39
ND<0	ND<0	0	69	39
ND<0	2.24	-2.24	69	40
ND<0	2.24	-2.24	69	41
ND<0	2.24	-2.24	69	42
ND<0	2.24	-2.24	69	43
5.56	2.24	3.32	70	43
ND<0	2.24	-2.24	70	44
ND<0	ND<0	0	70	44
ND<0	ND<0	0	70	44
ND<0	ND<0	0	70	44
5.56	ND<0	5.56	71	44
ND<0	ND<0	0	71	44
ND<0	ND<0	0	71	44
ND<0	ND<0	0	71	44
5.56	ND<0	5.56	72	44
ND<0	ND<0	0	72	44
ND<0	ND<0	0	72	44
5.56	ND<0	5.56	73	44
ND<0	ND<0	0	73	44
5.56	ND<0	5.56	74	44
ND<0	ND<0	0	74	44
ND<0	5.56	-5.56	74	45

S Statistic = 74 - 45 = 29

Tied Group	Value	Members
1	0	14

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1
10/29/2014	1
3/16/2015	1
10/21/2015	1

5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 6006
B = 0
C = 2184
D = 0
E = 182
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 763
Z-Score = 1.01367
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.01367 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-09

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
140	21	119	1	0
81	21	60	2	0
64	21	43	3	0
72	21	51	4	0
83	21	62	5	0
96	21	75	6	0
ND<0	21	-21	6	1
97	21	76	7	1
170	21	149	8	1
130	21	109	9	1
62	21	41	10	1
17	21	-4	10	2
92	21	71	11	2
ND<0	21	-21	11	3
110	21	89	12	3
67	21	46	13	3
74	21	53	14	3
64	21	43	15	3
180	21	159	16	3
81	21	60	17	3
81	140	-59	17	4
64	140	-76	17	5
72	140	-68	17	6
83	140	-57	17	7
96	140	-44	17	8
ND<0	140	-140	17	9
97	140	-43	17	10
170	140	30	18	10
130	140	-10	18	11
62	140	-78	18	12
17	140	-123	18	13
92	140	-48	18	14
ND<0	140	-140	18	15
110	140	-30	18	16
67	140	-73	18	17
74	140	-66	18	18
64	140	-76	18	19
180	140	40	19	19
81	140	-59	19	20
64	81	-17	19	21
72	81	-9	19	22
83	81	2	20	22
96	81	15	21	22
ND<0	81	-81	21	23
97	81	16	22	23
170	81	89	23	23
130	81	49	24	23
62	81	-19	24	24
17	81	-64	24	25
92	81	11	25	25
ND<0	81	-81	25	26
110	81	29	26	26
67	81	-14	26	27

74	81	-7	26	28
64	81	-17	26	29
180	81	99	27	29
81	81	0	27	29
72	64	8	28	29
83	64	19	29	29
96	64	32	30	29
ND<0	64	-64	30	30
97	64	33	31	30
170	64	106	32	30
130	64	66	33	30
62	64	-2	33	31
17	64	-47	33	32
92	64	28	34	32
ND<0	64	-64	34	33
110	64	46	35	33
67	64	3	36	33
74	64	10	37	33
64	64	0	37	33
180	64	116	38	33
81	64	17	39	33
83	72	11	40	33
96	72	24	41	33
ND<0	72	-72	41	34
97	72	25	42	34
170	72	98	43	34
130	72	58	44	34
62	72	-10	44	35
17	72	-55	44	36
92	72	20	45	36
ND<0	72	-72	45	37
110	72	38	46	37
67	72	-5	46	38
74	72	2	47	38
64	72	-8	47	39
180	72	108	48	39
81	72	9	49	39
96	83	13	50	39
ND<0	83	-83	50	40
97	83	14	51	40
170	83	87	52	40
130	83	47	53	40
62	83	-21	53	41
17	83	-66	53	42
92	83	9	54	42
ND<0	83	-83	54	43
110	83	27	55	43
67	83	-16	55	44
74	83	-9	55	45
64	83	-19	55	46
180	83	97	56	46
81	83	-2	56	47
ND<0	96	-96	56	48
97	96	1	57	48
170	96	74	58	48
130	96	34	59	48
62	96	-34	59	49
17	96	-79	59	50
92	96	-4	59	51
ND<0	96	-96	59	52
110	96	14	60	52
67	96	-29	60	53
74	96	-22	60	54

64	96	-32	60	55
180	96	84	61	55
81	96	-15	61	56
97	ND<0	97	62	56
170	ND<0	170	63	56
130	ND<0	130	64	56
62	ND<0	62	65	56
17	ND<0	17	66	56
92	ND<0	92	67	56
ND<0	ND<0	0	67	56
110	ND<0	110	68	56
67	ND<0	67	69	56
74	ND<0	74	70	56
64	ND<0	64	71	56
180	ND<0	180	72	56
81	ND<0	81	73	56
170	97	73	74	56
130	97	33	75	56
62	97	-35	75	57
17	97	-80	75	58
92	97	-5	75	59
ND<0	97	-97	75	60
110	97	13	76	60
67	97	-30	76	61
74	97	-23	76	62
64	97	-33	76	63
180	97	83	77	63
81	97	-16	77	64
130	170	-40	77	65
62	170	-108	77	66
17	170	-153	77	67
92	170	-78	77	68
ND<0	170	-170	77	69
110	170	-60	77	70
67	170	-103	77	71
74	170	-96	77	72
64	170	-106	77	73
180	170	10	78	73
81	170	-89	78	74
62	130	-68	78	75
17	130	-113	78	76
92	130	-38	78	77
ND<0	130	-130	78	78
110	130	-20	78	79
67	130	-63	78	80
74	130	-56	78	81
64	130	-66	78	82
180	130	50	79	82
81	130	-49	79	83
17	62	-45	79	84
92	62	30	80	84
ND<0	62	-62	80	85
110	62	48	81	85
67	62	5	82	85
74	62	12	83	85
64	62	2	84	85
180	62	118	85	85
81	62	19	86	85
92	17	75	87	85
ND<0	17	-17	87	86
110	17	93	88	86

67	17	50	89	86
74	17	57	90	86
64	17	47	91	86
180	17	163	92	86
81	17	64	93	86
ND<0	92	-92	93	87
110	92	18	94	87
67	92	-25	94	88
74	92	-18	94	89
64	92	-28	94	90
180	92	88	95	90
81	92	-11	95	91
110	ND<0	110	96	91
67	ND<0	67	97	91
74	ND<0	74	98	91
64	ND<0	64	99	91
180	ND<0	180	100	91
81	ND<0	81	101	91
67	110	-43	101	92
74	110	-36	101	93
64	110	-46	101	94
180	110	70	102	94
81	110	-29	102	95
74	67	7	103	95
64	67	-3	103	96
180	67	113	104	96
81	67	14	105	96
64	74	-10	105	97
180	74	106	106	97
81	74	7	107	97
180	64	116	108	97
81	64	17	109	97
81	180	-99	109	98

S Statistic = 109 - 98 = 11

Tied Group	Value	Members
1	81	2
2	64	2
3	0	2

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/24/2013	1
11/13/2013	1
4/15/2014	1
10/29/2014	1

3/16/2015	1
10/21/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 54
B = 0
C = 0
D = 0
E = 6
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1093.67
Z-Score = 0.302383
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.302383 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-09

Original Data (Not Transformed)
Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
140	21	119	1	0
81	21	60	2	0
64	21	43	3	0
72	21	51	4	0
83	21	62	5	0
96	21	75	6	0
ND<0	21	-21	6	1
97	21	76	7	1
170	21	149	8	1
130	21	109	9	1
62	21	41	10	1
17	21	-4	10	2
92	21	71	11	2
ND<0	21	-21	11	3
110	21	89	12	3
67	21	46	13	3
74	21	53	14	3
64	21	43	15	3
180	21	159	16	3
81	21	60	17	3
81	140	-59	17	4
64	140	-76	17	5
72	140	-68	17	6
83	140	-57	17	7
96	140	-44	17	8
ND<0	140	-140	17	9
97	140	-43	17	10
170	140	30	18	10
130	140	-10	18	11
62	140	-78	18	12
17	140	-123	18	13
92	140	-48	18	14
ND<0	140	-140	18	15
110	140	-30	18	16
67	140	-73	18	17
74	140	-66	18	18
64	140	-76	18	19
180	140	40	19	19
81	140	-59	19	20
64	81	-17	19	21
72	81	-9	19	22
83	81	2	20	22
96	81	15	21	22
ND<0	81	-81	21	23
97	81	16	22	23
170	81	89	23	23
130	81	49	24	23
62	81	-19	24	24
17	81	-64	24	25
92	81	11	25	25
ND<0	81	-81	25	26
110	81	29	26	26
67	81	-14	26	27

74	81	-7	26	28
64	81	-17	26	29
180	81	99	27	29
81	81	0	27	29
72	64	8	28	29
83	64	19	29	29
96	64	32	30	29
ND<0	64	-64	30	30
97	64	33	31	30
170	64	106	32	30
130	64	66	33	30
62	64	-2	33	31
17	64	-47	33	32
92	64	28	34	32
ND<0	64	-64	34	33
110	64	46	35	33
67	64	3	36	33
74	64	10	37	33
64	64	0	37	33
180	64	116	38	33
81	64	17	39	33
83	72	11	40	33
96	72	24	41	33
ND<0	72	-72	41	34
97	72	25	42	34
170	72	98	43	34
130	72	58	44	34
62	72	-10	44	35
17	72	-55	44	36
92	72	20	45	36
ND<0	72	-72	45	37
110	72	38	46	37
67	72	-5	46	38
74	72	2	47	38
64	72	-8	47	39
180	72	108	48	39
81	72	9	49	39
96	83	13	50	39
ND<0	83	-83	50	40
97	83	14	51	40
170	83	87	52	40
130	83	47	53	40
62	83	-21	53	41
17	83	-66	53	42
92	83	9	54	42
ND<0	83	-83	54	43
110	83	27	55	43
67	83	-16	55	44
74	83	-9	55	45
64	83	-19	55	46
180	83	97	56	46
81	83	-2	56	47
ND<0	96	-96	56	48
97	96	1	57	48
170	96	74	58	48
130	96	34	59	48
62	96	-34	59	49
17	96	-79	59	50
92	96	-4	59	51
ND<0	96	-96	59	52
110	96	14	60	52
67	96	-29	60	53
74	96	-22	60	54

64	96	-32	60	55
180	96	84	61	55
81	96	-15	61	56
97	ND<0	97	62	56
170	ND<0	170	63	56
130	ND<0	130	64	56
62	ND<0	62	65	56
17	ND<0	17	66	56
92	ND<0	92	67	56
ND<0	ND<0	0	67	56
110	ND<0	110	68	56
67	ND<0	67	69	56
74	ND<0	74	70	56
64	ND<0	64	71	56
180	ND<0	180	72	56
81	ND<0	81	73	56
170	97	73	74	56
130	97	33	75	56
62	97	-35	75	57
17	97	-80	75	58
92	97	-5	75	59
ND<0	97	-97	75	60
110	97	13	76	60
67	97	-30	76	61
74	97	-23	76	62
64	97	-33	76	63
180	97	83	77	63
81	97	-16	77	64
130	170	-40	77	65
62	170	-108	77	66
17	170	-153	77	67
92	170	-78	77	68
ND<0	170	-170	77	69
110	170	-60	77	70
67	170	-103	77	71
74	170	-96	77	72
64	170	-106	77	73
180	170	10	78	73
81	170	-89	78	74
62	130	-68	78	75
17	130	-113	78	76
92	130	-38	78	77
ND<0	130	-130	78	78
110	130	-20	78	79
67	130	-63	78	80
74	130	-56	78	81
64	130	-66	78	82
180	130	50	79	82
81	130	-49	79	83
17	62	-45	79	84
92	62	30	80	84
ND<0	62	-62	80	85
110	62	48	81	85
67	62	5	82	85
74	62	12	83	85
64	62	2	84	85
180	62	118	85	85
81	62	19	86	85
92	17	75	87	85
ND<0	17	-17	87	86
110	17	93	88	86

67	17	50	89	86
74	17	57	90	86
64	17	47	91	86
180	17	163	92	86
81	17	64	93	86
ND<0	92	-92	93	87
110	92	18	94	87
67	92	-25	94	88
74	92	-18	94	89
64	92	-28	94	90
180	92	88	95	90
81	92	-11	95	91
110	ND<0	110	96	91
67	ND<0	67	97	91
74	ND<0	74	98	91
64	ND<0	64	99	91
180	ND<0	180	100	91
81	ND<0	81	101	91
67	110	-43	101	92
74	110	-36	101	93
64	110	-46	101	94
180	110	70	102	94
81	110	-29	102	95
74	67	7	103	95
64	67	-3	103	96
180	67	113	104	96
81	67	14	105	96
64	74	-10	105	97
180	74	106	106	97
81	74	7	107	97
180	64	116	108	97
81	64	17	109	97
81	180	-99	109	98

S Statistic = 109 - 98 = 11

Tied Group	Value	Members
1	81	2
2	64	2
3	0	2

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/24/2013	1
11/13/2013	1
4/15/2014	1
10/29/2014	1

3/16/2015	1
10/21/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 54
B = 0
C = 0
D = 0
E = 6
F = 0
a = 19740
b = 71820
c = 840
Group Variance = 1093.67
Z-Score = 0.302383
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.302383 <= 1.65463 indicating no evidence of an upward trend