

January 17, 2017

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

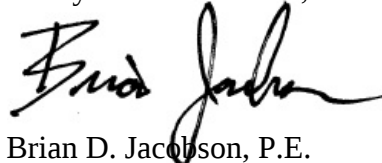
Subject: **Transmittal of Semi-annual Groundwater Monitoring Report #17
July 2016 through December 2017
Chemtrade Site, HSI#10498,
East Point, GA**

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 #17, July 2017 through December 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

17 January 2017

David Brownlee
Georgia Environmental Protection Division
Hazardous Site Response Program
2 Martin Luther King Jr Dr., Ste 1054
Atlanta, Georgia 30334

**Subject: January 2017 VRP Semi-Annual Progress Report Comments
Chemtrade Site, East Point, Georgia
HSI# 10498**

Dear Mr. David Brownlee:

On behalf of Chemtrade Solutions LLC (Chemtrade), Geosyntec is pleased to offer the following responses to comments received from the Georgia Environmental Protection Division (EPD), dated December 2, 2016. These comments were generated in response to the submittal by Chemtrade of the July 2016 Semi-Annual Groundwater Monitoring Report No. 16 (VRP Progress Report 7).

RESPONSE TO COMMENTS FROM EPD

Comment No. 1:

Per EPD's Letter of February 15, 2016, regarding the July 2015 & January 2016 VRP Progress Reports, the Report was to include certain updated information, which is not present:

- a) The results of excavating and sampling the SW-07 AA location and the attempt to locate an upstream source of impact.

The narrative in Section 3.3.4 contains the results of sampling SW-07 AA as does Figure 3-6. However, Section 4.4, the tables, Appendix A and Appendix B lack any mention of this sample.

- b) Update regarding the progress associated with implementing the proposed VRP Remediation Plan to address the surface water exposure pathway (i.e., slip line the storm water drains or perform any necessary repairs to prevent groundwater from

entering the storm drain system). Please provide EPD with a status update and updated schedule for the site related corrective measures.

- c) Update of the cost estimate for the remaining corrective measures to be completed at the site with an update to the associated financial assurance mechanism, as necessary. Please provide EPD with a status update and any necessary update to the associated financial assurance mechanism.

Response:

- a) *The laboratory results for SW-07AA were included in Laboratory Report AYL0215 dated 16 December 2015 in Appendix A of the report along with retests of SW-02 and SW-06. The sample was collected by hand as a grab sample and no field parameters were collected so a Field Form was not generated. A Chain of Custody was prepared which is presented in Appendix A of the report.*

Chemtrade has not historically reported additional storm drain sampling in the tables of the reports since these are collected as needed for engineering evaluation and not part of the monitoring schedule. Chemtrade proposed that a Technical Memorandum be prepared to summarize the storm drain sampling results and the proposed remedy. Given that MGA Holdings may be a upgradient source, the Technical Memorandum would be submitted after the findings from the MGA Holdings evaluation are integrated into the remedial decision. It is anticipated that the Technical Memorandum would be similar to the one submitted for the delineation sampling in the December 2013 report.

- b) *Chemtrade would prefer to implement the remedy concurrently with any remedy that may result from impacts from MGA Holdings. Chemtrade proposes to be responsible for slip lining between manholes SW-07X and SW-07AA and to install a repair at a visible infiltration point at SW-08A. Repairs upstream of SW-07AA would be done cooperatively with MGA Holdings after their potential impacts are assessed. This approach minimizes significant mobilization costs for the slip lining contractor and minimizes disturbances to the ball fields. If a joint solution with MGA Holdings can be reached the work could occur during the Fall of 2017 after the fields are out of use for the year.*
- c) *An updated Cost Estimate and the related financial assurance will be sent under separate cover.*

Comment No. 2:

A figure(s) should be provided to visually support the narrative wherever appropriate. For instance:

- a) Section 3.3.4 discusses stormwater samples that are cross gradient from the former HCA cells but are downgradient of the former acid pits. The provided figures fail to demonstrate the locations of the HCA cells, the acid pits and stormwater sample locations, and the topography I surface water gradients at the site;
- b) Sections 3.2.3 and 3.3.3 discuss soil boring DB-05, its location relative to the acid pits and HCA impoundments, and the impact that might have regarding the sulfate concentrations. However, DB-05 is not shown on any figure; and
- c) Neither Figure 1-3, nor Figure 3-6, demonstrates the flow direction in the stormwater drainage system.

Response:

- a) *The location of the former HCA cells is provided in Figure 1-2 and a reference to this figure was added to the text in Section 3.2.3. Section 3.3.4 is not in the current report since it would be a restatement of results. The acid pits are shown on Figure 3.6 that shows stormwater sampling to date in addition to the normal locations at SW-02, SW-06, SW-07, and SW-09. The location of delineation boring DB-5 and the general direction of groundwater flow were added to Figure 3-6.*
- b) *The location of delineation boring DB-5 was added to Figure 3-6.*
- c) *The groundwater flow direction was added to Figures 1-3 and 3-6.*

Comment No. 3:

While Figures 3-4 and 3-5 illustrate groundwater concentrations and the lateral extent of the area exceeding the Type 4 compliance criteria, the information is not included in the accompanying tables or narrative. Additionally, there is no information presented for

surface water. Please ensure that future VRP Progress Reports include a comparison of site data to the applicable Type 1/4 risk reduction standards/clean-up criteria in figures, tables and narrative format.

Response:

Table 3-1 was updated to indicate which wells were in compliance with Type 4 Risk Reduction Standards (RRS). Additional text was added to Section 3.2.3 to describe the boundaries shown in Figures 3-4 and 3-5. RRS were not developed for surface water since pathway elimination is the proposed remedy.

Comment No. 4:

The historical trend graphs shown in Figure(s) 3-2 are too small and cluttered to clearly portray movement towards stable or decreasing concentrations of contaminants. The narrative also states that the sulfate concentrations in several wells show a statistically significant decreasing trend. No supporting calculations, however, are provided for corroboration.

Response:

The historical trend graphs were reformatted to provide two graphs per page grouping data for a well or surface water location onto one page. The calculation output for the Mann-Kendall Trend Analysis Data is attached as Appendix C of the report. Chemtrade suggests that Appendix C only be submitted in electronic form in future submittals since at 240 pages this appendix is longer than the rest of the report and future sampling events will only add 13 lines of data per event.

Comment No. 5:

Sampling logs are inadequate to document that approved sampling protocols were followed.

a) Well sampling logs should include:

- i) The height/placement of pump tubing or intake, whether using the "Tubing-in-Screen" method, sometimes referred to as the "Low Flow" method, or a micro-purge method,

- ii) When the pump tubing or intake was placed in the well, and
- iii) Pumping rates and purge volumes at every measurement.

In addition, the narrative fails to mention whether the EPA's Field Branches Quality System and Technical Procedures (FBQSTP) Operating Procedure for "Groundwater Sampling", SESDPROC-301-R3, were strictly adhered to, or if any variations occurred, and how such variations may have impacted the sampling.

Response:

The field forms will be updated to include the requested data.

The sampling is in general accordance with the Operating Procedure for "Groundwater Sampling" using MicroPurge procedures for the "Tubing-in-Screened-Interval" Method. The only variation is 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. An audit of sampling methods will be performed and any additional variations will be included in the narrative for the next report.

Comment No. 6:

The Report lacks Tables of historic groundwater quality data as measured in the field (e.g., DO, pH, temperature, turbidity, conductivity, ORP, elevation data, etc.).

Response:

The only field parameter that is trended is pH on Figures 3-2 and 3-3. The other parameters are only used for evaluating if the well purge stream is stable for sampling. Parameters such as DO, temperature, turbidity, conductivity, ORP, elevation data are not used to make engineering decisions and are not trended.

Comment No. 7:

The industrial property to the northwest of the site is primarily referred to as the Furman Fertilizer Co. in the Report and figures. Section 3.3.4, however, refers to MGA Holdings with regard to the same property without any discussion in the Report regarding the relationship between the two. While EPD is aware of the relationship, members of the

public who might be reviewing the files might not. Please provide a simple explanation of the relationship in future narratives.

Regarding MGA Holdings, as indicated in the Report, On February 9, 2016, EPD requested MGA Holdings to submit analytical data and a formal release notification for a release at the former "acid pit". To date, EPD has not yet received a response to that correspondence.

Response:

Figure 1-1 was updated to indicate "MGA Holdings (Formerly Furman Farm Improvement Fertilizer Co)" and the text was revised to cross reference the two locations as the same property.

Chemtrade is willing to work cooperatively with MGA Holdings to assist with their investigation and develop a cost sharing remedy.

We hope the above responses are acceptable to EPD. If you have any questions or wish to discuss our proposed path forward, please contact either Mr. Eyaad Odeh of Chemtrade at (419) 290-1082 or Mr. Brian Jacobson of Geosyntec at (678) 202-9535.

Sincerely,



Brian D. Jacobson, P.E.
Senior Engineer



James Deitsch, Ph.D, P.E.
Principal Engineer

Copies to: Eyaad Odeh , Chemtrade
Hollister Hill, Troutman Sanders LLP
Brad Bowman, City of East Point



Prepared for

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**SEMI-ANNUAL GROUNDWATER
MONITORING REPORT NO. 17
JULY THROUGH DECEMBER 2016
CHEMTRADE SITE
EAST POINT, GEORGIA
HSI# 10498**

Prepared by

Geosyntec 
consultants

engineers | scientists | innovators

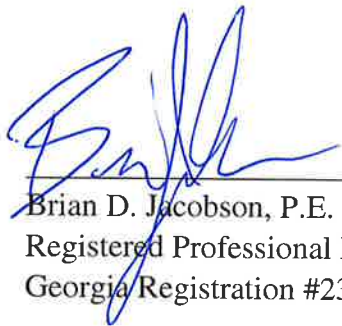
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Project Number GR5060

January 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.

 1/17/2017

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



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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 October 2016. This is the seventh 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. 17” 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 October 2016. 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 4 October 2016. All monitoring wells were gauged. The results of the groundwater elevation measurements are provided in **Table 3-1**.

The potentiometric map for October 2016 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 4-5 October 2016. 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 October 2016 sampling event. The sulfate concentrations were lower in the off-site wells, 140 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 35 mg/l. On-site well OW-1A at the western boundary was measured at 48 mg/l. The background monitoring well GCW-01D at the upgradient edge of the Site had 190 mg/l of sulfate. The results indicate groundwater entering the Site contains background concentrations of sulfate between 48 and 140 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 180 mg/l. The sulfate concentration along the northern property boundary at GCW-04D was 12 mg/L in May 2016 and 4,600 mg/L in October 2016. GCW-4D well is located outside the former impoundment areas. Sulfate at the eastern boundary at GCW-02D and GCW-03D were 3,800 and 7,000 mg/l, respectively. The source area monitoring well (GCW-05) sulfate concentration was 500 mg/l.

The sulfate concentrations generally showed a significant rebound to concentrations not seen since the HCA removal. This may be attributed to a dry summer and fall with reduced rainfall infiltration. At the time of the October sampling event the site was 9 inches short of rainfall for the year with 7.4 inches of the deficit occurring since the May sampling event. This sampling event is potentially an outlier and trends may revert to normal when rainfall returns to historic averages. Aluminum was detected at six of the nine monitoring wells sampled during the October 2016 sampling event. The concentrations were low at the off-site wells, 15.8 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 0.6 mg/l of aluminum. The background monitoring wells GCW- 01D at the upgradient edge of the Site contained 5.5 mg/l. The results indicate groundwater entering the Site contains background concentrations of aluminum between 0.6 to 15.8 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 419.0 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 this October 2016 sampling event, the pH dropped to 3.6, resulting in an increase in the aluminum concentration. Aluminum concentrations at the eastern boundary at GCW-02D and GCW-03D were 182 and 314 mg/l, respectively. The source area monitoring well (GCW-05) aluminum concentration was <0.1 mg/l.

The aluminum concentrations generally showed rebound to concentrations not seen since the HCA removal at some locations. This may be attributed to a dry summer and fall with reduced rainfall infiltration. At the time of the October sampling event the site was 9 inches short of rainfall for the year with 7.4 inches of the deficit occurring since the May sampling event. This sampling event is potentially an outlier and trends may revert to normal when rainfall returns to historic averages.

The pH measurements were generally consistent across the Site. The off-site wells EPW-01, -02, and -03 ranged from 4.8 to 6.7 standard units (s.u.). The upgradient wells GCW-01D and OW-1A were 4.2 and 5.1 s.u. respectively. The pH along the northern property boundary at well GCW-04D was 3.6 s.u. The northern and eastern wells GCW-02D and GCW-03D were similar and measured at 4.0 and 3.2 s.u. The pH for source area monitoring well (GCW-05) was measured at 7.9 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 around 140 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-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 3.9 and 3.7 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 October 2016. 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 October 2016 sampling event. The upgradient (SW-09) sulfate concentration was measured at 180 mg/l. A sample was collected cross-gradient (SW-06) at a location in the John D. Milner Sports Complex. Sulfate was measured at 4,600 mg/l. At the on-site location (SW-02), sulfate was measured at 2,200 mg/l. The sulfate concentration at the discharge of the storm drain to surface water at SW-07 was measured at 410 mg/l.

Aluminum was detected in the four storm drain water monitoring locations during the October 2016 sampling event. The upgradient (SW-09) aluminum concentration was 5.6 mg/l. The sample for aluminum collected cross-gradient (SW-06) was measured at 234 mg/l. At the on-site location (SW-02) aluminum was measured at 132 mg/l. The aluminum concentration at the discharge of the storm drain to surface water at SW-07 was measured at 40 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, except for the elevated pH of 14.0 s.u. at the upgradient storm drain SW-09. The high pH reading may be attributed to the low flow that was observed and effects of the cement in the concrete manhole raising the pH.

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 October 2016, samples were collected from nine monitoring wells. Samples from monitoring wells were collected using dedicated tubing and low-flow purging techniques. 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 shipped by overnight courier or hand delivered 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 is 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 500 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. Temperature (°C), 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 ground water surrounding the respective location.

Well GCW-03 was also tested for floating product. An interface probe was used to confirm the presence or absence of light non-aqueous phase liquids (LNAPL).

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 October 2016.

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. To ensure that the samples collected are representative of the storm drain water, field parameters are measured throughout the purging process. Temperature (°C), 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 eight 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 eight 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 21 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 5.1 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 3.7 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 2,200 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 410 mg/l which is greater than the background concentration of 46 to 140 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.

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

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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

FIGURES

APPENDIX A

GROUNDWATER AND STORM DRAIN LABORATORY RESULTS

APPENDIX B

GROUNDWATER AND STORM DRAIN SAMPLING FORM

APPENDIX C

MANN-KENDALL TREND ANALYSIS DATA



**Chemtrade
Solutions
LLC**

**SEMI-ANNUAL GROUNDWATER MONITORING REPORT NO. 17
JULY THROUGH DECEMBER 2016 CHEMTRADE SITE
EAST POINT GEORGIA HSI#10498**



**January
2017**

Table 3-1
Well Construction Data and Groundwater Elevations
January 2017
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)
				Oct-16	Oct-16
GCW-01S	1023.6	1024	182	15.6	1008.0
GCW-01M	1023.8	1024	34-44	15.6	1008.2
GCW-01D	1023.9	1024	58-68	15.1	1008.8
GCW-02S	983.6	984	16-26	5.8	977.8
GCW-02D	983.4	984	34-44	5.4	978.0
GCW-02V	984.7	985.0	85.5-95.5	5.6	979.1
GCW-03S	981.3	981.6	11-21	5.2	976.0
GCW-03D	981.2	982	28-38	5.3	975.9
GCW-04S	996.6	997.0	13-23	12.0	984.6
GCW-04M	997.0	997.4	30-40	11.9	985.1
GCW-04D	996.8	997.1	50-60	11.2	985.6
GCW-04V	996.7	997.0	114-124	10.5	986.2
GCW-05	995.1	994.9	80-90	8.0	987.1
EPW-01	1017.5	1017.7	24.51 ⁽¹⁾	22.2	995.3
EPW-02	980.0	980.3	19.41 ⁽¹⁾	10.5	969.5
EPW-03S	984.5	984.8	12-22	10.5	974.0
EPW-03M	984.3	984.6	29-39	10.3	974.0
EPW-03D	984.6	984.9	46-56	10.3	974.4
OW-1A ⁽²⁾	1030.6	1027.9	23.5-33.5 ⁽³⁾	18.0	1012.6

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
January 2017
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	190	5.5	No	No
GCW-02D	4.0	3800	182	Yes	Yes
GCW-03D	3.2	7000	314	Yes	Yes
GCW-04D	3.6	4600	419	Yes	Yes
GCW-05	7.9	500	<0.1	No	No
EPW-01	4.8	140	15.8	No	No
EPW-02	5.5	<5.0	<0.1	No	No
EPW-03D	6.7	35.0	<0.1	No	No
OW-1A	5.1	48	0.6	No	No
Duplicates	--	490 ⁽¹⁾	<0.1 ⁽¹⁾		

Notes:

⁽¹⁾: Duplicate was taken from GCW-05

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	No Trend
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	3	2200	132
SW-06	Cross-Gradient	4	182	234
SW-07	Downgradient	4	410	40.0
SW-09	Upgradient	14	180	5.6
Duplicate	Duplicate SW-02	--	1700	137

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

182

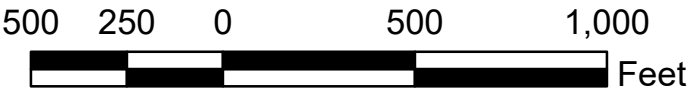


SITE VICINITY MAP

CHEMTRADE SOLUTIONS
EAST POINT, GEORGIA

Legend

- Approximate Property Line
- Approximate Site Property
- Storm Drain
- - - Unnamed Tributary
- South River



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consultants

ATLANTA, GEORGIA

JANUARY 2017	SCALE: 1" = 500'
PROJECT NO. GR5060	FIGURE NO. 1-1
DOCUMENT NO.	FILE NO. Site Vicinity Map.mxd



Legend

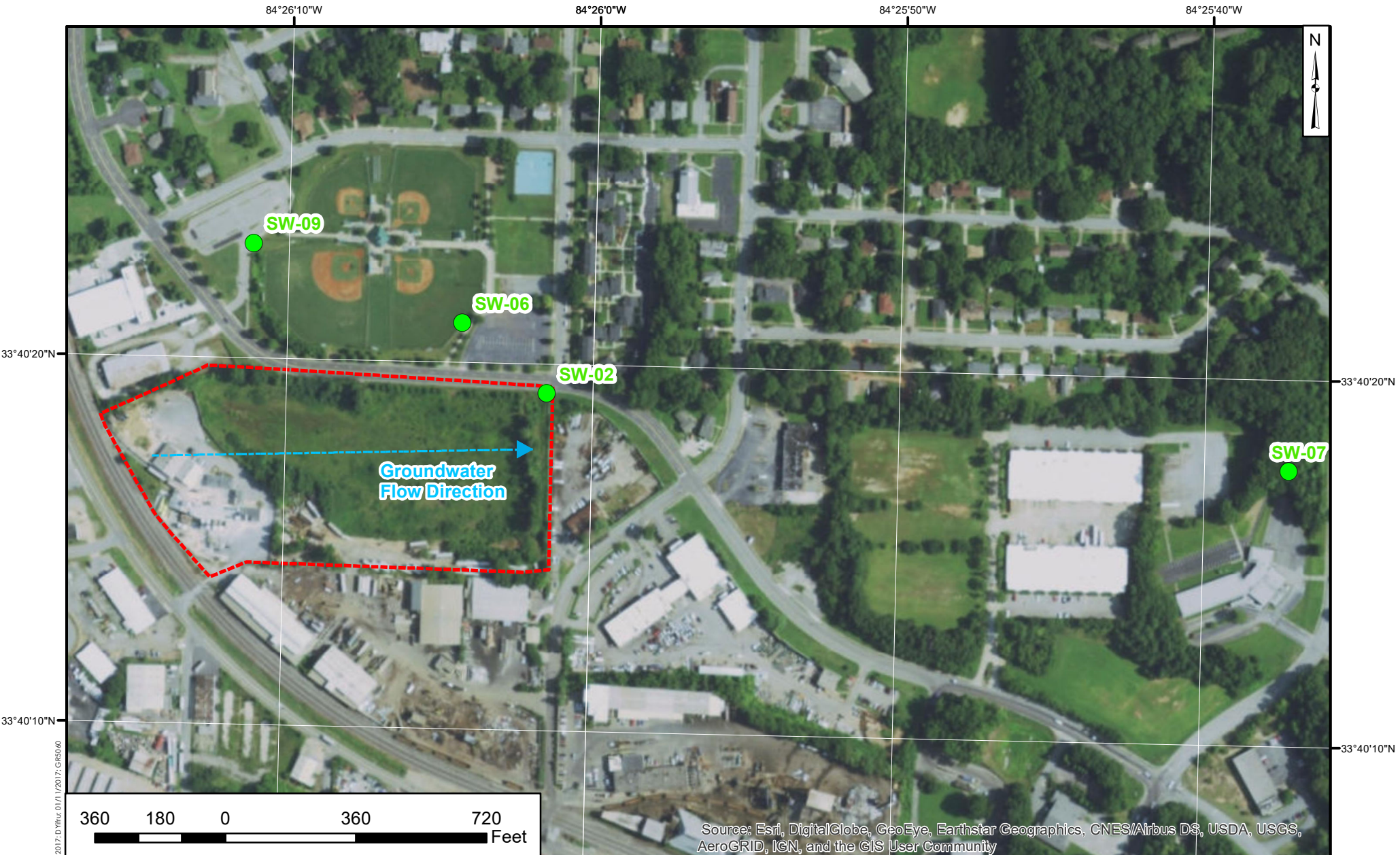
-  Monitoring Well selection
-  Excavation Cell
-  Approximate Property Boundary

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JANUARY 2017

MONITORING WELLS LOCATION MAP

Chemtrade Solutions, East Point, GA

Figure
1-2



Legend

- Surface Water Sample Location
- - - Approximate Property Boundary

Geosyntec
consultants
Kennesaw, GA

January 2017

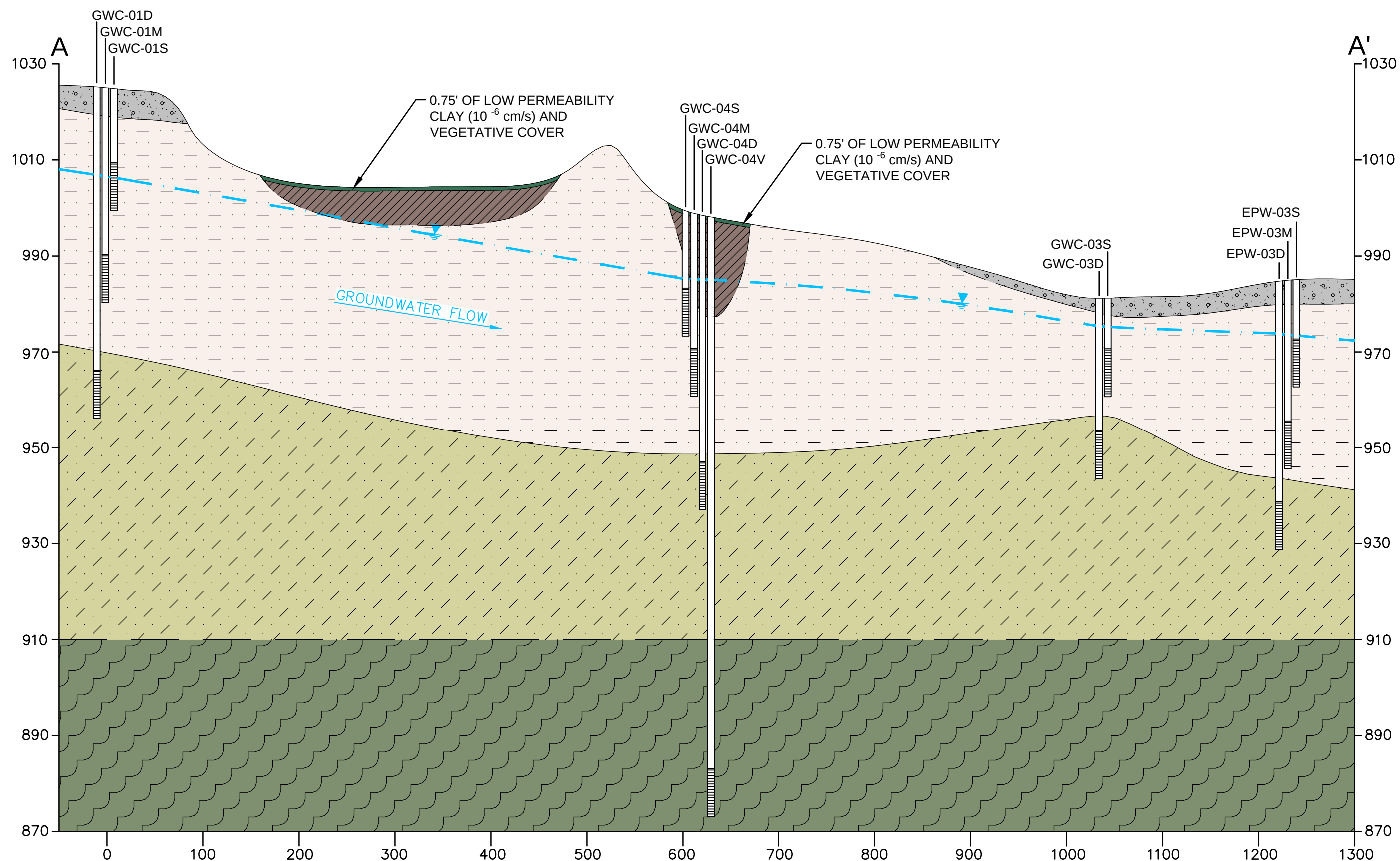
STORM DRAIN SAMPLE LOCATION MAP

Chemtrade Solutions, Atlanta, GA

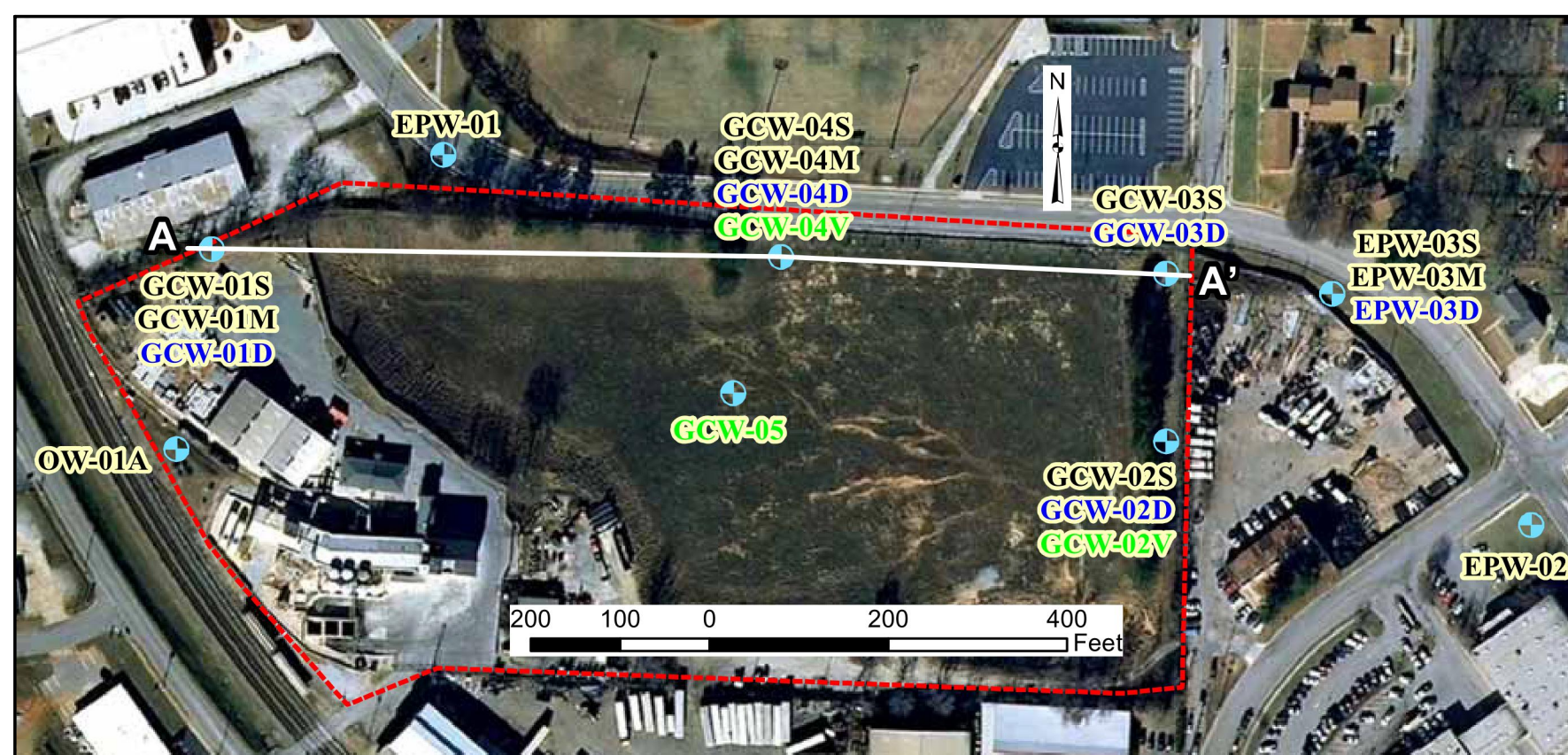
**Figure
1-3**

N:\genchem\GIS\WXD\January 2017\DWG\01/11/2017\GK5040

GEOLOGIC AND HYDROGEOLOGIC
CROSS SECTION ALONG A-A'



KEY MAP



LEGEND

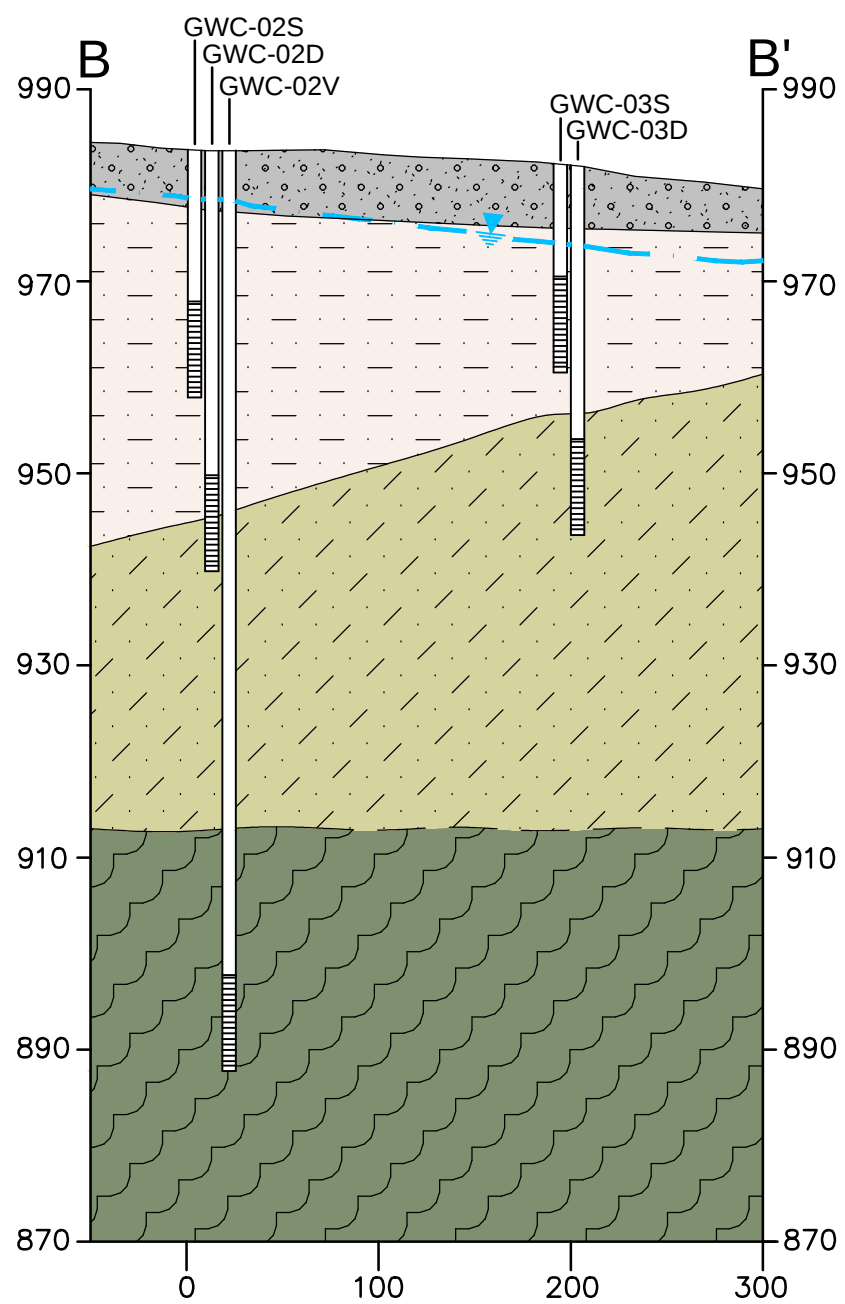
- 0.75' THICK LOW PERMEABILITY CLAY (10⁻⁶ cm/s) AND VEGETATIVE COVER
- GRAVELLY CLAY, FILL
- CLAY, FILL AFTER EXCAVATION
- SILTY SAND, RELICT SCHISTOSITY, MICACEOUS (SAPROLITE)
- PARTIALLY WEATHERED SCHIST
- BEDROCK (SCHIST)
- LITHOLOGIC CONTACT, DASHED WHERE INFERRED
- MONITORING WELL SCREEN ZONE WITH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

0 100' 200'
HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION = 5X

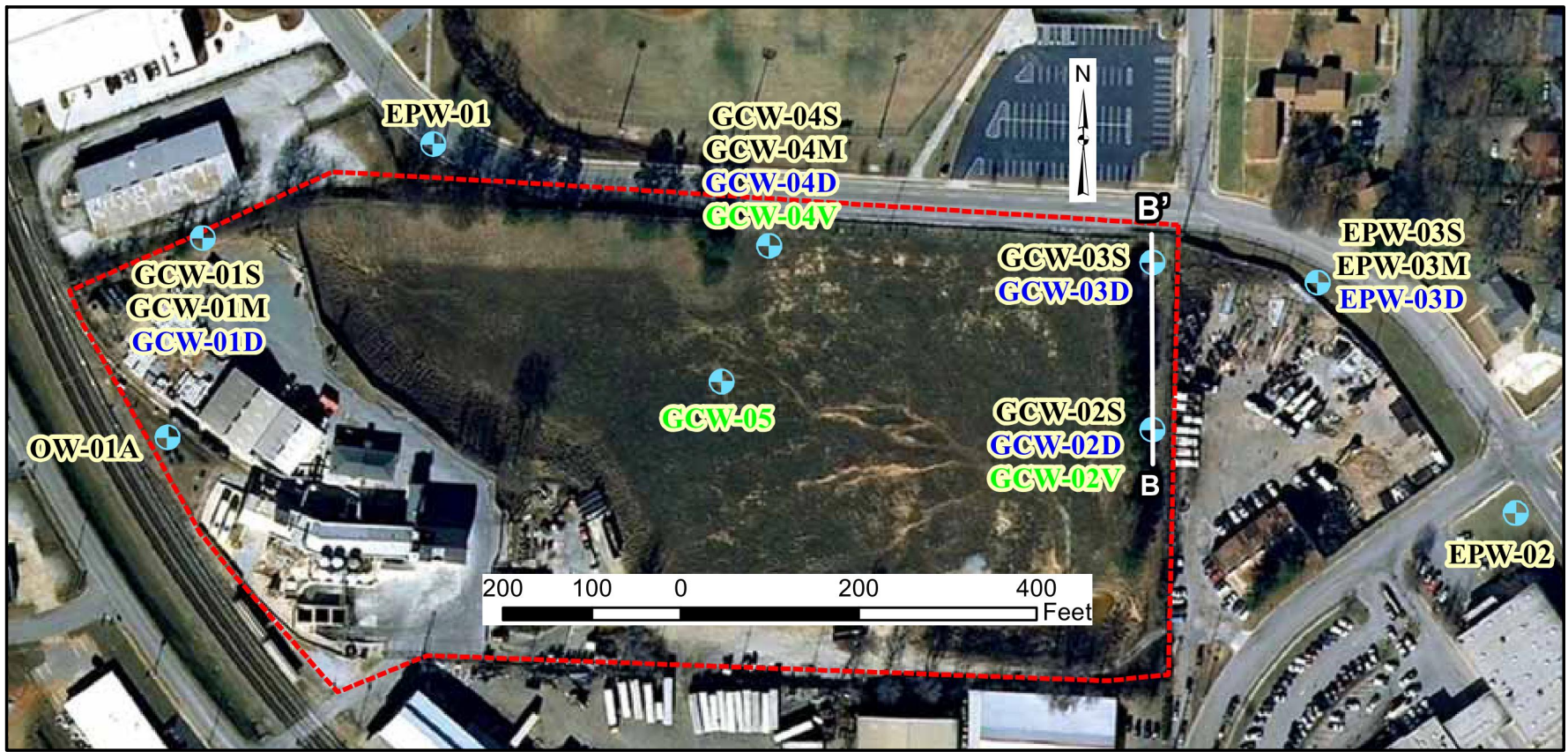
Geosyntec
consultants

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

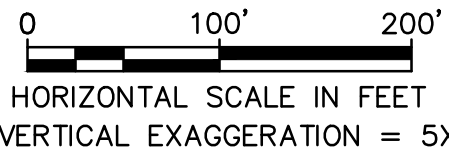
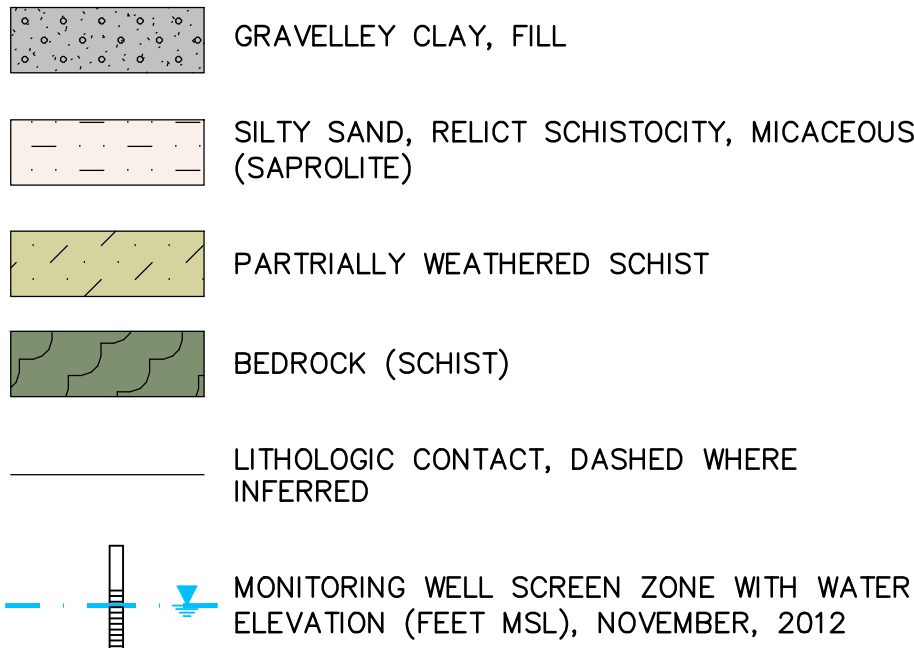
GEOLOGIC AND HYDROGEOLOGIC
CROSS SECTION ALONG B-B'



KEY MAP



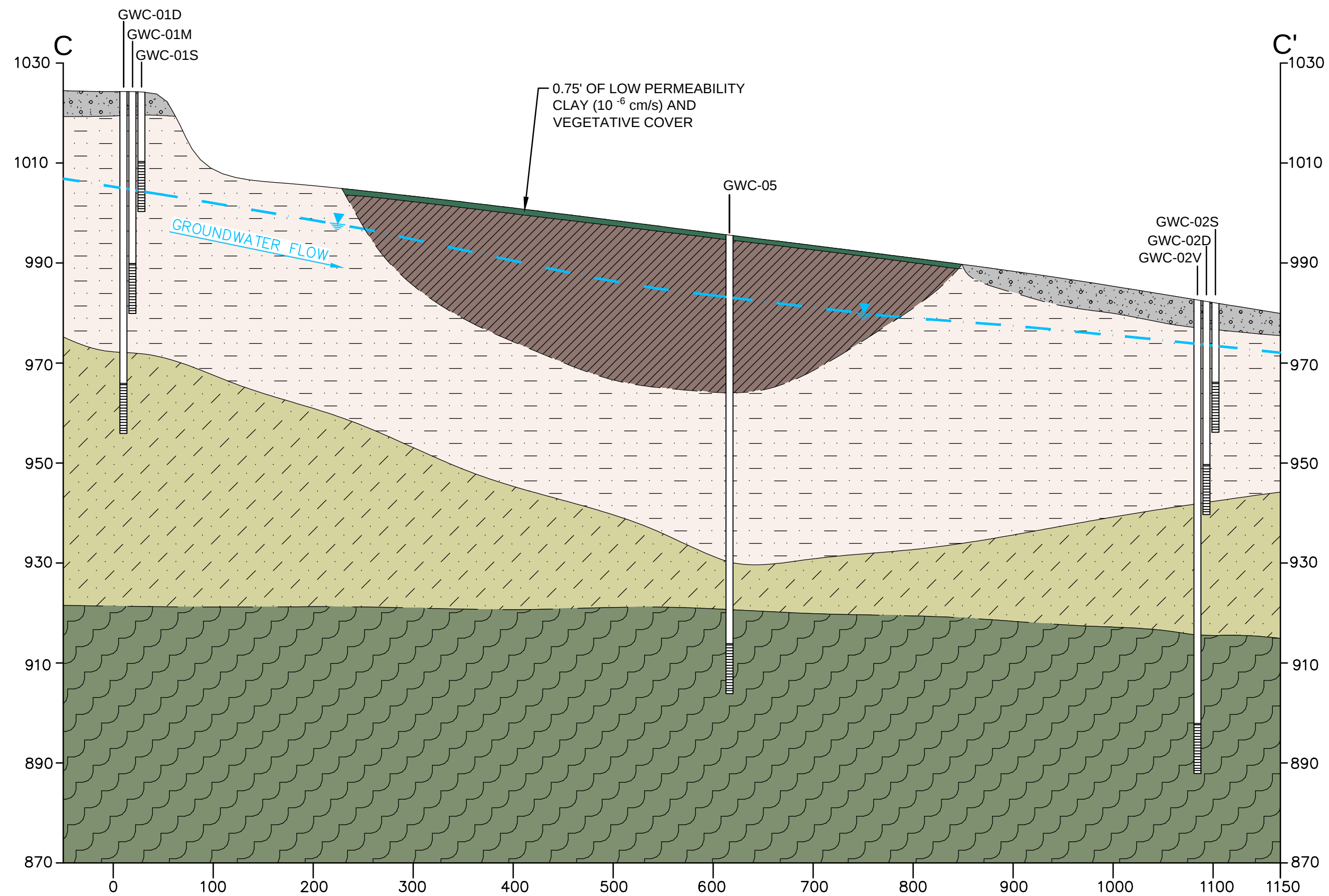
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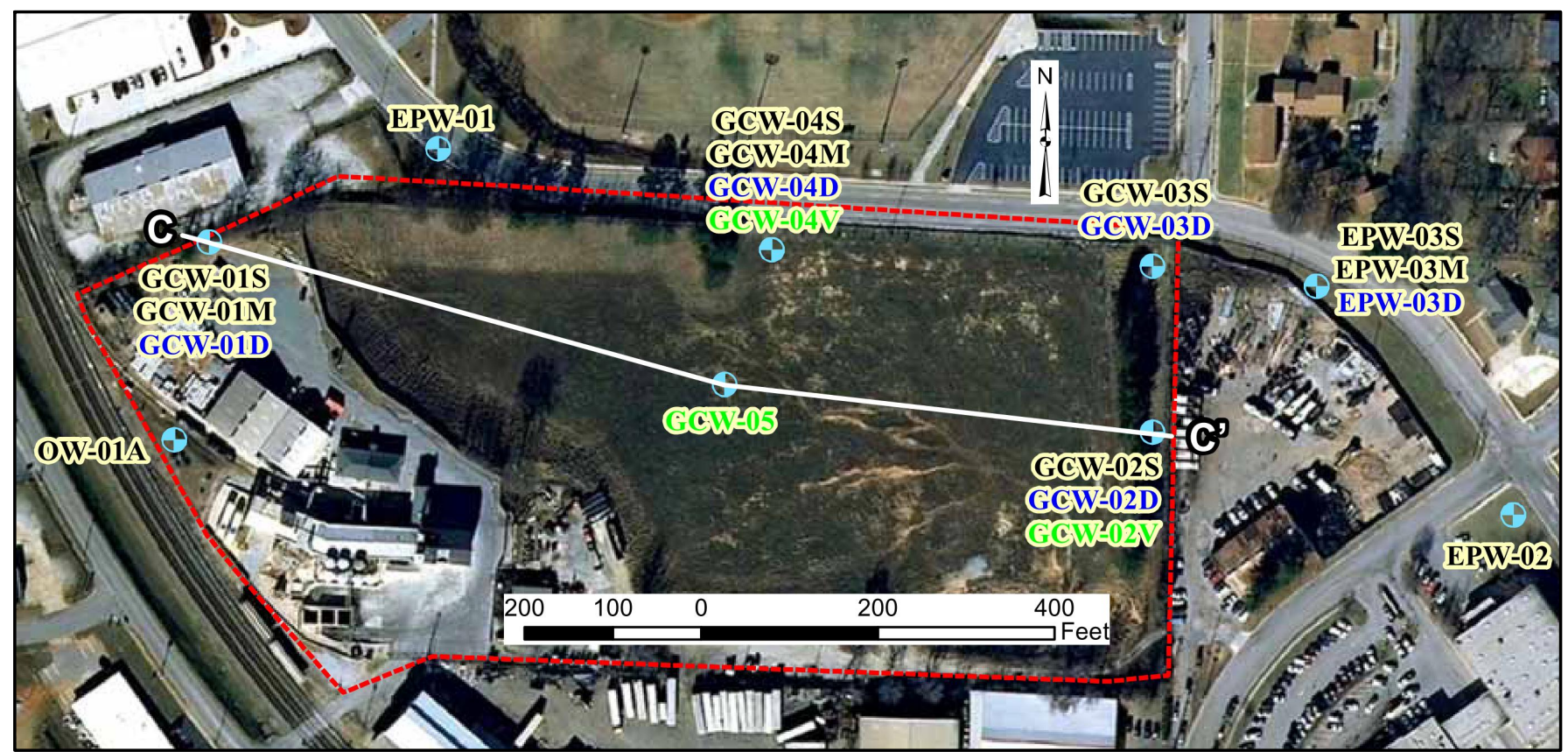
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DOCUMENT NO.	GA 130020	FIGURE NO.	2-2

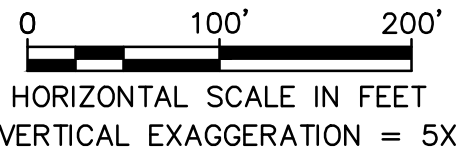
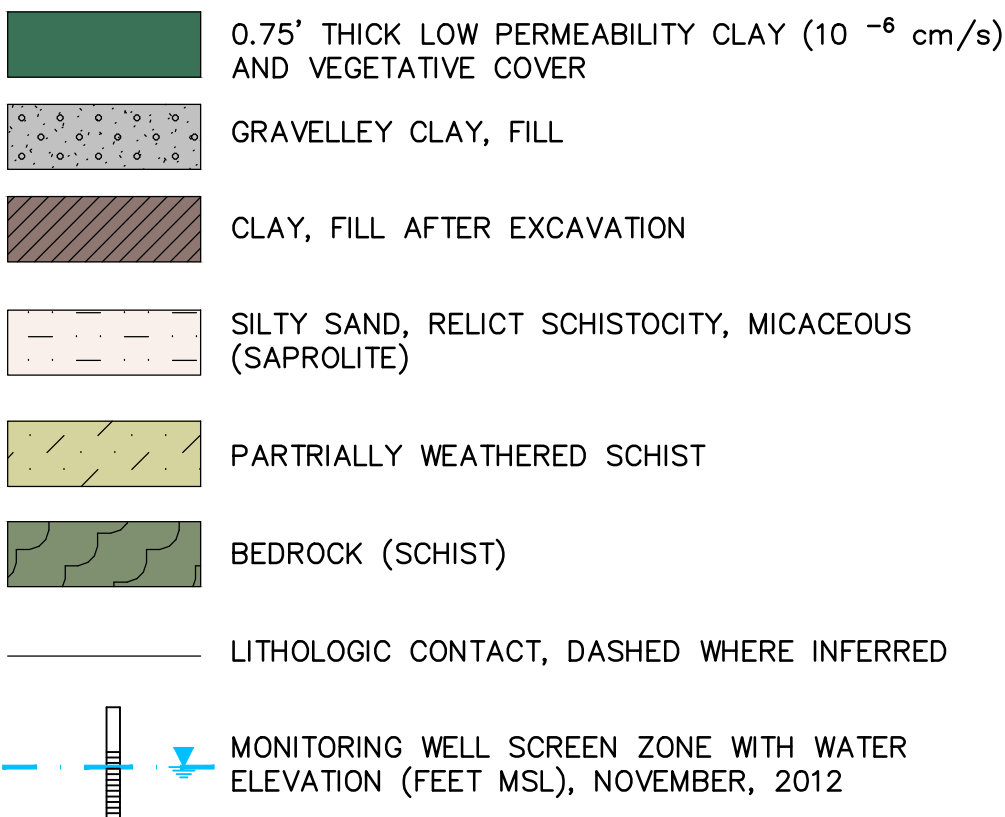
GEOLOGIC AND HYDROGEOLOGIC
CROSS SECTION ALONG C-C'



KEY MAP

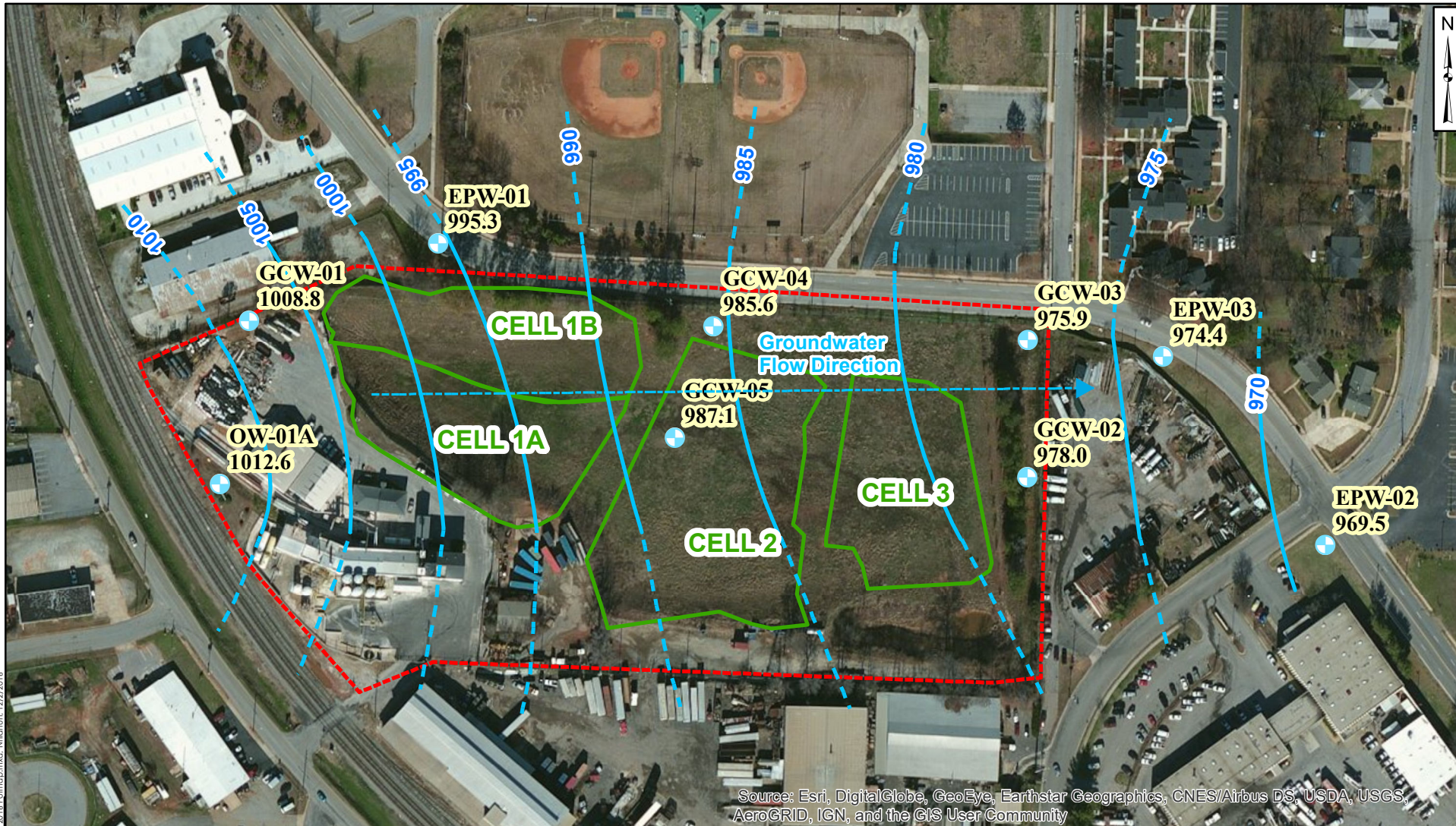


LEGEND



Geosyntec
consultants

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



Legend - Monitoring Well (Elevation in ft MSL) - October 2016 Groundwater Elevation (Dashed where Inferred) - Excavation Cell - Approximate Property Boundary	200 100 0 200 400 Feet Geosyntec consultants Kennesaw, GA December 2016	POTENTIOMETRIC SURFACE MAP Chemtrade Solutions, East Point, GA	Figure 3-1
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Figure 3-2
GCW-01S -M -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

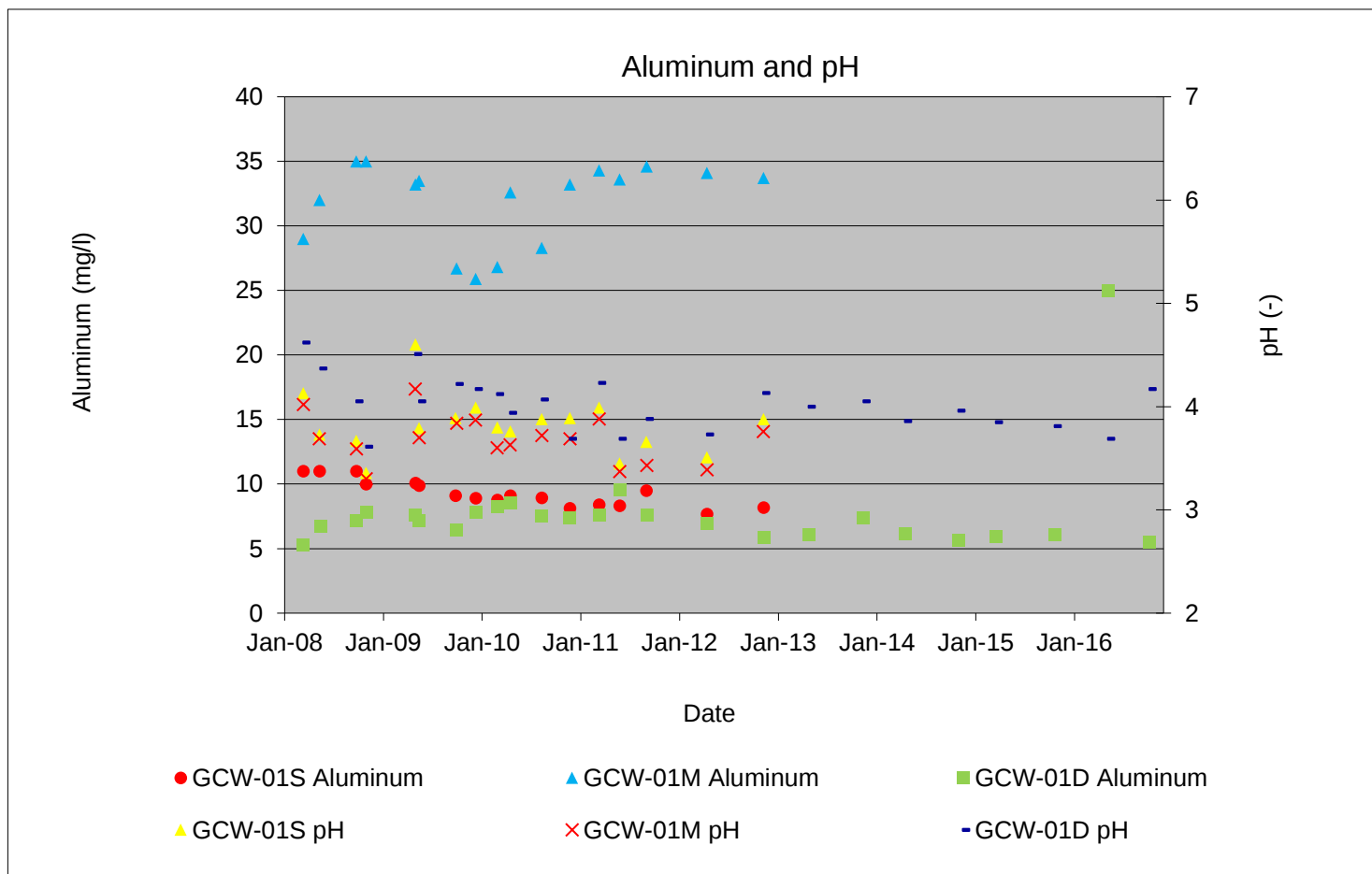
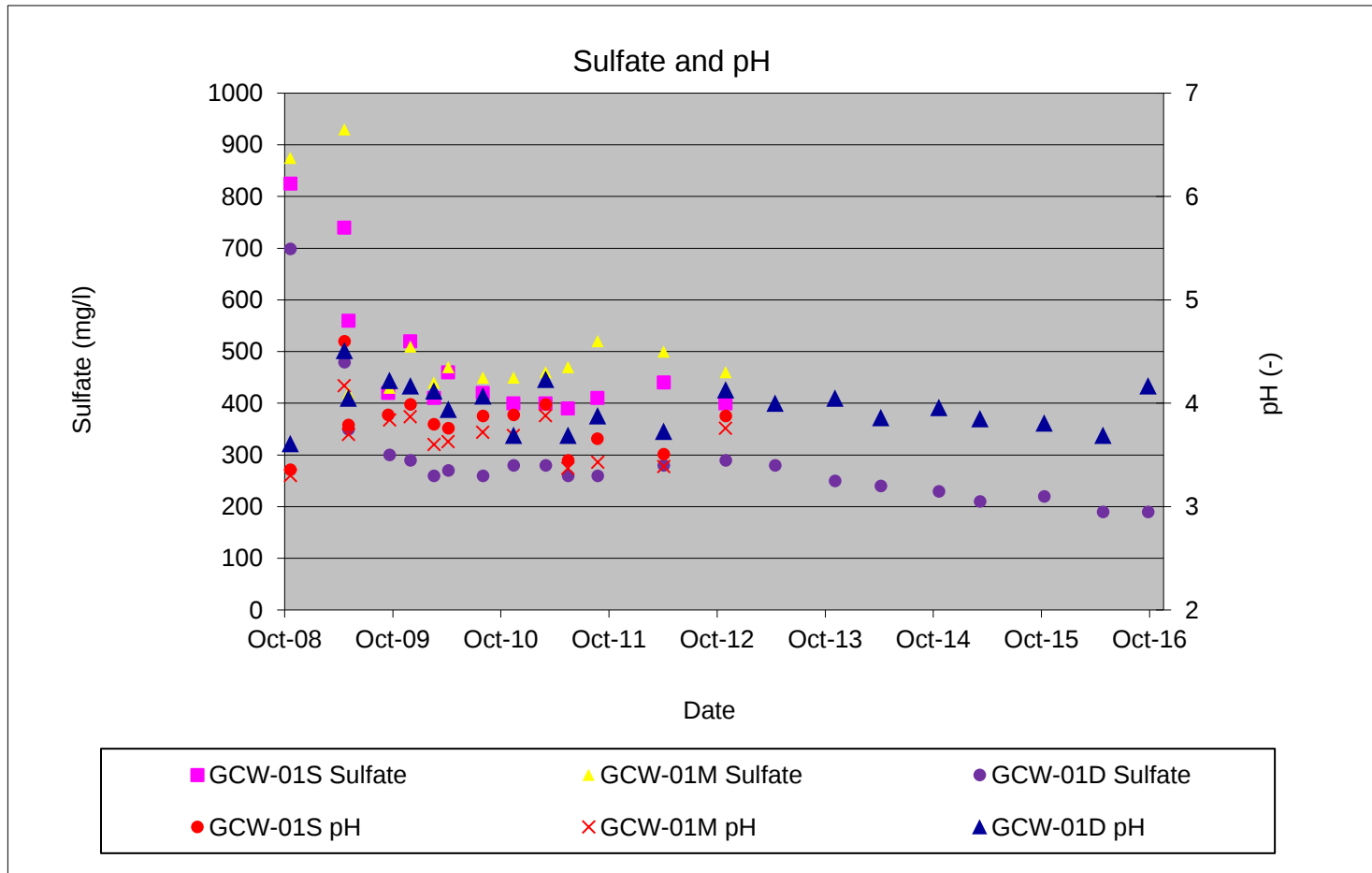


Figure 3-2 (Cont)
GCW-02S -D-V Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

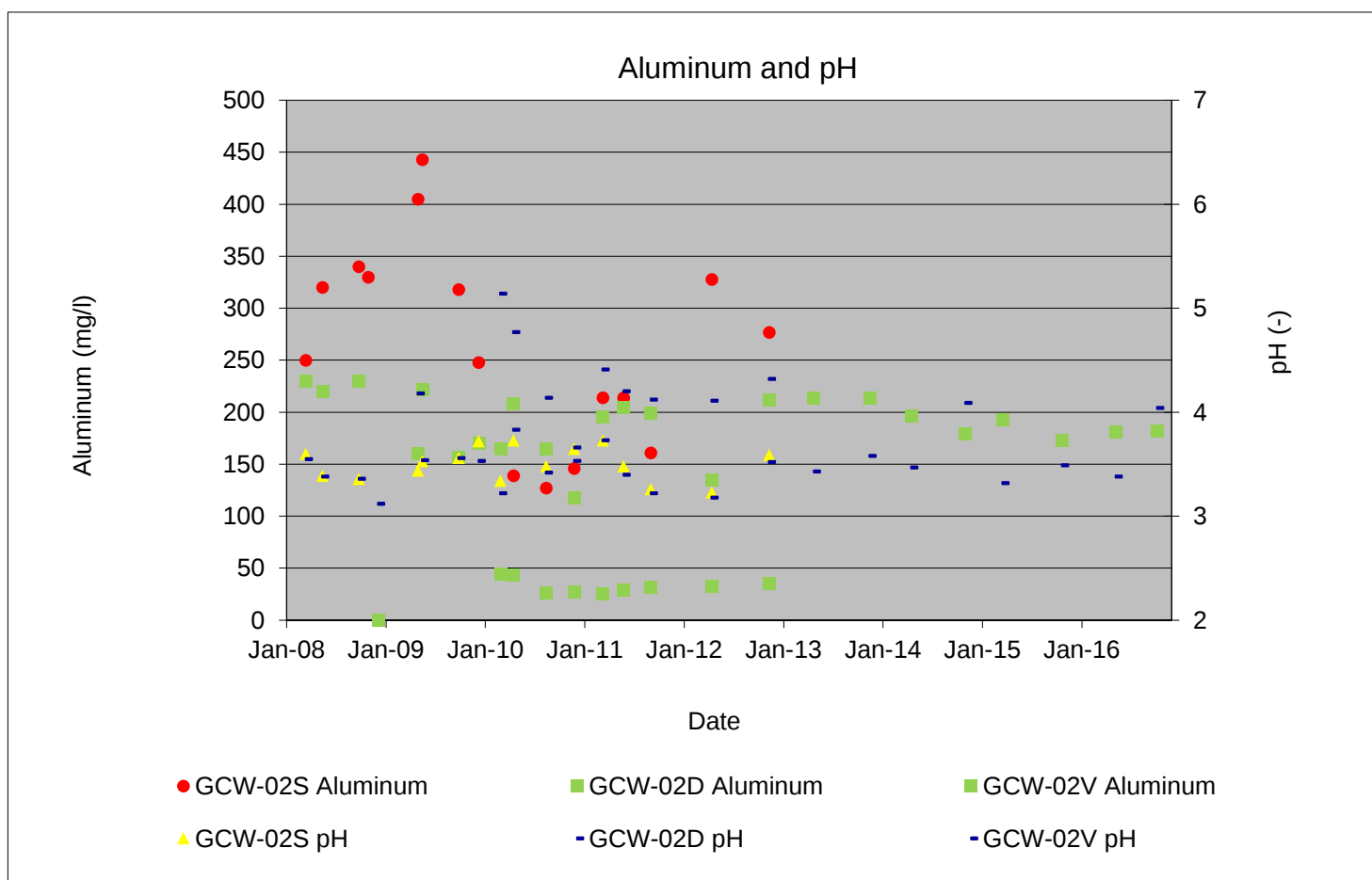
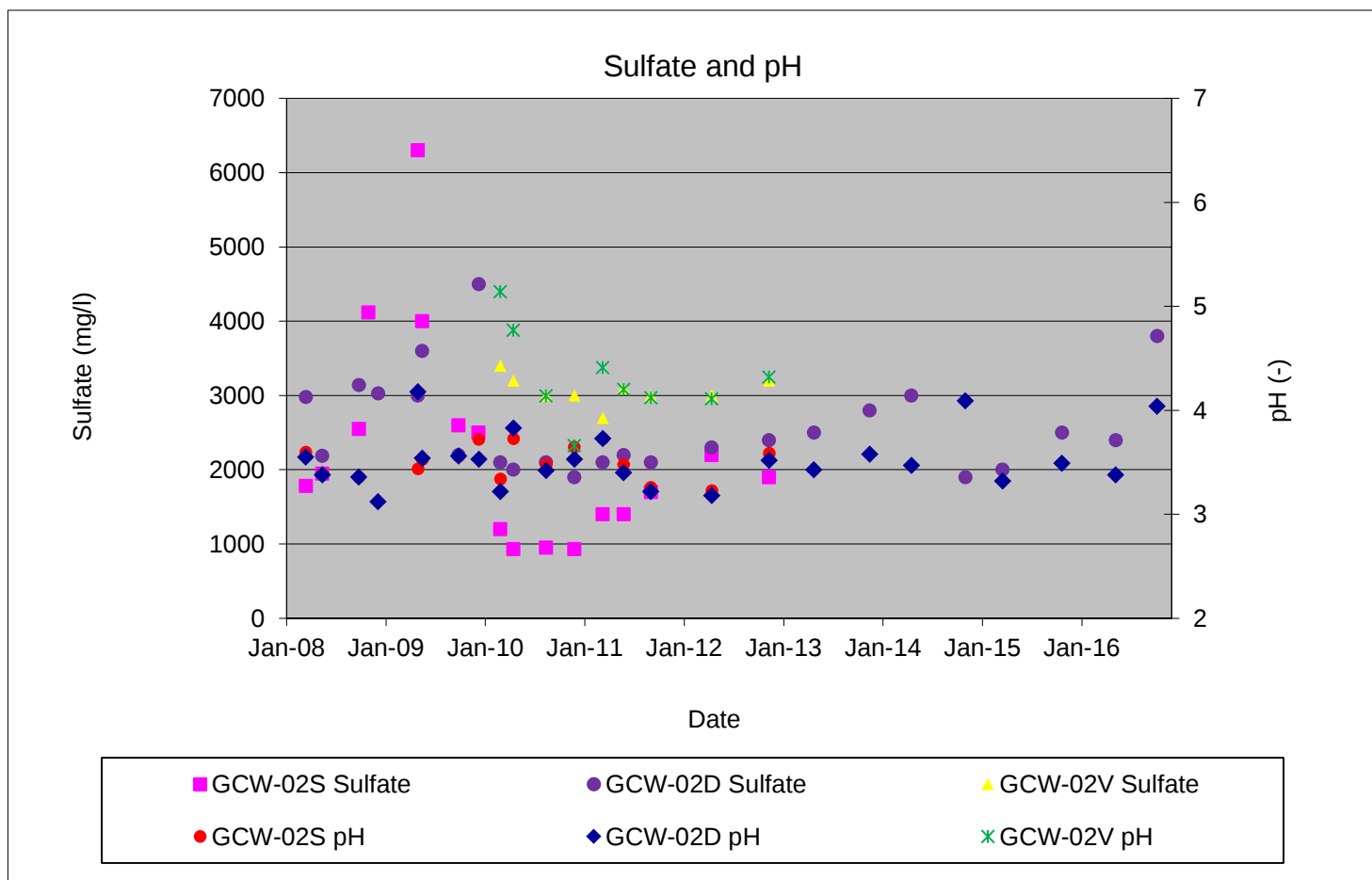


Figure 3-2 (Cont)
GCW-03S -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

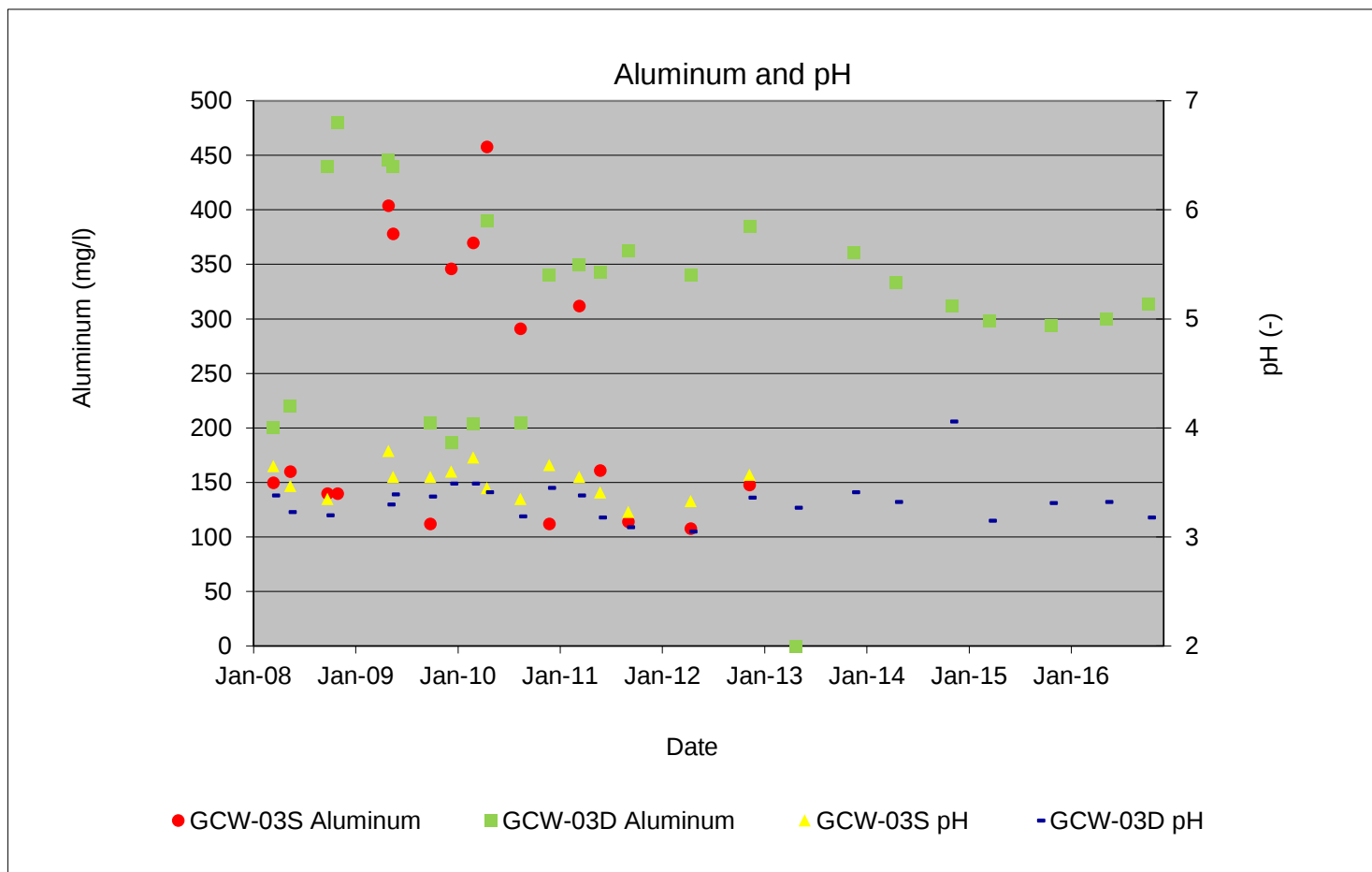
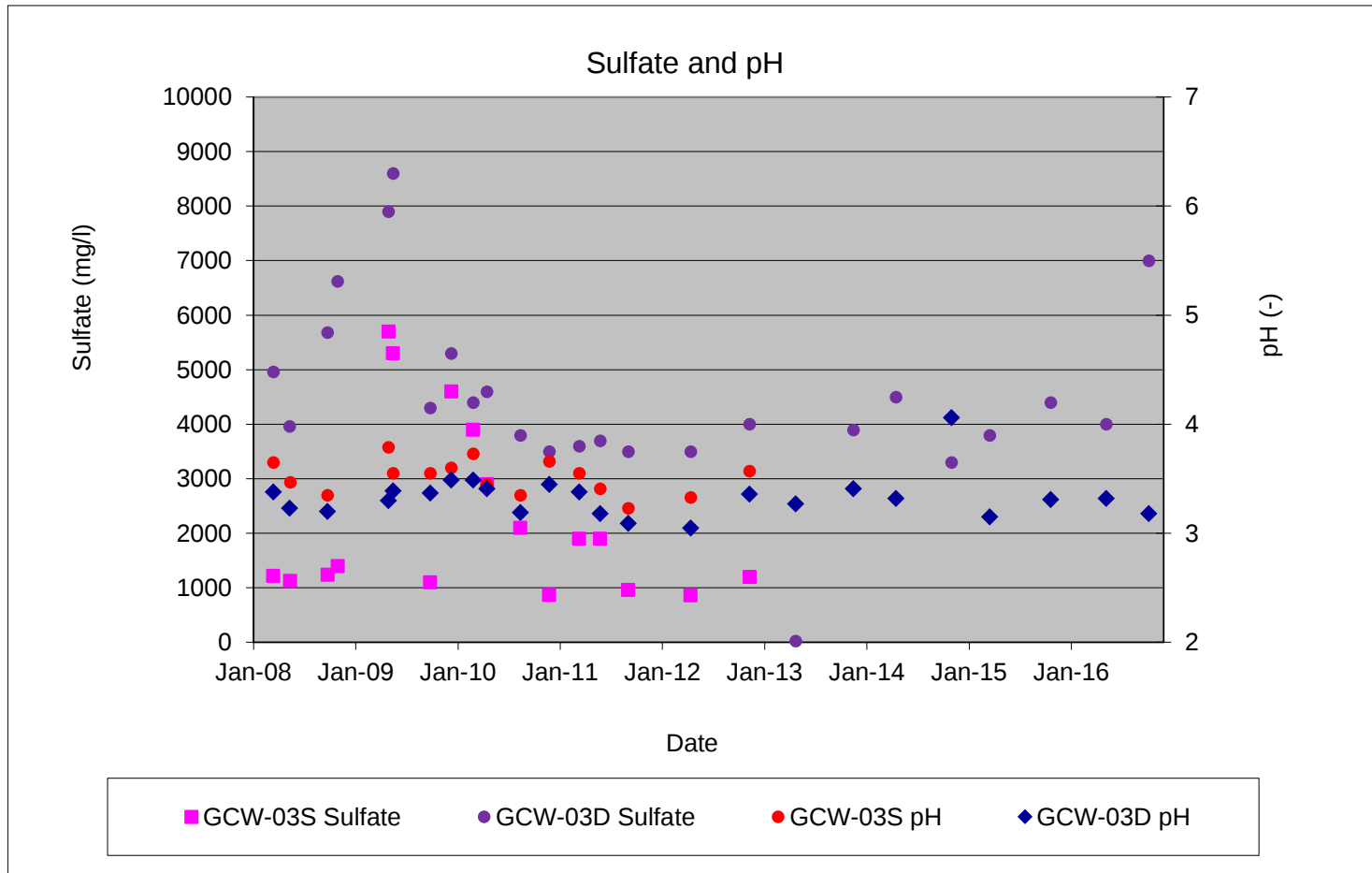


Figure 3-2 (Cont)
GCW-04S -M -D -V Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

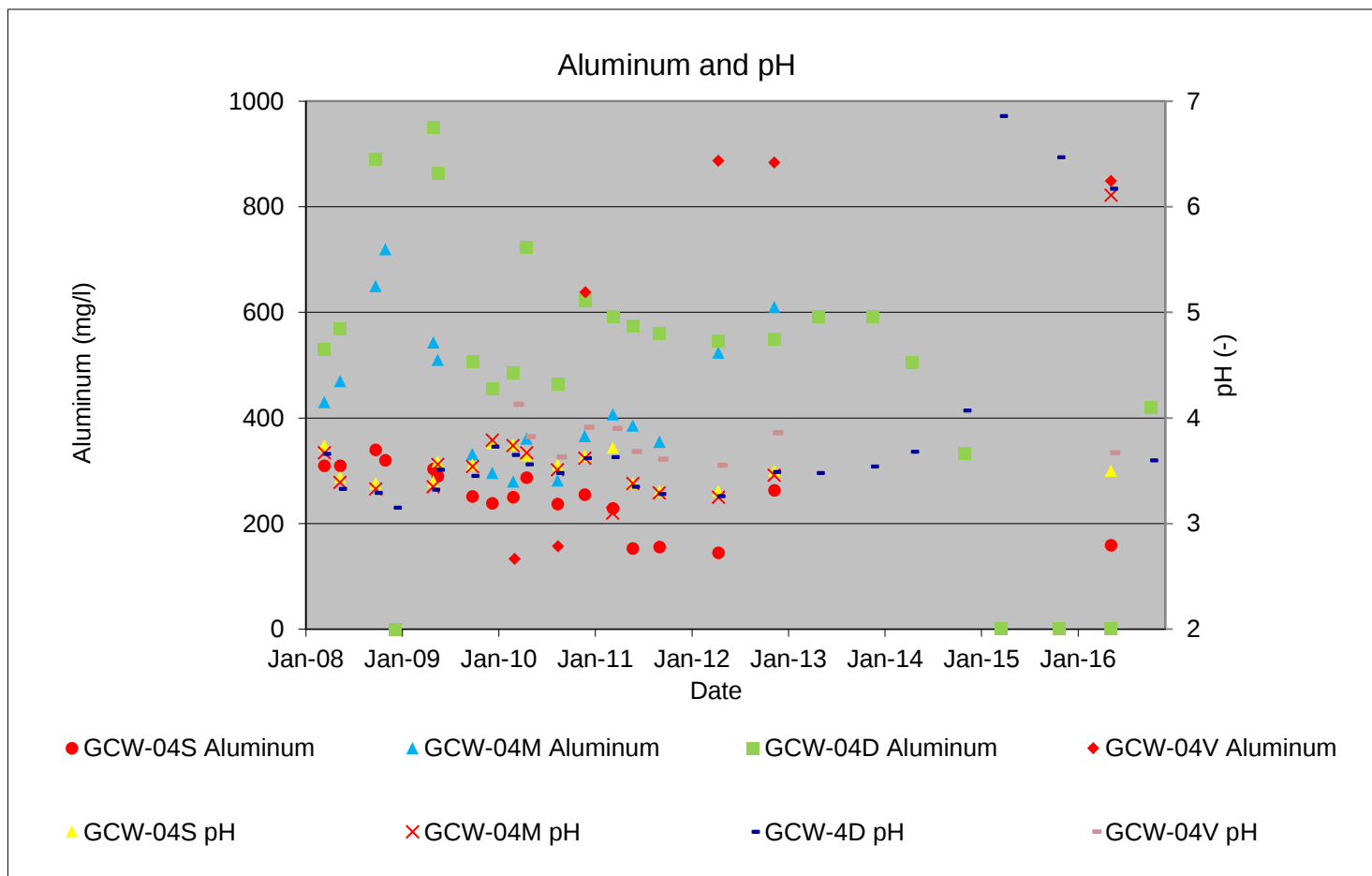
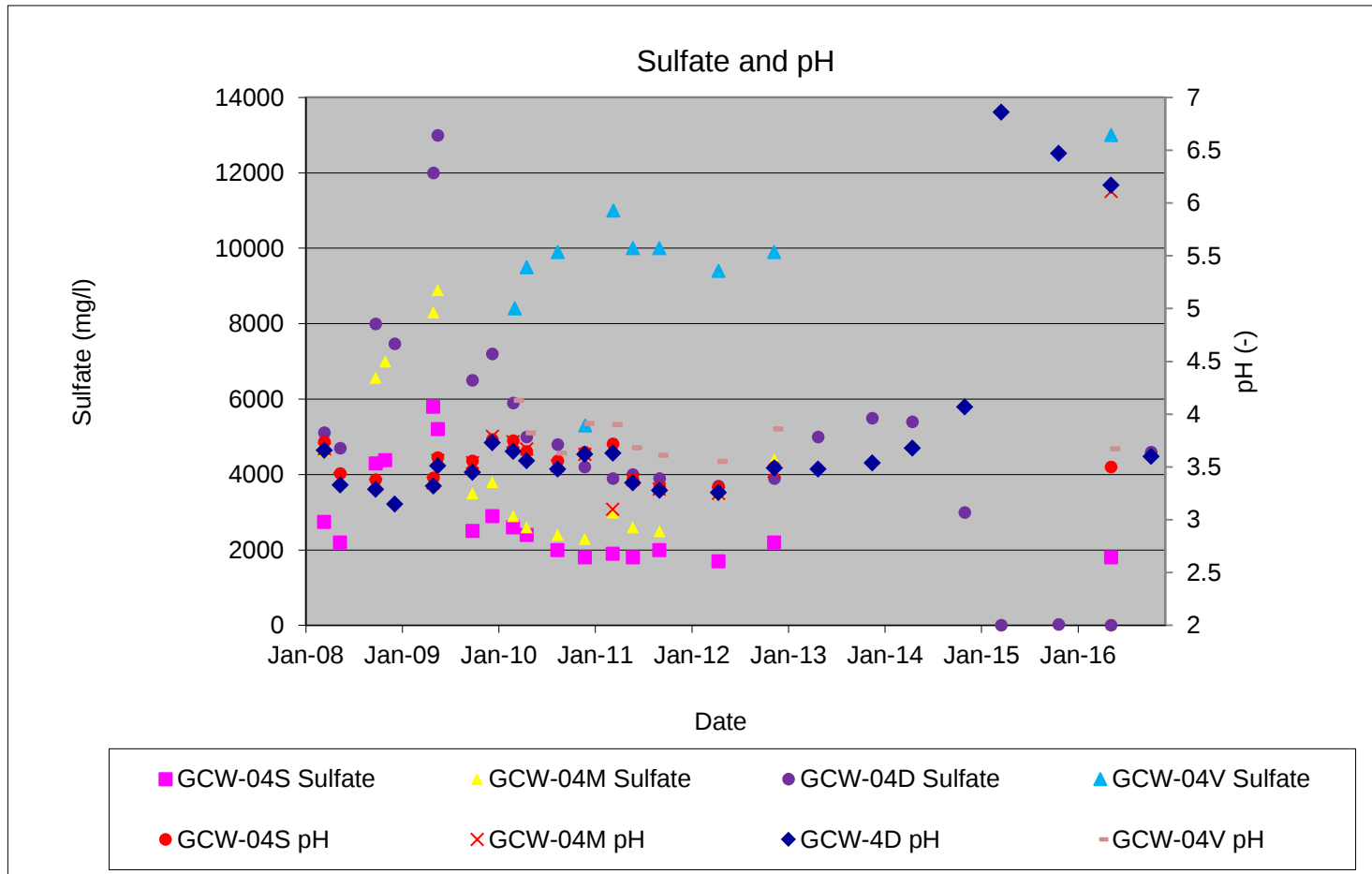


Figure 3-2 (Cont)
GCW-05 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

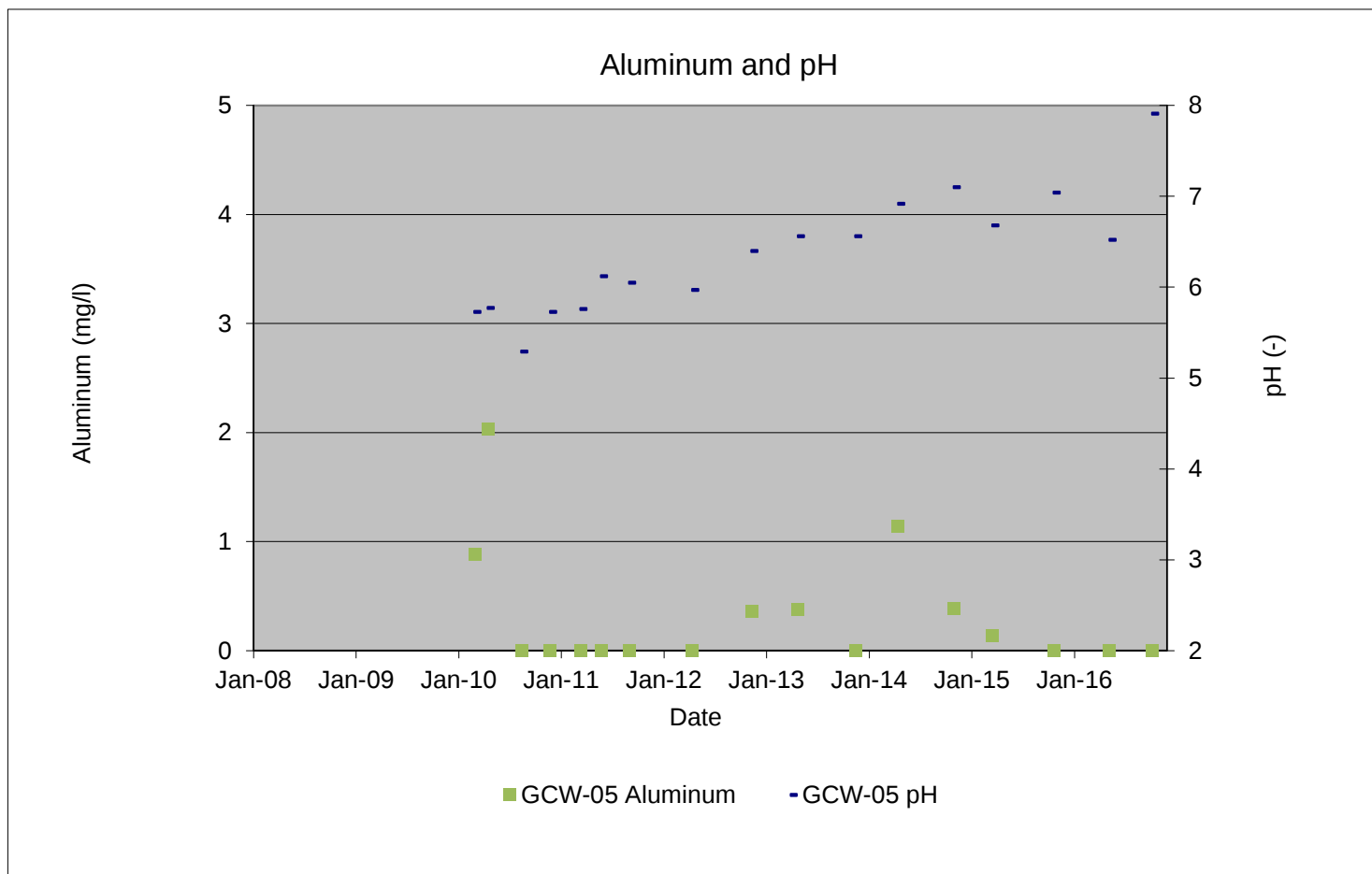
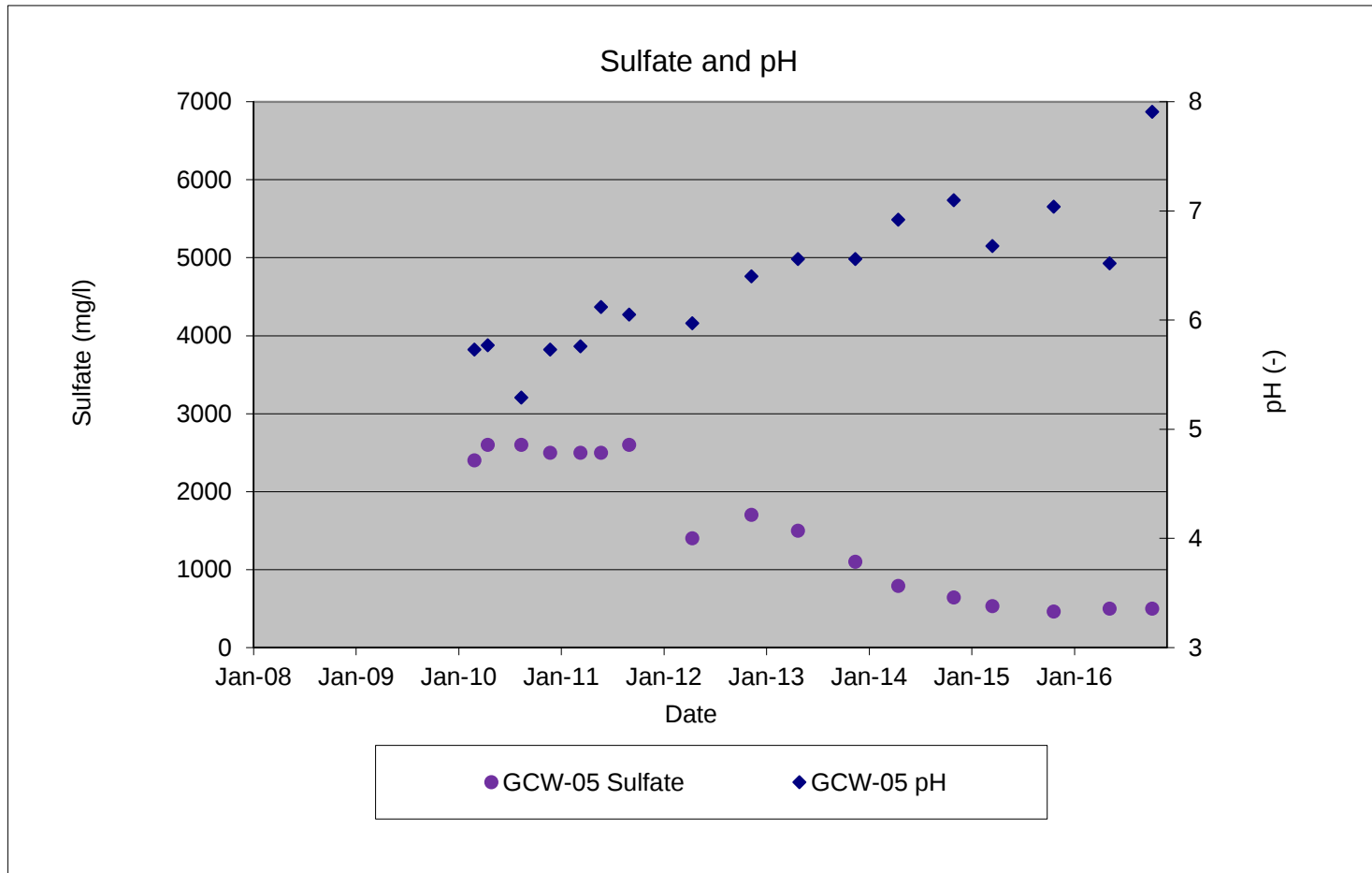


Figure 3-2 (Cont)
EPW-01 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

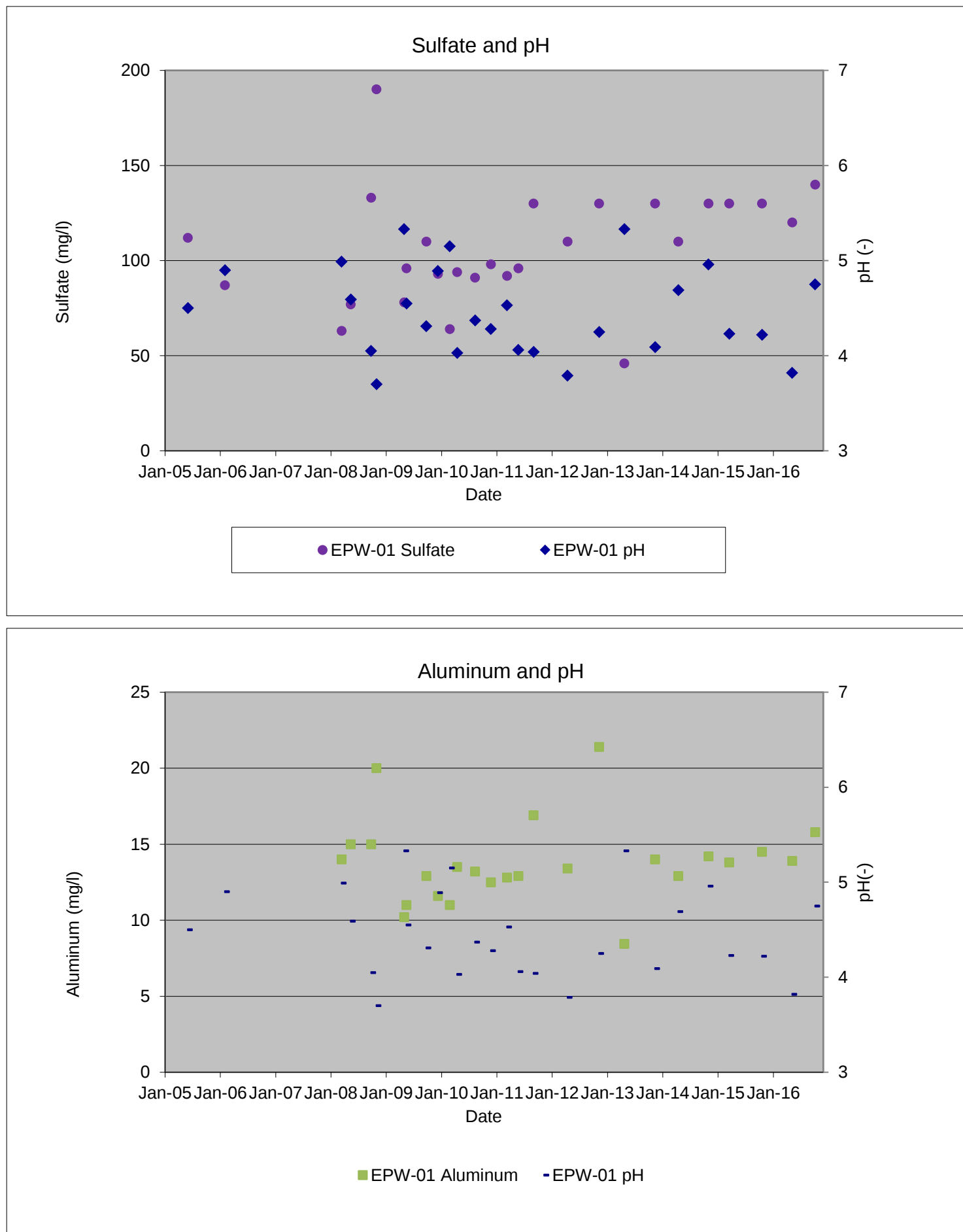


Figure 3-2 (Cont)
EPW-02 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

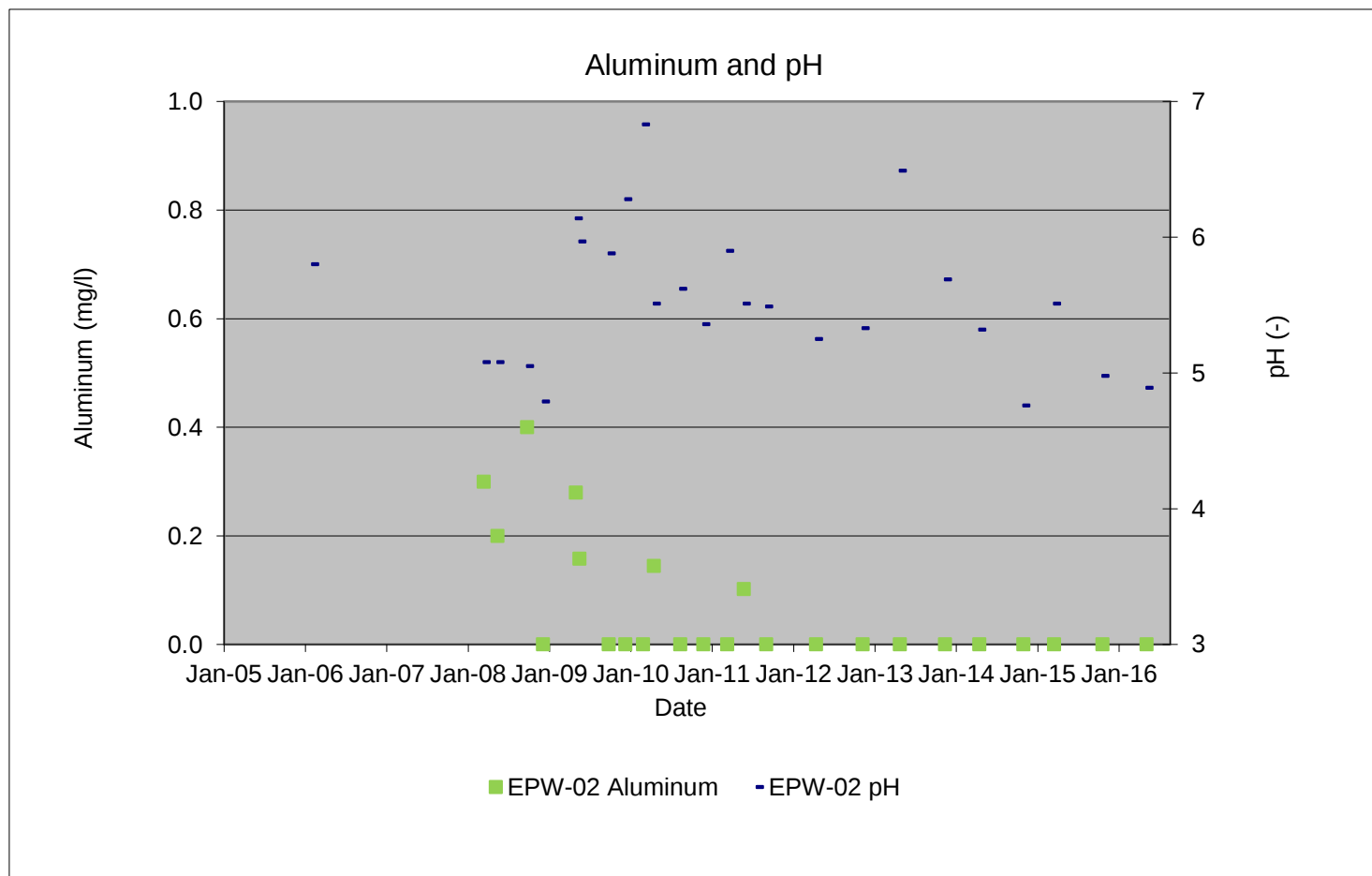
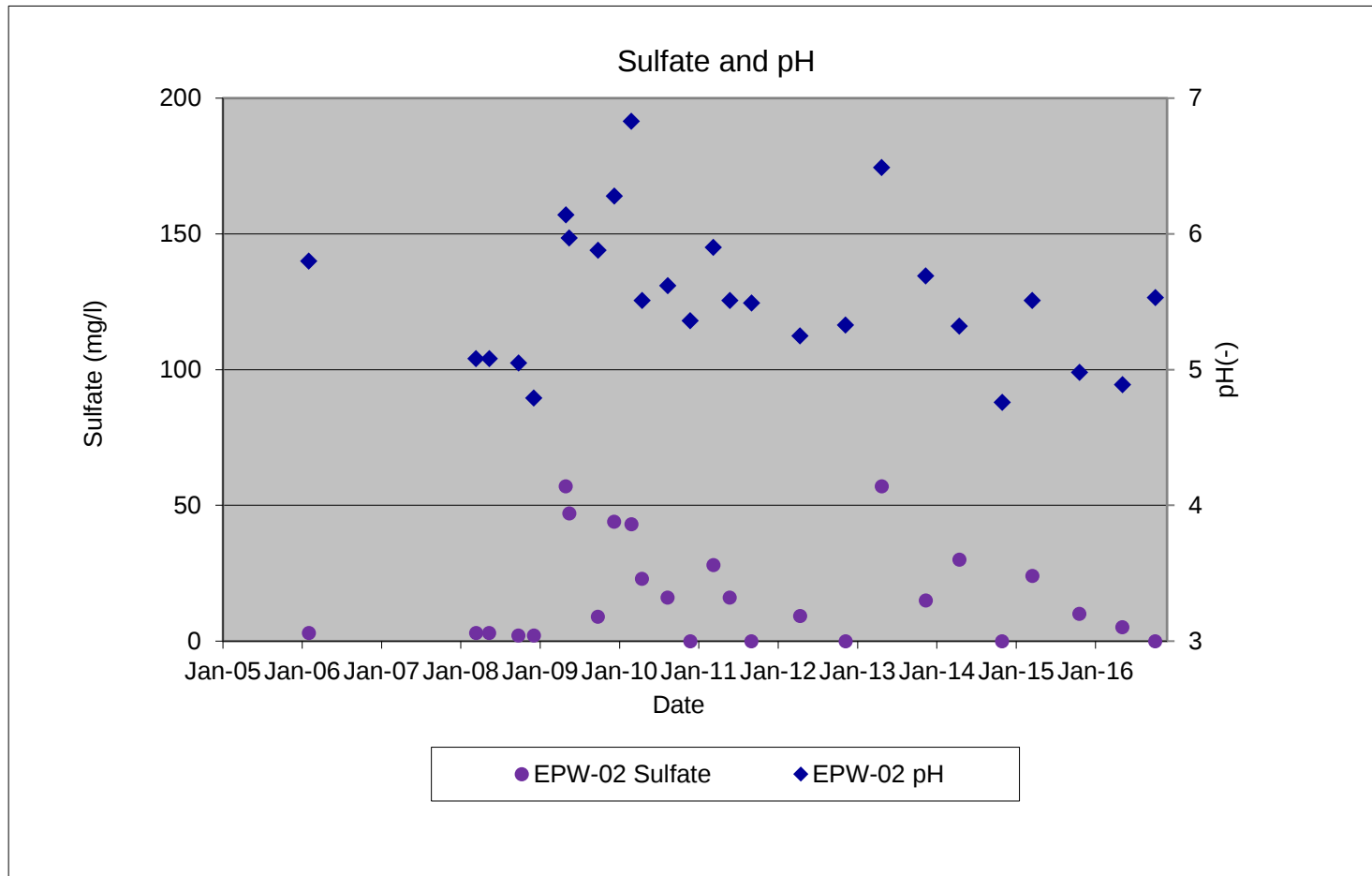


Figure 3-2 (Cont)
EPW-03S -M -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

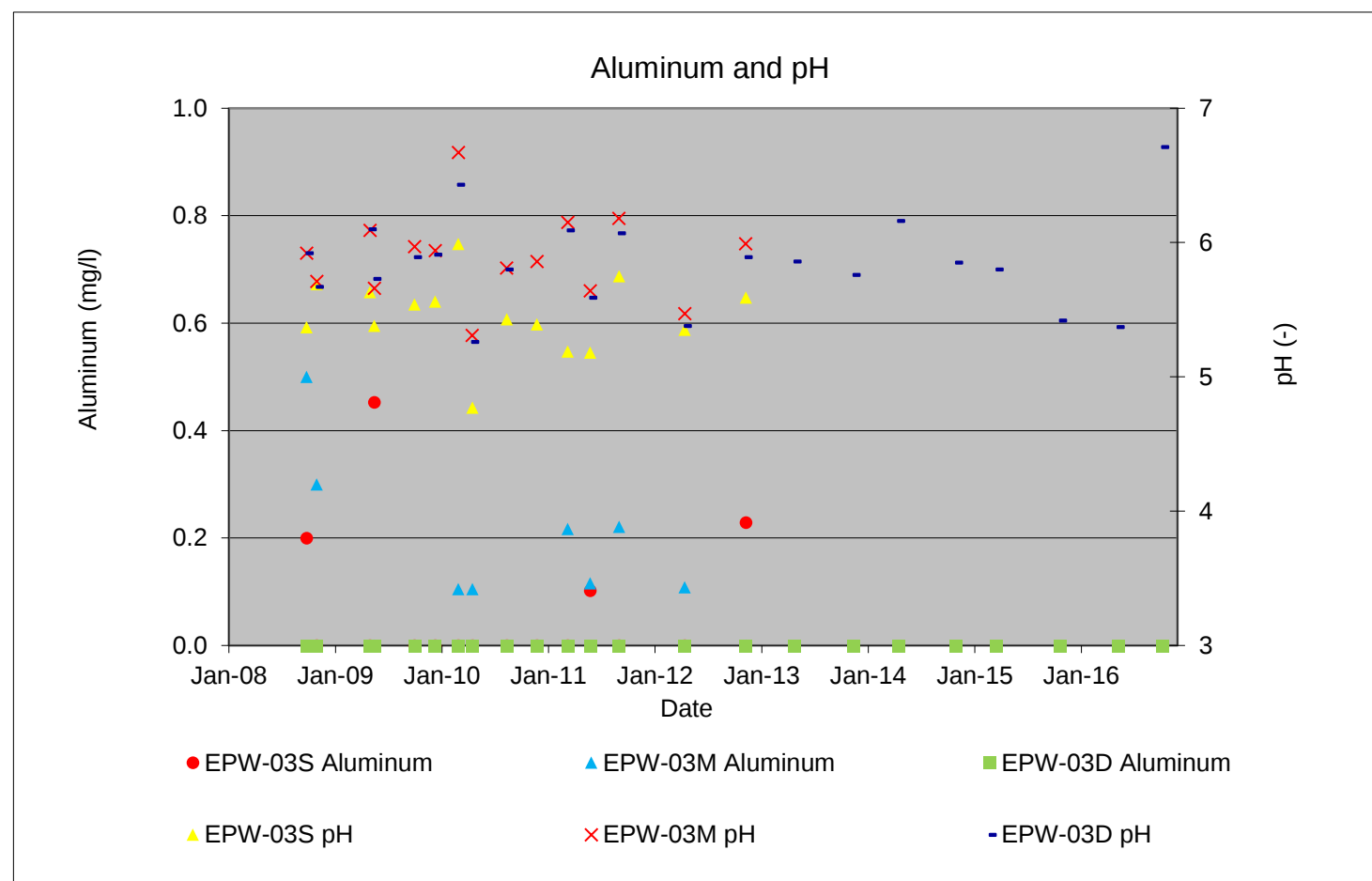
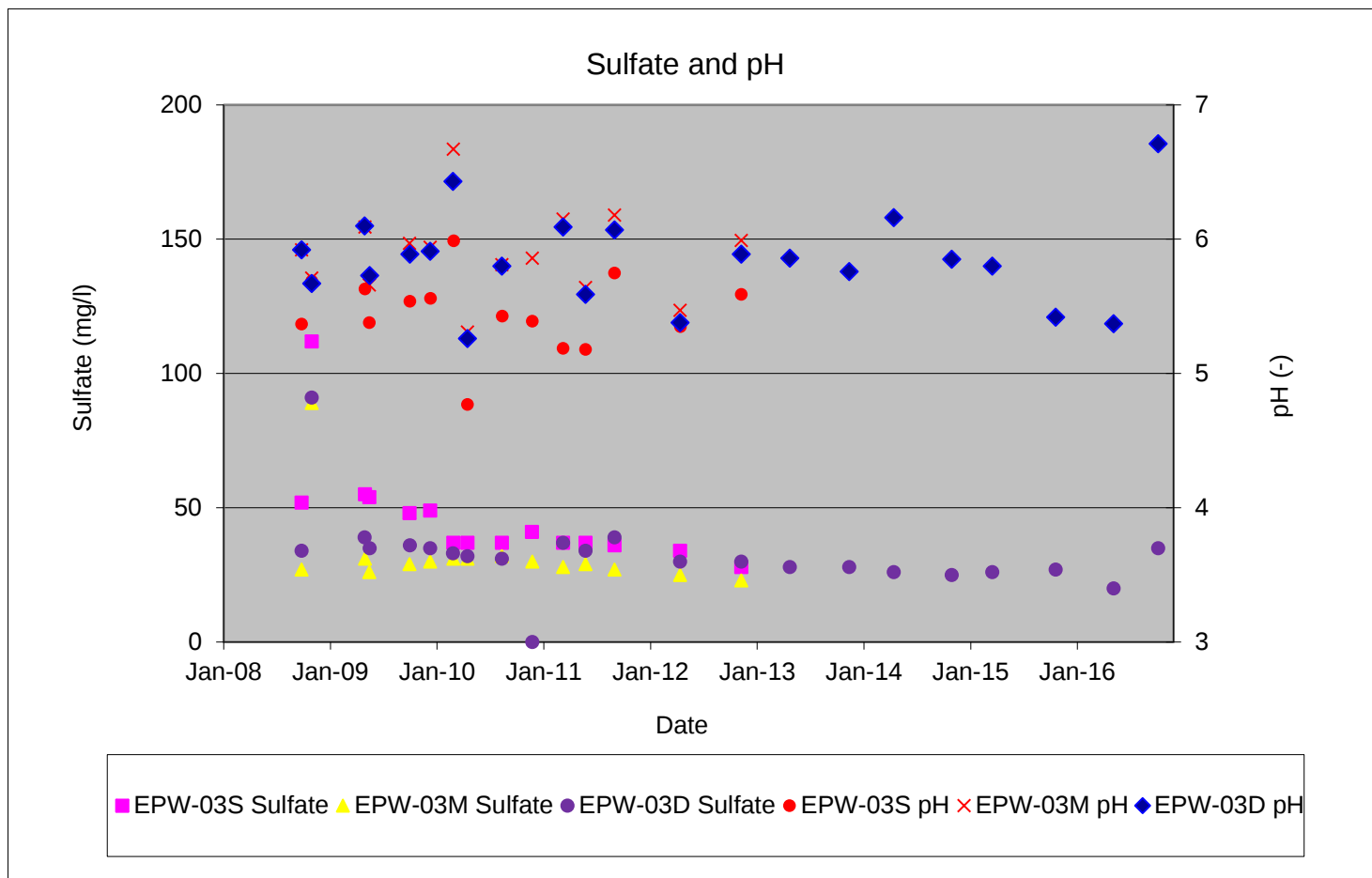


Figure 3-2 (Cont)
OW-1A Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

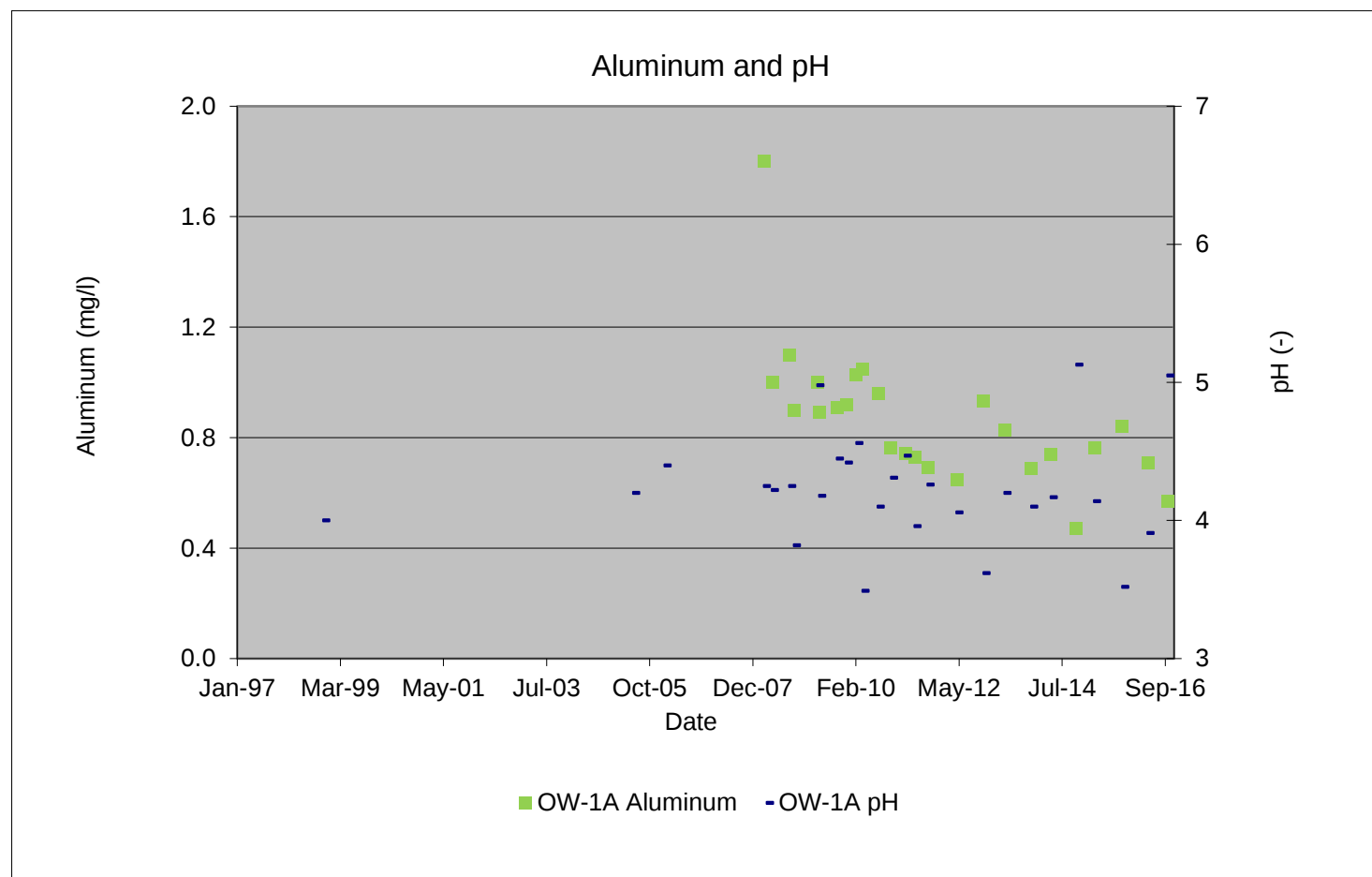
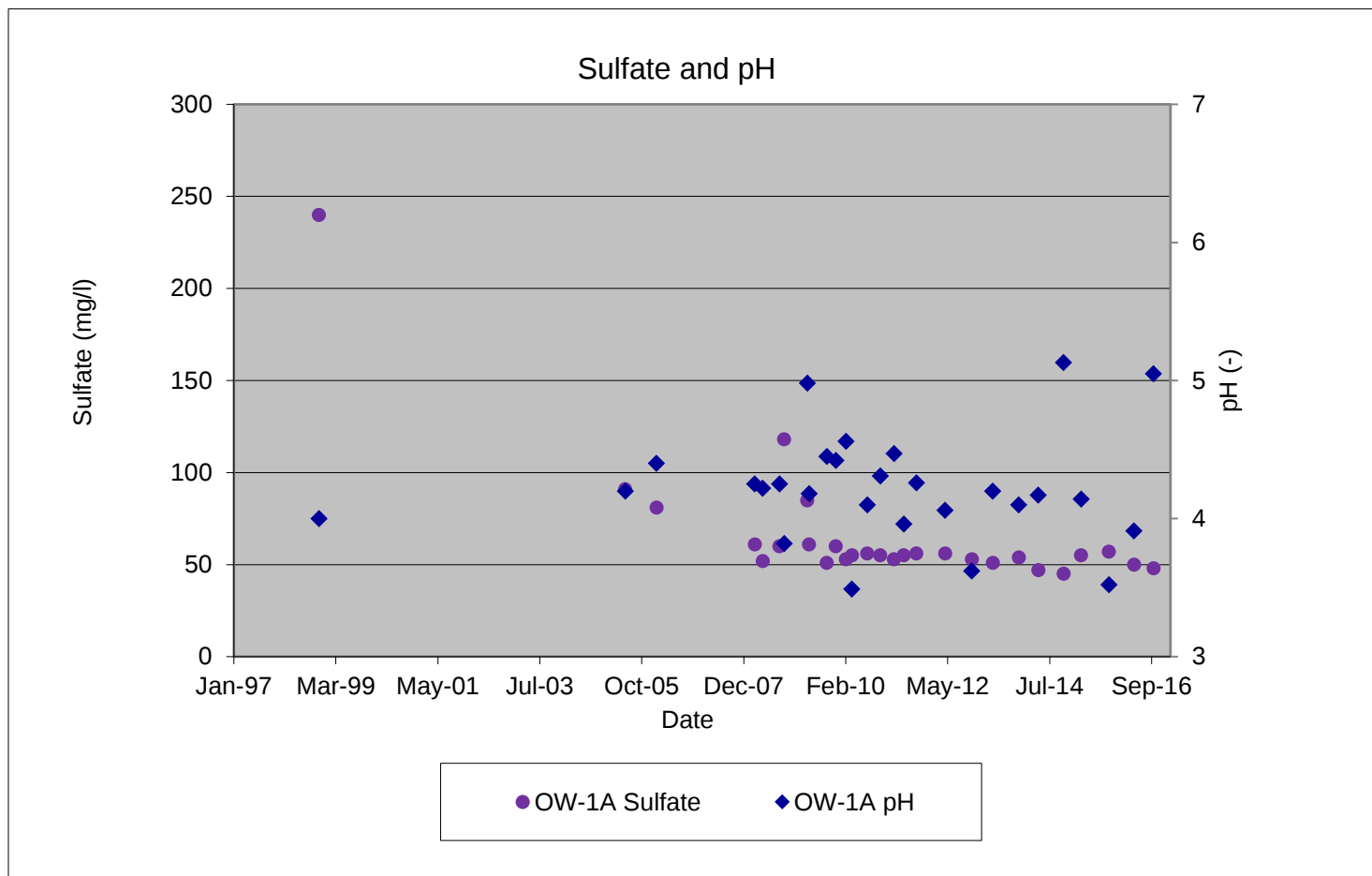


Figure 3-3
SW-02 (On-site) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

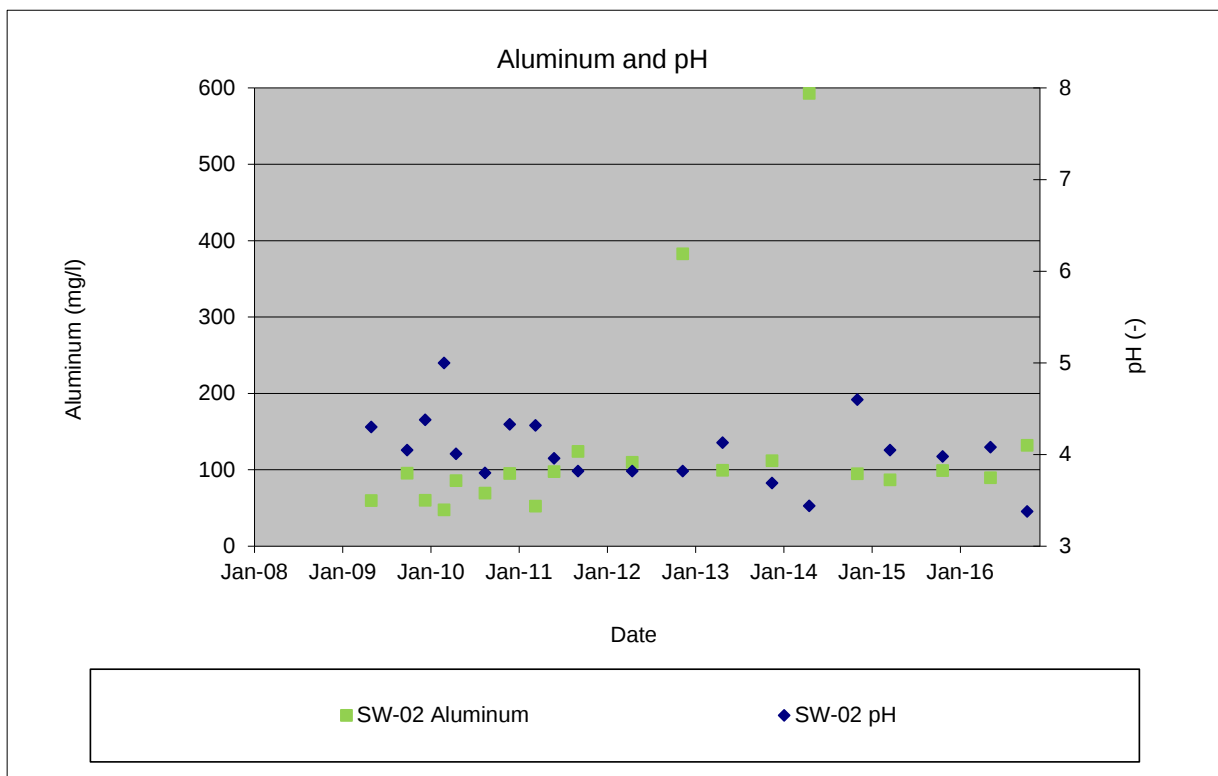
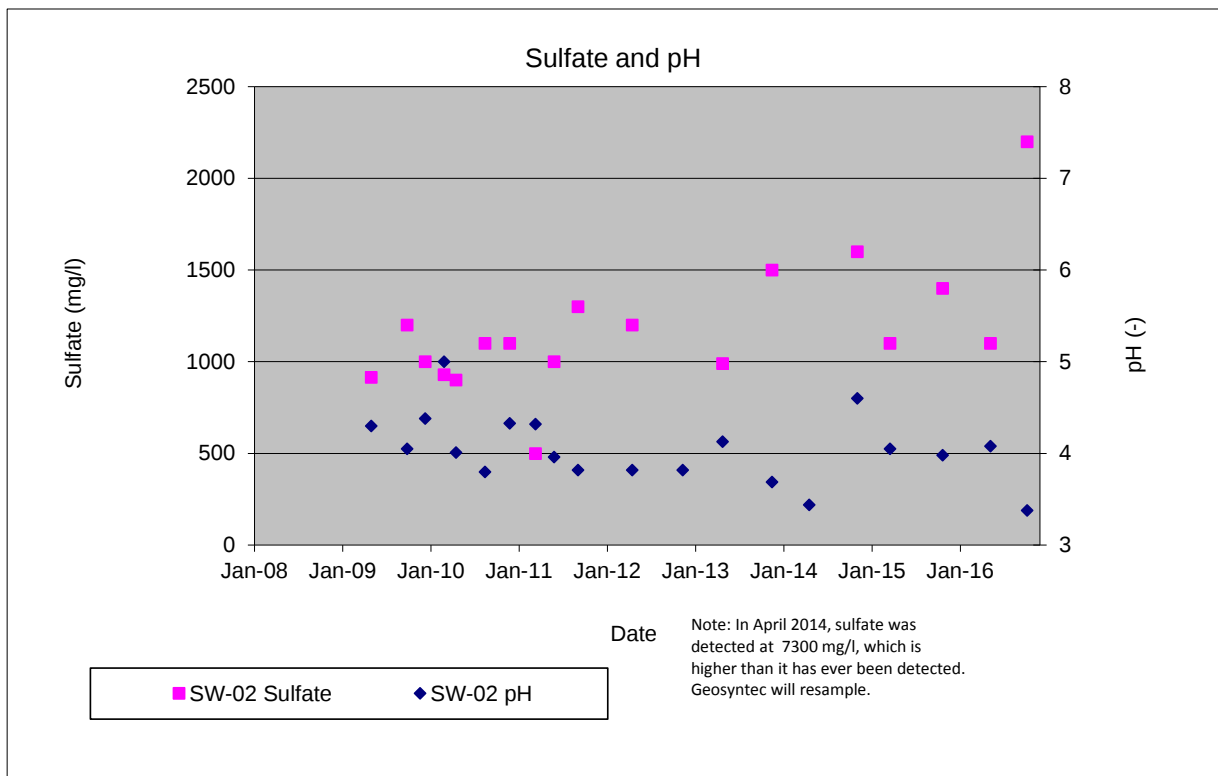


Figure 3-3 (Cont)
SW-06 (John D Milner Sports Complex) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

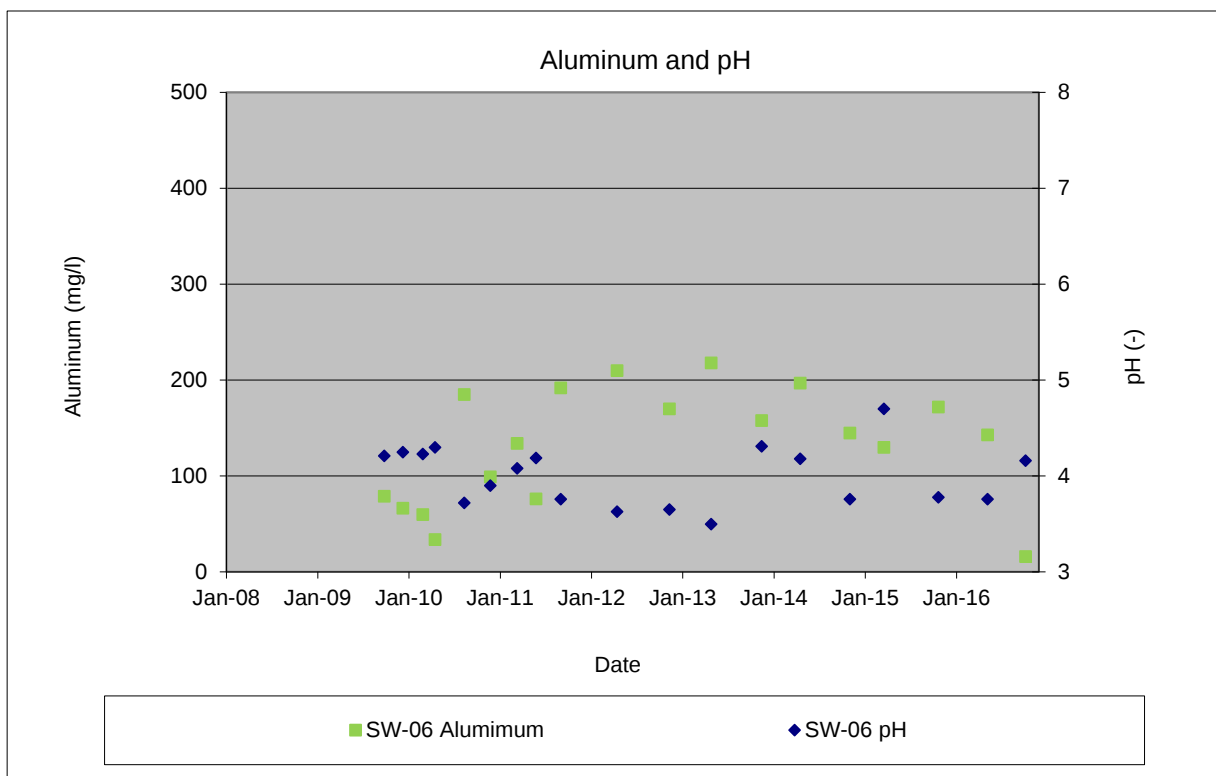
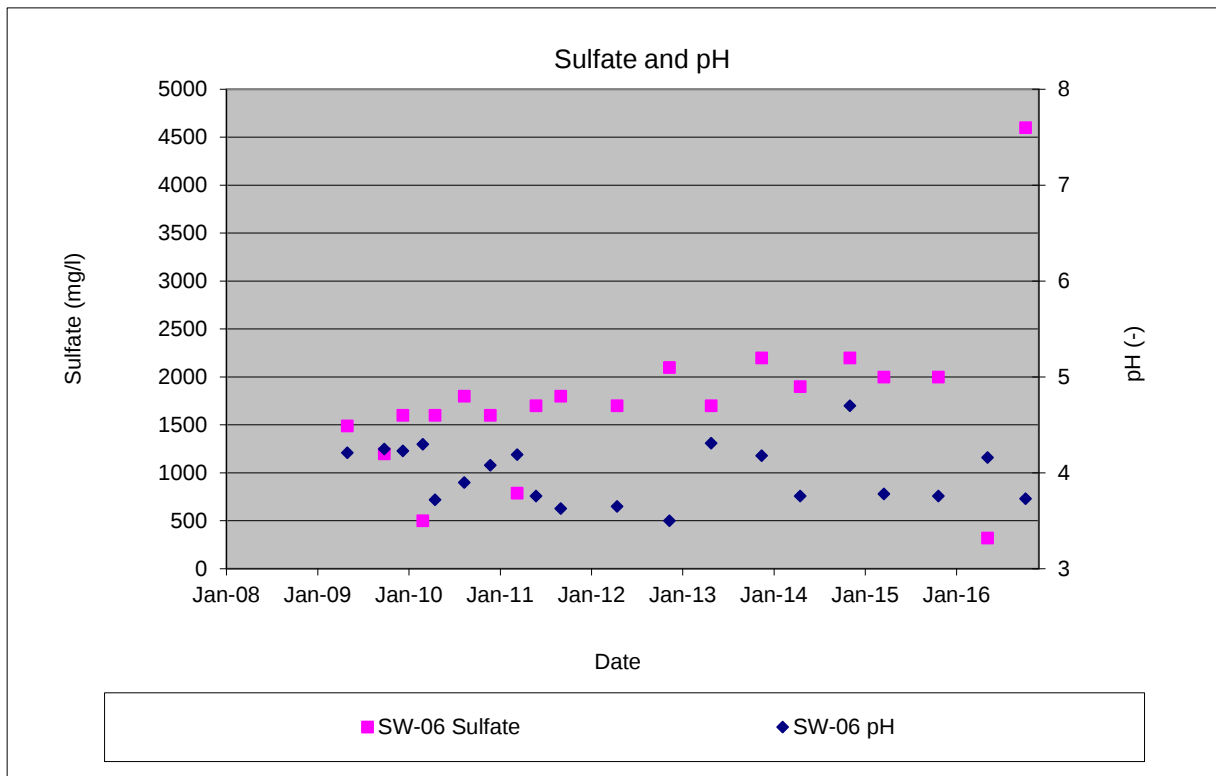


Figure 3-3 (Cont)
SW-07 (Unnamed Tributary) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

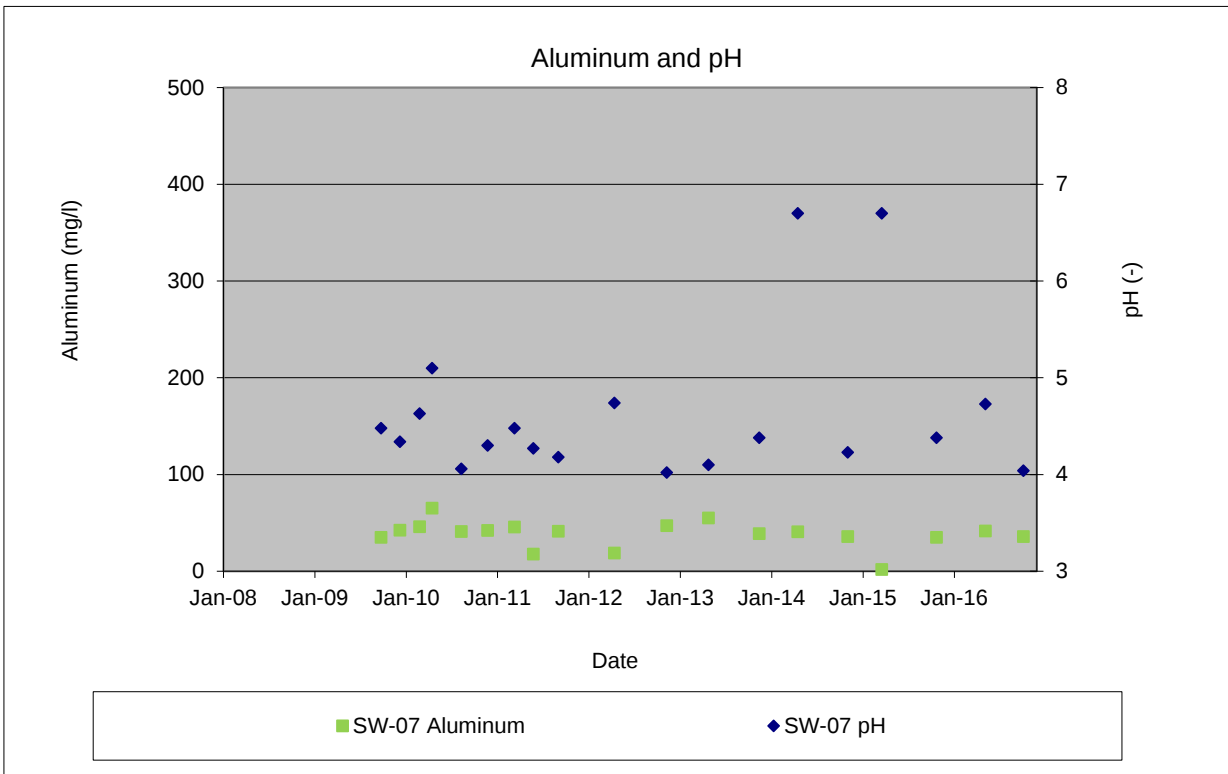
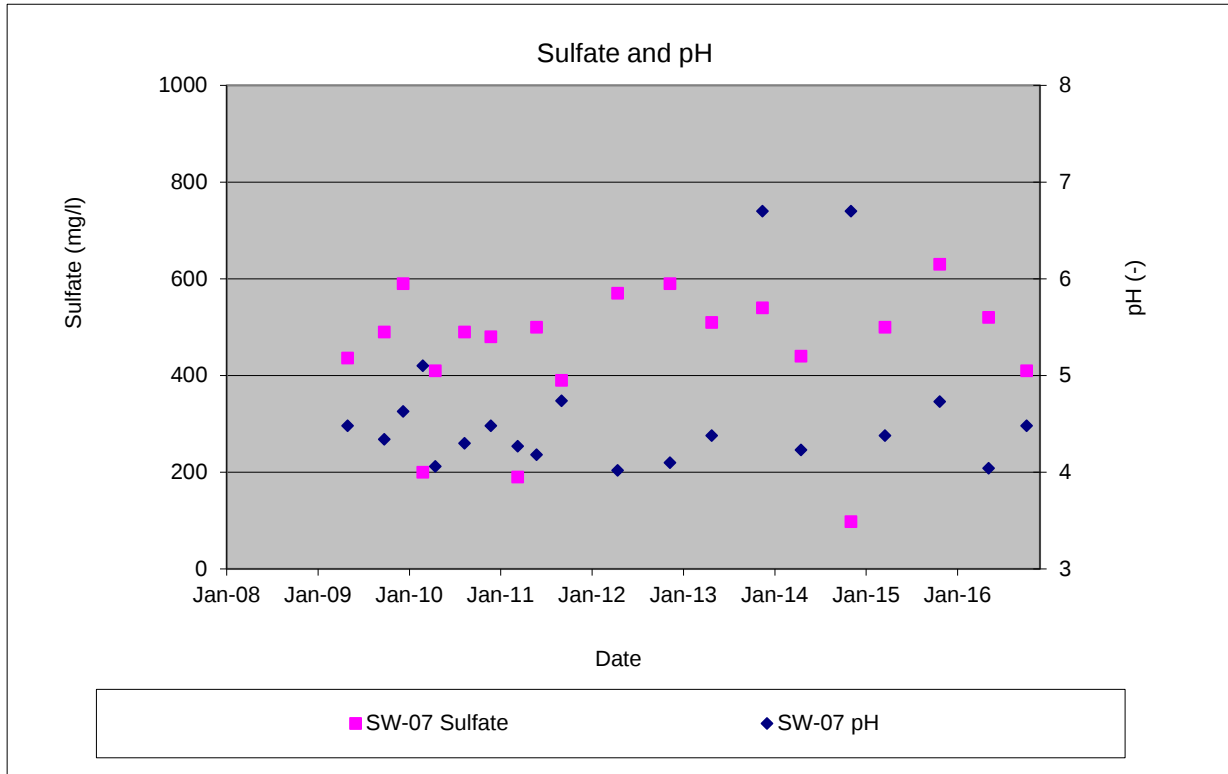
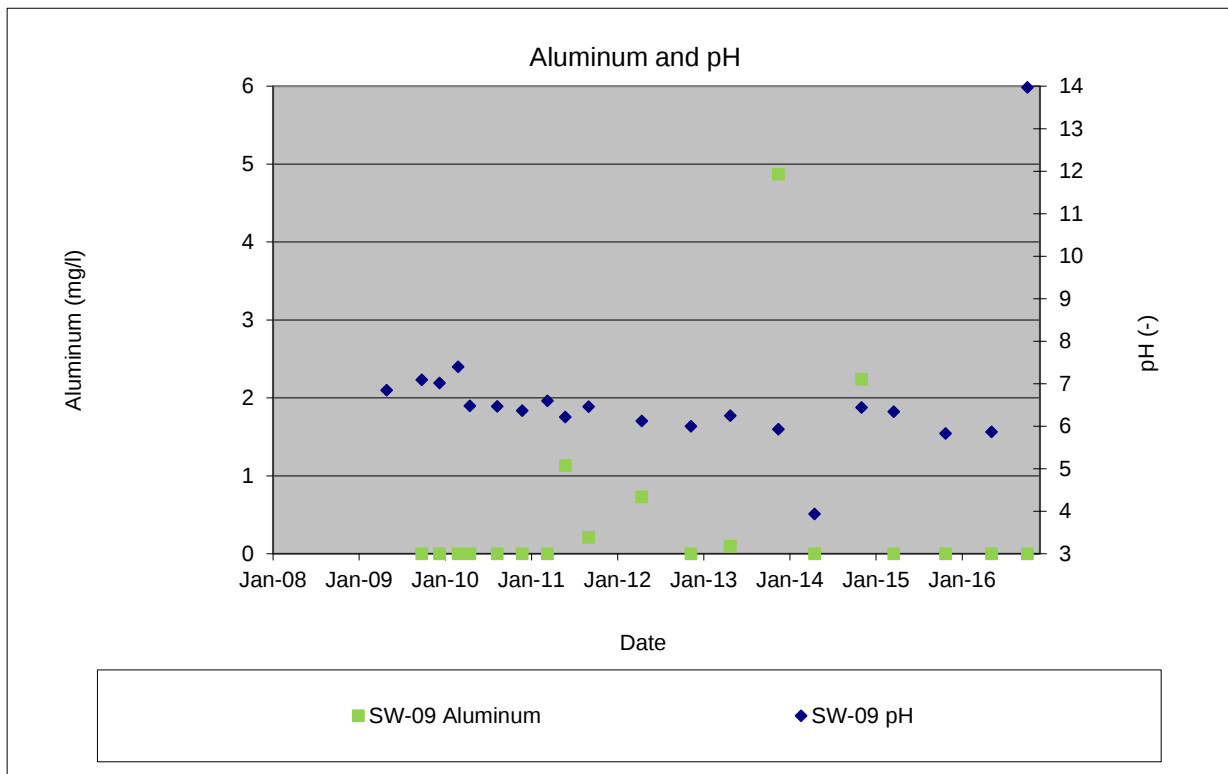
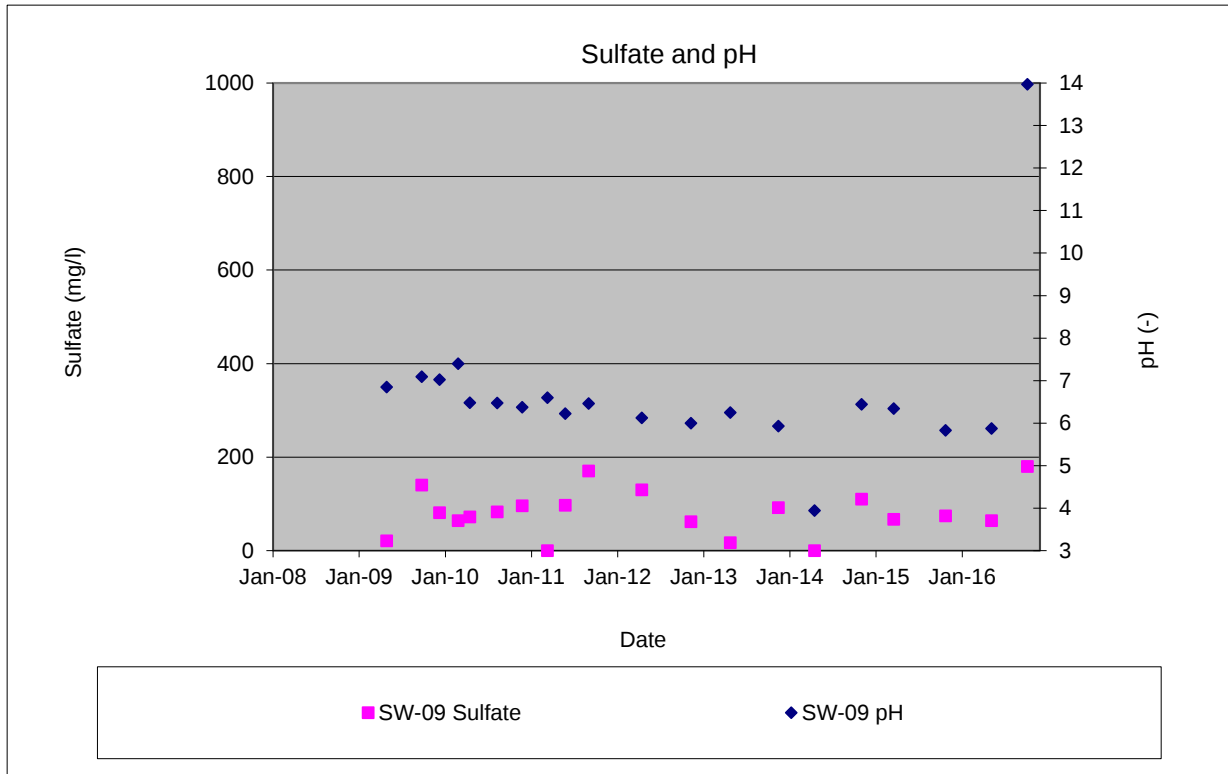


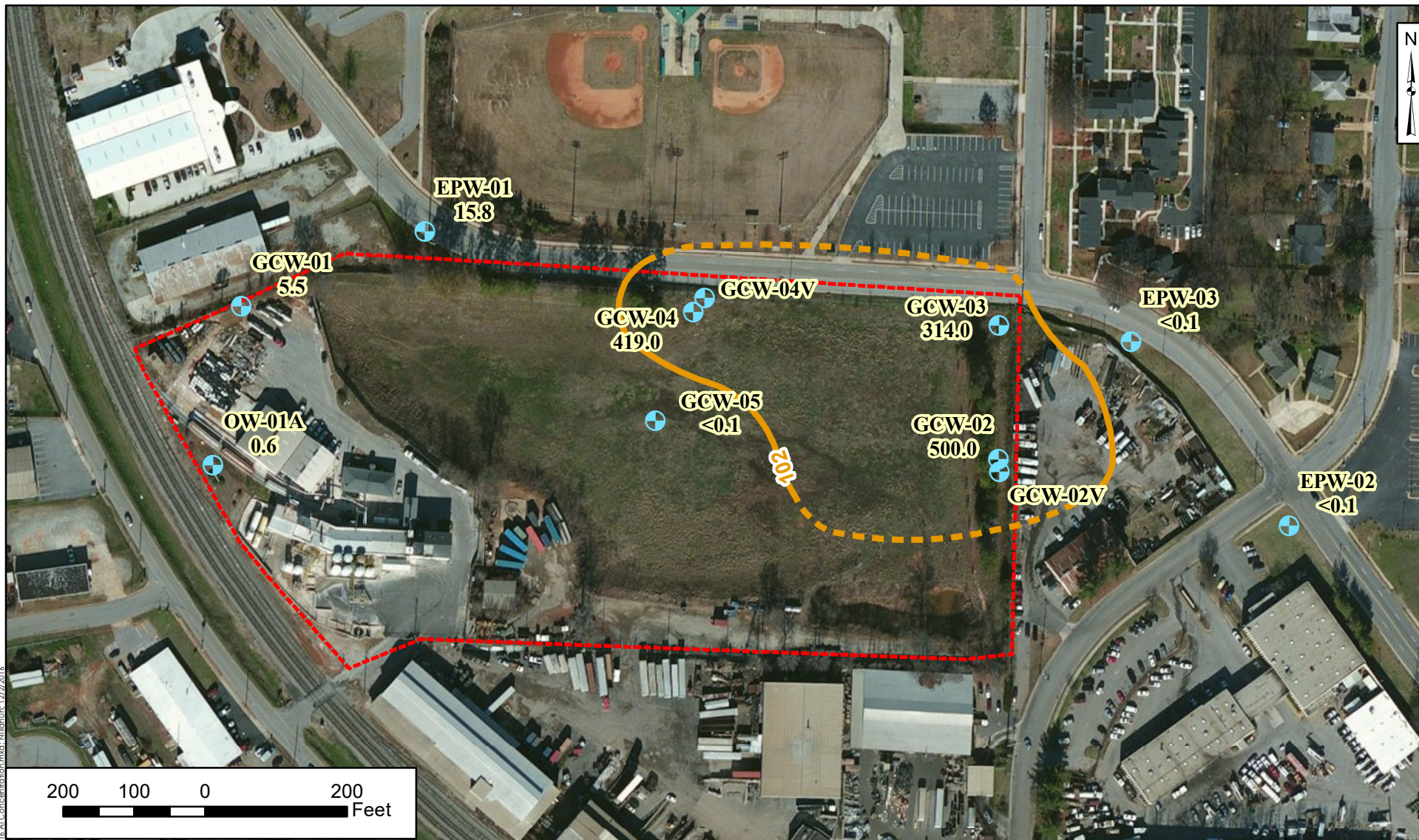
Figure 3-3 (Cont)
SW-09 (Upgradient) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia





\\epc-01\\epc13\\geosyntech\\GIS\\MWD\\Oct 2016\\SO4 Concentration.mxd; NTFS; 1/22/2016

Legend - Monitoring Well (SO4 Concentration in mg/L) - Sulfate Concentration (Inferred) - Sulfate Concentration mg/L - Approximate Property Boundary	Geosyntec consultants Kennesaw, GA December 2016	OCTOBER 2016 SULFATE CONCENTRATION ABOVE THE TYPE 4 RRS Chemtrade Solutions, East Point, GA	Figure 3-4
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Legend

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

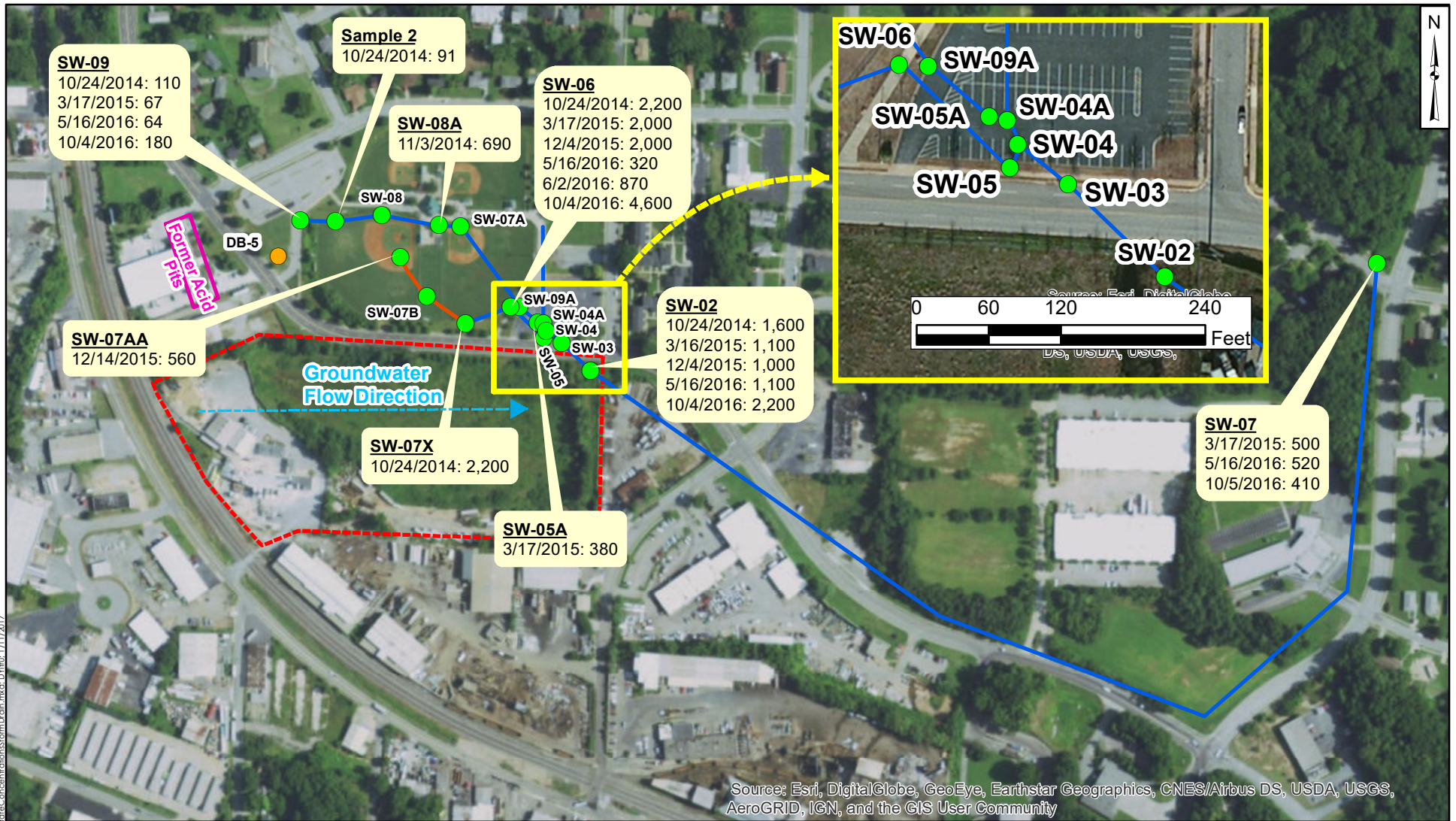
Geosyntec
consultants
Kennesaw, GA

December 2016

OCTOBER 2016 ALUMINUM CONCENTRATION ABOVE THE TYPE 4 RRS

Chemtrade Solutions, East Point, GA

Figure
3-5



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

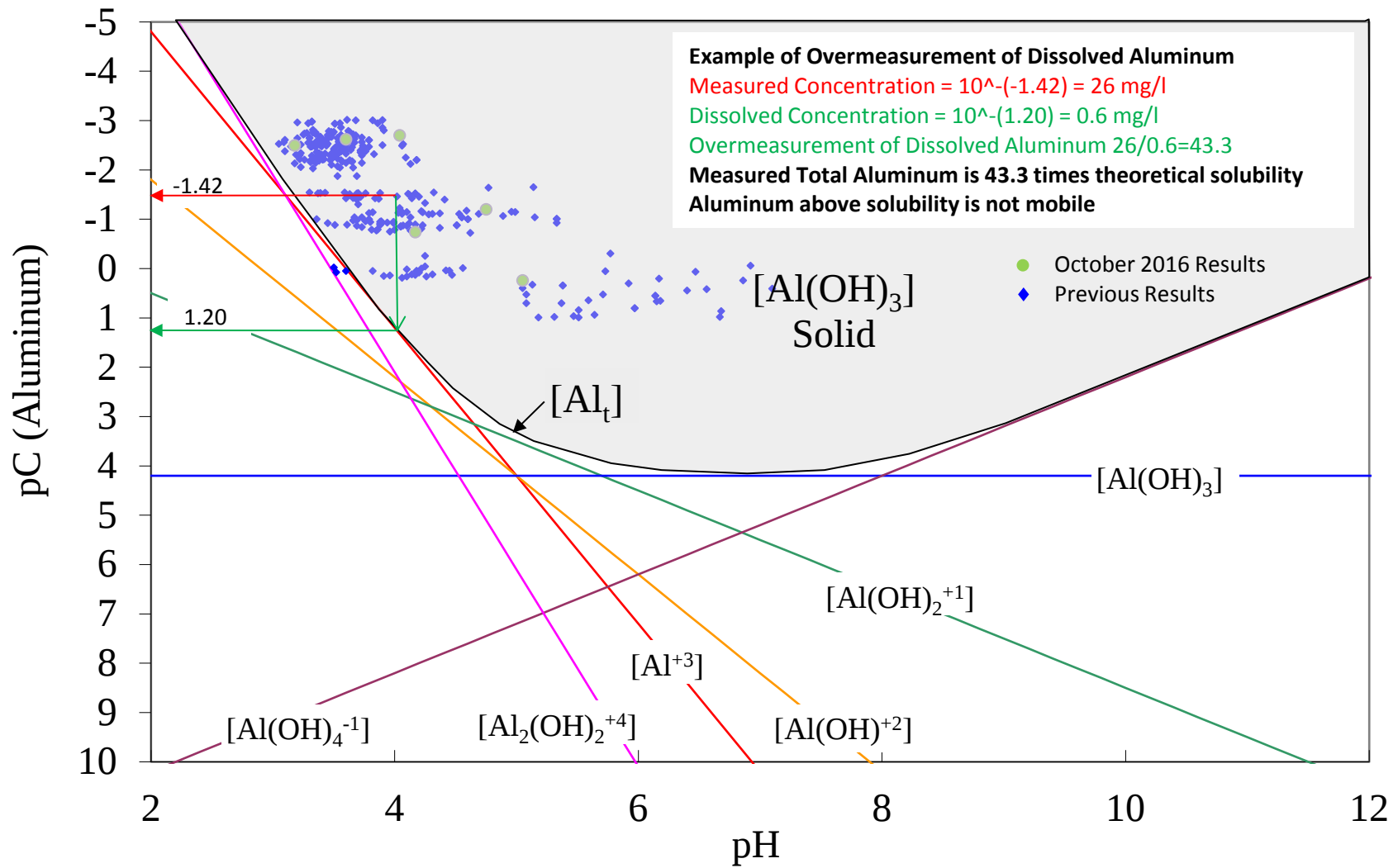
Geosyntec
consultants
Kennesaw, GA
January 2017

SULFATE CONCENTRATION IN STORM DRAIN

Chemtrade Solutions, East Point, GA

Figure
3-6

Figure 6-1
 Chemtrade Solutions
 Groundwater Sampling
 October 2016
 Aluminum Results Analysis





PACE ANALYTICAL SERVICES, INC.

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: AZJ0134

October 24, 2016

Project: Chemtrade

Project #:GR5060.2016

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:

A handwritten signature in black ink, appearing to read "Betsy McDaniel", written over a horizontal line.

Project Manager

This report may not be reproduced, except in full, without written approval from Pace Analytical Services, Inc. Pace Analytical Services, Inc. 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.



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

PACE ANALYTICAL SERVICES, INC.

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

October 24, 2016

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GCW-05-1016	AZJ0134-01	Ground Water	10/04/16 11:16	10/05/16 16:00
GCW-04D-1016	AZJ0134-02	Ground Water	10/04/16 11:13	10/05/16 16:00
GCW-02D-1016	AZJ0134-03	Ground Water	10/04/16 12:41	10/05/16 16:00
GCW-03D-1016	AZJ0134-04	Ground Water	10/04/16 12:56	10/05/16 16:00
Dup-01-1016	AZJ0134-05	Ground Water	10/04/16 00:00	10/05/16 16:00
EPW-02-1016	AZJ0134-06	Ground Water	10/04/16 14:01	10/05/16 16:00
EPW-01-1016	AZJ0134-07	Ground Water	10/04/16 15:01	10/05/16 16:00
SW-09-1016	AZJ0134-08	Surface Water	10/04/16 15:21	10/05/16 16:00
SW-02-1016	AZJ0134-09	Surface Water	10/04/16 13:05	10/05/16 16:00
Dup-02-1016	AZJ0134-10	Ground Water	10/04/16 00:00	10/05/16 16:00
EPW-03D-1016	AZJ0134-11	Ground Water	10/04/16 14:10	10/05/16 16:00
SW-06-1016	AZJ0134-12	Surface Water	10/04/16 14:58	10/05/16 16:00
OW-01A-1016	AZJ0134-13	Ground Water	10/05/16 10:50	10/05/16 16:00
GCW-01D-1016	AZJ0134-14	Ground Water	10/05/16 11:11	10/05/16 16:00
SW-07-1016	AZJ0134-15	Surface Water	10/05/16 11:30	10/05/16 16:00



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Attention: Mr. Brian Jacobson

October 24, 2016

Report No.: AZJ0134

Client ID: GCW-05-1016

Date/Time Sampled: 10/4/2016 11:16:00AM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-01

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	500	50	mg/L	EPA 9056A		10	10/14/16 12:08	10/14/16 17:57	6100391	RNB
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 16:53	6100294	FBS



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

October 24, 2016

Report No.: AZJ0134

Client ID: GCW-04D-1016

Date/Time Sampled: 10/4/2016 11:13:00AM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-02

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	4600	1000	mg/L	EPA 9056A		200	10/14/16 12:08	10/18/16 19:47	6100391	RNB
Metals, Total										
Aluminum	419	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 16:56	6100294	FBS



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October 24, 2016

Report No.: AZJ0134

Client ID: GCW-02D-1016

Date/Time Sampled: 10/4/2016 12:41:00PM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-03

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	3800	500	mg/L	EPA 9056A		100	10/14/16 12:08	10/18/16 6:41	6100391	RNB
Metals, Total										
Aluminum	182	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:00	6100294	FBS



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October 24, 2016

Report No.: AZJ0134

Client ID: GCW-03D-1016

Date/Time Sampled: 10/4/2016 12:56:00PM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-04

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	7000	1000	mg/L	EPA 9056A		200	10/14/16 12:08	10/18/16 20:09	6100391	RNB
Metals, Total										
Aluminum	314	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:04	6100294	FBS



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Kennesaw GA, 30144
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October 24, 2016

Report No.: AZJ0134

Client ID: Dup-01-1016

Date/Time Sampled: 10/4/2016 12:00:00AM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-05

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	490	100	mg/L	EPA 9056A		20	10/14/16 12:08	10/18/16 8:49	6100391	RNB
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:07	6100294	FBS



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Kennesaw GA, 30144
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October 24, 2016

Report No.: AZJ0134

Client ID: EPW-02-1016

Date/Time Sampled: 10/4/2016 2:01:00PM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-06

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	ND	5.0	mg/L	EPA 9056A		1	10/14/16 12:08	10/14/16 21:03	6100391	RNB
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:11	6100294	FBS



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October 24, 2016

Report No.: AZJ0134

Client ID: EPW-01-1016

Date/Time Sampled: 10/4/2016 3:01:00PM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-07

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	140	20	mg/L	EPA 9056A		4	10/14/16 12:08	10/14/16 21:23	6100391	RNB
Metals, Total										
Aluminum	15.8	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:15	6100294	FBS



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October 24, 2016

Report No.: AZJ0134

Client ID: SW-09-1016

Date/Time Sampled: 10/4/2016 3:21:00PM

Matrix: Surface Water

Project: Chemtrade

Lab Number ID: AZJ0134-08

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	180	25	mg/L	EPA 9056A		5	10/14/16 12:08	10/18/16 20:30	6100391	RNB
Metals, Total										
Aluminum	5.56	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:18	6100294	FBS



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October 24, 2016

Report No.: AZJ0134

Client ID: SW-02-1016

Date/Time Sampled: 10/4/2016 1:05:00PM

Matrix: Surface Water

Project: Chemtrade

Lab Number ID: AZJ0134-09

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	2200	250	mg/L	EPA 9056A		50	10/14/16 12:08	10/18/16 9:31	6100391	RNB
Metals, Total										
Aluminum	132	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:29	6100294	FBS



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Kennesaw GA, 30144
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October 24, 2016

Report No.: AZJ0134

Client ID: Dup-02-1016

Date/Time Sampled: 10/4/2016 12:00:00AM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-10

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	1700	1000	mg/L	EPA 9056A		200	10/14/16 12:08	10/22/16 1:33	6100391	RLC
Metals, Total										
Aluminum	137	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:33	6100294	FBS



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Kennesaw GA, 30144
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October 24, 2016

Report No.: AZJ0134

Client ID: EPW-03D-1016

Date/Time Sampled: 10/4/2016 2:10:00PM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-11

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	35	5.0	mg/L	EPA 9056A		1	10/14/16 12:08	10/14/16 22:46	6100391	RNB
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:37	6100294	FBS



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(770) 734-4200 FAX (770) 734-4201

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

October 24, 2016

Report No.: AZJ0134

Client ID: SW-06-1016

Date/Time Sampled: 10/4/2016 2:58:00PM

Matrix: Surface Water

Project: Chemtrade

Lab Number ID: AZJ0134-12

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	4600	500	mg/L	EPA 9056A		100	10/14/16 12:08	10/18/16 10:14	6100391	RNB
Metals, Total										
Aluminum	234	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:40	6100294	FBS



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Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

October 24, 2016

Report No.: AZJ0134

Client ID: OW-01A-1016

Date/Time Sampled: 10/5/2016 10:50:00AM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-13

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	48	10	mg/L	EPA 9056A		2	10/14/16 12:08	10/14/16 23:48	6100391	RNB
Metals, Total										
Aluminum	0.572	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:44	6100294	FBS



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Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

October 24, 2016

Report No.: AZJ0134

Client ID: GCW-01D-1016

Date/Time Sampled: 10/5/2016 11:11:00AM

Matrix: Ground Water

Project: Chemtrade

Lab Number ID: AZJ0134-14

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	190	20	mg/L	EPA 9056A		4	10/14/16 12:08	10/15/16 0:09	6100391	RNB
Metals, Total										
Aluminum	5.49	0.100	mg/L	EPA 6010C		1	10/12/16 11:05	10/12/16 17:48	6100294	FBS



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October 24, 2016

Report No.: AZJ0134

Client ID: SW-07-1016

Date/Time Sampled: 10/5/2016 11:30:00AM

Matrix: Surface Water

Project: Chemtrade

Lab Number ID: AZJ0134-15

Date/Time Received: 10/5/2016 4:00:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	410	100	mg/L	EPA 9056A		20	10/14/16 12:08	10/18/16 10:35	6100391	RNB
Metals, Total										
Aluminum	40.0	0.100	mg/L	EPA 6010C		1	10/13/16 10:00	10/13/16 13:27	6100333	FBS



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October 24, 2016

Report No.: AZJ0134

Inorganic Anions - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 6100391 - EPA 9056A										
Blank (6100391-BLK1)					Prepared & Analyzed: 10/14/16					
Sulfate	ND	5.0	mg/L							
LCS (6100391-BS1)					Prepared & Analyzed: 10/14/16					
Sulfate	10.1	5.0	mg/L	10.020		101	90-110			
Matrix Spike (6100391-MS1)					Source: AZJ0415-02 Prepared & Analyzed: 10/14/16					
Sulfate	59.8	5.0	mg/L	10.020	55.7	41	90-110			QM-05
Matrix Spike (6100391-MS2)					Source: AZJ0134-11 Prepared & Analyzed: 10/14/16					
Sulfate	30.8	5.0	mg/L	10.020	35.0	0	90-110			QM-05
Matrix Spike Dup (6100391-MSD1)					Source: AZJ0415-02 Prepared & Analyzed: 10/14/16					
Sulfate	60.0	5.0	mg/L	10.020	55.7	42	90-110	0.3	15	QM-05



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October 24, 2016

Report No.: AZJ0134

Metals, Total - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 6100294 - EPA 3010A										
Blank (6100294-BLK1)					Prepared & Analyzed: 10/12/16					
Aluminum	ND	0.100	mg/L							
LCS (6100294-BS1)					Prepared & Analyzed: 10/12/16					
Aluminum	1.01	0.100	mg/L	1.0000		101	80-120			
Matrix Spike (6100294-MS1)					Source: AZJ0132-21 Prepared & Analyzed: 10/12/16					
Aluminum	1.20	0.100	mg/L	1.0000	0.151	104	75-125			
Matrix Spike Dup (6100294-MSD1)					Source: AZJ0132-21 Prepared & Analyzed: 10/12/16					
Aluminum	1.21	0.100	mg/L	1.0000	0.151	106	75-125	1	20	
Post Spike (6100294-PS1)					Source: AZJ0132-21 Prepared & Analyzed: 10/12/16					
Aluminum	1.18		mg/L	1.0000	0.151	102	80-120			
Batch 6100333 - EPA 3010A										
Blank (6100333-BLK1)					Prepared & Analyzed: 10/13/16					
Aluminum	ND	0.100	mg/L							
LCS (6100333-BS1)					Prepared & Analyzed: 10/13/16					
Aluminum	1.01	0.100	mg/L	1.0000		101	80-120			
Matrix Spike (6100333-MS1)					Source: AZJ0320-01 Prepared & Analyzed: 10/13/16					
Aluminum	10.6	10.0	mg/L	10.000	ND	106	75-125			
Matrix Spike Dup (6100333-MSD1)					Source: AZJ0320-01 Prepared & Analyzed: 10/13/16					
Aluminum	10.9	10.0	mg/L	10.000	ND	109	75-125	3	20	



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October 24, 2016

Report No.: AZJ0134

Metals, Total - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 6100333 - EPA 3010A										
Post Spike (6100333-PS1)		Source: AZJ0320-01			Prepared & Analyzed: 10/13/16					
Aluminum	1.19		mg/L	1.0000	-0.031	122	80-120			QM-02



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October 24, 2016

Laboratory Certifications

Code	Description	Number	Expires
NC	North Carolina	381	12/31/2016
NELAC	FL DOH (Non-Pot. Water, Solids) Eff.: 07/01/2016	E87315	06/30/2017
SC	South Carolina	98011001	10/31/2016
TX	Texas	T104704397-08-TX	03/31/2017
VA	Virginia	1340	12/14/2016



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October 24, 2016

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-Nitrosodiphenylamine. 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

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

[illegible]



PACE ANALYTICAL SERVICES, INC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, GA 30092
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LOG-IN CHECKLIST

Printed: 10/24/2016 4:16:40PM

Attn: Mr. Brian Jacobson

Client: Geosyntec Consultants Inc.

Project: Chemtrade

Date Received: 10/05/16 16:00

Work Order: AZJ0134

Logged In By: Mohammad M. Rahman

OBSERVATIONS

#Samples: 15

#Containers: 30

Minimum Temp(C): 4.0

Maximum Temp(C): 4.0

Custody Seal(s) Used: Yes

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	YES
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:

Water Level Measurements

Project.: Chemtrade, East Point; Date: 10/4/16

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

Well	Time	DTW ^{ft}	Screen Interval	Notes
GCW-01S	0800	15.61	15-25	Dedicated 1/8" polyethylene sampling tubing is 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.
GCW-01M	0758	15.63	34-44	
GCW-01D	0759	15.08	58-68	
GCW-02S	0915	5.84	16-26	
GCW-02D	0844	5.43	34-44	
GCW-02V	0834	5.62	85.5-95.5	
GCW-03S	0809	5.23	11-21	Oil water interface probe: no product detected
GCW-03D	0854	5.28	38-28	Oil water interface probe: no product detected
GCW-04S	1000	11.97	13-23	
GCW-04M	1002	11.93	30-40	
GCW-04D	0945	11.21	50-60	
GCW-04V	1004	10.48	114-124	
GCW-05	1013	8.02	80-90	
EPW-01	0807	22.17	24.51 ⁽¹⁾	Missing metal end.
EPW-02	0820	10.45	19.41 ⁽¹⁾	missing bolts
EPW-03S	0816	10.49	12-22	
EPW-03M	0817	10.31	29-39	
EPW-03D	0815	10.25	46-56	
OW-1A	0955	17.98	34.5 ⁽¹⁾	

Notes:

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

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Monitoring Well: SW-02
Sample ID: SW-02/010

Sample ID: SW-021016

Sampler: SC

Sampling Date: 10/4/16

Project No.: GR5060.2016

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
1300	X										Brownish
1305	X	X	X	X	24.52	3.38	396	0.000	225	6.93	Clear

Meter Calibration

Meter Number:

Parameter Date & Time Calibrated & Acceptance

pH	±0.2 SU	pH 4: _____; pH 7: _____; pH 10: _____
	±0.2 mS	4.48 mS/cm fluid reads
Conductivity		
Turbidity	±2 NTU	0 NTU solution reads

Miscellaneous		Sample ID		Description	
Depth to Water (after sample):	ft	200-02-1016		Duplicate sample	
Total Purge Volume	gal				
Purge should be approximately	5 gallons				
Pump Rate:	in				
	min, sec.				

Weather:

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

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Monitoring Well: SW-06
Sample ID: SW-06-1016

Project No.: GR5060.2016

Sampling Date: 10/4/16
Sampler: SL

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	5								
1455	X			31.83	3.73	409	2.02	2.0	5.32	Clear
1458			X							

Meter Calibration

Meter Number:

Parameter Date & Time Calibrated & Acceptance

Calibration Results

Hd

±0.25

pH 4: _____; pH 7: _____; pH 10: _____

Conductivity

 $\pm 0.2 \text{ ms}$

4.48 mS/cm fluid reads

Turbidity

±2 NTU

0 NTU solution reads

Split, Blank, Duplicate, & Filtered Samples

Sample ID	Description
-----------	-------------

Depth to Water (after sample): _____ ft

Miscellaneous

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

Ground Water Sampling Measurements for Low-Flow Purgings

Site: Chemtrade

Monitoring Well: SW-09

Sample ID: SW-09-1016

Sampler: SC

Sampling Date: 10/4/16

Project No.: GR5060.2016

[illegible]

Meter Calibration

Meter Number:

Parameter Date & Time Calibrated & Acceptance

Calibration Results

Hd

US 7.07

pH 4: _____; pH 7: _____; pH 10: _____

Conductivity

 $\pm 0.2 \text{ mS}$

4.48 mS/cm fluid reads

Turbidity

UN 27

0 NTU solution reads

Split, Blank, Duplicate, & Filtered Samples

Description

Depth to Water (after sample): _____ ft

Miscellaneous

Weather:

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: EPW-01

Sample ID: EPW-01-1016

Sampler: C. Hays

Sampling Date: 10/4/2016

Project No.: GR5060.2016

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
2:20	X									
2:22	X			18.38	4.83	402	0.244	4.8	0.36	<i>Clear, no odor</i>
2:25	X			17.64	4.81	426	0.243	7.8	0.41	
2:30	X			20.51	4.82	427	0.225	4.2	3.05	
2:35	X			21.84	4.81	431	0.218	1.2	4.22	
2:40	X			21.85	4.79	436	0.217	0.5	4.43	<i>~2.0 gallons of splitting</i>
2:45	X			21.84	4.76	435	0.213	0.1	4.57	
2:50	X			21.84	4.75	437	0.213	0.1	4.70	
2:55	X			21.85	4.75	439	0.213	0.0	4.73	
3:00	X			21.84	4.75	438	0.212	0.0	4.74	
3:01		X								<i>2 containers</i>

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	0 NTU solution reads				

Meter Calibration	
Meter Number: <u>F2P6M65V</u>	

Weather:	
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.

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

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Monitoring Well: EW-02

Sample ID: 6P10-02-1016

Sampler:

C. Hug

Sampling Date: 10/4/16

Project No.: GR5060.2016

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
1:27 pm	X										
1:30	X	X			27.30	5.53	220	0.131	35.4	2.51	(Clear, no odor)
1:35		X			26.49	5.56	317	0.081	26.8	4.01	
1:40		X			26.48	5.53	333	0.071	28.3	3.14	
1:45		X			27.04	5.54	335	0.069	8.6	2.89	
1:50		X			27.06	5.54	337	0.067	3.6	2.76	
1:55		X			27.05	5.54	338	0.067	1.4	2.74	
2:00		X			27.06	5.53	339	0.067	1.5	2.75	
2:01		X									2 (colorless)
2:03				X							

Meter Calibration

Meter Number: F2P6MB5V

Collected by
e & Time Calibrated & Acceptance

Horvath A-52

Calibration Results

pH	±0.2 SU	pH 4: _____; pH 7: _____; pH 10: _____
	±0.2 mS	4.48 mS/cm fluid reads
Conductivity		0 NTU solution reads
Turbidity	±2 NTU	

Split, Blank, Duplicate, & Filtered Samples

Miscellaneous

Sample ID		Description	
Split, Blank, Duplicate, & Filtered Samples		Miscellaneous	
Depth to Water (after sample): _____ ft		Total Purge Volume ~ 4 gal	
		Purge should be approximately 5 gallons	
		Pump Rate: 4 gal in	
		36 min, _____ sec.	

Weather:

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

Flush mount, taking in well.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Monitoring Well: 6PW-03D

Sample ID: 6PW-03D-1016

Project No.: GR5060.2016

Sampling Date: 10/4/16

Sampler: SL

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
1340	X	X		19.5	6.61	387	0.285	2.7	7.24	clear
1345	X			19.18	6.73	374	0.277	2.3	5.36	"
1350	X			19.12	6.72	368	0.276	1.0	4.94	"
1355	X			19.38	6.73	362	0.276	0.0	4.53	"
1400	X			19.48	6.71	359	0.275	0.0	4.59	"
1405	X			19.38	6.72	358	0.275	0.0	4.59	"
1410	X	X	X	19.37	6.71	358	0.274	0.0	4.59	"

Parameter Date & Time Calibrated & Acceptance				Calibration Results			
pH	±0.2 SU	pH 4: _____ ; pH 7: _____ ; pH 10: _____	Meter Calibration Meter Number: _____				
	±0.2 mS	4.48 mS/cm fluid reads					
	±2 NTU	0 NTU solution reads					
Conductivity		Turbidity		Split, Blank, Duplicate, & Filtered Samples Miscellaneous			
Sample ID		Description					
Depth to Water (after sample): _____ ft		Total Purge Volume _____ gal		Purge should be approximately 5 gallons			
Pump Rate: _____ in		min, _____ sec.		Weather:			
Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)							

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Monitoring Well: GW-01D

Sample ID: 670-01D-1016

Sampler: C. Hunt

Sampling Date: 10/5/2016

Project No.: GR5060.2016

[illegible]

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

Flare mount
(Balloons too weak to lift, at 10:35pm → use can balloon)
(Bottle pump, lifting de ✓)

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Project No.: GR5060.2016

Monitoring Well: GCU-2D

Sampling Date: 10/4/16

Sample ID: GCU-02D-1016

Sampler: C. Hays

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
12:05	X									
12:07	X			19.55	4.16	492	2.67	3.8	1.63	Clear, no odor
12:10	X			18.25	4.02	529	2.67	4.5	0.07	
12:15	X			18.03	4.01	534	2.54	2.9	0.00	
12:20	X			17.91	4.02	536	2.39	1.2	0.00	
12:25	X			17.82	4.02	538	2.33	0.1	0.00	
12:30	X			17.66	4.03	539	2.29	0.3	0.00	(~2.5 gallons)
12:35	X			17.65	4.04	538	2.29	0.0	0.00	
12:40	X			17.66	4.04	538	2.30	0.0	0.00	2 Containers
12:41		X								
12:43		X								

Parameter Date & Time Calibrated & Acceptance				Meter Calibration				Calibration Results			
Collector By A102				Horiba U-52				Meter Number: F2R6H35V			
pH				pH 4: ; pH 7: ; pH 10:							
Conductivity				4.48 mS/cm fluid reads							
Turbidity				0 NTU solution reads							

Sample ID	Description	Depth to Water (after sample): ft	Total Purge Volume gal	Purge should be approximately 5 gallons	Pump Rate: in	38 min, sec.
Split, Blank, Duplicate, & Filtered Samples	Miscellaneous		3.5		3.5	

Weather:

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

Blank means, well & screen present in well.

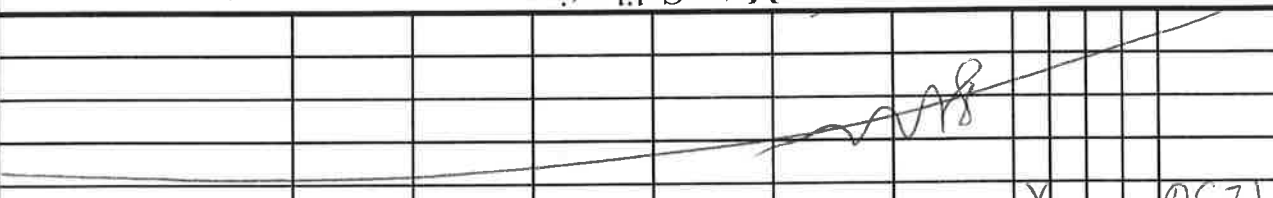
Full purging measured via flow cell, collection not (scale provided by A102).

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Monitoring Well: 6CW-03D
Sample ID: 6CW-03D-1016

Project No.: GR5060.2016
Sampling Date: 10/4/16
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
1230	X										
1231	X				20.00	3.25	429	3.23	3.0	0.41	Clear
1235	X				19.86	3.21	440	3.29	2.5	0.00	"
1240	X				19.72	3.19	457	3.29	2.1	0.00	"
1245	X				19.79	3.18	462	3.29	0.5	0.00	"
1250	X				19.88	3.18	461	3.28	0.5	0.00	"
1255	X				19.84	3.18	459	3.28	0.5	0.00	
1256				X							
											

Meter Calibration

Meter Number: _____

Parameter Date & Time Calibrated & Acceptance _____

Calibration Results _____

pH 4: _____; pH 7: _____; pH 10: _____

4.48 mS/cm fluid reads _____

0 NTU solution reads _____

pH

Conductivity _____

Turbidity _____

Split, Blank, Duplicate, & Filtered Samples

Sample ID _____

Description _____

Depth to Water (after sample): _____ ft

Miscellaneous _____

Total Purge Volume 74 gal

Purge should be approximately 5 gallons

Pump Rate: _____ in _____ min, _____ sec.

Weather:

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: GCM04D
Sample ID: GCM-04D-1016
Project No.: GR5060.2016
Sampling Date: 10/4/16
Sampler: CHUG

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
------	----------------------	-------------	-----------	------------------	----	------------------------	----------------------	-----------------	-----------	---------------------

10:28	X			20.68	6.44	297	0.112	0.0	3.54	Clear, no odor
10:35	X			20.00	6.41	350	0.109	0.0	2.04	10.35 min: Start to spit -> clear to redox? (~2.5 gal)
10:42	X			19.65	6.20	375	0.144	0.0	1.97	
10:50	X			19.95	6.17	381	0.114	0.0	1.96	
10:55	X			19.93	6.15	383	0.115	0.0	1.89	
11:00	X			19.56	3.97	457	1.11	0.0	0.96	(~3-3.5 gal)
11:05	X			19.55	3.62	452	2.15	0.0	0.00	
11:18	X			19.56	3.61	450	2.16	0.0	0.00	
11:14	X			19.56	3.60	451	2.18	0.0	0.00	2 containers

Meter Calibration										
Meter Number: F2P6H85V										
Calibration Results										
pH 4: 4.0; pH 7: 7.0; pH 10: 4.48 mS/cm fluid reads 4.49										
0 NTU solution reads										

pH		±0.2 SU	Conductivity		±0.2 mS	Turbidity		±2 NTU
Miscellaneous		Depth to Water (after sample): ft	Total Purge Volume ~4.5 gal		Purge should be approximately 5 gallons	Pump Rate: 4.5 gal/min		54 min, sec.

Weather: Sunny, dry.
Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)
Flash recorded well.
Used flow cell for fluid permeation. Calibration certificate provided.
Tubing & silicon present in well.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Monitoring Well: 6CW-05A
Sample ID: 6CW-05-1016

Project No.: GR5060.2016
Sampling Date: 10/4/16
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
1040	X									
1043	X			21.07	7.94	-93	1.01	10.5	1.47	clear
1048	X			19.85	7.92	-53	1.03	8.0	0.65	"
1053	X			19.82	7.91	-45	1.03	9.9	0.39	"
1058	X			18.98	7.91	-40	1.05	2.8	0.24	"
1100	X			18.99	7.91	-42	1.04	2.1	0.19	"
1105	X			18.95	7.91	-43	1.04	2.4	0.15	"
1110	X			18.82	7.91	-41	1.04	1.7	0.09	"
1113	X			18.82	7.91	-40	1.04	1.1	0.08	"
1116	X			18.83	7.91	-41	1.04	0.7	0.07	"

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

Sample ID: 6CW-05-1016			
Sample ID	Description	Depth to Water (after sample): _____ ft	Total Purge Volume _____ gal
Split, Blank, Duplicate, & Filtered Samples		Miscellaneous	
Purge should be approximately 5 gallons	Pump Rate: _____ in _____ min, _____ sec.	Weather: _____	

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

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Monitoring Well: MW-01A

Sample ID: 0W-01A-1016

Sampler: SC

Sampling Date:

Project No.: GR5060.2016

[illegible]

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
15	15	0	8	15
20	15	5	9	15
10.2	15	-4.8	9	16
11	15	-4	9	17
12.9	15	-2.1	9	18
11.6	15	-3.4	9	19
11	15	-4	9	20
13.5	15	-1.5	9	21
13.2	15	-1.8	9	22
12.5	15	-2.5	9	23
12.8	15	-2.2	9	24
12.9	15	-2.1	9	25
16.9	15	1.9	10	25
13.4	15	-1.6	10	26
21.4	15	6.4	11	26
8.44	15	-6.56	11	27
14	15	-1	11	28
12.9	15	-2.1	11	29
14.2	15	-0.8	11	30
13.8	15	-1.2	11	31
14.5	15	-0.5	11	32

13.9	15	-1.1	11	33
15.8	15	0.8	12	33
20	15	5	13	33
10.2	15	-4.8	13	34
11	15	-4	13	35
12.9	15	-2.1	13	36
11.6	15	-3.4	13	37
11	15	-4	13	38
13.5	15	-1.5	13	39
13.2	15	-1.8	13	40
12.5	15	-2.5	13	41
12.8	15	-2.2	13	42
12.9	15	-2.1	13	43
16.9	15	1.9	14	43
13.4	15	-1.6	14	44
21.4	15	6.4	15	44
8.44	15	-6.56	15	45
14	15	-1	15	46
12.9	15	-2.1	15	47
14.2	15	-0.8	15	48
13.8	15	-1.2	15	49
14.5	15	-0.5	15	50
13.9	15	-1.1	15	51
15.8	15	0.8	16	51
10.2	20	-9.8	16	52
11	20	-9	16	53
12.9	20	-7.1	16	54
11.6	20	-8.4	16	55
11	20	-9	16	56
13.5	20	-6.5	16	57
13.2	20	-6.8	16	58
12.5	20	-7.5	16	59
12.8	20	-7.2	16	60
12.9	20	-7.1	16	61
16.9	20	-3.1	16	62
13.4	20	-6.6	16	63
21.4	20	1.4	17	63
8.44	20	-11.56	17	64
14	20	-6	17	65
12.9	20	-7.1	17	66
14.2	20	-5.8	17	67
13.8	20	-6.2	17	68
14.5	20	-5.5	17	69
13.9	20	-6.1	17	70
15.8	20	-4.2	17	71
11	10.2	0.8	18	71
12.9	10.2	2.7	19	71
11.6	10.2	1.4	20	71
11	10.2	0.8	21	71
13.5	10.2	3.3	22	71
13.2	10.2	3	23	71
12.5	10.2	2.3	24	71
12.8	10.2	2.6	25	71
12.9	10.2	2.7	26	71

16.9	10.2	6.7	27	71
13.4	10.2	3.2	28	71
21.4	10.2	11.2	29	71
8.44	10.2	-1.76	29	72
14	10.2	3.8	30	72
12.9	10.2	2.7	31	72
14.2	10.2	4	32	72
13.8	10.2	3.6	33	72
14.5	10.2	4.3	34	72
13.9	10.2	3.7	35	72
15.8	10.2	5.6	36	72
12.9	11	1.9	37	72
11.6	11	0.6	38	72
11	11	0	38	72
13.5	11	2.5	39	72
13.2	11	2.2	40	72
12.5	11	1.5	41	72
12.8	11	1.8	42	72
12.9	11	1.9	43	72
16.9	11	5.9	44	72
13.4	11	2.4	45	72
21.4	11	10.4	46	72
8.44	11	-2.56	46	73
14	11	3	47	73
12.9	11	1.9	48	73
14.2	11	3.2	49	73
13.8	11	2.8	50	73
14.5	11	3.5	51	73
13.9	11	2.9	52	73
15.8	11	4.8	53	73
11.6	12.9	-1.3	53	74
11	12.9	-1.9	53	75
13.5	12.9	0.6	54	75
13.2	12.9	0.3	55	75
12.5	12.9	-0.4	55	76
12.8	12.9	-0.1	55	77
12.9	12.9	0	55	77
16.9	12.9	4	56	77
13.4	12.9	0.5	57	77
21.4	12.9	8.5	58	77
8.44	12.9	-4.46	58	78
14	12.9	1.1	59	78
12.9	12.9	0	59	78
14.2	12.9	1.3	60	78
13.8	12.9	0.9	61	78
14.5	12.9	1.6	62	78
13.9	12.9	1	63	78
15.8	12.9	2.9	64	78
11	11.6	-0.6	64	79
13.5	11.6	1.9	65	79
13.2	11.6	1.6	66	79
12.5	11.6	0.9	67	79
12.8	11.6	1.2	68	79
12.9	11.6	1.3	69	79

16.9	11.6	5.3	70	79
13.4	11.6	1.8	71	79
21.4	11.6	9.8	72	79
8.44	11.6	-3.16	72	80
14	11.6	2.4	73	80
12.9	11.6	1.3	74	80
14.2	11.6	2.6	75	80
13.8	11.6	2.2	76	80
14.5	11.6	2.9	77	80
13.9	11.6	2.3	78	80
15.8	11.6	4.2	79	80
13.5	11	2.5	80	80
13.2	11	2.2	81	80
12.5	11	1.5	82	80
12.8	11	1.8	83	80
12.9	11	1.9	84	80
16.9	11	5.9	85	80
13.4	11	2.4	86	80
21.4	11	10.4	87	80
8.44	11	-2.56	87	81
14	11	3	88	81
12.9	11	1.9	89	81
14.2	11	3.2	90	81
13.8	11	2.8	91	81
14.5	11	3.5	92	81
13.9	11	2.9	93	81
15.8	11	4.8	94	81
13.2	13.5	-0.3	94	82
12.5	13.5	-1	94	83
12.8	13.5	-0.7	94	84
12.9	13.5	-0.6	94	85
16.9	13.5	3.4	95	85
13.4	13.5	-0.1	95	86
21.4	13.5	7.9	96	86
8.44	13.5	-5.06	96	87
14	13.5	0.5	97	87
12.9	13.5	-0.6	97	88
14.2	13.5	0.7	98	88
13.8	13.5	0.3	99	88
14.5	13.5	1	100	88
13.9	13.5	0.4	101	88
15.8	13.5	2.3	102	88
12.5	13.2	-0.7	102	89
12.8	13.2	-0.4	102	90
12.9	13.2	-0.3	102	91
16.9	13.2	3.7	103	91
13.4	13.2	0.2	104	91
21.4	13.2	8.2	105	91
8.44	13.2	-4.76	105	92
14	13.2	0.8	106	92
12.9	13.2	-0.3	106	93
14.2	13.2	1	107	93
13.8	13.2	0.6	108	93
14.5	13.2	1.3	109	93

13.9	13.2	0.7	110	93
15.8	13.2	2.6	111	93
12.8	12.5	0.3	112	93
12.9	12.5	0.4	113	93
16.9	12.5	4.4	114	93
13.4	12.5	0.9	115	93
21.4	12.5	8.9	116	93
8.44	12.5	-4.06	116	94
14	12.5	1.5	117	94
12.9	12.5	0.4	118	94
14.2	12.5	1.7	119	94
13.8	12.5	1.3	120	94
14.5	12.5	2	121	94
13.9	12.5	1.4	122	94
15.8	12.5	3.3	123	94
12.9	12.8	0.1	124	94
16.9	12.8	4.1	125	94
13.4	12.8	0.6	126	94
21.4	12.8	8.6	127	94
8.44	12.8	-4.36	127	95
14	12.8	1.2	128	95
12.9	12.8	0.1	129	95
14.2	12.8	1.4	130	95
13.8	12.8	1	131	95
14.5	12.8	1.7	132	95
13.9	12.8	1.1	133	95
15.8	12.8	3	134	95
16.9	12.9	4	135	95
13.4	12.9	0.5	136	95
21.4	12.9	8.5	137	95
8.44	12.9	-4.46	137	96
14	12.9	1.1	138	96
12.9	12.9	0	138	96
14.2	12.9	1.3	139	96
13.8	12.9	0.9	140	96
14.5	12.9	1.6	141	96
13.9	12.9	1	142	96
15.8	12.9	2.9	143	96
13.4	16.9	-3.5	143	97
21.4	16.9	4.5	144	97
8.44	16.9	-8.46	144	98
14	16.9	-2.9	144	99
12.9	16.9	-4	144	100
14.2	16.9	-2.7	144	101
13.8	16.9	-3.1	144	102
14.5	16.9	-2.4	144	103
13.9	16.9	-3	144	104
15.8	16.9	-1.1	144	105
21.4	13.4	8	145	105
8.44	13.4	-4.96	145	106
14	13.4	0.6	146	106
12.9	13.4	-0.5	146	107

14.2	13.4	0.8	147	107
13.8	13.4	0.4	148	107
14.5	13.4	1.1	149	107
13.9	13.4	0.5	150	107
15.8	13.4	2.4	151	107
8.44	21.4	-12.96	151	108
14	21.4	-7.4	151	109
12.9	21.4	-8.5	151	110
14.2	21.4	-7.2	151	111
13.8	21.4	-7.6	151	112
14.5	21.4	-6.9	151	113
13.9	21.4	-7.5	151	114
15.8	21.4	-5.6	151	115
14	8.44	5.56	152	115
12.9	8.44	4.46	153	115
14.2	8.44	5.76	154	115
13.8	8.44	5.36	155	115
14.5	8.44	6.06	156	115
13.9	8.44	5.46	157	115
15.8	8.44	7.36	158	115
12.9	14	-1.1	158	116
14.2	14	0.2	159	116
13.8	14	-0.2	159	117
14.5	14	0.5	160	117
13.9	14	-0.1	160	118
15.8	14	1.8	161	118
14.2	12.9	1.3	162	118
13.8	12.9	0.9	163	118
14.5	12.9	1.6	164	118
13.9	12.9	1	165	118
15.8	12.9	2.9	166	118
13.8	14.2	-0.4	166	119
14.5	14.2	0.3	167	119
13.9	14.2	-0.3	167	120
15.8	14.2	1.6	168	120
14.5	13.8	0.7	169	120
13.9	13.8	0.1	170	120
15.8	13.8	2	171	120
13.9	14.5	-0.6	171	121
15.8	14.5	1.3	172	121
15.8	13.9	1.9	173	121

S Statistic = 173 - 121 = 52

Tied Group Value	Members
1	14
2	15
3	11

4 12.9 3

Time Period	Observations
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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

There are 0 time periods with multiple data

A = 120

B = 0

C = 6

D = 0

E = 12

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1826.67

Z-Score = 1.19327

Comparison Level at 95% confidence level = 1.65463 (upward trend)

1.19327 <= 1.65463 indicating no evidence of an upward 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
15	15	0	8	15
20	15	5	9	15
10.2	15	-4.8	9	16
11	15	-4	9	17
12.9	15	-2.1	9	18
11.6	15	-3.4	9	19
11	15	-4	9	20
13.5	15	-1.5	9	21
13.2	15	-1.8	9	22
12.5	15	-2.5	9	23
12.8	15	-2.2	9	24
12.9	15	-2.1	9	25
16.9	15	1.9	10	25
13.4	15	-1.6	10	26
21.4	15	6.4	11	26
8.44	15	-6.56	11	27
14	15	-1	11	28
12.9	15	-2.1	11	29
14.2	15	-0.8	11	30
13.8	15	-1.2	11	31
14.5	15	-0.5	11	32

13.9	15	-1.1	11	33
15.8	15	0.8	12	33
20	15	5	13	33
10.2	15	-4.8	13	34
11	15	-4	13	35
12.9	15	-2.1	13	36
11.6	15	-3.4	13	37
11	15	-4	13	38
13.5	15	-1.5	13	39
13.2	15	-1.8	13	40
12.5	15	-2.5	13	41
12.8	15	-2.2	13	42
12.9	15	-2.1	13	43
16.9	15	1.9	14	43
13.4	15	-1.6	14	44
21.4	15	6.4	15	44
8.44	15	-6.56	15	45
14	15	-1	15	46
12.9	15	-2.1	15	47
14.2	15	-0.8	15	48
13.8	15	-1.2	15	49
14.5	15	-0.5	15	50
13.9	15	-1.1	15	51
15.8	15	0.8	16	51
10.2	20	-9.8	16	52
11	20	-9	16	53
12.9	20	-7.1	16	54
11.6	20	-8.4	16	55
11	20	-9	16	56
13.5	20	-6.5	16	57
13.2	20	-6.8	16	58
12.5	20	-7.5	16	59
12.8	20	-7.2	16	60
12.9	20	-7.1	16	61
16.9	20	-3.1	16	62
13.4	20	-6.6	16	63
21.4	20	1.4	17	63
8.44	20	-11.56	17	64
14	20	-6	17	65
12.9	20	-7.1	17	66
14.2	20	-5.8	17	67
13.8	20	-6.2	17	68
14.5	20	-5.5	17	69
13.9	20	-6.1	17	70
15.8	20	-4.2	17	71
11	10.2	0.8	18	71
12.9	10.2	2.7	19	71
11.6	10.2	1.4	20	71
11	10.2	0.8	21	71
13.5	10.2	3.3	22	71
13.2	10.2	3	23	71
12.5	10.2	2.3	24	71
12.8	10.2	2.6	25	71
12.9	10.2	2.7	26	71

16.9	10.2	6.7	27	71
13.4	10.2	3.2	28	71
21.4	10.2	11.2	29	71
8.44	10.2	-1.76	29	72
14	10.2	3.8	30	72
12.9	10.2	2.7	31	72
14.2	10.2	4	32	72
13.8	10.2	3.6	33	72
14.5	10.2	4.3	34	72
13.9	10.2	3.7	35	72
15.8	10.2	5.6	36	72
12.9	11	1.9	37	72
11.6	11	0.6	38	72
11	11	0	38	72
13.5	11	2.5	39	72
13.2	11	2.2	40	72
12.5	11	1.5	41	72
12.8	11	1.8	42	72
12.9	11	1.9	43	72
16.9	11	5.9	44	72
13.4	11	2.4	45	72
21.4	11	10.4	46	72
8.44	11	-2.56	46	73
14	11	3	47	73
12.9	11	1.9	48	73
14.2	11	3.2	49	73
13.8	11	2.8	50	73
14.5	11	3.5	51	73
13.9	11	2.9	52	73
15.8	11	4.8	53	73
11.6	12.9	-1.3	53	74
11	12.9	-1.9	53	75
13.5	12.9	0.6	54	75
13.2	12.9	0.3	55	75
12.5	12.9	-0.4	55	76
12.8	12.9	-0.1	55	77
12.9	12.9	0	55	77
16.9	12.9	4	56	77
13.4	12.9	0.5	57	77
21.4	12.9	8.5	58	77
8.44	12.9	-4.46	58	78
14	12.9	1.1	59	78
12.9	12.9	0	59	78
14.2	12.9	1.3	60	78
13.8	12.9	0.9	61	78
14.5	12.9	1.6	62	78
13.9	12.9	1	63	78
15.8	12.9	2.9	64	78
11	11.6	-0.6	64	79
13.5	11.6	1.9	65	79
13.2	11.6	1.6	66	79
12.5	11.6	0.9	67	79
12.8	11.6	1.2	68	79
12.9	11.6	1.3	69	79

16.9	11.6	5.3	70	79
13.4	11.6	1.8	71	79
21.4	11.6	9.8	72	79
8.44	11.6	-3.16	72	80
14	11.6	2.4	73	80
12.9	11.6	1.3	74	80
14.2	11.6	2.6	75	80
13.8	11.6	2.2	76	80
14.5	11.6	2.9	77	80
13.9	11.6	2.3	78	80
15.8	11.6	4.2	79	80
13.5	11	2.5	80	80
13.2	11	2.2	81	80
12.5	11	1.5	82	80
12.8	11	1.8	83	80
12.9	11	1.9	84	80
16.9	11	5.9	85	80
13.4	11	2.4	86	80
21.4	11	10.4	87	80
8.44	11	-2.56	87	81
14	11	3	88	81
12.9	11	1.9	89	81
14.2	11	3.2	90	81
13.8	11	2.8	91	81
14.5	11	3.5	92	81
13.9	11	2.9	93	81
15.8	11	4.8	94	81
13.2	13.5	-0.3	94	82
12.5	13.5	-1	94	83
12.8	13.5	-0.7	94	84
12.9	13.5	-0.6	94	85
16.9	13.5	3.4	95	85
13.4	13.5	-0.1	95	86
21.4	13.5	7.9	96	86
8.44	13.5	-5.06	96	87
14	13.5	0.5	97	87
12.9	13.5	-0.6	97	88
14.2	13.5	0.7	98	88
13.8	13.5	0.3	99	88
14.5	13.5	1	100	88
13.9	13.5	0.4	101	88
15.8	13.5	2.3	102	88
12.5	13.2	-0.7	102	89
12.8	13.2	-0.4	102	90
12.9	13.2	-0.3	102	91
16.9	13.2	3.7	103	91
13.4	13.2	0.2	104	91
21.4	13.2	8.2	105	91
8.44	13.2	-4.76	105	92
14	13.2	0.8	106	92
12.9	13.2	-0.3	106	93
14.2	13.2	1	107	93
13.8	13.2	0.6	108	93
14.5	13.2	1.3	109	93

13.9	13.2	0.7	110	93
15.8	13.2	2.6	111	93
12.8	12.5	0.3	112	93
12.9	12.5	0.4	113	93
16.9	12.5	4.4	114	93
13.4	12.5	0.9	115	93
21.4	12.5	8.9	116	93
8.44	12.5	-4.06	116	94
14	12.5	1.5	117	94
12.9	12.5	0.4	118	94
14.2	12.5	1.7	119	94
13.8	12.5	1.3	120	94
14.5	12.5	2	121	94
13.9	12.5	1.4	122	94
15.8	12.5	3.3	123	94
12.9	12.8	0.1	124	94
16.9	12.8	4.1	125	94
13.4	12.8	0.6	126	94
21.4	12.8	8.6	127	94
8.44	12.8	-4.36	127	95
14	12.8	1.2	128	95
12.9	12.8	0.1	129	95
14.2	12.8	1.4	130	95
13.8	12.8	1	131	95
14.5	12.8	1.7	132	95
13.9	12.8	1.1	133	95
15.8	12.8	3	134	95
16.9	12.9	4	135	95
13.4	12.9	0.5	136	95
21.4	12.9	8.5	137	95
8.44	12.9	-4.46	137	96
14	12.9	1.1	138	96
12.9	12.9	0	138	96
14.2	12.9	1.3	139	96
13.8	12.9	0.9	140	96
14.5	12.9	1.6	141	96
13.9	12.9	1	142	96
15.8	12.9	2.9	143	96
13.4	16.9	-3.5	143	97
21.4	16.9	4.5	144	97
8.44	16.9	-8.46	144	98
14	16.9	-2.9	144	99
12.9	16.9	-4	144	100
14.2	16.9	-2.7	144	101
13.8	16.9	-3.1	144	102
14.5	16.9	-2.4	144	103
13.9	16.9	-3	144	104
15.8	16.9	-1.1	144	105
21.4	13.4	8	145	105
8.44	13.4	-4.96	145	106
14	13.4	0.6	146	106
12.9	13.4	-0.5	146	107

14.2	13.4	0.8	147	107
13.8	13.4	0.4	148	107
14.5	13.4	1.1	149	107
13.9	13.4	0.5	150	107
15.8	13.4	2.4	151	107
8.44	21.4	-12.96	151	108
14	21.4	-7.4	151	109
12.9	21.4	-8.5	151	110
14.2	21.4	-7.2	151	111
13.8	21.4	-7.6	151	112
14.5	21.4	-6.9	151	113
13.9	21.4	-7.5	151	114
15.8	21.4	-5.6	151	115
14	8.44	5.56	152	115
12.9	8.44	4.46	153	115
14.2	8.44	5.76	154	115
13.8	8.44	5.36	155	115
14.5	8.44	6.06	156	115
13.9	8.44	5.46	157	115
15.8	8.44	7.36	158	115
12.9	14	-1.1	158	116
14.2	14	0.2	159	116
13.8	14	-0.2	159	117
14.5	14	0.5	160	117
13.9	14	-0.1	160	118
15.8	14	1.8	161	118
14.2	12.9	1.3	162	118
13.8	12.9	0.9	163	118
14.5	12.9	1.6	164	118
13.9	12.9	1	165	118
15.8	12.9	2.9	166	118
13.8	14.2	-0.4	166	119
14.5	14.2	0.3	167	119
13.9	14.2	-0.3	167	120
15.8	14.2	1.6	168	120
14.5	13.8	0.7	169	120
13.9	13.8	0.1	170	120
15.8	13.8	2	171	120
13.9	14.5	-0.6	171	121
15.8	14.5	1.3	172	121
15.8	13.9	1.9	173	121

S Statistic = 173 - 121 = 52

Tied Group Value	Members
1	14
2	15
3	11

4

12.9

3

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

There are 0 time periods with multiple data

A = 120

B = 0

C = 6

D = 0

E = 12

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1826.67

Z-Score = 1.19327

Comparison Level at 95% confidence level = -1.65463 (downward trend)

1.19327 >= -1.65463 indicating no evidence of a downward 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
0.4	0.2	0.2	2	22
ND<0	0.2	-0.2	2	23
0.3	0.2	0.1	3	23
0.2	0.2	0	3	23
ND<0	0.2	-0.2	3	24
ND<0	0.2	-0.2	3	25
ND<0	0.2	-0.2	3	26
0.1	0.2	-0.1	3	27
ND<0	0.2	-0.2	3	28
ND<0	0.2	-0.2	3	29
ND<0	0.2	-0.2	3	30
0.1	0.2	-0.1	3	31
ND<0	0.2	-0.2	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	0.4	-0.4	3	43
0.3	0.4	-0.1	3	44
0.2	0.4	-0.2	3	45
ND<0	0.4	-0.4	3	46
ND<0	0.4	-0.4	3	47
ND<0	0.4	-0.4	3	48
0.1	0.4	-0.3	3	49
ND<0	0.4	-0.4	3	50
ND<0	0.4	-0.4	3	51
ND<0	0.4	-0.4	3	52
0.1	0.4	-0.3	3	53
ND<0	0.4	-0.4	3	54
ND<0	0.4	-0.4	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
0.3	ND<0	0.3	4	64
0.2	ND<0	0.2	5	64
ND<0	ND<0	0	5	64
ND<0	ND<0	0	5	64
ND<0	ND<0	0	5	64
0.1	ND<0	0.1	6	64
ND<0	ND<0	0	6	64
ND<0	ND<0	0	6	64
ND<0	ND<0	0	6	64
0.1	ND<0	0.1	7	64
ND<0	ND<0	0	7	64
ND<0	ND<0	0	7	64
ND<0	ND<0	0	7	64
ND<0	ND<0	0	7	64
ND<0	ND<0	0	7	64
ND<0	ND<0	0	7	64
ND<0	ND<0	0	7	64
ND<0	ND<0	0	7	64
ND<0	ND<0	0	7	64
0.2	0.3	-0.1	7	65
ND<0	0.3	-0.3	7	66
ND<0	0.3	-0.3	7	67
ND<0	0.3	-0.3	7	68
0.1	0.3	-0.2	7	69
ND<0	0.3	-0.3	7	70
ND<0	0.3	-0.3	7	71
ND<0	0.3	-0.3	7	72
0.1	0.3	-0.2	7	73

ND<0	0.3	-0.3	7	74
ND<0	0.3	-0.3	7	75
ND<0	0.3	-0.3	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	0.2	-0.2	7	85
ND<0	0.2	-0.2	7	86
ND<0	0.2	-0.2	7	87
0.1	0.2	-0.1	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
ND<0	0.2	-0.2	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	ND<0	0	7	103
ND<0	ND<0	0	7	103
0.1	ND<0	0.1	8	103
ND<0	ND<0	0	8	103
ND<0	ND<0	0	8	103
ND<0	ND<0	0	8	103
0.1	ND<0	0.1	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
ND<0	ND<0	0	9	103
0.1	ND<0	0.1	10	103
ND<0	ND<0	0	10	103
ND<0	ND<0	0	10	103
ND<0	ND<0	0	10	103
0.1	ND<0	0.1	11	103

ND<0	ND<0	0	11	103
ND<0	ND<0	0	11	103
ND<0	ND<0	0	11	103
ND<0	ND<0	0	11	103
ND<0	ND<0	0	11	103
ND<0	ND<0	0	11	103
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ND<0	ND<0	0	11	103
ND<0	ND<0	0	11	103
ND<0	ND<0	0	11	103
ND<0	ND<0	0	11	103
0.1	ND<0	0.1	12	103
ND<0	ND<0	0	12	103
ND<0	ND<0	0	12	103
ND<0	ND<0	0	12	103
0.1	ND<0	0.1	13	103
ND<0	ND<0	0	13	103
ND<0	ND<0	0	13	103
ND<0	ND<0	0	13	103
ND<0	ND<0	0	13	103
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ND<0	ND<0	0	13	103
ND<0	ND<0	0	13	103
ND<0	ND<0	0	13	103
ND<0	0.1	-0.1	13	104
ND<0	0.1	-0.1	13	105
ND<0	0.1	-0.1	13	106
0.1	0.1	0	13	106
ND<0	0.1	-0.1	13	107
ND<0	0.1	-0.1	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
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	ND<0	0	13	117
ND<0	ND<0	0	13	117
0.1	ND<0	0.1	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117
ND<0	ND<0	0	14	117

[illegible]

ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
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ND<0	ND<0	0	16	128
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ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128
ND<0	ND<0	0	16	128

S Statistic = 16 - 128 = -112

Tied Group Value		Members
1	0.3	2
2	0.2	2
3	0	18

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

There are 0 time periods with multiple data

A = 12600

B = 0

C = 4896

D = 0

E = 312

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1133.33

Z-Score = -3.29719

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-3.29719 < -1.65463 indicating a downward trend

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

[illegible]

[illegible]

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	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	22

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

There are 0 time periods with multiple data

A = 22638
B = 0
C = 9240
D = 0
E = 462
F = 0
a = 22638
b = 83160
c = 924
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

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

[illegible]

[illegible]

ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	0	0	0
ND<0	ND<0	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	22

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

There are 0 time periods with multiple data

A = 22638

B = 0

C = 9240

D = 0

E = 462

F = 0

a = 22638

b = 83160

c = 924

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: 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
7.2	6.7	0.5	25	0
7.8	6.7	1.1	26	0
7.6	6.7	0.9	27	0
7.2	6.7	0.5	28	0
6.5	6.7	-0.2	28	1
7.8	6.7	1.1	29	1
8.3	6.7	1.6	30	1
8.5	6.7	1.8	31	1
7.5	6.7	0.8	32	1
7.4	6.7	0.7	33	1
7.6	6.7	0.9	34	1
9.6	6.7	2.9	35	1
7.6	6.7	0.9	36	1
6.9	6.7	0.2	37	1
5.9	6.7	-0.8	37	2
6.1	6.7	-0.6	37	3
7.4	6.7	0.7	38	3
6.2	6.7	-0.5	38	4
5.7	6.7	-1	38	5
6	6.7	-0.7	38	6
6.1	6.7	-0.6	38	7

25	6.7	18.3	39	7
5.49	6.7	-1.21	39	8
7.8	7.2	0.6	40	8
7.6	7.2	0.4	41	8
7.2	7.2	0	41	8
6.5	7.2	-0.7	41	9
7.8	7.2	0.6	42	9
8.3	7.2	1.1	43	9
8.5	7.2	1.3	44	9
7.5	7.2	0.3	45	9
7.4	7.2	0.2	46	9
7.6	7.2	0.4	47	9
9.6	7.2	2.4	48	9
7.6	7.2	0.4	49	9
6.9	7.2	-0.3	49	10
5.9	7.2	-1.3	49	11
6.1	7.2	-1.1	49	12
7.4	7.2	0.2	50	12
6.2	7.2	-1	50	13
5.7	7.2	-1.5	50	14
6	7.2	-1.2	50	15
6.1	7.2	-1.1	50	16
25	7.2	17.8	51	16
5.49	7.2	-1.71	51	17
7.6	7.8	-0.2	51	18
7.2	7.8	-0.6	51	19
6.5	7.8	-1.3	51	20
7.8	7.8	0	51	20
8.3	7.8	0.5	52	20
8.5	7.8	0.7	53	20
7.5	7.8	-0.3	53	21
7.4	7.8	-0.4	53	22
7.6	7.8	-0.2	53	23
9.6	7.8	1.8	54	23
7.6	7.8	-0.2	54	24
6.9	7.8	-0.9	54	25
5.9	7.8	-1.9	54	26
6.1	7.8	-1.7	54	27
7.4	7.8	-0.4	54	28
6.2	7.8	-1.6	54	29
5.7	7.8	-2.1	54	30
6	7.8	-1.8	54	31
6.1	7.8	-1.7	54	32
25	7.8	17.2	55	32
5.49	7.8	-2.31	55	33
7.2	7.6	-0.4	55	34
6.5	7.6	-1.1	55	35
7.8	7.6	0.2	56	35
8.3	7.6	0.7	57	35
8.5	7.6	0.9	58	35
7.5	7.6	-0.1	58	36
7.4	7.6	-0.2	58	37
7.6	7.6	0	58	37
9.6	7.6	2	59	37

7.6	7.6	0	59	37
6.9	7.6	-0.7	59	38
5.9	7.6	-1.7	59	39
6.1	7.6	-1.5	59	40
7.4	7.6	-0.2	59	41
6.2	7.6	-1.4	59	42
5.7	7.6	-1.9	59	43
6	7.6	-1.6	59	44
6.1	7.6	-1.5	59	45
25	7.6	17.4	60	45
5.49	7.6	-2.11	60	46
6.5	7.2	-0.7	60	47
7.8	7.2	0.6	61	47
8.3	7.2	1.1	62	47
8.5	7.2	1.3	63	47
7.5	7.2	0.3	64	47
7.4	7.2	0.2	65	47
7.6	7.2	0.4	66	47
9.6	7.2	2.4	67	47
7.6	7.2	0.4	68	47
6.9	7.2	-0.3	68	48
5.9	7.2	-1.3	68	49
6.1	7.2	-1.1	68	50
7.4	7.2	0.2	69	50
6.2	7.2	-1	69	51
5.7	7.2	-1.5	69	52
6	7.2	-1.2	69	53
6.1	7.2	-1.1	69	54
25	7.2	17.8	70	54
5.49	7.2	-1.71	70	55
7.8	6.5	1.3	71	55
8.3	6.5	1.8	72	55
8.5	6.5	2	73	55
7.5	6.5	1	74	55
7.4	6.5	0.9	75	55
7.6	6.5	1.1	76	55
9.6	6.5	3.1	77	55
7.6	6.5	1.1	78	55
6.9	6.5	0.4	79	55
5.9	6.5	-0.6	79	56
6.1	6.5	-0.4	79	57
7.4	6.5	0.9	80	57
6.2	6.5	-0.3	80	58
5.7	6.5	-0.8	80	59
6	6.5	-0.5	80	60
6.1	6.5	-0.4	80	61
25	6.5	18.5	81	61
5.49	6.5	-1.01	81	62
8.3	7.8	0.5	82	62
8.5	7.8	0.7	83	62
7.5	7.8	-0.3	83	63
7.4	7.8	-0.4	83	64
7.6	7.8	-0.2	83	65
9.6	7.8	1.8	84	65

7.6	7.8	-0.2	84	66
6.9	7.8	-0.9	84	67
5.9	7.8	-1.9	84	68
6.1	7.8	-1.7	84	69
7.4	7.8	-0.4	84	70
6.2	7.8	-1.6	84	71
5.7	7.8	-2.1	84	72
6	7.8	-1.8	84	73
6.1	7.8	-1.7	84	74
25	7.8	17.2	85	74
5.49	7.8	-2.31	85	75

8.5	8.3	0.2	86	75
7.5	8.3	-0.8	86	76
7.4	8.3	-0.9	86	77
7.6	8.3	-0.7	86	78
9.6	8.3	1.3	87	78
7.6	8.3	-0.7	87	79
6.9	8.3	-1.4	87	80
5.9	8.3	-2.4	87	81
6.1	8.3	-2.2	87	82
7.4	8.3	-0.9	87	83
6.2	8.3	-2.1	87	84
5.7	8.3	-2.6	87	85
6	8.3	-2.3	87	86
6.1	8.3	-2.2	87	87
25	8.3	16.7	88	87
5.49	8.3	-2.81	88	88

7.5	8.5	-1	88	89
7.4	8.5	-1.1	88	90
7.6	8.5	-0.9	88	91
9.6	8.5	1.1	89	91
7.6	8.5	-0.9	89	92
6.9	8.5	-1.6	89	93
5.9	8.5	-2.6	89	94
6.1	8.5	-2.4	89	95
7.4	8.5	-1.1	89	96
6.2	8.5	-2.3	89	97
5.7	8.5	-2.8	89	98
6	8.5	-2.5	89	99
6.1	8.5	-2.4	89	100
25	8.5	16.5	90	100
5.49	8.5	-3.01	90	101

7.4	7.5	-0.1	90	102
7.6	7.5	0.1	91	102
9.6	7.5	2.1	92	102
7.6	7.5	0.1	93	102
6.9	7.5	-0.6	93	103
5.9	7.5	-1.6	93	104
6.1	7.5	-1.4	93	105
7.4	7.5	-0.1	93	106
6.2	7.5	-1.3	93	107
5.7	7.5	-1.8	93	108
6	7.5	-1.5	93	109
6.1	7.5	-1.4	93	110

25	7.5	17.5	94	110
5.49	7.5	-2.01	94	111
7.6	7.4	0.2	95	111
9.6	7.4	2.2	96	111
7.6	7.4	0.2	97	111
6.9	7.4	-0.5	97	112
5.9	7.4	-1.5	97	113
6.1	7.4	-1.3	97	114
7.4	7.4	0	97	114
6.2	7.4	-1.2	97	115
5.7	7.4	-1.7	97	116
6	7.4	-1.4	97	117
6.1	7.4	-1.3	97	118
25	7.4	17.6	98	118
5.49	7.4	-1.91	98	119
9.6	7.6	2	99	119
7.6	7.6	0	99	119
6.9	7.6	-0.7	99	120
5.9	7.6	-1.7	99	121
6.1	7.6	-1.5	99	122
7.4	7.6	-0.2	99	123
6.2	7.6	-1.4	99	124
5.7	7.6	-1.9	99	125
6	7.6	-1.6	99	126
6.1	7.6	-1.5	99	127
25	7.6	17.4	100	127
5.49	7.6	-2.11	100	128
7.6	9.6	-2	100	129
6.9	9.6	-2.7	100	130
5.9	9.6	-3.7	100	131
6.1	9.6	-3.5	100	132
7.4	9.6	-2.2	100	133
6.2	9.6	-3.4	100	134
5.7	9.6	-3.9	100	135
6	9.6	-3.6	100	136
6.1	9.6	-3.5	100	137
25	9.6	15.4	101	137
5.49	9.6	-4.11	101	138
6.9	7.6	-0.7	101	139
5.9	7.6	-1.7	101	140
6.1	7.6	-1.5	101	141
7.4	7.6	-0.2	101	142
6.2	7.6	-1.4	101	143
5.7	7.6	-1.9	101	144
6	7.6	-1.6	101	145
6.1	7.6	-1.5	101	146
25	7.6	17.4	102	146
5.49	7.6	-2.11	102	147
5.9	6.9	-1	102	148
6.1	6.9	-0.8	102	149
7.4	6.9	0.5	103	149
6.2	6.9	-0.7	103	150

5.7	6.9	-1.2	103	151
6	6.9	-0.9	103	152
6.1	6.9	-0.8	103	153
25	6.9	18.1	104	153
5.49	6.9	-1.41	104	154
6.1	5.9	0.2	105	154
7.4	5.9	1.5	106	154
6.2	5.9	0.3	107	154
5.7	5.9	-0.2	107	155
6	5.9	0.1	108	155
6.1	5.9	0.2	109	155
25	5.9	19.1	110	155
5.49	5.9	-0.41	110	156
7.4	6.1	1.3	111	156
6.2	6.1	0.1	112	156
5.7	6.1	-0.4	112	157
6	6.1	-0.1	112	158
6.1	6.1	0	112	158
25	6.1	18.9	113	158
5.49	6.1	-0.61	113	159
6.2	7.4	-1.2	113	160
5.7	7.4	-1.7	113	161
6	7.4	-1.4	113	162
6.1	7.4	-1.3	113	163
25	7.4	17.6	114	163
5.49	7.4	-1.91	114	164
5.7	6.2	-0.5	114	165
6	6.2	-0.2	114	166
6.1	6.2	-0.1	114	167
25	6.2	18.8	115	167
5.49	6.2	-0.71	115	168
6	5.7	0.3	116	168
6.1	5.7	0.4	117	168
25	5.7	19.3	118	168
5.49	5.7	-0.21	118	169
6.1	6	0.1	119	169
25	6	19	120	169
5.49	6	-0.51	120	170
25	6.1	18.9	121	170
5.49	6.1	-0.61	121	171
5.49	25	-19.51	121	172

S Statistic = 121 - 172 = -51

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

There are 0 time periods with multiple data

A = 138

B = 0

C = 6

D = 0

E = 14

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1825.67

Z-Score = -1.1702

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-1.1702 <= 1.65463 indicating no evidence of an upward 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
7.2	6.7	0.5	25	0
7.8	6.7	1.1	26	0
7.6	6.7	0.9	27	0
7.2	6.7	0.5	28	0
6.5	6.7	-0.2	28	1
7.8	6.7	1.1	29	1
8.3	6.7	1.6	30	1
8.5	6.7	1.8	31	1
7.5	6.7	0.8	32	1
7.4	6.7	0.7	33	1
7.6	6.7	0.9	34	1
9.6	6.7	2.9	35	1
7.6	6.7	0.9	36	1
6.9	6.7	0.2	37	1
5.9	6.7	-0.8	37	2
6.1	6.7	-0.6	37	3
7.4	6.7	0.7	38	3
6.2	6.7	-0.5	38	4
5.7	6.7	-1	38	5
6	6.7	-0.7	38	6
6.1	6.7	-0.6	38	7

25	6.7	18.3	39	7
5.49	6.7	-1.21	39	8
7.8	7.2	0.6	40	8
7.6	7.2	0.4	41	8
7.2	7.2	0	41	8
6.5	7.2	-0.7	41	9
7.8	7.2	0.6	42	9
8.3	7.2	1.1	43	9
8.5	7.2	1.3	44	9
7.5	7.2	0.3	45	9
7.4	7.2	0.2	46	9
7.6	7.2	0.4	47	9
9.6	7.2	2.4	48	9
7.6	7.2	0.4	49	9
6.9	7.2	-0.3	49	10
5.9	7.2	-1.3	49	11
6.1	7.2	-1.1	49	12
7.4	7.2	0.2	50	12
6.2	7.2	-1	50	13
5.7	7.2	-1.5	50	14
6	7.2	-1.2	50	15
6.1	7.2	-1.1	50	16
25	7.2	17.8	51	16
5.49	7.2	-1.71	51	17
7.6	7.8	-0.2	51	18
7.2	7.8	-0.6	51	19
6.5	7.8	-1.3	51	20
7.8	7.8	0	51	20
8.3	7.8	0.5	52	20
8.5	7.8	0.7	53	20
7.5	7.8	-0.3	53	21
7.4	7.8	-0.4	53	22
7.6	7.8	-0.2	53	23
9.6	7.8	1.8	54	23
7.6	7.8	-0.2	54	24
6.9	7.8	-0.9	54	25
5.9	7.8	-1.9	54	26
6.1	7.8	-1.7	54	27
7.4	7.8	-0.4	54	28
6.2	7.8	-1.6	54	29
5.7	7.8	-2.1	54	30
6	7.8	-1.8	54	31
6.1	7.8	-1.7	54	32
25	7.8	17.2	55	32
5.49	7.8	-2.31	55	33
7.2	7.6	-0.4	55	34
6.5	7.6	-1.1	55	35
7.8	7.6	0.2	56	35
8.3	7.6	0.7	57	35
8.5	7.6	0.9	58	35
7.5	7.6	-0.1	58	36
7.4	7.6	-0.2	58	37
7.6	7.6	0	58	37
9.6	7.6	2	59	37

7.6	7.6	0	59	37
6.9	7.6	-0.7	59	38
5.9	7.6	-1.7	59	39
6.1	7.6	-1.5	59	40
7.4	7.6	-0.2	59	41
6.2	7.6	-1.4	59	42
5.7	7.6	-1.9	59	43
6	7.6	-1.6	59	44
6.1	7.6	-1.5	59	45
25	7.6	17.4	60	45
5.49	7.6	-2.11	60	46
6.5	7.2	-0.7	60	47
7.8	7.2	0.6	61	47
8.3	7.2	1.1	62	47
8.5	7.2	1.3	63	47
7.5	7.2	0.3	64	47
7.4	7.2	0.2	65	47
7.6	7.2	0.4	66	47
9.6	7.2	2.4	67	47
7.6	7.2	0.4	68	47
6.9	7.2	-0.3	68	48
5.9	7.2	-1.3	68	49
6.1	7.2	-1.1	68	50
7.4	7.2	0.2	69	50
6.2	7.2	-1	69	51
5.7	7.2	-1.5	69	52
6	7.2	-1.2	69	53
6.1	7.2	-1.1	69	54
25	7.2	17.8	70	54
5.49	7.2	-1.71	70	55
7.8	6.5	1.3	71	55
8.3	6.5	1.8	72	55
8.5	6.5	2	73	55
7.5	6.5	1	74	55
7.4	6.5	0.9	75	55
7.6	6.5	1.1	76	55
9.6	6.5	3.1	77	55
7.6	6.5	1.1	78	55
6.9	6.5	0.4	79	55
5.9	6.5	-0.6	79	56
6.1	6.5	-0.4	79	57
7.4	6.5	0.9	80	57
6.2	6.5	-0.3	80	58
5.7	6.5	-0.8	80	59
6	6.5	-0.5	80	60
6.1	6.5	-0.4	80	61
25	6.5	18.5	81	61
5.49	6.5	-1.01	81	62
8.3	7.8	0.5	82	62
8.5	7.8	0.7	83	62
7.5	7.8	-0.3	83	63
7.4	7.8	-0.4	83	64
7.6	7.8	-0.2	83	65
9.6	7.8	1.8	84	65

7.6	7.8	-0.2	84	66
6.9	7.8	-0.9	84	67
5.9	7.8	-1.9	84	68
6.1	7.8	-1.7	84	69
7.4	7.8	-0.4	84	70
6.2	7.8	-1.6	84	71
5.7	7.8	-2.1	84	72
6	7.8	-1.8	84	73
6.1	7.8	-1.7	84	74
25	7.8	17.2	85	74
5.49	7.8	-2.31	85	75

8.5	8.3	0.2	86	75
7.5	8.3	-0.8	86	76
7.4	8.3	-0.9	86	77
7.6	8.3	-0.7	86	78
9.6	8.3	1.3	87	78
7.6	8.3	-0.7	87	79
6.9	8.3	-1.4	87	80
5.9	8.3	-2.4	87	81
6.1	8.3	-2.2	87	82
7.4	8.3	-0.9	87	83
6.2	8.3	-2.1	87	84
5.7	8.3	-2.6	87	85
6	8.3	-2.3	87	86
6.1	8.3	-2.2	87	87
25	8.3	16.7	88	87
5.49	8.3	-2.81	88	88

7.5	8.5	-1	88	89
7.4	8.5	-1.1	88	90
7.6	8.5	-0.9	88	91
9.6	8.5	1.1	89	91
7.6	8.5	-0.9	89	92
6.9	8.5	-1.6	89	93
5.9	8.5	-2.6	89	94
6.1	8.5	-2.4	89	95
7.4	8.5	-1.1	89	96
6.2	8.5	-2.3	89	97
5.7	8.5	-2.8	89	98
6	8.5	-2.5	89	99
6.1	8.5	-2.4	89	100
25	8.5	16.5	90	100
5.49	8.5	-3.01	90	101

7.4	7.5	-0.1	90	102
7.6	7.5	0.1	91	102
9.6	7.5	2.1	92	102
7.6	7.5	0.1	93	102
6.9	7.5	-0.6	93	103
5.9	7.5	-1.6	93	104
6.1	7.5	-1.4	93	105
7.4	7.5	-0.1	93	106
6.2	7.5	-1.3	93	107
5.7	7.5	-1.8	93	108
6	7.5	-1.5	93	109
6.1	7.5	-1.4	93	110

25	7.5	17.5	94	110
5.49	7.5	-2.01	94	111
7.6	7.4	0.2	95	111
9.6	7.4	2.2	96	111
7.6	7.4	0.2	97	111
6.9	7.4	-0.5	97	112
5.9	7.4	-1.5	97	113
6.1	7.4	-1.3	97	114
7.4	7.4	0	97	114
6.2	7.4	-1.2	97	115
5.7	7.4	-1.7	97	116
6	7.4	-1.4	97	117
6.1	7.4	-1.3	97	118
25	7.4	17.6	98	118
5.49	7.4	-1.91	98	119
9.6	7.6	2	99	119
7.6	7.6	0	99	119
6.9	7.6	-0.7	99	120
5.9	7.6	-1.7	99	121
6.1	7.6	-1.5	99	122
7.4	7.6	-0.2	99	123
6.2	7.6	-1.4	99	124
5.7	7.6	-1.9	99	125
6	7.6	-1.6	99	126
6.1	7.6	-1.5	99	127
25	7.6	17.4	100	127
5.49	7.6	-2.11	100	128
7.6	9.6	-2	100	129
6.9	9.6	-2.7	100	130
5.9	9.6	-3.7	100	131
6.1	9.6	-3.5	100	132
7.4	9.6	-2.2	100	133
6.2	9.6	-3.4	100	134
5.7	9.6	-3.9	100	135
6	9.6	-3.6	100	136
6.1	9.6	-3.5	100	137
25	9.6	15.4	101	137
5.49	9.6	-4.11	101	138
6.9	7.6	-0.7	101	139
5.9	7.6	-1.7	101	140
6.1	7.6	-1.5	101	141
7.4	7.6	-0.2	101	142
6.2	7.6	-1.4	101	143
5.7	7.6	-1.9	101	144
6	7.6	-1.6	101	145
6.1	7.6	-1.5	101	146
25	7.6	17.4	102	146
5.49	7.6	-2.11	102	147
5.9	6.9	-1	102	148
6.1	6.9	-0.8	102	149
7.4	6.9	0.5	103	149
6.2	6.9	-0.7	103	150

5.7	6.9	-1.2	103	151
6	6.9	-0.9	103	152
6.1	6.9	-0.8	103	153
25	6.9	18.1	104	153
5.49	6.9	-1.41	104	154
6.1	5.9	0.2	105	154
7.4	5.9	1.5	106	154
6.2	5.9	0.3	107	154
5.7	5.9	-0.2	107	155
6	5.9	0.1	108	155
6.1	5.9	0.2	109	155
25	5.9	19.1	110	155
5.49	5.9	-0.41	110	156
7.4	6.1	1.3	111	156
6.2	6.1	0.1	112	156
5.7	6.1	-0.4	112	157
6	6.1	-0.1	112	158
6.1	6.1	0	112	158
25	6.1	18.9	113	158
5.49	6.1	-0.61	113	159
6.2	7.4	-1.2	113	160
5.7	7.4	-1.7	113	161
6	7.4	-1.4	113	162
6.1	7.4	-1.3	113	163
25	7.4	17.6	114	163
5.49	7.4	-1.91	114	164
5.7	6.2	-0.5	114	165
6	6.2	-0.2	114	166
6.1	6.2	-0.1	114	167
25	6.2	18.8	115	167
5.49	6.2	-0.71	115	168
6	5.7	0.3	116	168
6.1	5.7	0.4	117	168
25	5.7	19.3	118	168
5.49	5.7	-0.21	118	169
6.1	6	0.1	119	169
25	6	19	120	169
5.49	6	-0.51	120	170
25	6.1	18.9	121	170
5.49	6.1	-0.61	121	171
5.49	25	-19.51	121	172

S Statistic = 121 - 172 = -51

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
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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

There are 0 time periods with multiple data

A = 138

B = 0

C = 6

D = 0

E = 14

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1825.67

Z-Score = -1.1702

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-1.1702 >= -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
230	220	10	3	21
240	220	20	4	21
160	220	-60	4	22
222	220	2	5	22
157	220	-63	5	23
170	220	-50	5	24
165	220	-55	5	25
208	220	-12	5	26
165	220	-55	5	27
118	220	-102	5	28
196	220	-24	5	29
205	220	-15	5	30
199	220	-21	5	31
135	220	-85	5	32
212	220	-8	5	33
214	220	-6	5	34
214	220	-6	5	35
197	220	-23	5	36
179	220	-41	5	37
193	220	-27	5	38
173	220	-47	5	39

181	220	-39	5	40
500	220	280	6	40
240	230	10	7	40
160	230	-70	7	41
222	230	-8	7	42
157	230	-73	7	43
170	230	-60	7	44
165	230	-65	7	45
208	230	-22	7	46
165	230	-65	7	47
118	230	-112	7	48
196	230	-34	7	49
205	230	-25	7	50
199	230	-31	7	51
135	230	-95	7	52
212	230	-18	7	53
214	230	-16	7	54
214	230	-16	7	55
197	230	-33	7	56
179	230	-51	7	57
193	230	-37	7	58
173	230	-57	7	59
181	230	-49	7	60
500	230	270	8	60
160	240	-80	8	61
222	240	-18	8	62
157	240	-83	8	63
170	240	-70	8	64
165	240	-75	8	65
208	240	-32	8	66
165	240	-75	8	67
118	240	-122	8	68
196	240	-44	8	69
205	240	-35	8	70
199	240	-41	8	71
135	240	-105	8	72
212	240	-28	8	73
214	240	-26	8	74
214	240	-26	8	75
197	240	-43	8	76
179	240	-61	8	77
193	240	-47	8	78
173	240	-67	8	79
181	240	-59	8	80
500	240	260	9	80
222	160	62	10	80
157	160	-3	10	81
170	160	10	11	81
165	160	5	12	81
208	160	48	13	81
165	160	5	14	81
118	160	-42	14	82
196	160	36	15	82
205	160	45	16	82

199	160	39	17	82
135	160	-25	17	83
212	160	52	18	83
214	160	54	19	83
214	160	54	20	83
197	160	37	21	83
179	160	19	22	83
193	160	33	23	83
173	160	13	24	83
181	160	21	25	83
500	160	340	26	83
157	222	-65	26	84
170	222	-52	26	85
165	222	-57	26	86
208	222	-14	26	87
165	222	-57	26	88
118	222	-104	26	89
196	222	-26	26	90
205	222	-17	26	91
199	222	-23	26	92
135	222	-87	26	93
212	222	-10	26	94
214	222	-8	26	95
214	222	-8	26	96
197	222	-25	26	97
179	222	-43	26	98
193	222	-29	26	99
173	222	-49	26	100
181	222	-41	26	101
500	222	278	27	101
170	157	13	28	101
165	157	8	29	101
208	157	51	30	101
165	157	8	31	101
118	157	-39	31	102
196	157	39	32	102
205	157	48	33	102
199	157	42	34	102
135	157	-22	34	103
212	157	55	35	103
214	157	57	36	103
214	157	57	37	103
197	157	40	38	103
179	157	22	39	103
193	157	36	40	103
173	157	16	41	103
181	157	24	42	103
500	157	343	43	103
165	170	-5	43	104
208	170	38	44	104
165	170	-5	44	105
118	170	-52	44	106
196	170	26	45	106
205	170	35	46	106

199	170	29	47	106
135	170	-35	47	107
212	170	42	48	107
214	170	44	49	107
214	170	44	50	107
197	170	27	51	107
179	170	9	52	107
193	170	23	53	107
173	170	3	54	107
181	170	11	55	107
500	170	330	56	107
208	165	43	57	107
165	165	0	57	107
118	165	-47	57	108
196	165	31	58	108
205	165	40	59	108
199	165	34	60	108
135	165	-30	60	109
212	165	47	61	109
214	165	49	62	109
214	165	49	63	109
197	165	32	64	109
179	165	14	65	109
193	165	28	66	109
173	165	8	67	109
181	165	16	68	109
500	165	335	69	109
165	208	-43	69	110
118	208	-90	69	111
196	208	-12	69	112
205	208	-3	69	113
199	208	-9	69	114
135	208	-73	69	115
212	208	4	70	115
214	208	6	71	115
214	208	6	72	115
197	208	-11	72	116
179	208	-29	72	117
193	208	-15	72	118
173	208	-35	72	119
181	208	-27	72	120
500	208	292	73	120
118	165	-47	73	121
196	165	31	74	121
205	165	40	75	121
199	165	34	76	121
135	165	-30	76	122
212	165	47	77	122
214	165	49	78	122
214	165	49	79	122
197	165	32	80	122
179	165	14	81	122
193	165	28	82	122
173	165	8	83	122

181	165	16	84	122
500	165	335	85	122
196	118	78	86	122
205	118	87	87	122
199	118	81	88	122
135	118	17	89	122
212	118	94	90	122
214	118	96	91	122
214	118	96	92	122
197	118	79	93	122
179	118	61	94	122
193	118	75	95	122
173	118	55	96	122
181	118	63	97	122
500	118	382	98	122
205	196	9	99	122
199	196	3	100	122
135	196	-61	100	123
212	196	16	101	123
214	196	18	102	123
214	196	18	103	123
197	196	1	104	123
179	196	-17	104	124
193	196	-3	104	125
173	196	-23	104	126
181	196	-15	104	127
500	196	304	105	127
199	205	-6	105	128
135	205	-70	105	129
212	205	7	106	129
214	205	9	107	129
214	205	9	108	129
197	205	-8	108	130
179	205	-26	108	131
193	205	-12	108	132
173	205	-32	108	133
181	205	-24	108	134
500	205	295	109	134
135	199	-64	109	135
212	199	13	110	135
214	199	15	111	135
214	199	15	112	135
197	199	-2	112	136
179	199	-20	112	137
193	199	-6	112	138
173	199	-26	112	139
181	199	-18	112	140
500	199	301	113	140
212	135	77	114	140
214	135	79	115	140
214	135	79	116	140
197	135	62	117	140

179	135	44	118	140
193	135	58	119	140
173	135	38	120	140
181	135	46	121	140
500	135	365	122	140
214	212	2	123	140
214	212	2	124	140
197	212	-15	124	141
179	212	-33	124	142
193	212	-19	124	143
173	212	-39	124	144
181	212	-31	124	145
500	212	288	125	145
214	214	0	125	145
197	214	-17	125	146
179	214	-35	125	147
193	214	-21	125	148
173	214	-41	125	149
181	214	-33	125	150
500	214	286	126	150
197	214	-17	126	151
179	214	-35	126	152
193	214	-21	126	153
173	214	-41	126	154
181	214	-33	126	155
500	214	286	127	155
179	197	-18	127	156
193	197	-4	127	157
173	197	-24	127	158
181	197	-16	127	159
500	197	303	128	159
193	179	14	129	159
173	179	-6	129	160
181	179	2	130	160
500	179	321	131	160
173	193	-20	131	161
181	193	-12	131	162
500	193	307	132	162
181	173	8	133	162
500	173	327	134	162
500	181	319	135	162

S Statistic = 135 - 162 = -27

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

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1830.33

Z-Score = -0.607727

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-0.607727 <= 1.65463 indicating no evidence of an upward 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
230	220	10	3	21
240	220	20	4	21
160	220	-60	4	22
222	220	2	5	22
157	220	-63	5	23
170	220	-50	5	24
165	220	-55	5	25
208	220	-12	5	26
165	220	-55	5	27
118	220	-102	5	28
196	220	-24	5	29
205	220	-15	5	30
199	220	-21	5	31
135	220	-85	5	32
212	220	-8	5	33
214	220	-6	5	34
214	220	-6	5	35
197	220	-23	5	36
179	220	-41	5	37
193	220	-27	5	38
173	220	-47	5	39

181	220	-39	5	40
500	220	280	6	40
240	230	10	7	40
160	230	-70	7	41
222	230	-8	7	42
157	230	-73	7	43
170	230	-60	7	44
165	230	-65	7	45
208	230	-22	7	46
165	230	-65	7	47
118	230	-112	7	48
196	230	-34	7	49
205	230	-25	7	50
199	230	-31	7	51
135	230	-95	7	52
212	230	-18	7	53
214	230	-16	7	54
214	230	-16	7	55
197	230	-33	7	56
179	230	-51	7	57
193	230	-37	7	58
173	230	-57	7	59
181	230	-49	7	60
500	230	270	8	60
160	240	-80	8	61
222	240	-18	8	62
157	240	-83	8	63
170	240	-70	8	64
165	240	-75	8	65
208	240	-32	8	66
165	240	-75	8	67
118	240	-122	8	68
196	240	-44	8	69
205	240	-35	8	70
199	240	-41	8	71
135	240	-105	8	72
212	240	-28	8	73
214	240	-26	8	74
214	240	-26	8	75
197	240	-43	8	76
179	240	-61	8	77
193	240	-47	8	78
173	240	-67	8	79
181	240	-59	8	80
500	240	260	9	80
222	160	62	10	80
157	160	-3	10	81
170	160	10	11	81
165	160	5	12	81
208	160	48	13	81
165	160	5	14	81
118	160	-42	14	82
196	160	36	15	82
205	160	45	16	82

199	160	39	17	82
135	160	-25	17	83
212	160	52	18	83
214	160	54	19	83
214	160	54	20	83
197	160	37	21	83
179	160	19	22	83
193	160	33	23	83
173	160	13	24	83
181	160	21	25	83
500	160	340	26	83
157	222	-65	26	84
170	222	-52	26	85
165	222	-57	26	86
208	222	-14	26	87
165	222	-57	26	88
118	222	-104	26	89
196	222	-26	26	90
205	222	-17	26	91
199	222	-23	26	92
135	222	-87	26	93
212	222	-10	26	94
214	222	-8	26	95
214	222	-8	26	96
197	222	-25	26	97
179	222	-43	26	98
193	222	-29	26	99
173	222	-49	26	100
181	222	-41	26	101
500	222	278	27	101
170	157	13	28	101
165	157	8	29	101
208	157	51	30	101
165	157	8	31	101
118	157	-39	31	102
196	157	39	32	102
205	157	48	33	102
199	157	42	34	102
135	157	-22	34	103
212	157	55	35	103
214	157	57	36	103
214	157	57	37	103
197	157	40	38	103
179	157	22	39	103
193	157	36	40	103
173	157	16	41	103
181	157	24	42	103
500	157	343	43	103
165	170	-5	43	104
208	170	38	44	104
165	170	-5	44	105
118	170	-52	44	106
196	170	26	45	106
205	170	35	46	106

199	170	29	47	106
135	170	-35	47	107
212	170	42	48	107
214	170	44	49	107
214	170	44	50	107
197	170	27	51	107
179	170	9	52	107
193	170	23	53	107
173	170	3	54	107
181	170	11	55	107
500	170	330	56	107
208	165	43	57	107
165	165	0	57	107
118	165	-47	57	108
196	165	31	58	108
205	165	40	59	108
199	165	34	60	108
135	165	-30	60	109
212	165	47	61	109
214	165	49	62	109
214	165	49	63	109
197	165	32	64	109
179	165	14	65	109
193	165	28	66	109
173	165	8	67	109
181	165	16	68	109
500	165	335	69	109
165	208	-43	69	110
118	208	-90	69	111
196	208	-12	69	112
205	208	-3	69	113
199	208	-9	69	114
135	208	-73	69	115
212	208	4	70	115
214	208	6	71	115
214	208	6	72	115
197	208	-11	72	116
179	208	-29	72	117
193	208	-15	72	118
173	208	-35	72	119
181	208	-27	72	120
500	208	292	73	120
118	165	-47	73	121
196	165	31	74	121
205	165	40	75	121
199	165	34	76	121
135	165	-30	76	122
212	165	47	77	122
214	165	49	78	122
214	165	49	79	122
197	165	32	80	122
179	165	14	81	122
193	165	28	82	122
173	165	8	83	122

181	165	16	84	122
500	165	335	85	122
196	118	78	86	122
205	118	87	87	122
199	118	81	88	122
135	118	17	89	122
212	118	94	90	122
214	118	96	91	122
214	118	96	92	122
197	118	79	93	122
179	118	61	94	122
193	118	75	95	122
173	118	55	96	122
181	118	63	97	122
500	118	382	98	122
205	196	9	99	122
199	196	3	100	122
135	196	-61	100	123
212	196	16	101	123
214	196	18	102	123
214	196	18	103	123
197	196	1	104	123
179	196	-17	104	124
193	196	-3	104	125
173	196	-23	104	126
181	196	-15	104	127
500	196	304	105	127
199	205	-6	105	128
135	205	-70	105	129
212	205	7	106	129
214	205	9	107	129
214	205	9	108	129
197	205	-8	108	130
179	205	-26	108	131
193	205	-12	108	132
173	205	-32	108	133
181	205	-24	108	134
500	205	295	109	134
135	199	-64	109	135
212	199	13	110	135
214	199	15	111	135
214	199	15	112	135
197	199	-2	112	136
179	199	-20	112	137
193	199	-6	112	138
173	199	-26	112	139
181	199	-18	112	140
500	199	301	113	140
212	135	77	114	140
214	135	79	115	140
214	135	79	116	140
197	135	62	117	140

179	135	44	118	140
193	135	58	119	140
173	135	38	120	140
181	135	46	121	140
500	135	365	122	140
214	212	2	123	140
214	212	2	124	140
197	212	-15	124	141
179	212	-33	124	142
193	212	-19	124	143
173	212	-39	124	144
181	212	-31	124	145
500	212	288	125	145
214	214	0	125	145
197	214	-17	125	146
179	214	-35	125	147
193	214	-21	125	148
173	214	-41	125	149
181	214	-33	125	150
500	214	286	126	150
197	214	-17	126	151
179	214	-35	126	152
193	214	-21	126	153
173	214	-41	126	154
181	214	-33	126	155
500	214	286	127	155
179	197	-18	127	156
193	197	-4	127	157
173	197	-24	127	158
181	197	-16	127	159
500	197	303	128	159
193	179	14	129	159
173	179	-6	129	160
181	179	2	130	160
500	179	321	131	160
173	193	-20	131	161
181	193	-12	131	162
500	193	307	132	162
181	173	8	133	162
500	173	327	134	162
500	181	319	135	162

S Statistic = 135 - 162 = -27

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

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1830.33

Z-Score = -0.607727

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-0.607727 >= -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
440	220	220	24	1
480	220	260	25	1
446	220	226	26	1
440	220	220	27	1
205	220	-15	27	2
187	220	-33	27	3
204	220	-16	27	4
390	220	170	28	4
205	220	-15	28	5
340	220	120	29	5
350	220	130	30	5
343	220	123	31	5
363	220	143	32	5
340	220	120	33	5
385	220	165	34	5
331	220	111	35	5
361	220	141	36	5
333	220	113	37	5
312	220	92	38	5
298	220	78	39	5
294	220	74	40	5

300	220	80	41	5
314	220	94	42	5
480	440	40	43	5
446	440	6	44	5
440	440	0	44	5
205	440	-235	44	6
187	440	-253	44	7
204	440	-236	44	8
390	440	-50	44	9
205	440	-235	44	10
340	440	-100	44	11
350	440	-90	44	12
343	440	-97	44	13
363	440	-77	44	14
340	440	-100	44	15
385	440	-55	44	16
331	440	-109	44	17
361	440	-79	44	18
333	440	-107	44	19
312	440	-128	44	20
298	440	-142	44	21
294	440	-146	44	22
300	440	-140	44	23
314	440	-126	44	24
446	480	-34	44	25
440	480	-40	44	26
205	480	-275	44	27
187	480	-293	44	28
204	480	-276	44	29
390	480	-90	44	30
205	480	-275	44	31
340	480	-140	44	32
350	480	-130	44	33
343	480	-137	44	34
363	480	-117	44	35
340	480	-140	44	36
385	480	-95	44	37
331	480	-149	44	38
361	480	-119	44	39
333	480	-147	44	40
312	480	-168	44	41
298	480	-182	44	42
294	480	-186	44	43
300	480	-180	44	44
314	480	-166	44	45
440	446	-6	44	46
205	446	-241	44	47
187	446	-259	44	48
204	446	-242	44	49
390	446	-56	44	50
205	446	-241	44	51
340	446	-106	44	52
350	446	-96	44	53
343	446	-103	44	54

363	446	-83	44	55
340	446	-106	44	56
385	446	-61	44	57
331	446	-115	44	58
361	446	-85	44	59
333	446	-113	44	60
312	446	-134	44	61
298	446	-148	44	62
294	446	-152	44	63
300	446	-146	44	64
314	446	-132	44	65
205	440	-235	44	66
187	440	-253	44	67
204	440	-236	44	68
390	440	-50	44	69
205	440	-235	44	70
340	440	-100	44	71
350	440	-90	44	72
343	440	-97	44	73
363	440	-77	44	74
340	440	-100	44	75
385	440	-55	44	76
331	440	-109	44	77
361	440	-79	44	78
333	440	-107	44	79
312	440	-128	44	80
298	440	-142	44	81
294	440	-146	44	82
300	440	-140	44	83
314	440	-126	44	84
187	205	-18	44	85
204	205	-1	44	86
390	205	185	45	86
205	205	0	45	86
340	205	135	46	86
350	205	145	47	86
343	205	138	48	86
363	205	158	49	86
340	205	135	50	86
385	205	180	51	86
331	205	126	52	86
361	205	156	53	86
333	205	128	54	86
312	205	107	55	86
298	205	93	56	86
294	205	89	57	86
300	205	95	58	86
314	205	109	59	86
204	187	17	60	86
390	187	203	61	86
205	187	18	62	86
340	187	153	63	86
350	187	163	64	86
343	187	156	65	86

363	187	176	66	86
340	187	153	67	86
385	187	198	68	86
331	187	144	69	86
361	187	174	70	86
333	187	146	71	86
312	187	125	72	86
298	187	111	73	86
294	187	107	74	86
300	187	113	75	86
314	187	127	76	86
390	204	186	77	86
205	204	1	78	86
340	204	136	79	86
350	204	146	80	86
343	204	139	81	86
363	204	159	82	86
340	204	136	83	86
385	204	181	84	86
331	204	127	85	86
361	204	157	86	86
333	204	129	87	86
312	204	108	88	86
298	204	94	89	86
294	204	90	90	86
300	204	96	91	86
314	204	110	92	86
205	390	-185	92	87
340	390	-50	92	88
350	390	-40	92	89
343	390	-47	92	90
363	390	-27	92	91
340	390	-50	92	92
385	390	-5	92	93
331	390	-59	92	94
361	390	-29	92	95
333	390	-57	92	96
312	390	-78	92	97
298	390	-92	92	98
294	390	-96	92	99
300	390	-90	92	100
314	390	-76	92	101
340	205	135	93	101
350	205	145	94	101
343	205	138	95	101
363	205	158	96	101
340	205	135	97	101
385	205	180	98	101
331	205	126	99	101
361	205	156	100	101
333	205	128	101	101
312	205	107	102	101
298	205	93	103	101
294	205	89	104	101

300	205	95	105	101
314	205	109	106	101
350	340	10	107	101
343	340	3	108	101
363	340	23	109	101
340	340	0	109	101
385	340	45	110	101
331	340	-9	110	102
361	340	21	111	102
333	340	-7	111	103
312	340	-28	111	104
298	340	-42	111	105
294	340	-46	111	106
300	340	-40	111	107
314	340	-26	111	108
343	350	-7	111	109
363	350	13	112	109
340	350	-10	112	110
385	350	35	113	110
331	350	-19	113	111
361	350	11	114	111
333	350	-17	114	112
312	350	-38	114	113
298	350	-52	114	114
294	350	-56	114	115
300	350	-50	114	116
314	350	-36	114	117
363	343	20	115	117
340	343	-3	115	118
385	343	42	116	118
331	343	-12	116	119
361	343	18	117	119
333	343	-10	117	120
312	343	-31	117	121
298	343	-45	117	122
294	343	-49	117	123
300	343	-43	117	124
314	343	-29	117	125
340	363	-23	117	126
385	363	22	118	126
331	363	-32	118	127
361	363	-2	118	128
333	363	-30	118	129
312	363	-51	118	130
298	363	-65	118	131
294	363	-69	118	132
300	363	-63	118	133
314	363	-49	118	134
385	340	45	119	134
331	340	-9	119	135
361	340	21	120	135
333	340	-7	120	136

312	340	-28	120	137
298	340	-42	120	138
294	340	-46	120	139
300	340	-40	120	140
314	340	-26	120	141
331	385	-54	120	142
361	385	-24	120	143
333	385	-52	120	144
312	385	-73	120	145
298	385	-87	120	146
294	385	-91	120	147
300	385	-85	120	148
314	385	-71	120	149
361	331	30	121	149
333	331	2	122	149
312	331	-19	122	150
298	331	-33	122	151
294	331	-37	122	152
300	331	-31	122	153
314	331	-17	122	154
333	361	-28	122	155
312	361	-49	122	156
298	361	-63	122	157
294	361	-67	122	158
300	361	-61	122	159
314	361	-47	122	160
312	333	-21	122	161
298	333	-35	122	162
294	333	-39	122	163
300	333	-33	122	164
314	333	-19	122	165
298	312	-14	122	166
294	312	-18	122	167
300	312	-12	122	168
314	312	2	123	168
294	298	-4	123	169
300	298	2	124	169
314	298	16	125	169
300	294	6	126	169
314	294	20	127	169
314	300	14	128	169

S Statistic = 128 - 169 = -41

Tied Group Value	Members
1	440
2	205
3	340

Time Period	Observations
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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

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1830.33

Z-Score = -0.934964

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-0.934964 <= 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
440	220	220	24	1
480	220	260	25	1
446	220	226	26	1
440	220	220	27	1
205	220	-15	27	2
187	220	-33	27	3
204	220	-16	27	4
390	220	170	28	4
205	220	-15	28	5
340	220	120	29	5
350	220	130	30	5
343	220	123	31	5
363	220	143	32	5
340	220	120	33	5
385	220	165	34	5
331	220	111	35	5
361	220	141	36	5
333	220	113	37	5
312	220	92	38	5
298	220	78	39	5
294	220	74	40	5

300	220	80	41	5
314	220	94	42	5
480	440	40	43	5
446	440	6	44	5
440	440	0	44	5
205	440	-235	44	6
187	440	-253	44	7
204	440	-236	44	8
390	440	-50	44	9
205	440	-235	44	10
340	440	-100	44	11
350	440	-90	44	12
343	440	-97	44	13
363	440	-77	44	14
340	440	-100	44	15
385	440	-55	44	16
331	440	-109	44	17
361	440	-79	44	18
333	440	-107	44	19
312	440	-128	44	20
298	440	-142	44	21
294	440	-146	44	22
300	440	-140	44	23
314	440	-126	44	24
446	480	-34	44	25
440	480	-40	44	26
205	480	-275	44	27
187	480	-293	44	28
204	480	-276	44	29
390	480	-90	44	30
205	480	-275	44	31
340	480	-140	44	32
350	480	-130	44	33
343	480	-137	44	34
363	480	-117	44	35
340	480	-140	44	36
385	480	-95	44	37
331	480	-149	44	38
361	480	-119	44	39
333	480	-147	44	40
312	480	-168	44	41
298	480	-182	44	42
294	480	-186	44	43
300	480	-180	44	44
314	480	-166	44	45
440	446	-6	44	46
205	446	-241	44	47
187	446	-259	44	48
204	446	-242	44	49
390	446	-56	44	50
205	446	-241	44	51
340	446	-106	44	52
350	446	-96	44	53
343	446	-103	44	54

363	446	-83	44	55
340	446	-106	44	56
385	446	-61	44	57
331	446	-115	44	58
361	446	-85	44	59
333	446	-113	44	60
312	446	-134	44	61
298	446	-148	44	62
294	446	-152	44	63
300	446	-146	44	64
314	446	-132	44	65
205	440	-235	44	66
187	440	-253	44	67
204	440	-236	44	68
390	440	-50	44	69
205	440	-235	44	70
340	440	-100	44	71
350	440	-90	44	72
343	440	-97	44	73
363	440	-77	44	74
340	440	-100	44	75
385	440	-55	44	76
331	440	-109	44	77
361	440	-79	44	78
333	440	-107	44	79
312	440	-128	44	80
298	440	-142	44	81
294	440	-146	44	82
300	440	-140	44	83
314	440	-126	44	84
187	205	-18	44	85
204	205	-1	44	86
390	205	185	45	86
205	205	0	45	86
340	205	135	46	86
350	205	145	47	86
343	205	138	48	86
363	205	158	49	86
340	205	135	50	86
385	205	180	51	86
331	205	126	52	86
361	205	156	53	86
333	205	128	54	86
312	205	107	55	86
298	205	93	56	86
294	205	89	57	86
300	205	95	58	86
314	205	109	59	86
204	187	17	60	86
390	187	203	61	86
205	187	18	62	86
340	187	153	63	86
350	187	163	64	86
343	187	156	65	86

363	187	176	66	86
340	187	153	67	86
385	187	198	68	86
331	187	144	69	86
361	187	174	70	86
333	187	146	71	86
312	187	125	72	86
298	187	111	73	86
294	187	107	74	86
300	187	113	75	86
314	187	127	76	86
390	204	186	77	86
205	204	1	78	86
340	204	136	79	86
350	204	146	80	86
343	204	139	81	86
363	204	159	82	86
340	204	136	83	86
385	204	181	84	86
331	204	127	85	86
361	204	157	86	86
333	204	129	87	86
312	204	108	88	86
298	204	94	89	86
294	204	90	90	86
300	204	96	91	86
314	204	110	92	86
205	390	-185	92	87
340	390	-50	92	88
350	390	-40	92	89
343	390	-47	92	90
363	390	-27	92	91
340	390	-50	92	92
385	390	-5	92	93
331	390	-59	92	94
361	390	-29	92	95
333	390	-57	92	96
312	390	-78	92	97
298	390	-92	92	98
294	390	-96	92	99
300	390	-90	92	100
314	390	-76	92	101
340	205	135	93	101
350	205	145	94	101
343	205	138	95	101
363	205	158	96	101
340	205	135	97	101
385	205	180	98	101
331	205	126	99	101
361	205	156	100	101
333	205	128	101	101
312	205	107	102	101
298	205	93	103	101
294	205	89	104	101

300	205	95	105	101
314	205	109	106	101
350	340	10	107	101
343	340	3	108	101
363	340	23	109	101
340	340	0	109	101
385	340	45	110	101
331	340	-9	110	102
361	340	21	111	102
333	340	-7	111	103
312	340	-28	111	104
298	340	-42	111	105
294	340	-46	111	106
300	340	-40	111	107
314	340	-26	111	108
343	350	-7	111	109
363	350	13	112	109
340	350	-10	112	110
385	350	35	113	110
331	350	-19	113	111
361	350	11	114	111
333	350	-17	114	112
312	350	-38	114	113
298	350	-52	114	114
294	350	-56	114	115
300	350	-50	114	116
314	350	-36	114	117
363	343	20	115	117
340	343	-3	115	118
385	343	42	116	118
331	343	-12	116	119
361	343	18	117	119
333	343	-10	117	120
312	343	-31	117	121
298	343	-45	117	122
294	343	-49	117	123
300	343	-43	117	124
314	343	-29	117	125
340	363	-23	117	126
385	363	22	118	126
331	363	-32	118	127
361	363	-2	118	128
333	363	-30	118	129
312	363	-51	118	130
298	363	-65	118	131
294	363	-69	118	132
300	363	-63	118	133
314	363	-49	118	134
385	340	45	119	134
331	340	-9	119	135
361	340	21	120	135
333	340	-7	120	136

312	340	-28	120	137
298	340	-42	120	138
294	340	-46	120	139
300	340	-40	120	140
314	340	-26	120	141
331	385	-54	120	142
361	385	-24	120	143
333	385	-52	120	144
312	385	-73	120	145
298	385	-87	120	146
294	385	-91	120	147
300	385	-85	120	148
314	385	-71	120	149
361	331	30	121	149
333	331	2	122	149
312	331	-19	122	150
298	331	-33	122	151
294	331	-37	122	152
300	331	-31	122	153
314	331	-17	122	154
333	361	-28	122	155
312	361	-49	122	156
298	361	-63	122	157
294	361	-67	122	158
300	361	-61	122	159
314	361	-47	122	160
312	333	-21	122	161
298	333	-35	122	162
294	333	-39	122	163
300	333	-33	122	164
314	333	-19	122	165
298	312	-14	122	166
294	312	-18	122	167
300	312	-12	122	168
314	312	2	123	168
294	298	-4	123	169
300	298	2	124	169
314	298	16	125	169
300	294	6	126	169
314	294	20	127	169
314	300	14	128	169

S Statistic = 128 - 169 = -41

Tied Group Value	Members
1	440
2	205
3	340

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

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1830.33

Z-Score = -0.934964

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-0.934964 >= -1.65463 indicating no evidence of 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
890	570	320	15	10
920	570	350	16	10
950	570	380	17	10
864	570	294	18	10
506	570	-64	18	11
456	570	-114	18	12
486	570	-84	18	13
723	570	153	19	13
464	570	-106	19	14
622	570	52	20	14
593	570	23	21	14
575	570	5	22	14
561	570	-9	22	15
546	570	-24	22	16
550	570	-20	22	17
593	570	23	23	17
592	570	22	24	17
505	570	-65	24	18
333	570	-237	24	19
0.6	570	-569.4	24	20
0.9	570	-569.1	24	21

0.6	570	-569.4	24	22
419	570	-151	24	23
920	890	30	25	23
950	890	60	26	23
864	890	-26	26	24
506	890	-384	26	25
456	890	-434	26	26
486	890	-404	26	27
723	890	-167	26	28
464	890	-426	26	29
622	890	-268	26	30
593	890	-297	26	31
575	890	-315	26	32
561	890	-329	26	33
546	890	-344	26	34
550	890	-340	26	35
593	890	-297	26	36
592	890	-298	26	37
505	890	-385	26	38
333	890	-557	26	39
0.6	890	-889.4	26	40
0.9	890	-889.1	26	41
0.6	890	-889.4	26	42
419	890	-471	26	43
950	920	30	27	43
864	920	-56	27	44
506	920	-414	27	45
456	920	-464	27	46
486	920	-434	27	47
723	920	-197	27	48
464	920	-456	27	49
622	920	-298	27	50
593	920	-327	27	51
575	920	-345	27	52
561	920	-359	27	53
546	920	-374	27	54
550	920	-370	27	55
593	920	-327	27	56
592	920	-328	27	57
505	920	-415	27	58
333	920	-587	27	59
0.6	920	-919.4	27	60
0.9	920	-919.1	27	61
0.6	920	-919.4	27	62
419	920	-501	27	63
864	950	-86	27	64
506	950	-444	27	65
456	950	-494	27	66
486	950	-464	27	67
723	950	-227	27	68
464	950	-486	27	69
622	950	-328	27	70
593	950	-357	27	71
575	950	-375	27	72

561	950	-389	27	73
546	950	-404	27	74
550	950	-400	27	75
593	950	-357	27	76
592	950	-358	27	77
505	950	-445	27	78
333	950	-617	27	79
0.6	950	-949.4	27	80
0.9	950	-949.1	27	81
0.6	950	-949.4	27	82
419	950	-531	27	83
506	864	-358	27	84
456	864	-408	27	85
486	864	-378	27	86
723	864	-141	27	87
464	864	-400	27	88
622	864	-242	27	89
593	864	-271	27	90
575	864	-289	27	91
561	864	-303	27	92
546	864	-318	27	93
550	864	-314	27	94
593	864	-271	27	95
592	864	-272	27	96
505	864	-359	27	97
333	864	-531	27	98
0.6	864	-863.4	27	99
0.9	864	-863.1	27	100
0.6	864	-863.4	27	101
419	864	-445	27	102
456	506	-50	27	103
486	506	-20	27	104
723	506	217	28	104
464	506	-42	28	105
622	506	116	29	105
593	506	87	30	105
575	506	69	31	105
561	506	55	32	105
546	506	40	33	105
550	506	44	34	105
593	506	87	35	105
592	506	86	36	105
505	506	-1	36	106
333	506	-173	36	107
0.6	506	-505.4	36	108
0.9	506	-505.1	36	109
0.6	506	-505.4	36	110
419	506	-87	36	111
486	456	30	37	111
723	456	267	38	111
464	456	8	39	111
622	456	166	40	111
593	456	137	41	111
575	456	119	42	111

561	456	105	43	111
546	456	90	44	111
550	456	94	45	111
593	456	137	46	111
592	456	136	47	111
505	456	49	48	111
333	456	-123	48	112
0.6	456	-455.4	48	113
0.9	456	-455.1	48	114
0.6	456	-455.4	48	115
419	456	-37	48	116
723	486	237	49	116
464	486	-22	49	117
622	486	136	50	117
593	486	107	51	117
575	486	89	52	117
561	486	75	53	117
546	486	60	54	117
550	486	64	55	117
593	486	107	56	117
592	486	106	57	117
505	486	19	58	117
333	486	-153	58	118
0.6	486	-485.4	58	119
0.9	486	-485.1	58	120
0.6	486	-485.4	58	121
419	486	-67	58	122
464	723	-259	58	123
622	723	-101	58	124
593	723	-130	58	125
575	723	-148	58	126
561	723	-162	58	127
546	723	-177	58	128
550	723	-173	58	129
593	723	-130	58	130
592	723	-131	58	131
505	723	-218	58	132
333	723	-390	58	133
0.6	723	-722.4	58	134
0.9	723	-722.1	58	135
0.6	723	-722.4	58	136
419	723	-304	58	137
622	464	158	59	137
593	464	129	60	137
575	464	111	61	137
561	464	97	62	137
546	464	82	63	137
550	464	86	64	137
593	464	129	65	137
592	464	128	66	137
505	464	41	67	137
333	464	-131	67	138
0.6	464	-463.4	67	139
0.9	464	-463.1	67	140

0.6	464	-463.4	67	141
419	464	-45	67	142
593	622	-29	67	143
575	622	-47	67	144
561	622	-61	67	145
546	622	-76	67	146
550	622	-72	67	147
593	622	-29	67	148
592	622	-30	67	149
505	622	-117	67	150
333	622	-289	67	151
0.6	622	-621.4	67	152
0.9	622	-621.1	67	153
0.6	622	-621.4	67	154
419	622	-203	67	155
575	593	-18	67	156
561	593	-32	67	157
546	593	-47	67	158
550	593	-43	67	159
593	593	0	67	159
592	593	-1	67	160
505	593	-88	67	161
333	593	-260	67	162
0.6	593	-592.4	67	163
0.9	593	-592.1	67	164
0.6	593	-592.4	67	165
419	593	-174	67	166
561	575	-14	67	167
546	575	-29	67	168
550	575	-25	67	169
593	575	18	68	169
592	575	17	69	169
505	575	-70	69	170
333	575	-242	69	171
0.6	575	-574.4	69	172
0.9	575	-574.1	69	173
0.6	575	-574.4	69	174
419	575	-156	69	175
546	561	-15	69	176
550	561	-11	69	177
593	561	32	70	177
592	561	31	71	177
505	561	-56	71	178
333	561	-228	71	179
0.6	561	-560.4	71	180
0.9	561	-560.1	71	181
0.6	561	-560.4	71	182
419	561	-142	71	183
550	546	4	72	183
593	546	47	73	183
592	546	46	74	183
505	546	-41	74	184

333	546	-213	74	185
0.6	546	-545.4	74	186
0.9	546	-545.1	74	187
0.6	546	-545.4	74	188
419	546	-127	74	189
593	550	43	75	189
592	550	42	76	189
505	550	-45	76	190
333	550	-217	76	191
0.6	550	-549.4	76	192
0.9	550	-549.1	76	193
0.6	550	-549.4	76	194
419	550	-131	76	195
592	593	-1	76	196
505	593	-88	76	197
333	593	-260	76	198
0.6	593	-592.4	76	199
0.9	593	-592.1	76	200
0.6	593	-592.4	76	201
419	593	-174	76	202
505	592	-87	76	203
333	592	-259	76	204
0.6	592	-591.4	76	205
0.9	592	-591.1	76	206
0.6	592	-591.4	76	207
419	592	-173	76	208
333	505	-172	76	209
0.6	505	-504.4	76	210
0.9	505	-504.1	76	211
0.6	505	-504.4	76	212
419	505	-86	76	213
0.6	333	-332.4	76	214
0.9	333	-332.1	76	215
0.6	333	-332.4	76	216
419	333	86	77	216
0.9	0.6	0.3	78	216
0.6	0.6	0	78	216
419	0.6	418.4	79	216
0.6	0.9	-0.3	79	217
419	0.9	418.1	80	217
419	0.6	418.4	81	217

S Statistic = 81 - 217 = -136

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

There are 0 time periods with multiple data

A = 36

B = 0

C = 0

D = 0

E = 4

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1831.33

Z-Score = -3.15464

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-3.15464 < -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	2.03	-2.03	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
0.4	2.03	-1.63	2	21
0.4	2.03	-1.63	2	22
ND<0	2.03	-2.03	2	23
1.1	2.03	-0.93	2	24
0.4	2.03	-1.63	2	25
0.1	2.03	-1.93	2	26
ND<0	2.03	-2.03	2	27
ND<0	2.03	-2.03	2	28
ND<0	2.03	-2.03	2	29
ND<0	ND<0	0	2	29
ND<0	ND<0	0	2	29
ND<0	ND<0	0	2	29
ND<0	ND<0	0	2	29
ND<0	ND<0	0	2	29
0.4	ND<0	0.4	3	29
0.4	ND<0	0.4	4	29
ND<0	ND<0	0	4	29
1.1	ND<0	1.1	5	29
0.4	ND<0	0.4	6	29
0.1	ND<0	0.1	7	29
ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29

ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29
0.4	ND<0	0.4	8	29
0.4	ND<0	0.4	9	29
ND<0	ND<0	0	9	29
1.1	ND<0	1.1	10	29
0.4	ND<0	0.4	11	29
0.1	ND<0	0.1	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
0.4	ND<0	0.4	13	29
0.4	ND<0	0.4	14	29
ND<0	ND<0	0	14	29
1.1	ND<0	1.1	15	29
0.4	ND<0	0.4	16	29
0.1	ND<0	0.1	17	29
ND<0	ND<0	0	17	29
ND<0	ND<0	0	17	29
ND<0	ND<0	0	17	29
ND<0	ND<0	0	17	29
ND<0	ND<0	0	17	29
0.4	ND<0	0.4	18	29
0.4	ND<0	0.4	19	29
ND<0	ND<0	0	19	29
1.1	ND<0	1.1	20	29
0.4	ND<0	0.4	21	29
0.1	ND<0	0.1	22	29
ND<0	ND<0	0	22	29
ND<0	ND<0	0	22	29
ND<0	ND<0	0	22	29
ND<0	ND<0	0	22	29
0.4	ND<0	0.4	23	29
0.4	ND<0	0.4	24	29
ND<0	ND<0	0	24	29
1.1	ND<0	1.1	25	29
0.4	ND<0	0.4	26	29
0.1	ND<0	0.1	27	29
ND<0	ND<0	0	27	29
ND<0	ND<0	0	27	29
ND<0	ND<0	0	27	29
0.4	ND<0	0.4	28	29
0.4	ND<0	0.4	29	29
ND<0	ND<0	0	29	29
1.1	ND<0	1.1	30	29
0.4	ND<0	0.4	31	29

0.1	ND<0	0.1	32	29
ND<0	ND<0	0	32	29
ND<0	ND<0	0	32	29
ND<0	ND<0	0	32	29
0.4	0.4	0	32	29
ND<0	0.4	-0.4	32	30
1.1	0.4	0.7	33	30
0.4	0.4	0	33	30
0.1	0.4	-0.3	33	31
ND<0	0.4	-0.4	33	32
ND<0	0.4	-0.4	33	33
ND<0	0.4	-0.4	33	34
ND<0	0.4	-0.4	33	35
1.1	0.4	0.7	34	35
0.4	0.4	0	34	35
0.1	0.4	-0.3	34	36
ND<0	0.4	-0.4	34	37
ND<0	0.4	-0.4	34	38
ND<0	0.4	-0.4	34	39
1.1	ND<0	1.1	35	39
0.4	ND<0	0.4	36	39
0.1	ND<0	0.1	37	39
ND<0	ND<0	0	37	39
ND<0	ND<0	0	37	39
ND<0	ND<0	0	37	39
0.4	1.1	-0.7	37	40
0.1	1.1	-1	37	41
ND<0	1.1	-1.1	37	42
ND<0	1.1	-1.1	37	43
ND<0	1.1	-1.1	37	44
0.1	0.4	-0.3	37	45
ND<0	0.4	-0.4	37	46
ND<0	0.4	-0.4	37	47
ND<0	0.4	-0.4	37	48
ND<0	0.1	-0.1	37	49
ND<0	0.1	-0.1	37	50
ND<0	0.1	-0.1	37	51
ND<0	ND<0	0	37	51
ND<0	ND<0	0	37	51
ND<0	ND<0	0	37	51

S Statistic = 37 - 51 = -14

Tied Group Value	Members
1	0
2	0.4

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

There are 0 time periods with multiple data

A = 2316

B = 0

C = 726

D = 0

E = 96

F = 0

a = 10608

b = 36720

c = 544

Group Variance = 460.667

Z-Score = -0.605689

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-0.605689 <= 1.65463 indicating no evidence of an upward 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	2.03	-2.03	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
0.4	2.03	-1.63	2	21
0.4	2.03	-1.63	2	22
ND<0	2.03	-2.03	2	23
1.1	2.03	-0.93	2	24
0.4	2.03	-1.63	2	25
0.1	2.03	-1.93	2	26
ND<0	2.03	-2.03	2	27
ND<0	2.03	-2.03	2	28
ND<0	2.03	-2.03	2	29
ND<0	ND<0	0	2	29
ND<0	ND<0	0	2	29
ND<0	ND<0	0	2	29
ND<0	ND<0	0	2	29
ND<0	ND<0	0	2	29
0.4	ND<0	0.4	3	29
0.4	ND<0	0.4	4	29
ND<0	ND<0	0	4	29
1.1	ND<0	1.1	5	29
0.4	ND<0	0.4	6	29
0.1	ND<0	0.1	7	29
ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29

ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29
ND<0	ND<0	0	7	29
0.4	ND<0	0.4	8	29
0.4	ND<0	0.4	9	29
ND<0	ND<0	0	9	29
1.1	ND<0	1.1	10	29
0.4	ND<0	0.4	11	29
0.1	ND<0	0.1	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
ND<0	ND<0	0	12	29
0.4	ND<0	0.4	13	29
0.4	ND<0	0.4	14	29
ND<0	ND<0	0	14	29
1.1	ND<0	1.1	15	29
0.4	ND<0	0.4	16	29
0.1	ND<0	0.1	17	29
ND<0	ND<0	0	17	29
ND<0	ND<0	0	17	29
ND<0	ND<0	0	17	29
ND<0	ND<0	0	17	29
ND<0	ND<0	0	17	29
0.4	ND<0	0.4	18	29
0.4	ND<0	0.4	19	29
ND<0	ND<0	0	19	29
1.1	ND<0	1.1	20	29
0.4	ND<0	0.4	21	29
0.1	ND<0	0.1	22	29
ND<0	ND<0	0	22	29
ND<0	ND<0	0	22	29
ND<0	ND<0	0	22	29
ND<0	ND<0	0	22	29
0.4	ND<0	0.4	23	29
0.4	ND<0	0.4	24	29
ND<0	ND<0	0	24	29
1.1	ND<0	1.1	25	29
0.4	ND<0	0.4	26	29
0.1	ND<0	0.1	27	29
ND<0	ND<0	0	27	29
ND<0	ND<0	0	27	29
ND<0	ND<0	0	27	29
0.4	ND<0	0.4	28	29
0.4	ND<0	0.4	29	29
ND<0	ND<0	0	29	29
1.1	ND<0	1.1	30	29
0.4	ND<0	0.4	31	29

0.1	ND<0	0.1	32	29
ND<0	ND<0	0	32	29
ND<0	ND<0	0	32	29
ND<0	ND<0	0	32	29
0.4	0.4	0	32	29
ND<0	0.4	-0.4	32	30
1.1	0.4	0.7	33	30
0.4	0.4	0	33	30
0.1	0.4	-0.3	33	31
ND<0	0.4	-0.4	33	32
ND<0	0.4	-0.4	33	33
ND<0	0.4	-0.4	33	34
ND<0	0.4	-0.4	33	35
1.1	0.4	0.7	34	35
0.4	0.4	0	34	35
0.1	0.4	-0.3	34	36
ND<0	0.4	-0.4	34	37
ND<0	0.4	-0.4	34	38
ND<0	0.4	-0.4	34	39
1.1	ND<0	1.1	35	39
0.4	ND<0	0.4	36	39
0.1	ND<0	0.1	37	39
ND<0	ND<0	0	37	39
ND<0	ND<0	0	37	39
ND<0	ND<0	0	37	39
0.4	1.1	-0.7	37	40
0.1	1.1	-1	37	41
ND<0	1.1	-1.1	37	42
ND<0	1.1	-1.1	37	43
ND<0	1.1	-1.1	37	44
0.1	0.4	-0.3	37	45
ND<0	0.4	-0.4	37	46
ND<0	0.4	-0.4	37	47
ND<0	0.4	-0.4	37	48
ND<0	0.1	-0.1	37	49
ND<0	0.1	-0.1	37	50
ND<0	0.1	-0.1	37	51
ND<0	ND<0	0	37	51
ND<0	ND<0	0	37	51
ND<0	ND<0	0	37	51

S Statistic = 37 - 51 = -14

Tied Group Value	Members
1	0
2	0.4

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

There are 0 time periods with multiple data

A = 2316

B = 0

C = 726

D = 0

E = 96

F = 0

a = 10608

b = 36720

c = 544

Group Variance = 460.667

Z-Score = -0.605689

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-0.605689 >= -1.65463 indicating no evidence of 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
1.1	1	0.1	1	24
0.9	1	-0.1	1	25
1	1	0	1	25
0.9	1	-0.1	1	26
0.9	1	-0.1	1	27
0.9	1	-0.1	1	28
1	1	0	1	28
1.1	1	0.1	2	28
1	1	0	2	28
0.8	1	-0.2	2	29
0.7	1	-0.3	2	30
0.7	1	-0.3	2	31
0.7	1	-0.3	2	32
0.6	1	-0.4	2	33
0.9	1	-0.1	2	34
0.8	1	-0.2	2	35
0.7	1	-0.3	2	36
0.7	1	-0.3	2	37
0.5	1	-0.5	2	38
0.8	1	-0.2	2	39
0.8	1	-0.2	2	40

0.7	1	-0.3	2	41
0.572	1	-0.428	2	42
0.9	1.1	-0.2	2	43
1	1.1	-0.1	2	44
0.9	1.1	-0.2	2	45
0.9	1.1	-0.2	2	46
0.9	1.1	-0.2	2	47
1	1.1	-0.1	2	48
1.1	1.1	0	2	48
1	1.1	-0.1	2	49
0.8	1.1	-0.3	2	50
0.7	1.1	-0.4	2	51
0.7	1.1	-0.4	2	52
0.7	1.1	-0.4	2	53
0.6	1.1	-0.5	2	54
0.9	1.1	-0.2	2	55
0.8	1.1	-0.3	2	56
0.7	1.1	-0.4	2	57
0.7	1.1	-0.4	2	58
0.5	1.1	-0.6	2	59
0.8	1.1	-0.3	2	60
0.8	1.1	-0.3	2	61
0.7	1.1	-0.4	2	62
0.572	1.1	-0.528	2	63
1	0.9	0.1	3	63
0.9	0.9	0	3	63
0.9	0.9	0	3	63
0.9	0.9	0	3	63
1	0.9	0.1	4	63
1.1	0.9	0.2	5	63
1	0.9	0.1	6	63
0.8	0.9	-0.1	6	64
0.7	0.9	-0.2	6	65
0.7	0.9	-0.2	6	66
0.7	0.9	-0.2	6	67
0.6	0.9	-0.3	6	68
0.9	0.9	0	6	68
0.8	0.9	-0.1	6	69
0.7	0.9	-0.2	6	70
0.7	0.9	-0.2	6	71
0.5	0.9	-0.4	6	72
0.8	0.9	-0.1	6	73
0.8	0.9	-0.1	6	74
0.7	0.9	-0.2	6	75
0.572	0.9	-0.328	6	76
0.9	1	-0.1	6	77
0.9	1	-0.1	6	78
0.9	1	-0.1	6	79
1	1	0	6	79
1.1	1	0.1	7	79
1	1	0	7	79
0.8	1	-0.2	7	80
0.7	1	-0.3	7	81
0.7	1	-0.3	7	82

0.7	1	-0.3	7	83
0.6	1	-0.4	7	84
0.9	1	-0.1	7	85
0.8	1	-0.2	7	86
0.7	1	-0.3	7	87
0.7	1	-0.3	7	88
0.5	1	-0.5	7	89
0.8	1	-0.2	7	90
0.8	1	-0.2	7	91
0.7	1	-0.3	7	92
0.572	1	-0.428	7	93
0.9	0.9	0	7	93
0.9	0.9	0	7	93
1	0.9	0.1	8	93
1.1	0.9	0.2	9	93
1	0.9	0.1	10	93
0.8	0.9	-0.1	10	94
0.7	0.9	-0.2	10	95
0.7	0.9	-0.2	10	96
0.7	0.9	-0.2	10	97
0.6	0.9	-0.3	10	98
0.9	0.9	0	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
0.5	0.9	-0.4	10	102
0.8	0.9	-0.1	10	103
0.8	0.9	-0.1	10	104
0.7	0.9	-0.2	10	105
0.572	0.9	-0.328	10	106
0.9	0.9	0	10	106
1	0.9	0.1	11	106
1.1	0.9	0.2	12	106
1	0.9	0.1	13	106
0.8	0.9	-0.1	13	107
0.7	0.9	-0.2	13	108
0.7	0.9	-0.2	13	109
0.7	0.9	-0.2	13	110
0.6	0.9	-0.3	13	111
0.9	0.9	0	13	111
0.8	0.9	-0.1	13	112
0.7	0.9	-0.2	13	113
0.7	0.9	-0.2	13	114
0.5	0.9	-0.4	13	115
0.8	0.9	-0.1	13	116
0.8	0.9	-0.1	13	117
0.7	0.9	-0.2	13	118
0.572	0.9	-0.328	13	119
1	0.9	0.1	14	119
1.1	0.9	0.2	15	119
1	0.9	0.1	16	119
0.8	0.9	-0.1	16	120
0.7	0.9	-0.2	16	121
0.7	0.9	-0.2	16	122

0.7	0.9	-0.2	16	123
0.6	0.9	-0.3	16	124
0.9	0.9	0	16	124
0.8	0.9	-0.1	16	125
0.7	0.9	-0.2	16	126
0.7	0.9	-0.2	16	127
0.5	0.9	-0.4	16	128
0.8	0.9	-0.1	16	129
0.8	0.9	-0.1	16	130
0.7	0.9	-0.2	16	131
0.572	0.9	-0.328	16	132
1.1	1	0.1	17	132
1	1	0	17	132
0.8	1	-0.2	17	133
0.7	1	-0.3	17	134
0.7	1	-0.3	17	135
0.7	1	-0.3	17	136
0.6	1	-0.4	17	137
0.9	1	-0.1	17	138
0.8	1	-0.2	17	139
0.7	1	-0.3	17	140
0.7	1	-0.3	17	141
0.5	1	-0.5	17	142
0.8	1	-0.2	17	143
0.8	1	-0.2	17	144
0.7	1	-0.3	17	145
0.572	1	-0.428	17	146
1	1.1	-0.1	17	147
0.8	1.1	-0.3	17	148
0.7	1.1	-0.4	17	149
0.7	1.1	-0.4	17	150
0.7	1.1	-0.4	17	151
0.6	1.1	-0.5	17	152
0.9	1.1	-0.2	17	153
0.8	1.1	-0.3	17	154
0.7	1.1	-0.4	17	155
0.7	1.1	-0.4	17	156
0.5	1.1	-0.6	17	157
0.8	1.1	-0.3	17	158
0.8	1.1	-0.3	17	159
0.7	1.1	-0.4	17	160
0.572	1.1	-0.528	17	161
0.8	1	-0.2	17	162
0.7	1	-0.3	17	163
0.7	1	-0.3	17	164
0.7	1	-0.3	17	165
0.6	1	-0.4	17	166
0.9	1	-0.1	17	167
0.8	1	-0.2	17	168
0.7	1	-0.3	17	169
0.7	1	-0.3	17	170
0.5	1	-0.5	17	171
0.8	1	-0.2	17	172
0.8	1	-0.2	17	173

0.7	1	-0.3	17	174
0.572	1	-0.428	17	175
0.7	0.8	-0.1	17	176
0.7	0.8	-0.1	17	177
0.7	0.8	-0.1	17	178
0.6	0.8	-0.2	17	179
0.9	0.8	0.1	18	179
0.8	0.8	0	18	179
0.7	0.8	-0.1	18	180
0.7	0.8	-0.1	18	181
0.5	0.8	-0.3	18	182
0.8	0.8	0	18	182
0.8	0.8	0	18	182
0.7	0.8	-0.1	18	183
0.572	0.8	-0.228	18	184
0.7	0.7	0	18	184
0.7	0.7	0	18	184
0.6	0.7	-0.1	18	185
0.9	0.7	0.2	19	185
0.8	0.7	0.1	20	185
0.7	0.7	0	20	185
0.7	0.7	0	20	185
0.5	0.7	-0.2	20	186
0.8	0.7	0.1	21	186
0.8	0.7	0.1	22	186
0.7	0.7	0	22	186
0.572	0.7	-0.128	22	187
0.7	0.7	0	22	187
0.6	0.7	-0.1	22	188
0.9	0.7	0.2	23	188
0.8	0.7	0.1	24	188
0.7	0.7	0	24	188
0.7	0.7	0	24	188
0.5	0.7	-0.2	24	189
0.8	0.7	0.1	25	189
0.8	0.7	0.1	26	189
0.7	0.7	0	26	189
0.572	0.7	-0.128	26	190
0.6	0.7	-0.1	26	191
0.9	0.7	0.2	27	191
0.8	0.7	0.1	28	191
0.7	0.7	0	28	191
0.7	0.7	0	28	191
0.5	0.7	-0.2	28	192
0.8	0.7	0.1	29	192
0.8	0.7	0.1	30	192
0.7	0.7	0	30	192
0.572	0.7	-0.128	30	193
0.9	0.6	0.3	31	193
0.8	0.6	0.2	32	193
0.7	0.6	0.1	33	193
0.7	0.6	0.1	34	193

0.5	0.6	-0.1	34	194
0.8	0.6	0.2	35	194
0.8	0.6	0.2	36	194
0.7	0.6	0.1	37	194
0.572	0.6	-0.028	37	195
0.8	0.9	-0.1	37	196
0.7	0.9	-0.2	37	197
0.7	0.9	-0.2	37	198
0.5	0.9	-0.4	37	199
0.8	0.9	-0.1	37	200
0.8	0.9	-0.1	37	201
0.7	0.9	-0.2	37	202
0.572	0.9	-0.328	37	203
0.7	0.8	-0.1	37	204
0.7	0.8	-0.1	37	205
0.5	0.8	-0.3	37	206
0.8	0.8	0	37	206
0.8	0.8	0	37	206
0.7	0.8	-0.1	37	207
0.572	0.8	-0.228	37	208
0.7	0.7	0	37	208
0.5	0.7	-0.2	37	209
0.8	0.7	0.1	38	209
0.8	0.7	0.1	39	209
0.7	0.7	0	39	209
0.572	0.7	-0.128	39	210
0.5	0.7	-0.2	39	211
0.8	0.7	0.1	40	211
0.8	0.7	0.1	41	211
0.7	0.7	0	41	211
0.572	0.7	-0.128	41	212
0.8	0.5	0.3	42	212
0.8	0.5	0.3	43	212
0.7	0.5	0.2	44	212
0.572	0.5	0.072	45	212
0.8	0.8	0	45	212
0.7	0.8	-0.1	45	213
0.572	0.8	-0.228	45	214
0.7	0.8	-0.1	45	215
0.572	0.8	-0.228	45	216
0.572	0.7	-0.128	45	217

S Statistic = 45 - 217 = -172

Tied Group Value	Members
1	4
2	2
3	5

4	0.8	4
5	0.7	6

Time Period	Observations
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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

There are 0 time periods with multiple data

A = 1140

B = 0

C = 228

D = 0

E = 76

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1770

Z-Score = -4.06452

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-4.06452 < -1.65463 indicating a downward 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
63	87	-24	10	17
77	87	-10	10	18
133	87	46	11	18
190	87	103	12	18
78	87	-9	12	19
96	87	9	13	19
110	87	23	14	19
93	87	6	15	19
64	87	-23	15	20
94	87	7	16	20
91	87	4	17	20
98	87	11	18	20
92	87	5	19	20
96	87	9	20	20
130	87	43	21	20
110	87	23	22	20
130	87	43	23	20
46	87	-41	23	21
130	87	43	24	21

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

78	133	-55	75	25
96	133	-37	75	26
110	133	-23	75	27
93	133	-40	75	28
64	133	-69	75	29
94	133	-39	75	30
91	133	-42	75	31
98	133	-35	75	32
92	133	-41	75	33
96	133	-37	75	34
130	133	-3	75	35
110	133	-23	75	36
130	133	-3	75	37
46	133	-87	75	38
130	133	-3	75	39
110	133	-23	75	40
130	133	-3	75	41
130	133	-3	75	42
130	133	-3	75	43
120	133	-13	75	44
140	133	7	76	44

78	190	-112	76	45
96	190	-94	76	46
110	190	-80	76	47
93	190	-97	76	48
64	190	-126	76	49
94	190	-96	76	50
91	190	-99	76	51
98	190	-92	76	52
92	190	-98	76	53
96	190	-94	76	54
130	190	-60	76	55
110	190	-80	76	56
130	190	-60	76	57
46	190	-144	76	58
130	190	-60	76	59
110	190	-80	76	60
130	190	-60	76	61
130	190	-60	76	62
130	190	-60	76	63
120	190	-70	76	64
140	190	-50	76	65

96	78	18	77	65
110	78	32	78	65
93	78	15	79	65
64	78	-14	79	66
94	78	16	80	66
91	78	13	81	66
98	78	20	82	66
92	78	14	83	66
96	78	18	84	66
130	78	52	85	66
110	78	32	86	66
130	78	52	87	66
46	78	-32	87	67

130	78	52	88	67
110	78	32	89	67
130	78	52	90	67
130	78	52	91	67
130	78	52	92	67
120	78	42	93	67
140	78	62	94	67
110	96	14	95	67
93	96	-3	95	68
64	96	-32	95	69
94	96	-2	95	70
91	96	-5	95	71
98	96	2	96	71
92	96	-4	96	72
96	96	0	96	72
130	96	34	97	72
110	96	14	98	72
130	96	34	99	72
46	96	-50	99	73
130	96	34	100	73
110	96	14	101	73
130	96	34	102	73
130	96	34	103	73
130	96	34	104	73
120	96	24	105	73
140	96	44	106	73
93	110	-17	106	74
64	110	-46	106	75
94	110	-16	106	76
91	110	-19	106	77
98	110	-12	106	78
92	110	-18	106	79
96	110	-14	106	80
130	110	20	107	80
110	110	0	107	80
130	110	20	108	80
46	110	-64	108	81
130	110	20	109	81
110	110	0	109	81
130	110	20	110	81
130	110	20	111	81
130	110	20	112	81
120	110	10	113	81
140	110	30	114	81
64	93	-29	114	82
94	93	1	115	82
91	93	-2	115	83
98	93	5	116	83
92	93	-1	116	84
96	93	3	117	84
130	93	37	118	84
110	93	17	119	84
130	93	37	120	84
46	93	-47	120	85

130	93	37	121	85
110	93	17	122	85
130	93	37	123	85
130	93	37	124	85
130	93	37	125	85
120	93	27	126	85
140	93	47	127	85
94	64	30	128	85
91	64	27	129	85
98	64	34	130	85
92	64	28	131	85
96	64	32	132	85
130	64	66	133	85
110	64	46	134	85
130	64	66	135	85
46	64	-18	135	86
130	64	66	136	86
110	64	46	137	86
130	64	66	138	86
130	64	66	139	86
130	64	66	140	86
120	64	56	141	86
140	64	76	142	86
91	94	-3	142	87
98	94	4	143	87
92	94	-2	143	88
96	94	2	144	88
130	94	36	145	88
110	94	16	146	88
130	94	36	147	88
46	94	-48	147	89
130	94	36	148	89
110	94	16	149	89
130	94	36	150	89
130	94	36	151	89
130	94	36	152	89
120	94	26	153	89
140	94	46	154	89
98	91	7	155	89
92	91	1	156	89
96	91	5	157	89
130	91	39	158	89
110	91	19	159	89
130	91	39	160	89
46	91	-45	160	90
130	91	39	161	90
110	91	19	162	90
130	91	39	163	90
130	91	39	164	90
130	91	39	165	90
120	91	29	166	90
140	91	49	167	90
92	98	-6	167	91

96	98	-2	167	92
130	98	32	168	92
110	98	12	169	92
130	98	32	170	92
46	98	-52	170	93
130	98	32	171	93
110	98	12	172	93
130	98	32	173	93
130	98	32	174	93
130	98	32	175	93
120	98	22	176	93
140	98	42	177	93
96	92	4	178	93
130	92	38	179	93
110	92	18	180	93
130	92	38	181	93
46	92	-46	181	94
130	92	38	182	94
110	92	18	183	94
130	92	38	184	94
130	92	38	185	94
130	92	38	186	94
120	92	28	187	94
140	92	48	188	94
130	96	34	189	94
110	96	14	190	94
130	96	34	191	94
46	96	-50	191	95
130	96	34	192	95
110	96	14	193	95
130	96	34	194	95
130	96	34	195	95
130	96	34	196	95
120	96	24	197	95
140	96	44	198	95
110	130	-20	198	96
130	130	0	198	96
46	130	-84	198	97
130	130	0	198	97
110	130	-20	198	98
130	130	0	198	98
130	130	0	198	98
130	130	0	198	98
120	130	-10	198	99
140	130	10	199	99
130	110	20	200	99
46	110	-64	200	100
130	110	20	201	100
110	110	0	201	100
130	110	20	202	100
130	110	20	203	100
130	110	20	204	100
120	110	10	205	100

140	110	30	206	100
46	130	-84	206	101
130	130	0	206	101
110	130	-20	206	102
130	130	0	206	102
130	130	0	206	102
130	130	0	206	102
120	130	-10	206	103
140	130	10	207	103
130	46	84	208	103
110	46	64	209	103
130	46	84	210	103
130	46	84	211	103
130	46	84	212	103
120	46	74	213	103
140	46	94	214	103
110	130	-20	214	104
130	130	0	214	104
130	130	0	214	104
130	130	0	214	104
120	130	-10	214	105
140	130	10	215	105
130	110	20	216	105
130	110	20	217	105
130	110	20	218	105
120	110	10	219	105
140	110	30	220	105
130	130	0	220	105
130	130	0	220	105
120	130	-10	220	106
140	130	10	221	106
130	130	0	221	106
120	130	-10	221	107
140	130	10	222	107
120	130	-10	222	108
140	130	10	223	108
140	120	20	224	108

S Statistic = 224 - 108 = 116

Tied Group Value	Members
1	96
2	110
3	130

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

There are 0 time periods with multiple data

A = 594

B = 0

C = 126

D = 0

E = 38

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2268

Z-Score = 2.41477

Comparison Level at 95% confidence level = 1.65463 (upward trend)

2.41477 > 1.65463 indicating an upward 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
3	3	0	16	7
2	3	-1	16	8
2	3	-1	16	9
57	3	54	17	9
47	3	44	18	9
9	3	6	19	9
44	3	41	20	9
43	3	40	21	9
23	3	20	22	9
16	3	13	23	9
ND<0	3	-3	23	10
28	3	25	24	10
16	3	13	25	10
ND<0	3	-3	25	11
9.3	3	6.3	26	11
ND<0	3	-3	26	12
57	3	54	27	12
15	3	12	28	12
30	3	27	29	12
ND<0	3	-3	29	13

24	3	21	30	13
10	3	7	31	13
5.1	3	2.1	32	13
ND<0	3	-3	32	14
2	3	-1	32	15
2	3	-1	32	16
57	3	54	33	16
47	3	44	34	16
9	3	6	35	16
44	3	41	36	16
43	3	40	37	16
23	3	20	38	16
16	3	13	39	16
ND<0	3	-3	39	17
28	3	25	40	17
16	3	13	41	17
ND<0	3	-3	41	18
9.3	3	6.3	42	18
ND<0	3	-3	42	19
57	3	54	43	19
15	3	12	44	19
30	3	27	45	19
ND<0	3	-3	45	20
24	3	21	46	20
10	3	7	47	20
5.1	3	2.1	48	20
ND<0	3	-3	48	21
2	2	0	48	21
57	2	55	49	21
47	2	45	50	21
9	2	7	51	21
44	2	42	52	21
43	2	41	53	21
23	2	21	54	21
16	2	14	55	21
ND<0	2	-2	55	22
28	2	26	56	22
16	2	14	57	22
ND<0	2	-2	57	23
9.3	2	7.3	58	23
ND<0	2	-2	58	24
57	2	55	59	24
15	2	13	60	24
30	2	28	61	24
ND<0	2	-2	61	25
24	2	22	62	25
10	2	8	63	25
5.1	2	3.1	64	25
ND<0	2	-2	64	26
57	2	55	65	26
47	2	45	66	26
9	2	7	67	26
44	2	42	68	26
43	2	41	69	26

23	2	21	70	26
16	2	14	71	26
ND<0	2	-2	71	27
28	2	26	72	27
16	2	14	73	27
ND<0	2	-2	73	28
9.3	2	7.3	74	28
ND<0	2	-2	74	29
57	2	55	75	29
15	2	13	76	29
30	2	28	77	29
ND<0	2	-2	77	30
24	2	22	78	30
10	2	8	79	30
5.1	2	3.1	80	30
ND<0	2	-2	80	31
47	57	-10	80	32
9	57	-48	80	33
44	57	-13	80	34
43	57	-14	80	35
23	57	-34	80	36
16	57	-41	80	37
ND<0	57	-57	80	38
28	57	-29	80	39
16	57	-41	80	40
ND<0	57	-57	80	41
9.3	57	-47.7	80	42
ND<0	57	-57	80	43
57	57	0	80	43
15	57	-42	80	44
30	57	-27	80	45
ND<0	57	-57	80	46
24	57	-33	80	47
10	57	-47	80	48
5.1	57	-51.9	80	49
ND<0	57	-57	80	50
9	47	-38	80	51
44	47	-3	80	52
43	47	-4	80	53
23	47	-24	80	54
16	47	-31	80	55
ND<0	47	-47	80	56
28	47	-19	80	57
16	47	-31	80	58
ND<0	47	-47	80	59
9.3	47	-37.7	80	60
ND<0	47	-47	80	61
57	47	10	81	61
15	47	-32	81	62
30	47	-17	81	63
ND<0	47	-47	81	64
24	47	-23	81	65
10	47	-37	81	66
5.1	47	-41.9	81	67
ND<0	47	-47	81	68

44	9	35	82	68
43	9	34	83	68
23	9	14	84	68
16	9	7	85	68
ND<0	9	-9	85	69
28	9	19	86	69
16	9	7	87	69
ND<0	9	-9	87	70
9.3	9	0.3	88	70
ND<0	9	-9	88	71
57	9	48	89	71
15	9	6	90	71
30	9	21	91	71
ND<0	9	-9	91	72
24	9	15	92	72
10	9	1	93	72
5.1	9	-3.9	93	73
ND<0	9	-9	93	74
43	44	-1	93	75
23	44	-21	93	76
16	44	-28	93	77
ND<0	44	-44	93	78
28	44	-16	93	79
16	44	-28	93	80
ND<0	44	-44	93	81
9.3	44	-34.7	93	82
ND<0	44	-44	93	83
57	44	13	94	83
15	44	-29	94	84
30	44	-14	94	85
ND<0	44	-44	94	86
24	44	-20	94	87
10	44	-34	94	88
5.1	44	-38.9	94	89
ND<0	44	-44	94	90
23	43	-20	94	91
16	43	-27	94	92
ND<0	43	-43	94	93
28	43	-15	94	94
16	43	-27	94	95
ND<0	43	-43	94	96
9.3	43	-33.7	94	97
ND<0	43	-43	94	98
57	43	14	95	98
15	43	-28	95	99
30	43	-13	95	100
ND<0	43	-43	95	101
24	43	-19	95	102
10	43	-33	95	103
5.1	43	-37.9	95	104
ND<0	43	-43	95	105
16	23	-7	95	106
ND<0	23	-23	95	107

28	23	5	96	107
16	23	-7	96	108
ND<0	23	-23	96	109
9.3	23	-13.7	96	110
ND<0	23	-23	96	111
57	23	34	97	111
15	23	-8	97	112
30	23	7	98	112
ND<0	23	-23	98	113
24	23	1	99	113
10	23	-13	99	114
5.1	23	-17.9	99	115
ND<0	23	-23	99	116
ND<0	16	-16	99	117
28	16	12	100	117
16	16	0	100	117
ND<0	16	-16	100	118
9.3	16	-6.7	100	119
ND<0	16	-16	100	120
57	16	41	101	120
15	16	-1	101	121
30	16	14	102	121
ND<0	16	-16	102	122
24	16	8	103	122
10	16	-6	103	123
5.1	16	-10.9	103	124
ND<0	16	-16	103	125
28	ND<0	28	104	125
16	ND<0	16	105	125
ND<0	ND<0	0	105	125
9.3	ND<0	9.3	106	125
ND<0	ND<0	0	106	125
57	ND<0	57	107	125
15	ND<0	15	108	125
30	ND<0	30	109	125
ND<0	ND<0	0	109	125
24	ND<0	24	110	125
10	ND<0	10	111	125
5.1	ND<0	5.1	112	125
ND<0	ND<0	0	112	125
16	28	-12	112	126
ND<0	28	-28	112	127
9.3	28	-18.7	112	128
ND<0	28	-28	112	129
57	28	29	113	129
15	28	-13	113	130
30	28	2	114	130
ND<0	28	-28	114	131
24	28	-4	114	132
10	28	-18	114	133
5.1	28	-22.9	114	134
ND<0	28	-28	114	135
ND<0	16	-16	114	136

9.3	16	-6.7	114	137
ND<0	16	-16	114	138
57	16	41	115	138
15	16	-1	115	139
30	16	14	116	139
ND<0	16	-16	116	140
24	16	8	117	140
10	16	-6	117	141
5.1	16	-10.9	117	142
ND<0	16	-16	117	143
9.3	ND<0	9.3	118	143
ND<0	ND<0	0	118	143
57	ND<0	57	119	143
15	ND<0	15	120	143
30	ND<0	30	121	143
ND<0	ND<0	0	121	143
24	ND<0	24	122	143
10	ND<0	10	123	143
5.1	ND<0	5.1	124	143
ND<0	ND<0	0	124	143
ND<0	9.3	-9.3	124	144
57	9.3	47.7	125	144
15	9.3	5.7	126	144
30	9.3	20.7	127	144
ND<0	9.3	-9.3	127	145
24	9.3	14.7	128	145
10	9.3	0.7	129	145
5.1	9.3	-4.2	129	146
ND<0	9.3	-9.3	129	147
57	ND<0	57	130	147
15	ND<0	15	131	147
30	ND<0	30	132	147
ND<0	ND<0	0	132	147
24	ND<0	24	133	147
10	ND<0	10	134	147
5.1	ND<0	5.1	135	147
ND<0	ND<0	0	135	147
15	57	-42	135	148
30	57	-27	135	149
ND<0	57	-57	135	150
24	57	-33	135	151
10	57	-47	135	152
5.1	57	-51.9	135	153
ND<0	57	-57	135	154
30	15	15	136	154
ND<0	15	-15	136	155
24	15	9	137	155
10	15	-5	137	156
5.1	15	-9.9	137	157
ND<0	15	-15	137	158
ND<0	30	-30	137	159

24	30	-6	137	160
10	30	-20	137	161
5.1	30	-24.9	137	162
ND<0	30	-30	137	163
24	ND<0	24	138	163
10	ND<0	10	139	163
5.1	ND<0	5.1	140	163
ND<0	ND<0	0	140	163
10	24	-14	140	164
5.1	24	-18.9	140	165
ND<0	24	-24	140	166
5.1	10	-4.9	140	167
ND<0	10	-10	140	168
ND<0	5.1	-5.1	140	169

S Statistic = 140 - 169 = -29

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

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

There are 0 time periods with multiple data

A = 420
B = 0
C = 66
D = 0
E = 32
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2035
Z-Score = -0.620692
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.620692 <= 1.65463 indicating no evidence of an upward 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
3	3	0	16	7
2	3	-1	16	8
2	3	-1	16	9
57	3	54	17	9
47	3	44	18	9
9	3	6	19	9
44	3	41	20	9
43	3	40	21	9
23	3	20	22	9
16	3	13	23	9
ND<0	3	-3	23	10
28	3	25	24	10
16	3	13	25	10
ND<0	3	-3	25	11
9.3	3	6.3	26	11
ND<0	3	-3	26	12
57	3	54	27	12
15	3	12	28	12
30	3	27	29	12
ND<0	3	-3	29	13

24	3	21	30	13
10	3	7	31	13
5.1	3	2.1	32	13
ND<0	3	-3	32	14
2	3	-1	32	15
2	3	-1	32	16
57	3	54	33	16
47	3	44	34	16
9	3	6	35	16
44	3	41	36	16
43	3	40	37	16
23	3	20	38	16
16	3	13	39	16
ND<0	3	-3	39	17
28	3	25	40	17
16	3	13	41	17
ND<0	3	-3	41	18
9.3	3	6.3	42	18
ND<0	3	-3	42	19
57	3	54	43	19
15	3	12	44	19
30	3	27	45	19
ND<0	3	-3	45	20
24	3	21	46	20
10	3	7	47	20
5.1	3	2.1	48	20
ND<0	3	-3	48	21
2	2	0	48	21
57	2	55	49	21
47	2	45	50	21
9	2	7	51	21
44	2	42	52	21
43	2	41	53	21
23	2	21	54	21
16	2	14	55	21
ND<0	2	-2	55	22
28	2	26	56	22
16	2	14	57	22
ND<0	2	-2	57	23
9.3	2	7.3	58	23
ND<0	2	-2	58	24
57	2	55	59	24
15	2	13	60	24
30	2	28	61	24
ND<0	2	-2	61	25
24	2	22	62	25
10	2	8	63	25
5.1	2	3.1	64	25
ND<0	2	-2	64	26
57	2	55	65	26
47	2	45	66	26
9	2	7	67	26
44	2	42	68	26
43	2	41	69	26

23	2	21	70	26
16	2	14	71	26
ND<0	2	-2	71	27
28	2	26	72	27
16	2	14	73	27
ND<0	2	-2	73	28
9.3	2	7.3	74	28
ND<0	2	-2	74	29
57	2	55	75	29
15	2	13	76	29
30	2	28	77	29
ND<0	2	-2	77	30
24	2	22	78	30
10	2	8	79	30
5.1	2	3.1	80	30
ND<0	2	-2	80	31
47	57	-10	80	32
9	57	-48	80	33
44	57	-13	80	34
43	57	-14	80	35
23	57	-34	80	36
16	57	-41	80	37
ND<0	57	-57	80	38
28	57	-29	80	39
16	57	-41	80	40
ND<0	57	-57	80	41
9.3	57	-47.7	80	42
ND<0	57	-57	80	43
57	57	0	80	43
15	57	-42	80	44
30	57	-27	80	45
ND<0	57	-57	80	46
24	57	-33	80	47
10	57	-47	80	48
5.1	57	-51.9	80	49
ND<0	57	-57	80	50
9	47	-38	80	51
44	47	-3	80	52
43	47	-4	80	53
23	47	-24	80	54
16	47	-31	80	55
ND<0	47	-47	80	56
28	47	-19	80	57
16	47	-31	80	58
ND<0	47	-47	80	59
9.3	47	-37.7	80	60
ND<0	47	-47	80	61
57	47	10	81	61
15	47	-32	81	62
30	47	-17	81	63
ND<0	47	-47	81	64
24	47	-23	81	65
10	47	-37	81	66
5.1	47	-41.9	81	67
ND<0	47	-47	81	68

44	9	35	82	68
43	9	34	83	68
23	9	14	84	68
16	9	7	85	68
ND<0	9	-9	85	69
28	9	19	86	69
16	9	7	87	69
ND<0	9	-9	87	70
9.3	9	0.3	88	70
ND<0	9	-9	88	71
57	9	48	89	71
15	9	6	90	71
30	9	21	91	71
ND<0	9	-9	91	72
24	9	15	92	72
10	9	1	93	72
5.1	9	-3.9	93	73
ND<0	9	-9	93	74
43	44	-1	93	75
23	44	-21	93	76
16	44	-28	93	77
ND<0	44	-44	93	78
28	44	-16	93	79
16	44	-28	93	80
ND<0	44	-44	93	81
9.3	44	-34.7	93	82
ND<0	44	-44	93	83
57	44	13	94	83
15	44	-29	94	84
30	44	-14	94	85
ND<0	44	-44	94	86
24	44	-20	94	87
10	44	-34	94	88
5.1	44	-38.9	94	89
ND<0	44	-44	94	90
23	43	-20	94	91
16	43	-27	94	92
ND<0	43	-43	94	93
28	43	-15	94	94
16	43	-27	94	95
ND<0	43	-43	94	96
9.3	43	-33.7	94	97
ND<0	43	-43	94	98
57	43	14	95	98
15	43	-28	95	99
30	43	-13	95	100
ND<0	43	-43	95	101
24	43	-19	95	102
10	43	-33	95	103
5.1	43	-37.9	95	104
ND<0	43	-43	95	105
16	23	-7	95	106
ND<0	23	-23	95	107

28	23	5	96	107
16	23	-7	96	108
ND<0	23	-23	96	109
9.3	23	-13.7	96	110
ND<0	23	-23	96	111
57	23	34	97	111
15	23	-8	97	112
30	23	7	98	112
ND<0	23	-23	98	113
24	23	1	99	113
10	23	-13	99	114
5.1	23	-17.9	99	115
ND<0	23	-23	99	116
ND<0	16	-16	99	117
28	16	12	100	117
16	16	0	100	117
ND<0	16	-16	100	118
9.3	16	-6.7	100	119
ND<0	16	-16	100	120
57	16	41	101	120
15	16	-1	101	121
30	16	14	102	121
ND<0	16	-16	102	122
24	16	8	103	122
10	16	-6	103	123
5.1	16	-10.9	103	124
ND<0	16	-16	103	125
28	ND<0	28	104	125
16	ND<0	16	105	125
ND<0	ND<0	0	105	125
9.3	ND<0	9.3	106	125
ND<0	ND<0	0	106	125
57	ND<0	57	107	125
15	ND<0	15	108	125
30	ND<0	30	109	125
ND<0	ND<0	0	109	125
24	ND<0	24	110	125
10	ND<0	10	111	125
5.1	ND<0	5.1	112	125
ND<0	ND<0	0	112	125
16	28	-12	112	126
ND<0	28	-28	112	127
9.3	28	-18.7	112	128
ND<0	28	-28	112	129
57	28	29	113	129
15	28	-13	113	130
30	28	2	114	130
ND<0	28	-28	114	131
24	28	-4	114	132
10	28	-18	114	133
5.1	28	-22.9	114	134
ND<0	28	-28	114	135
ND<0	16	-16	114	136

9.3	16	-6.7	114	137
ND<0	16	-16	114	138
57	16	41	115	138
15	16	-1	115	139
30	16	14	116	139
ND<0	16	-16	116	140
24	16	8	117	140
10	16	-6	117	141
5.1	16	-10.9	117	142
ND<0	16	-16	117	143
9.3	ND<0	9.3	118	143
ND<0	ND<0	0	118	143
57	ND<0	57	119	143
15	ND<0	15	120	143
30	ND<0	30	121	143
ND<0	ND<0	0	121	143
24	ND<0	24	122	143
10	ND<0	10	123	143
5.1	ND<0	5.1	124	143
ND<0	ND<0	0	124	143
ND<0	9.3	-9.3	124	144
57	9.3	47.7	125	144
15	9.3	5.7	126	144
30	9.3	20.7	127	144
ND<0	9.3	-9.3	127	145
24	9.3	14.7	128	145
10	9.3	0.7	129	145
5.1	9.3	-4.2	129	146
ND<0	9.3	-9.3	129	147
57	ND<0	57	130	147
15	ND<0	15	131	147
30	ND<0	30	132	147
ND<0	ND<0	0	132	147
24	ND<0	24	133	147
10	ND<0	10	134	147
5.1	ND<0	5.1	135	147
ND<0	ND<0	0	135	147
15	57	-42	135	148
30	57	-27	135	149
ND<0	57	-57	135	150
24	57	-33	135	151
10	57	-47	135	152
5.1	57	-51.9	135	153
ND<0	57	-57	135	154
30	15	15	136	154
ND<0	15	-15	136	155
24	15	9	137	155
10	15	-5	137	156
5.1	15	-9.9	137	157
ND<0	15	-15	137	158
ND<0	30	-30	137	159

24	30	-6	137	160
10	30	-20	137	161
5.1	30	-24.9	137	162
ND<0	30	-30	137	163
24	ND<0	24	138	163
10	ND<0	10	139	163
5.1	ND<0	5.1	140	163
ND<0	ND<0	0	140	163
10	24	-14	140	164
5.1	24	-18.9	140	165
ND<0	24	-24	140	166
5.1	10	-4.9	140	167
ND<0	10	-10	140	168
ND<0	5.1	-5.1	140	169

S Statistic = 140 - 169 = -29

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

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

There are 0 time periods with multiple data

A = 420
B = 0
C = 66
D = 0
E = 32
F = 0
a = 37050
b = 140400
c = 1300
Group Variance = 2035
Z-Score = -0.620692
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.620692 >= -1.65463 indicating no evidence of a downward 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
39	91	-52	8	13
35	91	-56	8	14
36	91	-55	8	15
35	91	-56	8	16
33	91	-58	8	17
32	91	-59	8	18
31	91	-60	8	19
37	91	-54	8	20
34	91	-57	8	21
39	91	-52	8	22
30	91	-61	8	23
30	91	-61	8	24
28	91	-63	8	25
28	91	-63	8	26
26	91	-65	8	27
25	91	-66	8	28
26	91	-65	8	29
27	91	-64	8	30
20	91	-71	8	31
35	91	-56	8	32
35	39	-4	8	33
36	39	-3	8	34
35	39	-4	8	35

33	39	-6	8	36
32	39	-7	8	37
31	39	-8	8	38
37	39	-2	8	39
34	39	-5	8	40
39	39	0	8	40
30	39	-9	8	41
30	39	-9	8	42
28	39	-11	8	43
28	39	-11	8	44
26	39	-13	8	45
25	39	-14	8	46
26	39	-13	8	47
27	39	-12	8	48
20	39	-19	8	49
35	39	-4	8	50
36	35	1	9	50
35	35	0	9	50
33	35	-2	9	51
32	35	-3	9	52
31	35	-4	9	53
37	35	2	10	53
34	35	-1	10	54
39	35	4	11	54
30	35	-5	11	55
30	35	-5	11	56
28	35	-7	11	57
28	35	-7	11	58
26	35	-9	11	59
25	35	-10	11	60
26	35	-9	11	61
27	35	-8	11	62
20	35	-15	11	63
35	35	0	11	63
35	36	-1	11	64
33	36	-3	11	65
32	36	-4	11	66
31	36	-5	11	67
37	36	1	12	67
34	36	-2	12	68
39	36	3	13	68
30	36	-6	13	69
30	36	-6	13	70
28	36	-8	13	71
28	36	-8	13	72
26	36	-10	13	73
25	36	-11	13	74
26	36	-10	13	75
27	36	-9	13	76
20	36	-16	13	77
35	36	-1	13	78
33	35	-2	13	79
32	35	-3	13	80
31	35	-4	13	81

37	35	2	14	81
34	35	-1	14	82
39	35	4	15	82
30	35	-5	15	83
30	35	-5	15	84
28	35	-7	15	85
28	35	-7	15	86
26	35	-9	15	87
25	35	-10	15	88
26	35	-9	15	89
27	35	-8	15	90
20	35	-15	15	91
35	35	0	15	91
32	33	-1	15	92
31	33	-2	15	93
37	33	4	16	93
34	33	1	17	93
39	33	6	18	93
30	33	-3	18	94
30	33	-3	18	95
28	33	-5	18	96
28	33	-5	18	97
26	33	-7	18	98
25	33	-8	18	99
26	33	-7	18	100
27	33	-6	18	101
20	33	-13	18	102
35	33	2	19	102
31	32	-1	19	103
37	32	5	20	103
34	32	2	21	103
39	32	7	22	103
30	32	-2	22	104
30	32	-2	22	105
28	32	-4	22	106
28	32	-4	22	107
26	32	-6	22	108
25	32	-7	22	109
26	32	-6	22	110
27	32	-5	22	111
20	32	-12	22	112
35	32	3	23	112
37	31	6	24	112
34	31	3	25	112
39	31	8	26	112
30	31	-1	26	113
30	31	-1	26	114
28	31	-3	26	115
28	31	-3	26	116
26	31	-5	26	117
25	31	-6	26	118
26	31	-5	26	119
27	31	-4	26	120
20	31	-11	26	121

35	31	4	27	121
34	37	-3	27	122
39	37	2	28	122
30	37	-7	28	123
30	37	-7	28	124
28	37	-9	28	125
28	37	-9	28	126
26	37	-11	28	127
25	37	-12	28	128
26	37	-11	28	129
27	37	-10	28	130
20	37	-17	28	131
35	37	-2	28	132
39	34	5	29	132
30	34	-4	29	133
30	34	-4	29	134
28	34	-6	29	135
28	34	-6	29	136
26	34	-8	29	137
25	34	-9	29	138
26	34	-8	29	139
27	34	-7	29	140
20	34	-14	29	141
35	34	1	30	141
30	39	-9	30	142
30	39	-9	30	143
28	39	-11	30	144
28	39	-11	30	145
26	39	-13	30	146
25	39	-14	30	147
26	39	-13	30	148
27	39	-12	30	149
20	39	-19	30	150
35	39	-4	30	151
30	30	0	30	151
28	30	-2	30	152
28	30	-2	30	153
26	30	-4	30	154
25	30	-5	30	155
26	30	-4	30	156
27	30	-3	30	157
20	30	-10	30	158
35	30	5	31	158
28	30	-2	31	159
28	30	-2	31	160
26	30	-4	31	161
25	30	-5	31	162
26	30	-4	31	163
27	30	-3	31	164
20	30	-10	31	165
35	30	5	32	165

28	28	0	32	165
26	28	-2	32	166
25	28	-3	32	167
26	28	-2	32	168
27	28	-1	32	169
20	28	-8	32	170
35	28	7	33	170
26	28	-2	33	171
25	28	-3	33	172
26	28	-2	33	173
27	28	-1	33	174
20	28	-8	33	175
35	28	7	34	175
25	26	-1	34	176
26	26	0	34	176
27	26	1	35	176
20	26	-6	35	177
35	26	9	36	177
26	25	1	37	177
27	25	2	38	177
20	25	-5	38	178
35	25	10	39	178
27	26	1	40	178
20	26	-6	40	179
35	26	9	41	179
20	27	-7	41	180
35	27	8	42	180
35	20	15	43	180

S Statistic = 43 - 180 = -137

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

There are 0 time periods with multiple data

A = 156

B = 0

C = 6

D = 0

E = 16

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1249

Z-Score = -3.8482

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-3.8482 < -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
358	290	68	5	20
699	290	409	6	20
480	290	190	7	20
350	290	60	8	20
300	290	10	9	20
290	290	0	9	20
260	290	-30	9	21
270	290	-20	9	22
260	290	-30	9	23
280	290	-10	9	24
280	290	-10	9	25
260	290	-30	9	26
260	290	-30	9	27
280	290	-10	9	28
290	290	0	9	28
280	290	-10	9	29
250	290	-40	9	30
240	290	-50	9	31
230	290	-60	9	32
210	290	-80	9	33
220	290	-70	9	34

190	290	-100	9	35
190	290	-100	9	36
699	358	341	10	36
480	358	122	11	36
350	358	-8	11	37
300	358	-58	11	38
290	358	-68	11	39
260	358	-98	11	40
270	358	-88	11	41
260	358	-98	11	42
280	358	-78	11	43
280	358	-78	11	44
260	358	-98	11	45
260	358	-98	11	46
280	358	-78	11	47
290	358	-68	11	48
280	358	-78	11	49
250	358	-108	11	50
240	358	-118	11	51
230	358	-128	11	52
210	358	-148	11	53
220	358	-138	11	54
190	358	-168	11	55
190	358	-168	11	56
480	699	-219	11	57
350	699	-349	11	58
300	699	-399	11	59
290	699	-409	11	60
260	699	-439	11	61
270	699	-429	11	62
260	699	-439	11	63
280	699	-419	11	64
280	699	-419	11	65
260	699	-439	11	66
260	699	-439	11	67
280	699	-419	11	68
290	699	-409	11	69
280	699	-419	11	70
250	699	-449	11	71
240	699	-459	11	72
230	699	-469	11	73
210	699	-489	11	74
220	699	-479	11	75
190	699	-509	11	76
190	699	-509	11	77
350	480	-130	11	78
300	480	-180	11	79
290	480	-190	11	80
260	480	-220	11	81
270	480	-210	11	82
260	480	-220	11	83
280	480	-200	11	84
280	480	-200	11	85
260	480	-220	11	86

260	480	-220	11	87
280	480	-200	11	88
290	480	-190	11	89
280	480	-200	11	90
250	480	-230	11	91
240	480	-240	11	92
230	480	-250	11	93
210	480	-270	11	94
220	480	-260	11	95
190	480	-290	11	96
190	480	-290	11	97
300	350	-50	11	98
290	350	-60	11	99
260	350	-90	11	100
270	350	-80	11	101
260	350	-90	11	102
280	350	-70	11	103
280	350	-70	11	104
260	350	-90	11	105
260	350	-90	11	106
280	350	-70	11	107
290	350	-60	11	108
280	350	-70	11	109
250	350	-100	11	110
240	350	-110	11	111
230	350	-120	11	112
210	350	-140	11	113
220	350	-130	11	114
190	350	-160	11	115
190	350	-160	11	116
290	300	-10	11	117
260	300	-40	11	118
270	300	-30	11	119
260	300	-40	11	120
280	300	-20	11	121
280	300	-20	11	122
260	300	-40	11	123
260	300	-40	11	124
280	300	-20	11	125
290	300	-10	11	126
280	300	-20	11	127
250	300	-50	11	128
240	300	-60	11	129
230	300	-70	11	130
210	300	-90	11	131
220	300	-80	11	132
190	300	-110	11	133
190	300	-110	11	134
260	290	-30	11	135
270	290	-20	11	136
260	290	-30	11	137
280	290	-10	11	138
280	290	-10	11	139
260	290	-30	11	140

260	290	-30	11	141
280	290	-10	11	142
290	290	0	11	142
280	290	-10	11	143
250	290	-40	11	144
240	290	-50	11	145
230	290	-60	11	146
210	290	-80	11	147
220	290	-70	11	148
190	290	-100	11	149
190	290	-100	11	150
270	260	10	12	150
260	260	0	12	150
280	260	20	13	150
280	260	20	14	150
260	260	0	14	150
260	260	0	14	150
280	260	20	15	150
290	260	30	16	150
280	260	20	17	150
250	260	-10	17	151
240	260	-20	17	152
230	260	-30	17	153
210	260	-50	17	154
220	260	-40	17	155
190	260	-70	17	156
190	260	-70	17	157
260	270	-10	17	158
280	270	10	18	158
280	270	10	19	158
260	270	-10	19	159
260	270	-10	19	160
280	270	10	20	160
290	270	20	21	160
280	270	10	22	160
250	270	-20	22	161
240	270	-30	22	162
230	270	-40	22	163
210	270	-60	22	164
220	270	-50	22	165
190	270	-80	22	166
190	270	-80	22	167
280	260	20	23	167
280	260	20	24	167
260	260	0	24	167
260	260	0	24	167
280	260	20	25	167
290	260	30	26	167
280	260	20	27	167
250	260	-10	27	168
240	260	-20	27	169
230	260	-30	27	170
210	260	-50	27	171
220	260	-40	27	172

190	260	-70	27	173
190	260	-70	27	174
280	280	0	27	174
260	280	-20	27	175
260	280	-20	27	176
280	280	0	27	176
290	280	10	28	176
280	280	0	28	176
250	280	-30	28	177
240	280	-40	28	178
230	280	-50	28	179
210	280	-70	28	180
220	280	-60	28	181
190	280	-90	28	182
190	280	-90	28	183
260	280	-20	28	184
260	280	-20	28	185
280	280	0	28	185
290	280	10	29	185
280	280	0	29	185
250	280	-30	29	186
240	280	-40	29	187
230	280	-50	29	188
210	280	-70	29	189
220	280	-60	29	190
190	280	-90	29	191
190	280	-90	29	192
260	260	0	29	192
280	260	20	30	192
290	260	30	31	192
280	260	20	32	192
250	260	-10	32	193
240	260	-20	32	194
230	260	-30	32	195
210	260	-50	32	196
220	260	-40	32	197
190	260	-70	32	198
190	260	-70	32	199
280	260	20	33	199
290	260	30	34	199
280	260	20	35	199
250	260	-10	35	200
240	260	-20	35	201
230	260	-30	35	202
210	260	-50	35	203
220	260	-40	35	204
190	260	-70	35	205
190	260	-70	35	206
290	280	10	36	206
280	280	0	36	206
250	280	-30	36	207
240	280	-40	36	208

230	280	-50	36	209
210	280	-70	36	210
220	280	-60	36	211
190	280	-90	36	212
190	280	-90	36	213
280	290	-10	36	214
250	290	-40	36	215
240	290	-50	36	216
230	290	-60	36	217
210	290	-80	36	218
220	290	-70	36	219
190	290	-100	36	220
190	290	-100	36	221
250	280	-30	36	222
240	280	-40	36	223
230	280	-50	36	224
210	280	-70	36	225
220	280	-60	36	226
190	280	-90	36	227
190	280	-90	36	228
240	250	-10	36	229
230	250	-20	36	230
210	250	-40	36	231
220	250	-30	36	232
190	250	-60	36	233
190	250	-60	36	234
230	240	-10	36	235
210	240	-30	36	236
220	240	-20	36	237
190	240	-50	36	238
190	240	-50	36	239
210	230	-20	36	240
220	230	-10	36	241
190	230	-40	36	242
190	230	-40	36	243
220	210	10	37	243
190	210	-20	37	244
190	210	-20	37	245
190	220	-30	37	246
190	220	-30	37	247
190	190	0	37	247

S Statistic = 37 - 247 = -210

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

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

There are 0 time periods with multiple data

A = 396

B = 0

C = 54

D = 0

E = 32

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1811.33

Z-Score = -4.91074

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-4.91074 < -1.65463 indicating 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
3140	2190	950	8	17
3030	2190	840	9	17
3000	2190	810	10	17
3600	2190	1410	11	17
2200	2190	10	12	17
4500	2190	2310	13	17
2100	2190	-90	13	18
2000	2190	-190	13	19
2100	2190	-90	13	20
1900	2190	-290	13	21
2100	2190	-90	13	22
2200	2190	10	14	22
2100	2190	-90	14	23
2300	2190	110	15	23
2400	2190	210	16	23
2500	2190	310	17	23
2800	2190	610	18	23
3000	2190	810	19	23
1900	2190	-290	19	24
2000	2190	-190	19	25
2500	2190	310	20	25

2400	2190	210	21	25
3800	2190	1610	22	25
3030	3140	-110	22	26
3000	3140	-140	22	27
3600	3140	460	23	27
2200	3140	-940	23	28
4500	3140	1360	24	28
2100	3140	-1040	24	29
2000	3140	-1140	24	30
2100	3140	-1040	24	31
1900	3140	-1240	24	32
2100	3140	-1040	24	33
2200	3140	-940	24	34
2100	3140	-1040	24	35
2300	3140	-840	24	36
2400	3140	-740	24	37
2500	3140	-640	24	38
2800	3140	-340	24	39
3000	3140	-140	24	40
1900	3140	-1240	24	41
2000	3140	-1140	24	42
2500	3140	-640	24	43
2400	3140	-740	24	44
3800	3140	660	25	44
3000	3030	-30	25	45
3600	3030	570	26	45
2200	3030	-830	26	46
4500	3030	1470	27	46
2100	3030	-930	27	47
2000	3030	-1030	27	48
2100	3030	-930	27	49
1900	3030	-1130	27	50
2100	3030	-930	27	51
2200	3030	-830	27	52
2100	3030	-930	27	53
2300	3030	-730	27	54
2400	3030	-630	27	55
2500	3030	-530	27	56
2800	3030	-230	27	57
3000	3030	-30	27	58
1900	3030	-1130	27	59
2000	3030	-1030	27	60
2500	3030	-530	27	61
2400	3030	-630	27	62
3800	3030	770	28	62
3600	3000	600	29	62
2200	3000	-800	29	63
4500	3000	1500	30	63
2100	3000	-900	30	64
2000	3000	-1000	30	65
2100	3000	-900	30	66
1900	3000	-1100	30	67
2100	3000	-900	30	68
2200	3000	-800	30	69

2100	3000	-900	30	70
2300	3000	-700	30	71
2400	3000	-600	30	72
2500	3000	-500	30	73
2800	3000	-200	30	74
3000	3000	0	30	74
1900	3000	-1100	30	75
2000	3000	-1000	30	76
2500	3000	-500	30	77
2400	3000	-600	30	78
3800	3000	800	31	78
2200	3600	-1400	31	79
4500	3600	900	32	79
2100	3600	-1500	32	80
2000	3600	-1600	32	81
2100	3600	-1500	32	82
1900	3600	-1700	32	83
2100	3600	-1500	32	84
2200	3600	-1400	32	85
2100	3600	-1500	32	86
2300	3600	-1300	32	87
2400	3600	-1200	32	88
2500	3600	-1100	32	89
2800	3600	-800	32	90
3000	3600	-600	32	91
1900	3600	-1700	32	92
2000	3600	-1600	32	93
2500	3600	-1100	32	94
2400	3600	-1200	32	95
3800	3600	200	33	95
4500	2200	2300	34	95
2100	2200	-100	34	96
2000	2200	-200	34	97
2100	2200	-100	34	98
1900	2200	-300	34	99
2100	2200	-100	34	100
2200	2200	0	34	100
2100	2200	-100	34	101
2300	2200	100	35	101
2400	2200	200	36	101
2500	2200	300	37	101
2800	2200	600	38	101
3000	2200	800	39	101
1900	2200	-300	39	102
2000	2200	-200	39	103
2500	2200	300	40	103
2400	2200	200	41	103
3800	2200	1600	42	103
2100	4500	-2400	42	104
2000	4500	-2500	42	105
2100	4500	-2400	42	106
1900	4500	-2600	42	107
2100	4500	-2400	42	108
2200	4500	-2300	42	109

2100	4500	-2400	42	110
2300	4500	-2200	42	111
2400	4500	-2100	42	112
2500	4500	-2000	42	113
2800	4500	-1700	42	114
3000	4500	-1500	42	115
1900	4500	-2600	42	116
2000	4500	-2500	42	117
2500	4500	-2000	42	118
2400	4500	-2100	42	119
3800	4500	-700	42	120
2000	2100	-100	42	121
2100	2100	0	42	121
1900	2100	-200	42	122
2100	2100	0	42	122
2200	2100	100	43	122
2100	2100	0	43	122
2300	2100	200	44	122
2400	2100	300	45	122
2500	2100	400	46	122
2800	2100	700	47	122
3000	2100	900	48	122
1900	2100	-200	48	123
2000	2100	-100	48	124
2500	2100	400	49	124
2400	2100	300	50	124
3800	2100	1700	51	124
2100	2000	100	52	124
1900	2000	-100	52	125
2100	2000	100	53	125
2200	2000	200	54	125
2100	2000	100	55	125
2300	2000	300	56	125
2400	2000	400	57	125
2500	2000	500	58	125
2800	2000	800	59	125
3000	2000	1000	60	125
1900	2000	-100	60	126
2000	2000	0	60	126
2500	2000	500	61	126
2400	2000	400	62	126
3800	2000	1800	63	126
1900	2100	-200	63	127
2100	2100	0	63	127
2200	2100	100	64	127
2100	2100	0	64	127
2300	2100	200	65	127
2400	2100	300	66	127
2500	2100	400	67	127
2800	2100	700	68	127
3000	2100	900	69	127
1900	2100	-200	69	128
2000	2100	-100	69	129
2500	2100	400	70	129

2400	2100	300	71	129
3800	2100	1700	72	129
2100	1900	200	73	129
2200	1900	300	74	129
2100	1900	200	75	129
2300	1900	400	76	129
2400	1900	500	77	129
2500	1900	600	78	129
2800	1900	900	79	129
3000	1900	1100	80	129
1900	1900	0	80	129
2000	1900	100	81	129
2500	1900	600	82	129
2400	1900	500	83	129
3800	1900	1900	84	129
2200	2100	100	85	129
2100	2100	0	85	129
2300	2100	200	86	129
2400	2100	300	87	129
2500	2100	400	88	129
2800	2100	700	89	129
3000	2100	900	90	129
1900	2100	-200	90	130
2000	2100	-100	90	131
2500	2100	400	91	131
2400	2100	300	92	131
3800	2100	1700	93	131
2100	2200	-100	93	132
2300	2200	100	94	132
2400	2200	200	95	132
2500	2200	300	96	132
2800	2200	600	97	132
3000	2200	800	98	132
1900	2200	-300	98	133
2000	2200	-200	98	134
2500	2200	300	99	134
2400	2200	200	100	134
3800	2200	1600	101	134
2300	2100	200	102	134
2400	2100	300	103	134
2500	2100	400	104	134
2800	2100	700	105	134
3000	2100	900	106	134
1900	2100	-200	106	135
2000	2100	-100	106	136
2500	2100	400	107	136
2400	2100	300	108	136
3800	2100	1700	109	136
2400	2300	100	110	136
2500	2300	200	111	136
2800	2300	500	112	136
3000	2300	700	113	136

1900	2300	-400	113	137
2000	2300	-300	113	138
2500	2300	200	114	138
2400	2300	100	115	138
3800	2300	1500	116	138
2500	2400	100	117	138
2800	2400	400	118	138
3000	2400	600	119	138
1900	2400	-500	119	139
2000	2400	-400	119	140
2500	2400	100	120	140
2400	2400	0	120	140
3800	2400	1400	121	140
2800	2500	300	122	140
3000	2500	500	123	140
1900	2500	-600	123	141
2000	2500	-500	123	142
2500	2500	0	123	142
2400	2500	-100	123	143
3800	2500	1300	124	143
3000	2800	200	125	143
1900	2800	-900	125	144
2000	2800	-800	125	145
2500	2800	-300	125	146
2400	2800	-400	125	147
3800	2800	1000	126	147
1900	3000	-1100	126	148
2000	3000	-1000	126	149
2500	3000	-500	126	150
2400	3000	-600	126	151
3800	3000	800	127	151
2000	1900	100	128	151
2500	1900	600	129	151
2400	1900	500	130	151
3800	1900	1900	131	151
2500	2000	500	132	151
2400	2000	400	133	151
3800	2000	1800	134	151
2400	2500	-100	134	152
3800	2500	1300	135	152
3800	2400	1400	136	152

S Statistic = 136 - 152 = -16

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
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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

There are 0 time periods with multiple data

A = 264

B = 0

C = 24

D = 0

E = 24

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1818.67

Z-Score = -0.351734

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-0.351734 <= 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
3140	2190	950	8	17
3030	2190	840	9	17
3000	2190	810	10	17
3600	2190	1410	11	17
2200	2190	10	12	17
4500	2190	2310	13	17
2100	2190	-90	13	18
2000	2190	-190	13	19
2100	2190	-90	13	20
1900	2190	-290	13	21
2100	2190	-90	13	22
2200	2190	10	14	22
2100	2190	-90	14	23
2300	2190	110	15	23
2400	2190	210	16	23
2500	2190	310	17	23
2800	2190	610	18	23
3000	2190	810	19	23
1900	2190	-290	19	24
2000	2190	-190	19	25
2500	2190	310	20	25

2400	2190	210	21	25
3800	2190	1610	22	25
3030	3140	-110	22	26
3000	3140	-140	22	27
3600	3140	460	23	27
2200	3140	-940	23	28
4500	3140	1360	24	28
2100	3140	-1040	24	29
2000	3140	-1140	24	30
2100	3140	-1040	24	31
1900	3140	-1240	24	32
2100	3140	-1040	24	33
2200	3140	-940	24	34
2100	3140	-1040	24	35
2300	3140	-840	24	36
2400	3140	-740	24	37
2500	3140	-640	24	38
2800	3140	-340	24	39
3000	3140	-140	24	40
1900	3140	-1240	24	41
2000	3140	-1140	24	42
2500	3140	-640	24	43
2400	3140	-740	24	44
3800	3140	660	25	44
3000	3030	-30	25	45
3600	3030	570	26	45
2200	3030	-830	26	46
4500	3030	1470	27	46
2100	3030	-930	27	47
2000	3030	-1030	27	48
2100	3030	-930	27	49
1900	3030	-1130	27	50
2100	3030	-930	27	51
2200	3030	-830	27	52
2100	3030	-930	27	53
2300	3030	-730	27	54
2400	3030	-630	27	55
2500	3030	-530	27	56
2800	3030	-230	27	57
3000	3030	-30	27	58
1900	3030	-1130	27	59
2000	3030	-1030	27	60
2500	3030	-530	27	61
2400	3030	-630	27	62
3800	3030	770	28	62
3600	3000	600	29	62
2200	3000	-800	29	63
4500	3000	1500	30	63
2100	3000	-900	30	64
2000	3000	-1000	30	65
2100	3000	-900	30	66
1900	3000	-1100	30	67
2100	3000	-900	30	68
2200	3000	-800	30	69

2100	3000	-900	30	70
2300	3000	-700	30	71
2400	3000	-600	30	72
2500	3000	-500	30	73
2800	3000	-200	30	74
3000	3000	0	30	74
1900	3000	-1100	30	75
2000	3000	-1000	30	76
2500	3000	-500	30	77
2400	3000	-600	30	78
3800	3000	800	31	78
2200	3600	-1400	31	79
4500	3600	900	32	79
2100	3600	-1500	32	80
2000	3600	-1600	32	81
2100	3600	-1500	32	82
1900	3600	-1700	32	83
2100	3600	-1500	32	84
2200	3600	-1400	32	85
2100	3600	-1500	32	86
2300	3600	-1300	32	87
2400	3600	-1200	32	88
2500	3600	-1100	32	89
2800	3600	-800	32	90
3000	3600	-600	32	91
1900	3600	-1700	32	92
2000	3600	-1600	32	93
2500	3600	-1100	32	94
2400	3600	-1200	32	95
3800	3600	200	33	95
4500	2200	2300	34	95
2100	2200	-100	34	96
2000	2200	-200	34	97
2100	2200	-100	34	98
1900	2200	-300	34	99
2100	2200	-100	34	100
2200	2200	0	34	100
2100	2200	-100	34	101
2300	2200	100	35	101
2400	2200	200	36	101
2500	2200	300	37	101
2800	2200	600	38	101
3000	2200	800	39	101
1900	2200	-300	39	102
2000	2200	-200	39	103
2500	2200	300	40	103
2400	2200	200	41	103
3800	2200	1600	42	103
2100	4500	-2400	42	104
2000	4500	-2500	42	105
2100	4500	-2400	42	106
1900	4500	-2600	42	107
2100	4500	-2400	42	108
2200	4500	-2300	42	109

2100	4500	-2400	42	110
2300	4500	-2200	42	111
2400	4500	-2100	42	112
2500	4500	-2000	42	113
2800	4500	-1700	42	114
3000	4500	-1500	42	115
1900	4500	-2600	42	116
2000	4500	-2500	42	117
2500	4500	-2000	42	118
2400	4500	-2100	42	119
3800	4500	-700	42	120
2000	2100	-100	42	121
2100	2100	0	42	121
1900	2100	-200	42	122
2100	2100	0	42	122
2200	2100	100	43	122
2100	2100	0	43	122
2300	2100	200	44	122
2400	2100	300	45	122
2500	2100	400	46	122
2800	2100	700	47	122
3000	2100	900	48	122
1900	2100	-200	48	123
2000	2100	-100	48	124
2500	2100	400	49	124
2400	2100	300	50	124
3800	2100	1700	51	124
2100	2000	100	52	124
1900	2000	-100	52	125
2100	2000	100	53	125
2200	2000	200	54	125
2100	2000	100	55	125
2300	2000	300	56	125
2400	2000	400	57	125
2500	2000	500	58	125
2800	2000	800	59	125
3000	2000	1000	60	125
1900	2000	-100	60	126
2000	2000	0	60	126
2500	2000	500	61	126
2400	2000	400	62	126
3800	2000	1800	63	126
1900	2100	-200	63	127
2100	2100	0	63	127
2200	2100	100	64	127
2100	2100	0	64	127
2300	2100	200	65	127
2400	2100	300	66	127
2500	2100	400	67	127
2800	2100	700	68	127
3000	2100	900	69	127
1900	2100	-200	69	128
2000	2100	-100	69	129
2500	2100	400	70	129

2400	2100	300	71	129
3800	2100	1700	72	129
2100	1900	200	73	129
2200	1900	300	74	129
2100	1900	200	75	129
2300	1900	400	76	129
2400	1900	500	77	129
2500	1900	600	78	129
2800	1900	900	79	129
3000	1900	1100	80	129
1900	1900	0	80	129
2000	1900	100	81	129
2500	1900	600	82	129
2400	1900	500	83	129
3800	1900	1900	84	129
2200	2100	100	85	129
2100	2100	0	85	129
2300	2100	200	86	129
2400	2100	300	87	129
2500	2100	400	88	129
2800	2100	700	89	129
3000	2100	900	90	129
1900	2100	-200	90	130
2000	2100	-100	90	131
2500	2100	400	91	131
2400	2100	300	92	131
3800	2100	1700	93	131
2100	2200	-100	93	132
2300	2200	100	94	132
2400	2200	200	95	132
2500	2200	300	96	132
2800	2200	600	97	132
3000	2200	800	98	132
1900	2200	-300	98	133
2000	2200	-200	98	134
2500	2200	300	99	134
2400	2200	200	100	134
3800	2200	1600	101	134
2300	2100	200	102	134
2400	2100	300	103	134
2500	2100	400	104	134
2800	2100	700	105	134
3000	2100	900	106	134
1900	2100	-200	106	135
2000	2100	-100	106	136
2500	2100	400	107	136
2400	2100	300	108	136
3800	2100	1700	109	136
2400	2300	100	110	136
2500	2300	200	111	136
2800	2300	500	112	136
3000	2300	700	113	136

1900	2300	-400	113	137
2000	2300	-300	113	138
2500	2300	200	114	138
2400	2300	100	115	138
3800	2300	1500	116	138
2500	2400	100	117	138
2800	2400	400	118	138
3000	2400	600	119	138
1900	2400	-500	119	139
2000	2400	-400	119	140
2500	2400	100	120	140
2400	2400	0	120	140
3800	2400	1400	121	140
2800	2500	300	122	140
3000	2500	500	123	140
1900	2500	-600	123	141
2000	2500	-500	123	142
2500	2500	0	123	142
2400	2500	-100	123	143
3800	2500	1300	124	143
3000	2800	200	125	143
1900	2800	-900	125	144
2000	2800	-800	125	145
2500	2800	-300	125	146
2400	2800	-400	125	147
3800	2800	1000	126	147
1900	3000	-1100	126	148
2000	3000	-1000	126	149
2500	3000	-500	126	150
2400	3000	-600	126	151
3800	3000	800	127	151
2000	1900	100	128	151
2500	1900	600	129	151
2400	1900	500	130	151
3800	1900	1900	131	151
2500	2000	500	132	151
2400	2000	400	133	151
3800	2000	1800	134	151
2400	2500	-100	134	152
3800	2500	1300	135	152
3800	2400	1400	136	152

S Statistic = 136 - 152 = -16

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
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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

There are 0 time periods with multiple data

A = 264

B = 0

C = 24

D = 0

E = 24

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1818.67

Z-Score = -0.351734

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-0.351734 >= -1.65463 indicating no evidence of a downward 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
5680	3960	1720	7	18
6620	3960	2660	8	18
7900	3960	3940	9	18
8600	3960	4640	10	18
4300	3960	340	11	18
5300	3960	1340	12	18
4400	3960	440	13	18
4600	3960	640	14	18
3800	3960	-160	14	19
3500	3960	-460	14	20
3600	3960	-360	14	21
3700	3960	-260	14	22
3500	3960	-460	14	23
3500	3960	-460	14	24
4000	3960	40	15	24
3600	3960	-360	15	25
3900	3960	-60	15	26
4500	3960	540	16	26
3300	3960	-660	16	27
3800	3960	-160	16	28
4400	3960	440	17	28

4000	3960	40	18	28
7000	3960	3040	19	28
6620	5680	940	20	28
7900	5680	2220	21	28
8600	5680	2920	22	28
4300	5680	-1380	22	29
5300	5680	-380	22	30
4400	5680	-1280	22	31
4600	5680	-1080	22	32
3800	5680	-1880	22	33
3500	5680	-2180	22	34
3600	5680	-2080	22	35
3700	5680	-1980	22	36
3500	5680	-2180	22	37
3500	5680	-2180	22	38
4000	5680	-1680	22	39
3600	5680	-2080	22	40
3900	5680	-1780	22	41
4500	5680	-1180	22	42
3300	5680	-2380	22	43
3800	5680	-1880	22	44
4400	5680	-1280	22	45
4000	5680	-1680	22	46
7000	5680	1320	23	46
7900	6620	1280	24	46
8600	6620	1980	25	46
4300	6620	-2320	25	47
5300	6620	-1320	25	48
4400	6620	-2220	25	49
4600	6620	-2020	25	50
3800	6620	-2820	25	51
3500	6620	-3120	25	52
3600	6620	-3020	25	53
3700	6620	-2920	25	54
3500	6620	-3120	25	55
3500	6620	-3120	25	56
4000	6620	-2620	25	57
3600	6620	-3020	25	58
3900	6620	-2720	25	59
4500	6620	-2120	25	60
3300	6620	-3320	25	61
3800	6620	-2820	25	62
4400	6620	-2220	25	63
4000	6620	-2620	25	64
7000	6620	380	26	64
8600	7900	700	27	64
4300	7900	-3600	27	65
5300	7900	-2600	27	66
4400	7900	-3500	27	67
4600	7900	-3300	27	68
3800	7900	-4100	27	69
3500	7900	-4400	27	70
3600	7900	-4300	27	71
3700	7900	-4200	27	72

3500	7900	-4400	27	73
3500	7900	-4400	27	74
4000	7900	-3900	27	75
3600	7900	-4300	27	76
3900	7900	-4000	27	77
4500	7900	-3400	27	78
3300	7900	-4600	27	79
3800	7900	-4100	27	80
4400	7900	-3500	27	81
4000	7900	-3900	27	82
7000	7900	-900	27	83
4300	8600	-4300	27	84
5300	8600	-3300	27	85
4400	8600	-4200	27	86
4600	8600	-4000	27	87
3800	8600	-4800	27	88
3500	8600	-5100	27	89
3600	8600	-5000	27	90
3700	8600	-4900	27	91
3500	8600	-5100	27	92
3500	8600	-5100	27	93
4000	8600	-4600	27	94
3600	8600	-5000	27	95
3900	8600	-4700	27	96
4500	8600	-4100	27	97
3300	8600	-5300	27	98
3800	8600	-4800	27	99
4400	8600	-4200	27	100
4000	8600	-4600	27	101
7000	8600	-1600	27	102
5300	4300	1000	28	102
4400	4300	100	29	102
4600	4300	300	30	102
3800	4300	-500	30	103
3500	4300	-800	30	104
3600	4300	-700	30	105
3700	4300	-600	30	106
3500	4300	-800	30	107
3500	4300	-800	30	108
4000	4300	-300	30	109
3600	4300	-700	30	110
3900	4300	-400	30	111
4500	4300	200	31	111
3300	4300	-1000	31	112
3800	4300	-500	31	113
4400	4300	100	32	113
4000	4300	-300	32	114
7000	4300	2700	33	114
4400	5300	-900	33	115
4600	5300	-700	33	116
3800	5300	-1500	33	117
3500	5300	-1800	33	118
3600	5300	-1700	33	119
3700	5300	-1600	33	120

3500	5300	-1800	33	121
3500	5300	-1800	33	122
4000	5300	-1300	33	123
3600	5300	-1700	33	124
3900	5300	-1400	33	125
4500	5300	-800	33	126
3300	5300	-2000	33	127
3800	5300	-1500	33	128
4400	5300	-900	33	129
4000	5300	-1300	33	130
7000	5300	1700	34	130
4600	4400	200	35	130
3800	4400	-600	35	131
3500	4400	-900	35	132
3600	4400	-800	35	133
3700	4400	-700	35	134
3500	4400	-900	35	135
3500	4400	-900	35	136
4000	4400	-400	35	137
3600	4400	-800	35	138
3900	4400	-500	35	139
4500	4400	100	36	139
3300	4400	-1100	36	140
3800	4400	-600	36	141
4400	4400	0	36	141
4000	4400	-400	36	142
7000	4400	2600	37	142
3800	4600	-800	37	143
3500	4600	-1100	37	144
3600	4600	-1000	37	145
3700	4600	-900	37	146
3500	4600	-1100	37	147
3500	4600	-1100	37	148
4000	4600	-600	37	149
3600	4600	-1000	37	150
3900	4600	-700	37	151
4500	4600	-100	37	152
3300	4600	-1300	37	153
3800	4600	-800	37	154
4400	4600	-200	37	155
4000	4600	-600	37	156
7000	4600	2400	38	156
3500	3800	-300	38	157
3600	3800	-200	38	158
3700	3800	-100	38	159
3500	3800	-300	38	160
3500	3800	-300	38	161
4000	3800	200	39	161
3600	3800	-200	39	162
3900	3800	100	40	162
4500	3800	700	41	162
3300	3800	-500	41	163
3800	3800	0	41	163
4400	3800	600	42	163

4000	3800	200	43	163
7000	3800	3200	44	163
3600	3500	100	45	163
3700	3500	200	46	163
3500	3500	0	46	163
3500	3500	0	46	163
4000	3500	500	47	163
3600	3500	100	48	163
3900	3500	400	49	163
4500	3500	1000	50	163
3300	3500	-200	50	164
3800	3500	300	51	164
4400	3500	900	52	164
4000	3500	500	53	164
7000	3500	3500	54	164
3700	3600	100	55	164
3500	3600	-100	55	165
3500	3600	-100	55	166
4000	3600	400	56	166
3600	3600	0	56	166
3900	3600	300	57	166
4500	3600	900	58	166
3300	3600	-300	58	167
3800	3600	200	59	167
4400	3600	800	60	167
4000	3600	400	61	167
7000	3600	3400	62	167
3500	3700	-200	62	168
3500	3700	-200	62	169
4000	3700	300	63	169
3600	3700	-100	63	170
3900	3700	200	64	170
4500	3700	800	65	170
3300	3700	-400	65	171
3800	3700	100	66	171
4400	3700	700	67	171
4000	3700	300	68	171
7000	3700	3300	69	171
3500	3500	0	69	171
4000	3500	500	70	171
3600	3500	100	71	171
3900	3500	400	72	171
4500	3500	1000	73	171
3300	3500	-200	73	172
3800	3500	300	74	172
4400	3500	900	75	172
4000	3500	500	76	172
7000	3500	3500	77	172
4000	3500	500	78	172
3600	3500	100	79	172
3900	3500	400	80	172
4500	3500	1000	81	172

3300	3500	-200	81	173
3800	3500	300	82	173
4400	3500	900	83	173
4000	3500	500	84	173
7000	3500	3500	85	173
3600	4000	-400	85	174
3900	4000	-100	85	175
4500	4000	500	86	175
3300	4000	-700	86	176
3800	4000	-200	86	177
4400	4000	400	87	177
4000	4000	0	87	177
7000	4000	3000	88	177
3900	3600	300	89	177
4500	3600	900	90	177
3300	3600	-300	90	178
3800	3600	200	91	178
4400	3600	800	92	178
4000	3600	400	93	178
7000	3600	3400	94	178
4500	3900	600	95	178
3300	3900	-600	95	179
3800	3900	-100	95	180
4400	3900	500	96	180
4000	3900	100	97	180
7000	3900	3100	98	180
3300	4500	-1200	98	181
3800	4500	-700	98	182
4400	4500	-100	98	183
4000	4500	-500	98	184
7000	4500	2500	99	184
3800	3300	500	100	184
4400	3300	1100	101	184
4000	3300	700	102	184
7000	3300	3700	103	184
4400	3800	600	104	184
4000	3800	200	105	184
7000	3800	3200	106	184
4000	4400	-400	106	185
7000	4400	2600	107	185
7000	4000	3000	108	185

S Statistic = 108 - 185 = -77

Tied Group Value	Members
1	4400
2	3800
3	3500

4	3600	2
5	4000	2

Time Period	Observations
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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

There are 0 time periods with multiple data

A = 138

B = 0

C = 6

D = 0

E = 14

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1825.67

Z-Score = -1.7787

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-1.7787 < -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
8000	4700	3300	10	15
7470	4700	2770	11	15
12000	4700	7300	12	15
13000	4700	8300	13	15
6500	4700	1800	14	15
7200	4700	2500	15	15
5900	4700	1200	16	15
5000	4700	300	17	15
4800	4700	100	18	15
4200	4700	-500	18	16
3900	4700	-800	18	17
4000	4700	-700	18	18
3900	4700	-800	18	19
3700	4700	-1000	18	20
3900	4700	-800	18	21
5000	4700	300	19	21
5500	4700	800	20	21
5400	4700	700	21	21
3000	4700	-1700	21	22
9.8	4700	-4690.2	21	23
30	4700	-4670	21	24

12	4700	-4688	21	25
4600	4700	-100	21	26
7470	8000	-530	21	27
12000	8000	4000	22	27
13000	8000	5000	23	27
6500	8000	-1500	23	28
7200	8000	-800	23	29
5900	8000	-2100	23	30
5000	8000	-3000	23	31
4800	8000	-3200	23	32
4200	8000	-3800	23	33
3900	8000	-4100	23	34
4000	8000	-4000	23	35
3900	8000	-4100	23	36
3700	8000	-4300	23	37
3900	8000	-4100	23	38
5000	8000	-3000	23	39
5500	8000	-2500	23	40
5400	8000	-2600	23	41
3000	8000	-5000	23	42
9.8	8000	-7990.2	23	43
30	8000	-7970	23	44
12	8000	-7988	23	45
4600	8000	-3400	23	46
12000	7470	4530	24	46
13000	7470	5530	25	46
6500	7470	-970	25	47
7200	7470	-270	25	48
5900	7470	-1570	25	49
5000	7470	-2470	25	50
4800	7470	-2670	25	51
4200	7470	-3270	25	52
3900	7470	-3570	25	53
4000	7470	-3470	25	54
3900	7470	-3570	25	55
3700	7470	-3770	25	56
3900	7470	-3570	25	57
5000	7470	-2470	25	58
5500	7470	-1970	25	59
5400	7470	-2070	25	60
3000	7470	-4470	25	61
9.8	7470	-7460.2	25	62
30	7470	-7440	25	63
12	7470	-7458	25	64
4600	7470	-2870	25	65
13000	12000	1000	26	65
6500	12000	-5500	26	66
7200	12000	-4800	26	67
5900	12000	-6100	26	68
5000	12000	-7000	26	69
4800	12000	-7200	26	70
4200	12000	-7800	26	71
3900	12000	-8100	26	72
4000	12000	-8000	26	73

3900	12000	-8100	26	74
3700	12000	-8300	26	75
3900	12000	-8100	26	76
5000	12000	-7000	26	77
5500	12000	-6500	26	78
5400	12000	-6600	26	79
3000	12000	-9000	26	80
9.8	12000	-11990.2	26	81
30	12000	-11970	26	82
12	12000	-11988	26	83
4600	12000	-7400	26	84
6500	13000	-6500	26	85
7200	13000	-5800	26	86
5900	13000	-7100	26	87
5000	13000	-8000	26	88
4800	13000	-8200	26	89
4200	13000	-8800	26	90
3900	13000	-9100	26	91
4000	13000	-9000	26	92
3900	13000	-9100	26	93
3700	13000	-9300	26	94
3900	13000	-9100	26	95
5000	13000	-8000	26	96
5500	13000	-7500	26	97
5400	13000	-7600	26	98
3000	13000	-10000	26	99
9.8	13000	-12990.2	26	100
30	13000	-12970	26	101
12	13000	-12988	26	102
4600	13000	-8400	26	103
7200	6500	700	27	103
5900	6500	-600	27	104
5000	6500	-1500	27	105
4800	6500	-1700	27	106
4200	6500	-2300	27	107
3900	6500	-2600	27	108
4000	6500	-2500	27	109
3900	6500	-2600	27	110
3700	6500	-2800	27	111
3900	6500	-2600	27	112
5000	6500	-1500	27	113
5500	6500	-1000	27	114
5400	6500	-1100	27	115
3000	6500	-3500	27	116
9.8	6500	-6490.2	27	117
30	6500	-6470	27	118
12	6500	-6488	27	119
4600	6500	-1900	27	120
5900	7200	-1300	27	121
5000	7200	-2200	27	122
4800	7200	-2400	27	123
4200	7200	-3000	27	124
3900	7200	-3300	27	125
4000	7200	-3200	27	126

3900	7200	-3300	27	127
3700	7200	-3500	27	128
3900	7200	-3300	27	129
5000	7200	-2200	27	130
5500	7200	-1700	27	131
5400	7200	-1800	27	132
3000	7200	-4200	27	133
9.8	7200	-7190.2	27	134
30	7200	-7170	27	135
12	7200	-7188	27	136
4600	7200	-2600	27	137
5000	5900	-900	27	138
4800	5900	-1100	27	139
4200	5900	-1700	27	140
3900	5900	-2000	27	141
4000	5900	-1900	27	142
3900	5900	-2000	27	143
3700	5900	-2200	27	144
3900	5900	-2000	27	145
5000	5900	-900	27	146
5500	5900	-400	27	147
5400	5900	-500	27	148
3000	5900	-2900	27	149
9.8	5900	-5890.2	27	150
30	5900	-5870	27	151
12	5900	-5888	27	152
4600	5900	-1300	27	153
4800	5000	-200	27	154
4200	5000	-800	27	155
3900	5000	-1100	27	156
4000	5000	-1000	27	157
3900	5000	-1100	27	158
3700	5000	-1300	27	159
3900	5000	-1100	27	160
5000	5000	0	27	160
5500	5000	500	28	160
5400	5000	400	29	160
3000	5000	-2000	29	161
9.8	5000	-4990.2	29	162
30	5000	-4970	29	163
12	5000	-4988	29	164
4600	5000	-400	29	165
4200	4800	-600	29	166
3900	4800	-900	29	167
4000	4800	-800	29	168
3900	4800	-900	29	169
3700	4800	-1100	29	170
3900	4800	-900	29	171
5000	4800	200	30	171
5500	4800	700	31	171
5400	4800	600	32	171
3000	4800	-1800	32	172
9.8	4800	-4790.2	32	173
30	4800	-4770	32	174

12	4800	-4788	32	175
4600	4800	-200	32	176
3900	4200	-300	32	177
4000	4200	-200	32	178
3900	4200	-300	32	179
3700	4200	-500	32	180
3900	4200	-300	32	181
5000	4200	800	33	181
5500	4200	1300	34	181
5400	4200	1200	35	181
3000	4200	-1200	35	182
9.8	4200	-4190.2	35	183
30	4200	-4170	35	184
12	4200	-4188	35	185
4600	4200	400	36	185
4000	3900	100	37	185
3900	3900	0	37	185
3700	3900	-200	37	186
3900	3900	0	37	186
5000	3900	1100	38	186
5500	3900	1600	39	186
5400	3900	1500	40	186
3000	3900	-900	40	187
9.8	3900	-3890.2	40	188
30	3900	-3870	40	189
12	3900	-3888	40	190
4600	3900	700	41	190
3900	4000	-100	41	191
3700	4000	-300	41	192
3900	4000	-100	41	193
5000	4000	1000	42	193
5500	4000	1500	43	193
5400	4000	1400	44	193
3000	4000	-1000	44	194
9.8	4000	-3990.2	44	195
30	4000	-3970	44	196
12	4000	-3988	44	197
4600	4000	600	45	197
3700	3900	-200	45	198
3900	3900	0	45	198
5000	3900	1100	46	198
5500	3900	1600	47	198
5400	3900	1500	48	198
3000	3900	-900	48	199
9.8	3900	-3890.2	48	200
30	3900	-3870	48	201
12	3900	-3888	48	202
4600	3900	700	49	202
3900	3700	200	50	202
5000	3700	1300	51	202
5500	3700	1800	52	202
5400	3700	1700	53	202

3000	3700	-700	53	203
9.8	3700	-3690.2	53	204
30	3700	-3670	53	205
12	3700	-3688	53	206
4600	3700	900	54	206
5000	3900	1100	55	206
5500	3900	1600	56	206
5400	3900	1500	57	206
3000	3900	-900	57	207
9.8	3900	-3890.2	57	208
30	3900	-3870	57	209
12	3900	-3888	57	210
4600	3900	700	58	210
5500	5000	500	59	210
5400	5000	400	60	210
3000	5000	-2000	60	211
9.8	5000	-4990.2	60	212
30	5000	-4970	60	213
12	5000	-4988	60	214
4600	5000	-400	60	215
5400	5500	-100	60	216
3000	5500	-2500	60	217
9.8	5500	-5490.2	60	218
30	5500	-5470	60	219
12	5500	-5488	60	220
4600	5500	-900	60	221
3000	5400	-2400	60	222
9.8	5400	-5390.2	60	223
30	5400	-5370	60	224
12	5400	-5388	60	225
4600	5400	-800	60	226
9.8	3000	-2990.2	60	227
30	3000	-2970	60	228
12	3000	-2988	60	229
4600	3000	1600	61	229
30	9.8	20.2	62	229
12	9.8	2.2	63	229
4600	9.8	4590.2	64	229
12	30	-18	64	230
4600	30	4570	65	230
4600	12	4588	66	230

S Statistic = 66 - 230 = -164

Tied Group Value	Members
1	5000
2	3900

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

There are 0 time periods with multiple data

A = 84

B = 0

C = 6

D = 0

E = 8

F = 0

a = 33000

b = 124200

c = 1200

Group Variance = 1828.67

Z-Score = -3.81171

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-3.81171 < -1.65463 indicating a downward 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
2600	2600	0	6	10
2500	2600	-100	6	11
2500	2600	-100	6	12
2500	2600	-100	6	13
2600	2600	0	6	13
1400	2600	-1200	6	14
1700	2600	-900	6	15
1500	2600	-1100	6	16
1100	2600	-1500	6	17
790	2600	-1810	6	18
640	2600	-1960	6	19
530	2600	-2070	6	20
460	2600	-2140	6	21
500	2600	-2100	6	22
500	2600	-2100	6	23
2500	2600	-100	6	24
2500	2600	-100	6	25
2500	2600	-100	6	26
2600	2600	0	6	26
1400	2600	-1200	6	27
1700	2600	-900	6	28
1500	2600	-1100	6	29
1100	2600	-1500	6	30
790	2600	-1810	6	31
640	2600	-1960	6	32
530	2600	-2070	6	33
460	2600	-2140	6	34
500	2600	-2100	6	35

500	2600	-2100	6	36
2500	2500	0	6	36
2500	2500	0	6	36
2600	2500	100	7	36
1400	2500	-1100	7	37
1700	2500	-800	7	38
1500	2500	-1000	7	39
1100	2500	-1400	7	40
790	2500	-1710	7	41
640	2500	-1860	7	42
530	2500	-1970	7	43
460	2500	-2040	7	44
500	2500	-2000	7	45
500	2500	-2000	7	46
2500	2500	0	7	46
2600	2500	100	8	46
1400	2500	-1100	8	47
1700	2500	-800	8	48
1500	2500	-1000	8	49
1100	2500	-1400	8	50
790	2500	-1710	8	51
640	2500	-1860	8	52
530	2500	-1970	8	53
460	2500	-2040	8	54
500	2500	-2000	8	55
500	2500	-2000	8	56
2600	2500	100	9	56
1400	2500	-1100	9	57
1700	2500	-800	9	58
1500	2500	-1000	9	59
1100	2500	-1400	9	60
790	2500	-1710	9	61
640	2500	-1860	9	62
530	2500	-1970	9	63
460	2500	-2040	9	64
500	2500	-2000	9	65
500	2500	-2000	9	66
1400	2600	-1200	9	67
1700	2600	-900	9	68
1500	2600	-1100	9	69
1100	2600	-1500	9	70
790	2600	-1810	9	71
640	2600	-1960	9	72
530	2600	-2070	9	73
460	2600	-2140	9	74
500	2600	-2100	9	75
500	2600	-2100	9	76
1700	1400	300	10	76
1500	1400	100	11	76
1100	1400	-300	11	77
790	1400	-610	11	78
640	1400	-760	11	79

530	1400	-870	11	80
460	1400	-940	11	81
500	1400	-900	11	82
500	1400	-900	11	83
1500	1700	-200	11	84
1100	1700	-600	11	85
790	1700	-910	11	86
640	1700	-1060	11	87
530	1700	-1170	11	88
460	1700	-1240	11	89
500	1700	-1200	11	90
500	1700	-1200	11	91
1100	1500	-400	11	92
790	1500	-710	11	93
640	1500	-860	11	94
530	1500	-970	11	95
460	1500	-1040	11	96
500	1500	-1000	11	97
500	1500	-1000	11	98
790	1100	-310	11	99
640	1100	-460	11	100
530	1100	-570	11	101
460	1100	-640	11	102
500	1100	-600	11	103
500	1100	-600	11	104
640	790	-150	11	105
530	790	-260	11	106
460	790	-330	11	107
500	790	-290	11	108
500	790	-290	11	109
530	640	-110	11	110
460	640	-180	11	111
500	640	-140	11	112
500	640	-140	11	113
460	530	-70	11	114
500	530	-30	11	115
500	530	-30	11	116
500	460	40	12	116
500	460	40	13	116
500	500	0	13	116

S Statistic = 13 - 116 = -103

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

There are 0 time periods with multiple data

A = 150

B = 0

C = 12

D = 0

E = 14

F = 0

a = 10608

b = 36720

c = 544

Group Variance = 581

Z-Score = -4.23167

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-4.23167 < -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
81	91	-10	0	28
61	91	-30	0	29
52	91	-39	0	30
60	91	-31	0	31
118	91	27	1	31
85	91	-6	1	32
61	91	-30	1	33
51	91	-40	1	34
60	91	-31	1	35
53	91	-38	1	36
55	91	-36	1	37
56	91	-35	1	38
55	91	-36	1	39
53	91	-38	1	40
55	91	-36	1	41
56	91	-35	1	42
56	91	-35	1	43
53	91	-38	1	44

51	91	-40	1	45
54	91	-37	1	46
47	91	-44	1	47
45	91	-46	1	48
55	91	-36	1	49
57	91	-34	1	50
50	91	-41	1	51
48	91	-43	1	52
61	81	-20	1	53
52	81	-29	1	54
60	81	-21	1	55
118	81	37	2	55
85	81	4	3	55
61	81	-20	3	56
51	81	-30	3	57
60	81	-21	3	58
53	81	-28	3	59
55	81	-26	3	60
56	81	-25	3	61
55	81	-26	3	62
53	81	-28	3	63
55	81	-26	3	64
56	81	-25	3	65
56	81	-25	3	66
53	81	-28	3	67
51	81	-30	3	68
54	81	-27	3	69
47	81	-34	3	70
45	81	-36	3	71
55	81	-26	3	72
57	81	-24	3	73
50	81	-31	3	74
48	81	-33	3	75
52	61	-9	3	76
60	61	-1	3	77
118	61	57	4	77
85	61	24	5	77
61	61	0	5	77
51	61	-10	5	78
60	61	-1	5	79
53	61	-8	5	80
55	61	-6	5	81
56	61	-5	5	82
55	61	-6	5	83
53	61	-8	5	84
55	61	-6	5	85
56	61	-5	5	86
56	61	-5	5	87
53	61	-8	5	88
51	61	-10	5	89
54	61	-7	5	90
47	61	-14	5	91
45	61	-16	5	92
55	61	-6	5	93
57	61	-4	5	94

50	61	-11	5	95
48	61	-13	5	96
60	52	8	6	96
118	52	66	7	96
85	52	33	8	96
61	52	9	9	96
51	52	-1	9	97
60	52	8	10	97
53	52	1	11	97
55	52	3	12	97
56	52	4	13	97
55	52	3	14	97
53	52	1	15	97
55	52	3	16	97
56	52	4	17	97
56	52	4	18	97
53	52	1	19	97
51	52	-1	19	98
54	52	2	20	98
47	52	-5	20	99
45	52	-7	20	100
55	52	3	21	100
57	52	5	22	100
50	52	-2	22	101
48	52	-4	22	102
118	60	58	23	102
85	60	25	24	102
61	60	1	25	102
51	60	-9	25	103
60	60	0	25	103
53	60	-7	25	104
55	60	-5	25	105
56	60	-4	25	106
55	60	-5	25	107
53	60	-7	25	108
55	60	-5	25	109
56	60	-4	25	110
56	60	-4	25	111
53	60	-7	25	112
51	60	-9	25	113
54	60	-6	25	114
47	60	-13	25	115
45	60	-15	25	116
55	60	-5	25	117
57	60	-3	25	118
50	60	-10	25	119
48	60	-12	25	120
85	118	-33	25	121
61	118	-57	25	122
51	118	-67	25	123
60	118	-58	25	124
53	118	-65	25	125
55	118	-63	25	126
56	118	-62	25	127

55	118	-63	25	128
53	118	-65	25	129
55	118	-63	25	130
56	118	-62	25	131
56	118	-62	25	132
53	118	-65	25	133
51	118	-67	25	134
54	118	-64	25	135
47	118	-71	25	136
45	118	-73	25	137
55	118	-63	25	138
57	118	-61	25	139
50	118	-68	25	140
48	118	-70	25	141
61	85	-24	25	142
51	85	-34	25	143
60	85	-25	25	144
53	85	-32	25	145
55	85	-30	25	146
56	85	-29	25	147
55	85	-30	25	148
53	85	-32	25	149
55	85	-30	25	150
56	85	-29	25	151
56	85	-29	25	152
53	85	-32	25	153
51	85	-34	25	154
54	85	-31	25	155
47	85	-38	25	156
45	85	-40	25	157
55	85	-30	25	158
57	85	-28	25	159
50	85	-35	25	160
48	85	-37	25	161
51	61	-10	25	162
60	61	-1	25	163
53	61	-8	25	164
55	61	-6	25	165
56	61	-5	25	166
55	61	-6	25	167
53	61	-8	25	168
55	61	-6	25	169
56	61	-5	25	170
56	61	-5	25	171
53	61	-8	25	172
51	61	-10	25	173
54	61	-7	25	174
47	61	-14	25	175
45	61	-16	25	176
55	61	-6	25	177
57	61	-4	25	178
50	61	-11	25	179
48	61	-13	25	180
60	51	9	26	180

53	51	2	27	180
55	51	4	28	180
56	51	5	29	180
55	51	4	30	180
53	51	2	31	180
55	51	4	32	180
56	51	5	33	180
56	51	5	34	180
53	51	2	35	180
51	51	0	35	180
54	51	3	36	180
47	51	-4	36	181
45	51	-6	36	182
55	51	4	37	182
57	51	6	38	182
50	51	-1	38	183
48	51	-3	38	184
53	60	-7	38	185
55	60	-5	38	186
56	60	-4	38	187
55	60	-5	38	188
53	60	-7	38	189
55	60	-5	38	190
56	60	-4	38	191
56	60	-4	38	192
53	60	-7	38	193
51	60	-9	38	194
54	60	-6	38	195
47	60	-13	38	196
45	60	-15	38	197
55	60	-5	38	198
57	60	-3	38	199
50	60	-10	38	200
48	60	-12	38	201
55	53	2	39	201
56	53	3	40	201
55	53	2	41	201
53	53	0	41	201
55	53	2	42	201
56	53	3	43	201
56	53	3	44	201
53	53	0	44	201
51	53	-2	44	202
54	53	1	45	202
47	53	-6	45	203
45	53	-8	45	204
55	53	2	46	204
57	53	4	47	204
50	53	-3	47	205
48	53	-5	47	206
56	55	1	48	206
55	55	0	48	206
53	55	-2	48	207
55	55	0	48	207

56	55	1	49	207
56	55	1	50	207
53	55	-2	50	208
51	55	-4	50	209
54	55	-1	50	210
47	55	-8	50	211
45	55	-10	50	212
55	55	0	50	212
57	55	2	51	212
50	55	-5	51	213
48	55	-7	51	214
55	56	-1	51	215
53	56	-3	51	216
55	56	-1	51	217
56	56	0	51	217
56	56	0	51	217
53	56	-3	51	218
51	56	-5	51	219
54	56	-2	51	220
47	56	-9	51	221
45	56	-11	51	222
55	56	-1	51	223
57	56	1	52	223
50	56	-6	52	224
48	56	-8	52	225
53	55	-2	52	226
55	55	0	52	226
56	55	1	53	226
56	55	1	54	226
53	55	-2	54	227
51	55	-4	54	228
54	55	-1	54	229
47	55	-8	54	230
45	55	-10	54	231
55	55	0	54	231
57	55	2	55	231
50	55	-5	55	232
48	55	-7	55	233
55	53	2	56	233
56	53	3	57	233
56	53	3	58	233
53	53	0	58	233
51	53	-2	58	234
54	53	1	59	234
47	53	-6	59	235
45	53	-8	59	236
55	53	2	60	236
57	53	4	61	236
50	53	-3	61	237
48	53	-5	61	238
56	55	1	62	238
56	55	1	63	238
53	55	-2	63	239

51	55	-4	63	240
54	55	-1	63	241
47	55	-8	63	242
45	55	-10	63	243
55	55	0	63	243
57	55	2	64	243
50	55	-5	64	244
48	55	-7	64	245
56	56	0	64	245
53	56	-3	64	246
51	56	-5	64	247
54	56	-2	64	248
47	56	-9	64	249
45	56	-11	64	250
55	56	-1	64	251
57	56	1	65	251
50	56	-6	65	252
48	56	-8	65	253
53	56	-3	65	254
51	56	-5	65	255
54	56	-2	65	256
47	56	-9	65	257
45	56	-11	65	258
55	56	-1	65	259
57	56	1	66	259
50	56	-6	66	260
48	56	-8	66	261
51	53	-2	66	262
54	53	1	67	262
47	53	-6	67	263
45	53	-8	67	264
55	53	2	68	264
57	53	4	69	264
50	53	-3	69	265
48	53	-5	69	266
54	51	3	70	266
47	51	-4	70	267
45	51	-6	70	268
55	51	4	71	268
57	51	6	72	268
50	51	-1	72	269
48	51	-3	72	270
47	54	-7	72	271
45	54	-9	72	272
55	54	1	73	272
57	54	3	74	272
50	54	-4	74	273
48	54	-6	74	274
45	47	-2	74	275
55	47	8	75	275
57	47	10	76	275

50	47	3	77	275
48	47	1	78	275
55	45	10	79	275
57	45	12	80	275
50	45	5	81	275
48	45	3	82	275
57	55	2	83	275
50	55	-5	83	276
48	55	-7	83	277
50	57	-7	83	278
48	57	-9	83	279
48	50	-2	83	280

S Statistic = 83 - 280 = -197

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

There are 0 time periods with multiple data

A = 342

B = 0

C = 36

D = 0

E = 30

F = 0

a = 46116

b = 176904

c = 1512

Group Variance = 2543

Z-Score = -3.88672

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-3.88672 < -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
60.2	95.6	-35.4	17	3
47.7	95.6	-47.9	17	4
86	95.6	-9.6	17	5
69.4	95.6	-26.2	17	6
95.2	95.6	-0.4	17	7
52.5	95.6	-43.1	17	8
97.8	95.6	2.2	18	8
124	95.6	28.4	19	8
110	95.6	14.4	20	8
383	95.6	287.4	21	8
99.4	95.6	3.8	22	8
112	95.6	16.4	23	8
593	95.6	497.4	24	8
94.8	95.6	-0.8	24	9
87	95.6	-8.6	24	10
99	95.6	3.4	25	10
89.7	95.6	-5.9	25	11
132	95.6	36.4	26	11
47.7	60.2	-12.5	26	12
86	60.2	25.8	27	12
69.4	60.2	9.2	28	12
95.2	60.2	35	29	12
52.5	60.2	-7.7	29	13
97.8	60.2	37.6	30	13
124	60.2	63.8	31	13

110	60.2	49.8	32	13
383	60.2	322.8	33	13
99.4	60.2	39.2	34	13
112	60.2	51.8	35	13
593	60.2	532.8	36	13
94.8	60.2	34.6	37	13
87	60.2	26.8	38	13
99	60.2	38.8	39	13
89.7	60.2	29.5	40	13
132	60.2	71.8	41	13

86	47.7	38.3	42	13
69.4	47.7	21.7	43	13
95.2	47.7	47.5	44	13
52.5	47.7	4.8	45	13
97.8	47.7	50.1	46	13
124	47.7	76.3	47	13
110	47.7	62.3	48	13
383	47.7	335.3	49	13
99.4	47.7	51.7	50	13
112	47.7	64.3	51	13
593	47.7	545.3	52	13
94.8	47.7	47.1	53	13
87	47.7	39.3	54	13
99	47.7	51.3	55	13
89.7	47.7	42	56	13
132	47.7	84.3	57	13

69.4	86	-16.6	57	14
95.2	86	9.2	58	14
52.5	86	-33.5	58	15
97.8	86	11.8	59	15
124	86	38	60	15
110	86	24	61	15
383	86	297	62	15
99.4	86	13.4	63	15
112	86	26	64	15
593	86	507	65	15
94.8	86	8.8	66	15
87	86	1	67	15
99	86	13	68	15
89.7	86	3.7	69	15
132	86	46	70	15

95.2	69.4	25.8	71	15
52.5	69.4	-16.9	71	16
97.8	69.4	28.4	72	16
124	69.4	54.6	73	16
110	69.4	40.6	74	16
383	69.4	313.6	75	16
99.4	69.4	30	76	16
112	69.4	42.6	77	16
593	69.4	523.6	78	16
94.8	69.4	25.4	79	16
87	69.4	17.6	80	16
99	69.4	29.6	81	16
89.7	69.4	20.3	82	16

132	69.4	62.6	83	16
52.5	95.2	-42.7	83	17
97.8	95.2	2.6	84	17
124	95.2	28.8	85	17
110	95.2	14.8	86	17
383	95.2	287.8	87	17
99.4	95.2	4.2	88	17
112	95.2	16.8	89	17
593	95.2	497.8	90	17
94.8	95.2	-0.4	90	18
87	95.2	-8.2	90	19
99	95.2	3.8	91	19
89.7	95.2	-5.5	91	20
132	95.2	36.8	92	20
97.8	52.5	45.3	93	20
124	52.5	71.5	94	20
110	52.5	57.5	95	20
383	52.5	330.5	96	20
99.4	52.5	46.9	97	20
112	52.5	59.5	98	20
593	52.5	540.5	99	20
94.8	52.5	42.3	100	20
87	52.5	34.5	101	20
99	52.5	46.5	102	20
89.7	52.5	37.2	103	20
132	52.5	79.5	104	20
124	97.8	26.2	105	20
110	97.8	12.2	106	20
383	97.8	285.2	107	20
99.4	97.8	1.6	108	20
112	97.8	14.2	109	20
593	97.8	495.2	110	20
94.8	97.8	-3	110	21
87	97.8	-10.8	110	22
99	97.8	1.2	111	22
89.7	97.8	-8.1	111	23
132	97.8	34.2	112	23
110	124	-14	112	24
383	124	259	113	24
99.4	124	-24.6	113	25
112	124	-12	113	26
593	124	469	114	26
94.8	124	-29.2	114	27
87	124	-37	114	28
99	124	-25	114	29
89.7	124	-34.3	114	30
132	124	8	115	30
383	110	273	116	30
99.4	110	-10.6	116	31
112	110	2	117	31
593	110	483	118	31
94.8	110	-15.2	118	32

87	110	-23	118	33
99	110	-11	118	34
89.7	110	-20.3	118	35
132	110	22	119	35
99.4	383	-283.6	119	36
112	383	-271	119	37
593	383	210	120	37
94.8	383	-288.2	120	38
87	383	-296	120	39
99	383	-284	120	40
89.7	383	-293.3	120	41
132	383	-251	120	42
112	99.4	12.6	121	42
593	99.4	493.6	122	42
94.8	99.4	-4.6	122	43
87	99.4	-12.4	122	44
99	99.4	-0.4	122	45
89.7	99.4	-9.7	122	46
132	99.4	32.6	123	46
593	112	481	124	46
94.8	112	-17.2	124	47
87	112	-25	124	48
99	112	-13	124	49
89.7	112	-22.3	124	50
132	112	20	125	50
94.8	593	-498.2	125	51
87	593	-506	125	52
99	593	-494	125	53
89.7	593	-503.3	125	54
132	593	-461	125	55
87	94.8	-7.8	125	56
99	94.8	4.2	126	56
89.7	94.8	-5.1	126	57
132	94.8	37.2	127	57
99	87	12	128	57
89.7	87	2.7	129	57
132	87	45	130	57
89.7	99	-9.3	130	58
132	99	33	131	58
132	89.7	42.3	132	58

S Statistic = 132 - 58 = 74

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

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 950

Z-Score = 2.36843

Comparison Level at 95% confidence level = 1.65463 (upward trend)

2.36843 > 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
60	66.6	-6.6	14	6
33.8	66.6	-32.8	14	7
185	66.6	118.4	15	7
99.1	66.6	32.5	16	7
134	66.6	67.4	17	7
76.3	66.6	9.7	18	7
192	66.6	125.4	19	7
210	66.6	143.4	20	7
170	66.6	103.4	21	7
218	66.6	151.4	22	7
158	66.6	91.4	23	7
197	66.6	130.4	24	7
145	66.6	78.4	25	7
130	66.6	63.4	26	7
172	66.6	105.4	27	7
143	66.6	76.4	28	7
16.1	66.6	-50.5	28	8
234	66.6	167.4	29	8
33.8	60	-26.2	29	9
185	60	125	30	9
99.1	60	39.1	31	9
134	60	74	32	9
76.3	60	16.3	33	9
192	60	132	34	9
210	60	150	35	9

170	60	110	36	9
218	60	158	37	9
158	60	98	38	9
197	60	137	39	9
145	60	85	40	9
130	60	70	41	9
172	60	112	42	9
143	60	83	43	9
16.1	60	-43.9	43	10
234	60	174	44	10

185	33.8	151.2	45	10
99.1	33.8	65.3	46	10
134	33.8	100.2	47	10
76.3	33.8	42.5	48	10
192	33.8	158.2	49	10
210	33.8	176.2	50	10
170	33.8	136.2	51	10
218	33.8	184.2	52	10
158	33.8	124.2	53	10
197	33.8	163.2	54	10
145	33.8	111.2	55	10
130	33.8	96.2	56	10
172	33.8	138.2	57	10
143	33.8	109.2	58	10
16.1	33.8	-17.7	58	11
234	33.8	200.2	59	11

99.1	185	-85.9	59	12
134	185	-51	59	13
76.3	185	-108.7	59	14
192	185	7	60	14
210	185	25	61	14
170	185	-15	61	15
218	185	33	62	15
158	185	-27	62	16
197	185	12	63	16
145	185	-40	63	17
130	185	-55	63	18
172	185	-13	63	19
143	185	-42	63	20
16.1	185	-168.9	63	21
234	185	49	64	21

134	99.1	34.9	65	21
76.3	99.1	-22.8	65	22
192	99.1	92.9	66	22
210	99.1	110.9	67	22
170	99.1	70.9	68	22
218	99.1	118.9	69	22
158	99.1	58.9	70	22
197	99.1	97.9	71	22
145	99.1	45.9	72	22
130	99.1	30.9	73	22
172	99.1	72.9	74	22
143	99.1	43.9	75	22
16.1	99.1	-83	75	23

234	99.1	134.9	76	23
76.3	134	-57.7	76	24
192	134	58	77	24
210	134	76	78	24
170	134	36	79	24
218	134	84	80	24
158	134	24	81	24
197	134	63	82	24
145	134	11	83	24
130	134	-4	83	25
172	134	38	84	25
143	134	9	85	25
16.1	134	-117.9	85	26
234	134	100	86	26
192	76.3	115.7	87	26
210	76.3	133.7	88	26
170	76.3	93.7	89	26
218	76.3	141.7	90	26
158	76.3	81.7	91	26
197	76.3	120.7	92	26
145	76.3	68.7	93	26
130	76.3	53.7	94	26
172	76.3	95.7	95	26
143	76.3	66.7	96	26
16.1	76.3	-60.2	96	27
234	76.3	157.7	97	27
210	192	18	98	27
170	192	-22	98	28
218	192	26	99	28
158	192	-34	99	29
197	192	5	100	29
145	192	-47	100	30
130	192	-62	100	31
172	192	-20	100	32
143	192	-49	100	33
16.1	192	-175.9	100	34
234	192	42	101	34
170	210	-40	101	35
218	210	8	102	35
158	210	-52	102	36
197	210	-13	102	37
145	210	-65	102	38
130	210	-80	102	39
172	210	-38	102	40
143	210	-67	102	41
16.1	210	-193.9	102	42
234	210	24	103	42
218	170	48	104	42
158	170	-12	104	43
197	170	27	105	43
145	170	-25	105	44
130	170	-40	105	45

172	170	2	106	45
143	170	-27	106	46
16.1	170	-153.9	106	47
234	170	64	107	47
158	218	-60	107	48
197	218	-21	107	49
145	218	-73	107	50
130	218	-88	107	51
172	218	-46	107	52
143	218	-75	107	53
16.1	218	-201.9	107	54
234	218	16	108	54
197	158	39	109	54
145	158	-13	109	55
130	158	-28	109	56
172	158	14	110	56
143	158	-15	110	57
16.1	158	-141.9	110	58
234	158	76	111	58
145	197	-52	111	59
130	197	-67	111	60
172	197	-25	111	61
143	197	-54	111	62
16.1	197	-180.9	111	63
234	197	37	112	63
130	145	-15	112	64
172	145	27	113	64
143	145	-2	113	65
16.1	145	-128.9	113	66
234	145	89	114	66
172	130	42	115	66
143	130	13	116	66
16.1	130	-113.9	116	67
234	130	104	117	67
143	172	-29	117	68
16.1	172	-155.9	117	69
234	172	62	118	69
16.1	143	-126.9	118	70
234	143	91	119	70
234	16.1	217.9	120	70

S Statistic = 120 - 70 = 50

Tied Group Value	Members
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Time Period	Observations
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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

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 950

Z-Score = 1.58977

Comparison Level at 95% confidence level = 1.65463 (upward trend)

1.58977 <= 1.65463 indicating no evidence of 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
60	66.6	-6.6	14	6
33.8	66.6	-32.8	14	7
185	66.6	118.4	15	7
99.1	66.6	32.5	16	7
134	66.6	67.4	17	7
76.3	66.6	9.7	18	7
192	66.6	125.4	19	7
210	66.6	143.4	20	7
170	66.6	103.4	21	7
218	66.6	151.4	22	7
158	66.6	91.4	23	7
197	66.6	130.4	24	7
145	66.6	78.4	25	7
130	66.6	63.4	26	7
172	66.6	105.4	27	7
143	66.6	76.4	28	7
16.1	66.6	-50.5	28	8
234	66.6	167.4	29	8
33.8	60	-26.2	29	9
185	60	125	30	9
99.1	60	39.1	31	9
134	60	74	32	9
76.3	60	16.3	33	9
192	60	132	34	9
210	60	150	35	9

170	60	110	36	9
218	60	158	37	9
158	60	98	38	9
197	60	137	39	9
145	60	85	40	9
130	60	70	41	9
172	60	112	42	9
143	60	83	43	9
16.1	60	-43.9	43	10
234	60	174	44	10

185	33.8	151.2	45	10
99.1	33.8	65.3	46	10
134	33.8	100.2	47	10
76.3	33.8	42.5	48	10
192	33.8	158.2	49	10
210	33.8	176.2	50	10
170	33.8	136.2	51	10
218	33.8	184.2	52	10
158	33.8	124.2	53	10
197	33.8	163.2	54	10
145	33.8	111.2	55	10
130	33.8	96.2	56	10
172	33.8	138.2	57	10
143	33.8	109.2	58	10
16.1	33.8	-17.7	58	11
234	33.8	200.2	59	11

99.1	185	-85.9	59	12
134	185	-51	59	13
76.3	185	-108.7	59	14
192	185	7	60	14
210	185	25	61	14
170	185	-15	61	15
218	185	33	62	15
158	185	-27	62	16
197	185	12	63	16
145	185	-40	63	17
130	185	-55	63	18
172	185	-13	63	19
143	185	-42	63	20
16.1	185	-168.9	63	21
234	185	49	64	21

134	99.1	34.9	65	21
76.3	99.1	-22.8	65	22
192	99.1	92.9	66	22
210	99.1	110.9	67	22
170	99.1	70.9	68	22
218	99.1	118.9	69	22
158	99.1	58.9	70	22
197	99.1	97.9	71	22
145	99.1	45.9	72	22
130	99.1	30.9	73	22
172	99.1	72.9	74	22
143	99.1	43.9	75	22
16.1	99.1	-83	75	23

234	99.1	134.9	76	23
76.3	134	-57.7	76	24
192	134	58	77	24
210	134	76	78	24
170	134	36	79	24
218	134	84	80	24
158	134	24	81	24
197	134	63	82	24
145	134	11	83	24
130	134	-4	83	25
172	134	38	84	25
143	134	9	85	25
16.1	134	-117.9	85	26
234	134	100	86	26
192	76.3	115.7	87	26
210	76.3	133.7	88	26
170	76.3	93.7	89	26
218	76.3	141.7	90	26
158	76.3	81.7	91	26
197	76.3	120.7	92	26
145	76.3	68.7	93	26
130	76.3	53.7	94	26
172	76.3	95.7	95	26
143	76.3	66.7	96	26
16.1	76.3	-60.2	96	27
234	76.3	157.7	97	27
210	192	18	98	27
170	192	-22	98	28
218	192	26	99	28
158	192	-34	99	29
197	192	5	100	29
145	192	-47	100	30
130	192	-62	100	31
172	192	-20	100	32
143	192	-49	100	33
16.1	192	-175.9	100	34
234	192	42	101	34
170	210	-40	101	35
218	210	8	102	35
158	210	-52	102	36
197	210	-13	102	37
145	210	-65	102	38
130	210	-80	102	39
172	210	-38	102	40
143	210	-67	102	41
16.1	210	-193.9	102	42
234	210	24	103	42
218	170	48	104	42
158	170	-12	104	43
197	170	27	105	43
145	170	-25	105	44
130	170	-40	105	45

172	170	2	106	45
143	170	-27	106	46
16.1	170	-153.9	106	47
234	170	64	107	47
158	218	-60	107	48
197	218	-21	107	49
145	218	-73	107	50
130	218	-88	107	51
172	218	-46	107	52
143	218	-75	107	53
16.1	218	-201.9	107	54
234	218	16	108	54
197	158	39	109	54
145	158	-13	109	55
130	158	-28	109	56
172	158	14	110	56
143	158	-15	110	57
16.1	158	-141.9	110	58
234	158	76	111	58
145	197	-52	111	59
130	197	-67	111	60
172	197	-25	111	61
143	197	-54	111	62
16.1	197	-180.9	111	63
234	197	37	112	63
130	145	-15	112	64
172	145	27	113	64
143	145	-2	113	65
16.1	145	-128.9	113	66
234	145	89	114	66
172	130	42	115	66
143	130	13	116	66
16.1	130	-113.9	116	67
234	130	104	117	67
143	172	-29	117	68
16.1	172	-155.9	117	69
234	172	62	118	69
16.1	143	-126.9	118	70
234	143	91	119	70
234	16.1	217.9	120	70

S Statistic = 120 - 70 = 50

Tied Group Value	Members
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Time Period	Observations
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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

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 950

Z-Score = 1.58977

Comparison Level at 95% confidence level = -1.65463 (downward trend)

1.58977 >= -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
46.1	42.5	3.6	17	3
65.2	42.5	22.7	18	3
41.1	42.5	-1.4	18	4
42.2	42.5	-0.3	18	5
45.8	42.5	3.3	19	5
17.9	42.5	-24.6	19	6
41.5	42.5	-1	19	7
18.8	42.5	-23.7	19	8
47.1	42.5	4.6	20	8
55	42.5	12.5	21	8
38.9	42.5	-3.6	21	9
40.8	42.5	-1.7	21	10
35.8	42.5	-6.7	21	11
1.8	42.5	-40.7	21	12
87	42.5	44.5	22	12
41.6	42.5	-0.9	22	13
36	42.5	-6.5	22	14
40	42.5	-2.5	22	15
65.2	46.1	19.1	23	15
41.1	46.1	-5	23	16
42.2	46.1	-3.9	23	17
45.8	46.1	-0.3	23	18
17.9	46.1	-28.2	23	19
41.5	46.1	-4.6	23	20
18.8	46.1	-27.3	23	21

47.1	46.1	1	24	21
55	46.1	8.9	25	21
38.9	46.1	-7.2	25	22
40.8	46.1	-5.3	25	23
35.8	46.1	-10.3	25	24
1.8	46.1	-44.3	25	25
87	46.1	40.9	26	25
41.6	46.1	-4.5	26	26
36	46.1	-10.1	26	27
40	46.1	-6.1	26	28
41.1	65.2	-24.1	26	29
42.2	65.2	-23	26	30
45.8	65.2	-19.4	26	31
17.9	65.2	-47.3	26	32
41.5	65.2	-23.7	26	33
18.8	65.2	-46.4	26	34
47.1	65.2	-18.1	26	35
55	65.2	-10.2	26	36
38.9	65.2	-26.3	26	37
40.8	65.2	-24.4	26	38
35.8	65.2	-29.4	26	39
1.8	65.2	-63.4	26	40
87	65.2	21.8	27	40
41.6	65.2	-23.6	27	41
36	65.2	-29.2	27	42
40	65.2	-25.2	27	43
42.2	41.1	1.1	28	43
45.8	41.1	4.7	29	43
17.9	41.1	-23.2	29	44
41.5	41.1	0.4	30	44
18.8	41.1	-22.3	30	45
47.1	41.1	6	31	45
55	41.1	13.9	32	45
38.9	41.1	-2.2	32	46
40.8	41.1	-0.3	32	47
35.8	41.1	-5.3	32	48
1.8	41.1	-39.3	32	49
87	41.1	45.9	33	49
41.6	41.1	0.5	34	49
36	41.1	-5.1	34	50
40	41.1	-1.1	34	51
45.8	42.2	3.6	35	51
17.9	42.2	-24.3	35	52
41.5	42.2	-0.7	35	53
18.8	42.2	-23.4	35	54
47.1	42.2	4.9	36	54
55	42.2	12.8	37	54
38.9	42.2	-3.3	37	55
40.8	42.2	-1.4	37	56
35.8	42.2	-6.4	37	57
1.8	42.2	-40.4	37	58
87	42.2	44.8	38	58
41.6	42.2	-0.6	38	59
36	42.2	-6.2	38	60

40	42.2	-2.2	38	61
17.9	45.8	-27.9	38	62
41.5	45.8	-4.3	38	63
18.8	45.8	-27	38	64
47.1	45.8	1.3	39	64
55	45.8	9.2	40	64
38.9	45.8	-6.9	40	65
40.8	45.8	-5	40	66
35.8	45.8	-10	40	67
1.8	45.8	-44	40	68
87	45.8	41.2	41	68
41.6	45.8	-4.2	41	69
36	45.8	-9.8	41	70
40	45.8	-5.8	41	71
41.5	17.9	23.6	42	71
18.8	17.9	0.9	43	71
47.1	17.9	29.2	44	71
55	17.9	37.1	45	71
38.9	17.9	21	46	71
40.8	17.9	22.9	47	71
35.8	17.9	17.9	48	71
1.8	17.9	-16.1	48	72
87	17.9	69.1	49	72
41.6	17.9	23.7	50	72
36	17.9	18.1	51	72
40	17.9	22.1	52	72
18.8	41.5	-22.7	52	73
47.1	41.5	5.6	53	73
55	41.5	13.5	54	73
38.9	41.5	-2.6	54	74
40.8	41.5	-0.7	54	75
35.8	41.5	-5.7	54	76
1.8	41.5	-39.7	54	77
87	41.5	45.5	55	77
41.6	41.5	0.1	56	77
36	41.5	-5.5	56	78
40	41.5	-1.5	56	79
47.1	18.8	28.3	57	79
55	18.8	36.2	58	79
38.9	18.8	20.1	59	79
40.8	18.8	22	60	79
35.8	18.8	17	61	79
1.8	18.8	-17	61	80
87	18.8	68.2	62	80
41.6	18.8	22.8	63	80
36	18.8	17.2	64	80
40	18.8	21.2	65	80
55	47.1	7.9	66	80
38.9	47.1	-8.2	66	81
40.8	47.1	-6.3	66	82
35.8	47.1	-11.3	66	83
1.8	47.1	-45.3	66	84

87	47.1	39.9	67	84
41.6	47.1	-5.5	67	85
36	47.1	-11.1	67	86
40	47.1	-7.1	67	87
38.9	55	-16.1	67	88
40.8	55	-14.2	67	89
35.8	55	-19.2	67	90
1.8	55	-53.2	67	91
87	55	32	68	91
41.6	55	-13.4	68	92
36	55	-19	68	93
40	55	-15	68	94
40.8	38.9	1.9	69	94
35.8	38.9	-3.1	69	95
1.8	38.9	-37.1	69	96
87	38.9	48.1	70	96
41.6	38.9	2.7	71	96
36	38.9	-2.9	71	97
40	38.9	1.1	72	97
35.8	40.8	-5	72	98
1.8	40.8	-39	72	99
87	40.8	46.2	73	99
41.6	40.8	0.8	74	99
36	40.8	-4.8	74	100
40	40.8	-0.8	74	101
1.8	35.8	-34	74	102
87	35.8	51.2	75	102
41.6	35.8	5.8	76	102
36	35.8	0.2	77	102
40	35.8	4.2	78	102
87	1.8	85.2	79	102
41.6	1.8	39.8	80	102
36	1.8	34.2	81	102
40	1.8	38.2	82	102
41.6	87	-45.4	82	103
36	87	-51	82	104
40	87	-47	82	105
36	41.6	-5.6	82	106
40	41.6	-1.6	82	107
40	36	4	83	107

S Statistic = 83 - 107 = -24

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

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 950

Z-Score = -0.746219

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-0.746219 <= 1.65463 indicating no evidence of 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
46.1	42.5	3.6	17	3
65.2	42.5	22.7	18	3
41.1	42.5	-1.4	18	4
42.2	42.5	-0.3	18	5
45.8	42.5	3.3	19	5
17.9	42.5	-24.6	19	6
41.5	42.5	-1	19	7
18.8	42.5	-23.7	19	8
47.1	42.5	4.6	20	8
55	42.5	12.5	21	8
38.9	42.5	-3.6	21	9
40.8	42.5	-1.7	21	10
35.8	42.5	-6.7	21	11
1.8	42.5	-40.7	21	12
87	42.5	44.5	22	12
41.6	42.5	-0.9	22	13
36	42.5	-6.5	22	14
40	42.5	-2.5	22	15
65.2	46.1	19.1	23	15
41.1	46.1	-5	23	16
42.2	46.1	-3.9	23	17
45.8	46.1	-0.3	23	18
17.9	46.1	-28.2	23	19
41.5	46.1	-4.6	23	20
18.8	46.1	-27.3	23	21

47.1	46.1	1	24	21
55	46.1	8.9	25	21
38.9	46.1	-7.2	25	22
40.8	46.1	-5.3	25	23
35.8	46.1	-10.3	25	24
1.8	46.1	-44.3	25	25
87	46.1	40.9	26	25
41.6	46.1	-4.5	26	26
36	46.1	-10.1	26	27
40	46.1	-6.1	26	28
41.1	65.2	-24.1	26	29
42.2	65.2	-23	26	30
45.8	65.2	-19.4	26	31
17.9	65.2	-47.3	26	32
41.5	65.2	-23.7	26	33
18.8	65.2	-46.4	26	34
47.1	65.2	-18.1	26	35
55	65.2	-10.2	26	36
38.9	65.2	-26.3	26	37
40.8	65.2	-24.4	26	38
35.8	65.2	-29.4	26	39
1.8	65.2	-63.4	26	40
87	65.2	21.8	27	40
41.6	65.2	-23.6	27	41
36	65.2	-29.2	27	42
40	65.2	-25.2	27	43
42.2	41.1	1.1	28	43
45.8	41.1	4.7	29	43
17.9	41.1	-23.2	29	44
41.5	41.1	0.4	30	44
18.8	41.1	-22.3	30	45
47.1	41.1	6	31	45
55	41.1	13.9	32	45
38.9	41.1	-2.2	32	46
40.8	41.1	-0.3	32	47
35.8	41.1	-5.3	32	48
1.8	41.1	-39.3	32	49
87	41.1	45.9	33	49
41.6	41.1	0.5	34	49
36	41.1	-5.1	34	50
40	41.1	-1.1	34	51
45.8	42.2	3.6	35	51
17.9	42.2	-24.3	35	52
41.5	42.2	-0.7	35	53
18.8	42.2	-23.4	35	54
47.1	42.2	4.9	36	54
55	42.2	12.8	37	54
38.9	42.2	-3.3	37	55
40.8	42.2	-1.4	37	56
35.8	42.2	-6.4	37	57
1.8	42.2	-40.4	37	58
87	42.2	44.8	38	58
41.6	42.2	-0.6	38	59
36	42.2	-6.2	38	60

40	42.2	-2.2	38	61
17.9	45.8	-27.9	38	62
41.5	45.8	-4.3	38	63
18.8	45.8	-27	38	64
47.1	45.8	1.3	39	64
55	45.8	9.2	40	64
38.9	45.8	-6.9	40	65
40.8	45.8	-5	40	66
35.8	45.8	-10	40	67
1.8	45.8	-44	40	68
87	45.8	41.2	41	68
41.6	45.8	-4.2	41	69
36	45.8	-9.8	41	70
40	45.8	-5.8	41	71
41.5	17.9	23.6	42	71
18.8	17.9	0.9	43	71
47.1	17.9	29.2	44	71
55	17.9	37.1	45	71
38.9	17.9	21	46	71
40.8	17.9	22.9	47	71
35.8	17.9	17.9	48	71
1.8	17.9	-16.1	48	72
87	17.9	69.1	49	72
41.6	17.9	23.7	50	72
36	17.9	18.1	51	72
40	17.9	22.1	52	72
18.8	41.5	-22.7	52	73
47.1	41.5	5.6	53	73
55	41.5	13.5	54	73
38.9	41.5	-2.6	54	74
40.8	41.5	-0.7	54	75
35.8	41.5	-5.7	54	76
1.8	41.5	-39.7	54	77
87	41.5	45.5	55	77
41.6	41.5	0.1	56	77
36	41.5	-5.5	56	78
40	41.5	-1.5	56	79
47.1	18.8	28.3	57	79
55	18.8	36.2	58	79
38.9	18.8	20.1	59	79
40.8	18.8	22	60	79
35.8	18.8	17	61	79
1.8	18.8	-17	61	80
87	18.8	68.2	62	80
41.6	18.8	22.8	63	80
36	18.8	17.2	64	80
40	18.8	21.2	65	80
55	47.1	7.9	66	80
38.9	47.1	-8.2	66	81
40.8	47.1	-6.3	66	82
35.8	47.1	-11.3	66	83
1.8	47.1	-45.3	66	84

87	47.1	39.9	67	84
41.6	47.1	-5.5	67	85
36	47.1	-11.1	67	86
40	47.1	-7.1	67	87
38.9	55	-16.1	67	88
40.8	55	-14.2	67	89
35.8	55	-19.2	67	90
1.8	55	-53.2	67	91
87	55	32	68	91
41.6	55	-13.4	68	92
36	55	-19	68	93
40	55	-15	68	94
40.8	38.9	1.9	69	94
35.8	38.9	-3.1	69	95
1.8	38.9	-37.1	69	96
87	38.9	48.1	70	96
41.6	38.9	2.7	71	96
36	38.9	-2.9	71	97
40	38.9	1.1	72	97
35.8	40.8	-5	72	98
1.8	40.8	-39	72	99
87	40.8	46.2	73	99
41.6	40.8	0.8	74	99
36	40.8	-4.8	74	100
40	40.8	-0.8	74	101
1.8	35.8	-34	74	102
87	35.8	51.2	75	102
41.6	35.8	5.8	76	102
36	35.8	0.2	77	102
40	35.8	4.2	78	102
87	1.8	85.2	79	102
41.6	1.8	39.8	80	102
36	1.8	34.2	81	102
40	1.8	38.2	82	102
41.6	87	-45.4	82	103
36	87	-51	82	104
40	87	-47	82	105
36	41.6	-5.6	82	106
40	41.6	-1.6	82	107
40	36	4	83	107

S Statistic = 83 - 107 = -24

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

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 950

Z-Score = -0.746219

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-0.746219 >= -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
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
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
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
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
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
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
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
0.728	0.212	0.516	53	9
ND<0	0.212	-0.212	53	10
0.1	0.212	-0.112	53	11
4.87	0.212	4.658	54	11
ND<0	0.212	-0.212	54	12
2.24	0.212	2.028	55	12
ND<0	0.212	-0.212	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
5.56	0.212	5.348	56	16
ND<0	0.728	-0.728	56	17
0.1	0.728	-0.628	56	18
4.87	0.728	4.142	57	18
ND<0	0.728	-0.728	57	19
2.24	0.728	1.512	58	19
ND<0	0.728	-0.728	58	20
ND<0	0.728	-0.728	58	21
ND<0	0.728	-0.728	58	22
ND<0	0.728	-0.728	58	23
5.56	0.728	4.832	59	23
0.1	ND<0	0.1	60	23
4.87	ND<0	4.87	61	23
ND<0	ND<0	0	61	23
2.24	ND<0	2.24	62	23
ND<0	ND<0	0	62	23

ND<0	ND<0	0	62	23
ND<0	ND<0	0	62	23
ND<0	ND<0	0	62	23
5.56	ND<0	5.56	63	23
4.87	0.1	4.77	64	23
ND<0	0.1	-0.1	64	24
2.24	0.1	2.14	65	24
ND<0	0.1	-0.1	65	25
ND<0	0.1	-0.1	65	26
ND<0	0.1	-0.1	65	27
ND<0	0.1	-0.1	65	28
5.56	0.1	5.46	66	28
ND<0	4.87	-4.87	66	29
2.24	4.87	-2.63	66	30
ND<0	4.87	-4.87	66	31
ND<0	4.87	-4.87	66	32
ND<0	4.87	-4.87	66	33
ND<0	4.87	-4.87	66	34
5.56	4.87	0.69	67	34
2.24	ND<0	2.24	68	34
ND<0	ND<0	0	68	34
ND<0	ND<0	0	68	34
ND<0	ND<0	0	68	34
ND<0	ND<0	0	68	34
5.56	ND<0	5.56	69	34
ND<0	2.24	-2.24	69	35
ND<0	2.24	-2.24	69	36
ND<0	2.24	-2.24	69	37
ND<0	2.24	-2.24	69	38
5.56	2.24	3.32	70	38
ND<0	ND<0	0	70	38
ND<0	ND<0	0	70	38
ND<0	ND<0	0	70	38
5.56	ND<0	5.56	71	38
ND<0	ND<0	0	71	38
ND<0	ND<0	0	71	38
5.56	ND<0	5.56	72	38
ND<0	ND<0	0	72	38
5.56	ND<0	5.56	73	38
5.56	ND<0	5.56	74	38

S Statistic = 74 - 38 = 36

Tied Group Value	Members
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1	0	13
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Time Period	Observations
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2/15/2009	1
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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

There are 0 time periods with multiple data

A = 4836
 B = 0
 C = 1716
 D = 0
 E = 156
 F = 0
 a = 17100
 b = 61560
 c = 760
 Group Variance = 681.333
 Z-Score = 1.34087
 Comparison Level at 95% confidence level = 1.65463 (upward trend)
 1.34087 <= 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
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
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
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
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
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
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
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
0.728	0.212	0.516	53	9
ND<0	0.212	-0.212	53	10
0.1	0.212	-0.112	53	11
4.87	0.212	4.658	54	11
ND<0	0.212	-0.212	54	12
2.24	0.212	2.028	55	12
ND<0	0.212	-0.212	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
5.56	0.212	5.348	56	16
ND<0	0.728	-0.728	56	17
0.1	0.728	-0.628	56	18
4.87	0.728	4.142	57	18
ND<0	0.728	-0.728	57	19
2.24	0.728	1.512	58	19
ND<0	0.728	-0.728	58	20
ND<0	0.728	-0.728	58	21
ND<0	0.728	-0.728	58	22
ND<0	0.728	-0.728	58	23
5.56	0.728	4.832	59	23
0.1	ND<0	0.1	60	23
4.87	ND<0	4.87	61	23
ND<0	ND<0	0	61	23
2.24	ND<0	2.24	62	23
ND<0	ND<0	0	62	23

ND<0	ND<0	0	62	23
ND<0	ND<0	0	62	23
ND<0	ND<0	0	62	23
5.56	ND<0	5.56	63	23
4.87	0.1	4.77	64	23
ND<0	0.1	-0.1	64	24
2.24	0.1	2.14	65	24
ND<0	0.1	-0.1	65	25
ND<0	0.1	-0.1	65	26
ND<0	0.1	-0.1	65	27
ND<0	0.1	-0.1	65	28
5.56	0.1	5.46	66	28
ND<0	4.87	-4.87	66	29
2.24	4.87	-2.63	66	30
ND<0	4.87	-4.87	66	31
ND<0	4.87	-4.87	66	32
ND<0	4.87	-4.87	66	33
ND<0	4.87	-4.87	66	34
5.56	4.87	0.69	67	34
2.24	ND<0	2.24	68	34
ND<0	ND<0	0	68	34
ND<0	ND<0	0	68	34
ND<0	ND<0	0	68	34
ND<0	ND<0	0	68	34
5.56	ND<0	5.56	69	34
ND<0	2.24	-2.24	69	35
ND<0	2.24	-2.24	69	36
ND<0	2.24	-2.24	69	37
ND<0	2.24	-2.24	69	38
5.56	2.24	3.32	70	38
ND<0	ND<0	0	70	38
ND<0	ND<0	0	70	38
ND<0	ND<0	0	70	38
5.56	ND<0	5.56	71	38
ND<0	ND<0	0	71	38
ND<0	ND<0	0	71	38
5.56	ND<0	5.56	72	38
ND<0	ND<0	0	72	38
5.56	ND<0	5.56	73	38
5.56	ND<0	5.56	74	38

S Statistic = 74 - 38 = 36

Tied Group Value	Members
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1	0	13
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Time Period	Observations
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2/15/2009	1
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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

There are 0 time periods with multiple data

A = 4836
B = 0
C = 1716
D = 0
E = 156
F = 0
a = 17100
b = 61560
c = 760
Group Variance = 681.333
Z-Score = 1.34087
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.34087 >= -1.65463 indicating no evidence of a downward 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
1100	915	185	14	2
1400	915	485	15	2
1100	915	185	16	2
2200	915	1285	17	2
1000	1200	-200	17	3
930	1200	-270	17	4
900	1200	-300	17	5
1100	1200	-100	17	6
1100	1200	-100	17	7
500	1200	-700	17	8
1000	1200	-200	17	9
1300	1200	100	18	9
1200	1200	0	18	9
3100	1200	1900	19	9
990	1200	-210	19	10
1500	1200	300	20	10
7300	1200	6100	21	10
1600	1200	400	22	10
1100	1200	-100	22	11
1400	1200	200	23	11
1100	1200	-100	23	12
2200	1200	1000	24	12
930	1000	-70	24	13
900	1000	-100	24	14
1100	1000	100	25	14
1100	1000	100	26	14
500	1000	-500	26	15
1000	1000	0	26	15
1300	1000	300	27	15

1200	1000	200	28	15
3100	1000	2100	29	15
990	1000	-10	29	16
1500	1000	500	30	16
7300	1000	6300	31	16
1600	1000	600	32	16
1100	1000	100	33	16
1400	1000	400	34	16
1100	1000	100	35	16
2200	1000	1200	36	16

900	930	-30	36	17
1100	930	170	37	17
1100	930	170	38	17
500	930	-430	38	18
1000	930	70	39	18
1300	930	370	40	18
1200	930	270	41	18
3100	930	2170	42	18
990	930	60	43	18
1500	930	570	44	18
7300	930	6370	45	18
1600	930	670	46	18
1100	930	170	47	18
1400	930	470	48	18
1100	930	170	49	18
2200	930	1270	50	18

1100	900	200	51	18
1100	900	200	52	18
500	900	-400	52	19
1000	900	100	53	19
1300	900	400	54	19
1200	900	300	55	19
3100	900	2200	56	19
990	900	90	57	19
1500	900	600	58	19
7300	900	6400	59	19
1600	900	700	60	19
1100	900	200	61	19
1400	900	500	62	19
1100	900	200	63	19
2200	900	1300	64	19

1100	1100	0	64	19
500	1100	-600	64	20
1000	1100	-100	64	21
1300	1100	200	65	21
1200	1100	100	66	21
3100	1100	2000	67	21
990	1100	-110	67	22
1500	1100	400	68	22
7300	1100	6200	69	22
1600	1100	500	70	22
1100	1100	0	70	22
1400	1100	300	71	22
1100	1100	0	71	22

2200	1100	1100	72	22
500	1100	-600	72	23
1000	1100	-100	72	24
1300	1100	200	73	24
1200	1100	100	74	24
3100	1100	2000	75	24
990	1100	-110	75	25
1500	1100	400	76	25
7300	1100	6200	77	25
1600	1100	500	78	25
1100	1100	0	78	25
1400	1100	300	79	25
1100	1100	0	79	25
2200	1100	1100	80	25
1000	500	500	81	25
1300	500	800	82	25
1200	500	700	83	25
3100	500	2600	84	25
990	500	490	85	25
1500	500	1000	86	25
7300	500	6800	87	25
1600	500	1100	88	25
1100	500	600	89	25
1400	500	900	90	25
1100	500	600	91	25
2200	500	1700	92	25
1300	1000	300	93	25
1200	1000	200	94	25
3100	1000	2100	95	25
990	1000	-10	95	26
1500	1000	500	96	26
7300	1000	6300	97	26
1600	1000	600	98	26
1100	1000	100	99	26
1400	1000	400	100	26
1100	1000	100	101	26
2200	1000	1200	102	26
1200	1300	-100	102	27
3100	1300	1800	103	27
990	1300	-310	103	28
1500	1300	200	104	28
7300	1300	6000	105	28
1600	1300	300	106	28
1100	1300	-200	106	29
1400	1300	100	107	29
1100	1300	-200	107	30
2200	1300	900	108	30
3100	1200	1900	109	30
990	1200	-210	109	31
1500	1200	300	110	31
7300	1200	6100	111	31
1600	1200	400	112	31

1100	1200	-100	112	32
1400	1200	200	113	32
1100	1200	-100	113	33
2200	1200	1000	114	33
990	3100	-2110	114	34
1500	3100	-1600	114	35
7300	3100	4200	115	35
1600	3100	-1500	115	36
1100	3100	-2000	115	37
1400	3100	-1700	115	38
1100	3100	-2000	115	39
2200	3100	-900	115	40
1500	990	510	116	40
7300	990	6310	117	40
1600	990	610	118	40
1100	990	110	119	40
1400	990	410	120	40
1100	990	110	121	40
2200	990	1210	122	40
7300	1500	5800	123	40
1600	1500	100	124	40
1100	1500	-400	124	41
1400	1500	-100	124	42
1100	1500	-400	124	43
2200	1500	700	125	43
1600	7300	-5700	125	44
1100	7300	-6200	125	45
1400	7300	-5900	125	46
1100	7300	-6200	125	47
2200	7300	-5100	125	48
1100	1600	-500	125	49
1400	1600	-200	125	50
1100	1600	-500	125	51
2200	1600	600	126	51
1400	1100	300	127	51
1100	1100	0	127	51
2200	1100	1100	128	51
1100	1400	-300	128	52
2200	1400	800	129	52
2200	1100	1100	130	52

S Statistic = 130 - 52 = 78

Tied Group Value	Members
1	2
2	2
3	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
3/16/2015	1
10/23/2015	1
5/4/2016	1
10/4/2016	1

There are 0 time periods with multiple data

A = 192

B = 0

C = 24

D = 0

E = 16

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 939.333

Z-Score = 2.51235

Comparison Level at 95% confidence level = 1.65463 (upward trend)

2.51235 > 1.65463 indicating 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
1600	1200	400	16	4
500	1200	-700	16	5
1600	1200	400	17	5
1800	1200	600	18	5
1600	1200	400	19	5
790	1200	-410	19	6
1700	1200	500	20	6
1800	1200	600	21	6
1700	1200	500	22	6
2100	1200	900	23	6
1700	1200	500	24	6
2200	1200	1000	25	6
1900	1200	700	26	6
2200	1200	1000	27	6
2000	1200	800	28	6
2000	1200	800	29	6
320	1200	-880	29	7
4600	1200	3400	30	7
500	1600	-1100	30	8
1600	1600	0	30	8
1800	1600	200	31	8
1600	1600	0	31	8
790	1600	-810	31	9
1700	1600	100	32	9
1800	1600	200	33	9

1700	1600	100	34	9
2100	1600	500	35	9
1700	1600	100	36	9
2200	1600	600	37	9
1900	1600	300	38	9
2200	1600	600	39	9
2000	1600	400	40	9
2000	1600	400	41	9
320	1600	-1280	41	10
4600	1600	3000	42	10
1600	500	1100	43	10
1800	500	1300	44	10
1600	500	1100	45	10
790	500	290	46	10
1700	500	1200	47	10
1800	500	1300	48	10
1700	500	1200	49	10
2100	500	1600	50	10
1700	500	1200	51	10
2200	500	1700	52	10
1900	500	1400	53	10
2200	500	1700	54	10
2000	500	1500	55	10
2000	500	1500	56	10
320	500	-180	56	11
4600	500	4100	57	11
1800	1600	200	58	11
1600	1600	0	58	11
790	1600	-810	58	12
1700	1600	100	59	12
1800	1600	200	60	12
1700	1600	100	61	12
2100	1600	500	62	12
1700	1600	100	63	12
2200	1600	600	64	12
1900	1600	300	65	12
2200	1600	600	66	12
2000	1600	400	67	12
2000	1600	400	68	12
320	1600	-1280	68	13
4600	1600	3000	69	13
1600	1800	-200	69	14
790	1800	-1010	69	15
1700	1800	-100	69	16
1800	1800	0	69	16
1700	1800	-100	69	17
2100	1800	300	70	17
1700	1800	-100	70	18
2200	1800	400	71	18
1900	1800	100	72	18
2200	1800	400	73	18
2000	1800	200	74	18
2000	1800	200	75	18
320	1800	-1480	75	19

4600	1800	2800	76	19
790	1600	-810	76	20
1700	1600	100	77	20
1800	1600	200	78	20
1700	1600	100	79	20
2100	1600	500	80	20
1700	1600	100	81	20
2200	1600	600	82	20
1900	1600	300	83	20
2200	1600	600	84	20
2000	1600	400	85	20
2000	1600	400	86	20
320	1600	-1280	86	21
4600	1600	3000	87	21
1700	790	910	88	21
1800	790	1010	89	21
1700	790	910	90	21
2100	790	1310	91	21
1700	790	910	92	21
2200	790	1410	93	21
1900	790	1110	94	21
2200	790	1410	95	21
2000	790	1210	96	21
2000	790	1210	97	21
320	790	-470	97	22
4600	790	3810	98	22
1800	1700	100	99	22
1700	1700	0	99	22
2100	1700	400	100	22
1700	1700	0	100	22
2200	1700	500	101	22
1900	1700	200	102	22
2200	1700	500	103	22
2000	1700	300	104	22
2000	1700	300	105	22
320	1700	-1380	105	23
4600	1700	2900	106	23
1700	1800	-100	106	24
2100	1800	300	107	24
1700	1800	-100	107	25
2200	1800	400	108	25
1900	1800	100	109	25
2200	1800	400	110	25
2000	1800	200	111	25
2000	1800	200	112	25
320	1800	-1480	112	26
4600	1800	2800	113	26
2100	1700	400	114	26
1700	1700	0	114	26
2200	1700	500	115	26
1900	1700	200	116	26
2200	1700	500	117	26

2000	1700	300	118	26
2000	1700	300	119	26
320	1700	-1380	119	27
4600	1700	2900	120	27
1700	2100	-400	120	28
2200	2100	100	121	28
1900	2100	-200	121	29
2200	2100	100	122	29
2000	2100	-100	122	30
2000	2100	-100	122	31
320	2100	-1780	122	32
4600	2100	2500	123	32
2200	1700	500	124	32
1900	1700	200	125	32
2200	1700	500	126	32
2000	1700	300	127	32
2000	1700	300	128	32
320	1700	-1380	128	33
4600	1700	2900	129	33
1900	2200	-300	129	34
2200	2200	0	129	34
2000	2200	-200	129	35
2000	2200	-200	129	36
320	2200	-1880	129	37
4600	2200	2400	130	37
2200	1900	300	131	37
2000	1900	100	132	37
2000	1900	100	133	37
320	1900	-1580	133	38
4600	1900	2700	134	38
2000	2200	-200	134	39
2000	2200	-200	134	40
320	2200	-1880	134	41
4600	2200	2400	135	41
2000	2000	0	135	41
320	2000	-1680	135	42
4600	2000	2600	136	42
320	2000	-1680	136	43
4600	2000	2600	137	43
4600	320	4280	138	43

S Statistic = 138 - 43 = 95

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

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

There are 0 time periods with multiple data

A = 186

B = 0

C = 12

D = 0

E = 18

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 939.667

Z-Score = 3.06649

Comparison Level at 95% confidence level = 1.65463 (upward trend)

3.06649 > 1.65463 indicating 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
590	490	100	14	6
200	490	-290	14	7
410	490	-80	14	8
490	490	0	14	8
480	490	-10	14	9
190	490	-300	14	10
500	490	10	15	10
390	490	-100	15	11
570	490	80	16	11
590	490	100	17	11
510	490	20	18	11
540	490	50	19	11
440	490	-50	19	12
98	490	-392	19	13
500	490	10	20	13
630	490	140	21	13
520	490	30	22	13
410	490	-80	22	14
200	590	-390	22	15
410	590	-180	22	16
490	590	-100	22	17
480	590	-110	22	18
190	590	-400	22	19
500	590	-90	22	20
390	590	-200	22	21

570	590	-20	22	22
590	590	0	22	22
510	590	-80	22	23
540	590	-50	22	24
440	590	-150	22	25
98	590	-492	22	26
500	590	-90	22	27
630	590	40	23	27
520	590	-70	23	28
410	590	-180	23	29
410	200	210	24	29
490	200	290	25	29
480	200	280	26	29
190	200	-10	26	30
500	200	300	27	30
390	200	190	28	30
570	200	370	29	30
590	200	390	30	30
510	200	310	31	30
540	200	340	32	30
440	200	240	33	30
98	200	-102	33	31
500	200	300	34	31
630	200	430	35	31
520	200	320	36	31
410	200	210	37	31
490	410	80	38	31
480	410	70	39	31
190	410	-220	39	32
500	410	90	40	32
390	410	-20	40	33
570	410	160	41	33
590	410	180	42	33
510	410	100	43	33
540	410	130	44	33
440	410	30	45	33
98	410	-312	45	34
500	410	90	46	34
630	410	220	47	34
520	410	110	48	34
410	410	0	48	34
480	490	-10	48	35
190	490	-300	48	36
500	490	10	49	36
390	490	-100	49	37
570	490	80	50	37
590	490	100	51	37
510	490	20	52	37
540	490	50	53	37
440	490	-50	53	38
98	490	-392	53	39
500	490	10	54	39
630	490	140	55	39
520	490	30	56	39

410	490	-80	56	40
190	480	-290	56	41
500	480	20	57	41
390	480	-90	57	42
570	480	90	58	42
590	480	110	59	42
510	480	30	60	42
540	480	60	61	42
440	480	-40	61	43
98	480	-382	61	44
500	480	20	62	44
630	480	150	63	44
520	480	40	64	44
410	480	-70	64	45
500	190	310	65	45
390	190	200	66	45
570	190	380	67	45
590	190	400	68	45
510	190	320	69	45
540	190	350	70	45
440	190	250	71	45
98	190	-92	71	46
500	190	310	72	46
630	190	440	73	46
520	190	330	74	46
410	190	220	75	46
390	500	-110	75	47
570	500	70	76	47
590	500	90	77	47
510	500	10	78	47
540	500	40	79	47
440	500	-60	79	48
98	500	-402	79	49
500	500	0	79	49
630	500	130	80	49
520	500	20	81	49
410	500	-90	81	50
570	390	180	82	50
590	390	200	83	50
510	390	120	84	50
540	390	150	85	50
440	390	50	86	50
98	390	-292	86	51
500	390	110	87	51
630	390	240	88	51
520	390	130	89	51
410	390	20	90	51
590	570	20	91	51
510	570	-60	91	52
540	570	-30	91	53
440	570	-130	91	54
98	570	-472	91	55

500	570	-70	91	56
630	570	60	92	56
520	570	-50	92	57
410	570	-160	92	58
510	590	-80	92	59
540	590	-50	92	60
440	590	-150	92	61
98	590	-492	92	62
500	590	-90	92	63
630	590	40	93	63
520	590	-70	93	64
410	590	-180	93	65
540	510	30	94	65
440	510	-70	94	66
98	510	-412	94	67
500	510	-10	94	68
630	510	120	95	68
520	510	10	96	68
410	510	-100	96	69
440	540	-100	96	70
98	540	-442	96	71
500	540	-40	96	72
630	540	90	97	72
520	540	-20	97	73
410	540	-130	97	74
98	440	-342	97	75
500	440	60	98	75
630	440	190	99	75
520	440	80	100	75
410	440	-30	100	76
500	98	402	101	76
630	98	532	102	76
520	98	422	103	76
410	98	312	104	76
630	500	130	105	76
520	500	20	106	76
410	500	-90	106	77
520	630	-110	106	78
410	630	-220	106	79
410	520	-110	106	80

S Statistic = $106 - 80 = 26$

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

Time Period	Observations
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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

There are 0 time periods with multiple data

A = 72

B = 0

C = 0

D = 0

E = 8

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 946

Z-Score = 0.81282

Comparison Level at 95% confidence level = 1.65463 (upward trend)

0.81282 <= 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
590	490	100	14	6
200	490	-290	14	7
410	490	-80	14	8
490	490	0	14	8
480	490	-10	14	9
190	490	-300	14	10
500	490	10	15	10
390	490	-100	15	11
570	490	80	16	11
590	490	100	17	11
510	490	20	18	11
540	490	50	19	11
440	490	-50	19	12
98	490	-392	19	13
500	490	10	20	13
630	490	140	21	13
520	490	30	22	13
410	490	-80	22	14
200	590	-390	22	15
410	590	-180	22	16
490	590	-100	22	17
480	590	-110	22	18
190	590	-400	22	19
500	590	-90	22	20
390	590	-200	22	21

570	590	-20	22	22
590	590	0	22	22
510	590	-80	22	23
540	590	-50	22	24
440	590	-150	22	25
98	590	-492	22	26
500	590	-90	22	27
630	590	40	23	27
520	590	-70	23	28
410	590	-180	23	29
410	200	210	24	29
490	200	290	25	29
480	200	280	26	29
190	200	-10	26	30
500	200	300	27	30
390	200	190	28	30
570	200	370	29	30
590	200	390	30	30
510	200	310	31	30
540	200	340	32	30
440	200	240	33	30
98	200	-102	33	31
500	200	300	34	31
630	200	430	35	31
520	200	320	36	31
410	200	210	37	31
490	410	80	38	31
480	410	70	39	31
190	410	-220	39	32
500	410	90	40	32
390	410	-20	40	33
570	410	160	41	33
590	410	180	42	33
510	410	100	43	33
540	410	130	44	33
440	410	30	45	33
98	410	-312	45	34
500	410	90	46	34
630	410	220	47	34
520	410	110	48	34
410	410	0	48	34
480	490	-10	48	35
190	490	-300	48	36
500	490	10	49	36
390	490	-100	49	37
570	490	80	50	37
590	490	100	51	37
510	490	20	52	37
540	490	50	53	37
440	490	-50	53	38
98	490	-392	53	39
500	490	10	54	39
630	490	140	55	39
520	490	30	56	39

410	490	-80	56	40
190	480	-290	56	41
500	480	20	57	41
390	480	-90	57	42
570	480	90	58	42
590	480	110	59	42
510	480	30	60	42
540	480	60	61	42
440	480	-40	61	43
98	480	-382	61	44
500	480	20	62	44
630	480	150	63	44
520	480	40	64	44
410	480	-70	64	45
500	190	310	65	45
390	190	200	66	45
570	190	380	67	45
590	190	400	68	45
510	190	320	69	45
540	190	350	70	45
440	190	250	71	45
98	190	-92	71	46
500	190	310	72	46
630	190	440	73	46
520	190	330	74	46
410	190	220	75	46
390	500	-110	75	47
570	500	70	76	47
590	500	90	77	47
510	500	10	78	47
540	500	40	79	47
440	500	-60	79	48
98	500	-402	79	49
500	500	0	79	49
630	500	130	80	49
520	500	20	81	49
410	500	-90	81	50
570	390	180	82	50
590	390	200	83	50
510	390	120	84	50
540	390	150	85	50
440	390	50	86	50
98	390	-292	86	51
500	390	110	87	51
630	390	240	88	51
520	390	130	89	51
410	390	20	90	51
590	570	20	91	51
510	570	-60	91	52
540	570	-30	91	53
440	570	-130	91	54
98	570	-472	91	55

500	570	-70	91	56
630	570	60	92	56
520	570	-50	92	57
410	570	-160	92	58
510	590	-80	92	59
540	590	-50	92	60
440	590	-150	92	61
98	590	-492	92	62
500	590	-90	92	63
630	590	40	93	63
520	590	-70	93	64
410	590	-180	93	65
540	510	30	94	65
440	510	-70	94	66
98	510	-412	94	67
500	510	-10	94	68
630	510	120	95	68
520	510	10	96	68
410	510	-100	96	69
440	540	-100	96	70
98	540	-442	96	71
500	540	-40	96	72
630	540	90	97	72
520	540	-20	97	73
410	540	-130	97	74
98	440	-342	97	75
500	440	60	98	75
630	440	190	99	75
520	440	80	100	75
410	440	-30	100	76
500	98	402	101	76
630	98	532	102	76
520	98	422	103	76
410	98	312	104	76
630	500	130	105	76
520	500	20	106	76
410	500	-90	106	77
520	630	-110	106	78
410	630	-220	106	79
410	520	-110	106	80

S Statistic = $106 - 80 = 26$

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

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

There are 0 time periods with multiple data

A = 72

B = 0

C = 0

D = 0

E = 8

F = 0

a = 17100

b = 61560

c = 760

Group Variance = 946

Z-Score = 0.81282

Comparison Level at 95% confidence level = -1.65463 (downward trend)

0.81282 >= -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	140	-59	16	4
64	140	-76	16	5
72	140	-68	16	6
83	140	-57	16	7
96	140	-44	16	8
ND<0	140	-140	16	9
97	140	-43	16	10
170	140	30	17	10
130	140	-10	17	11
62	140	-78	17	12
17	140	-123	17	13
92	140	-48	17	14
ND<0	140	-140	17	15
110	140	-30	17	16
67	140	-73	17	17
74	140	-66	17	18
64	140	-76	17	19
180	140	40	18	19
64	81	-17	18	20
72	81	-9	18	21
83	81	2	19	21
96	81	15	20	21
ND<0	81	-81	20	22
97	81	16	21	22
170	81	89	22	22

130	81	49	23	22
62	81	-19	23	23
17	81	-64	23	24
92	81	11	24	24
ND<0	81	-81	24	25
110	81	29	25	25
67	81	-14	25	26
74	81	-7	25	27
64	81	-17	25	28
180	81	99	26	28
72	64	8	27	28
83	64	19	28	28
96	64	32	29	28
ND<0	64	-64	29	29
97	64	33	30	29
170	64	106	31	29
130	64	66	32	29
62	64	-2	32	30
17	64	-47	32	31
92	64	28	33	31
ND<0	64	-64	33	32
110	64	46	34	32
67	64	3	35	32
74	64	10	36	32
64	64	0	36	32
180	64	116	37	32
83	72	11	38	32
96	72	24	39	32
ND<0	72	-72	39	33
97	72	25	40	33
170	72	98	41	33
130	72	58	42	33
62	72	-10	42	34
17	72	-55	42	35
92	72	20	43	35
ND<0	72	-72	43	36
110	72	38	44	36
67	72	-5	44	37
74	72	2	45	37
64	72	-8	45	38
180	72	108	46	38
96	83	13	47	38
ND<0	83	-83	47	39
97	83	14	48	39
170	83	87	49	39
130	83	47	50	39
62	83	-21	50	40
17	83	-66	50	41
92	83	9	51	41
ND<0	83	-83	51	42
110	83	27	52	42
67	83	-16	52	43
74	83	-9	52	44
64	83	-19	52	45

180	83	97	53	45
ND<0	96	-96	53	46
97	96	1	54	46
170	96	74	55	46
130	96	34	56	46
62	96	-34	56	47
17	96	-79	56	48
92	96	-4	56	49
ND<0	96	-96	56	50
110	96	14	57	50
67	96	-29	57	51
74	96	-22	57	52
64	96	-32	57	53
180	96	84	58	53
97	ND<0	97	59	53
170	ND<0	170	60	53
130	ND<0	130	61	53
62	ND<0	62	62	53
17	ND<0	17	63	53
92	ND<0	92	64	53
ND<0	ND<0	0	64	53
110	ND<0	110	65	53
67	ND<0	67	66	53
74	ND<0	74	67	53
64	ND<0	64	68	53
180	ND<0	180	69	53
170	97	73	70	53
130	97	33	71	53
62	97	-35	71	54
17	97	-80	71	55
92	97	-5	71	56
ND<0	97	-97	71	57
110	97	13	72	57
67	97	-30	72	58
74	97	-23	72	59
64	97	-33	72	60
180	97	83	73	60
130	170	-40	73	61
62	170	-108	73	62
17	170	-153	73	63
92	170	-78	73	64
ND<0	170	-170	73	65
110	170	-60	73	66
67	170	-103	73	67
74	170	-96	73	68
64	170	-106	73	69
180	170	10	74	69
62	130	-68	74	70
17	130	-113	74	71
92	130	-38	74	72
ND<0	130	-130	74	73
110	130	-20	74	74

67	130	-63	74	75
74	130	-56	74	76
64	130	-66	74	77
180	130	50	75	77
17	62	-45	75	78
92	62	30	76	78
ND<0	62	-62	76	79
110	62	48	77	79
67	62	5	78	79
74	62	12	79	79
64	62	2	80	79
180	62	118	81	79
92	17	75	82	79
ND<0	17	-17	82	80
110	17	93	83	80
67	17	50	84	80
74	17	57	85	80
64	17	47	86	80
180	17	163	87	80
ND<0	92	-92	87	81
110	92	18	88	81
67	92	-25	88	82
74	92	-18	88	83
64	92	-28	88	84
180	92	88	89	84
110	ND<0	110	90	84
67	ND<0	67	91	84
74	ND<0	74	92	84
64	ND<0	64	93	84
180	ND<0	180	94	84
67	110	-43	94	85
74	110	-36	94	86
64	110	-46	94	87
180	110	70	95	87
74	67	7	96	87
64	67	-3	96	88
180	67	113	97	88
64	74	-10	97	89
180	74	106	98	89
180	64	116	99	89

S Statistic = 99 - 89 = 10

Tied Group Value	Members
1	64
2	0

Time Period	Observations
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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
There are 0 time periods with multiple data	

A = 36
B = 0
C = 0
D = 0
E = 4
F = 0
a = 17100
b = 61560
c = 760
Group Variance = 948
Z-Score = 0.292306
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.292306 <= 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	140	-59	16	4
64	140	-76	16	5
72	140	-68	16	6
83	140	-57	16	7
96	140	-44	16	8
ND<0	140	-140	16	9
97	140	-43	16	10
170	140	30	17	10
130	140	-10	17	11
62	140	-78	17	12
17	140	-123	17	13
92	140	-48	17	14
ND<0	140	-140	17	15
110	140	-30	17	16
67	140	-73	17	17
74	140	-66	17	18
64	140	-76	17	19
180	140	40	18	19
64	81	-17	18	20
72	81	-9	18	21
83	81	2	19	21
96	81	15	20	21
ND<0	81	-81	20	22
97	81	16	21	22
170	81	89	22	22

130	81	49	23	22
62	81	-19	23	23
17	81	-64	23	24
92	81	11	24	24
ND<0	81	-81	24	25
110	81	29	25	25
67	81	-14	25	26
74	81	-7	25	27
64	81	-17	25	28
180	81	99	26	28
72	64	8	27	28
83	64	19	28	28
96	64	32	29	28
ND<0	64	-64	29	29
97	64	33	30	29
170	64	106	31	29
130	64	66	32	29
62	64	-2	32	30
17	64	-47	32	31
92	64	28	33	31
ND<0	64	-64	33	32
110	64	46	34	32
67	64	3	35	32
74	64	10	36	32
64	64	0	36	32
180	64	116	37	32
83	72	11	38	32
96	72	24	39	32
ND<0	72	-72	39	33
97	72	25	40	33
170	72	98	41	33
130	72	58	42	33
62	72	-10	42	34
17	72	-55	42	35
92	72	20	43	35
ND<0	72	-72	43	36
110	72	38	44	36
67	72	-5	44	37
74	72	2	45	37
64	72	-8	45	38
180	72	108	46	38
96	83	13	47	38
ND<0	83	-83	47	39
97	83	14	48	39
170	83	87	49	39
130	83	47	50	39
62	83	-21	50	40
17	83	-66	50	41
92	83	9	51	41
ND<0	83	-83	51	42
110	83	27	52	42
67	83	-16	52	43
74	83	-9	52	44
64	83	-19	52	45

180	83	97	53	45
ND<0	96	-96	53	46
97	96	1	54	46
170	96	74	55	46
130	96	34	56	46
62	96	-34	56	47
17	96	-79	56	48
92	96	-4	56	49
ND<0	96	-96	56	50
110	96	14	57	50
67	96	-29	57	51
74	96	-22	57	52
64	96	-32	57	53
180	96	84	58	53
97	ND<0	97	59	53
170	ND<0	170	60	53
130	ND<0	130	61	53
62	ND<0	62	62	53
17	ND<0	17	63	53
92	ND<0	92	64	53
ND<0	ND<0	0	64	53
110	ND<0	110	65	53
67	ND<0	67	66	53
74	ND<0	74	67	53
64	ND<0	64	68	53
180	ND<0	180	69	53
170	97	73	70	53
130	97	33	71	53
62	97	-35	71	54
17	97	-80	71	55
92	97	-5	71	56
ND<0	97	-97	71	57
110	97	13	72	57
67	97	-30	72	58
74	97	-23	72	59
64	97	-33	72	60
180	97	83	73	60
130	170	-40	73	61
62	170	-108	73	62
17	170	-153	73	63
92	170	-78	73	64
ND<0	170	-170	73	65
110	170	-60	73	66
67	170	-103	73	67
74	170	-96	73	68
64	170	-106	73	69
180	170	10	74	69
62	130	-68	74	70
17	130	-113	74	71
92	130	-38	74	72
ND<0	130	-130	74	73
110	130	-20	74	74

67	130	-63	74	75
74	130	-56	74	76
64	130	-66	74	77
180	130	50	75	77
17	62	-45	75	78
92	62	30	76	78
ND<0	62	-62	76	79
110	62	48	77	79
67	62	5	78	79
74	62	12	79	79
64	62	2	80	79
180	62	118	81	79
92	17	75	82	79
ND<0	17	-17	82	80
110	17	93	83	80
67	17	50	84	80
74	17	57	85	80
64	17	47	86	80
180	17	163	87	80
ND<0	92	-92	87	81
110	92	18	88	81
67	92	-25	88	82
74	92	-18	88	83
64	92	-28	88	84
180	92	88	89	84
110	ND<0	110	90	84
67	ND<0	67	91	84
74	ND<0	74	92	84
64	ND<0	64	93	84
180	ND<0	180	94	84
67	110	-43	94	85
74	110	-36	94	86
64	110	-46	94	87
180	110	70	95	87
74	67	7	96	87
64	67	-3	96	88
180	67	113	97	88
64	74	-10	97	89
180	74	106	98	89
180	64	116	99	89

S Statistic = 99 - 89 = 10

Tied Group Value	Members
1	64
2	0

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
There are 0 time periods with multiple data	

A = 36
 B = 0
 C = 0
 D = 0
 E = 4
 F = 0
 a = 17100
 b = 61560
 c = 760
 Group Variance = 948
 Z-Score = 0.292306
 Comparison Level at 95% confidence level = -1.65463 (downward trend)
 0.292306 >= -1.65463 indicating no evidence of a downward trend