Reynolds Metals Company LLC /
St. Lawrence Reduction Plant

194 County Route 45
P.O. Box 500
Massena, NY 13662 USA

August 10, 2021

Ms. Kelly Hale
Region 6, Division of Environmental Remediation
NYSDEC
317 Washington Street
Watertown, NY 13601

Subject: 645009, Reynolds Metals Inc. – Massena, St. Lawrence County
2020 Periodic Review Report
Response to Comments

Dear Ms. Hale:

Alcoa is in receipt of your letter dated June 15, 2021 with comments on the 2020 Reynolds Metals Periodic Review Report and provides the following responses and the revised report:
Comment:

1. General Comment regarding the Tables – Please amend the keys/ notes necessary to identify any notations within the tables (e.g., Table 2-5).

   Response:

   Table keys and notes have been updated to accurately reflect the content of the corresponding table.

2. Section 4.7.5 Post-Closure Assessment (p. 4-9) – The reoccurring statement regarding MW-45 and the potential migration of landfill contaminants is of concern. The Department would request an assessment be completed to determine if MW-46, MW-47, PZ-53, PZ-54 can be sampled for "the conventional parameters" in the upcoming sampling events. For the piezometers, the information for depth of screen have been removed from the PRR due to inaccuracies, however it is likely that the piezometers are screened at a similar depth to MW-45 and MW-39S. The deeper monitoring wells should also be sampled to determine if any cyanide is detected at depth. Please add these 4 sample locations to the fall and winter sampling in 2021.

   Response:

   Modification of the groundwater monitoring program will be postponed pending completion of an update to the conceptual site model (CSM), which is near completion. The update expands upon a general CSM developed in 2019 in response

to a DEC request for specific information. It will include a more thorough assessment of the hydrogeological setting as well as hydrogeochemical analysis. The findings of the CSM and recommendations for future site management will be reviewed with DEC upon completion.

Observations at MW-45 will be addressed in the updated CSM. More specifically, the statement, "potential transport of Landfill contaminants may have occurred to the location" will be expanded upon to address the present state of fluoride, cyanide, and sulfate observed at the well.

Respectively,

Robyn Gross
Alcoa Asset Planning & Management

ec: Gregg Townsend, NYSDEC
Daniel Tucholski, NYSDOH
Wendy Kuehner, NYSDOH
Paul Rodrigue, CDM Smith

Report

Alcoa Corp.
Reynolds Metals Company, LLC.

2020 Periodic Review Report for
Reynolds Metals Company, LLC.

May 14, 2021, (Revised, August 9, 2021)

Table of Contents

List of Tables

List of Figures

Appendices

Section 1
Introduction

1.1 Intent of Document

This *2020 Periodic Review Report for the Reynolds Metals Company, LLC.* was prepared by CDM Smith for Alcoa Corporation (Alcoa) in Massena, New York. This report presents the results of the post-closure monitoring program conducted during 2020 at the Reynolds Metals Company, LLC facility (Site No. 645009).

The remediated sites addressed in this report are:

- the closed Industrial Landfill (OU1);
- the Black Mud Pond (BMP) (Operable Unit 2 (OU2));
- the North Yard (OU3);
- Wetlands (OU4);
- the former Potliner Storage Pad (OU5); and
- miscellaneous areas including the Rectifier Yard (OU6).

The Facility was owned and operated by Reynolds Metals Company until 2001 at which time Alcoa Inc. purchased the Reynolds Metals Company and took responsibility for post-closure activities. Reynolds Metals Company has remained as a wholly owned subsidiary company.

This report follows the framework contained in previous Periodic Review Reports documenting post closure monitoring activities and the ongoing implementation of Institutional/Engineering Controls for the facility.

This annual PRR provides:

- a brief background summary for each of the remediated sites.
- a summary of the activities that occurred at each site during 2020.
- an overall site plan showing all the monitoring wells associated with the post-closure monitoring efforts.
- a groundwater contour map for the spring and fall of 2020.
- a summary of the analytical data collected during 2020.
- a statistical analysis of the groundwater samples collected.
- a review of the Institutional/Engineering Control plan.

- certification of the Institutional/Engineering Controls; and
- findings and recommendations for future activities.

1.1.1 Organization of Report

The remaining sections of this report present a summary of O&M activities performed (Section 2), the post-closure monitoring data (Section 3), evaluation of the post-closure groundwater data (Section 4), and review of the IC/EC plan and findings and recommendations (Section 5).

Appendix A contains Table 1 from the Landfill Cap Installation Addendum to the Area-Specific Completion Report for the Remediation of the Landfill/Former Potliner Storage Area (Bechtel, February 2003) and available field change request information. Appendix B contains a compilation of the required O&M activities scheduled during 2020. Appendix C contains the analytical data. Appendix D presents the statistical analysis results. Appendix E contains copies of the data quality assessments for the sampling rounds at the Reynolds Metals Company, LLC. sites in 2020. Appendix F contains the Institutional and Engineering Controls Certification Form.

1.2 Background Information

1.2.1 General Information

The Reynolds Metals Company, LLC. property was formally owned and operated by Reynolds Metals Company as the St. Lawrence Reduction Plant. In 2001, Alcoa purchased the Reynolds Company and at that time Alcoa took responsibility for post-closure activities. Reynolds Metals Company has remained as a wholly owned subsidiary company.

The Reynolds Metals Company St. Lawrence Reduction Plant was built in 1958 and ceased production in 2014. In the mid-1980s, the Reynolds Metals Company entered an Order of Consent with NYSDEC to develop a remedial investigation/action plan to address contamination of the facility. In 1992, NYSDEC issued a Record of Decision (ROD) that summarized the selected remediation activities for each of the hazardous waste sites.

Based on closure documents submitted to NYSDEC:

- Miscellaneous areas were closed in 1994.
- remedial construction for the former Potliner Storage Pad was completed in 1995.
- the BMP was closed in 1996.
- remedial construction for the North Yard was completed in 1997; and
- the Industrial Landfill cap was completed in 2003.

During the site closures, a series of monitoring wells were installed throughout the plant. These wells now serve as the monitoring well network for post-closure activities. The Operable Units are shown on Figure 1-1. Construction details for the monitoring wells at the facility are shown in Table 1-1. The locations of State Pollutant Discharge Elimination System (SPDES) regulated Outfalls are presented in Figure 1-2 and a facility watershed map is presented in Figure 1-3.

The following sections describe remedial activities at specific sites at the Reynolds Metals Company, LLC. facility.

1.2.2 Industrial Landfill (OU1)

The 11.5-acre Industrial Landfill (referred to as the "Landfill") is south of the production area of the plant and immediately north of a wetlands area. The Landfill historically received plant garbage and process waste, construction debris, spent potliner and sewage sludge. Waste management activities were permanently terminated at the landfill on June 30, 1990.

As documented in The *Area Specific Completion Report for Remediation of the Landfill/Former Potliner Storage Area* (*Bechtel, October 1997) and Overall Completion Report for the Alcoa, Inc. Massena East Smelter Plant Site Remediation Project (Bechtel, July 2003),* landfill closure activities were conducted in accordance with the Order on Consent (and associated ROD) dated September 9, 1987. These activities included construction of an upgraded groundwater leachate recovery system, keyed into highly impermeable material below the landfill (completed in 1997), and placement of a hazardous waste landfill cap over the landfill (completed in 2003).

The leachate collection system included the construction of a perimeter leachate collection trench with a portion of the landfill perimeter also having a cutoff wall keyed into the low-permeability subsoils. A double-walled leachate transfer line from the Landfill to the now former Outfall 01A treatment system was also installed. Currently, groundwater collected by the leachate collection system is continuously monitored through SPDES-regulated Outfall 01C. All water collected through Outfall 01C is currently treated at the onsite SPDES-regulated Outfall 003 treatment system.

The landfill cap was constructed over the full extent of the landfill, which comprises of a geosynthetic clay layer, a 40 mil very low-density polyethylene (VLDPE) geomembrane, and drainage geo-composite. In addition, surface water controls were installed to reduce the amount of surface water run-on entering the site and to control erosional effects of surface water running off the site. Construction quality assurance associated with this work is documented and reported in the *Construction Quality Assurance Certification Report for the Landfill/Former Potliner Storage Area Closure Cap* (Bechtel, June 2003).

Prior to the placement of the cap, impacted soils and sediment from the Wetlands, Potliner Storage Pad and Miscellaneous Areas were consolidated in the Landfill. As documented in the *Overall Completion Report for the Alcoa, Inc. Massena East Smelter Plant Site Remediation Project (Bechtel, July 2003)*, a ROD amendment was issued by NYSDEC in 1995 allowing Reynolds to increase the PCB limit (from 25 ppm to 50 ppm) on low-level contaminated soils that could be placed in the landfill prior to capping. Any soil containing greater than 50 ppm PCBs was disposed of offsite.

Materials consolidated in the landfill included:

- Potliner-impacted soils (2 feet) immediately north of the landfill and within the New York Power Authority easement. This action, performed under Field Change Request (FCR) 190, reduced the size of the landfill management area by more than 2 acres. Some potlining material was inaccessible and remained in-place following the remedial effort.
- Impacted soils from the wetlands, the area north of Haverstock Road, the Rectifier Yard and associated ditch, the North Yard, the Potliner Storage Pad, the 002 Diversion Area, and other various onsite remedial efforts. An area identified in 1998 as a former short-term storage area

for potliner and other process material and known as the "Former Material Stockpile Area" was managed and remediated under the Landfill Area of Concern. This ¼-acre area was sampled under FCR-199 and remediated under FCR-200. The work was documented and reported in the *Post-Remedial Report for Second Quarter 1998* and in the *Landfill Cap Installation Addendum to the Area-Specific Completion Report for the Remediation of the Landfill/Former Potliner Storage Area* (Bechtel, February 2003). The available field change request information can be found in Appendix A.

- In 2001 and 2002, dredging spoils with less than 50 ppm PCBs from the St. Lawrence River were disposed in the Landfill. Disposal of river dredging spoils in the Landfill is documented in the *Landfill Cap Installation Addendum to the Area-Specific Completion Report for the Remediation of the Landfill/Former Potliner Storage Area* (Bechtel, February 2003).

The total quantity of remediation spoils disposed of in the Landfill is approximately 220,000 cubic yards. Table 1 from the *Landfill Cap Installation Addendum to the Area-Specific Completion Report for the Remediation of the Landfill/Former Potliner Storage Area* (Bechtel, February 2003) summarizes the quantities of material from onsite remedial actions disposed of in the landfill. This table is included in Appendix A. Additional details can be found in the site-specific remediation completion reports.

Between November 2010 and May 2012, a series of upgradient groundwater extraction wells (EW-01 through EW-06) were installed north of the Landfill to lower shallow groundwater elevations beneath the Landfill. In addition to the extraction wells, piezometers (PZ-71 through PZ-79) were installed to monitor groundwater elevations. Construction details for these monitoring locations are also provided in Table 1-1. Additional details on the groundwater extraction system upgradient of the Industrial Landfill are provided in Section 4.7.4. Extracted groundwater from this system is ultimately discharged through SPDES-regulated Outfall 001. In October 2018, Alcoa erected a new building for the extraction well lines, performing needed updated and repairs. The extraction wells continue to pump and discharge to the same location.

1.2.3 Black Mud Pond (OU2)

The BMP was built in 1973 to store residues from the process that recovered cryolite from spent potliner. It is approximately 6 acres in area and located on a ridge west of the production area of the plant. Active use of the pond ended in 1990.

The primary objective of the remediation of the BMP was to eliminate migration of the constituents of concern, specifically cyanide and fluoride. As discussed in the *Area-Specific Completion Report for Remediation of the Black Mud Pond* (Bechtel, July 1997), a network of over 2,200 linear feet of sand-filled French drain was installed in the BMP to extract groundwater and reduce a principal mechanism of contaminant transport from the area. This French drain system consists of four horizontal drains that were installed in the north-south direction with a gradual slope to the south end. Two lateral drains were installed in the east-west direction to improve the collection capability of the system. A PVC riser was provided at the south end of each north-south drain. This work was completed in September 1995. Following this, the dewatering sump was installed at the low point of the BMP, near the southwest corner. The riser at the westernmost north-south drain line was replaced with a pipe that connected the line to the sump. To provide a hydraulic connection with the other three north-south drain lines, a sand-filled trench was built along the bottom of the BMP between the sump and the risers.

After NYSDEC approval in May 1995, soil with PCB levels <10 ppm from the Potliner Storage Pad, the area south of the Digging Building (Facility 85), and the overburden by the southwest corner of the BMP, was placed in the BMP to provide initial soil cover for construction equipment. In January 1996, 7,700 cubic yards of wetlands soil with residual fluoride and cyanide was excavated and hauled to the BMP. The area was capped with a hazardous waste closure cap to isolate the waste and prevent surface water infiltration. The cap consists of a geonet composite for gas collection, a geosynthetic clay layer, a geomembrane liner of 40-mil linear low-density polyethylene, a geonet composite for drainage and a final 30-inch topsoil and grass cover. Additional remediation activities are detailed in the area specific completion report mentioned previously.

Extracted groundwater has historically been conveyed to the Outfall 01B equalization tank and then transferred by tanker truck to the Arconic, Inc. (formerly Alcoa) Massena West Plant Outfall 01F facility for treatment and discharge. Beginning in September 2017, BMP groundwater was no longer treated at the Massena West Plant and instead collected and stored for shipment via railcar to an offsite location for treatment and disposal.

1.2.4 North Yard (OU3)

The North Yard is located north of the main plant buildings. It was the center for receiving, storing and distributing raw materials for the plant's operation. The North Yard was the site of the heat transfer medium (HTM) system that maintained the fluidity and temperature of the coal tar pitch for anode and cathode manufacturing. The HTM system equipment was located in the Pitch Pumphouse, in the central portion of the North Yard; the HTM piping extends northward to the Pitch tanks and southward to the Carbon Plant. Before a replacement program was initiated in the 1970's, the HTM fluid contained PCBs. Soil analysis conducted by Bechtel shows that prior to remediation, the highest concentrations of PCBs on the Reynolds facility were found near the HTM system.

To conduct remediation while minimizing disruption of plant operation, two distinct remedial construction plans were developed and described in the *Amendment to the Record of Decision, Reynolds Metals Company, St. Lawrence County, New York* (NYSDEC, June 1995). These plans divided the North Yard into critical and non-critical work areas:

- Area 1, the south-central portion of the North Yard, was defined as the area where essential plant operations take place. The design required excavating to established limits (i.e., horizontally within the ≥100 ppm PCB footprint and vertically to <25 ppm PCBs) and installing a low permeability cap over all areas with residual PCB levels ≥10 ppm. Area 1 covered nearly 3 acres.

- Area 2 was defined as the contaminated but non-critical portions of the North Yard. The design for this area was similar to that for the other onsite remediation areas; excavation of soils exceeding the ROD cleanup goal of ≥10 ppm PCBs followed by surface restoration. Area 2 covered nearly 7 acres.

Remediation construction met all design objectives. In fact, although the ROD amendment allowed for higher residual concentrations of PCBs in Area 1, remedial excavations in most of that area met the more stringent cleanup goal established for Area 2.

As stated in Volume 1 of the *Area Specific Completion Report for the Remediation of the North Yard (Bechtel, 1998),* various remedial measured were performed to reduce the possibility of erosion and transport of PCBs. In 1991, a drain, consisting of a 12-inch diameter perforated polyethylene pipe and

a trench filled with crushed stone was installed along the plant fence located at the western side of the North Yard. The underdrain system, intended to control groundwater near the ground surface, also influences the groundwater flow field in this area which is downgradient of the former Potliner Storage Pad. This underdrain system discharges to the West Sump, which was installed in 1988. Water collected in the sump was historically pumped to the Outfall 01A wastewater treatment facility for treatment and discharge through the plant's SPDES outfall system. On February 5, 2016, the NYSDEC approved a SPDES modification request to decommission the DRAVO treatment plant and divert flows from Outfall 01A to Outfall 003 for treatment and discharge.

Since approval of the *Area-Specific Completion Report for the Remediation of the North Yard* (Bechtel, October 1998), several additional remedial efforts have been conducted in this area. Key activities performed since 1998 were:

- In March 2000, an underground water main was repaired in North Yard grid H32 (south of Facility 25A, the Unloading Shed). The excavation spoils (approximately 25 Cubic Yards (CY) of soil at 8 ppm PCB concentration) were disposed of in the Landfill. Details are presented in the *Post-Remedial Report for Second Quarter 2000*.

- In July 2000, PCBs were identified in the excavation spoils from the repair of concrete pavement covering North Yard grid G41. The area was investigated under FCR-204 and remediated under FCR-206. The broken concrete pavement (approximately 115 CY) and the soil from grids G42 and J44 (69 CY) were disposed of in the Landfill. Additional spoils (92 CY) were disposed offsite. This remedial effort was completed in August 2001 and reported in the *Post-Remedial Report for Third Quarter 2001*.

- In the summer of 2001, sampling was conducted at the proposed site for a new tank, located immediately east of an existing tank (Facility 65A) near the west end of the North Yard area of concern. Soil samples collected in September 2001 from beneath the concrete over the proposed excavation footprint showed PCB concentrations less than 4 ppm in the upper 6 inches and nondetect in the 24 to 30-inch depth interval. An excavation and disposal plan was approved by NYSDEC on October 30, 2001. The concrete layer and upper 2 feet of soil was excavated by the remediation contractor, after which the area was turned over to the plant's general contractor for tank construction. The soil (46 CY) was disposed of in the Landfill. To formally record the work, FCN-209 was submitted to NYSDEC and approved on November 30, 2001. Details of the work are reported in the *Post-Remedial Report for Fourth Quarter 2001*. The available field change request information can be found in Appendix A.

On April 1, 2016 a letter from the NYSDEC noted impacts and the continuing source to groundwater of the North Yard. The letter requires that the French drain and downgradient components be maintained indefinitely. Semi-annual groundwater monitoring is performed to monitor potential impacts to groundwater, which is discussed further in Section 4.9.

1.2.5 Former Potliner Storage Pad (OU5)

The former Potliner Storage Pad (PSP) is a concrete slab immediately north of the Crusher Building on the northwestern side of the production area. The pad was used in the past to store spent potliner materials. The remediation area encompasses the concrete pad and includes the area of Building 82 (Crusher Building) and Building 85 (Cathode Digging Building) and the West Ditch that runs through the area. The remediation area was increased to include an additional area designated south of the Digging Building, resulting in a total remediation area of 5 acres.

As discussed in the *Area-Specific Completion Report for Remediation of the Potliner Storage Pad Area (Bechtel, December 1996),* PCBs had been detected in samples from the PSP area, and fluoride, cyanide, sulfate, and polynuclear aromatic hydrocarbons (PAHs) were also considered chemicals of concern. The 10 ppm PCB cleanup goal for the PSP was established in the ROD. Residual concentrations of cyanide, sulfate, and fluoride were evaluated and compared with the New York State effluent standards. When the PSP boundaries were expanded to the area south of the Digging Building (which drains towards the Wetlands), Reynolds and the NYSDEC agreed that a lower cleanup target of 1 ppm PCBs was appropriate for the added area. Remedial work included excavation of soils containing PCBs and other chemicals of concern, backfilling with clean materials, improving drainage and extensive paving to direct surface water runoff and prevent surface water infiltration. In areas where fluoride and cyanide levels were elevated, but PCBs were not, the action was to remove most of the elevated concentrations and isolate the residual constituents by covering with clean backfill and paving the surface with reinforced concrete. Some soils with PCB concentrations <10 ppm were disposed of in the Black Mud Pond. The remaining soils with PCB concentrations <10 ppm and soils with PCB concentrations ≥10 but <50 ppm PCBs were disposed of in the onsite Industrial Landfill. Soil with ≥50 ppm PCBs was disposed of offsite.

Since publication of the *Area-Specific Completion Report* only one significant additional remedial effort has been performed in this area. In September 1999, excavation was performed near Building 85 (Cathode Digging Building) as part of the plant modernization effort. The resulting excavation spoils (approximately 120 CY) were disposed of in the Landfill. The work was documented in the *Post-Remedial Report for Third Quarter 1999*. Construction details for the monitoring wells at this site are shown in Table 1-1.

1.2.6 Wetlands and Miscellaneous Areas (OU4 and OU6)

Remedial measures were historically implemented for the Wetlands (OU4) and Miscellaneous Areas (OU6) identified in the 1992 ROD. There are no operation and maintenance (O&M) requirements associated with these areas and are therefore not discussed in later sections of the PRR.

Wetlands

A 172-acre area located south and west of the Landfill that was mapped by NYSDEC as Regulated Wetland RR-6 Class II wetlands. Portions of the Wetlands were identified in the 1992 ROD as remediation areas due to the presence of contaminants of concern including PCBs, fluoride and sulfate. The remediation area was approximately 7.8 acres and was designated as Wetlands OU4. The remedial scope of work included temporary dewatering of impacted areas, excavation of sediment and soils, restoration of excavated areas and creating replacement wetlands. This work is documented in the *Area-Specific Completion Report for Remediation, Restoration, and Mitigation of Wetlands RR-6* (Bechtel, January 1998).

Rectifier Yard

The Rectifier Yard is on the southern end of the production area of the plant within the perimeter road. Its principal use is as a high-voltage electrical substation. Surface water is drained from the Rectifier Yard by two networks of catch basins. The northern network collects transformer cooling water and stormwater runoff and discharge to a drainage system beneath the potrooms, which is connected to the plant's SPDES outfall system. Stormwater runoff from the southern half of the Rectifier Yard collects in the southern network of catch basins and drains to the Rectifier Yard Pond.

Rectifier Yard remediation consisted of soil excavation in a ½-acre area. The excavated area was backfilled, graded and surfaced with crushed stone. Remediation work also included extending and rerouting storm drains, excavating oil transfer piping, cleaning storm drains and providing a sampling station/retention pond for surface water runoff immediately upstream of the wetlands.

Remediation work is documented in the *Area-Specific Completion Report for the Remediation of the Rectifier Yard* (Bechtel, January 1995). O&M activities are limited to inspections of the Rectifier Yard Pond; collection of surface water samples from the Rectifier Yard Pond was discontinued per NYSDEC approval in 2013.

Former Soil Stock Pile

The Former Soil Stockpile was an area located southwest of the BMP where soil spoils containing less than 10 ppm total PCBs from various remedial efforts performed at the site were stored. Remedial activities performed in 1994 included excavation/removal of this material to below the cleanup goal of 1 ppm total PCBs. Excavated material was placed in the onsite Landfill. Details of the remediation action are provided in the *Area-Specific Completion Report for Remediation of the Soil Stockpile* (Bechtel, August 1995).

West Ditch Outfall

Remediation of the downstream portion of the West Ditch located north of Haverstock Road is detailed in the *Project Completion Report for the Remediation of the 002 Outfall/West Ditch System and Remediation of the 007 Outfall* (Bechtel, November 1992). The objectives of the remediation included the removal PCB impacted soil and sediment from the 008 and 007 Outfall drainage systems to meet the cleanup goal of 10 ppm total PCBs. Excavated material was ultimately placed in the onsite Landfill.

002 Diversion Area (Outfall 005)

The 002 Diversion Area was located in the northeast corner of the plant. The 002 Diversion project was an interim remedial measure completed in 1989 which consisted of diverting surface water flow to a piped system to capture waters that formerly discharged to Outfall 002 and the majority of surface water runoff from the east side of the facility. As part of the diversion project, confirmatory soil samples collected in excavated areas identified elevated PCB concentrations. These areas were therefore identified as miscellaneous areas in the 1992 ROD. Remedial activities performed are documented in the *Area-Specific Completion Report of the 002 Diversion Area* (Bechtel, April 1997) and included excavation of soils to meet the cleanup goal of 10 ppm total PCBs. Excavated material containing less than 50 ppm total PCBs was disposed of in the onsite Landfill while material with a total PCB concentration greater than 50 ppm was disposed of offsite.

The Outfall 005 drainage basin is located in the eastern portion of the 002 Diversion Area. PCB detections in stormwater discharge from Outfall 005 in 1998 prompted additional remedial efforts in 1999. This remediation is documented in the *Completion Report for Remediation of the 005 Drainage Basin 002 Diversion Area* (Bechtel, July-August 1999). Excavated material was disposed of in the onsite Landfill.

Area North of Haverstock Road and Outfall 004

The Area North of Haverstock Road was a narrow strip of land approximately 1,200 feet long by 200 to 300 feet wide located between Haverstock Road and the St. Lawrence River. Remediation completed in 1994 is documented in the *Area-Specific Completion Report for Remediation of the Area North of Haverstock Road* (Bechtel, March 1995). The remedial action included excavation of sediment

and soils to meet a cleanup goal of 1 ppm total PCBs. The 004 Outfall (later designated as 006) was located within this area and was remediated during installation of a new storm sewer and outfall. This work is also documented in the *Area-Specific Completion Report for Remediation of the Area North of Haverstock Road* (Bechtel, March 1995). Excavated material containing less than 50 ppm total PCBs was disposed of in the onsite Landfill while material with a total PCB concentration greater than 50 ppm was disposed of offsite.

Facility Location and ID														
Monitoring Well ID	Site	Alcoa Coordinates[1] Northing	Alcoa Coordinates[1] Easting	Ground Elevation (feet)	Date Installed	Company	Material Type and Size	Depth of Well (feet)	Bottom of Hole Elevation (feet)	Top of Inner Casing (feet)	Screen Depth Top (feet)	Screen Depth Bottom (feet)	Screen Elevation Top (feet)	Screen Elevation Bottom (feet)
MW-1S	NYD	5453.40	-8700.70	224.30	9/16/87	WCC	2 inch Dia. PVC	16.00	208.30	226.56	6.00	16.00	218.30	208.30
MW-03S	PSP	5286.2	-9353.6	224.7	10/17/08	ATL	2 inch Dia. PVC	23.00	201.7	227.2	13.00	23.00	211.68	201.68
MW-10S	LFILL	3455.20	-9730.10	214.50	9/1/87	WCC	2 inch Dia. PVC	20.50	194.00	217.62	10.50	20.50	204.00	194.00
MW-11SR	BMP	4516.60	-9682.60	240.20	9/11/87	WCC	2 inch Dia. PVC	27.00	213.20	242.71	17.00	27.00	223.20	213.20
MW-12S	BMP	4830.10	-9907.20	245.10	9/16/87	WCC	2 inch Dia. PVC	16.00	229.10	248.18	6.00	16.00	239.10	229.10
MW-13D	BMP	4648.4	-10125.3	243.70	9/9/87	WCC	2 inch Dia. PVC	49.00	194.70	245.16	39.00	49.00	204.70	194.70
MW-13S	BMP	4659.5	-10126	243.70	9/14/87	WCC	2 inch Dia. PVC	16.50	227.20	245.19	6.50	16.50	237.20	227.20
MW-14S	BMP	4392.9	-10174.5	246.60	9/4/87	WCC	2 inch Dia. PVC	18.00	228.60	248.16	8.00	18.00	238.60	228.60
MW-15S-91	BMP	4085.4	-9954.1	239.60	8/12/91	ATL	2 inch Dia. PVC	31.00	208.60	242.10	21.00	31.00	218.60	208.60
MW-15D	BMP	4085.9	-9962.7	239.70	9/3/87	WCC	2 inch Dia. PVC	57.00	182.70	242.30	47.00	57.00	192.70	182.70
MW-15S-87	BMP	4085.80	-9973.70	239.60	9/10/87	WCC	2 inch Dia. PVC	31.00	208.60	242.38	21.00	31.00	218.60	208.60
MW-16S	NYD	5268.20	-8578.60	225.90	8/7/91	WCC	2 inch Dia. PVC	23.00	202.90	228.70	13.00	23.00	212.90	202.90
MW-17S	NYD	5327.20	-8684.60	223.40	8/24/89	WCC	2 inch Dia. PVC	18.00	205.40	227.12	8.00	18.00	215.40	205.40
MW-18S	NYD	5269.20	-8827.70	224.70	8/30/89	WCC	2 inch Dia. PVC	22.00	202.70	226.87	12.00	22.00	212.70	202.70
MW-19S	NYD	5455.00	-8978.00	223.50	8/28/89	WCC	2 inch Dia. PVC	16.50	207.00	226.76	6.50	16.50	217.00	207.00
MW-20-85-S	BMP	3928.20	-9860.30	222.70	8/15/85	ATL	2 inch Dia. PVC	30.50	192.20	225.95	20.50	30.50	202.20	192.20
MW-20-85-D	BMP	3917.80	-9856.00	223.00	8/20/85	ATL	2 inch Dia. PVC	61.20	161.80	226.70	51.20	61.20	171.80	161.80
MW-21-85S	BMP	4411.00	-9516.90	227.20	8/22/85	ATL	2 inch Dia. PVC	31.00	196.20	228.88	21.00	31.00	206.20	196.20
MW-21-85D	BMP	4426.30	-9518.40	227.20	8/22/85	ATL	2 inch Dia. PVC	58.00	169.20	228.87	48.00	58.00	179.20	169.20
MW-22-85-D	BMP	4891.40	-10040.30	244.20	8/15/85	ATL	2 inch Dia. PVC	60.60	183.60	246.48	50.60	60.60	193.60	183.60
MW-22-85-S	BMP	4891.40	-10025.50	244.50	8/7/85	ATL	2 inch Dia. PVC	30.30	214.20	246.94	20.30	30.30	224.20	214.20
MW-23-85-D	BMP	4468.90	-10245.10	242.10	8/5/85	ATL	2 inch Dia. PVC	58.00	184.10	246.14	48.00	58.00	194.10	184.10
MW-23-85-S	BMP	4487.0	-10241.0	241.9	10/17/08	ATL	2 inch Dia. PVC	30.5	211.4	245.01	20.5	30.5	221.40	211.40
MW-26S	PSP	5390.70	-9410.30	224.00	8/23/89	WCC	2 inch Dia. PVC	27.50	196.50	225.36	17.50	27.50	206.50	196.50
MW-27S	PSP	5014.80	-9371.92	227.49	8/23/89	WCC	2 inch Dia. PVC	22.50	204.99	230.50	12.50	22.50	214.99	204.99
MW-28S	PSP	5394.40	-9329.10	224.30	---	WCC	2 inch Dia. PVC	26.00	198.30	226.54	16.00	26.00	208.30	198.30
MW-29S	BMP	5185.20	-9898.90	237.60	8/14/89	WCC	2 inch Dia. PVC	17.00	220.60	241.62	7.00	17.00	230.60	220.60
MW-30S	BMP	3966.90	-10131.60	231.70	8/14/89	WCC	2 inch Dia. PVC	17.00	214.70	234.54	7.00	17.00	224.70	214.70
MW-31SR	BMP	4124.60	-10770.60	233.20	8/9/89	WCC	2 inch Dia. PVC	19.50	213.70	234.83	9.50	19.50	223.70	213.70
MW-32S	EAST P-LOT	4089.10	-7406.10	224.20	8/9/89	WCC	2 inch Dia. PVC	37.00	187.20	227.28	27.00	37.00	197.20	187.20
MW-33S	PSP	5476.80	-9466.90	223.20	8/16/95	ATL	2 inch Dia. PVC	26.00	197.20	225.72	16.00	26.00	207.20	197.20
MW-34S	PSP	5466.90	-9241.60	215.60	8/21/95	ATL	2 inch Dia. PVC	24.50	191.10	218.56	14.50	24.50	201.10	191.10
MW-35SR	PSP	5695.50	-9332.20	211.10	10/27/97	ATL	2 inch Dia. PVC	26.80	184.30	213.54	16.80	26.80	194.30	184.30
MW-36	NYD	5672.60	-8883.30	207.00	9/3/96	ATL	2 inch Dia. PVC	31.50	175.50	209.40	21.50	31.50	185.50	175.50
MW-37	NYD	5650.50	-8708.00	204.90	9/5/96	ATL	2 inch Dia. PVC	32.00	172.90	207.68	22.00	32.00	182.90	172.90
MW-38	NYD	5604.50	-8469.60	198.20	9/6/96	ATL	2 inch Dia. PVC	32.00	166.20	202.71	22.00	32.00	176.20	166.20
MW-39S	LFILL	2575.50	-9630.60	193.30	10/29/97	ATL	2 inch Dia. PVC	18.50	174.80	196.16	8.50	18.50	184.80	174.80
MW-40S	LFILL	2729.30	-9245.10	192.00	10/30/97	ATL	2 inch Dia. PVC	17.50	174.50	194.32	7.50	17.50	184.50	174.50
MW-41	NYD	5501.70	-8370.20	221.50	4/11/06	ATL	2 inch Dia. PVC	47.00	174.50	224.25	35.00	45.00	186.50	176.50
MW-42	NYD	5698.30	-9347.80	209.10	4/12/06	ATL	2 inch Dia. PVC	47.00	162.10	211.40	34.00	44.00	175.10	165.10
MW-43	NYD	5701.90	-9461.50	206.70	4/14/06	ATL	2 inch Dia. PVC	47.00	159.70	209.12	34.50	44.50	172.20	162.20
MW-44	NYD	5702.40	-9459.40	206.60	4/18/06	ATL	2 inch Dia. PVC	26.50	180.10	209.04	15.00	25.00	191.60	181.60
MW-45	LFILL	2527.60	-9634.90	193.40	4/19/06	ATL	2 inch Dia. PVC	15.50	177.90	195.83	5.00	15.00	188.40	178.40
MW-46	LFILL	2767.2	-9260.1	198.02	8/13/10	ATL	2 inch Dia. PVC	8.00	190.02	200.72	24.00	29.00	174.02	169.02
MW-47	LFILL	2578.2	-9633.3	193.00	8/13/10	ATL	2 inch Dia. PVC	44.00	149.00	196.49	29.00	34.00	164.00	159.00
MPOF1403D	BMP	4231.90	-9994.90	250.40	7/2/96	ATL	2 inch Dia. PVC	32.50	217.90	254.95	30.50	32.50	219.90	217.90
MPOF1402S	BMP	4236.30	-9996.10	248.70	7/3/96	ATL	2 inch Dia. PVC	25.00	223.70	254.21	23.00	25.00	225.70	223.70
MPOG1603D	BMP	4346.30	-9785.50	251.00	7/2/96	ATL	2 inch Dia. PVC	31.50	219.50	254.72	29.50	31.50	221.50	219.50
MPOG1601S	BMP	4349.50	-9795.60	252.70	2/11/95	ATL	2 inch Dia. PVC	20.50	232.20	254.32	0.00	19.50	252.70	233.20

Facility Location and ID														
Monitoring Well ID	Site	Alcoa Coordinates[3] Northing	Alcoa Coordinates[3] Easting	Ground Elevation (feet)	Date Installed	Company	Material Type and Size	Depth of Well (feet)	Bottom of Hole Elevation (feet)	Top of Inner Casing (feet)	Screen Depth Top (feet)	Screen Depth Bottom (feet)	Screen Elevation Top (feet)	Screen Elevation Bottom (feet)
Piezometers														
PZ-1	LFILL	3110.15	-8980.84	215.70	6/5/02	ATL	2 inch Dia. PVC	15.20	200.50	218.28	5.20	15.20	210.50	200.50
PZ-2	LFILL	3106.96	-8974.50	214.30	6/5/02	ATL	2 inch Dia. PVC	14.00	200.30	217.04	4.00	14.00	210.30	200.30
PZ-3	LFILL	3103.48	-8966.37	213.00	6/5/02	ATL	2 inch Dia. PVC	14.00	199.00	215.10	7.00	14.00	206.00	199.00
PZ-4	LFILL	3102.54	-8964.80	212.60	6/5/02	ATL	2 inch Dia. PVC	12.00	200.60	215.78	7.00	12.00	205.60	200.60
PZ-5	LFILL	3103.23	-8962.11	213.00	6/6/02	ATL	2 inch Dia. PVC	12.90	200.10	216.02	7.90	12.90	205.10	200.10
PZ-6	LFILL	2862.02	-9158.43	199.60	5/29/02	ATL	2 inch Dia. PVC	14.00	185.60	202.24	9.00	14.00	190.60	185.60
PZ-7	LFILL	2854.46	-9155.56	198.00	5/29/02	ATL	2 inch Dia. PVC	10.40	187.60	201.02	5.40	10.40	192.60	187.60
PZ-8	LFILL	2843.34	-9150.24	197.70	5/30/02	ATL	2 inch Dia. PVC	10.40	187.30	201.85	6.40	10.40	191.30	187.30
PZ-9	LFILL	2841.53	-9149.39	198.20	5/30/02	ATL	2 inch Dia. PVC	10.40	187.80	201.53	6.40	10.40	191.80	187.80
PZ-10	LFILL	2721.24	-9493.49	199.90	6/3/02	ATL	2 inch Dia. PVC	14.00	185.90	202.82	7.00	14.00	192.90	185.90
PZ-11	LFILL	2715.00	-9490.99	199.20	6/3/02	ATL	2 inch Dia. PVC	13.50	185.70	202.43	8.50	13.50	190.70	185.70
PZ-12	LFILL	2702.16	-9485.72	197.80	6/4/02	ATL	2 inch Dia. PVC	11.60	186.20	201.10	7.60	11.60	190.20	186.20
PZ-13	LFILL	2700.22	-9485.03	197.40	6/4/02	ATL	2 inch Dia. PVC	11.70	185.70	201.12	7.70	11.70	189.70	185.70
PZ-14	LFILL	2714.94	-9918.27	199.50	5/23/02	ATL	2 inch Dia. PVC	10.90	188.60	201.91	5.90	10.90	193.60	188.60
PZ-15	LFILL	2709.67	-9923.35	198.30	5/23/02	ATL	2 inch Dia. PVC	9.80	188.50	200.58	5.80	9.80	192.50	188.50
PZ-16	LFILL	2701.32	-9931.53	198.40	5/23/02	ATL	2 inch Dia. PVC	9.90	188.50	200.66	7.90	9.90	190.50	188.50
PZ-17	LFILL	2699.53	-9933.31	198.60	5/23/02	ATL	2 inch Dia. PVC	10.20	188.40	200.99	8.20	10.20	190.40	188.40
PZ-18	LFILL	3100.32	-9930.31	208.60	5/21/02	ATL	2 inch Dia. PVC	11.90	196.70	210.96	6.90	11.90	201.70	196.70
PZ-19	LFILL	3103.66	-9933.61	207.20	5/21/02	ATL	2 inch Dia. PVC	10.50	196.70	209.47	5.50	10.50	201.70	196.70
PZ-20	LFILL	3107.65	-9939.05	205.50	5/21/02	ATL	2 inch Dia. PVC	8.70	196.80	208.10	3.70	8.70	201.80	196.80
PZ-21	LFILL	3109.13	-9941.03	205.00	5/21/02	ATL	2 inch Dia. PVC	8.60	196.40	207.75	3.60	8.60	201.40	196.40
PZ-22	LFILL	3109.92	-9942.97	205.30	5/21/02	ATL	2 inch Dia. PVC	9.40	195.90	207.72	4.40	9.40	200.90	195.90
PZ-23	PSP	5126.80	-9324.30	227.30	4/19/06	ATL	1 inch Dia. PVC	16.00	211.30	231.80	1.00	16.00	226.30	211.30
PZ-24	PSP	5208.60	-9327.80	225.40	4/19/06	ATL	1 inch Dia. PVC	12.00	213.40	225.20	2.00	12.00	223.40	213.40
PZ-25	PSP	5255.90	-9327.20	224.30	4/19/06	ATL	1 inch Dia. PVC	12.00	212.30	224.10	1.50	12.00	222.80	212.30
PZ-26	PSP	5317.60	-9331.50	224.00	4/19/06	ATL	1 inch Dia. PVC	12.00	212.00	223.80	1.50	12.00	222.50	212.00
PZ-27	PSP	5335.10	-9265.10	224.10	4/20/06	ATL	1 inch Dia. PVC	11.00	213.10	223.90	0.75	11.00	223.35	213.10
PZ-28	PSP	5291.90	-9401.80	224.30	4/20/06	ATL	1 inch Dia. PVC	12.00	212.30	224.10	1.50	12.00	222.80	212.30
PZ-29	PSP	5174.00	-9439.90	225.10	4/20/06	ATL	1 inch Dia. PVC	9.50	215.60	229.30	1.50	9.00	223.60	216.10
PZ-30	PSP	5121.60	-9388.20	226.50	4/19/06	ATL	1 inch Dia. PVC	9.10	217.40	231.50	0.75	9.00	225.75	217.50
PZ-31	PSP	5054.80	-9387.80	227.30	4/20/06	ATL	1 inch Dia. PVC	12.00	215.30	231.80	1.50	12.00	225.80	215.30
PZ-32	BMP	4572.60	-10091.50	246.70	4/17/06	ATL	1 inch Dia. PVC	11.10	235.60	251.47	0.70	11.00	246.00	235.70
PZ-33	BMP	4584.30	-10132.60	244.20	4/17/06	ATL	1 inch Dia. PVC	12.00	232.20	249.03	1.50	12.00	242.70	232.20
PZ-34	BMP	4591.20	-10163.50	241.50	4/17/06	ATL	1 inch Dia. PVC	10.20	231.30	246.36	1.50	10.00	240.00	231.50
PZ-35	BMP	4603.20	-10192.00	240.30	4/18/06	ATL	1 inch Dia. PVC	6.00	234.30	244.98	0.75	6.00	239.55	234.30
PZ-36	BMP	4615.10	-10222.40	239.30	4/18/06	ATL	1 inch Dia. PVC	6.50	232.80	243.85	1.00	6.50	238.30	232.80
PZ-37	BMP	4129.30	-10108.80	240.10	4/18/06	ATL	1 inch Dia. PVC	16.00	224.10	244.54	0.75	16.00	239.35	224.10
PZ-38	BMP	4100.70	-10119.60	239.70	4/18/06	ATL	1 inch Dia. PVC	12.00	227.70	244.15	1.50	12.00	238.20	227.70
PZ-39	BMP	4061.80	-10127.30	229.30	4/20/06	ATL	1 inch Dia. PVC	4.00	225.30	233.63	0.75	4.00	228.55	225.30
PZ-40	BMP	4024.70	-10136.60	228.10	4/20/06	ATL	1 inch Dia. PVC	2.00	226.10	232.65	0.50	2.00	227.60	226.10
PZ-41	BMP	3993.80	-10137.30	228.70	4/20/06	ATL	1 inch Dia. PVC	2.00	226.70	232.64	0.50	2.00	228.20	226.70
PZ-42	BMP	4106.20	-9846.50	238.20	4/18/06	ATL	1 inch Dia. PVC	15.00	223.20	242.72	3.00	13.00	235.20	225.20
PZ-43	BMP	4083.20	-9841.60	238.80	4/18/06	ATL	1 inch Dia. PVC	16.00	222.80	243.20	1.00	16.00	237.80	222.80
PZ-44	BMP	4027.80	-9840.10	225.00	4/18/06	ATL	1 inch Dia. PVC	12.00	213.00	229.01	1.50	12.00	223.50	213.00
PZ-45	BMP	3997.60	-9837.00	223.20	4/18/06	ATL	1 inch Dia. PVC	12.00	211.20	228.24	1.50	12.00	221.70	211.20
PZ-46	BMP	3962.60	-9835.00	223.20	4/18/06	ATL	1 inch Dia. PVC	7.50	215.70	227.69	1.50	7.50	221.70	215.70
PZ-47	LFILL	2666.55	-9948.29	192.55	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-48	LFILL	2664.64	-9943.86	192.76	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-49	LFILL	2621.17	-9578.61	192.63	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]

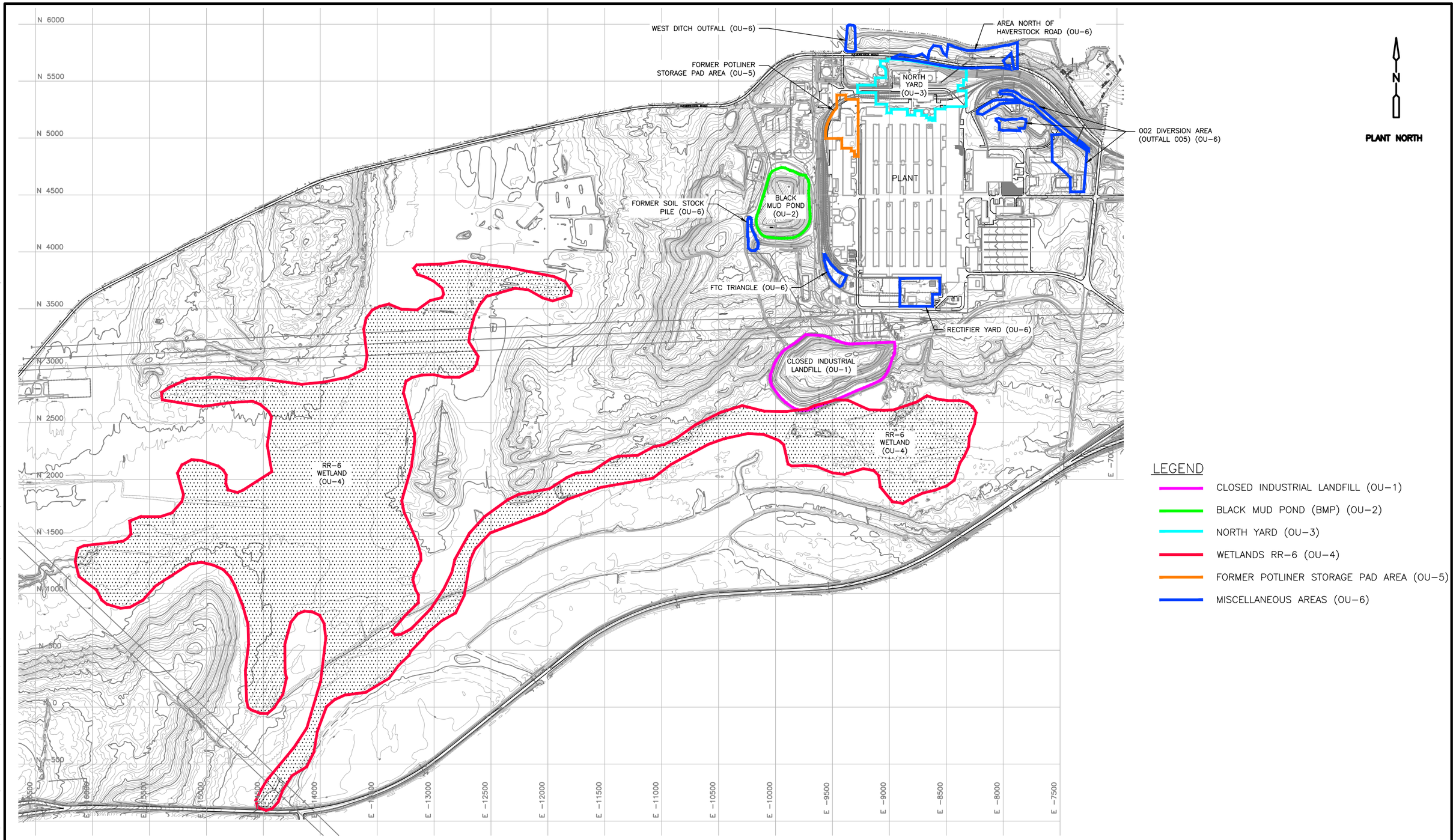
Facility Location and ID														
Monitoring Well ID	Site	Alcoa Coordinates[1] Northing	Alcoa Coordinates[1] Easting	Ground Elevation (feet)	Date Installed	Company	Material Type and Size	Depth of Well (feet)	Bottom of Hole Elevation (feet)	Top of Inner Casing (feet)	Screen Depth Top (feet)	Screen Depth Bottom (feet)	Screen Elevation Top (feet)	Screen Elevation Bottom (feet)
PZ-50	LFILL	2618.77	-9582.24	192.76	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-51	LFILL	2751.74	-9308.03	198.90	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-52	LFILL	2754.22	-9302.20	198.70	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-53	LFILL	2338.60	-9459.86	191.60	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-54	LFILL	2342.46	-9456.01	191.64	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-55	LFILL	2132.46	-9191.93	192.23	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-56	LFILL	2136.99	-9191.10	192.55	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-57	LFILL	2077.21	-8794.79	192.30	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-58	LFILL	2080.97	-8793.47	192.48	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-59	LFILL	2824.95	-8538.55	191.82	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-60	LFILL	2828.77	-8539.85	191.70	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-61	LFILL	2743.96	-8561.26	191.17	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-62	LFILL	2741.57	-8563.22	191.10	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-63	LFILL	2575.54	-8590.12	190.72	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-64	LFILL	2578.08	-8595.12	190.76	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-65	LFILL	3120.40	-7794.92	201.86	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-66	LFILL	3126.77	-7800.31	202.25	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-67	LFILL	2730.85	-8036.21	192.15	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-68	LFILL	2734.27	-8034.03	192.29	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-69	LFILL	2978.47	-7644.46	200.27	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-70	LFILL	2981.21	-7641.61	200.32	9/29/08 - 10/10/08	ATL	2 inch Dia. PVC	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]	---[4]
PZ-71S	LFILL	3162.5	-9883.5	209.69	7/13/10	ATL	1 inch Dia. PVC	35	174.69	212.75	10.00	20.00	199.69	189.69
PZ-71D	LFILL	3162.3	-9883.4	209.69	7/13/10	ATL	1 inch Dia. PVC	35	174.69	212.61	25.00	35.00	184.69	174.69
PZ-72	LFILL	3170.6	-9871.2	209.94	7/14/10	ATL	1 inch Dia. PVC	21	188.94	212.67	10.00	20.00	199.94	189.94
PZ-73S	LFILL	3303.1	-9630.7	210.67	8/19/10	ATL	1 inch Dia. PVC	34	176.67	209.94	15.00	20.00	195.67	190.67
PZ-73D	LFILL	3303.3	-9630.9	210.67	819/10	ATL	1 inch Dia. PVC	34	176.67	210.17	27.50	32.50	183.17	178.17
PZ-74D	LFILL	3303.5	-9615.7	210.93	8/20/10	ATL	1 inch Dia. PVC	34	176.93	210.40	27.50	32.50	183.43	178.43
PZ-74S	LFILL	3303.4	-9615.8	210.93	8/20/10	ATL	1 inch Dia. PVC	34	176.93	210.30	15.00	20.00	195.93	190.93
PZ-75S	LFILL	3210.9	-9243.2	224.06	7/22/10	ATL	1 inch Dia. PVC	46.5	177.56	226.91	16.75	21.75	207.31	202.31
PZ-75D	LFILL	3210.9	-9243.2	224.06	7/22/10	ATL	1 inch Dia. PVC	46.5	177.56	226.90	40.50	45.50	183.56	178.56
PZ-76	LFILL	3211.7	-9227.9	224.00	7/23/10	ATL	1 inch Dia. PVC	46.5	177.50	226.25	40.50	45.50	183.50	178.50
PZ-77	LFILL	3227.0	-9785.9	210.77	5/24/12	ATL	1 inch Dia. PVC	35	175.77	213.53	30.00	35.00	180.77	175.77
PZ-78	LFILL	3302.1	-9640.9	210.14	5/17/12	ATL	1 inch Dia. PVC	35	175.14	210.14	30.00	35.00	180.14	175.14
PZ-79	LFILL	3241.1	-9378.5	218.90	5/16/12	ATL	1 inch Dia. PVC	35	183.90	221.36	30.00	35.00	188.90	183.90
Extraction Wells														
EW-01	LFILL	3157.0	-9891.8	209.32	7/12/10	ATL	4 inch Dia. PVC	55	154.32	212.47	26.00	36.00	183.32	173.32
EW-02	LFILL	3302.3	-9640.7	210.72	8/18/10	ATL	4 inch Dia. PVC	47	163.72	210.13	25.00	35.00	185.72	175.72
EW-03	LFILL	3209.9	-9253.3	224.06	7/21/10	ATL	4 inch Dia. PVC	57	167.06	226.30	38.00	48.00	186.06	176.06
EW-04	LFILL	3314.0	-9455.2	218.73	5/23/12	ATL	4 inch Dia. PVC	49	169.73	218.13	37.00	47.00	181.73	171.73
EW-05	LFILL	3223.4	-9306.6	223.88	5/16/12	ATL	4 inch Dia. PVC	50	173.88	226.55	38.00	48.00	185.88	175.88
EW-06	LFILL	3224.8	-9129.9	221.55	5/14/12	ATL	4 inch Dia. PVC	54	167.55	224.39	42.00	52.00	179.55	169.55

Notes:

1. The northings and eastings listed are based on Alcoa's coordinate system. This system is based on the benchmark location King's Bench, which is located just west of Alcoa's Building 60.
2. Destroyed during construction.
3. Borrow Pit
4. Information was determined to be inaccurate. Information not available.

Key:

--- = Well data unavailable

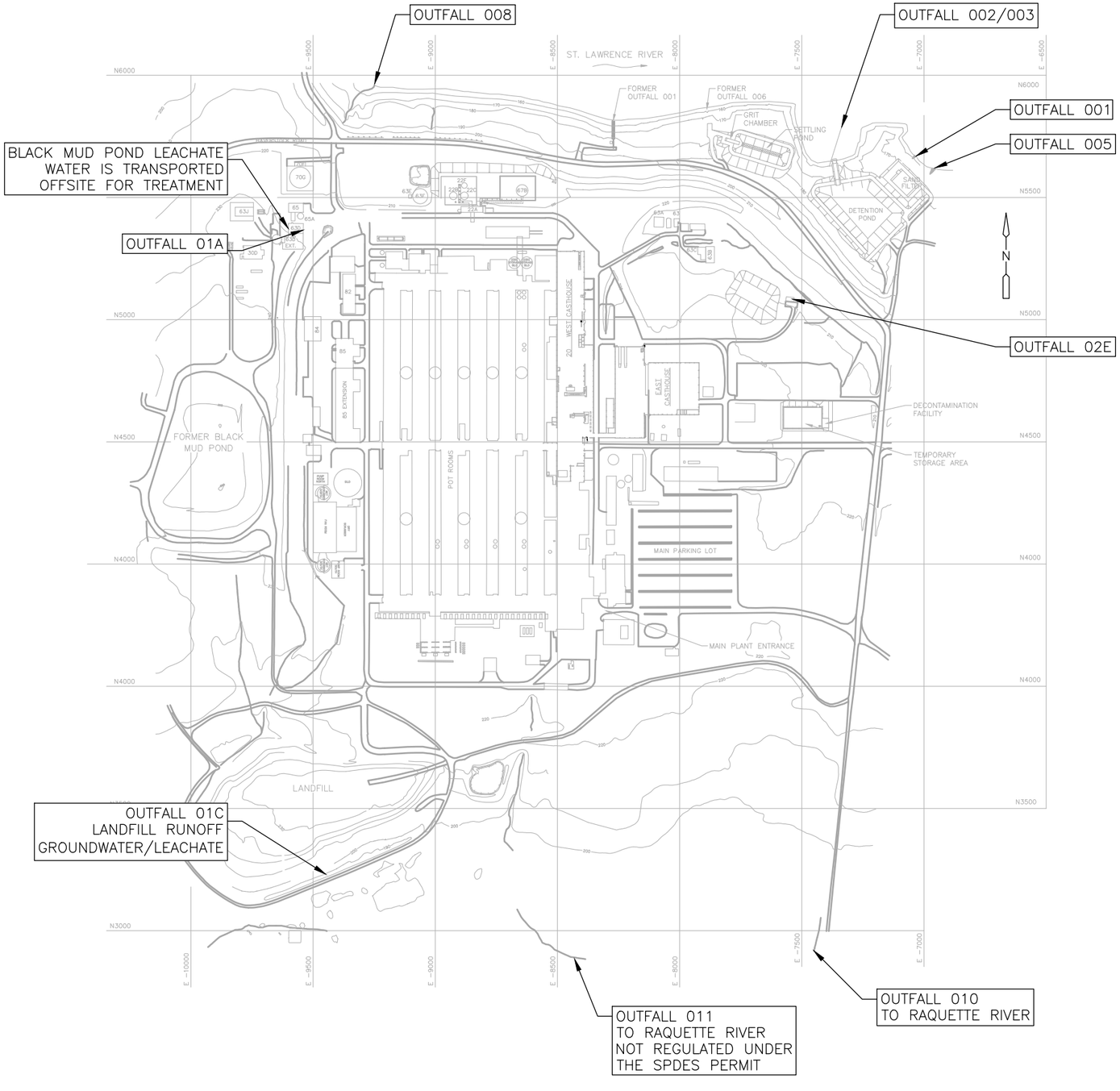


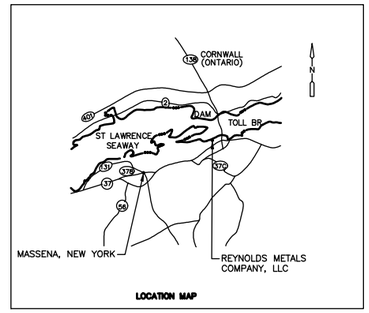
1" = 800'

400 0 800

Reynolds Metals Company, LLC. - Massena, New York

FIGURE 1-1
SITE OPERABLE UNITS





FACILITY OUTFALLS REGULATED UNDER SPDES PERMIT NO. NY0000132

Outfall No.	Receiving Waterbody Discharge Location, Latitude N /Longitude W (deg, min, sec)	Receiving Stream/Class	Monitoring Location, Latitude N /Longitude W (deg, min, sec)
001	44,59,11 / 74,44,46	St. Lawrence River / A	same as Receiving Waterbody
01A	see 001	Outfall 001	44,59,03 / 74,45,19
01C	see 001	Outfall 01A	44,58,37 / 74,45,09
02E	see 005	Outfall 005	44,59,05 / 74,44,52
003	44,59,11 / 74,44,50	St. Lawrence River / A	44,59,07 / 74,44,57
005	44,59,11 / 74,44,45	St. Lawrence River / A	same as Receiving Waterbody
008	44,59,11 / 74,45,18	St. Lawrence River / A	same as Receiving Waterbody
010	44,58,33 / 74,44,38	Raquette River / B	44,58,38 / 74,44,40

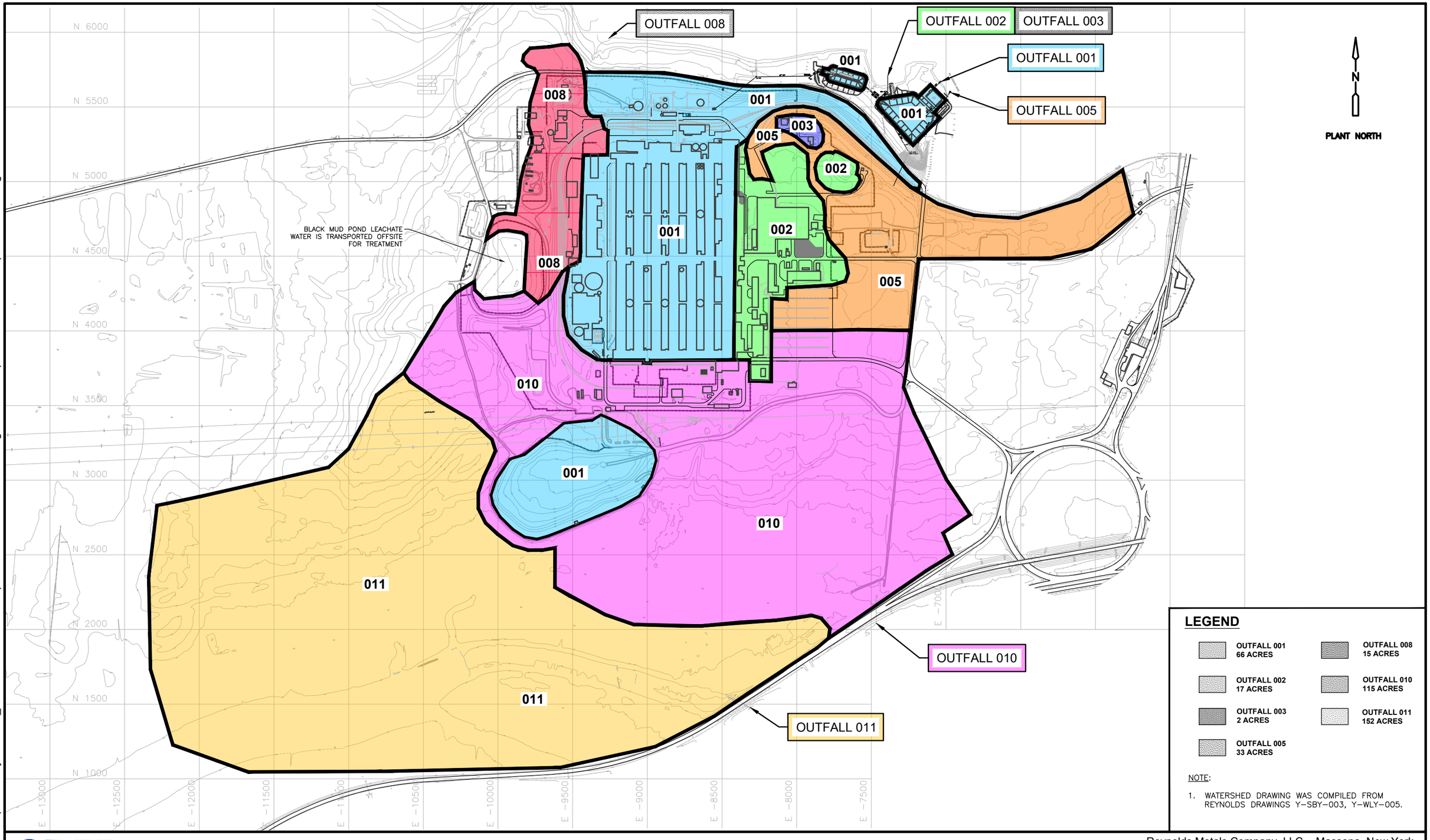
TABLE RETRIEVED FROM REYNOLDS SPDES PERMIT NO. NY0000132

CDM Smith

1" = 500'
250 0 500

Reynolds Metals Company, LLC. - Massena, New York

FIGURE 1-2
OUTFALL LOCATION PLAN



LEGEND

OUTFALL 001 66 ACRES	OUTFALL 008 15 ACRES
OUTFALL 002 17 ACRES	OUTFALL 010 115 ACRES
OUTFALL 003 2 ACRES	OUTFALL 011 152 ACRES
OUTFALL 005 33 ACRES	

NOTE:

1. WATERSHED DRAWING WAS COMPILED FROM REYNOLDS DRAWINGS Y-SBY-003, Y-WLY-005.

CDM Smith

Reynolds Metals Company, LLC. - Massena, New York

FIGURE 1-3
SITE WATERSHED MAP

Section 2
Operations and Maintenance

2.1 Introduction

This section presents a summary of O&M performed at the Reynolds Metals Company, LLC. remedial sites during 2020. Activities involved routine inspections and documentation as well as addressing deficiencies which were identified during these inspections. A listing of and the schedule for these activities are compiled in Appendix B.

Reynolds Metals Facility will comply with post-closure requirements found in the New York Codes, Rules and Regulations 6 NYCRR 373-2.14(g) (2), including maintenance and monitoring throughout the post-closure care period. The applicable requirements include:

- maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events.
- maintain and monitor the groundwater monitoring system and comply with all other applicable requirements.
- prevent run-on and runoff from eroding or otherwise damaging the final cover systems; and
- protect and maintain surveyed benchmarks.

2.2 Black Mud Pond

Key post-remediation activities include maintaining the cap, collection and treatment of groundwater from the French drain system, as well as inspections and groundwater monitoring.

Figure 2-1 is a site plan of the BMP and the associated groundwater wells used for monitoring. The following items require periodic inspections:

- the groundwater transfer line from the BMP dewatering sump to the storage tanks.
- the BMP cap; and
- the groundwater collection system.

2.2.1 Operations

Operations consisted of the extraction, transfer, storage, and treatment of groundwater. Historically (2003 through August 2017) the BMP groundwater was treated and discharged at the Outfall 01F cyanide treatment system at the Arconic Massena West Plant. Since September 2017, BMP groundwater has been collected and transported via railcar to an offsite treatment and disposal facility. The annual quantities of groundwater pumped in previous years as well as 2020 are provided in Table 2-1.

In calendar year 2020, 64,838 gallons or an average of approximately 178 gallons per day of groundwater was extracted from the BMP through December 21, 2020. Accumulated water was transported offsite in three railcar shipments recorded in April, September, and December 2020.

Figure 2-1 depicts the groundwater control trenches that collect groundwater beneath the BMP and groundwater monitoring wells located within and proximal to the BMP. The groundwater collection system includes four horizontal drains that had originally been installed with four submersible pumps. Currently, the four horizontal drains (A-1 through A-4) empty into a sand filled trench. The groundwater then drains by gravity to the southernmost lateral drain, which also drains by gravity to the sump labeled "dewatering sump". From this point, the submersible pump within the dewatering sump pumps the groundwater to treatment.

The BMP cap was completed in 1997 and the transfer line was operational from 1997-2004. Upgrades to the leachate transfer line occurred in 2004. The upgraded pumping system transfers groundwater from the dewatering sump to the Outfall 01B equalization tank. Since the cyanide destruction treatment system at this site has been decommissioned and removed with NYSDEC approval, the groundwater pumped to the Outfall 01B tank was transferred by tanker truck to the Arconic Massena West Plant Outfall 01F for treatment and discharge since 2003. Beginning in September 2017, BMP groundwater is collected and transferred via railcar to an offsite treatment and disposal facility and is no longer treated at the Arconic Massena West Plant.

Currently the BMP groundwater collection system is operated automatically; the pumps convey water to tanks 208, 211, and 216 when flow is present. Tank water levels are monitored routinely and when close to full capacity the water from the tanks is pumped into a railcar for transport to an offsite treatment and disposal facility.

2.2.2 Maintenance, Repairs and Modifications

No maintenance, repair and modification activities were completed in 2020.

As identified in the *Monitoring Well Decommissioning Work Plan for the Reynolds Metals Company, LLC.* (March 2021), repairs were completed on monitoring wells MW-20-85-S and MW-20-85-D in October 2019 to address uplift of their inner casings. At both locations, the well's inner and outer casings were pushed up making access difficult. The stickup protector was removed from each location and the inner casing was cut down to an accessible elevation. The area around the 2-inch PVC was excavated to 4 feet below ground surface and a Sono Tube installed. The well protector was re-installed over the 2-inch PVC inner casing and the Sono Tube was filled with concrete. Survey of each location is planned to be performed in conjunction with the 2021 well repair work outlined in the Revised Monitoring Well Decommissioning Work Plan approved by the NYSDEC on March 10, 2021.

The final cover system was inspected bi-annually for evidence of vegetative deterioration, erosion, siltation, ponding, uplift, washouts, leachate breakout, rodent holes, and checked for obstructions in the passive gas vents. The culverts, swales, check dams and riprap were included in the bi-annual inspections. The functionality of these systems was inspected and showed no evidence of overland flooding or erosion, no evidence of scouring, inlets and outlets remained unobstructed, and evidence that positive drainage has been maintained. No problems were noted in 2020.

2.2.3 Monitoring

The following O&M monitoring results were obtained during the reporting period:

- quantities of groundwater removed from the BMP are recorded in Table 2-1 and are shown graphically in Figures 2-2 and 2-3.

2.3 Industrial Landfill

The following subsections describe the operations, inspections and maintenance activities performed at the closed Landfill.

Key post-remediation activities include maintaining the cap, leachate collection and treatment, inspections, and groundwater monitoring. Inspections, maintenance and groundwater monitoring are required per the Basis of Design Report (BODR), submitted to NYSDEC on January 27, 2012 for the Groundwater Extraction System. Figure 2-4 shows a plan of the Landfill and the associated groundwater wells and piezometers used for monitoring. The following items require periodic inspections:

- the Landfill cap;
- the leachate collection system; and
- the up-gradient extraction wells.

2.3.1 Operations & Monitoring

Operations consisted of the collection of 4,484,895 gallons of groundwater by the leachate collection system for the year 2020. Monthly quantities are tabulated in Table 2-2. The monthly Landfill data reported in Table 2-2 reflects the Landfill (Outfall 01C) flowmeter readings. The SPDES Discharge Monitoring Reports were derived from a flow totalizer at the Outfall. A plot of the total flow recovered and treated, starting with the 32,130,235 gallons on record in January 1999, is presented in Figures 2-5 and 2-6. All water collected from the Landfill was treated at the onsite Outfall 003 Wastewater Treatment System.

Additionally, approximately 2,246,100 gallons of groundwater were collected by the upgradient extraction well system (EW-01, EW-02, EW-04, EW-05 and EW-06) during 2020 compared to 2,372,043 gallons in 2019. All water collected from upgradient of the Landfill was conveyed to and ultimately discharged at Outfall 001.

Monthly groundwater quantities for each extraction well are tabulated in Table 2-3 and presented graphically in Figure 2-7. Table 2-3 also presents what months the extraction wells were operational in 2020. All five extraction wells remained operational throughout the majority of the year except EW-02 which did not operate in November through December of 2020 due to an impeller issue. Analytical data collected at the extraction wells is presented in Table 2-4.

Bi-annual inspections were performed on the final cap at the Industrial Landfill during 2020. This included inspection of the cover system for evidence of vegetative deterioration, erosion, siltation, ponding, uplift, washouts, leachate breakout, and rodent holes. The culverts, swales, check dams and riprap were included in the bi-annual inspections. The functionality of these systems was inspected and showed no evidence of overland flooding or erosion, no evidence of scouring, inlets and outlets remained unobstructed, and evidence that positive drainage has been maintained. No problems were noted.

2.3.2 Maintenance, Repairs and Modifications

No non-routine maintenance, repairs of modifications were required to the landfill cap during the year. The EW-02 impeller issue for the groundwater extraction system was addressed by replacing the pump on January 5, 2021. No other non-routine maintenance, repairs of modifications were required to the groundwater extraction systems.

2.4 Former Potliner Storage Pad

Figure 2-8 is the plan of the former Potliner Storage Pad and the groundwater wells in the vicinity. Key post-remedial activities include inspections and groundwater monitoring. Groundwater under the former Potliner Storage Pad flows in a north and northeast direction toward the North Yard French drain.

2.4.1 Maintenance, Repairs and Modifications

Paving remained intact and the stormwater collection system functioned normally in 2020.

2.5 North Yard

Figure 2-8 also shows the area of the North Yard and the monitoring wells near that area. Key post-remedial activities include limited groundwater collection and treatment (West Sump), inspections and groundwater monitoring.

Periodic inspections of West and East Sump are required in this area. Plant personnel maintain the integrity of the secondary containment around the tanks in this area.

2.5.1 Operations and Monitoring

Operations consisted of collection, transfer, storage, and treatment of groundwater from French drains and surface water from secondary containments around the Pitch, Fuel Oil Tanks, and other tanks in the area.

Based on a 2019 evaluation which determined the flow rate of the new sump pump (flow rate when pump is operating) at approximately 32.6 gallons per minute, 1,320,691 gallons were pumped from the French Drain sump in 2020. Estimates of the volume of water removed monthly from the French Drain in 2020 are provided in Table 2-5. Water samples were collected at the French Drain sump as part of the cyanide investigation which is reviewed in Section 4.8.2.

2.5.2 Maintenance, Repairs and Modifications

The French Drain pump was fully functional in 2020 following repairs performed in 2019. No additional non-routine maintenance was required.

2.6 Rectifier Yard

Figure 2-9 is the plan of the Rectifier Yard and the drainage network that leads to the Rectifier Yard Pond. Key post-remedial activities include inspections and replacement of the Rectifier Yard Pond oil absorbent boom (as needed but no less than annually). Monitoring of the surface water chemistry of the retention pond is no longer required per NYSDEC approval in January 2013.

2.6.1 Operations

No operational activities are associated with the remedial actions conducted for the Rectifier Yard or other miscellaneous areas.

2.6.2 Maintenance, Repairs and Modifications

Oil booms were changed in March and September 2020 at the Rectifier Yard Pond. There were no further issues at the Rectifier Yard Pond in 2020.

Month	1997		1998		1999		2000		2001		2002		2003		2004[3]	
	Monthly Quantity[1]	Cumulative Total[2]	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total
January	62,210	766,370	26,439	1,309,112	21,042	1,530,707	9,213	1,691,692	11,324	1,809,675	9,738	1,902,167	472	1,990,028	1,600[4]	2,050,617
February	41,900	808,270	10,411	1,319,523	20,223	1,550,930	10,179	1,701,871	9,334	1,819,009	8,574	1,910,741	0	1,990,028	2,800[4]	2,053,417
March	39,600	847,870	16,430	1,335,953	11,184	1,562,114	0	1,701,871	11,228	1,830,237	8,090	1,918,831	0	1,990,028	3,100[4]	2,056,517
April	41,550	889,420	4,890	1,340,843	14,271	1,576,385	2,807	1,704,678	9,222	1,839,459	10,109	1,928,940	0	1,990,028	8,000[4]	2,064,517
May	49,620	939,040	6,910	1,347,753	13,831	1,590,216	23,697	1,728,375	9,728	1,849,187	9,669	1,938,609	0	1,990,028	7,816[5]	2,072,333
June	54,730	993,770	24,290	1,372,043	13,359	1,603,575	3,286	1,731,661	6,990	1,856,177	4,675	1,943,284	0	1,990,028	8,935[5]	2,081,268
July	69,210	1,062,980	24,800	1,396,843	12,566	1,616,141	13,876	1,745,537	10,240	1,866,417	9,907	1,953,191	44,991	2,035,019	9,074[5]	2,090,342
September	52,047	1,175,652	20,800	1,442,443	14,010	1,641,269	11,447	1,765,229	9,935	1,885,272	3,975	1,968,482	2,800	2,043,417	10,977[5]	2,111,648
October	45,176	1,220,828	24,800	1,467,243	14,799	1,656,068	2,615	1,767,844	7,157	1,892,429	8,596	1,977,078	2,800	2,046,217	11,664[5]	2,123,312
November	30,345	1,251,173	20,960	1,488,203	13,276	1,669,344	18,235	1,786,079	0	1,892,429	9,804	1,986,882	0	2,046,217	12,285[5]	2,135,597
December	31,500	1,282,673	21,462	1,509,665	13,135	1,682,479	12,272	1,798,351	0	1,892,429	2,674	1,989,556	2,800	2,049,017	15,691[5]	2,151,288
Total for Year	578,513		226,992		172,814		115,872		94,078		97,127		59,461		102,271	

Notes:

1. Groundwater quantities are given in gallons.
2. Totals are calculated since June 26, 1996, the date when the lined pond was removed and surface water transfer began.
3. In 2004, all quantities of groundwater were treated at the Outfall 01F cyanide treatment facility.
4. Quantity based on volume removed by tanker truck.
5. From May to December 2004, quantity based on flowmeter readings.
6. Beginning in September 2017, water is collected and shipped offsite via railcar for treatment and disposal. The total accumulated volume between September and December 2017 is 19,502 gallons
7. Monthly volumes estimated from flow totalizer readings through December 24,2018. Accumulated water was transported offsite in three railcar shipments recorded in April, August and December 2018.

Table 2-1
Reynolds Metals Company, LLC.
Summary of Groundwater Quantities Removed from BMP

Month	2005[4]		2006[4]		2007[4]		2008[4]		2009[4]		2010[4]		2011[4]		2012[4]	
	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total
January	5,600[4]	2,156,888	7,200	2,282,888	10,400	2,399,688	8,400	2,497,488	8,400	2,588,088	8,600	2,678,088	10,400	2,784,888	5,600	2,885,688
February	9,600[4]	2,166,488	11,200	2,294,088	11,200	2,410,888	6,600	2,504,088	5,600	2,593,688	5,600	2,683,688	8,400	2,793,288	8,400	2,894,088
March	11,200[4]	2,177,688	8,400	2,302,488	9,400	2,420,288	8,400	2,512,488	5,600	2,599,288	12,200	2,695,888	11,200	2,804,488	8,400	2,902,488
April	8,600[4]	2,186,288	8,400	2,310,888	9,600	2,429,888	5,600	2,518,088	5,600	2,604,888	5,600	2,701,488	8,400	2,812,888	11,200	2,913,688
May	16,800[4]	2,203,088	8,400	2,319,288	6,600	2,436,488	8,400	2,526,488	10,400	2,615,288	11,200	2,712,688	8,400	2,821,288	5,600	2,919,288
June	11,200[4]	2,214,288	11,200	2,330,488	8,400	2,444,888	5,600	2,532,088	5,600	2,620,888	5,600	2,718,288	5,600	2,826,888	8,400	2,927,688
July	10,400[4]	2,224,688	8,400	2,338,888	4,200	2,449,088	8,400	2,540,488	11,200	2,632,088	8,600	2,726,888	5,600	2,832,488	2,800	2,930,488
September	15,800[4]	2,240,488	8,400	2,355,688	10,200	2,469,488	5,600	2,554,488	5,600	2,646,088	5,600	2,743,688	11,200	2,849,288	2,800	2,941,688
October	8,400[4]	2,248,888	14,000	2,369,688	5,600	2,475,088	5,600	2,560,088	8,400	2,654,488	14,000	2,757,688	8,400	2,857,688	2,800	2,944,488
November	11,200[4]	2,260,088	8,400	2,378,088	8,400	2,483,488	8,400	2,568,488	8,400	2,662,888	11,200	2,768,888	8,400	2,866,088	8,400	2,952,888
December	15,600[4]	2,275,688	11,200	2,389,288	5,600	2,489,088	11,200	2,579,688	6,600	2,669,488	5,600	2,774,488	14,000	2,880,088	11,200	2,964,088
Total for Year	124,400		113,600		99,800		90,600		89,800		105,000		105,600		84,000	

Notes:

1. Groundwater quantities are given in gallons.
2. Totals are calculated since June 26, 1996, the date when the lined pond was removed and surface water transfer began.
3. In 2004, all quantities of groundwater were treated at the Outfall 01F cyanide treatment facility.
4. Quantity based on volume removed by tanker truck.
5. From May to December 2004, quantity based on flowmeter readings.
6. Beginning in September 2017, water is collected and shipped offsite via railcar for treatment and disposal. The total accumulated volume between September and December 2017 is 19,502 gallons
7. Monthly volumes estimated from flow totalizer readings through December 24,2018. Accumulated water was transported offsite in three railcar shipments recorded in April, August and December 2018.

Table 2-1
Reynolds Metals Company, LLC.
Summary of Groundwater Quantities Removed from BMP

Month	2013[4]		2014[4]		2015[4]		2016[4]		2017[4,6]		2018[7]		2019[8]		2020	
	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total
January	5,600	2,969,688	8,400	3,070,488	8,400	3,185,288	2,800	3,241,688	5,000	3,321,488	6,967	3,396,857	7,209	3,458,272	1,051	3,526,273
February	5,600	2,975,288	8,400	3,078,888	5,600	3,190,888	0	3,241,688	7,600	3,329,088	5,673	3,402,530	3,126	3,461,398	9,313	3,532,567
March	8,400	2,983,688	5,600	3,084,488	14,400	3,205,288	11,200	3,252,888	8,400	3,337,488	6,042	3,408,572	7,430	3,468,828	6,294	3,537,359
April	8,400	2,992,088	8,400	3,092,888	2,800	3,208,088	5,600	3,258,488	2,800	3,340,288	0	3,408,572	3,319	3,472,147	4,792	3,542,045
May	5,600	2,997,688	8,400	3,101,288	5,600	3,213,688	8,400	3,266,888	8,400	3,348,688	5,117	3,413,689	6,015	3,478,162	4,686	3,548,439
June	8,400	3,006,088	8,400	3,109,688	8,400	3,222,088	2,800	3,269,688	8,400	3,357,088	6,269	3,419,958	6,242	3,484,404	6,394	3,553,021
July	8,400	3,014,488	14,000	3,123,688	2,800	3,224,888	5,600	3,275,288	5,600	3,362,688	5,192	3,425,150	4,976	3,489,380	4,582	3,559,435
September	8,400	3,031,288	11,200	3,148,888	2,800	3,233,288	8,400	3,292,088	0	3,370,388	6,930	3,437,213	3,730	3,498,104	5,138	3,569,996
October	11,200	3,042,488	11,200	3,160,088	0	3,233,288	7,600	3,299,688	0	3,370,388	2,174	3,439,387	7,416	3,505,520	5,423	3,576,726
November	5,600	3,048,088	8,400	3,168,488	2,800	3,236,088	8,400	3,308,088	0	3,370,388	5,725	3,445,112	5,515	3,511,035	6,730	3,580,747
December	14,000	3,062,088	8,400	3,176,888	2,800	3,238,888	8,400	3,316,488	19502	3,389,890	5,951	3,451,063	5,925	3,516,960	4,021	3,645,585
Total for Yea	98,000		114,800		62,000		77,600		73,402		61,173		65,897		64,838	

Notes:

1. Groundwater quantities are given in gallons.
2. Totals are calculated since June 26, 1996, the date when the lined pond was removed and surface water transfer began.
3. In 2004, all quantities of groundwater were treated at the Outfall 01F cyanide treatment facility.
4. Quantity based on volume removed by tanker truck.
5. From May to December 2004, quantity based on flowmeter readings.
6. Beginning in September 2017, water is collected and shipped offsite via railcar for treatment and disposal. The total accumulated volume between September and December 2017 is 19,502 gallons
7. Monthly volumes estimated from flow totalizer readings through December 24,2018. Accumulated water was transported offsite in three railcar shipments recorded in April, August and December 2018 totaling 65,919 gallons.
8. Monthly volumes estimated from flow totalizer readings between December 24,2018 and December 23, 2019. Accumulated water was transported offsite in three railcar shipments recorded in April, August and December 2019. The BMP flowmeter was repaired/reset in October 2019; shipment volumes were used to estimate the volume for this month.

Table 2-1
Reynolds Metals Company, LLC.
Summary of Groundwater Quantities Removed from BMP

Month	1999		2000		2001		2002		2003		2004		2005	
	Monthly Quantity[1]	Cumulative Total[2]	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total
January	1,050,370	32,130,235	610,802	40,289,510	788,334	53,062,064	1,453,705	64,312,202	485,292	73,655,904	542,455	79,438,633	835,126	86,590,770
February	923,917	33,054,152	896,705	41,186,215	973,735	54,035,799	857,292	65,169,494	270,328	73,926,232	365,950	79,804,583	606,581	87,197,351
March	1,849,073	34,903,225	1,652,232	42,838,447	1,339,237	55,375,036	947,248	66,116,742	680,754	74,606,986	417,067	80,221,650	1,075,735	88,273,086
April	655,542	35,558,767	1,725,352	44,563,799	984,693	56,359,729	1,407,871	67,524,613	659,503	75,266,489	531,531	80,753,181	1,578,756	89,851,842
May	366,192	35,924,959	1,848,988	46,412,787	1,155,585	57,515,314	1,139,489	68,664,102	209,581	75,476,070	757,966	81,511,147	1,004,319	90,856,161
June	398,666	36,323,625	750,211	47,162,998	1,018,585	58,533,899	1,696,212	70,360,314	57,707	75,533,777	573,294	82,084,441	1,087,759	91,943,920
August	324,197	37,010,492	904,441	49,008,966	373,359	59,441,117	404,739	71,802,093	429,135	76,502,114	524,652	83,073,268	464,180	93,195,893
September	384,107	37,394,599	1,114,891	50,123,857	511,950	59,953,067	250,070	72,052,163	266,833	76,768,947	601,062	83,674,330	1,392,139	94,588,032
October	612,392	38,006,991	676,925	50,800,782	810,097	60,763,164	548,279	72,600,442	518,425	77,287,372	458,382	84,132,712	1,224,686	95,812,718
November	864,205	38,871,196	752,861	51,553,643	913,594	61,676,758	99,951	72,700,393	788,915	78,076,287	686,725	84,819,437	1,443,978	97,256,696
December	807,512	39,678,708	720,087	52,273,730	1,181,739	62,858,497	470,219	73,170,612	819,891	78,896,178	936,207	85,755,644	1,073,878	98,330,574
Total for Year	8,598,843		12,595,022		10,584,767		10,312,115		5,725,566		6,859,466		12,574,930	

Notes:

1. Groundwater and surface water quantities are given in gallons.
2. Cumulative totals of groundwater and surface water transferred from the Landfill are calculated since October 1995.
3. Value is approximated due to flowmeter malfunction.

Table 2-2
Reynolds Metals Company, LLC.
Summary of Groundwater Quantities Removed from Landfill

Month	2006		2007		2008		2009		2010		2011		2012	
	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total
January	1,362,171	99,692,745	1,062,731	111,381,075	1,270,876	122,547,623	866,518	134,961,301	816,164	146,895,958	692,092	157,268,968	239,266	166,513,302
February	1,008,073	100,700,818	796,631	112,177,706	791,750	123,339,373	958,576	135,919,877	352,554	147,248,512	456,807	157,725,775	200,134	166,713,436
March	974,915	101,675,733	868,294	113,046,000	1,363,158	124,702,531	958,324	136,878,201	1,708,541	148,957,053	747,466	158,473,241	652,700	167,366,136
April	1,018,407	102,694,140	1,365,215	114,411,215	1,161,146	125,863,677	1,323,900	138,202,101	858,398	149,815,451	877,571	159,350,812	998,391	168,364,527
May	1,067,701	103,761,841	700,943	115,112,158	1,035,462	126,899,139	879,889	139,081,990	666,947	150,482,398	1,322,988	160,673,800	1,297,721	169,662,248
June	908,499	104,670,340	749,659	115,861,817	916,180	127,815,319	1,083,979	140,165,969	553,689	151,036,087	1,032,015	161,705,815	435,391	170,097,639
August	923,987	106,495,064	932,751	117,578,369	409,618	129,048,802	586,191	142,254,888	688,691	152,498,556	759,707	163,317,981	159,842	170,531,501
September	664,535	107,159,599	414,710	117,993,079	1,539,979	130,588,781	1,071,028	143,325,916	702,620	153,201,176	896,171	164,214,152	131,811	170,663,312
October	1,060,939	108,220,538	1,075,316	119,068,395	734,558	131,323,339	656,505	143,982,421	1,187,114	154,388,290	813,781	165,027,933	367,737	171,031,049
November	987,672	109,208,210	1,207,852	120,276,247	775,246	132,098,585	965,066	144,947,487	1,332,834	155,721,124	795,888	165,823,821	366,636	171,397,685
December	1,110,134	110,318,344	1,000,500	121,276,747	1,996,198	134,094,783	1,132,307	146,079,794	855,752	156,576,876	450,215	166,274,036	347,325	171,745,010
Total for Year	11,987,770		10,958,403		12,818,036		11,985,011		10,497,082		9,697,160		5,470,974	

Notes:

1. Groundwater and surface water quantities are given in gallons.
2. Cumulative totals of groundwater and surface water transferred from the Landfill are calculated since October 1995.
3. Value is approximated due to flowmeter malfunction.

Table 2-2
Reynolds Metals Company, LLC.
Summary of Groundwater Quantities Removed from Landfill

Month	2013		2014		2015		2016		2017		2018		2019		2020	
	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total	Monthly Quantity	Cumulative Total
January	72,080	171,817,090	1,160,922	185,050,785	236,808	191,785,262	956,258	198,731,048	371,407	202,776,083	711,422	205,561,470	368,598	210,696,037	618,532	216,333,539
February	1,417,987	173,235,077	1,053,588	186,104,373	130,820	191,916,082	682,521	199,413,569	326,000	203,102,083	753,905	206,315,375	311,684	211,007,721	399,439	216,732,978
March	971,837	174,206,914	1,270,812	187,375,185	371,849	192,287,931	536,722	199,950,291	287,196	203,389,279	758,170	207,073,545	556,955	211,564,677	1,112,532	217,845,510
April	1,027,140	175,234,053	1,360,116	188,735,301	724,852	193,012,783	734,806	200,685,097	475,254	203,864,533	918,655	207,992,200	738,038	212,302,715	706,726	218,552,236
May	2,025,696	177,259,749	724,358	189,459,659	193,342	193,206,125	299,789	200,984,886	258,801	204,123,334	553,580	208,545,780	841,547	213,144,262	322,308	218,874,544
June	223,696	177,483,445	625,109	190,084,768	234,258	193,440,383	250,726	201,235,612	129,593	204,252,927	351,824	208,897,604	399,813	213,544,075	211,298	219,085,842
August	1,515,543	179,516,598	254,140	190,586,561	960,915	194,620,378	126,052	201,533,093	118,198	204,572,466	162,529	209,211,306	136,435	213,892,252	83,448	219,251,448
September	1,032,732	180,549,330	343,200	190,929,761	561,980	195,182,358	108,064	201,641,157	45,468	204,617,934	154,088	209,365,394	59,944	213,952,196	59,575	219,311,023
October	1,218,524	181,767,854	164,565	191,094,326	666,793	195,849,151	158,391	201,799,548	13,097	204,631,031	195,095	209,560,489	359,539	214,311,734	132,408	219,443,431
November	1,305,517	183,073,371	143,484	191,237,810	883,148	196,732,299	247,515	202,047,063	105,726	204,736,757	405,146	209,965,635	779,330	215,091,065	289,693	219,733,124
December	816,492	183,889,863	310,644	191,548,454	1,042,491	197,774,790	357,613	202,404,676	113,291	204,850,048	361,804	210,327,439	623,942	215,715,007	466,778	220,199,902
Total for Year	12,144,853[3.]		7,658,591		6,226,336		4,629,886		2,445,372		5,477,391		5,387,568		4,484,895	

Notes:

1. Groundwater and surface water quantities are given in gallons.
2. Cumulative totals of groundwater and surface water transferred from the Landfill are calculated since October 1995.
3. Value is approximated due to flowmeter malfunction.

Table 2-2
Reynolds Metals Company, LLC.
Summary of Groundwater Quantities Removed from Landfill

Date	EW-01	EW-02	EW-04	EW-05	EW-06
1/6/2020	2,818,900	2,250,300	5,540,400	968,300	2,191,100
1/27/2020	2,852,900	2,276,500	5,631,300	978,600	2,211,200
2/3/2020	2,864,200	2,285,800	5,667,000	982,000	2,217,700
3/2/2020	2,908,000	2,316,800	5,794,400	995,200	2,244,100
3/30/2020	2,952,500	2,343,300	5,947,200	1,009,000	2,270,800
4/6/2020	2,963,800	2,344,200	5,985,300	1,012,600	2,277,500
4/27/2020	2,997,800	2,348,900	6,061,800	1,023,200	2,298,300
5/4/2020	2,998,700	2,349,200	6,079,300	1,026,600	2,305,400
6/1/2020	3,052,300	2,369,600	6,096,300	1,039,900	2,332,500
6/29/2020	3,092,700	2,391,100	6,157,900	1,051,100	2,358,700
7/27/2020	3,131,400	2,408,600	6,214,300	1,061,000	2,384,300
8/31/2020	3,178,200	2,430,900	6,287,100	1,073,100	2,414,700
9/27/2020	3,212,800	2,445,400	6,343,200	1,082,100	2,437,500
10/5/2020	3,222,900	2,449,900	6,359,500	1,084,700	2,444,300
11/2/2020	3,260,800	2,459,800	6,425,000	1,094,300	2,468,500
11/30/2020	3,300,000	2,459,800	6,498,600	1,104,500	2,493,500
12/28/2020	3,342,600	2,459,800	6,579,000	1,114,700	2,519,000
Calc.Total 2020	523,700	209,500	1,038,600	146,400	327,900

Table 2-3
Reynolds Metals Company, LLC.
Extraction Well Flowmeter Readings

Well	January	February	March	April	May	June	July	August	September	October	November	December
EW-01	O	O	O	O	O	O	O	O	O	O	O	O
EW-02	O	O	O	O	O	O	O	O	O	O	X	X
EW-04	O	O	O	O	O	O	O	O	O	O	O	O
EW-05	O	O	O	O	O	O	O	O	O	O	O	O
EW-06	O	O	O	O	O	O	O	O	O	O	O	O

Key:

X= Not Operational

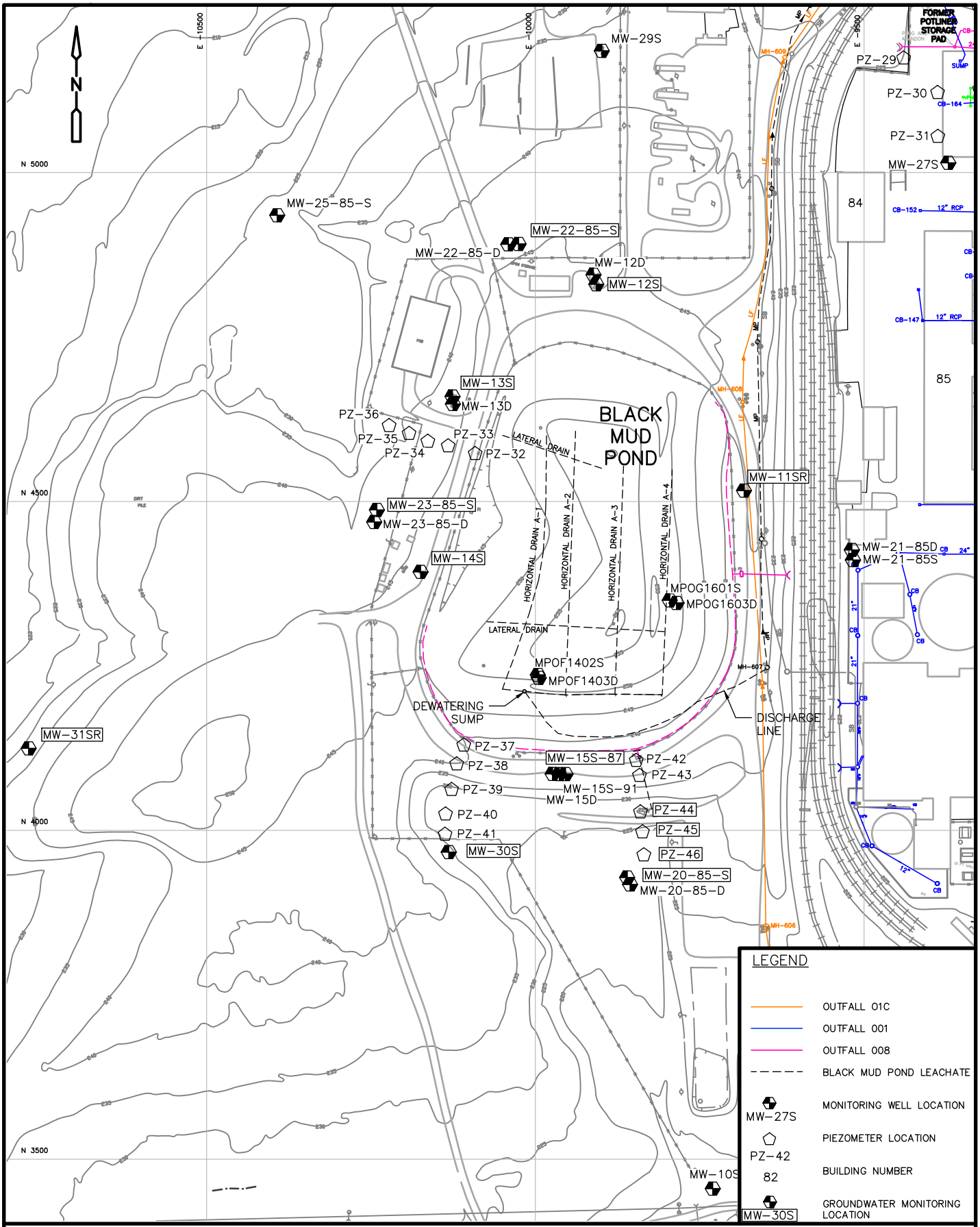
O= Operational

	EW-01		EW-02		EW-04		EW-05		EW-06	
Date	Fluoride (mg/l)	Total Cyanide (mg/l)	Fluoride (mg/l)	Total Cyanide (mg/l)	Fluoride (mg/l)	Total Cyanide (mg/l)	Fluoride (mg/l)	Total Cyanide (mg/l)	Fluoride (mg/l)	Total Cyanide (mg/l)
Feb-20	0.38	0.01U	0.39	0.0298	0.35	0.0915	0.13	0.0439	0.99	0.723
May-20	0.27	0.005U	0.28	0.0504	0.24	0.144	0.1U	0.0607	0.86	0.513
Aug-20	0.12	0.0055	0.1U	0.0325	0.1U	0.0978	0.1U	0.0571	0.4	0.564
Nov-20	0.42	0.0091	0.34	0.078	0.32	0.102	0.22	0.0637	0.61	0.636

Key:
U = Nondetect

Table 2-5
Reynolds Metals Company, LLC.
Extraction Well Analytical Parameters

Month	2020
January	229,830.00
February	74,719.20
March	373,791.60
April	148,069.20
May	51,442.80
June	40,293.60
July	35,208.00
August	47,726.40
September	34,816.80
October	49,291.20
November	94,866.00
December	140,636.40
Total for Year	1,320,691



Reynolds Metals Company, LLC. - Massena, New York

1" = 200'

100 0 200

FIGURE 2-1
BLACK MUD POND
LOCATION PLAN

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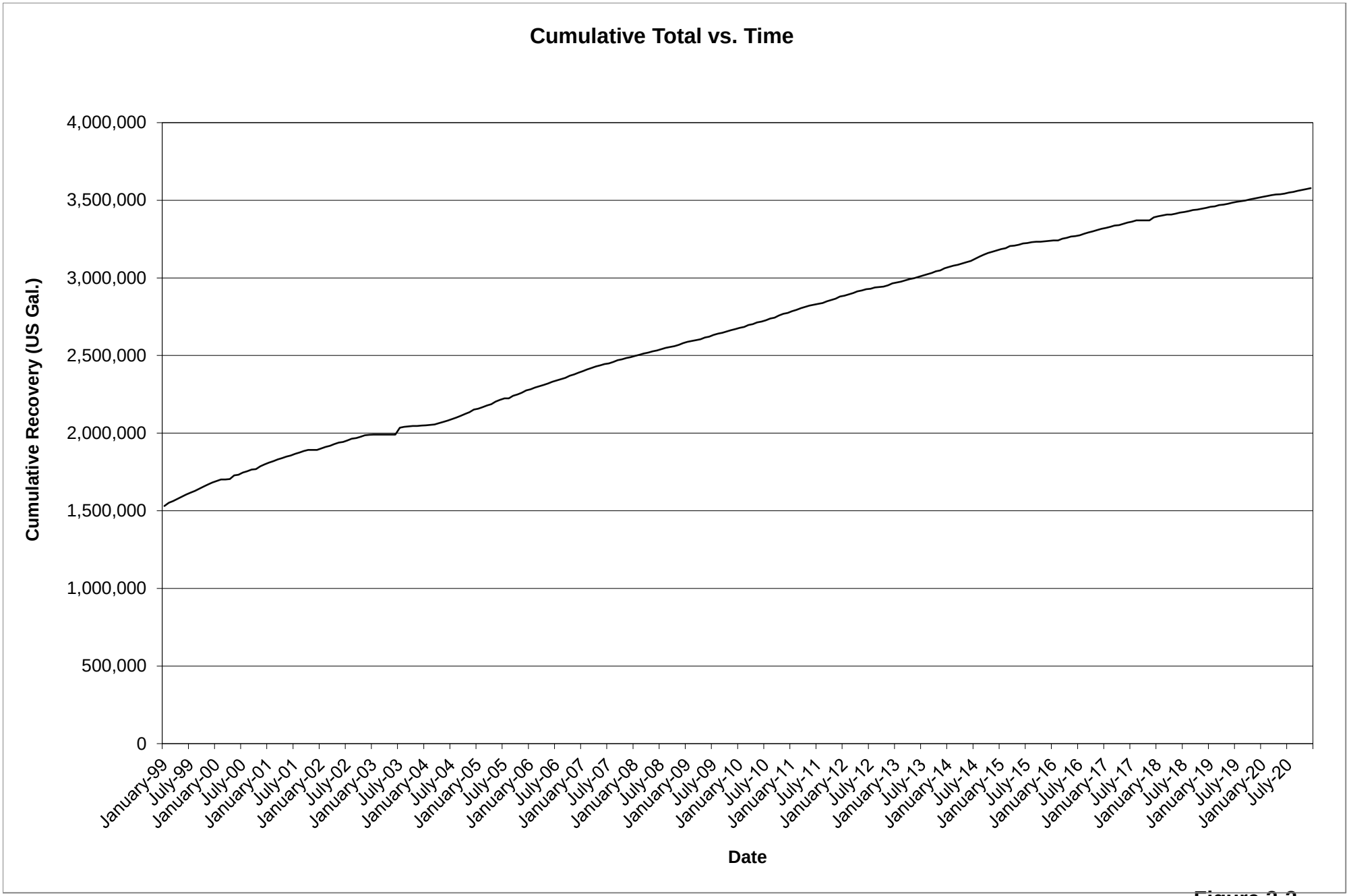

CDM Smith

May 14, 2021
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Figure 2-2
Reynolds Metals Company, LLC.
BMP Groundwater Removal

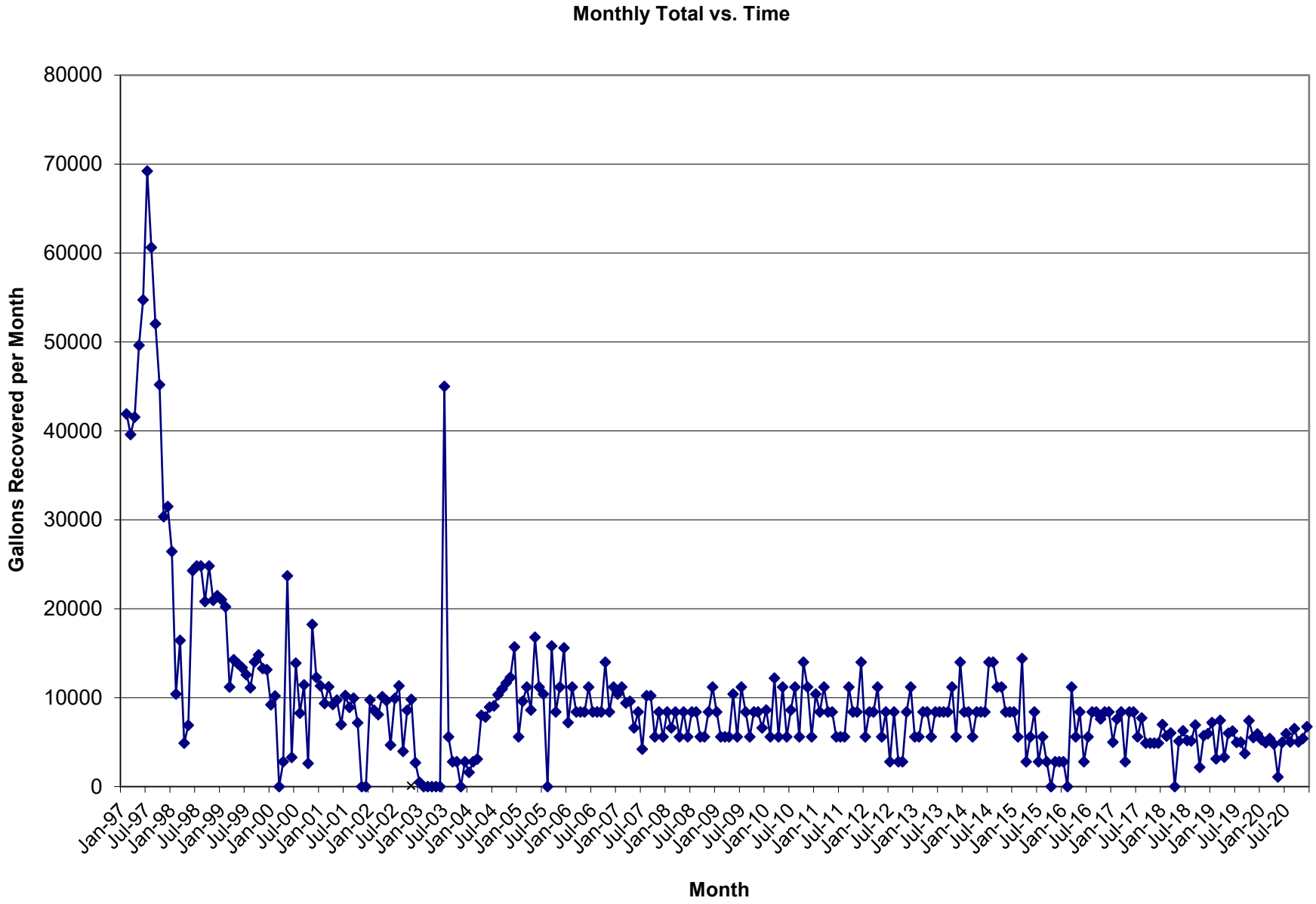

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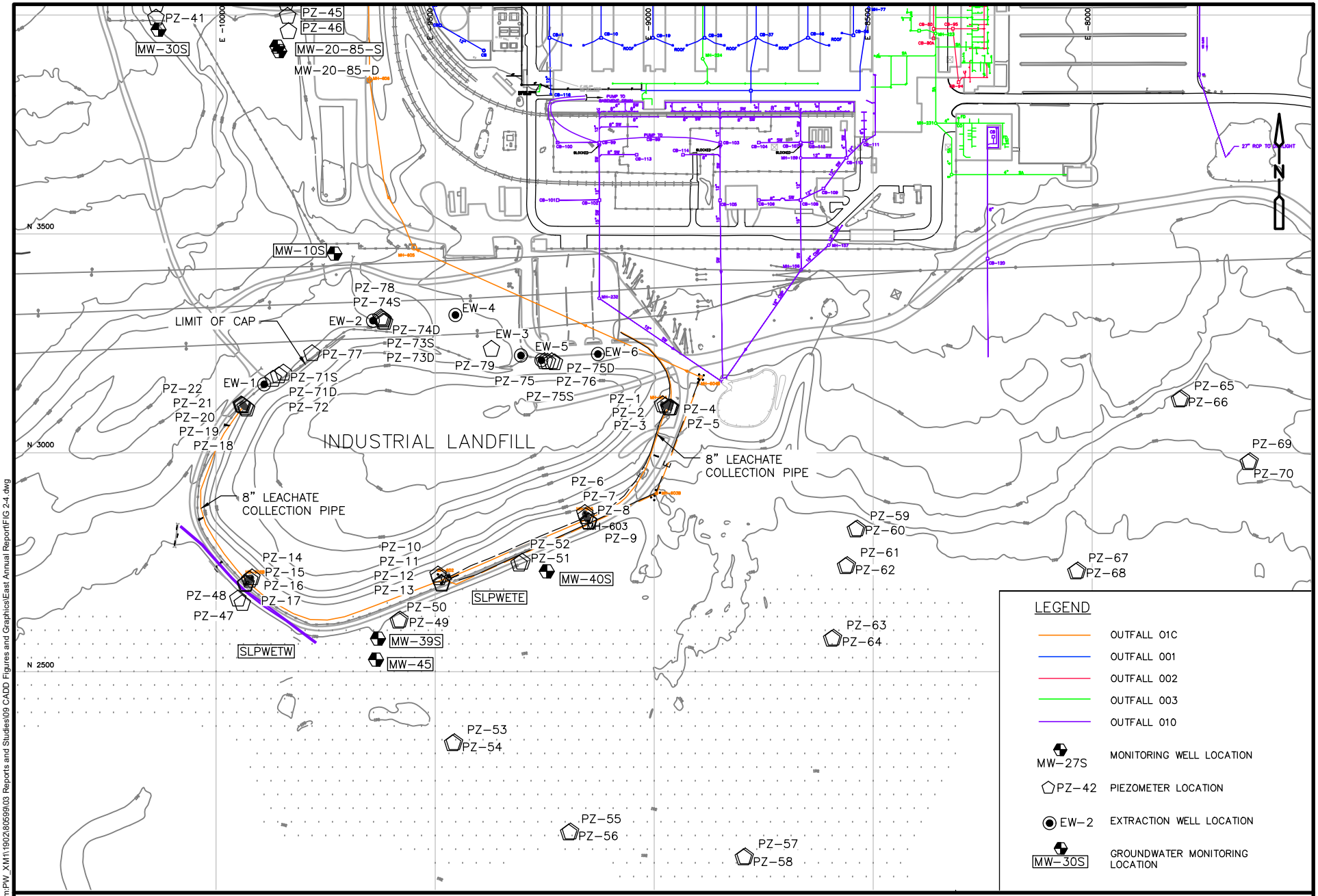
Figure 2-3
Reynolds Metals Company, LLC.
BMP Groundwater Removal



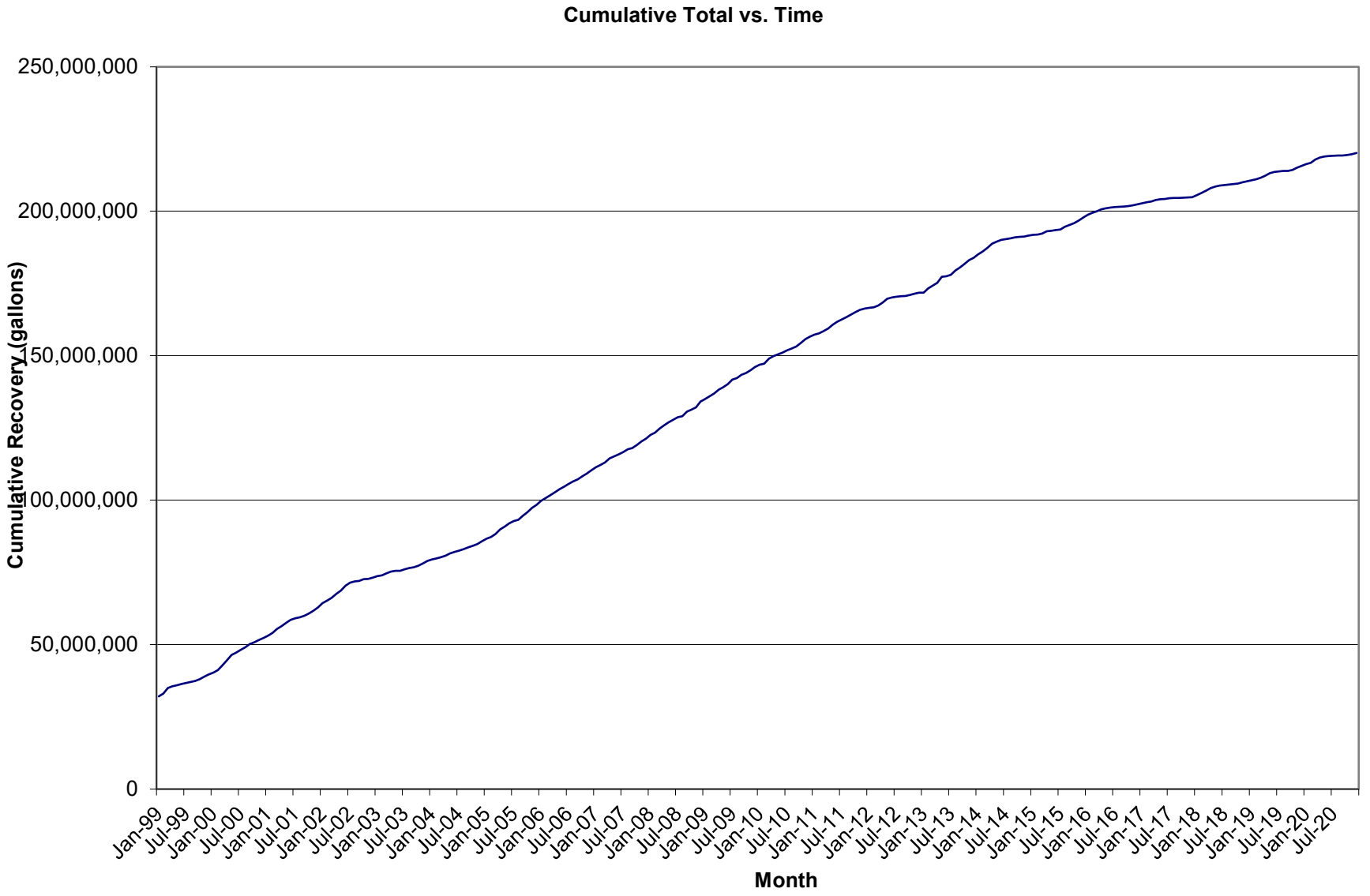
CDM Smith

Reynolds Metals Company, LLC. - Massena, New York

1" = 300

150 0 300

FIGURE 2-4
INDUSTRIAL LANDFILL
LOCATION PLAN



Note:
Cumulative recovery is calculated from time of pumping system startup in October 1995.

CDM Smith
May 14, 2021
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Figure 2-5
Reynolds Metals Company, LLC.
Cumulative Landfill Groundwater Removal

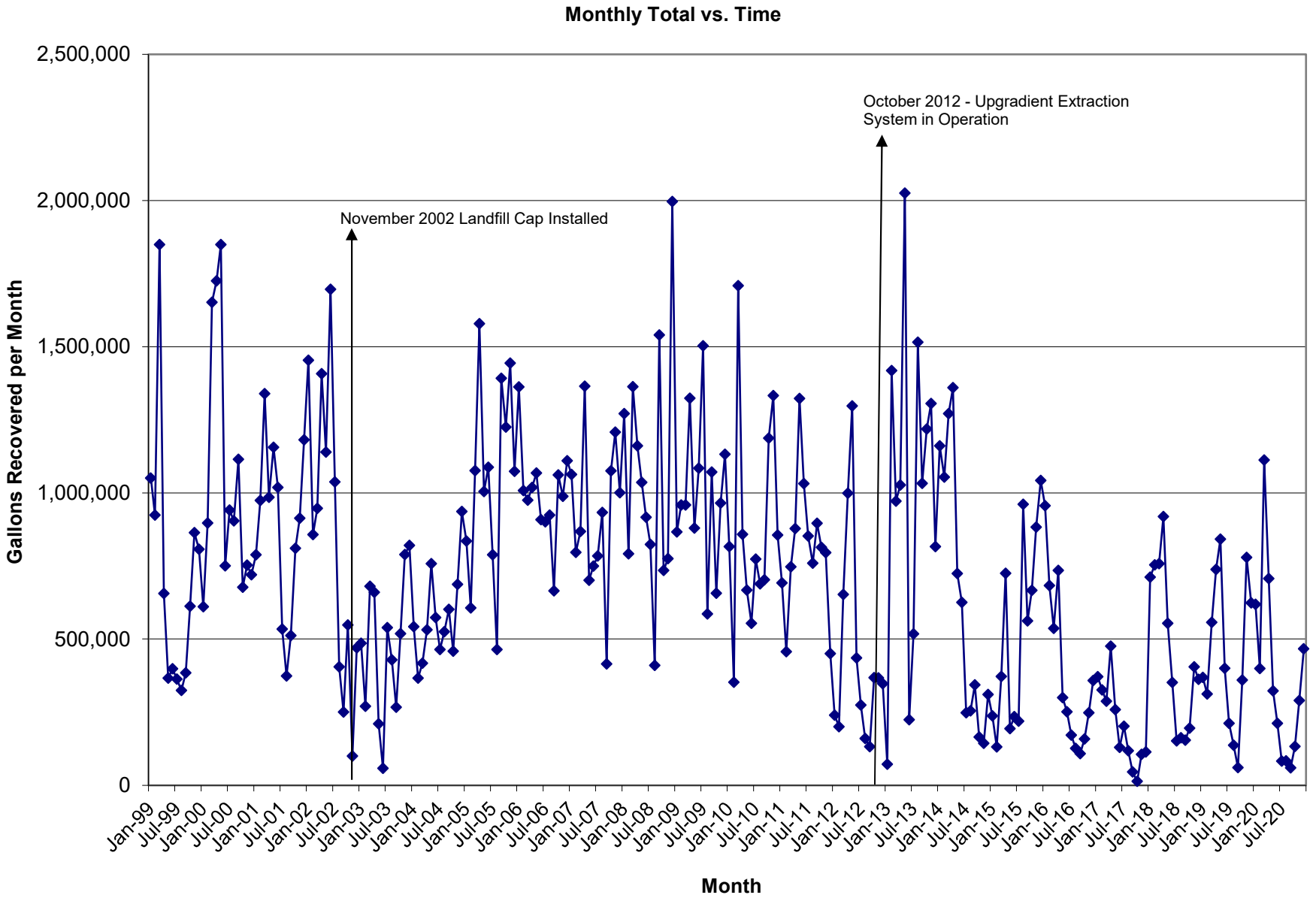

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Figure 2-6
Reynolds Metals Company, LLC.
Monthly Landfill Groundwater Removal

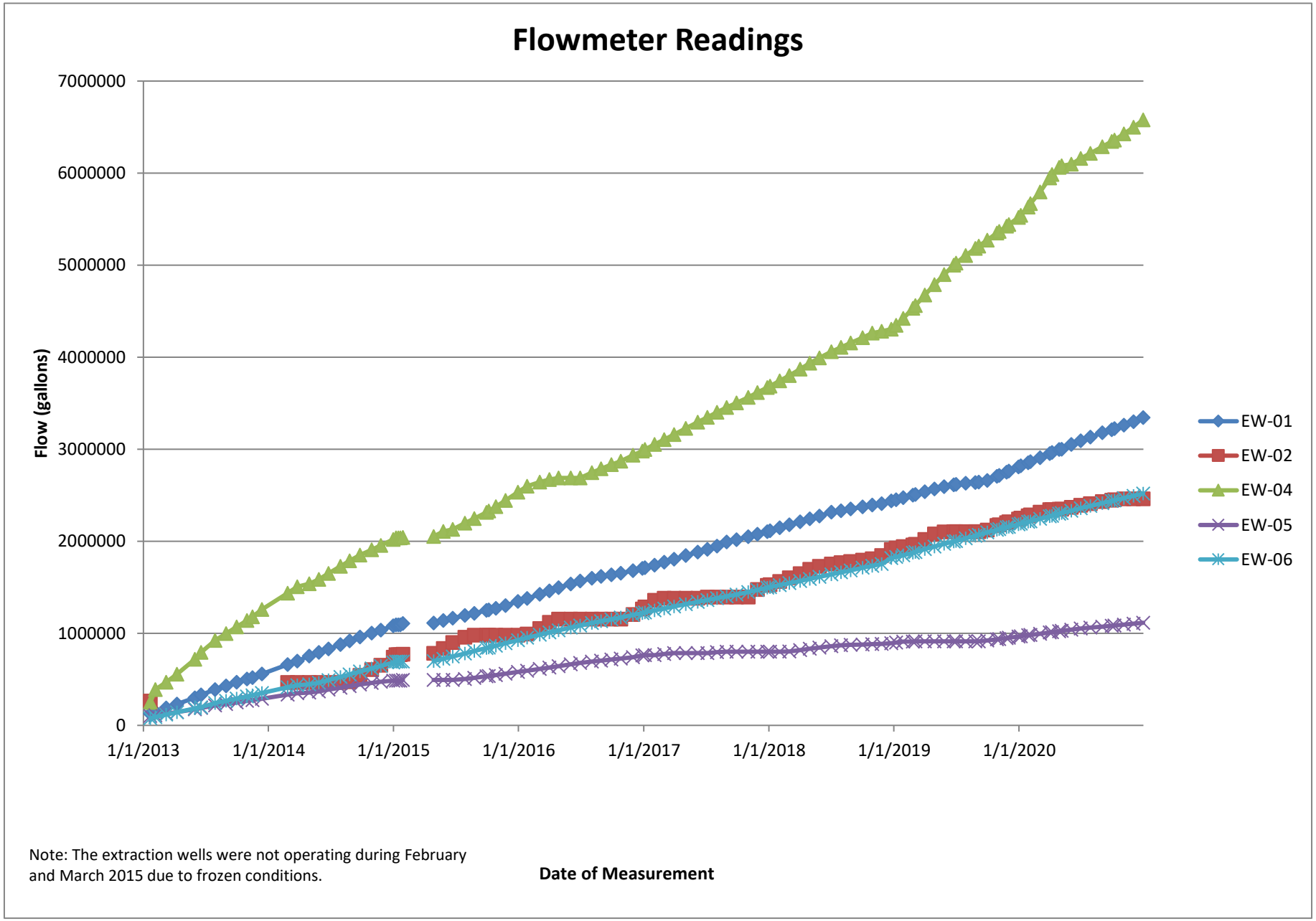

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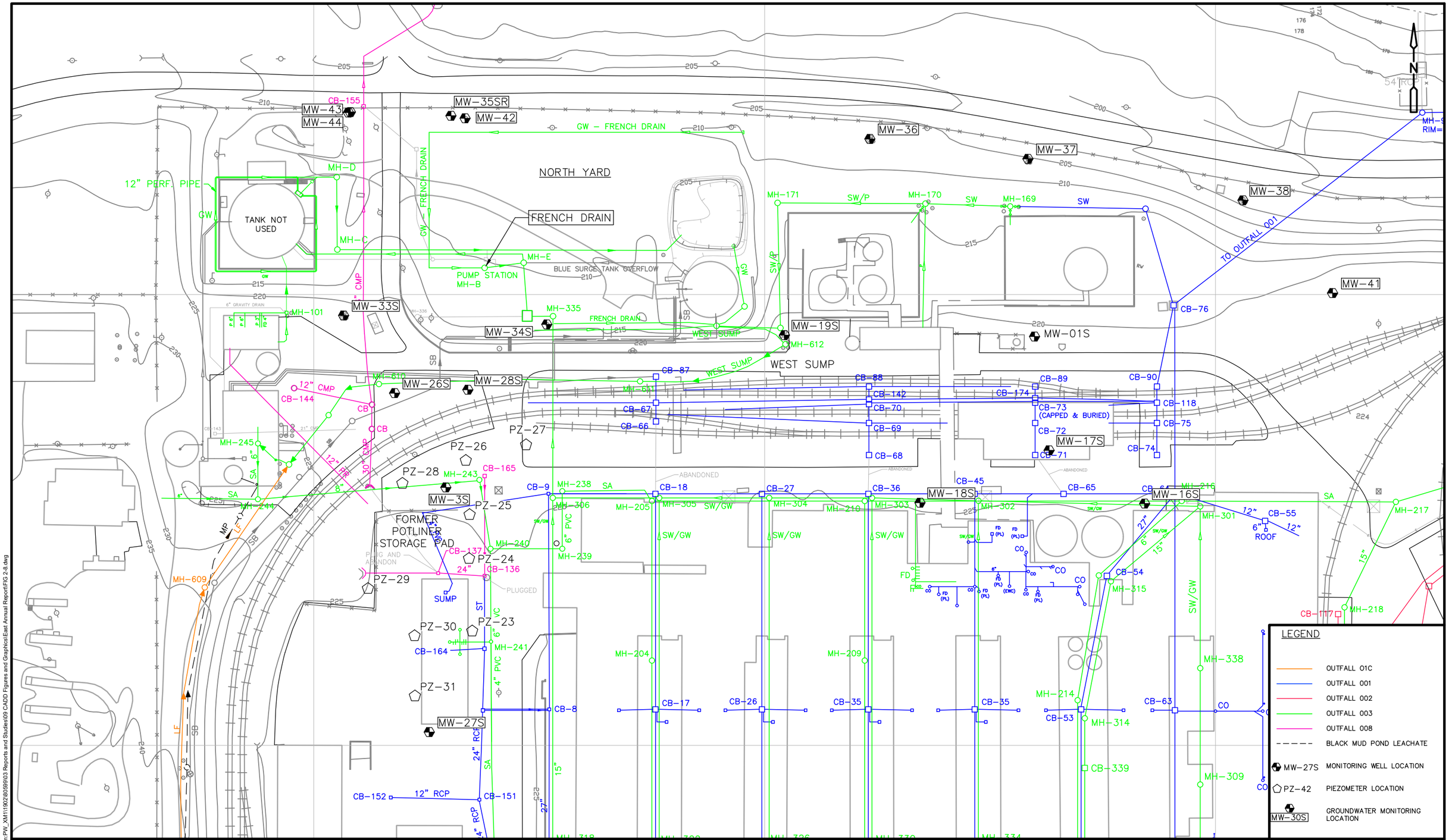
Figure 2-7
Reynolds Metals Company, LLC.
Flowmeter Readings

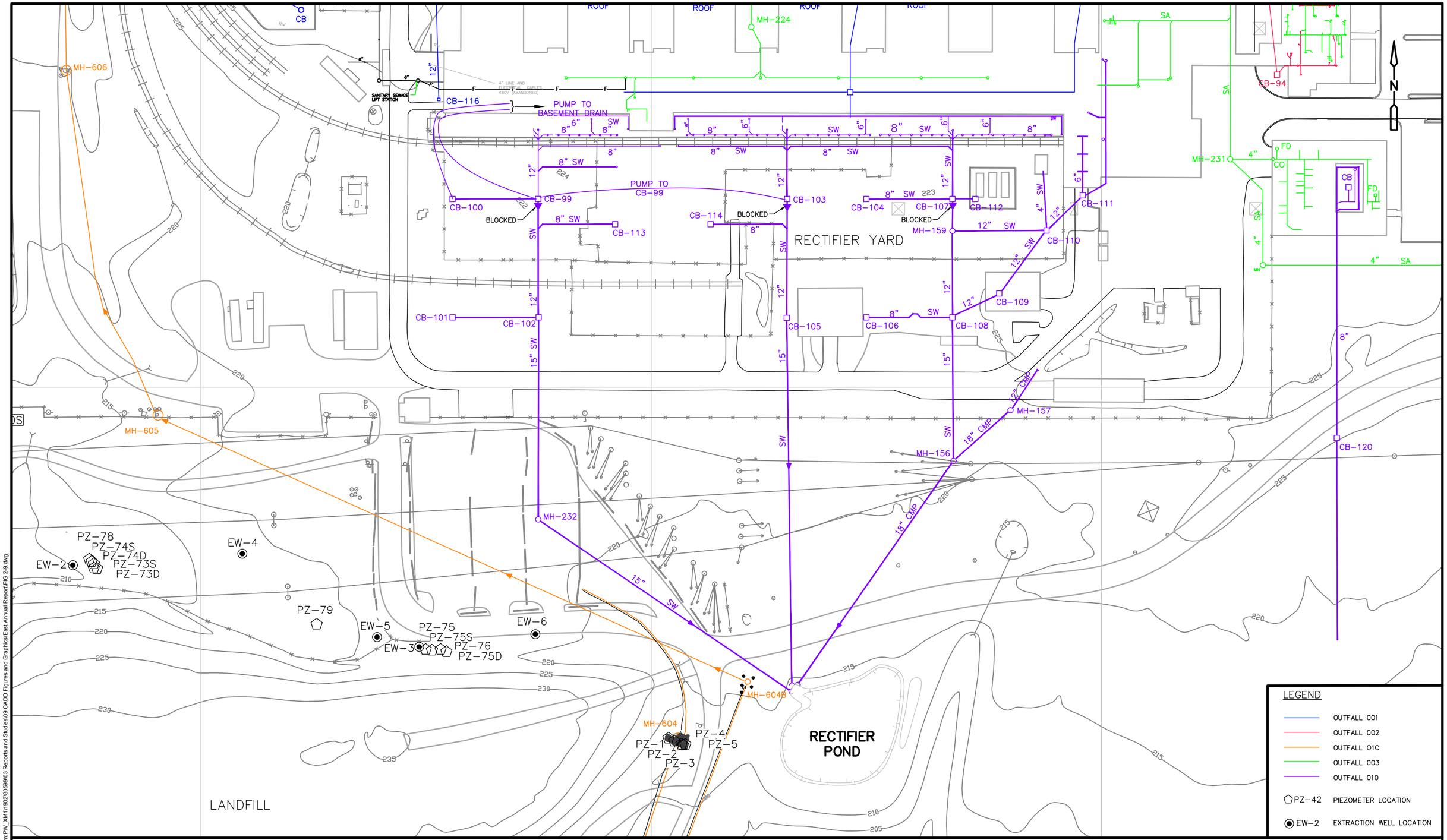


1" = 100'

50 0 100

Reynolds Metals Company, LLC. - Massena, New York

FIGURE 2-8
NORTH YARD AND FORMER POTLINER STORAGE PAD
LOCATION PLAN



CDM Smith

1" = 100'

50 0 100

Reynolds Metals Company, LLC. - Massena, New York

FIGURE 2-9
PLANT
RECTIFIER YARD LOCATION PLAN

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Section 3

Post-Closure Monitoring

3.1 Overview

This section presents the monitoring locations and the precipitation, groundwater elevation, and water quality data collected during the post-closure monitoring program for 2020.

3.2 Monitoring Locations

Table 3-1 summarizes the groundwater monitoring schedule and lists the monitoring wells assigned to each site included in the post-closure monitoring program and Figures 2-1, 2-4 and 2-8 show the locations of these wells.

3.3 Precipitation Data

Precipitation and other weather data are collected daily at the Massena International Airport weather station. The daily and cumulative precipitation data for 2020 was submitted to NYSDEC in a letter dated February 16, 2021.

3.4 Water Level Measurements

Groundwater elevations were measured monthly, quarterly, or semi-annually in 2020 at designated monitoring wells and piezometers near each of the sites during the post-closure monitoring sampling events. Water level measurements are presented for each site in Tables 3-2 through 3-5. The groundwater elevations of the BMP monitoring wells and piezometers installed within the cap are shown in Figure 3-1. These results are discussed in Section 4.

3.5 Groundwater Sampling and Analysis

The post-closure groundwater monitoring program consisted of the four rounds of sampling conducted in 2020 at the wells shown in Table 3-1. The monitoring locations associated with the Landfill are sampled quarterly, while the remaining areas are sampled semi-annually. All analyses were performed by Alpha Analytical in Westborough, Massachusetts. Alpha Analytical subcontracted WAD cyanide analysis to ALS Environmental located in Rochester, New York for all four rounds of sampling in 2020.

CDM Smith completed all well gauging and groundwater sampling, including collection of field parameters (pH, temperature, specific conductance, turbidity, and redox potential) during purging and groundwater sampling. Sampling was performed using the procedures specified in the *Quality Assurance Project Plan (*QAPP) (CDM, March 2008). The historical analytical results are presented in Appendix C. The historical data is also summarized and compared to 2020 results in Table 4-2. Field testing results are presented in Appendix C.

3.6 Data Quality Review

Data quality assessments were performed by CDM Smith using the analytical results provided by the laboratory.

Project-generated quality control samples were reviewed and included:

- field duplicates; and
- field blanks.

Additionally, the following quality control methods and/or data were reviewed for each sample event:

- laboratory method blank results.
- Matrix spike/matrix spike duplicate (MS/MSD) samples.
- Surrogate spike recoveries.
- Laboratory control samples (LCS).
- Sample holding time summaries ; and
- Sample receipt conditions.

The complete data quality assessments for the scheduled March, June, September, and December 2020 sampling rounds are included in Appendix E.

Site	Monitoring Well	Parameters	Sampling Frequency	Water Level Frequency
BMP	MPOF1402S[1]	---		M
	MPOF1403D[1]	---		M
	MPOG1601S[1]	---		M
	MPOG1603D[1]	---		M
	MW-11SR	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-12S	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-12D	---		S
	MW-13S	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-14S	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-15S-87	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-15S-91	---	S	S
	MW-20-85S	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-20-85D	---		S
	MW-21-85S	---		S
	MW-21-85D	---		S
	MW-22-85S [2]	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-22-85D	---		S
	MW-23-85S	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-23-85D	---		S
	MW-25-85S	---		S
	MW-29S	---		S
	MW-30S	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-31SR	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	PZ-32 thru PZ-43[1]	---		---[3]
	PZ-44 thru PZ-46 [2]	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	---[3]
Landfill	PZ-1 thru PZ-22[1]	---		M
	MW-10S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	Q
	MW-39S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	Q
	MW-40S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	Q
	MW-45	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	Q
	Wetlands (2 Locations)	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	---
	EW-01	F, Sulfate, CN Total	Q	M
	EW-02	F, Sulfate, CN Total	Q	M
	EW-03	---	---	M
	EW-04	F, Sulfate, CN Total	Q	M
	EW-05	F, Sulfate, CN Total	Q	M
	EW-06	F, Sulfate, CN Total	Q	M
	PZ-76 thru PZ-79'	---	---	M
	MW-46	---	---	M
	MW-47	---	---	M

Table 3-1
Reynolds Metals Company, LLC.
Groundwater Monitoring Schedule

Site	Monitoring Well	Parameters	Sampling Frequency	Water Level Frequency
Potliner Storage Pad	MW-3S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-26S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-27S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-28S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-33S	CN Total, CN WAD	S	S
	MW-34S	CN Total, CN WAD	S	S
	MW-35SR	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-42	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-43	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-44	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	PZ-23 thru PZ-31[1]	---		M
North Yard	MW-1S	---		S
	MW-16S	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-17S	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-18	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-19S	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-36	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-37	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-38	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-41	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	French Drains	CN Total, CN WAD, F, Sulfate	S	---
Rectifier Yard	Rypondpipe	PCBs	---[4]	---

Notes:
1. Piezometer
2. Incorporated into quarterly sampling in October 2008 to determine if fluoride is migrating from the BMP.
3. Groundwater levels no longer collected; inaccurate measurements due to upheaval of piezometers.
4. Sampling discontinued per letter from NYSDEC dated January 3, 2013.

Key:
Q = Quarterly
M = Monthly
S = Semi-annual
--- = Not sampled or not applicable

Table 3-1
Reynolds Metals Company, LLC.
Groundwater Monitoring Schedule

Monthly Piezometer Water Level Elevations

Location	Jan-20[1]	Feb-20[1]	Mar-20[1]	Apr-20[1]	May-20[1]	Jun-20[1]	Jul-20[1]	Aug-20[1]	Sep-20[1]	Oct-20[1]	Nov-20[1]	Dec-20[1]
MPOF1402S	229.11	227.61	229.71	227.56	228.41	227.48	---	227.59	227.66	227.71	227.61	227.58
MPOF1403D	230.05	227.65	228.85	230.05	228.45	229.42	---	228.45	228.35	228.55	229.3	229.71
MPOG1601S	230.22	231.62	233.22	231.42	231.14	231.42	---	231.62	231.72	221.92	231.62	231.61
MPOG1603D	231.52	232.12	230.92	231.82	231.82	231.61	---	231.17	231.12	231.22	231.02	231.52

Semiannual Water Level Elevations and Comprehensive Groundwater Monitoring Elevations

Location[3]	Jan-20[1]	Feb-20[1]	Mar-20[1]	Apr-20[1]	May-20[1]	Jun-20[1]	Jul-20[1]	Aug-20[1]	Sep-20[1]	Oct-20[1]	Nov-20[1]	Dec-20[1]
MW-11SR	---	---	---	236.01	---	232.81	---	233.99	---	---	---	236.77
MW-12D	---	---	---	239.43	---	235.13	---	233.48	---	---	---	238.93
MW-12S	---	---	---	243.28	---	240.88	---	240.98	---	---	---	243.66
MW-13D	---	---	---	239.56	---	237.34	---	236.41	---	---	---	238.86
MW-13S	---	---	---	239.78	---	237.95	---	238.94	---	---	---	239.81
MW-14S	---	---	---	243.46	---	240.71	---	240.04	---	---	---	243.83
MW-15D	---	---	---	226.3	---	---	---	224.2	---	---	---	---
MW-15S-87	---	---	---	236.38	---	228.6	---	224.13	---	---	---	237.05
MW-15S-91	---	---	---	228.8	---	226.6	---	225.5	---	---	---	226.9
MW-20-85-D	---	---	---	218.4	---	216.15	---	222.6	---	---	---	223.75
MW-20-85-S	---	---	---	223.13	---	222	---	217.84	---	---	---	217.54
MW-21-85D	---	---	---	223.92	---	223.43	---	223.97	---	---	---	223.57
MW-21-85S	---	---	---	223.83	---	223.52	---	223.88	---	---	---	223.55
MW-22-85-D	---	---	---	238.04	---	233.98	---	232.18	---	---	---	237.58
MW-22-85-S	---	---	---	240.74	---	237.84	---	234.94	---	---	---	240.56
MW-23-85-D	---	---	---	239.29	---	236.62	---	234.74	---	---	---	238.94
MW-23-85-S	---	---	---	240.01	---	236.09	---	233.7	---	---	---	239.78
MW-25-85-S	---	---	---	224.14	---	222.54	---	218.39	---	---	---	225.46
MW-29S	---	---	---	235.12	---	231.72	---	227.82	---	---	---	241.62
MW-30S	---	---	---	228.91	---	219.18	---	225.43	---	---	---	229.05
MW-31SR	---	---	---	223.33	---	219.18	---	218	---	---	---	222.28
PZ-44	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]
PZ-45	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]
PZ-46	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]	---[2]

Notes:

1. Elevations are given in feet above Mean Sea Level (MSL).

2.Groundwater levels no longer collected; inaccurate measurements due to upheaval of piezometers.

Key:

--- = Water levels were not measured

Monthly Piezometer Water Level Elevations

Location	Jan-20[1]	Feb-20[1]	Mar-20[1]	Apr-20[1]	May-20[1]	Jun-20[1]	Jul-20[1]	Aug-20[1]	Sep-20[1]	Oct-20[1]	Nov-20[1]	Dec-20[1]
Transect 1												
PZ-1[a]	205.48	205.08	207.08	206.68	204.93	205.08	---	205.06	204.93	205.73	205.78	205.98
PZ-2	202.22	200.74	201.84	201.21	200.94	201.04	---	200.92	200.89	200.84	201.04	200.89
Drain Invert	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*	*200.00*
PZ-3	200.63	200.4	201	200.55	199.9	199.95	---	199.8	199.8	200.58	200.4	200.6
PZ-4	201.16	201.18	200.18	201.23	201.05	201.18	---	201.16	201.18	201.16	201.23	201.18
PZ-5[b]	203.12	202.82	203.42	200.4	202.04	201.32	---	200.92	200.92	200.97	201.42	201.62
Transect 2												
PZ-6[a]	191.61	191.49	191.39	191.64	192.24	192.14	192.24	192.12	192.04	192.09	192.24	192.04
PZ-7	192.14	191.72	190.72	192.14	190.92	190.67	---	190.77	190.57	190.82	190.72	191.69
Drain Invert	*188.20*	*188.20*	*188.20*	*188.20*	*188.20*	*188.20*	*188.20*	*188.20*	*188.20*	*188.20*	*188.20*	*188.20*
PZ-8	190.15	191.25	191.05	191.55	190.65	190.45	---	190.2	190.15	190.63	190.55	191.85
PZ-9[b]	193.06	192.63	191.93	193.53	191.13	191.33	---	190.93	190.78	191.13	191.38	192.71
Transect 3												
PZ-10[a]	191.09	192.12	190.62	191.12	191.05	191.17	---	191.32	191.12	191.3	191.12	191.02
PZ-11	191.08	191.13	189.73	191.08	191.78	191.13	---	191.23	191.13	190.61	191.08	190.98
Drain Invert	*186.10*	*186.10*	*186.10*	*186.10*	*186.10*	*186.10*	*186.10*	*186.10*	*186.10*	*186.10*	*186.10*	*186.10*
PZ-12	192.1	192.1	191.3	192.1	191.63	191.47	---	191.05	190.77	191.38	191.27	191.62
PZ-13[b]	192.02	189.02	191.22	192.07	191.7	191.42	---	191.02	190.72	191.3	191.23	191.61
Transect 4												
PZ-14[a]	190.91	191.41	190.71	190.51	190.23	190.51	---	191.01	190.76	190.61	191.01	190.91
PZ-15	190.86	190.98	190.18	190.43	190.37	190.48	---	191.13	190.78	190.58	191.03	190.95
Drain Invert	*189.90*	*189.90*	*189.90*	*189.90*	*189.90*	*189.90*	*189.90*	*189.90*	*189.90*	*189.90*	*189.90*	*189.90*
PZ-16	191.14	191.36	190.66	190.81	190.68	190.86	---	190.91	190.56	190.66	190.96	190.01
PZ-17[b]	191.27	191.59	191.09	190.99	190.89	190.99	---	190.89	190.59	190.77	191.04	191.09
Transect 5												
PZ-18[a]	201.17	201.06	200.86	201.21	200.81	200.86	---	200.51	200.06	200.76	200.76	201.16
PZ-19	200.8	200.57	200.47	200.85	199.7	200.87	---	200.72	200.34	200.85	200.85	200.87
Drain Invert	*196.50*	*196.50*	*196.50*	*196.50*	*196.50*	*196.50*	*196.50*	*196.50*	*196.50*	*196.50*	*196.50*	*196.50*
PZ-20	195.98	196	196.4	196	195.29	195.9	---	195.98	195.95	196	195.98	195.98
PZ-21	201.33	200.95	200.35	201.35	200.25	199.95	---	199.42	199.15	201	200.7	201
PZ-22[b]	201.8	201.32	201.92	201.72	200.47	200.47	---	198.92	198.5	200.02	200.47	201.12

Monthly Water Level Elevations

Location	Jan-20[1]	Feb-20[1]	Mar-20[1]	Apr-20[1]	May-20[1]	Jun-20[1]	Jul-20[1]	Aug-20[1]	Sep-20[1]	Oct-20[1]	Nov-20[1]	Dec-20[1]
EW-01[2]	182.59	183.77	185.07	183.47	182.06	183.12	---	181.07	181.87	182.27	177.47	181.47
EW-02[2]	---[3]	---[3]	---[3]	203.73	183.03	195.58	---	195.53	195.18	194.01	199.43	185.13
EW-03[2]	203.8	203.1	202.2	204.4	196.32	202.86	---	201.37	200.5	202.75	202.59	203.7
EW-04[2]	189.13	---[3]	---[3]	203.71	207.3	178.33	---	191.53	191.28	191.15	194.41	193.76
EW-05[2]	191.73	189.05	190.95	190.15	189.35	201.95	---	191.45	190.25	190.15	188.05	189.45
EW-06[2]	185.67	187.09	188.59	187.19	189.25	189.19	---	187.99	188.89	186.69	188.89	189.59
PZ-76	204.15	203.95	203.05	204.75	203.71	202.43	---	201.7.	200.95	203.05	202.9	204.05
PZ-77	205.35	205.13	205.93	205.68	203.55	204.68	---	203.73	202.23	205.13	204.93	205.48
PZ-78	205.94	---[3]	---[3]	208.29	207.31	202.24	---	201.79	200.04	201.04	203.34	205.44
PZ-79	206.56	206.16	208.46	208.51	207.19	204.06	---	203.46	201.96	205.66	204.96	206.68

Quarterly Water Level Elevations and Comprehensive Groundwater Monitoring Elevations

Location	Jan-20[1]	Feb-20[1]	Mar-20[1]	Apr-20[1]	May-20[1]	Jun-20[1]	Jul-20[1]	Aug-20[1]	Sep-20[1]	Oct-20[1]	Nov-20[1]	Dec-20[1]
MW-10S	---	---	212.22	211.17	---	208.72	---	209.02	208.22	---	---	211.53
MW-39S	---	---	192.16	192.76	---	191.66	---	190.76	190.51	---	---	191.83
MW-40S	---	---	192.12	192.7	---	192.07	---	191.22	190.92	---	---	192.07
MW-45	---	---	192.63	192.38	---	191.48	---	190.63	190.03	---	---	191.75

Notes:

1. Elevations are given in feet above MSL.

2. The groundwater extraction system was completed in summer/fall 2012 and monthly groundwater level measurements were initiatied in November 2012.

3.Frozen conditions prevented a water level from being taken.

Key:

a = Upslope side of drain

b = Downslope side of drain

--- = Water levels were not measured

Monthly Piezometer Water Level Elevations at the Former Potliner Storage Pad Area												
Location	**Jan-20[1]**	**Feb-20[1]**	**Mar-20[1]**	**Apr-20[1]**	**May-20[1]**	**Jun-20[1]**	**Jul-20[1]**	**Aug-20[1]**	**Sep-20[1]**	**Oct-20[1]**	**Nov-20[1]**	**Dec-20[1]**
PZ-23	219.65	218.9	219.6	219.8	219.7	219.4	---	219.5	219.3	219.9	219.47	219.43
PZ-29	224.49	---[2]	---[2]	222.5	221.89	221.95	---	221.6	221.69	224.39	221.69	217.39
PZ-30	225.1	223.3	224.2	223.55	222.68	222.75	---	223.25	222.6	225	223.08	222.96
PZ-31	224.7	225.6	224.9	225.85	224.91	224.9	---	225.28	224.55	226.2	224.9	225.3

Semiannual Water Level Elevations and Comprehensive Groundwater Monitoring Elevations												
Location[1]	**Jan-20[1]**	**Feb-20[1]**	**Mar-20[1]**	**Apr-20[1]**	**May-20[1]**	**Jun-20[1]**	**Jul-20[1]**	**Aug-20[1]**	**Sep-20[1]**	**Oct-20[1]**	**Nov-20[1]**	**Dec-20[1]**
MW-03S	---	---	---	221.6	---	220.2	---	221.35	---	---	---	221.2
MW-26S	---	---	---	215.31	---	214.26	---	215.4	---	---	---	215.46
MW-27S	---	---	---	221.25	---	221.4	---	221.81	---	---	---	221.06
MW-28S	---	---	---	214.29	---	213.14	---	213.94	---	---	---	214.2
MW-33S	---	---	---	213.22	---	212.42	---	213.02	---	---	---	213.21
MW-34S	---	---	---	205.91	---	205.56	---	205.96	---	---	---	206.44
MW-35SR	---	---	---	202.89	---	197.19	---	197.42	---	---	---	195.32

Notes:

1. Elevations are given in feet above MSL.

2. Frozen

Key:

--- = Water levels were not measured

Semiannual Water Level Elevations and Comprehensive Groundwater Monitoring Elevations

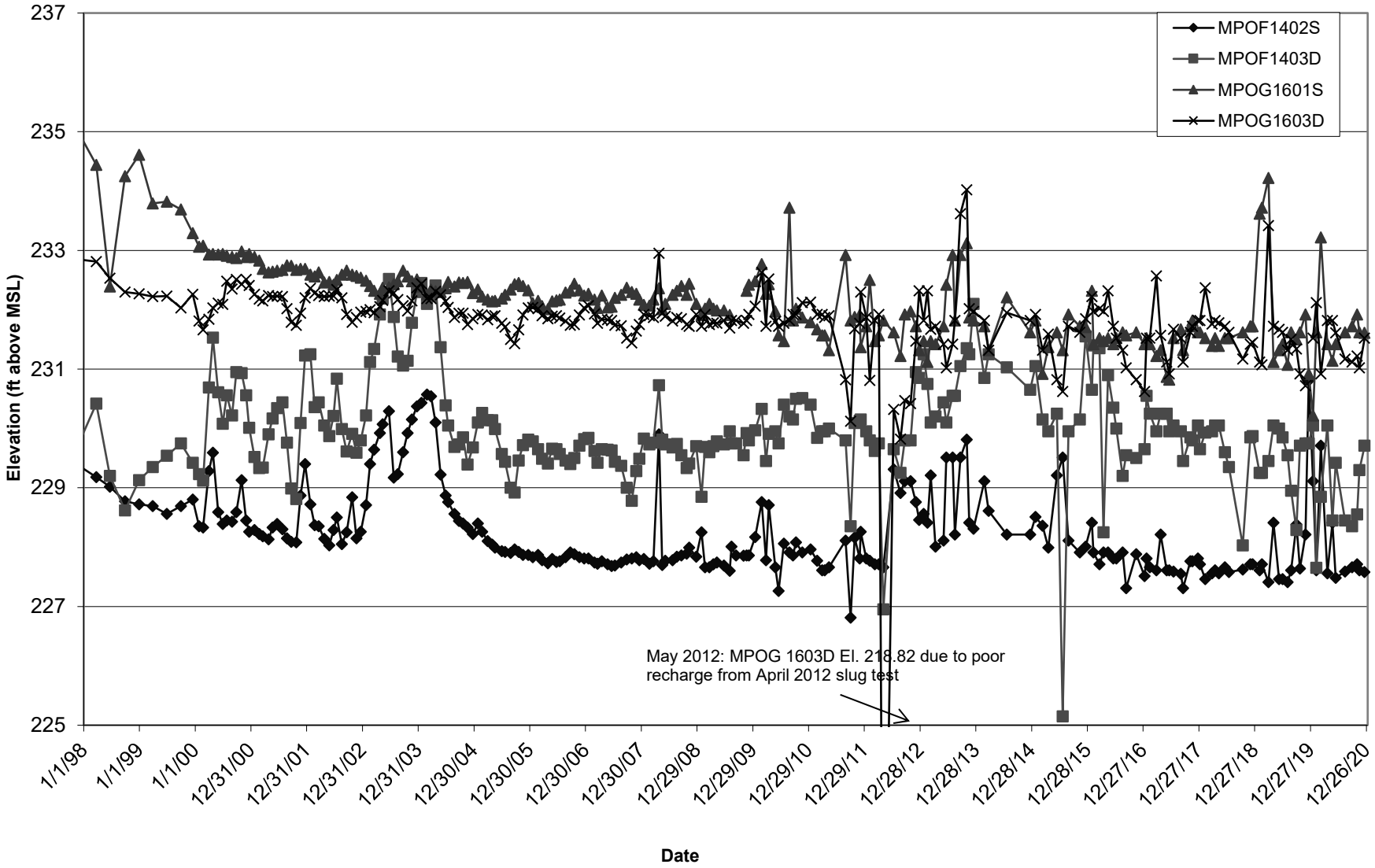
Location	Jan-20[1]	Feb-20[1]	Mar-20[1]	Apr-20[1]	May-20[1]	Jun-20[1]	Jul-20[1]	Aug-20[1]	Sep-20[1]	Oct-20[1]	Nov-20[1]	Dec-20[1]
MW-01S	---	---	---	214.23	---	211.76	---	213.75	---	---	---	213.16
MW-16S	---	---	---	209.95	---	209.38	---	210.9	---	---	---	210.09
MW-17S	---	---	---	218.12	---	214.82	---	214.27	---	---	---	216.97
MW-18S	---	---	---	208.57	---	208.12	---	208.57	---	---	---	208.59
MW-19S	---	---	---	214.46	---	213.69	---	213.84	---	---	---	214.43
MW-36	---	---	---	201.87	---	201	---	201.2	---	---	---	201.9
MW-37	---	---	---	204.63	---	203.28	---	202.98	---	---	---	204.9
MW-41	---	---	---	200.82	---	199.12	---	199.45	---	---	---	200.15
MW-42	---	---	---	190.58	---	190.1	---	190.07	---	---	---	190.29
MW-43	---	---	---	201.17	---	199.77	---	200.12	---	---	---	201.2
MW-44	---	---	---	201.49	---	200.14	---	200.39	---	---	---	201.44

Note:

1. Elevations are given in feet above MSL.

Key:

--- = Water levels were not measured



CDM Smith

May 14, 2021
pw:\80599\03\05\20east\tbls.xls

Figure 3-1
Reynolds Metals Company, LLC.
Groundwater Elevations in BMP Piezometers

Section 4
Evaluation of Monitoring Results

4.1 General

This section presents an evaluation of the groundwater level measurements and water quality data collected during the post-closure groundwater monitoring program.

It is organized to provide general data on facility-wide precipitation, groundwater elevations and groundwater flow followed by area specific discussions of hydraulic conditions and groundwater quality at each of the monitored sites. The data is evaluated relative to post-closure monitoring requirements, remedial action objectives, available standards, criteria and guidelines, and historical trends. In the sections covering the individual remediated sites, reference is made to the NYSDEC groundwater quality standards. The following concentrations were used in the evaluation of groundwater quality:

Chemical	**Concentration**
Cyanide	0.2 mg/l
Fluoride	1.5 mg/l
Sulfate	250 mg/l
Total PCBs	0.09 µg/l

All concentrations listed above are NYSDEC Groundwater Class GA standards. Also monitored were total and dissolved aluminum and weak acid dissociable (WAD) cyanide. It should also be noted that cyanide was analyzed as total cyanide. Free cyanide, the form most likely to exhibit toxicological effects, was not characterized. There are no Groundwater Class GA standards established for aluminum, dissolved aluminum and WAD cyanide

Total and dissolved aluminum continues to be monitored and evaluated. Assessment of the distribution and trends of total aluminum is complicated by inclusion of varying amounts and composition of solid material in samples and potential interactions between sulfate and fluoride in the environment. This also makes the evaluation of the statistical analysis for total aluminum problematic. Additional data collection will continue to further assess potential site-related associations.

4.2 Precipitation

The annual precipitation rate during the period 1990 to 2020 averaged 33.22 inches per year. In 2020 the Massena area received 26.09 inches of precipitation, approximately 7.13 inches less than the average annual amount. Monthly precipitation during 2020 ranged from 0.56 inches (December) to 5.46 inches (August). Variation in the amount and timing of precipitation affects the amount of

groundwater recharge and, therefore, produces changes in water level elevations. The largest monthly precipitation measurements in 2020 were recorded during the months of March, August, and October.

4.3 Groundwater Elevations

During the post-closure sampling events, groundwater elevations were measured at select monitoring wells and piezometers throughout the Reynolds facility. Groundwater elevations (El.) are provided in feet above Mean Sea Level. Groundwater elevation contours using data from the shallow wells and piezometers are presented as Figure 4-1 and Figure 4-2. These figures were developed from the measured groundwater elevations presented in Tables 3-2 through 3-5 in Section 3. The figures present groundwater contours interpreted from measurements collected in April and August 2020.

In general, groundwater elevations are highest at the north side of the BMP and radiate outward to the St. Lawrence River to the north, wetlands south of the Landfill, east to the plant, and to the west. Details of area-specific groundwater elevations and hydraulic gradients are presented in Sections 4.6 through 4.9.

Several underdrain and French drain systems are present at the facility, each of which is expected to influence local groundwater levels and flow:

- Storm sewers are located beneath the former potlines at elevations ranging from El. 215.2 feet in the south portion of the plant to El. 208.8 feet at the north side of the plant. Although not specifically designed as underdrains, these storm sewers are located below the water table and may serve as local discharge points for groundwater.
- A French drain system is present in the North Yard at approximately El. 201 feet.
- The BMP contains a network of drains within the waste zone.
- Six extraction wells are located north of the industrial landfill.
- A shallow groundwater perimeter drain system is present at the southern, downgradient edge of the Landfill. The invert of this drainage system ranges from approximately El. 200 feet to El. 186.1 feet.

Groundwater elevation data is provided in Table 3-3.

4.4 Hydraulic Gradients

Groundwater elevation contours, Figures 4-1 and 4-2, indicate a groundwater north-south divide near the northwest corner of the BMP. Details on horizontal hydraulic gradients are discussed by site in Sections 4.6 through 4.9.

4.5 Monitoring Data

A summary of the historical and 2020 analytical data as well as the results of the overall statistical trend analysis from the monitored sites are compiled in Table 4-2. The sampling results for 2020 are presented in Appendix C of this report. Appendix D presents the results of these trend analyses. These data are discussed below according to its associated site.

4.6 Black Mud Pond

The BMP cap is designed to prevent infiltration and a horizontal extraction drain (comprising eight pipes) has been constructed at the base of the waste materials on top of the low permeability till. As noted in the BMP completion report an 8-foot-wide clay barrier wall was installed around the north and west sides of the BMP in 1985. During closure of the BMP, the northern most portion was consolidated beneath the cap and the area between the cap and MW-12S was backfilled with clay. Clay emplacements around the north and west perimeters of the BMP limit shallow groundwater flow along the north and west edges of the BMP cap.

4.6.1 Groundwater Recovery

In 2020 approximately 64,838 gallons of water were removed through December 21, 2020.

4.6.2 Groundwater Elevations and Hydraulic Gradients

The BMP has clusters of groundwater wells and piezometers installed at multiple elevations that can be used to determine the vertical hydraulic groundwater gradients. There are eight well clusters adjacent to the BMP and two well clusters within the capped area of the BMP from which the vertical hydraulic gradients can be established. The water level elevation data and computed vertical gradients for these well clusters in 2020 are presented in Table 4-1. A summary of the vertical gradient observations is provided below.

Well Cluster	Location	Vertical Gradients	
		April 2020	August 2020
Clusters			
MW-12-S/D	North of BMP	Downward	Downward
MW-22-85-S/D	North of BMP	Downward	Downward
MW-21-85-S/D	East of BMP	Upward	Upward
MW-15S-87/15D	South of BMP	Downward	Upward
MW-15S-91/15D	South of BMP	Downward	Downward
MW-20-85-S/D	South of BMP and MW15	Downward	Upward
MW-23-85-S/D	West of BMP	Downward	Upward
MW-13-S/D	North-west of BMP	Downward	Downward
MPOF1402S/MPOF1403D	Within Capped Area	Upward	Upward
MPOG1601S/MPOG1603D	Within Capped Area	Upward	Downward

The MPOF and MPOG well clusters are located within the capped area of the BMP and are used to assess hydraulic heads and gradients within the BMP unit; groundwater elevations are recorded monthly. The MPOF cluster is located on the southwestern side of the waste zone and the MPOG cluster is located on the eastern side of the waste zone. The MPOF cluster exhibited a consistent upward gradient from MPOF1403D to MPOF1402S throughout 2020 except in March when a downward gradient was present. The MPOG cluster exhibited upward gradients from MPOG1601S to MPOG1603D in January through June while downward gradients were present during the remaining months.

Groundwater elevation contours for April and August 2020, presented in Figures 4-1 and 4-2, indicate that there is a hydraulic divide along the north and west sides of the capped BMP consistent with the

presence of the low permeability barrier in this area. Horizontal hydraulic gradients are radial from the high points near MW-12S and MW-14S. Due to the presence of the barrier wall, there is no gradient flow from the BMP to the north and west. The predominant direction of groundwater flow in the vicinity of the BMP is to the south.

The horizontal hydraulic gradient north of the BMP is to the north and groundwater eventually discharges to the North Yard French Drain and the St. Lawrence River. Hydraulic gradients to the south of the BMP are generally to the south such that groundwater discharges to groundwater collection systems associated with the Industrial Landfill and the wetland south of the Reynolds facility. Hydraulic gradients west of the BMP are to the southwest and groundwater discharge is to the wetland to the south of the plant. This wetland eventually discharges to the Raquette River and is monitored as SPDES Outfall 010. The steepest hydraulic gradients are eastward between the BMP and the plant area.

Groundwater is removed from beneath the BMP cap by a system of underdrains. Based on the BMP completion report, these drains are located at the base of the black mud pond and on the top of the underlying glacial till. Groundwater elevations in the two shallow wells screened across the mud/till interface are higher than the underdrains and base of the black mud. The MPOF cluster normally exhibits an upward gradient throughout most of the year, while the MPOG cluster showed an upward gradient between January and June and a downward gradient the remainder of the year. It appears that the fine-grained nature of the black mud combined with the upward gradient of groundwater near the MPOF cluster precludes dewatering below the level of the black mud. However, dewatering of the drainage system is expected to create groundwater flow within the mud toward the drains.

4.6.3 Groundwater Quality

The analytical data collected at the wells monitored during the semi-annual monitoring program are presented in Appendix C. Table 4-2 presents the historical range of concentrations at each monitoring location as well as the 2020 analytical results for comparison. Table 4-2 also includes a statistical assessment of long-term trends in groundwater chemistry. Appendix D includes a Mann-Kendall and Sens Slope statistical assessment of individual parameters that exceed NYSWQS. Overall and recent trend observations are provided below.

Based on groundwater analytical results from MW-11SR, MW-12S, MW-13S, MW-14S, MW-15S-87, MW-20-85-S, MW-22-85-S, MW-23-85S, MW-30S, MW-31SR, PZ-44, PZ-45 and PZ-46, the following findings can be made regarding groundwater around the BMP:

- Total cyanide was detected in three monitoring wells (MW-12S, MW-13S and MW-31SR); all cyanide concentrations were below the NYSWQS of 0.2 mg/l.
- WAD cyanide was not detected at any BMP monitoring locations in 2020 except MW-13S at 0.013 mg/l.
- Fluoride was detected in all 13 monitoring locations sampled in 2020, and seven (MW-12S, MW-13S, MW-15S-87, MW-30S, PZ-44, PZ-45 and PZ-46) had concentrations above the NYSWQS of 1.5 mg/l. Of these, MW-12S, MW-15S-87, PZ-45 and PZ-46 exhibited overall statistically increasing trends while a decreasing trend was observed at PZ-44. The remaining locations showed no trend. MW-12S fluoride has been stable to decreasing since a historical high concentration of 15.44 mg/l on 10/27/2009. PZ-45 fluoride has an overall upward trend

but appears stable to decreasing since the maximum concentration of 3.8 mg/l was observed on 12/28/16. PZ-46 fluoride has been decreasing over the last 3 measurements (since 12/28/16).

- Sulfate was detected above the NYSWQS of 250 mg/l in 11 of 13 monitoring locations. Based on Mann-Kendall and Sens Slope analysis, MW-12S, MW-13S, PZ-44, PZ-45 display statistically significant increasing trends for sulfate. Sulfate concentrations in MW-13S have been decreasing since reaching a historic high in June 2014. MW-11SR, MW-14S and MW-22-85S display statistically significant decreasing trends. No statistical trends were present in PZ-46, MW-20-85S, MW-23-85S or MW-30S. Sulfate was above the NYSWQS in MW-30S for the first time since 2012.

- PCBs were not detected at any monitoring locations at the BMP in 2020 except MW-13S which had an Aroclor 1254 detection of 0.116 µg/l in December 2020. This is the highest detection historically; Aroclor 1254 was last detected in 2018 (0.039 µg/l) and in 2008 (0.073 µg/l). While there have been sporadic PCB detections at MW-13S, the most recent prior detection that was above the historical reporting limit of 0.065 µg/l occurred in 2012 (Aroclor 1248 at 0.098 µg/l).

- Total aluminum was detected at all monitoring locations in 2020 except MW-20-85S and dissolved aluminum was only detected at MW-12S and PZ-44 (above the MDL but below the reporting limited) and PZ-46 (0.125 mg/l). Total aluminum has been decreasing in MW-15S-87 since the maximum concentration of 28.93 mg/l was observed on 10/16/08. Aluminum was substantially lower (6.24 and 0.713 mg/l) in this well in the 2020 monitoring events.

4.6.4 Post-Closure Monitoring Assessment

Review of the BMP completion report indicated that seepage from the BMP through a winnowed till layer was addressed in 1985 with the construction of an 8-foot-wide clay barrier wall. In addition, post-consolidation samples collected north of the capped portion of the BMP indicated some elevated residual fluoride concentrations. Historic releases may be responsible for the detections of cyanide, fluoride, and sulfate north and west of the closed BMP as these are areas from which BMP materials were consolidated when the BMP was closed.

MW-11SR and MW-15S-87 are directly downgradient of the BMP. Total cyanide, WAD cyanide, fluoride and PCBs are the contaminants of concern (COCs) in MW-11SR and are non-detect or at concentrations below applicable water quality standards. Sulfate concentrations are above the NYSWQS, however, display a statistically decreasing trend. PCBs, total cyanide, sulfate, and WAD cyanide are the COCs in in MW-15S-87 and are also non-detect or below water quality standards. Fluoride concentrations are above the NYSWQS in MW-15S-87 and display a statistically significant increasing trend. This is consistent with recent monitoring.

Total aluminum results ranged from 0.1U to 11.7 mg/l, while dissolved aluminum was not detected above the historical reporting limit of 0.1 mg/l at any location except PZ-46, with a concentration of 0.125 mg/l.

Although groundwater elevations are not below the waste material and the existing underdrain system does not appear capable of lowering groundwater elevations below the waste, capping and ongoing dewatering has resulted in upward gradients into the south part of the closed cell.

While recent sampling of PZ-44, PZ-45 and PZ-46 show the presence of elevated concentrations of fluoride and sulfate, these are most likely residual impacts from conditions prior to consolidation of the BMP. Concentrations at these sampling locations as well as MW-20-85S located south of the piezometers will continue to be monitored.

4.7 Industrial Landfill

4.7.1 Groundwater and Surface Water Recovery

Groundwater and surface water recovery was initiated in 2003. Since the installation of the cap, which was completed in November 2002, stormwater runoff no longer contacts contaminated materials, therefore, surface water treatment is no longer required. A series of groundwater extraction wells were installed along the northern side of the Industrial Landfill.

A total of 4,484,895 gallons were collected by the leachate collection system in 2020 and another 2,246,100 gallons of groundwater were collected by the upgradient extraction well system.

4.7.2 Groundwater Elevations and Hydraulic Gradients

Groundwater elevation contours based on measurements collected during April and August 2020 (wet and dry weather) are presented in Figures 4-1 and 4-2. Groundwater flows under the Landfill in a general southward direction. Shallow groundwater is collected in the perimeter drain leachate collection system. Five transects of piezometers were installed across the perimeter drain: Transect 1 consisting of PZ-1 through PZ-5, Transect 2 consisting of PZ-6 through PZ-9, Transect 3 consisting of PZ-10 through PZ-13, Transect 4 consisting of PZ-14 through PZ-17, and Transect 5 consisting of PZ-18 through PZ- 22. Tabulated groundwater elevation data for the piezometers is presented in Table 3-3. Figure 4-3 shows plots of groundwater elevations in downgradient wells MW-39S and MW-40S compared to elevations in the nearby piezometer clusters located at the landfill boundary.

Groundwater elevations at the piezometers were measured monthly in 2020. The groundwater elevation data shows that during 2020 the inverts of the perimeter drains were lower than the groundwater elevations of the piezometers in Transects 2, 3 and 4, and were primarily lower than the perimeter drain in Transect 1 except for PZ-3 between May and September. Groundwater elevations at or below the reported invert of the perimeter drain were recorded at PZ-20 in Transect 5. However, a consistent inward gradient was noted at this cluster from piezometers PZ-22 and PZ-20 indicating that hydraulic control was maintained.

In summary, review of the groundwater elevation data for the five transects indicates that hydraulic control of shallow groundwater was maintained throughout 2020 at most transects. Historical water elevation data from Transect 4 indicates that groundwater in this area may not be completely captured during periods with relatively low water levels. This scenario was documented through a series of field studies performed between 2007 and 2011, and a report summarizing the results of the studies and a recommended path forward was submitted to NYSDEC on January 27, 2012. The report proposed a groundwater interception system to limit shallow groundwater flow beneath the landfill and was approved in a letter from NYSDEC dated February 13, 2012. Construction, startup, and data collection for the system are discussed in Section 4.7.4.

4.7.3 Groundwater Quality

Groundwater samples were collected and analyzed from monitoring well MW-10S, located upgradient of the Landfill, and from monitoring wells MW-39S, MW-40S and MW-45, located downgradient of the

Landfill. Surface water samples are also collected to monitor the water quality south of the Landfill at two locations (SLPWETW and SLPWETE); however, samples were only collected in December 2020 at SLPWETW because of frozen or dry conditions prevented collection during the March, June, and September sampling rounds.

The concentrations of chemical constituents are shown in Appendix Table C-2 and the historical summaries as well as 2020 results are provided in Table 4-2.

Upgradient Well MW-10S

PCBs were non-detect at MW-10S in 2020. Total aluminum was detected at concentrations ranging from 0.065 to 0.437 mg/l. Dissolved aluminum was non-detect in three of the four sampling events, while the March sample had a detection above the method detection limit (MDL), but below the reporting limit of 0.1 mg/l.

Total cyanide and WAD cyanide were non-detect during all four sampling events in 2020. Fluoride was detected in three of the four sampling events, while sulfate was detected in all four sampling rounds. All detections of fluoride and sulfate were below their NYSWQS of 1.5 mg/l and 250 mg/l, respectively.

Downgradient Well MW-39S

No PCBs were detected in MW-39S. Total aluminum was detected in all four samples at concentrations ranging from 0.144 to 5.51 mg/l, while dissolved aluminum was detected in three of four samples collected in 2020 (highest concentration at 0.136 mg/l). Total cyanide was detected in all four sampling rounds in 2020, however all results were below the NYSWQS of 0.2 mg/l. WAD cyanide was non-detect in all four sampling events of 2020.

Fluoride was detected in all four sampling rounds in 2020; the March (1.57 mg/l), June (1.65 mg/l) and September (1.76 mg/l) results were above the NYSWQS of 1.5 mg/l. Concentrations do not show a statistically significant trend for fluoride. Sulfate was detected below the NYSWQS of 250 mg/l during all sampling rounds during 2020.

Downgradient Well MW-40S

PCBs were not detected in MW-40S in 2020. Total aluminum was detected in one of four samples at a concentration of 0.0104 mg/l and dissolved aluminum was non-detect in all four samples. Total cyanide was detected in all four sampling events however all concentrations were below NYSWQS. WAD cyanide was non-detect in all four sampling events. Fluoride and sulfate were each detected during all four sampling events in 2020 below their respective NYSWQS.

Downgradient Well MW-45

PCBs were not detected in MW-45 during 2020. Total aluminum was detected in all four sampling rounds in 2020 with dissolved aluminum detected in two of four samples at concentrations of 0.038J and 0.0134J, both of which are under the laboratory reporting limit.

Total cyanide was detected in all four sampling rounds in 2020; three of the four samples were above the NYSWQS of 0.2 mg/l. There is a statistically significant decreasing trend for total cyanide in MW-45. WAD cyanide was detected in all four sampling rounds at concentrations ranging from 0.011 mg/l to 0.035 mg/l. WAD cyanide concentrations do not display a statistically significant trend. Fluoride was detected in two of the four rounds, but concentrations remained below the NYSWQS. Sulfate was detected in all four sampling rounds at concentrations above the NYSWQS of 250 mg/l (531 mg/l to

844 mg/l). Sulfate concentrations have displayed a statistically significant increasing trend since 2018.

Wetlands Water Samples

Surface water samples were collected from the western (SLPWETW) wetlands adjacent to and downgradient of the Landfill in December 2020 only. Surface water samples were not collected during the other sampling events or from the eastern wetlands (SLPWETE) due to either dry or frozen conditions. PCBs, total and dissolved aluminum, and WAD cyanide were non-detect in SLPWETW. Total cyanide was detected above the MDL and below the reporting limit at 0.004J mg/l. Fluoride was detected above the NYSWQS at 4.21 mg/l; concentrations do not display a trend. Sulfate was detected below the NYSWQS.

4.7.4 Industrial Landfill Upgradient Groundwater Extraction System

Associated with the random detections of total cyanide at Outfall 010, a range of remedial alternatives were investigated in 2010 and 2011 and the installation and operation of a series of upgradient groundwater extraction wells to lower the shallow groundwater beneath the Landfill was recommended. Extraction wells EW-01 and EW-03 were installed in 2010 and Extraction wells EW-04, EW-05 and EW-06 were installed in May 2012. The extraction wells were designed to lower groundwater elevations north of the Landfill and thereby limit the amount of water that is impacted by the waste and not captured by the leachate collection system.

Monthly flowmeter readings were recorded for the five extraction wells and are shown in Table 2-3. The totalized flows indicate that approximately 2,246,100 gallons were pumped in 2020.

In accordance with the monitoring plan proposed in the BODR, monthly groundwater level measurements are to be collected at extraction wells EW-01 through EW-06 and piezometers 76 through 79. In 2020, groundwater levels were recorded monthly at all locations except when frozen conditions or access issues were present. Groundwater levels recorded in 2020 are presented in Table 3-3.

In 2020 all five extraction wells remained operational throughout the majority of the year except EW-02 which was not operational in November through December. This was due to an impeller issue and a new pump was installed on January 5, 2021. Groundwater levels for the extraction wells and piezometers since startup of the system are presented in Figure 4-4. This figure shows that the extraction wells have been efficient at lowering the groundwater to the north of the Industrial Landfill.

In 2020, the average groundwater level in piezometers PZ-76 through PZ-79 ranged from approximately 200.3 feet to 205.8 feet. The largest fluctuations were observed in PZ-78 where levels ranged from 200.04 feet to 208.29 feet, and in PZ-79 where levels ranged from 201.96 feet to 208.51 feet. The average groundwater elevation observed while extraction wells were functioning ranged from approximately 182 feet in EW-01 to 191 feet in EW-05. The inner casing of EW-04 has experienced upheaval and has been identified for repair in 2021 in accordance with the *Monitoring Well Decommissioning Work Plan for the Reynolds Metals Company, LLC.* (March 2021).

In addition to groundwater level measurements, quarterly groundwater samples are collected at each of the extraction wells and analyzed for total cyanide and fluoride. The analytical data for all the testing completed since the system was started to the end of 2020 is reported in Appendix C. Analytical results for 2020 are provided in Table 2-4. Fluoride concentrations were below the NYSWQS of 1.5 mg/l in all extraction wells. Total cyanide was detected in all five extraction wells but

was above the NYSWQS of 0.2 mg/l in EW-06 only. Total cyanide concentrations in EW-06 have been above 0.4 mg/l since 2013 and ranged from 0.24 mg/l to 0.723 mg/l in 2020, equaling the historic high detection observed in 2018.

In 2020 there were sporadic exceedances of the SPDES total cyanide limit of 200 µg/l at Outfall 010. Alcoa is currently working on identifying the source; this work is being managed through the SPDES program.

4.7.5 Post-Closure Assessment

Within the physical and hydraulic restrictions of the site setting, the existing monitoring well network is well located to assess post-closure conditions at the Landfill.

The groundwater quality results at farthest downgradient monitoring point MW-45 indicate that potential transport of Landfill contaminants may have occurred to this location. Total cyanide has consistently been detected above the NYSWQS in MW-45, though concentrations have displayed a decreasing trend since 2013. Sulfate increased from low, stable levels in MW-45 to above the NYSWQS standard in September 2015. Concentrations have largely remained above the NYSWQS since and display a statistically significant increasing trend. Fluoride was detected in two of the four rounds, but concentrations remained below the NYSWQS. The increased sulfate concentrations may be a result of less groundwater moving through the system after construction and operation of the upgradient groundwater extraction system.

Historical (2010/2011) groundwater quality data is available from MW-46 and MW-47 which does not indicate migration of groundwater impacts from the landfill in deep groundwater.

Downgradient groundwater will continue to be monitored in MW-39S, MW-40S, and MW-45 and will be used to evaluate the effectiveness of the upgradient groundwater extraction system. Surface water will continue to be monitored in the eastern and western wetlands (east-wetland and west-wetland).

4.8 Former Potliner Storage Pad

4.8.1 Groundwater Elevations and Hydraulic Gradients

Groundwater elevation contours based on measurements collected during April and August 2020 are presented in Figures 4-1 and 4-2.

This site is currently monitored by 10 monitoring wells, as well as 4 piezometers that were installed at the Potliner Storage Pad in 2006. Five piezometers (PZ-24 and PZ-28) have been damaged and identified for decommissioning in 2021 in accordance with the *Reynolds Monitoring Well Decommissioning Plan* (March 2021). Additionally, piezometer PZ-29 has experienced upheaval and is scheduled to be repaired in 2021.

MW-27S is upgradient of the area and MW-03S is directly adjacent to the area. The closest downgradient wells are MW-26S and MW-28S. Further downgradient are MW-33S and MW-34S, both of which are also upgradient of the North Yard, and MW-35SR, which is downgradient of the North Yard. MW-42, MW-43, and MW-44, which were installed in the spring of 2006, are located downgradient of both the Potliner Storage Pad area and the North Yard.

Groundwater elevations and hydraulic gradients indicate groundwater under the former Potliner Storage Pad flows in a north and northeast direction, toward the North Yard French drain, and then north to the St. Lawrence River.

The North Yard French drain system, located beneath the western side of the North Yard and at an elevation of approximately 201 feet, influences the direction of the groundwater flow from the Potliner Storage Pad. The French drain system and the sewer system network located on the north end of the pot rooms draw groundwater to the east.

4.8.2 Groundwater Quality

Historical concentrations are provided in Appendix Table C-3 and the historical summaries as well as 2020 results are provided in Table 4-2. Appendix D includes a Mann-Kendall and Sens Slope statistical assessment of individual parameters that exceed NYSWQS. These forms of analysis display trends based on entire historical data sets Observations on recent trends are provided below.

Wells near the Site

Upgradient Well - MW-27S

PCBs were not detected at this well in 2020. Total aluminum was detected in both sampling rounds however dissolved aluminum was non-detect during both sampling events. Total cyanide was detected in both sampling events in 2020 at concentrations below the NYSWQS of 0.2 mg/l. WAD cyanide was not detected in either sampling event in 2020. Fluoride was detected above the NYSWQS of 1.5 mg/l during both sampling rounds; however, concentrations display a statistically significant decreasing trend. Sulfate was detected in both sampling rounds above the NYSWQS of 250 mg/l; no trend currently exists whereas there had been a decreasing trend for sulfate in MW-27S prior to 2019.

Adjacent to/Under Site - MW-03S

PCBs were not detected at MW-03S in 2020. PCBs were last detected in 2018 and in 2002.

Total aluminum was detected in both sampling events however, dissolved aluminum was non-detect in both samples collected in 2020. Total cyanide was detected above the NYSWQS of 0.2 mg/l during both sampling events (0.63 mg/l and 1.77 mg/l); concentrations display a statistically significant decreasing trend. WAD cyanide was detected in both sampling events at 0.037 mg/l and 0.123 mg/l; concentrations do not display a trend. Fluoride was detected above the NYSWQS of 1.5 mg/l in both samples (10.1 mg/l and 12.9 mg/l); concentrations display an overall statistically significant increasing trend since testing began, however, concentrations have been decreasing, excluding one data point in 2018, since reaching a peak of 24.39 mg/l in July 2006. Sulfate was detected above the NYSWQS of 250 mg/l in both samples collected in 2020 at 256 mg/l and 313 mg/l; a statistically significant decreasing trend is present.

Downgradient Wells - MW-26S and MW-28S

Western Side - MW-26S

PCBs were not detected in MW-26S in 2020. Total aluminum was detected in both rounds in 2020 however, dissolved aluminum was only detected in one of two samples at 0.041 mg/l. Total cyanide and WAD cyanide were not detected in 2020. Fluoride was detected above the NYSWQS of 1.5 mg/l in both sampling rounds; a statistically significant increasing trend exists. Concentrations have stabilized since reaching a maximum value of 6.87 mg/l in June 2016 and the last few measurements show a decreasing trend. Sulfate was detected in both samples collected in 2020 at concentrations below the NYSWQS of 250 mg/l.

Eastern Side - MW-28S

PCBs were not detected at MW-28S in 2020. Total aluminum was detected in both sampling events; however, dissolved aluminum was non-detect or detected above the MDL but below the reporting limit. Total cyanide was detected above the NYSWQS at concentrations of 2.34 and 2.94 mg/l; no trend exists. WAD cyanide was detected in both rounds ranging from 0.029 mg/l to 0.087 mg/l; no trend exists. Fluoride was detected in both samples at concentrations above the NYSWQS; a statistically significant decreasing trend exists, and concentrations decreased substantially since the peak concentration was observed in January 1999. Concentrations have increased slightly since 2015 and appear stable over the last four years. Sulfate has been decreasing in MW-28S since May 2000 and has been below the NYSWQS of 250 mg/l for the last 6 monitoring events.

Wells Further Downgradient – MW-33S and MW-34S

MW-33S and MW-34S are located approximately 80 feet north and downgradient of wells MW-26S and MW-28S and are tested for total cyanide and WAD cyanide only.

MW-33S, the western most of these wells, was non-detect for total cyanide and WAD cyanide. This location has a history of nondetectable cyanide however cyanide was detected in June 2019 at 0.04 mg/l. Prior to June 2019 total cyanide had been detected only three times since monitoring began in 1995, the most recent detection occurring in 2004. At MW-34S, the easternmost well, total cyanide concentrations were observed at a maximum concentration of 0.095 mg/l in 2005 and have since remained stable and below the NYSWQS standard. Total cyanide was detected in both samples collected in 2020; however, total cyanide concentrations at this well have not been above the NYSWQS standard of 0.2 mg/l. WAD cyanide was not detected at MW-34S in 2020.

Wells Most Downgradient – MW-35SR, MW-42, MW-43 and MW-44

MW-35SR, MW-42, MW-43, and MW-44 are the most downgradient wells of the Potliner Storage Pad and the North Yard, located approximately 200 feet north of MW-33S and MW-34S and extending west of MW-35SR.

PCBs were not detected in any of the downgradient locations in 2020 except MW-35SR which had an Aroclor 1254 detection of 0.206 µg/l in December 2020. Aroclor 1254 and Aroclor 1260 were last detected in MW-35SR above the historical reporting limit of 0.065 µg/l in 2012, while Aroclor 1248 was last detected in 2017.

Total aluminum was detected in both samples collected at MW-35SR however, dissolved aluminum was only detected in one sampling event above the MDL, but below the reporting limit. Total cyanide and WAD cyanide were non-detect during both sampling rounds in 2020. Fluoride was detected during both sampling rounds below the NYSWQS of 1.5 mg/l. Sulfate was detected above the NYSWQS of 250 mg/l during both sampling events at a concentration of 574 mg/l and 652 mg/l. There is no statistically significant trend present for sulfate in MW-35SR.

Total aluminum was detected in MW-42 during both sampling rounds in 2020. Dissolved aluminum was non-detect in December, however had a historically high concentration of 2.36 mg/l in June 2020. Total cyanide was detected in both sampling events below the NYSWQS of 0.2 mg/l. WAD cyanide was not detected in 2020. Both fluoride and sulfate were consistently detected above their respective NYSWQS during 2020. While the overall trend is upward, fluoride concentrations reached a peak concentration of 48.2 mg/L in June 2018 and have since been declining. While the overall trend is

upward, sulfate concentrations reached a peak concentration of 1910 mg/l in December 2015 and have since been declining.

At MW-43, total and dissolved aluminum were detected in both sampling rounds. Total cyanide and WAD cyanide were non-detect during both sampling rounds. Fluoride and sulfate were both detected in MW-43; however, concentrations have remained below their respective NYSWQS since monitoring began at this well in 2006.

At MW-44, total aluminum was detected in both samples collected in 2020 and dissolved aluminum was detected in one sampling event at 0.36 mg/l. Total cyanide and WAD cyanide were non-detect in 2020. Fluoride and sulfate were detected in both sampling events below their respective NYSWQS.

North Yard French Drain Collection System – FDRAIN1

As Figures 4-1 and 4-2 show, groundwater below the former Potliner Storage Pad area flows in a northeasterly direction. The western part of the flow field discharges to the St. Lawrence River. The eastern part of the flow field is influenced by the North Yard French drain system, which also recovers some of this groundwater.

The groundwater recovered by the underdrain system is treated at an onsite water treatment system and is discharged through the plant SPDES outfall system at Outfall 003.

Samples were obtained from the groundwater collected in the French drain system and analyzed for total cyanide, WAD cyanide, fluoride, and sulfate. Total cyanide was detected in both sampling events, with concentrations above the NYSWQS of 0.2 mg/l. Total cyanide concentrations have displayed a statistically significant decreasing trend since 2015, whereas no trend existed previously. WAD cyanide was detected in both sampling events within the historical range at this location; concentrations do not display a trend whereas a decreasing trend previously existed. Fluoride was detected above the NYSWQS of 1.5 mg/l in both sampling events; concentrations display a statistically significant decreasing trend. Sulfate was detected in both sampling events, with one sample above the NYSWQS of 250 mg/l; no trend exists.

In addition to scheduled groundwater samples, additional groundwater samples were collected in 2020 for total cyanide at the French Drain sump as part of the cyanide investigation effort. A total of 40 samples were collected in 2020 for total cyanide; concentrations ranged from 0.228 mg/l to 2.08 mg/l. The results of the cyanide investigation sampling conducted in both 2019 and 2020 are reported in Table 4-3.

4.8.3 Post-Closure Assessment

With the addition of the monitoring wells installed in 2006, and the confirmation of contaminant recovery in the North Yard French drain system, the groundwater monitoring well network is well-located to assess post-closure conditions in the vicinity and downgradient of the former Potliner Storage Pad.

The lateral extent of the elevated COC concentrations is delineated by MW-26S to the west and MW-34S to the east. The downgradient extent of elevated COC concentrations associated with the PSP in shallow groundwater appears to be captured by the French drain in the North Yard. Total cyanide was detected above the laboratory reporting limit in only one of four monitoring wells (MW-42) located at the fence line along Haverstock Road; total cyanide was detected in both samples collected at MW-42 at concentrations of 0.158 mg/l and 0.172 mg/l.

No PCBs were detected in the PSP area in 2020 except for MW-35SR which had an Aroclor 1254 detection. Total aluminum results ranged from 0.084 mg/l to 47.6 mg/l, while dissolved aluminum was detected at concentrations between 0.036 mg/l to 2.36 mg/l.

The highest concentrations of total cyanide detected in groundwater in 2020 were at the center of the Potliner Storage Pad site at MW-03S (1.77 mg/l) and MW-28S (2.94 mg/l). Total cyanide concentrations in MW-03S have been above NYSWQS since monitoring began in 1998. Total cyanide concentrations in MW-28S, located north and downgradient of MW-03S have also remained above NYSWQS since monitoring began in 1999. A statistically significant decreasing trend exists for total cyanide in MW-03S.

The persistent elevated concentrations of constituents associated with potliner material indicate that some residual source likely remains near the former Potliner Storage Pad or the Crusher Building. Review of the final excavation surfaces and post-excavation sampling results indicate that limitations on excavation imposed by the active buildings and roadways and cleanup goals specific to PCBs may have resulted in some residual PSP impacted material left in-place.

As mentioned above, the operation of the French drain system influences the direction of the groundwater flow from the Potliner Storage Pad area. Concentrations of COCs in samples collected from the French drain are above the groundwater quality standards and all captured groundwater is treated prior to discharge.

4.9 North Yard

4.9.1 Groundwater Elevations and Hydraulic Gradients

Groundwater flow under the western side of the North Yard is northerly and appears to be influenced by the French underdrain system located around the pitch tanks. This groundwater collection system, as discussed earlier, also recovers groundwater downgradient from the Potliner Storage Pad.

On the eastern side of the North Yard, there appears to be a groundwater divide near the former ore offloading building and defined by MW-19S and MW-17S. Southwest of the divide, groundwater flows toward the plant. This groundwater is monitored with MW-16S and MW-18S. Northeast of the divide, groundwater flows to MW-36, MW-37, and MW-38 and to the St. Lawrence River. A portion of the northerly flow appears to trend northeast toward MW-38 and to MW-41.

4.9.2 Groundwater Quality

Historical concentrations are provided in Appendix Table C-4 and the historical summaries as well as 2020 results are provided in Table 4-2.

Wells on or near the Groundwater Divide - MW-16S, MW-17S, and MW-19S

There were no PCB detections in MW-16S, MW-17S or MW-19S during 2020. Total aluminum was detected in MW-16S and MW-19S during 2020; however, dissolved aluminum was non-detect at all three locations. Total cyanide and WAD cyanide were not detected or detected below the reporting limit in all three locations. Fluoride was detected in all three wells and was above the NYSWQS of 1.5 mg/l at MW-16S and MW-19S. A statistically significant decreasing trend for fluoride is present in MW-16S. The Mann-Kendall analysis identified no trend for fluoride in MW-19S over the entire data set extending from 1999 through 2020. This is a result of current concentrations being similar to initial concentrations. The initial trend was upward through approximately 2009. A peak fluoride concentration in MW-19S of 10.40 mg/l was observed in January 2009, and concentrations have been

declining since that time. Sulfate was detected in all three wells; however, all concentrations were below the NYSWQS of 250 mg/l.

Well Downgradient - Southward Gradient; MW-18S

Monitoring well MW-18S monitors groundwater that flows southward beneath the plant. PCBs were not detected in MW-18S in 2020. Total aluminum was detected in both samples collected from MW-18S in 2020; however, the detections were below the reporting limit of 0.1 mg/l. Dissolved aluminum was detected in both samples at concentrations above the MDL but below the reporting limit of 0.1 mg/l;. Total cyanide was detected below the NYSWQS of 0.2 mg/l. WAD cyanide was not detected in the two sampling events in 2020.

Fluoride was detected above the NYSWQS in 2020. Fluoride concentrations have consistently been above NYSWQS in MW-18S since monitoring began in 1999; however, concentrations currently display a statistically significant decreasing trend. Sulfate was detected in both sampling events in 2020 below the NYSWQS. Sulfate concentrations in MW-18S have been decreasing since monitoring began and the December 2020 concentration is the lowest historically at 178 mg/l.

Wells Downgradient - Northward Gradient; MW-36, MW-37, MW-38, and MW-41

No PCBs were detected during any 2020 sampling event at MW-36, MW-37, MW-38, and MW-41. Total aluminum was consistently detected in all four monitoring wells in 2020 and dissolved aluminum was detected in at least one event at each location. Total cyanide and WAD cyanide concentrations were non-detect or detected above the MDL and below the reporting limit at these wells in 2020. Fluoride was detected in all four monitoring wells in 2020 however, only MW-36 had a concentration above the NYSWQS. There has been a statistically significant decreasing trend present for fluoride at MW-36 since monitoring began. Sulfate was detected in all four monitoring wells and was above the NYSWQS of 250 mg/l at MW-36, MW-37, and MW-41. There is an overall statistically significant increasing trend for sulfate in MW-36, MW-37 and MW-41; however, sulfate has been decreasing in MW-36 since reaching a peak concentration in December 2014 and decreasing in MW-41 since February 2012.

4.9.3 Post-Closure Assessment

Based on the groundwater contours, the groundwater monitoring well network is well located to assess post-closure conditions at the North Yard.

Monitoring well MW-18S is well-located to assess groundwater flowing toward the plant. Groundwater from MW-18S flows beneath the East Plant potrooms, where the storm sewer lines may serve as points of discharge. Total aluminum concentrations in the most downgradient wells are elevated relative to the other sites. In 2020 dissolved aluminum was detected above the reporting limit of 0.1 mg/l in samples collected from MW-36, MW-38, and MW-41. Aluminum is not a primary constituent of concern in groundwater as it is not typically soluble and there is no established groundwater standard. Consistent increasing trends for sulfate have been observed in downgradient locations MW-36, MW-37, and MW-41. MW-36 and MW-41 have shown decreasing trends in recent years.

4.10 Rectifier Yard

Historically, effluent from the Rectifier Yard Pond is sampled quarterly for PCBs. Sampling at this location has been discontinued as approved in a letter from the NYSDEC dated January 3, 2013.

Reference Well	MW-12-S		MW-13-S		MW-15S-91	MW-15D	MW-15S-87	MW-20-85-S		MW-21-85-S		MW-22-85-S		MW-23-85-S	
Well No.		**MW-12-D**		**MW-13-D**					**MW-20-85-D**		**MW-21-85-D**		**MW-22-85-D**		**MW-23-85-D**
Well Cluster Location	North of BMP		Northwest of BMP		South of BMP			South of BMP and MW-15 Cluster		East of BMP		North of BMP		West of BMP	
Screen Elevation															
Top (ft)	239.1	206.00	237.2	204.70	218.6	192.7	218.6	202.2	171.80	206.2	179.20	224.2	193.60	221.4	194.10
Bottom (ft)	229.1	196.00	227.2	194.70	208.6	182.7	208.6	192.2	161.80	196.2	169.20	214.2	183.60	211.4	184.10
Groundwater Elevation															
April-20	243.28	239.43	239.78	239.56	228.8	226.3	236.68	223.13	218.4	223.83	223.92	240.74	238.04	240.01	239.29
August-20	240.98	233.48	238.94	236.41	225.5	224.2	224.13	217.84	222.6	223.88	222.6	238.94	232.18	233.7	234.74
Differential Height, dh (ft)															
April-20	3.85		0.22		2.50		10.38	4.73		-0.09		2.70		0.72	
August-20	7.50		2.53		1.30		-0.07	-4.76		1.28		6.76		-1.04	
Vertical Gradient (dh/dl)[1]															
April-20	0.1163		0.0068		0.0965		0.4008	0.1556		-0.0033		0.0882		0.0264	
August-20	0.2266		0.0778		0.0502		-0.0027	-0.1566		0.0474		0.2209		-0.0381	

Note:
1.Negative gradient value indicates an upward vertical gradient

Table 4-1
Reynolds Metals Company, LLC.
Vertical Hydraulic Gradients

Reference Well Well No.	MPOF1402S	MPOF1403D	MPOG1601S	MPOG1603D
Screen Elevation				
Top (ft)	225.7	218.40	252.7	221.50
Bottom (ft)	223.7	216.40	233.2	219.50
Groundwater Elevation				
January-20	229.11	230.05	230.22	231.52
February-20	227.56	230.05	231.42	231.82
March-20	229.71	228.85	233.32	230.92
May-20	228.41	228.45	231.14	231.82
June-20	227.48	229.42	231.42	231.61
July-20	---	---	---	---
August-20	227.59	228.45	231.62	231.17
September-20	227.66	228.35	231.72	231.12
October-20	227.71	228.55	231.92	231.22
November-20	227.61	229.3	231.62	231.02
December-20	227.58	229.71	231.61	231.52
Vertical Distance, dl (ft)	7.30		31.20	
Differential Height, dh (ft)				
January-20	-0.94		-1.3	
February-20	-2.49		-0.4	
March-20	0.86		2.4	
April-19	-1.64		-0.6	
May-20	-0.04		-0.68	
June-20	-1.94		-0.19	
July-20	---		---	
August-20	-0.86		0.45	
September-20	-0.69		0.6	
October-20	-0.84		0.7	
November-20	-1.69		0.6	
December-20	-2.13		0.09	
Vertical Gradient (dh/dl)[1]				
January-20	-0.1288		-0.0417	
February-20	-0.3411		-0.0128	
March-20	0.1178		0.0769	
April-19	-0.2247		-0.0192	
May-20	-0.0055		-0.0218	
June-20	-0.2658		-0.0061	
July-20	---		---	
August-20	-0.1178		0.0144	
September-20	-0.0945		0.0192	
October-20	-0.1151		0.0224	
November-20	-0.2315		0.0192	
December-20	-0.2918		0.0029	

Note:

1.Negative gradient value indicates an upward vertical gradient

Key:

--- = Water level measurements not collected

Table 4-1
Reynolds Metals Company, LLC.
Vertical Hydraulic Gradients

MW-11SR												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	12.7	2.3683	69/69	1999-2019	0.189	0.274	0.2315	2/2	**No Trend**
Aluminum-dissolved	mg/l	NR	0.01U	0.322	0.0684	17/39	1999-2019	0.1U	0.1U	0.1U	0/2	Decreasing
Total Cyanide	mg/l	0.2	0.005U	0.222	0.0097	4/70	1999-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.017	0.0051	1/62	1999-2019	0.01UJ	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.2U	1.9	0.3776	68/70	1999-2019	0.5U	0.473	0.3615	0/2	Below Standard
Sulfate	mg/l	250	79.62	3200	988.51	68/68	1999-2019	231	424	327.5	2/2	Decreasing
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.032U	0.0347U	0/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.02U	0.032U	0.0347U	0/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.032U	0.0347U	0/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.02U	0.032U	0.0347U	0/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.02U	0.065U	0.0347U	---	1999-2019	0.019U	0.065U	0.019U	---	Below Standard

MW-12S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.103	55.65	10.2113	69/69	1999-2019	0.306	0.445	0.3755	2/2	**No Trend**
Aluminum-dissolved	mg/l	NR	0.1U	0.524	0.0992	22/39	1999-2019	0.1U	0.035J	0.0425	1/2	Below Range
Total Cyanide	mg/l	0.2	0.01U	0.2205	0.0509	68/69	1999-2019	0.027	0.028	0.028	2/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.0465	0.0091	28/63	1999-2019	0.01UJ	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	5.233	29.365	11.1339	69/69	1999-2019	11.4	11.5	11.45	2/2	Increasing
Sulfate	mg/l	250	220	1040	555.7272	69/69	1999-2019	943	1000	971.5	2/2	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.05U	0.485U	0.02U	0/63	1999-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.05U	0.143	0.0369	1/63	1999-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.485U	0.02U	0/63	1999-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.05U	0.485U	0.02U	0/63	1999-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.05U	0.143	0.0369	---	1999-2019	0.02U	0.065U	0.02U	---	Below Standard

MW-13S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.011U	4.799	1.3798	68/70	1999-2019	0.218	0.259	0.2385	2/2	No Trend
Aluminum-dissolved	mg/l	NR	0.01U	0.817	0.0911	18/39	1999-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.017	0.631	0.1821	70/70	1999-2019	0.01	0.069	0.0395	2/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.367	0.0206	42/70	1999-2019	0.01U	0.013	0.009	1/2	Within Range
Fluoride	mg/l	1.5	0.788	17	8.0611	70/70	1999-2019	6.56	7.76	7.16	2/2	Increasing
Sulfate	mg/l	250	57	4132.9	1720.30	70/70	1999-2019	1710	2540	2125	2/2	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.049U	0.495U	0.049U	0/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.049U	0.18	0.0417	6/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.049U	0.073	0.0363	2/63	1999-2019	0.019U	0.116	0.0628	1/2	Below Standard
Aroclor 1260	µg/l	NR	0.049U	0.014J	0.0353	1/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.049U	0.253		---	1999-2019	0.019U	0.116	0.019U	---	Below Standard

MW-14S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	65.3	8.0158	38/39	1999-2019	0.044	0.06	0.052	2/2	Decreasing
Aluminum-dissolved	mg/l	NR	0.01U	0.8605	0.0879	15/38	1999-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.228	0.0145	3/39	1999-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.0198U	0.005U	0/38	1999-2019	0.01U	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.25	8.3933	0.7283	39/39	1999-2019	0.389	0.766	0.5775	2/2	Below Standard
Sulfate	mg/l	250	251	526	350.8173	39/39	1999-2019	330	403	366.5	2/2	Decreasing
PCBs												
Aroclor 1242	µg/l	NR	0.049U	0.485U	0.049U	0/38	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.049U	0.485U	0.049U	0/38	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.049U	0.485U	0.049U	0/38	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.049U	0.485U	0.049U	0/38	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.049U	0.485U	0.049U	---	1999-2019	0.019U	0.065U	0.019U	---	Below Standard

MW-15S-87												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	29.6	4.8267	68/69	1999-2019	0.713	6.24	3.4765	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.1U	0.332	0.0705	17/37	2006-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.031	0.0054	5/69	1999-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.01U	0.005U	0/68	1999-2019	0.01UJ	0.01UJ	0.01UJ	0/2	Within Range
Fluoride	mg/l	1.5	0.901	4.25	1.7368	69/69	1999-2019	3	3.62	3.31	2/2	Increasing
Sulfate	mg/l	250	51.4	1800	423.0033	69/69	1999-2019	106	121	113.5	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.196U	0.02U	0/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.02U	0.151	0.0351	1/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.082	0.0347	1/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.02U	0.278U	0.02U	0/63	1999-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.02U	0.278U	0.0351	---	1999-2019	0.019U	0.065U	0.019U	---	Below Standard

MW-20-85-S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	5.32	0.5704	17/33	2006-2019	0.1U	0.1U	0.1U	0/2	Decreasing
Aluminum-dissolved	mg/l	NR	0.1U	0.282	0.0727	11/33	2006-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.0105	0.0044	3/34	2006-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.006U	0.01U	0.006U	0/33	2006-2019	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.085U	0.797	0.2304	32/34	2006-2019	0.5U	0.567	0.4085	1/2	Below Standard
Sulfate	mg/l	250	164.99	321	248.6842	34/34	2006-2019	268	281	274.5	2/2	No Trend
PCBs												
Aroclor 1242	µg/l	NR	0.047U	0.168U	0.047U	0/34	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.047U	0.168U	0.047U	0/34	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.047U	0.238U	0.047U	0/34	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.047U	0.238U	0.047U	0/34	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.047U	0.238U	0.047U	---	2006-2019	0.02U	0.065U	0.02U	---	Below Standard

MW-22-85-S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.524	11.7	3.8412	31/31	2006-2019	0.275	0.315	0.295	2/2	Decreasing
Aluminum-dissolved	mg/l	NR	0.008U	0.238	0.0629	6/31	2006-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.01	0.0041	5/31	2006-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.006U	0.01U	0.006U	0/29	2006-2019	0.01U	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.085U	0.88	0.2294	26/31	2006-2019	0.5U	0.699	0.4745	1/2	Below Standard
Sulfate	mg/l	250	373.5	614	449.371	31/31	2006-2019	402	404	403	2/2	Decreasing
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.173U	0.061U	0/31	2006-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.173U	0.061U	0/31	2006-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.245U	0.061U	0/31	2006-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.245U	0.061U	0/31	2006-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.061U	0.245U	0.061U	---	2006-2019	0.019U	0.065U	0.019U	---	Below Standard
MW-23-85S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.06	84.45	6.6201	35/35	2006-2019	1.02	1.27	1.145	2/2	Decreasing
Aluminum-dissolved	mg/l	NR	0.01U	0.298	0.058	11/35	2006-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.002	0.0043	1/35	2006-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.01U	0.005U	0/34	2006-2019	0.01U	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.2U	0.63	0.3491	34/35	2006-2019	0.398	0.81	0.604	2/2	Below Standard
Sulfate	mg/l	250	145.09	439	352.2906	35/35	2006-2019	358	389	373.5	2/2	No Trend
PCBs												
Aroclor 1242	µg/l	NR	0.05U	0.5U	0.05U	0/35	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.05U	0.5U	0.05U	0/35	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.05U	0.5U	0.05U	0/35	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.05U	0.5U	0.05U	0/35	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.05U	0.5U	0.05U	---	2006-2019	0.02U	0.065U	0.02U	---	Below Standard

MW-30S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	2.32	308.3	60.3854	39/39	2006-2019	0.222	0.558	0.39	2/2	Decreasing
Aluminum-dissolved	mg/l	NR	0.01U	0.608	0.1196	18/39	2006-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.115	0.0075	2/39	2006-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.0358	0.0057	2/38	2006-2019	0.01U	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	4.26	54.2	7.4157	39/39	2006-2019	4.78	6.03	5.405	2/2	No Trend
Sulfate	mg/l	250	47.3	342	106.8624	39/39	2006-2019	89.7	273	181.35	2/2	No Trend
PCBs												
Aroclor 1242	µg/l	NR	0.048U	0.5U	0.048U	0/39	2006-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.048U	0.073	0.0384	1/39	2006-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.048U	0.5U	0.048U	0/39	2006-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.048U	0.5U	0.048U	0/39	2006-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.048U	0.073		---	2006-2019	0.019U	0.065U	0.019U	---	Below Standard

MW-31SR												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	33.41	5.751	68/69	2006-2019	1.49	1.65	1.57	2/2	No Trend
Aluminum-dissolved	mg/l	NR	0.01U	0.308	0.0597	13/39	2006-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	2	0.0597	33/69	2006-2019	0.002J	0.005U	0.002	1/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.0175	0.006	11/63	2006-2019	0.01U	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.51	3.7	1.169	69/69	2006-2019	0.913	0.998	0.9555	2/2	Below Standard
Sulfate	mg/l	250	140	417.47	194.9913	69/69	2006-2019	178	193	185.5	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.051U	0.495U	0.051U	0/63	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.051U	0.117	0.0396	4/63	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.051U	0.495U	0.051U	0/63	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.051U	0.495U	0.051U	0/63	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.051U	0.117		---	2006-2019	0.02U	0.065U	0.02U	---	Below Standard

PZ-44												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.13	37.3	7.613	28/28	2006-2019	0.397	11.7	6.0485	2/2	**No Trend**
Aluminum-dissolved	mg/l	NR	0.01U	0.374	0.0604	10/26	2006-2019	0.1U	0.041	0.0455	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.01	0.004	5/29	2006-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.01U	0.04	0.0063	1/27	2006-2019	0.01U	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	1.18	5.74	3.8126	29/29	2006-2019	3.32	4.15	3.735	2/2	Decreasing
Sulfate	mg/l	250	22.6	1660	893.2	28/28	2006-2019	1000	1100	1050	2/2	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.051U	0.065U	0.051U	0/29	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.051U	0.065U	0.051U	0/29	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.051U	0.065U	0.051U	0/29	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.051U	0.065U	0.051U	0/29	2006-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.051U	0.065U	0.051U	---	---	0.02U	0.065U	0.02U	---	Below Standard

PZ-45												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	1.672	24.6	8.5542	22/22	2006-2019	0.065	2.52	1.585	2/2	Decreasing
Aluminum-dissolved	mg/l	NR	0.008U	0.285	0.0683	6/17	2006-2019	0.1U	0.1U	0.1U	1/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.01	0.0039	5/24	2006-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.006U	0.066	0.0086	3/22	2006-2019	0.01U	0.01U	0.01U	0/1	Within Range
Fluoride	mg/l	1.5	0.5	3.8	1.359	24/24	2006-2019	1.19	2.34	1.765	2/2	Increasing
Sulfate	mg/l	66	66	1960	1020.1364	22/22	2006-2019	1180	1240	1210	2/2	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.047U	0.0722U	0.047U	0/23	2006-2019	0.02U	0.02U	0.02U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.047U	0.0722U	0.047U	0/23	2006-2019	0.02U	0.02U	0.02U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.047U	0.0722U	0.047U	0/23	2006-2019	0.02U	0.02U	0.02U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.047U	0.0722U	0.047U	0/23	2006-2019	0.02U	0.02U	0.02U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.047U	0.0722U	0.047U	---	---	0.02U	0.02U	0.02U	---	Below Standard

PZ-46												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	2.25	11.32	5.4158	4/4	2009-2019	6	6	6	1/1	Withing Range
Aluminum-dissolved	mg/l	NR	0.1U	0.04J	0.0333	2/3	2010-2019	0.125	0.125	0.125	1/1	Withing Range
Total Cyanide	mg/l	0.2	0.01U	0.003J	0.0049	1/8	2006-2019	0.005U	0.005U	0.005U	0/1	Below Standard
WAD Cyanide	mg/l	NR	0.01U	0.01U	0.01U	0/5	2009-2019	0.01U	0.01U	0.01U	0/1	Withing Range
Fluoride	mg/l	1.5	1.187	3.92	2.0126	11/11	2008-2019	2.11	3	2.555	2/2	Increasing
Sulfate	mg/l	250	17	1680	869	8/8	2008-2019	1040J	1480	1260	2/2	No Trend
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.13U	0.061U	0/14	2009-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.13U	0.061U	0/14	2009-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.13U	0.061U	0/14	2009-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.13U	0.061U	0/14	2009-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.065U	0.13U	0.061U	---	---	0.065U	0.065U	0.065U	---	Below Standard

Notes:

1. Results are compared to New York State Water Quality Standards (NYSWQS) for Class GA groundwaters under 6 NYCRR Part 703.5, November 2016.
2. For calculation of average, 1/2 detection limit is used for U values.
3. There is no NYSWQS Class GA groundwater standard for aluminum.
4. Although there is no NYSWQS established for individual Aroclors, a standard of 0.09 µg/l total PCBs is used.
5. Bolded text classifies a change from the previous years analysis

Key:

U = Nondetect
J = Estimated
UJ = Estimated nondetect
NR = No regulatory limit
--- = Not sampled or statistical analysis not performed

MW-10S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.011U	68.7	2.8343	87/91	1997-2019	0.0665	0.437	0.2098	4/4	No Trend
Aluminum-dissolved	mg/l	NR	0.1U	0.263	0.0648	10/41	2009-2019	0.1U	0.0055J	0.0389	1/4	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.03	0.0058	10/91	1997-2019	0.005U	0.004J	0.03	1/4	Below Standard
WAD Cyanide	mg/l	NR	0.01U	0.087	0.0068	48/82	1997-2019	0.01U	0.01U	0.01U	0/4	Within Range
Fluoride	mg/l	1.5	0.238	3.988	1.5077	83/83	1997-2019	0.375U	0.18	0.1696	3/4	Below Standard
Sulfate	mg/l	250	52.43	477	126.3506	83/83	1997-2019	86.4	158	111.825	4/4	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.481U	0.02U	0/76	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1248	µg/l	NR	0.02U	0.481U	0.02U	0/76	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.481U	0.02U	0/76	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1260	µg/l	NR	0.02U	0.481U	0.02U	0/76	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Total PCBs	µg/l	0.09 [4]	0.02U	0.481U	0.02U	---	---	0.019U	0.065U	0.019U	---	Below Standard

MW-39S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	468	32.8928	83/84	1997-2019	0.144	5.51	2.0455	4/4	Increasing
Aluminum-dissolved	mg/l	NR	0.1U	0.802	0.1162	16/43	2009-2019	0.1U	0.136	0.0703	3/4	Below Range
Total Cyanide	mg/l	0.2	0.01U	0.4245	0.1395	81/83	1997-2019	0.022	0.048	0.036	4/4	Below Standard
WAD Cyanide	mg/l	NR	0.01U	0.087	0.0207	49/83	1997-2019	0.01U	0.01U	0.01U	0/4	Within Range
Fluoride	mg/l	1.5	0.238	3.988	1.5002	84/84	1997-2019	1.33	1.76	1.5775	4/4	No Trend
Sulfate	mg/l	250	52.43	477	126.353	84/84	1997-2019	133	210J	169	4/4	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.0205U	0.513U	0.065U	0/77	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1248	µg/l	NR	0.0205U	0.513U	0.065U	0/77	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1254	µg/l	NR	0.021U	0.513U	0.065U	0/77	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1260	µg/l	NR	0.021U	0.0598	0.0341	1/77	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Total PCBs	µg/l	0.09 [4]	0.021U	0.0598	0.0341	---	---	0.019U	0.065U	0.019U	---	Below Standard

MW-40S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.011U	69.2	1.2679	70/81	1997-2019	0.1U	0.0104	0.0401	1/4	Decreasing
Aluminum-dissolved	mg/l	NR	0.008U	0.283	0.0603	5/41	2009-2019	0.01U	0.1U	0.01U	0/4	Within Range
Total Cyanide	mg/l	0.2	0.0295	0.48	0.2029	80/80	1997-2019	0.046	0.0825	0.0615	4/4	Below Standard
WAD Cyanide	mg/l	NR	0.01U	0.131	0.0276	52/80	1997-2019	0.01U	0.01U	0.01U	0/4	Within Range
Fluoride	mg/l	1.5	0.2U	0.456	0.2386	76/81	1997-2019	0.179	0.3105	0.2244	4/4	Below Standard
Sulfate	mg/l	250	0.21	180.65	73.2542	81/81	1997-2019	56.1	58	57.3625	4/4	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.508U	0.02U	0/76	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1248	µg/l	NR	0.02U	1.197	0.0515	2/76	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.508U	0.02U	0/76	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Aroclor 1260	µg/l	NR	0.02U	0.508U	0.02U	0/76	2000-2019	0.019U	0.065U	0.019U	0/4	Below Standard
Total PCBs	µg/l	0.09 [4]	0.049U	1.197	0.0515	---	---	0.019U	0.065U	0.019U	---	Below Standard

MW-45												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.586	139.5	27.5775	55/55	2006-2019	0.267	0.7515	0.4534	4/4	Decreasing
Aluminum-dissolved	mg/l	NR	0.01U	0.298	0.0731	14/44	2009-2019	0.1U	0.038	0.0378	2/4	Within Range
Total Cyanide	mg/l	0.2	0.161	2.49	0.9333	54/54	2006-2019	0.022	0.458	0.4108	4/4	Decreasing
WAD Cyanide	mg/l	NR	0.01U	0.579	0.0795	50/55	2006-2019	0.011	0.035	0.0194	4/4	No Trend
Fluoride	mg/l	1.5	0.259	0.8509	0.5411	55/55	2006-2019	1.25U	0.43	0.5152	2/4	Below Standard
Sulfate	mg/l	250	74.13	871	269.0984	55/55	2006-2019	531	844	664.625	4/4	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.521U	0.02U	0/53	2006-2019	0.02U	0.065U	0.02U	0/4	Below Standard
Aroclor 1248	µg/l	NR	0.02U	0.521U	0.02U	0/53	2006-2019	0.02U	0.065U	0.02U	0/4	Below Standard
Aroclor 1254	µg/l	NR	0.021U	0.521U	0.021U	0/53	2006-2019	0.02U	0.065U	0.02U	0/4	Below Standard
Aroclor 1260	µg/l	NR	0.021U	0.521U	0.021U	0/53	2006-2019	0.02U	0.065U	0.02U	0/4	Below Standard
Total PCBs	µg/l	0.09 [4]	0.021U	0.521U	0.02U	---	---	0.02U	0.065U	0.02U	---	Below Standard

SLP-WETE[6]												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.109	4.275	0.786	20/22	2006-2019	NS	NS	NS	NS	Decreasing
Aluminum-dissolved	mg/l	NR	0.1U	0.0365	0.038	4/15	2006-2019	NS	NS	NS	NS	Within Range
Total Cyanide	mg/l	0.2	0.01U	0.074	0.01	4/24	2006-2019	NS	NS	NS	NS	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.018	0.0057	2/24	2006-2019	NS	NS	NS	NS	Within Range
Fluoride	mg/l	1.5	0.7323	10.8J	3.3363	24/24	2006-2019	NS	NS	NS	NS	No Trend
Sulfate	mg/l	250	5U	199	28.7548	18/22	2006-2019	NS	NS	NS	NS	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.0663U	0.065U	0/22	2006-2019	NS	NS	NS	NS	---
Aroclor 1248	µg/l	NR	0.061U	0.0663U	0.065U	0/22	2006-2019	NS	NS	NS	NS	---
Aroclor 1254	µg/l	NR	0.061U	0.0663U	0.065U	0/22	2006-2019	NS	NS	NS	NS	---
Aroclor 1260	µg/l	NR	0.061U	0.0663U	0.065U	0/22	2006-2019	NS	NS	NS	NS	---
Total PCBs	µg/l	0.09 [4]	0.061U	0.0663U	0.065U	---	---					
SLP-WETW[7]												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	1.62	0.4195	16/21	2006-2019	0.1U	0.1U	0.1U	0/1	No Trend
Aluminum-dissolved	mg/l	NR	0.008U	0.011	0.0365	1/15	2009-2019	0.1U	0.1U	0.1U	0/1	Within Range
Total Cyanide	mg/l	0.2	0.01U	0.12	0.014	4/23	2006-2019	0.004J	0.004J	0.004J	1/1	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.01U	0.005U	0/23	2006-2019	0.01U	0.01U	0.01U	0/1	Within Range
Fluoride	mg/l	1.5	0.7083	6.07	2.1288	23/23	2006-2019	4.21	4.21	4.21	1/1	No Trend
Sulfate	mg/l	250	5U	158	27.0819	17/21	2006-2019	107	107	107	1/1	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.0691U	0.061U	0/21	2006-2019	0.065U	0.065U	0.065U	0/1	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.0691U	0.061U	0/21	2006-2019	0.065U	0.065U	0.065U	0/1	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.072P	0.0339	1/21	2006-2019	0.065U	0.065U	0.065U	0/1	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.015JP	0.0312	1/21	2006-2019	0.065U	0.065U	0.065U	0/1	Below Standard
Total PCBs	µg/l	0.09 [4]	0.061U	0.072		---	---	0.065U	0.065U	0.065U	---	---

Notes:

1. Results are compared to New York State Water Quality Standards (NYSWQS) for Class GA groundwaters under 6 NYCRR Part 703.5, November 2016.
2. For calculation of average, 1/2 detection limit is used for U values.
3. There is no NYSWQS Class GA groundwater standard for aluminum.
4. Although there is no NYSWQS established for individual Aroclors, a standard of 0.09 µg/l total PCBs is used.
5. Bolded text classifies a change from the previous years analysis
6. Also known as 'east-wetland' in the report.
7. Also known as 'west-wetland' in the report.

Key:

U = Nondetect
J = Estimated
UJ = Estimated nondetect
NS=Not Sampled
NR = No regulatory limit
--- = Not sampled or statistical analysis not performed
P = the relative percent difference between the results for the two columns exceeded method-specific criteria

MW-03S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.19	39.4	6.6152	59/59	1998-2019	1.3	2.92	2.11	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.1U	0.443	0.1173	9/17	2009-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.746	16	7.4446	59/59	1998-2019	0.63	1.77	1.2	2/2	Decreasing
WAD Cyanide	mg/l	NR	0.024	0.869	0.2086	47/47	2000-2019	0.037	0.123	0.08	2/2	No Trend
Fluoride	mg/l	1.5	8.4	32.1	16.8244	59/59	1998-2019	10.1	12.9	11.5	2/2	Increasing
Sulfate	mg/l	250	218	714.78	501.602	59/59	1998-2019	256	313	284.5	2/2	Decreasing
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.064U	0.051U	0/49	2000-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.02U	0.064U	0.051U	0/49	2000-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.051U	0.067	0.051U	0/49	2000-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.051U	2.171	0.0816	1/49	2000-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.051U	2.171	0.0816	---	---	0.065U	0.065U	0.065U	---	Below Standard

MW-26S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.12	82.42	14.4195	74/74	1998-2019	0.636	6.78	3.708	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.1U	1.419	0.1587	11/28	2009-2019	0.1U	0.041	0.0455	1/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.11	0.014	16/74	1998-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.0068	0.0049	2/61	2000-2019	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	2.7	6.87	4.5104	74/74	1998-2019	4.95	5.74	5.345	2/2	Increasing
Sulfate	mg/l	250	88	446.68	250.041	74/74	1998-2019	132	190	161	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.172U	0.061U	0.02U	0.065U	0.02U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.155	0.0388	0.02U	0.065U	0.02U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.244U	0.061U	0.02U	0.065U	0.02U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.257	0.0374	0.02U	0.065U	0.02U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.063U	0.412		---	---	0.02U	0.065U	0.065U	---	Below Standard

Parameter ID	Unit	NYSWQS[1]	Historical Range Min	Historical Range Max	Historical Range Average[2]	Historical Frequency of Detection	Historical Monitoring Period	2020 Results Min	2020 Results Max	2020 Results Average[2]	Frequency of Detection	Statistical Analysis[5]
MW-27S												
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1	27.79	5.1355	70/70	1999-2019	0.539	0.811	0.675	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.1U	0.402	0.0769	9/28	2009-2019	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.01U	0.17	0.0463	68/69	1999-2019	0.01	0.023	0.0165	2/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.049	0.0065	24/70	2000-2019	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	1.89	8.9	4.362	70/70	1999-2019	2.44	2.96	2.7	2/2	Decreasing
Sulfate	mg/l	250	140	320	258.3138	70/70	1999-2019	285	289	287	2/2	No Trend
PCBs												
Aroclor 1242	µg/l	NR	0.019U	0.495U	0.019U	0/63	2000-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.019U	0.066	0.0358	1/63	2000-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.495U	0.02U	0/63	2000-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.02U	0.495U	0.02U	0/63	2000-2019	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.02U	0.066	0.0358	---	---	0.019U	0.065U	0.019U	---	Below Standard
MW-28S												
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	21.715	5.0524	71/71	1999-2019	0.488	3.63	2.039	2/2	No Trend
Aluminum-dissolved	mg/l	NR	0.1U	0.595	0.0722	9/29	2009-2019	0.1U	0.036	0.043	1/2	Within Range
Total Cyanide	mg/l	0.2	0.67	18	5.0666	71/71	1999-2019	2.34	2.94	2.64	2/2	No Trend
WAD Cyanide	mg/l	NR	0.01U	1.3	0.0955	60/62	2000-2019	0.029	0.087	0.058	2/2	No Trend
Fluoride	mg/l	1.5	9.5	170	42.0659	71/71	1999-2019	14.3	15.7	15	2/2	Decreasing
Sulfate	mg/l	250	154	690	347.5885	71/71	1999-2019	160	169	164.5	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.0305	0.0326	0/63	2000-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.11	0.0355	3/62	2000-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.067	0.0341	2/62	2000-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.0305	0.0332	0/63	2000-2019	0.02U	0.065U	0.02U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.061U	0.11	0.0355	---	---	0.02U	0.065U	0.02U	---	Below Standard

MW-33S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Cyanide	mg/l	0.2	0.005U	0.329	0.0095	5/81	1995-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.01U	0.005U	0/61	2000-2019	0.01U	0.01U	0.01U	0/2	Within Range
MW-34S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Cyanide	mg/l	0.2	0.01U	0.0945	0.0418	60/81	1995-2019	0.053	0.073	0.063	2/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.0325	0.0094	20/60	2000-2019	0.01U	0.01U	0.01U	0/2	Within Range
MW-35SR												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	2.48	280.35	47.3566	33/33	2008-2019	5.06	9.75	7.405	2/2	Decreasing
Aluminum-dissolved	mg/l	NR	0.1U	1.922	0.1569	13/33	2008-2019	0.1U	0.04J	0.0325	1/2	Within Range
Total Cyanide	mg/l	0.2	0.01U	1.4	0.0736	14/81	1995-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.01U	0.2	0	2/62	2008-2019	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.2	2.56	0.0082	33/33	2008-2019	1.25	1.39	1.32	2/2	Below Standard
Sulfate	mg/l	250	51.7	701	507.7485	33/33	2008-2019	574	652	613	2/2	No Trend
PCBs												
Aroclor 1242	µg/l	NR	0.049U	0.065	0.0333	1/33	2008-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.049U	0.281	0.0698	9/33	2008-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.049U	0.56	0.0541	7/33	2008-2019	0.065U	0.206	0.119	1/2	No Trend
Aroclor 1260	µg/l	NR	0.049U	0.065	0.0359	1/33	2008-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.049U	0.56		---	---	0.065U	0.206	0.119	---	Below Standard

MW-42												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	2.182	666.1	62.7791	39/39	2006-2019	12.7	47.6	30.15	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.01U	1.4	0.2503	21/39	2006-2019	0.1U	2.36	1.205	1/2	Highest historically
Total Cyanide	mg/l	0.2	0.01U	0.41	0.2292	34/41	2006-2019	0.158	0.172	0.165	2/2	Below Standard
WAD Cyanide	mg/l	NR	0.01U	0.23	0.0178	22/40	2006-2019	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	1.307	48.2	21.5906	41/41	2006-2019	27.8	38.4	33.1	2/2	Increasing
Sulfate	mg/l	250	66.5	1910	1070.0554	41/41	2006-2019	1190	1290	1240	2/2	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.053U	0.1725U	0.0329	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.053U	0.1725U	0.0329	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.053U	0.029	0.0363	1/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.053U	0.2455U	0.0338	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.053U	0.029	0.0363	---	---	0.065U	0.065U	0.065U	---	Below Standard

MW-43												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	2.011	92	33.9919	39/39	2006-2019	9.83	15.25	12.54	2/2	Decreasing
Aluminum-dissolved	mg/l	NR	0.01U	0.605	0.1501	18/39	2006-2019	0.076	0.512	0.294	2/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.01	0.0045	3/41	2006-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.01	0.0049	2/38	2006-2019	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.2U	0.901	0.2614	38/41	2006-2019	0.5U	0.537	0.3935	1/2	Below Standard
Sulfate	mg/l	250	132	222	171.9188	41/41	2006-2019	111	123	117	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.173U	0.061U	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.173U	0.061U	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.246U	0.061U	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.246U	0.061U	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.064U	0.0325U	0.061U	---	---	0.065U	0.065U	0.065U	---	Below Standard

MW-44												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	10.31	0.8587	29/38	2006-2019	0.084	0.212	0.148	2/2	No Trend
Aluminum-dissolved	mg/l	NR	0.01U	0.13	0.0529	12/38	2006-2019	0.1U	0.36	0.043	1/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.0324	0.005	1/41	2006-2019	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.01	0.0048	1/38	2006-2019	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.2U	1.09	0.2748	36/41	2006-2019	0.376	0.613	0.4945	2/2	Below Standard
Sulfate	mg/l	250	121	275	161.1844	41/41	2006-2019	100	110	105	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.176U	0.061U	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.176U	0.061U	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.25U	0.061U	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.25U	0.061U	0/39	2006-2019	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.065U	0.176U	0.061U	---	---	0.065U	0.065U	0.065U	---	Below Standard

FDRAIN-1												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Cyanide	mg/l	0.2	0.018	2.44	0.9649	40/41	2006-2019	0.308	1.63	0.969	2/2	Decreasing
WAD Cyanide	mg/l	NR	0.01U	0.215	0.0339	33/40	2006-2019	0.011	0.153	0.082	2/2	No Trend
Fluoride	mg/l	1.5	11.5	38.11	24.3246	41/41	2006-2019	16.5	21.3	18.9	2/2	Decreasing
Sulfate	mg/l	250	38.6	2180	480.183	40/40	2006-2019	205	254	229.5	2/2	No Trend

Notes:

1. Results are compared to New York State Water Quality Standards (NYSWQS) for Class GA groundwaters under 6 NYCRR Part 703.5, November 2016.
2. For calculation of average, 1/2 detection limit is used for U values.
3. There is no NYSWQS Class GA groundwater standard for aluminum.
4. Although there is no NYSWQS established for individual Aroclors, a standard of 0.09 µg/l total PCBs is used.
5. Bolded text classifies a change from the previous years analysis

Key:

U = Nondetect
J = Estimated
UJ = Estimated Nondetect
NR = No regulatory limit
--- = Not sampled or statistical analysis not performed

MW-16S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.003U	7.8	0.2539	48/69	1999-2020	0.1U	0.052	0.051	1/2	No Trend
Aluminum-dissolved	mg/l	NR	0.008U	0.102	0.0521	7/38	2006-2020	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.35	0.0251	34/70	1999-2020	0.002J	0.004J	0.002J	2/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.11	0.006	9/68	1999-2020	0.01U	0.01UJ	0.01U	0/2	Below Standard
Fluoride	mg/l	1.5	1.144	640	23.0831	70/70	1999-2020	7.42	7.92	7.67	2/2	Decreasing
Sulfate	mg/l	250	136	3600	486.5138	70/70	1999-2020	171	200	185.5	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.577	0.0537	4/63	2000-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.181	0.0355	1/63	2000-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.245U	0.061U	0/63	2000-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.142	0.0371	3/63	2000-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]					---	0.019U	0.065U	0.019U		Below Standard

MW-17S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	20.84	2.762	68/69	1999-2020	0.1U	0.1U	0.1U	0/2	No Trend
Aluminum-dissolved	mg/l	NR	0.01U	1.611	0.1126	14/38	2006-2020	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.03	0.0058	7/69	1999-2020	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.0068	0.0044	8/68	1999-2020	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.2U	2.5	0.9617	68/69	1999-2020	0.886	1.05	0.968	2/2	Below Standard
Sulfate	mg/l	250	81.6	670	254.3559	69/69	1999-2020	103	159	131	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.049U	0.18U	0.049U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.049U	0.471	0.0399	1/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.049U	0.131	0.0351	1/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.049U	0.255U	0.049U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.049U	0.602	0.0756	---	---	0.065U	0.065U	0.065U		Below Standard

MW-18S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.2U	18	1.4199	68/70	1999-2020	0.051J	0.0705J	0.0608	2/2	No Trend
Aluminum-dissolved	mg/l	NR	0.01U	3.25	0.4804	32/39	2006-2020	0.059J	0.0805J	0.0698	2/2	Increasing
Total Cyanide	mg/l	0.2	0.044U	1.12	0.197	70/71	1999-2020	0.007	0.0275J	0.007	2/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.037	0.0052	8/69	1999-2020	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	4.868	4800	185.0586	71/71	1999-2020	15.12	29.1	22.11	2/2	Decreasing
Sulfate	mg/l	250	182.5	20000	1504.0122	71/71	1999-2020	178	215.5	196.75	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.061U	0.0825	0.034	2/62	2000-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.061U	0.217	0.0678	24/62	2000-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.061U	0.134	0.037	3/62	2000-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.061U	0.0512	0.035	1/62	2000-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.061U	0.4847	0.1889	---	---	0.065U	0.065U	0.065U		---

MW-19S												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.011U	12	0.7685	62/69	1999-2020	0.1U	0.033	0.0415	1/2	No Trend
Aluminum-dissolved	mg/l	NR	0.008U	0.19	0.0534	9/38	2006-2020	0.1U	0.1U	0.1U	0/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.002	0.0046	2/70	1999-2020	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.0068J	0.0044	1/69	1999-2020	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.457	10.4	5.0447	70/70	1999-2020	3.3	3.49	3.395	2/2	No Trend
Sulfate	mg/l	250	86.695	490	240.1251	70/70	1999-2020	97.6	101	99.3	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.176U	0.02U	0/63	2000-2020	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.02U	0.145	0.0344	1/63	2000-2020	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.07	0.035	3/63	2000-2020	0.02U	0.065U	0.02U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.02U	0.25U	0.02U	0/63	2000-2020	0.02U	0.065U	0.02U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.049U	0.215	0.07	---	---	0.02U	0.065U	0.065U		Below Standard

MW-36												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.085	743	57.9556	70/70	1999-2020	6.74	25.3	16.02	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.01U	2.32	0.3494	21/39	2006-2020	0.229	1.46	0.8445	1/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	6.61	0.1099	5/70	1999-2020	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.02U	0.0045	0/69	1999-20120	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.382	41	3.396	70/70	1999-2020	1.99	2.35	2.17	2/2	Decreasing
Sulfate	mg/l	250	42.5	1640	550.7897	70/70	1999-2020	352	361	356.5	2/2	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.166U	0.05U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.02U	0.166U	0.05U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.236U	0.05U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.02U	0.236U	0.05U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.02U	0.065U	0.05U	---	---	0.065U	0.065U	0.065U		---

MW-37												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.1U	473	65.8896	68/69	1999-20	12.5	25.2	18.85	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.014U	0.292	0.1034	17/39	2006-2020	0.032	0.054	0.043	2/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.34	0.0096	1/70	1999-2020	0.005U	0.003J	0.005U	1/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.02U	0.004	0/69	1999-2020	0.01U	0.01UJ	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.1	2.16	0.4674	70/70	1999-2020	0.5U	0.59	0.42	2/2	Below Standard
Sulfate	mg/l	250	27.95	326.04	280.2195	70/70	1999-2020	292	308	300	2/2	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.05U	0.0315	0.0323	1/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.05U	0.157	0.0342	2/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.05U	0.47	0.0474	2/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.05U	0.12	0.0353	1/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.05U	0.157	0.0474	---	---	0.065U	0.065U	0.065U		---

MW-38												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.13	822	89.9204	70/70	1999-2020	9.6	16.2	12.9	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.01U	2.96	0.2803	22/39	2006-2020	0.1U	4.06	2.055	2/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.0105	0.0047	2/70	1999-2020	0.005U	0.005U	0.005U	0/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.02U	0.0045	0/69	1999-2020	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.35	2.686	0.654	70/70	1999-2020	0.435	0.756	0.6045	2/2	Below Standard
Sulfate	mg/l	250	40.7	284.14	176.9454	70/70	1999-2020	182	185	183.5	2/2	Below Standard
PCBs												
Aroclor 1242	µg/l	NR	0.02U	0.18U	0.065U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.02U	0.122	0.0351	3/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.021U	0.255U	0.065U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.021U	0.255U	0.065U	0/63	2000-2020	0.065U	0.065U	0.065U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.021U	0.122	0.03665681	---	---	0.065U	0.065U	0.065U		---

MW-41												
			Historical Range			Historical Frequency of Detection	Historical Monitoring Period	2020 Results			Frequency of Detection	Statistical Analysis[5]
Parameter ID	Unit	NYSWQS[1]	Min	Max	Average[2]			Min	Max	Average[2]		
Conventionals												
Total Aluminum	mg/l	NR [3]	0.183	67.5	19.1371	39/39	2006-2020	5.35	8.66	7.005	2/2	Increasing
Aluminum-dissolved	mg/l	NR	0.01U	0.39	0.0876	16/39	2006-2020	0.1U	0.143	0.0965	1/2	Within Range
Total Cyanide	mg/l	0.2	0.005U	0.005	0.0042	3/41	2006-2020	0.005U	0.001J	0.0018	1/2	Below Standard
WAD Cyanide	mg/l	NR	0.005U	0.023	0.0057	3/40	2006-2020	0.01U	0.01U	0.01U	0/2	Within Range
Fluoride	mg/l	1.5	0.168	0.609	0.3198	41/41	2006-2020	0.5U	0.385	0.3175	1/2	Below Standard
Sulfate	mg/l	250	130.96	922	381.7146	41/41	2006-2020	335	359	347	2/2	Increasing
PCBs												
Aroclor 1242	µg/l	NR	0.019U	0.176U	0.049U	0/39	2006-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1248	µg/l	NR	0.019U	0.176U	0.049U	0/39	2006-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1254	µg/l	NR	0.02U	0.068	0.0338	1/39	2006-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Aroclor 1260	µg/l	NR	0.02U	0.25U	0.049U	0/39	2006-2020	0.019U	0.065U	0.019U	0/2	Below Standard
Total PCBs	µg/l	0.09 [4]	0.02U	0.068	0.0338	---	---	0.019U	0.065U	0.019U		Below Standard

Notes:

1. Results are compared to New York State Water Quality Standards (NYSWQS) for Class GA groundwaters under 6 NYCRR Part 703.5, November 2016.
2. For calculation of average, 1/2 detection limit is used for U values.
3. There is no NYSWQS Class GA groundwater standard for aluminum.
4. Although there is no NYSWQS established for individual Aroclors, a standard of 0.09 µg/l total PCBs is used.
5. Bolded text classifies a change from the previous years analysis

Key:

U = Nondetect
J = Estimated value
UJ = Estimated nondetect
NR = No regulatory limit
--- = Not sampled or statistical analysis not performed

Sample Date[1]	Units	Total Cyanide	Fluoride
4/24/2019	mg/l	0.314	13.5
6/10/2019	mg/l	0.933	20.5
7/8/2019	mg/l	0.168	6.55
8/5/2019	mg/l	1.25	22.0
8/26/2019	mg/l	0.507	17.0
1/3/2020	mg/l	0.495	---
1/29/2020	mg/l	0.378	---
2/4/2020	mg/l	1.56	---
2/11/2020	mg/l	1.92	---
2/18/2020	mg/l	1.67	---
2/25/2020	mg/l	1.81	---
3/3/2020	mg/l	0.311	---
3/10/2020	mg/l	0.228	---
3/17/2020	mg/l	0.593	---
3/24/2020	mg/l	0.887	---
3/31/2020	mg/l	0.343	---
4/7/2020	mg/l	0.646	---
4/14/2020	mg/l	0.406	---
4/21/2020	mg/l	0.76	---
4/28/2020	mg/l	1.36	---
6/9/2020	mg/l	1.34	---
6/16/2020	mg/l	1.66	---
7/28/2020	mg/l	2.07	---
8/4/2020	mg/l	1.89	---
8/11/2020	mg/l	1.52	---
8/18/2020	mg/l	1.64	---
8/25/2020	mg/l	2.02	---
9/1/2020	mg/l	1.67	---
9/8/2020	mg/l	1.52	---
9/15/2020	mg/l	1.93	---
9/22/2020	mg/l	1.84	---
9/29/2020	mg/l	1.96	---
10/6/2020	mg/l	1.98	---
10/13/2020	mg/l	1.72	---
10/20/2020	mg/l	1.46	---
10/27/2020	mg/l	2.04	---
11/3/2020	mg/l	2.08	---
11/10/2020	mg/l	1.84	---
11/17/2020	mg/l	2.07	---
11/23/2020	mg/l	1.92	---
12/1/2020	mg/l	1.49	---
12/8/2020	mg/l	1.6	---
12/15/2020	mg/l	1.88	---
12/21/2020	mg/l	1.89	---
12/29/2020	mg/l	1.53	---

Note:

1. These samples were collected in addition to the semiannual samples collected as part of the groundwater monitoring program.

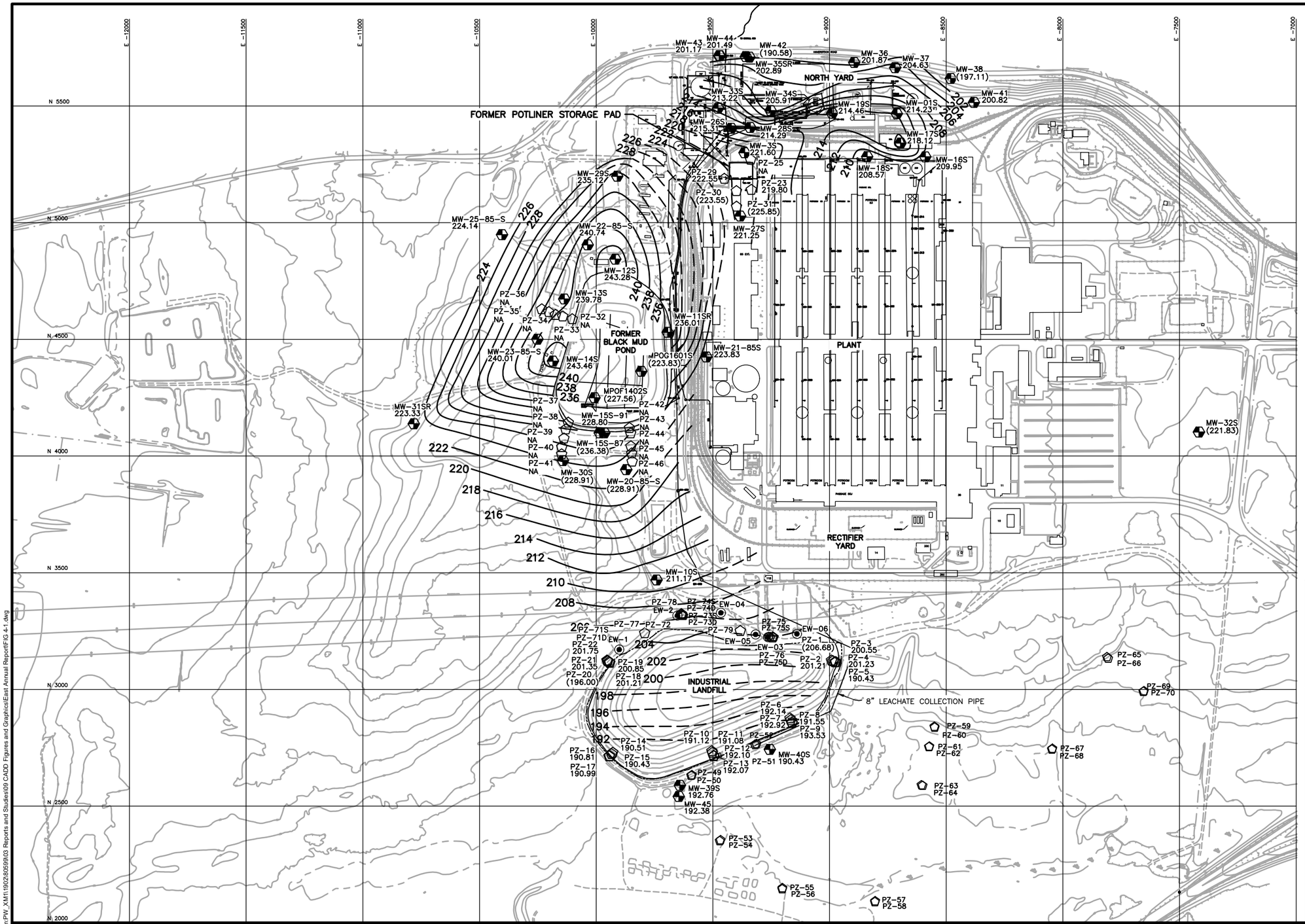
Key:

--- = Not sampled

Table 4-3

Reynolds Metals Company, LLC.

French Drain Cyanide Trackdown Analytical Results



NOTES

1. WATER LEVEL MEASUREMENTS WERE COLLECTED APRIL 2020.
2. PLANT TOPOGRAPHY BASED ON AERIAL SURVEY IN 2000.

LEGEND

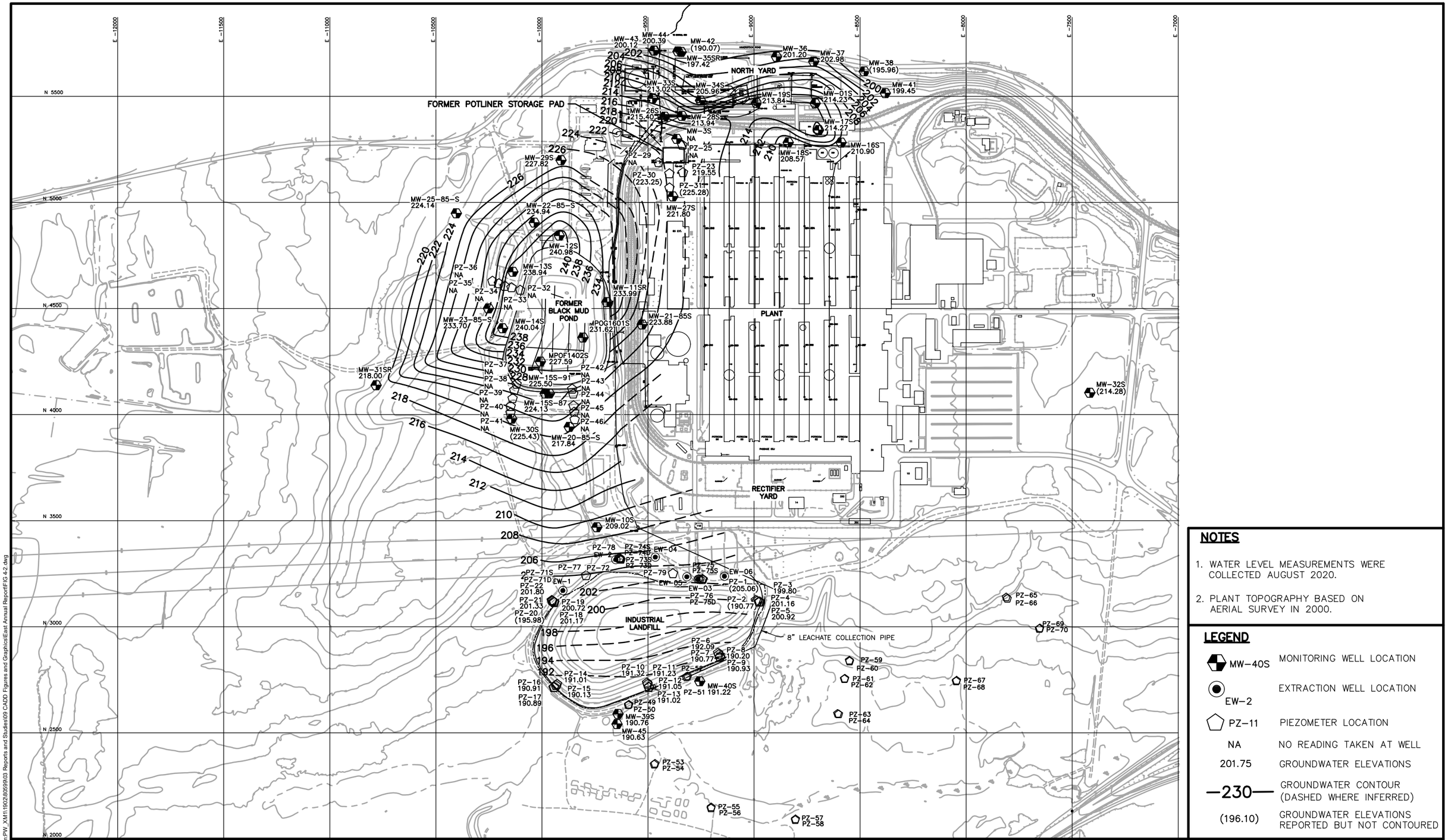
MW-40S	MONITORING WELL LOCATION
EW-2	EXTRACTION WELL LOCATION
PZ-11	PIEZOMETER LOCATION
NA	NO READING TAKEN AT WELL
201.75	GROUNDWATER ELEVATIONS
—230—	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
(196.10)	GROUNDWATER ELEVATIONS REPORTED BUT NOT CONTOURED

1" = 425'

212.5 0 425

Reynolds Metals Company, LLC. - Massena, New York

FIGURE 4-1
SPRING 2020 SITEWIDE SHALLOW GROUNDWATER CONTOUR PLAN



NOTES

1. WATER LEVEL MEASUREMENTS WERE COLLECTED AUGUST 2020.
2. PLANT TOPOGRAPHY BASED ON AERIAL SURVEY IN 2000.

LEGEND

MW-40S	MONITORING WELL LOCATION
EW-2	EXTRACTION WELL LOCATION
PZ-11	PIEZOMETER LOCATION
NA	NO READING TAKEN AT WELL
201.75	GROUNDWATER ELEVATIONS
—230—	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
(196.10)	GROUNDWATER ELEVATIONS REPORTED BUT NOT CONTOURED

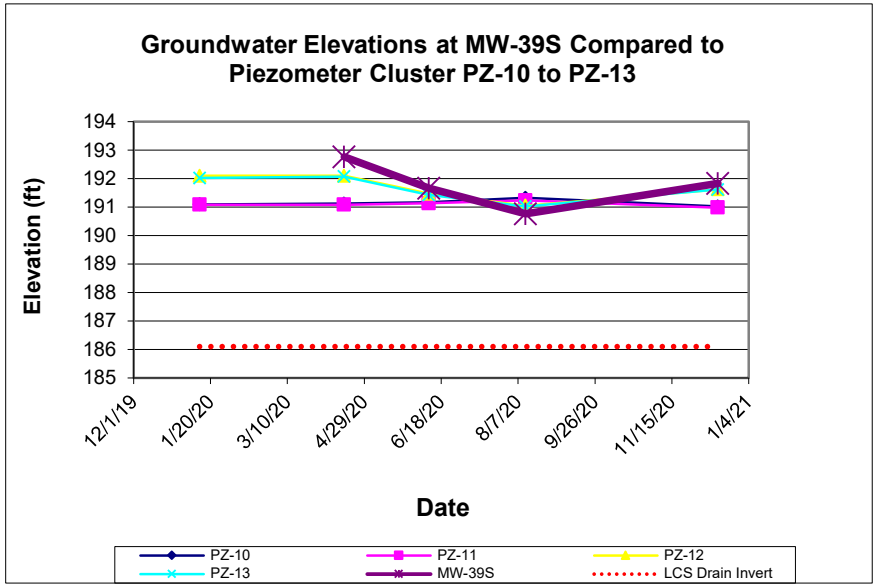
CDM Smith

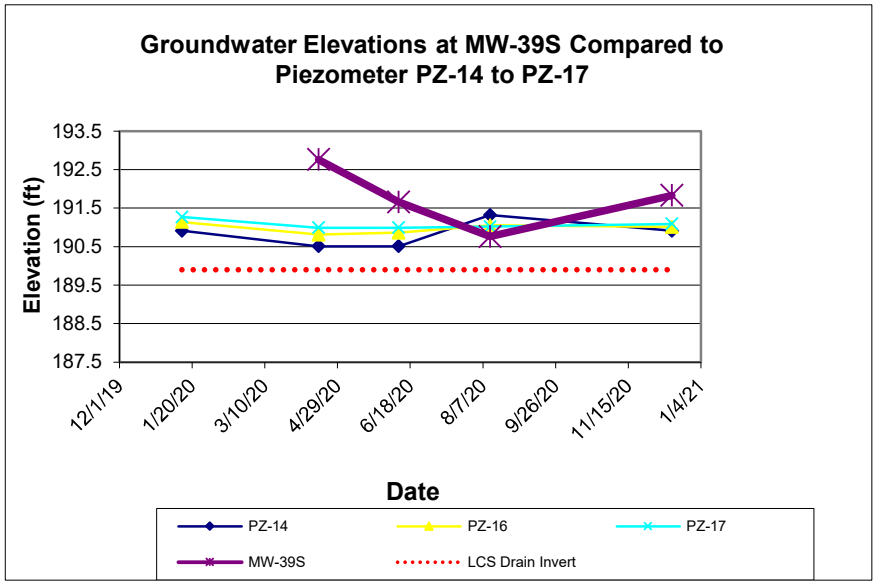
1" = 425'

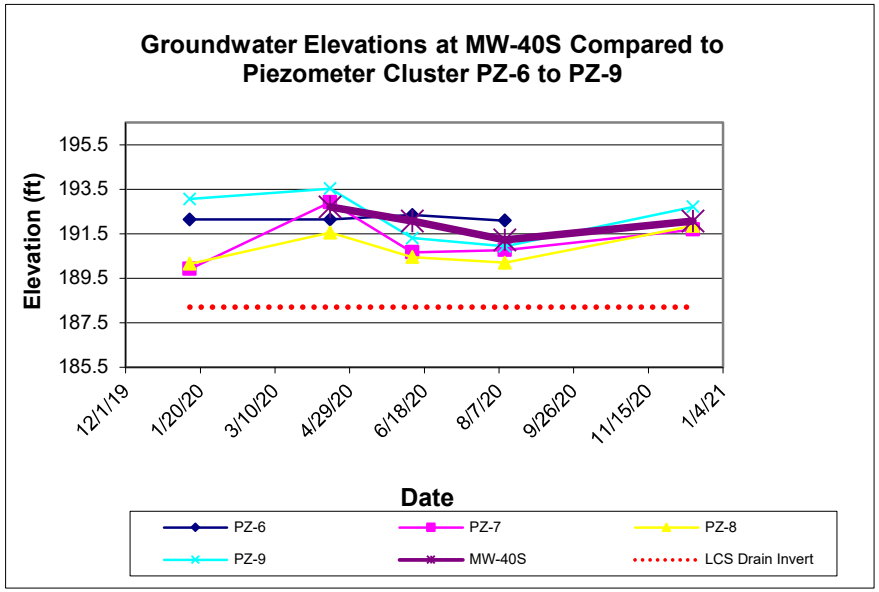
212.5 0 425

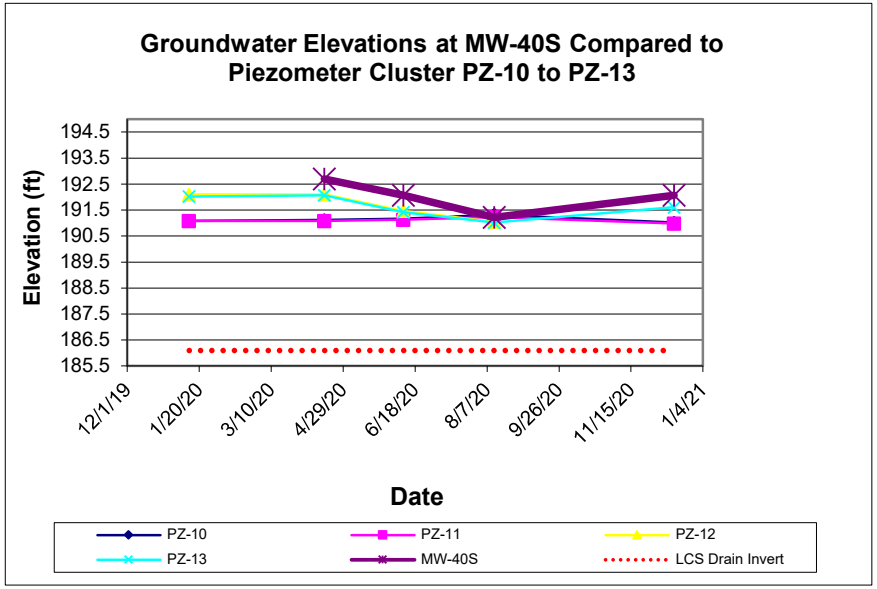
Reynolds Metals Company, LLC. - Massena, New York

FIGURE 4-2
FALL 2020 SITEWIDE SHALLOW GROUNDWATER CONTOUR PLAN









CDM Smith

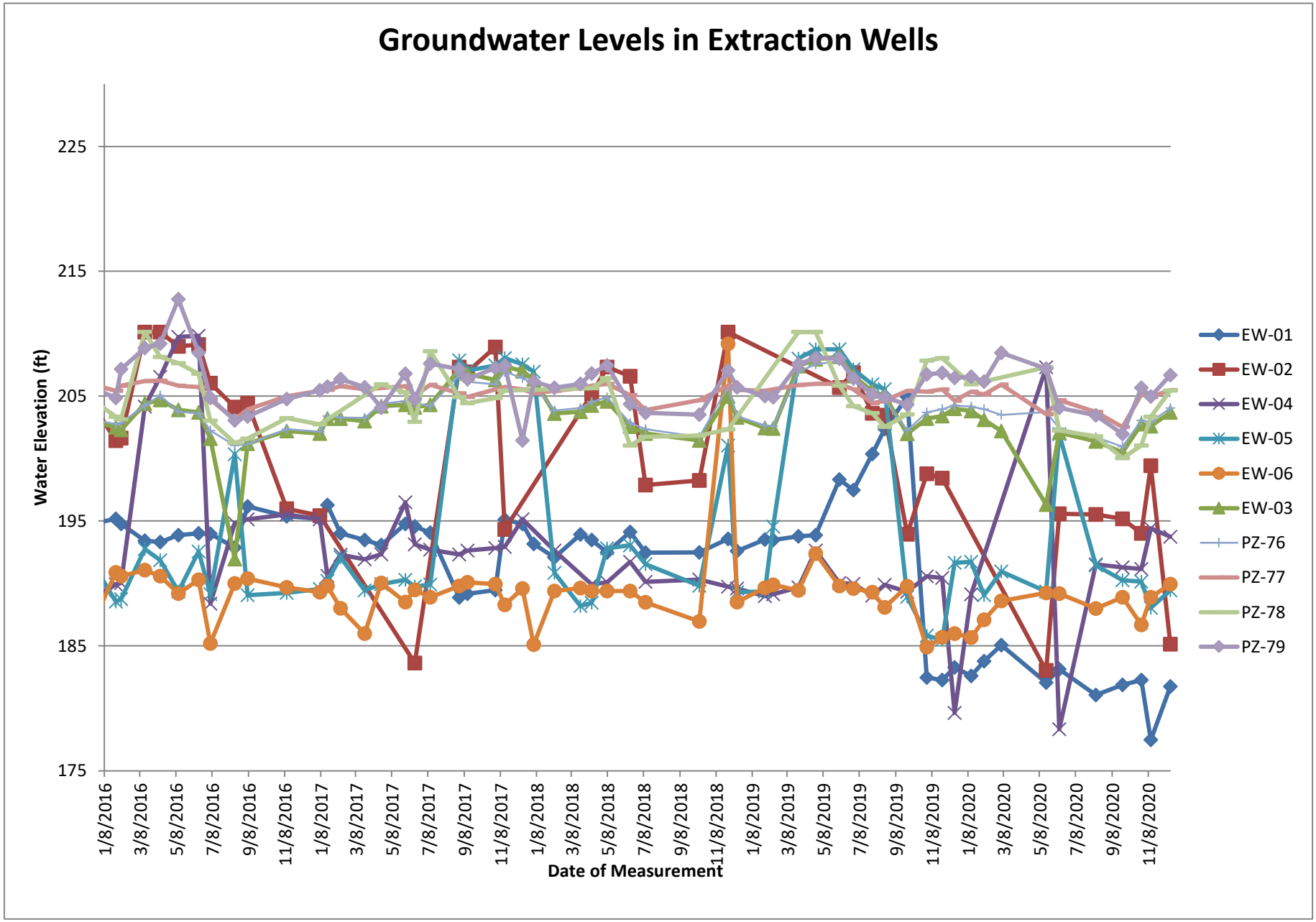
May 14, 2021

pw:\80599\03\05\20\east\tbls.xls

Figure 4-3

Reynolds Metals Company, LLC.

Groundwater Elevations Landfill Downgradient Wells and Piezometers (ft above MSL)



CDM Smith

May 14, 2021
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Figure 4-4
Reynolds Metals Company, LLC.
Groundwater Levels in Extraction Wells

Section 5
Finding and Recommendations

5.1 General

This section provides general findings regarding the post-closure conditions and post-closure monitoring programs at the various locations of the Reynolds Facility and provides recommendations for modifications to the post-closure monitoring program.

5.2 Black Mud Pond Findings

The existing underdrain system, installed below the waste zone, was estimated from boring logs and cross sections on remediation record drawings to have an approximate elevation of El. 224 feet. Historic operation of the underdrain system produced water level elevations of approximately 228 feet in monitoring well MPOF-1402S and approximately 232 feet in MPOG-1601S. Dewatering of the BMP has resulted in a primarily upward gradient from deep to shallow overburden groundwater at MPOF-1402S and MPOF-1403D and a primarily slight downward gradient from shallow to deep overburden groundwater at MPOG-1601S and MPOG-1603D. In addition, higher water levels in piezometers installed adjacent to the BMP than the underdrain elevations demonstrate an inward gradient is created by consistently dewatering the underdrains in the BMP. During periods of consistent sump pump operation, an inward hydraulic gradient was observed between MPOG-1402S and the surrounding wells and piezometers.

The capping system meets the ROD remediation action objectives (RAO) for protecting facility workers and surface water. The dewatering system installed by Bechtel and Reynolds was not designed to lower water levels below the bottom of the waste. However, consistent operation of the underdrain and sump system has created an upward vertical gradient and an inward horizontal gradient. Regular post-closure monitoring and recent sampling of PZ-44, PZ-45 and PZ-46 demonstrate the presence of elevated concentrations of fluoride and sulfate outside of the BMP which are most likely related to residual impacts from conditions prior to consolidation of the BMP. Continued monitoring will be performed.

5.3 Industrial Landfill Findings

Based on groundwater contour maps, the existing monitoring well network is effective in assessing post-closure conditions at the former Industrial Landfill. Consistent operation of the leachate collection system provides significant hydraulic control of shallow groundwater. The groundwater quality results at the farthest downgradient monitoring point MW-45 indicate that potential transport of Landfill contaminants may have occurred to this location. Total cyanide has consistently been detected above the NYSWQS in MW-45, though concentrations have displayed a decreasing trend since 2014. Fluoride is routinely detected though concentrations have remained below the NYSWQS. Sulfate increased from low, stable levels in MW-45 to above the NYSWQS standard in September 2015. Concentrations have largely remained above the NYSWQS since and display a statistically significant increasing trend. The Landfill is operating as designed and continued monitoring will be performed.

5.4 Former Potliner Storage Pad Findings

Based on the groundwater contour plans, the groundwater monitoring well network is effective to assess post-closure conditions near the former Potliner Storage Pad.

The persistent elevated concentrations of constituents associated with potliner material indicate that some residual source likely remains near the former Potliner Storage Pad or the Crusher Building. Review of the final excavation surfaces and post-excavation sampling results indicate that limitations on excavation imposed by the active buildings and roadways may have resulted in some residual PSP impacted material left in-place. However, the detections of total cyanide, fluoride, and sulfate above their respective NYSWQS Class GA standards in the North Yard French drain, and lower concentrations in downgradient shallow monitoring wells; indicate that the French drain is recovering contaminants from the shallow groundwater originating from the vicinity of the former Potliner Storage Pad. Groundwater captured by the North Yard French drain is treated prior to discharge.

5.5 North Yard Findings

Based on the groundwater contour plans, the groundwater monitoring well network is effective to assess post-closure conditions at the North Yard.

Total aluminum concentrations in the most downgradient monitoring wells are elevated relative to other sites. Based on the differences between total and dissolved aluminum concentrations it is likely that the major of total aluminum detected in groundwater samples is associated with particulate and colloidal forms. Therefore, the total aluminum concentrations are not representative of the mobile fraction of aluminum in groundwater.

5.6 Rectifier Yard Findings

The rectifier yard pond was not sampled in 2020 as per letter from the NYSDEC dated January 3, 2013.

5.7 IC/EC Plan Review

The following are the IC/EC Plan Reviews for the closed remediation sites:

5.7.1 Black Mud Pond

The engineering controls associated with the closed BMP include a cap with a vegetated cover along with an underdrain system. The underdrain system is used to extract groundwater beneath the in-place waste pile. The purpose of this system is to limit infiltration and prevent potentially affected groundwater from migrating from the site. This underdrain system was actively pumped throughout 2020. As mentioned in Section 5.2, an inward horizontal and upward vertical hydraulic gradient was observed in response to pumping. In addition, the entire site is surrounded by a fence to control access. Therefore, the institutional and engineering controls are in place, adequate and functioning as designed.

5.7.2 Industrial Landfill

The engineering controls associated with the closed Industrial Landfill include a cap with a vegetated cover along with a downgradient perimeter underdrain system. This underdrain system is used to extract groundwater beneath the in-place waste pile. The purpose of this system is to limit infiltration and prevent potentially affected groundwater from migrating from the site. This system has functioned as designed and has remained unchanged since it was approved by NYSDEC.

The upgradient groundwater extraction system was constructed during summer 2012 and began full operation in October 2012. Five extraction wells located upgradient of the Landfill are pumped continuously with the purpose of lowering the shallow groundwater beneath the Landfill and reducing the impact on the surrounding groundwater regime; a total of approximately 2,246,100 gallons were extracted throughout 2020. Based on the operational experience to date, it is anticipated that continual maintenance of the system will be required and that weekly inspections will be necessary for the near future.

Sporadic total cyanide exceedances at SPDES Outfall 010 occurred in 2020; an evaluation to determine the source(s) of total cyanide is currently being performed.

The institutional and engineering controls are adequate and functioning as designed.

5.7.3 Former Potliner Storage Pad

Part of the remedial work at former Potliner Storage Pad included excavation and extensive paving to prevent surface water infiltration. This was inspected regularly and is in good condition, as mentioned in Section 2.4.1. Furthermore, contaminant concentrations observed in the French drain relative to the surrounding monitoring locations suggest that it is effectively capturing contaminated groundwater originating at the former Potliner Storage Pad. Table 2-6 presents the estimated monthly volume of water removed from the French Drain Sump and Table 4-3 presents the fluoride and total cyanide results for 2020. Concentrations above NYSWQS are currently being conveyed and treated through the Outfall 003 system.

At this time, no other controls are proposed for this area except routine maintenance and repair of the pavement and continued monitoring. The institutional and engineering controls are adequate and functioning as designed.

5.7.4 North Yard

Groundwater in the North Yard is controlled by two underdrain systems. The first drains into pump station MH-B (shown on Figure 2-8), groundwater from this pump station is sampled and operation/inspection of this pump station is completed by plant maintenance staff. No problems were reported during the reporting period.

The second groundwater collection system, located near the former Potliner Storage Pad, conveys groundwater directly to the east into the west sump where it is conveyed to Outfall 003. At the time of the closure no performance criteria were established for this system.

5.7.5 Wetlands and Facility Wide

Facility wide and wetlands institutional and engineering controls include groundwater monitoring, SPDES surface water and process water monitoring and fencing for access control. These controls remain in-place and are effective at this time.

5.8 Summary and Recommendations

No recommended changes are being made to the existing monitoring schedule. Several monitoring locations were identified for repair or decommissioning as outlined in the *Monitoring Well Decommissioning Work Plan for the Reynolds Metals Company, LLC.* (March 2021). Piezometers in the area of the BMP, PSP and Landfill have experienced upheaval and are anticipated to be repaired in

2021. It is recommended that following completion of repair and decommissioning work that a re-survey of all monitoring locations be completed.

5.8.1 Sampling Schedule

Table 5-1 presents the proposed post-closure monitoring schedule for 2021 at the Reynolds Metals Company, LLC. Massena East Plant.

Site	Monitoring Well	Parameters	Sampling Frequency	Water Level Frequency
BMP	MPOF1402S[1]	---		M
	MPOF1403D[1]	---		M
	MPOG1601S[1]	---		M
	MPOG1603D[1]	---		M
	MW-11SR	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-12S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-12D	---		S
	MW-13S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-14S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-15S-87	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-15S-91	---		S
	MW-20-85S	Al (Total & Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-20-85D	---		S
	MW-21-85S	---		S
	MW-21-85D	---		S
	MW-22-85S [2]	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-22-85D	---		S
	MW-23-85S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-23-85D	---		S
	MW-25-85S	---		S
	MW-29S	---		S
	MW-30S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-31SR	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	PZ-32 thru PZ-43[1]	---		---[3]
	PZ-44 thru PZ-46 [2]	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	---[3]

Table 5-1
Reynolds Metals Company, LLC.
2021 Schedule for Monitoring

Site	Monitoring Well	Parameters	Sampling Frequency	Water Level Frequency
Landfill	PZ-1 thru PZ-22[1]	---		M
	MW-10S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	Q
	MW-39S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	Q
	MW-40S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	Q
	MW-45	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	Q
	Wetlands (2 Locations)	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	Q	---
	EW-01	---	---	M
	EW-02	---	---	M
	EW-03	---	---	M
	EW-04	---	---	M
	EW-05	---	---	M
	EW-06	---	---	M
	PZ-76 thru PZ-79	---	---	M
	MW-46	---	---	M
	MW-47	---	---	M
Potliner Storage Pad	MW-3S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-26S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-27S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-28S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-33S	CN Total, CN WAD	S	S
	MW-34S	CN Total, CN WAD	S	S
	MW-35SR	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-42	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-43	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-44	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	PZ-23 thru PZ-31[1]	---		M

Table 5-1
Reynolds Metals Company, LLC.
2021 Schedule for Monitoring

Site	Monitoring Well	Parameters	Sampling Frequency	Water Level Frequency
North Yard	MW-1S	---		S
	MW-16S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-17S	Al (Total and Dissolved), CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-18	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-19S	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-36	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-37	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-38	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	MW-41	Total Al, Dissolved Al, CN Total, CN WAD, F, PCBs Total, Sulfate	S	S
	French Drains	CN Total, CN WAD, F, Sulfate	S	---
Rectifier Yard	Rypondpipe	PCBs	---[4]	---

Notes:

1. Piezometer
2. Incorporated into quarterly sampling in October 2008 to determine if fluoride is migrating from the BMP.
3. Groundwater levels no longer collected; inaccurate measurements due to upheaval of piezometers.
4. Sampling discontinued per letter from NYSDEC dated January 3, 2013.

Key:

Q = Quarterly
M = Monthly
S = Semi-annual
--- = Not sampled

Table 5-1
Reynolds Metals Company, LLC.
2021 Schedule for Monitoring

Appendix A

Table 1 and Available Field Change Request Documentation

Table 1

Landfill Cap Installation Addendum to the Area-Specific Completion Report for the Remediation of the Landfill/Former Potliner Storage Area (Bechtel, February 2003)

Table 1
Quantities of Material from Onsite Remedial Actions Disposed of in the Landfill

Period	Area	Quantity (yd^3)	
Pre 03/01/93	Various Interim Remedial Measures (IRMs)	152	
	Subtotal for pre-OOC		*152*
Post 03/01/93	002 Diversion Area – 005 Ditch	54	
	Subtotal for 1993		*54*
1994	Area North of Haverstock Road [1]	10,837	
	Rectifier Yard Ditch [1]	19,116	
	Soil Stockpile [2]	5,367	
	Landfill – southern toe of Landfill	4,820	
	Potliner Storage Pad – construction spoils from Digging Building extension	1,848	
	Rectifier Yard	110	
	Subtotal for 1994		*42,098*
1995	002 Diversion Area – area west of storm water surge pond	4,616	
	002 Diversion Area – Engineering Building area	242	
	Rectifier Yard [3]	2,589	
	Potliner Storage Pad	3,144	
	Potliner Storage Pad – area south of Digging Building	3,777	
	Landfill – construction spoils from leachate collection system trench	1,167	
	Wetlands – Area West of Landfill	10,199	
	Wetlands	18,141	
	North Yard	9,381	
	Subtotal for 1995		*53,256*
1996	Landfill – construction spoils from leachate transfer line	1,300	
	Wetlands	2,368	
	North Yard	15,951	
	002 Diversion Area – water tower area	1,819	
	Landfill – consolidation of Area North of Landfill (FCR-190)	18,505	
	Subtotal for 1996		*39,943*
1997	North Yard – Grids H34 & H35 and the surrounding area	293	
	Subtotal for 1997		*293*
1998	Landfill – Former Material Stockpile Area (FCR-200)	1,280	
	Subtotal for 1998		*1,280*

Table 1 (continued)

Year	Area	Quantity (yd^3)	
1999	002 Diversion Area – 005 Drainage Basin (FCR-202)	1,600	
	Potliner Storage Pad – Modernization of Facility 85, Cathode Digging Building	120	
	Subtotal for 1999		*1,720*
2000	North Yard – repair of underground water main in North Yard grid H32 (south of Facility 25A, the Unloading Shed)	25	
	Subtotal for 2000		*25*
2001	North Yard – Grid G41 and vicinity (FCR-206)	184	
	North Yard –water storage tank installation (FCN-209)	46	
	002 Diversion Area – Pipeline north of sewage treatment plant drying beds (FCN-210)	105	
	002 Diversion Area – Removal of soil from the onsite Borrow Area, where it was underlying the stockpile of broken concrete that had been previously removed from a building construction project near the maintenance shops (FCN-211)	86	
	St. Lawrence River remediation – dredging spoils [(4)]	75,500	
	Subtotal for 2001		*75,921*
2002	St. Lawrence River remediation – cleanup of work areas	5,000	
	002 Diversion Area – removal of soil associated with plant improvements	300	
	Subtotal for 2002		*5,300*
Total			***220,042***

Notes:

(1) A total of 1,606 yd^3 of material with ≥25 and <50 ppm PCBs from the Area North of Haverstock Road and the Rectifier Yard Ditch was temporarily stored and covered at the asphalt pad adjacent to the decontamination facility. Stockpiled material was hauled to Landfill in September 1995.

(2) Soil Stockpile contained material with <10 ppm PCBs excavated previously from other areas.

(3) Rectifier Yard quantity includes approximately 200 yd^3 of stone removed from transformer pits.

(4) The volume of St. Lawrence River dredging spoils reflects the addition of 15% Portland cement.

Field Change Request 190

Area Specific Completion Report for Remediation of the Landfill/Former Potliner Storage Area (Bechtel, October 1997)

FIELD CHANGE REQUESTS

FCR-085	Revised alignment of west end of LCRS to key into lower-permeability soils.
FCR-142	Added drawings for leachate transfer line from L/FPS Area to surge tank of GAC treatment system.
FCR-157	Revised testing method for secondary containment pipe from low-pressure air test to high-pressure hydrostatic test.
FCR-160	Voided - see NCR 002.
FCR-161	Deleted interim connections with existing leachate transfer line (install new line parallel with existing line).
FCR-164	Defined requirements and sampling plan for consolidation of northern portion of the L/FPS Area *(superseded by FCR 190)*.
FCR-190	Defined requirements and sampling plan for consolidation of northern portion of the L/FPS Area.
FCR-194	Provided leak-detection manhole (MH 611) to reduce distance between leak detection points (MH 610 and MH 612).
FCR-198	Moved monitoring wells for Landfill closer to Landfill (MW-39S and MW-40S).

FIELD CHANGE NOTICES

FCN-058	Revised berm width and height on south side of Landfill to function as a haul road.
FCN-086	Added lip extension from base of HDPE manhole (MH 602) to provide means for antiflotation anchor.
FCN-090	Substituted a larger stone for backfilling connecting trenches.
FCN-159	Revised leachate transfer line alignment to allow the existing 4-in. pipe to be gradually bent downwards for connection at MH 604.
FCN-162	Relocated MH 608 southward to avoid interference with Massena Electric power pole and underground cable.

Field Change Requests 199 and 200

Landfill Cap Installation Addendum to the Area-Specific Completion Report for the Remediation of the Landfill/Former Potliner Storage Area (Bechtel, February 2003)

FIELD CHANGE REQUESTS AND FIELD CHANGE NOTICES

No.	Description
FCR-194	Provide leak-detection manhole (MH-611) to reduce distance between leak detection points (MH-610 and MH-612).
FCR-198	Move proposed locations for monitoring wells MW-39S and MW-40S closer to the Landfill.
FCR-199	Investigate the Former Materials Stockpile Area.
FCR-200	Remediate of the Former Materials Stockpile Area.
FCR-201	Raise the access road south of the Landfill.
FCR-208	Upgrade the leachate transfer line.
FCR-212	Update the Landfill cap design.
FCR-213	Provide intermediate drain for Landfill closure cap.
FCR-214	Revise Specification CSP-037, *Furnishing and Installing a Hazardous Waste Landfill Cover.*
FCN-215	Correct survey data for Landfill cap design.
FCR-216	Modify Landfill cap design to ensure cover over leachate collection and recovery system.
FCN-217	Modify perimeter drain for northwest portion of the Landfill cap.
FCR-218	Modify compaction requirements for cover soils in the Landfill cap.
FCN-219	Allow placing some GCL on the Landfill with the woven side up.

Field Change Request 204

Field Change Request 204 Not Able to be Located

Field Change Request 206

Post Remedial Report for Third Quarter 2001 (Bechtel, April 2002)

July 23, 2001

Mr. Philip G. Waite, P.E.
Project Manager
NYSDEC - Region 6
Division of Environmental Remediation
State Office Building
317 Washington Street
Watertown, NY 13601

SUBJECT: Bechtel Job No. 20384, Reynolds Metals Company,
St. Lawrence Reduction Plant Site Remediation Project
FCR-206 FOR REMEDIATION OF NORTH YARD GRID G41; Subject Code 1109

REFERENCE: Letter from Grindstaff (Bechtel) to Waite (NYSDEC), February 28, 2001, "Sampling Plan for North Yard Grid G41 Area"

Dear Mr. Waite:

Bechtel Associates Professional Corporation-NY is making this submittal on behalf of Reynolds Metals Company (RMC) and in accordance with the Order on Consent, Index #A6-0291-92-12, effective date March 1, 1993.

Field Change Request (FCR) 206 is attached for your use. This FCR is to remediate North Yard Grid G41 and vicinity. Specifically, the area will be excavated and disposed of in accordance with established protocol: cleaned concrete and < 50 ppm PCB soil to the onsite Landfill and ≥ 50 ppm soil to Model City. The work, including all data, will be documented and reported to NYSDEC.

If you have any questions on this matter, please call me at (865) 220-2000 or Dave Bence, RMC Project Manager, at (315) 764-1996.

Very truly yours,

Jeffrey W. Grindstaff

Jeffrey W. Grindstaff, P.E.
Project Engineering Manager

Attachment: FCR-206, which includes Figure 1 (pre-excavation data) and Drawing 20384-Y-NYZ-005 (excavation plan) (1 copy)

cc: K. Farrar, DEC Division of Environmental Remediation, Albany, w/o
K. Jock, Akwesasne Mohawk Nation, w/1
C. Shoemaker, DEC Regional Water Engineer, Utica, w/o
A. Rice, DEC Region 6, Division of Water, Watertown, w/o
J. Sheehan, DOH Bureau of Environmental Exposure Investigation, w/o
C. Dowd, DEC Division of Fish and Wildlife, Albany, w/o
D. Sweredoski, DEC Division of Environmental Remediation, w/o

BECHTEL ENVIRONMENTAL, INC.
100 Union Valley Road
Oak Ridge, TN 37830 USA
mailing address P.O. Box 350
Oak Ridge, TN 37831-0350 USA

FIELD CHANGE REQUEST/FIELD CHANGE NOTICE

Job No. 20384-061

Page 1 of 1

FCR NO.	FCN NO.
206	

DRAWING OR SPECIFICATION NUMBER	REV. NO.	DRAWING OR SPECIFICATION CHANGES				PREPARED BY AND DATE	CHECKED BY AND DATE
		DCN	FCR	FCN	ADDENDA		
Y-NYZ-005	0		X			7-20-01	7-20-01

REFERENCE

FCR-204, Sampling North Yard Grid G41 and Vicinity (includes drawing 20384-Y-NYZ-004, North Yard Soil Sampling Plan for Grid G41 and Vicinity)

REASON FOR CHANGE

PCBs were identified in the excavation spoil from the July 2000 repair of the concrete pavement over grid G41 (see history and description in FCR-204).

EXISTING CONDITION

Grid G41 is in the North Yard area of concern, which was successfully remediated as described in the *Area-Specific Completion Report for Remediation of North Yard* (Bechtel 1998). PCBs were subsequently discovered in grid G41beneath concrete pavement. This area was sampled under FCR-204; results are presented on Figure 1.

DESCRIPTION OF CHANGE

Re: REMEDIATION OF NORTH YARD GRID G41 AND VICINITY

For this work, conform to established project requirements including the following documents:

- *RD/RA Work Plan*, Rev. 2 (Bechtel 1993)
- *Area-Specific Safety and Health Plan for Remediation of North Yard Area*, Rev. 1 (Bechtel 1995)
- *Area-Specific Work Plan for Remediation of North Yard Area*, Rev. 1 (Bechtel 1995)

Remediate the subject area and perform post-remedial sampling per the attached Drawing 20384-Y-NYZ-005. Submit documentation of the work, including all sampling data, to NYSDEC.

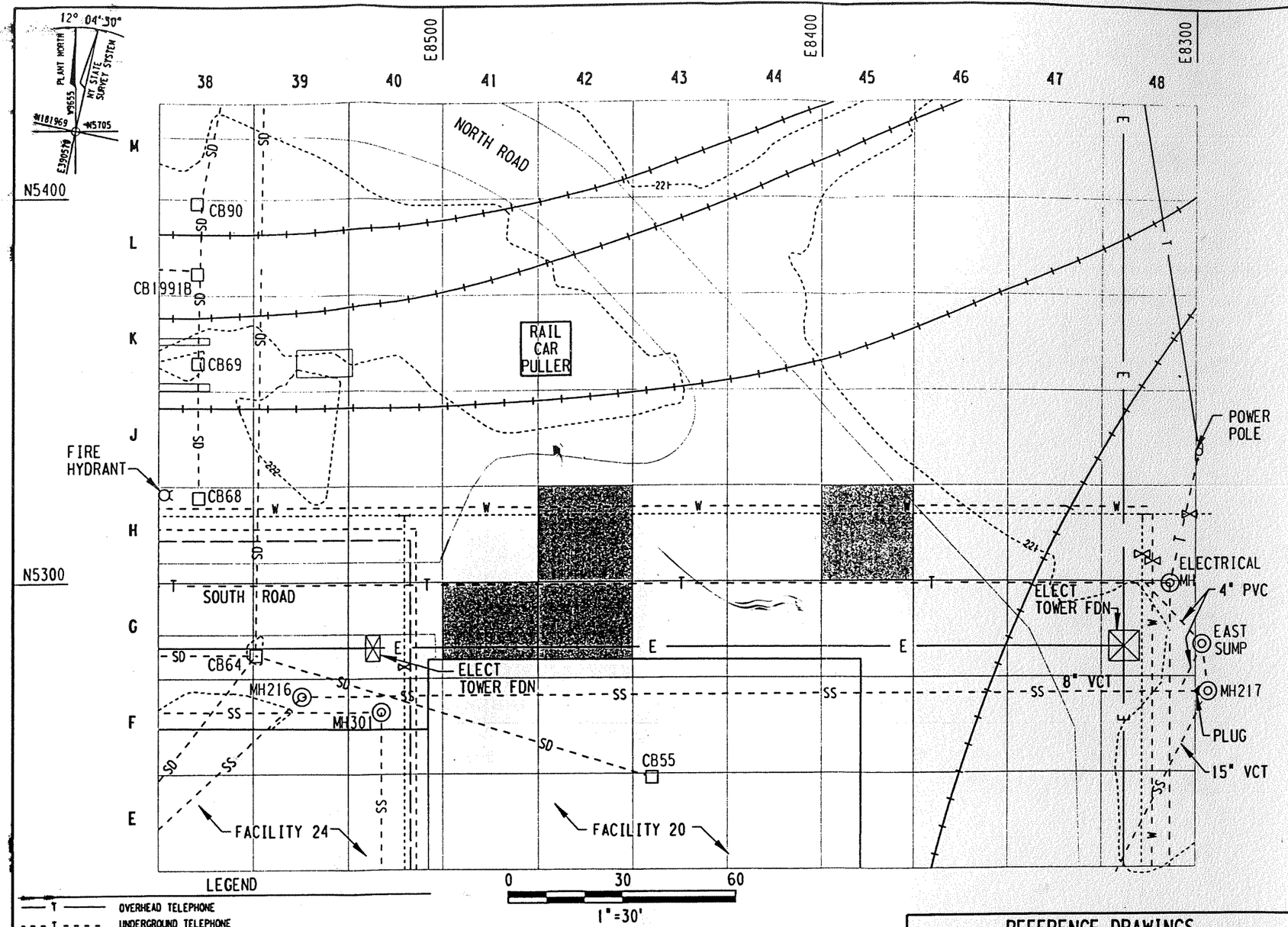
Attachments:

1. Figure 1 (FCR-206), Pre-Excavation PCB Data for North Yard Grid G41and Vicinity
2. Bechtel Drawing 20384-Y-NYZ-005, North Yard Excavation Plan for Grid G41 and Vicinity

CHANGE APPROVED	REQUESTED DATE OF FCR DISPOSITION	PROJECT FIELD ENGINEER/DATE
YES ☒ NO ☐	7-20-01	7-20-01
FCR APPROVED	**FCR/FCN INCORPORATION REQUIRED**	**ENGINEERING GROUP SUPERVISOR/DATE**
YES ☒ NO ☐	YES ☐ NO ☒ (see remark #1)	7-201-01

REMARKS

1. This FCR is written toward a new drawing (Y-NYZ-005) in order to provide the documentation and control necessary for the subject remediation. Therefore, this FCR need not be incorporated into Y-NYZ-005.



EXCAVATION SCHEDULE FOR NORTH YARD GRID G41 AND VICINITY

GRID	INITIAL DEPTH OF CUT	MAXIMUM PCB RESULT	DISPOSAL LOCATION FOR SOIL	DISPOSAL VOLUME		
				OFFISTE	ONSITE	TOTAL
G41	1.0 FT	121.4 PPM	OFFSITE (MODEL CITY)	23 CY		23 CY
G42	1.0 FT	18.81 PPM	ONSITE LANDFILL		23 CY	23 CY
H42	2.0 FT	72.94 PPM	OFFSITE (MODEL CITY)	46 CY		46 CY
H45	1.0 FT	69 PPM	OFFSITE (MODEL CITY)	23 CY		23 CY
DISPOSAL VOLUME				92 CY	23 CY	115 CY

NOTES:
1. DISPOSE OF CONCRETE (70 CY) IN THE ONSITE LANDFILL.
2. PCB DISPOSAL LIMIT FOR ONSITE LANDFILL IS <50 PPM.

REFERENCE DRAWINGS

NORTH YARD SOIL SAMPLING PLAN	Y-NYZ-001
NORTH YARD SOIL SAMPLING PLAN	Y-NYZ-002
YARD PIPING PLAN - AREA 7	19-6225-Y-M-7
YARD PIPING PLAN - AREA 6	19-6225-Y-M-6
PLANT 13.8KV DISTRIBUTION PLAN & SECTIONS - SHEET 1	19-6225-Y-E-5
NORTH YARD SOIL SAMPLING PLAN GRID G41 AND VICINITY	Y-NYZ-004

NOTES:

1. COORDINATES ARE BASED ON PLANT GRID. REMEDIATION GRID ALIGNS WITH PLANT GRID; LETTERS I, O, AND Q ARE OMITTED TO AVOID CONFUSION WITH NUMBERS 0 AND 1.
2. FOR PCB SAMPLE RESULTS, SEE FIGURE 1 IN FCR-206.
3. PERFORM WORK PER THIS DRAWING AND THE FOLLOWING SPECIFICATIONS:
   - CSP-005, ONSITE TRANSPORT OF CONTAMINATED MATERIAL
   - CSP-021, REINFORCED CONCRETE
   - CSP-024, UNCONTAMINATED EARTHWORK
   - CSP-025, CONTAMINATED EARTHWORK
4. PRIOR TO EXCAVATION, COORDINATE WITH BECHTEL TO LOCATE AND PROTECT UTILITIES AND OTHER PLANT FEATURES FROM DAMAGE OR CONTAMINATION.
5. TRANSFER WATER COLLECTED WITHIN EXCAVATION AREAS TO AN ONSITE TREATMENT SYSTEM PER BECHTEL DIRECTION.
6. TO REMOVE CONCRETE, SAW CUT ABOVE LIMITS OF EXCAVATION, PREFERABLY ALONG EXISTING JOINTS. REMOVE CONCRETE. REMOVE LOOSE MATERIAL (STONE, SOIL, ETC.) FROM SURFACE. WASH CONCRETE TO REMOVE REMAINING FOREIGN MATERIAL. INCLUDE LOOSE MATERIAL AND SEDIMENT WASHED FROM CONCRETE WITH EXCAVATION SPOILS FOR DISPOSAL. CUT REBAR TO WITHIN 6" OF SURFACE.
7. SAMPLING AND ANALYSIS OF CONCRETE IS NOT REQUIRED. DISPOSE OF CONCRETE IN ONSITE LANDFILL, FILLING VOIDS AROUND CONCRETE WITH COMPACTED EARTH. EVENTUALLY, COVER CONCRETE WITH AT LEAST 2' OF EARTH BEFORE PLACEMENT OF LANDFILL CAP.
8. EXCAVATE AND DISPOSE OF SPOILS PER THE EXCAVATION SCHEDULE TO ACHIEVE THE CLEANUP GOAL OF <10 PPM PCB.
9. COLLECT AND COMPOSITE 9 RANDOM SAMPLES FROM EACH EXCAVATED GRID. ANALYZE EACH GRID COMPOSITE USING SW-846 METHOD 8080/8082. EACH COMPOSITE MUST BE BELOW THE CLEANUP GOAL.
10. WHEN SO DIRECTED BY BECHTEL, BACKFILL EXCAVATIONS WITH STRUCTURAL FILL (E.G., COMPACTED EARTH, CRUSHED STONE, OR CLSM), AND RESTORE CONCRETE TO MATCH EXISTING PAVEMENT (REBAR, FINISH, ETC.).

STATE OF NEW YORK
JEFFREY W. GRINDSTAFF
LICENSED PROFESSIONAL ENGINEER
7-20-01
W.O. 070638

NO.	DATE	REVISIONS	BY	CADD CHKR	DESIGN SUPV	ENGR	PROJ ENGR	RMC
1	7/20/01	ISSUED FOR USE	CH					

SCALE NOTED

BECHTEL ENVIRONMENTAL INC.
OAK RIDGE, TENNESSEE

REYNOLDS METALS COMPANY - MASSENA N.Y.
ST. LAWRENCE REDUCTION PLANT

NORTH YARD
EXCAVATION PLAN
GRID G41 AND VICINITY

JOB NO.	DRAWING NO.	REV
20384	Y-NYZ-005	0

O:\20384\YNYZ-005.DGN
07/20/2001

11 X 17

Grid H45 - Excavation Complete

Dated 08/22/2001

Wetlands

Potliner Storage Pad

Field Change Request 209

Post Remedial Report for Fourth Quarter 2001 (Bechtel, June 2002)

FIELD CHANGE REQUEST/FIELD CHANGE NOTICE

Job No. 20384-061

Page 1 of 1

FCR NO.	FCN NO.
	209

DRAWING OR SPECIFICATION NUMBER	REV. NO.	DRAWING OR SPECIFICATION CHANGES				PREPARED BY AND DATE	CHECKED BY AND DATE
		DCN	FCR	FCN	ADDENDA		
Overall Completion Report (Bechtel, October 2000)	0			X		11-20-01 J. Grindstaff	11-20-01

REFERENCE

1. Letter from D. Bence (RMC) to P. Waite (NYSDEC), "Water Storage Tank Installation – Site Sample Results; Disposal of Excavation Spoil," October 12, 2001.
2. Letter from to P. Waite (NYSDEC) to R. Esterline (RMC), "Water Storage Tank Installation and 002 Diversion Area Disposal in Onsite Landfill," October 30, 2001.

REASON FOR CHANGE

Alcoa will replace the potable water storage tank at its Massena East Smelting Plant (formerly RMC). The new tank will be immediately east of the existing tank (Facility 65A).

EXISTING CONDITION

The work site is near the west end of the North Yard Area of Concern, which was successfully remediated as described in the *Area-Specific Completion Report for Remediation of North Yard* (Bechtel 1998). The near-surface soil PCB concentrations in this portion of the North Yard have been characterized in the past as generally between 1 and 10 ppm. The area is paved with concrete. Soil samples were collected beneath the concrete in September 2001 over the excavation footprint for the proposed new tank; PCB concentrations were < 4 ppm in the upper 6 inches and non-detect in the 24-30 inch depth. Reference 1 depicts the excavation area and provides the pre-excavation sampling results.

DESCRIPTION OF CHANGE

Re: AREA EXCAVATION FOR WATER STORAGE TANK INSTALLATION

This FCN pertains only to remedial work. Excavation beyond the 2-ft limit, restoration, and related capital work are by others.

Work under this FCN conformed to the requirements established by the following project documents:

- *RD/RA Work Plan*, Rev. 2 (Bechtel 1993)
- *Area-Specific Safety and Health Plan for Remediation of North Yard Area*, Rev. 1 (Bechtel 1995)
- *Area-Specific Work Plan for Remediation of North Yard Area*, Rev. 1 (Bechtel 1995)
- CSP-005, *Onsite Transportation of Contaminated Material*
- CSP-024, *Uncontaminated Earthwork*
- CSP-025, *Contaminated Earthwork*

Concrete pavement was removed. Concrete spoils were brushed or washed to remove loose material, which was collected and disposed of per established protocol. Rebar was cut to within 6" of concrete surface. Concrete spoils were then disposed of as common fill in an area west of the plant facilities.

Soil was excavated to a depth of 2 ft, with the spoils disposed of in the onsite Landfill.

Details of this work will be added to the project's Overall Completion Report for submission to NYSDEC.

CHANGE APPROVED	REQUESTED DATE OF FCR DISPOSITION	PROJECT FIELD ENGINEER/DATE
YES ☒ NO ☐		11-20-01
FCR APPROVED	**FCR/FCN INCORPORATION REQUIRED**	**ENGINEERING GROUP SUPERVISOR/DATE**
YES ☒ NO ☐	YES ☒ NO ☐	11-20-01

REMARKS

Potliner Storage Pad

Wetlands

Appendix B

O&M Activities

Description of Activity	Schedule Requirement	Planned Schedule											
		J	F	M	A	M	J	J	A	S	O	N	D
Surface Water *(see Note 1)*													
Inspect surface water monitoring stations	Annually					X							
Monitor surface water chemistry from RY Pond (pond east of Landfill)	Quarterly[4]												
	(Revised July 1999, January 2013)												
Groundwater													
Inspect monitoring wells/piezometers	Annually					X							
Monitor groundwater chemistry	Quarterly[5]			X			X			X			X
Measure water levels in wells/piezometers	Quarterly			X			X			X			X
See also under “BMP” and “Landfill” below													
General Area Inspections													
Inspect BMP cap and area	Spring and Fall				X						X		
Inspect Landfill cap and area	Spring and Fall				X						X		
Inspect North Yard and tank containments	Annually					X							
Inspect North Yard west and east sumps	Quarterly	X			X			X			X		
Inspect PSP and area	Annually					X							
Inspect RY and area	Annually					X							
BMP Groundwater Removal													
Measure groundwater elevations inside BMP	Monthly	X	X	X	X	X	X	X	X	X	X	X	X
Obtain groundwater transfer quantity from BMP	Monthly	X	X	X	X	X	X	X	X	X	X	X	X
Inspect discharge line from BMP sump	Quarterly	X			X			X			X		
Landfill Groundwater & Stormwater Removal													
Measure groundwater elevations around landfill	Monthly	X	X	X	X	X	X	X	X	X	X	X	X
Record quantity of groundwater and stormwater transferred from Landfill (see Note 2)	Weekly - Reported Monthly	X	X	X	X	X	X	X	X	X	X	X	X
Inspect LCRS and groundwater transfer line	Quarterly	X			X			X			X		

Notes:

1. SPDES surface water monitoring is performed and reported separately.
2. Transfer will consist only of landfill groundwater (i.e., no stormwater).
3. Chart shows schedule for year 2019.
4. Quarterly sampling for PCBs discontinued per letter from NYSDEC dated January 3, 2013.
5. Groundwater sampled quarterly at Landfill; all other areas sampled semiannually

Appendix C

Analytical Data

Monitoring Well MW-11SR

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-11SR	99Q1	47	0.39	0.01U	0.4	0.065U	3200
MW-11SR	99Q2	48	0.42	0.01U	0.3	0.065U	2900
MW-11SR	99Q3	49	0.22	0.01U	0.3	0.065U	3100
MW-11SR	99Q4	50	0.64	0.01U	0.4	0.065U	1900
MW-11SR	00Q1	51	2.3	0.01U	0.4	0.065U	2600
MW-11SR	00Q2	52	0.58	0.01U	0.3	0.065U	2200
MW-11SR	00Q3	53	0.49	0.01U	0.3	0.065U	2200
MW-11SR	00Q4	54	0.1U	0.01U	0.294	0.065U	1860
MW-11SR	01Q1	55	0.12	0.01U	0.336	0.065U	1710.19
MW-11SR	01Q2	56	0.94	0.222	0.02U	0.065U	1859.77
MW-11SR	01Q3	57	2.51	0.01U	0.02U	0.065U	201.74
MW-11SR	01Q4	58	0.33	0.01U	0.379	0.065U	1570.9
MW-11SR	02Q1	59	0.1	0.01U	0.308	0.065U	1665.55
MW-11SR	02Q2	60	0.16	0.01U	0.286	0.065U	1518.64
MW-11SR	02Q3	61	0.16	0.01U	0.391	0.065U	1622.13
MW-11SR	02Q4	62	0.16	0.01U	0.372	0.065U	1179.98
MW-11SR	03Q1	63	1.082	0.01U	0.354	0.065U	1487.367
MW-11SR	03Q2	64	0.273	0.01U	0.348	0.065U	1562.88
MW-11SR	03Q3	65	4.552	0.01U	0.344	0.065U	1322.15
MW-11SR	03Q4	66	0.052	0.01U	0.358	0.065U	1314.33
MW-11SR	04Q1	67	3.233	0.01U	0.295	0.065U	1322.56
MW-11SR	04Q2	68	0.581J	0.01U	0.316	0.065U	1105.91
MW-11SR	04Q3	69	0.672	0.01U	0.376	0.065U	1200.76
MW-11SR	04Q4	70	6.464J	0.01U	0.41	0.065U	1032.48
MW-11SR	05Q1	71	9.085	0.01U	0.4429	0.065U	943.35
MW-11SR	05Q2	72	0.891	0.01U	0.3439	0.065U	1059.045
MW-11SR	05Q3	73	2.331	0.01U	0.3713	0.065U	995.67
MW-11SR	05Q4	74	0.963	0.01U	0.3459	0.065U	572.92
MW-11SR	06Q1	75	0.314	0.01U	0.26	0.066	748.1
MW-11SR	06Q2	76	0.641J	0.01U	0.3306	0.066	79.62
MW-11SR	06Q3	77	1.507	0.01U	0.3402	0.065U	928.55
MW-11SR	06Q4	78	1.333	0.01U	0.3401	0.065U	602.79
MW-11SR	07Q1	79	0.391	0.01U	0.341	0.065U	913.9
MW-11SR	07Q2	80	0.48	0.01U	0.3366	0.065U	892.04
MW-11SR	07Q3	81	4.898	0.01U	0.3818	0.065U	827.31
MW-11SR	07Q4	82	1.656	0.005U	0.3022	0.065U	700
MW-11SR	08Q1	83	7.57	0.005U	0.3745	0.065U	592
MW-11SR	08Q2	84	2.1095R	0.01U	0.3782	0.065U	788.5
MW-11SR	08Q3	85	2.713	0.01U	0.3552	0.065U	694
MW-11SR	08Q4	86	6.22	0.01U	0.4102	0.065U	698
MW-11SR	09Q1	87	11.9	0.01UJ	0.33	0.505U	488
MW-11SR	09Q2	88	7.74	0.01U	0.4009	0.065U	561
MW-11SR	09Q3	89	8.11	0.01U	0.3126	0.065U	585
MW-11SR	09Q4	90	3.251	0.01U	0.3936	0.505U	579
MW-11SR	10Q1	91	2.29	0.01U	0.2855	0.065U	556
MW-11SR	10Q2	92	1.39	0.01U	0.284	0.065U	564
MW-11SR	10Q3	93	2.618	0.01U	1.34	0.065U	537
MW-11SR	10Q4	94	10.42	0.01U	0.3474	0.065U	497
MW-11SR	11Q1	95	3.99	0.01U	0.4	0.065U	624
MW-11SR	11Q2	96	0.94	0.01U	0.41	0.065U	611
MW-11SR	11Q3	97	12.7	0.12	1.9	0.049U	110
MW-11SR	11Q4	98	7.49	0.01U	0.38	0.065U	482
MW-11SR	12Q1	99	1.57	0.01U	0.38	0.065U	729
MW-11SR	12Q2	100	1.83	0.01U	0.56	0.061U	600
MW-11SR	12Q3	101	1.23	0.01U	0.32	0.061U	469
MW-11SR	12Q4	102	2.77	0.01U	0.41	0.061U	522
MW-11SR	13Q2	104	5.68	0.01U	0.32	0.061U	590
MW-11SR	13Q4	106	5.37	0.01U	0.32	0.061U	332
MW-11SR	14Q2	108	1.97	0.01U	0.3	0.061U	502
MW-11SR	14Q4	110	2.68	0.01U	0.3	0.061U	314
MW-11SR	15Q2	112	0.32	0.01U	0.33J	0.061U	453
MW-11SR	15Q4	114	0.24	0.01U	0.37	0.061U	349
MW-11SR	16Q2	116	0.4	0.005U	0.37	0.065U	486
MW-11SR	16Q4	118	0.386	0.002J	0.315	0.065U	433
MW-11SR	17Q2	120	0.174	0.005U	0.25	0.065U	479.5
MW-11SR	17Q4	122	1.28	0.005U	0.312	0.065U	355
MW-11SR	18Q2	124	0.508	0.01U	0.304	0.065U	458
MW-11SR	18Q4	126	0.4815	0.01U	0.311	0.02U	307
MW-11SR	19Q2	128	0.81	0.005U	0.288	0.065U	300J
MW-11SR	19Q4	130	0.456	0.004J	0.47	0.065U	303
MW-11SR	20Q2	132	0.189	0.005U	0.473	0.019U	424
MW-11SR	20Q4	134	0.274	0.005U	0.5	0.065U	231

Monitoring Well MW-12S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-12S	99Q1	47	Note 1				
MW-12S	99Q2	48	0.46	0.05	6.5	0.065U	220
MW-12S	99Q3	49	5.7	0.05	7.5	0.065U	340
MW-12S	99Q4	50	1	0.05	8.2	0.065U	290
MW-12S	00Q1	51	2.2	0.06	8.2	0.065U	290
MW-12S	00Q2	52	0.34	0.05	7	0.065U	330
MW-12S	00Q3	53	0.8	0.05	7.5	0.065U	420
MW-12S	00Q4	54	0.12	0.01U	8.468	0.065U	357
MW-12S	01Q1	55	0.39	0.049	8.233	0.065U	319.53
MW-12S	01Q2	56	2.44	0.069	6.227	0.065U	406.56
MW-12S	01Q3	57	0.71	0.062	6.69	0.065U	406.77
MW-12S	01Q4	58	0.23	0.0855	11.01	0.065U	424.67
MW-12S	02Q1	59	0.28	0.044	10.19	0.065U	461.09
MW-12S	02Q2	60	0.29	0.073	9.073	0.065U	456.15
MW-12S	02Q3	61	0.3	0.063	11.97	0.065U	466.44
MW-12S	02Q4	62	0.286	0.063	10.69	0.065U	495.65
MW-12S	03Q1	63	55.65	0.0575	9.798	0.065U	400.184
MW-12S	03Q2	64	0.103	0.0685	8.556	0.065U	353.27
MW-12S	03Q3	65	0.212	0.07	10.55	0.065U	382.08
MW-12S	03Q4	66	5.777	0.0615	11.69	0.065U	285.99
MW-12S	04Q1	67	13.39	0.058	9.071	0.065U	370.14
MW-12S	04Q2	68	10.103	0.0705	10.8	0.065U	346.07
MW-12S	04Q3	69	13.91	0.0605	8.83	0.065U	315
MW-12S	04Q4	70	7.731J	0.0175	12.88	0.065U	409.32
MW-12S	05Q1	71	17.01	0.0435	7.345	0.065U	363.82
MW-12S	05Q2	72	8.279	0.0615	12.52	0.065U	370.07
MW-12S	05Q3	73	5.9455	0.04275	11.081	0.065U	369.945
MW-12S	05Q4	74	6.791	0.072	16.05	0.065U	376.77
MW-12S	06Q1	75	12.35	0.0425	8.77	0.065U	446.59
MW-12S	06Q2	76	8.01	0.0445	14.68	0.065U	457.2
MW-12S	06Q3	77	4.826	0.0458	5.233J	0.065U	437.485
MW-12S	06Q4	78	1.317	0.0735	13.2	0.065U	362.88
MW-12S	07Q1	79	15.64	0.055	9.006	0.065U	413.57
MW-12S	07Q2	80	16.03	0.057	13.66	0.065U	570.22
MW-12S	07Q3	81	10.5295	0.0625	29.365	0.065U	526.705
MW-12S	07Q4	82	3.26	0.049	10.39	0.143	380
MW-12S	08Q1	83	30.3	0.113	10.13	0.065U	383
MW-12S	08Q2	84	12.01R	0.035	12.29	0.065U	595
MW-12S	08Q3	85	48.405J	0.04R	12.255	0.065U	583
MW-12S	08Q4	86	19.995J	0.035J	12.89	0.065U	584
MW-12S	09Q1	87	31.1	0.026J	11.8	0.485U	497
MW-12S	09Q2	88	25.9	0.0346	9.997	0.065U	483
MW-12S	09Q3	89	26.9	0.0331R	13.7	0.065U	570
MW-12S	09Q4	90	13.28	0.0686	15.44	0.065U	628
MW-12S	10Q1	91	13.52	0.0508	13.93	0.065U	395
MW-12S	10Q2	92	1.141	0.01U	0.2761J	0.065U	514
MW-12S	10Q3	93	47.89	0.034	11.1	0.065U	690
MW-12S	10Q4	94	18.95	0.059	13.75	0.065U	686
MW-12S	11Q1	95	1.01	0.06	13.3	0.065U	670
MW-12S	11Q2	96	6.01	0.044	11.8	0.065U	794
MW-12S	11Q3	97	12.7	0.059	12.3	0.05U	832
MW-12S	11Q4	98	13.3	0.046	11.8	0.063U	625
MW-12S	12Q1	99	16.7	0.04	10.8	0.064U	594
MW-12S	12Q2	100	19	0.044	11.8	0.061U	787
MW-12S	12Q3	101	16	0.04	13.8	0.061U	797
MW-12S	12Q4	102	4.89	0.04	9.54	0.061U	481
MW-12S	13Q2	104	22	0.037	11.3	0.061U	703
MW-12S	13Q4	106	4.2	0.039	10.1	0.061U	804
MW-12S	14Q2	108	18.3	0.04	10.7	0.068U	887
MW-12S	14Q4	110	13.2	0.041	12.3	0.061U	822
MW-12S	15Q2	112	4.91	0.043	12.6	0.061U	888
MW-12S	15Q4	114	1.28	0.039	14.5	0.061U	775
MW-12S	16Q2	116	3.04	0.027	13.8	0.065U	1030
MW-12S	16Q4	118	5.87	0.018	13.7	0.065U	777
MW-12S	17Q2	120	1.55	0.032	9.38	0.065U	806
MW-12S	17Q4	122	5.44	0.021	11.3	0.065U	946
MW-12S	18Q2	124	3.83	0.029	11	0.065U	1020
MW-12S	18Q4	126	3.2	0.039	12.5	0.02U	955
MW-12S	19Q2	128	7.09	0.011	10.6	0.065U	1040J
MW-12S	19Q4	130	0.5	0.011	11.2	0.065U	958
MW-12S	20Q2	132	0.445	0.028	11.5	0.02U	1000
MW-12S	20Q4	134	0.306	0.027	11.4	0.065U	943

Monitoring Well MW-13S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-13S	99Q1	47	2.1	0.18	10	0.065U	1300
MW-13S	99Q2	48	2.8	0.33	5.3	0.094	2000
MW-13S	99Q3	49	2	0.41	4.1	0.065U	3500
MW-13S	99Q4	50	1.9	0.1	17	0.23	310
MW-13S	00Q1	51	1.6	0.23	9.2	0.065U	1200
MW-13S	00Q2	52	0.48	0.06	13	0.094	270
MW-13S	00Q3	53	1.9	0.09	11	0.065U	880
MW-13S	00Q4	54	0.22	0.289	4.507	0.065U	3680
MW-13S	01Q1	55	0.19	0.341	6.37	0.065U	2531.55
MW-13S	01Q2	56	0.27	0.235	7.978	0.065U	974.43
MW-13S	01Q3	57	2.48	0.536	0.788	0.065U	4132.9
MW-13S	01Q4	58	0.24	0.631	6.666	0.065U	3153.12
MW-13S	02Q1	59	0.12	0.399	7.777	0.065U	1452.18
MW-13S	02Q2	60	0.23	0.268	9.637	0.065U	1867.8
MW-13S	02Q3	61	0.15	0.418	4.768	0.065U	3812.14
MW-13S	02Q4	62	0.216	0.142	11.48	0.065U	967.85
MW-13S	03Q1	63	0.1U	0.31	7.089	0.065U	1621.104
MW-13S	03Q2	64	0.011U	0.244	7.732	0.065U	1649.91
MW-13S	03Q3	65	0.084	0.312	8.38	0.065U	1717.19
MW-13S	03Q4	66	0.1	0.161	7.738	0.065U	2075.19
MW-13S	04Q1	67	2.762	0.176	5.153	0.065U	1130.18
MW-13S	04Q2	68	2.814	0.025	11.2	0.065U	347.31
MW-13S	04Q3	69	0.562	0.343	7.892	0.065U	3192.21
MW-13S	04Q4	70	1.228J	0.0435	5.339	0.065U	3110.15
MW-13S	05Q1	71	1.83	0.017	11.89	0.065U	2260.85
MW-13S	05Q2	72	1.846	0.053	8.765	0.065U	377.6
MW-13S	05Q3	73	1.19	0.484	5.903	0.065U	---
MW-13S	05Q4	74	0.6065	0.12225	11.9565	0.065U	656.085
MW-13S	06Q1	75	1.163	0.0685	8.763	0.065U	1541.67
MW-13S	06Q2	76	2.153	0.0475	10.88	0.067	466.56
MW-13S	06Q3	77	1.2	0.231	4.629	0.065U	537.94
MW-13S	06Q4	78	0.4575	0.1413J	8.7695J	0.065U	977.075J
MW-13S	07Q1	79	1.085	0.13	9.811	0.065U	1203.62
MW-13S	07Q2	80	2.797	0.069	10.97	0.065U	578.77
MW-13S	07Q3	81	0.612	0.4	3.486	0.065U	267.84
MW-13S	07Q4	82	0.698	0.137	10.615	0.065U	605
MW-13S	08Q1	83	30.3	0.113	10.13	0.065U	383
MW-13S	08Q2	84	12.01R	0.035	12.29	0.065U	595
MW-13S	08Q3	85	48.405J	0.04R	12.255	0.065U	583
MW-13S	08Q4	86	19.995J	0.035J	12.89	0.065U	584
MW-13S	09Q1	87	2.125J	0.2025	8.86J	0.5U	1735
MW-13S	09Q2	88	2.8	0.159	5.714	0.065U	2170
MW-13S	09Q3	89	2.8	0.132	6.771	0.065U	2540J
MW-13S	09Q4	90	2.072	0.124	8.087	0.065U	1330
MW-13S	10Q1	91	2.823	0.102J	3.271	0.065U	2650
MW-13S	10Q2	92	2.5	0.051	12.88	0.065U	660
MW-13S	10Q3	93	1.211	0.191	4.885	0.065U	2770
MW-13S	10Q4	94	1.922	0.107	6.731	0.065U	1540
MW-13S	11Q1	95	1.66	0.067	8.63	0.065U	754
MW-13S	11Q2	96	4.79	0.16	4.66	0.18	2580
MW-13S	11Q3	97	0.88	0.271	12	0.049U	1440
MW-13S	11Q4	98	2.3	0.106	11.2	0.065U	510
MW-13S	12Q1	99	1.4	0.102	12.1	0.098	900
MW-13S	12Q2	100	1.16	0.194	7.96	0.0305	2250
MW-13S	12Q3	101	0.46	0.198	15	0.0315	1140
MW-13S	12Q4	102	0.76	0.097	11.3	0.0305	485
MW-13S	13Q2	104	3.2	0.084	4.62	0.061U	3200
MW-13S	13Q4	106	0.66	0.072	10	0.061U	852
MW-13S	14Q2	108	0.58	0.088	3.84	0.064U	3930
MW-13S	14Q4	110	0.28J	0.142	9.71	0.061U	2270
MW-13S	15Q2	112	0.72	0.064	2.29	0.061U	3760
MW-13S	15Q4	114	0.56	0.218	14.8	0.061U	1640
MW-13S	16Q2	116	0.23	0.099	9.64	0.065U	2710
MW-13S	16Q4	118	4.13	0.04	9.68	0.062	758
MW-13S	17Q2	120	0.363	0.063	6.99	0.065U	2080
MW-13S	17Q4	122	0.93J	0.043	9.64	0.065U	1400
MW-13S	18Q2	124	1.16	0.061	4.75	0.039	3000
MW-13S	18Q4	126	0.422	0.045	12.5	0.065U	738
MW-13S	19Q2	128	0.157	0.036	2.67	0.065U	3280J
MW-13S	19Q4	130	0.185	0.018	8.6	0.065U	687
MW-13S	20Q2	132	0.259	0.069	6.56	0.019U	2540
MW-13S	20Q4	134	0.218	0.01	7.76	0.065U	1704

Monitoring Well MW-15S/MW-15S-87

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-15S-87	99Q1	47	1	0.01U	1.3	0.065U	560
MW-15S-87	99Q2	48	0.53	0.01U	1	0.065U	640
MW-15S-87	99Q3	49	0.37	0.01U	1.2	0.065U	1800
MW-15S-87	99Q4	50	0.31	0.01U	1.4	0.065U	900
MW-15S-87	00Q1	51	0.44	0.01U	1.5	0.065U	900
MW-15S-87	00Q2	52	0.81	0.01U	1.3	0.065U	1100
MW-15S-87	00Q3	53	0.33	0.01U	1.3	0.082	900
MW-15S-87	00Q4	54	0.18	0.01U	1.268	0.065U	732
MW-15S-87	01Q1	55	0.3	0.01U	1.232	0.065U	849.75
MW-15S-87	01Q2	56	0.11	0.01U	1.123	0.065U	855.3
MW-15S-87	01Q3	57	0.44	0.01U	1.106	0.065U	930.81
MW-15S-87	01Q4	58	0.13	0.01U	1.021	0.065U	888.43
MW-15S-87	02Q1	59	0.1U	0.01U	1.011	0.065U	797.08
MW-15S-87	02Q2	60	0.1	0.01U	1.021	0.233	868.27
MW-15S-87	02Q3	61	0.11	0.0265	1.241	0.065U	891.51
MW-15S-87	02Q4	62	0.044	0.01U	1.089	0.065U	972.17
MW-15S-87	03Q1	63	0.1U	0.01U	1.054	0.065U	840.077
MW-15S-87	03Q2	64	0.014	0.01U	0.901	0.065U	876.29
MW-15S-87	03Q3	65	0.097	0.01U	1.263	0.065U	896.45
MW-15S-87	03Q4	66	0.066	0.01U	1.142	0.065U	964.35
MW-15S-87	04Q1	67	4.509	0.01U	1.104	0.065U	716.83
MW-15S-87	04Q2	68	6.142	0.01U	1.327	0.065U	339.49
MW-15S-87	04Q3	69	10.19	0.01U	1.304	0.065U	728.36
MW-15S-87	04Q4	70	3.116J	0.01U	1.481	0.065U	819.62
MW-15S-87	05Q1	71	4.407	0.01U	1.413	0.065U	373.92
MW-15S-87	05Q2	72	4.587	0.01U	1.338	0.065U	177.72
MW-15S-87	05Q3	73	8.314	0.01U	1.654	0.065U	340.25
MW-15S-87	05Q4	74	3.39	0.01U	1.841	0.065U	148.66
MW-15S-87	06Q1	75	3.968	0.01U	1.697	0.065U	89.43
MW-15S-87	06Q2	76	2.404	0.01U	1.337	0.065U	107.92
MW-15S-87	06Q3	77	5.163	0.01U	1.417	0.065U	201.02
MW-15S-87	06Q4	78	1.26	0.01U	2.02	0.065U	220.55
MW-15S-87	07Q1	79	3.45	0.01U	1.578	0.065U	86.5
MW-15S-87	07Q2	80	1.698	0.01U	2.103	0.065U	76.63
MW-15S-87	07Q3	81	9.59	0.01U	1.68	0.065U	284.74
MW-15S-87	07Q4	82	2.97	0.031	1.795	0.065U	390
MW-15S-87	08Q1	83	24	0.005U	1.786	0.065U	170
MW-15S-87	08Q2	84	13.51R	0.01U	1.858	0.065U	156
MW-15S-87	08Q3	85	17.76	0.01U	1.898	0.065U	238
MW-15S-87	08Q4	86	28.93	0.01U	1.445	0.065U	391
MW-15S-87	09Q1	87	7.85	0.005UR	1.25	0.2U	230J
MW-15S-87	09Q2	88	1.84J	0.01U	1.507	0.065U	242
MW-15S-87	09Q3	89	19.8	0.01U	1.683	0.065U	243
MW-15S-87	09Q4	90	7.313	0.01U	1.584	0.065U	230
MW-15S-87	10Q1	91	11.91	0.01U	1.793	0.065U	165
MW-15S-87	10Q2	92	3.683	0.01U	1.597	0.065U	167
MW-15S-87	10Q3	93	4.6	0.01U	1.524	0.065U	214
MW-15S-87	10Q4	94	7.048	0.01U	1.504	0.065U	51.4
MW-15S-87	11Q1	95	9.16	0.01U	1.55	0.0657U	122
MW-15S-87	11Q2	96	12	0.01U	1.6	0.12U	110
MW-15S-87	11Q3	97	29.6	0.01U	1.63	0.049U	336
MW-15S-87	11Q4	98	3.54	0.01U	1.85	0.063U	193
MW-15S-87	12Q1	99	2.25	0.01U	1.63	0.064U	139
MW-15S-87	12Q2	100	5.34	0.01U	2.14	0.061U	240
MW-15S-87	12Q3	101	NA	NA	NA	0.064	NA
MW-15S-87	12Q4	102	1.1	0.01U	2.06	0.061U	247
MW-15S-87	13Q2	104	2.08	0.01U	2.51	0.061U	146
MW-15S-87	13Q4	106	1.35	0.01U	2.43	0.061U	83.9
MW-15S-87	14Q2	108	4.08	0.01U	2.61	0.065U	172
MW-15S-87	14Q4	110	7.49	0.01U	2.28	0.061U	258
MW-15S-87	15Q2	112	1.65	0.01U	2.42	0.061U	248
MW-15S-87	15Q4	114	7.98	0.01U	2.54	0.061U	248
MW-15S-87	16Q2	116	0.762	0.005U	2.66	0.065U	201
MW-15S-87	16Q4	118	0.226	0.002J	4.25	0.065U	55.8
MW-15S-87	17Q2	120	0.466	0.007	2.46	0.065U	99.5
MW-15S-87	17Q4	122	1.16	0.005U	2.91	0.065U	73.8
MW-15S-87	18Q2	124	3.37	0.005U	3.1	0.065U	131
MW-15S-87	18Q4	126	2.48	0.005U	3.09	0.02U	122
MW-15S-87	19Q2	128	3.41	0.005U	2.87	0.065U	131J
MW-15S-87	19Q4	130	3.41	0.005U	3.26	0.065U	68.7
MW-15S-87	20Q2	132	6.24	0.005U	3	0.019U	121
MW-15S-88	20Q4	134	0.713	0.005U	3.62	0.065U	106

Monitoring Well MW-31SR

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-31SR	99Q4	1	0.97	0.01	1.3	0.065U	240
MW-31SR	00Q1[2]	2 (1)	5.3	2	0.9	0.065U	140
MW-31SR	00Q1	3	4.35	0.03	3.7	NA	167
MW-31SR	00Q2	4	2.3	0.04	1.1	0.065U	150
MW-31SR	00Q3	5	0.64	0.02	0.8	0.065U	170
MW-31SR	00Q4	6	0.01U	0.01U	0.622	0.065U	170
MW-31SR	01Q1	7	0.26	0.01U	0.77	0.065U	174.06
MW-31SR	01Q2	8	3.01	0.011	0.744	0.065U	189.5
MW-31SR	01Q3	9	2.18	0.01U	0.579	0.065U	174.27
MW-31SR	01Q4	10	0.78	0.01U	0.58	0.065U	168.51
MW-31SR	02Q1	11	0.12	0.048	0.863	0.065U	325.29
MW-31SR	02Q2	12	0.1U	0.01U	0.836	0.065U	221.8
MW-31SR	02Q3	13	0.15	0.01U	0.964	0.065U	176.95
MW-31SR	02Q4	14	0.212	0.01U	0.666	0.065U	186.2
MW-31SR	03Q1	15	0.1U	0.012	0.706	0.065U	205.75
MW-31SR	03Q2	16	0.045	0.0375	1.717	0.065U	417.47
MW-31SR	03Q3	17	0.076	0.01U	0.687	0.065U	186.41
MW-31SR	03Q4	18	0.076	0.01U	0.608	0.065U	187.64
MW-31SR	04Q1	19	12.3	0.0245	1.363	0.065U	242.79
MW-31SR	04Q2	20	33.41	0.0415	2.332	0.083	277.35
MW-31SR	04Q3	21	4.11	0.01U	0.665	0.065U	188.26
MW-31SR	04Q4	22	4.796J	0.01U	0.73	0.065U	172.05
MW-31SR	05Q1	71	16.82	0.031	0.9683	0.065U	206.76
MW-31SR	05Q2	72	6.704	0.036	2.462	0.065U	229.22
MW-31SR	05Q3	73	4.775	0.01U	0.6742	0.065U	181.8
MW-31SR	05Q4	74	6.264	0.0695	3.621	0.065U	257.8
MW-31SR	06Q1	75	6.375	0.0385	3.15	0.065U	224.08
MW-31SR	06Q2	76	13.43	0.0125	1.565	0.065U	180.91
MW-31SR	06Q3	77	10.45	0.01U	0.7745	0.078	188.77
MW-31SR	06Q4	78	2.191	0.0155	1.03	0.117	167.46
MW-31SR	07Q1	79	5.265	0.044	2.747	0.065U	172.4
MW-31SR	07Q2	80	6.26	0.0228	1.5105	0.065U	184.5
MW-31SR	07Q3	81	3.893	0.01U	0.6158	0.065U	191.9
MW-31SR	07Q4	82	4.888	0.005U	0.5877	0.065U	190
MW-31SR	08Q1	83	6.1	0.023	1.71	0.065U	201
MW-31SR	08Q2	84	15.68R	0.01U	1.1	0.065U	186
MW-31SR	08Q3	85	6.135	0.01U	0.6965	0.065U	179J
MW-31SR	08Q4	86	11.74	0.01U	0.5851	0.107	180
MW-31SR	09Q1	87	24.6	0.01U	0.79	0.495U	184
MW-31SR	09Q2	88	9.1	0.01U	1.422	0.065U	182
MW-31SR	09Q3	89	22	0.01U	0.5853	0.065U	168J
MW-31SR	09Q4	90	17.82	0.01U	0.6539	0.065U	198
MW-31SR	10Q1	91	15.86	0.01J	1.142	0.065U	186
MW-31SR	10Q2	92	2.173	0.01U	0.6839	0.065U	176
MW-31SR	10Q3	93	10.49	0.01U	0.6116	0.065U	177
MW-31SR	10Q4	94	12.51	0.028	1.691	0.065U	169
MW-31SR	11Q1	95	2.73	0.01U	1.7	0.065U	171
MW-31SR	11Q2	96	4.09	0.01U	1.39	0.065U	172
MW-31SR	11Q3	97	6.73	0.01U	0.59	0.051U	182
MW-31SR	11Q4	98	4.78	0.01U	0.92	0.064U	189
MW-31SR	12Q1	99	15.5	0.01U	0.55	0.064U	200
MW-31SR	12Q2	100	7.5	0.01U	0.73	0.061U	180
MW-31SR	12Q3	101	5.54	0.01U	0.51	0.061U	185
MW-31SR	12Q4	102	3.34	0.01U	0.99	0.061U	194
MW-31SR	13Q2	104	6.11	0.01U	1.8	0.061U	219
MW-31SR	13Q4	106	1.74	0.01U	1.53	0.061U	188
MW-31SR	14Q2	108	2.16	0.01U	1.16	0.066U	190
MW-31SR	14Q4	110	1.4J	0.01U	0.6	0.061U	183
MW-31SR	15Q2	112	0.84	0.01U	0.75	0.061U	192
MW-31SR	15Q4	114	1.62	0.01U	0.58	0.061U	206
MW-31SR	16Q2	116	0.662	0.004J	0.726	0.065U	201
MW-31SR	16Q4	118	0.516	0.013	1.61	0.065U	178
MW-31SR	17Q2	120	0.404	0.015	1.15	0.065U	180
MW-31SR	17Q4	122	0.438	0.013	1.68	0.065U	198
MW-31SR	18Q2	124	1.8	0.01U	1.08	0.065U	204
MW-31SR	18Q4	126	1.34	0.01U	1.49	0.065U	189
MW-31SR	19Q2	128	3.96	0.007	0.696	0.065U	218J
MW-31SR	19Q4	130	1.08	0.011	1.43	0.065U	189
MW-31SR	20Q2	132	1.49	0.002J	0.0998	0.02U	193
MW-31SR	20Q4	134	1.65	0.005U	0.913	0.065U	178

Notes:

1. Missing data indicates that the well was frozen.
2. Results for 00Q1 for Upstate Laboratories are shaded. See discussion in 00Q1 report, Appendix B, Section 5.

Key:

U = Not detected at value listed
NA = Not available
J = Estimated
R = Rejected value

Monitoring Well MW-10S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-10S	97Q1	39	0.47	0.03	0.02U	0.065U	170
MW-10S	97Q2	40	0.43	0.01U	0.02U	0.065U	180
MW-10S	97Q3	41	1.1	0.01U	0.02U	0.065U	160
MW-10S	97Q4	42	1.1	0.01U	0.02U	0.065U	190
MW-10S	98Q1	43	2.3	0.02	0.2	0.065U	170
MW-10S	98Q2	44	1.9	0.01U	0.02U	0.065U	120
MW-10S	98Q3	45	0.75	0.01U	0.02U	0.065U	170
MW-10S	98Q4	46	0.96	0.01U	0.02U	0.065U	150
MW-10S	99Q1	47	0.83	0.01U	0.02U	0.065U	550
MW-10S	99Q2	48	0.36	0.01U	0.02U	0.065U	150
MW-10S	99Q3	49	1.6	0.01	0.02U	0.065U	230
MW-10S	99Q4	50	1.5	0.02	0.02U	0.065U	150
MW-10S	00Q1	51	3.8	0.01U	0.3	0.065U	140
MW-10S	00Q2	52	0.23	0.01U	0.2	0.065U	160
MW-10S	00Q3	53	0.96	0.01U	0.2	0.065U	170
MW-10S	00Q4	54	0.1U	0.01U	0.237	0.065U	154
MW-10S	01Q1	55	0.82	0.01U	0.2U	0.065U	176.74
MW-10S	01Q2	56	0.67	0.01U	0.2U	0.065U	149.17
MW-10S	01Q3	57	3	0.01U	0.2U	0.065U	166.25
MW-10S	01Q4	58	0.11	0.01U	0.198	0.065U	174.89
MW-10S	02Q1	59	0.1	0.01U	0.2U	0.065U	161.93
MW-10S	02Q2	60	0.1U	0.01U	0.2U	0.065U	154.31
MW-10S	02Q3	61	0.2	0.01U	0.378	0.065U	149.17
MW-10S	02Q4	62	0.19	0.01U	0.256	0.065U	180.03
MW-10S	03Q1	63	0.558	0.01U	0.254	0.065U	167.069
MW-10S	03Q2	64	0.011	0.01U	0.219	0.065U	165.63
MW-10S	03Q3	65	3.079	0.01U	0.21	0.065U	167.89
MW-10S	03Q4	66	0.31U	0.01U	0.25	0.065U	180.03
MW-10S	04Q1	67	3.878	0.01U	0.423	0.065U	154.72
MW-10S	04Q2	68	1.999	0.01U	0.68	0.065U	135.59
MW-10S	04Q3	69	1.344	0.01U	0.338	0.065U	169.13
MW-10S	04Q4	70	2.564J	0.01U	0.494	0.065U	158
MW-10S	05Q1	71	10.41	0.01U	1.52	0.065U	142.48
MW-10S	05Q2	72	13.91	0.01U	1.073	0.065U	145.06
MW-10S	05Q3	73	2.966	0.01U	0.4308	0.065U	185.2
MW-10S	05Q4	74	2.911	0.0175	1.604	0.065U	122.57
MW-10S	06Q1	75	2.0755J	0.01U	1.7725	0.065U	126.73
MW-10S	06Q2	76	0.112	0.01U	0.6968	0.065U	149.01
MW-10S	06Q3	77	1.537	0.01U	0.8895	0.065U	142.47
MW-10S	06Q4	78	0.311	0.01U	0.3994	0.065U	170.44
MW-10S	07Q1	79	0.666	0.01U	0.2885	0.065U	174.62
MW-10S	07Q2	80	2.737	0.01U	0.3366	0.065U	179.72
MW-10S	07Q3	81	0.247	0.01U	0.2415	0.065U	185.6
MW-10S	07Q4	82	0.892	0.005U	0.2934	0.065U	220
MW-10S	08Q1	83	4.23	0.005U	0.3492	0.065U	186
MW-10S	08Q2	84	3.272	0.01U	0.2U	0.065U	178J
MW-10S	08Q3	85	4.768	0.01U	0.2596	0.065U	296
MW-10S	08Q4	86	2.522	0.01U	0.2707	0.065U	204
MW-10S	09Q1	87	1.57	0.01U	0.2	0.481U	197
MW-10S	09Q2	88	3.44	0.01U	0.266	0.065U	196
MW-10S	09Q3	89	4.125	0.01U	0.204	0.065U	190.5
MW-10S	09Q4	90	2	0.01U	0.215	0.065U	225.5
MW-10S	10Q1	91	3.551	0.0243	0.2U	0.065U	174
MW-10S	10Q2	92	2.062	0.01U	0.2U	0.065U	201
MW-10S	10Q3	93	1.06	0.01U	0.2103	0.065U	190
MW-10S	10Q4	94	2.548	0.01U	0.2U	0.065U	192.5
MW-10S	11Q1	95	2.62	0.01U	0.22	0.065U	211
MW-10S	11Q2	96	2.21	0.01U	0.2	0.065U	200
MW-10S	11Q3	97	68.7	0.01U	0.24	0.05U	249
MW-10S	11Q4	98	7.55	0.01U	0.2	0.066U	256
MW-10S	12Q1	99	1.22	0.01U	0.17	0.064U	245
MW-10S	12Q2	100	1.93	0.01U	0.14	0.061U	211
MW-10S	12Q3	101	1.24	0.01U	0.14	0.063U	327
MW-10S	12Q4	102	9.43	0.01U	0.18	0.061U	233
MW-10S	13Q1	103	2.45	0.01U	0.14	0.061U	198
MW-10S	13Q2	104	1.7	0.01U	0.1U	0.061U	199
MW-10S	13Q3	105	1.16	0.01U	0.18	0.061U	193
MW-10S	13Q4	106	2.53	0.01U	0.16	0.061U	179
MW-10S	14Q1	107	6.35	0.01U	0.15	0.061U	208
MW-10S	14Q2	108	1.13	0.01U	0.16	0.061U	155
MW-10S	14Q3	109	1.74 J	0.01U	0.18	0.061U	173
MW-10S	14Q4	110	1.81J	0.01U	0.16	0.061U	158
MW-10S	15Q1	111	2.37	0.01U	0.18	0.061U	189
MW-10S	15Q2	112	0.63J	0.01U	0.14	0.061U	199
MW-10S	15Q3	113	4.08J	0.01U	0.16	0.061U	174
MW-10S	15Q4	114	2.53	0.01U	0.17	0.061U	207
MW-10S	16Q1	115	0.72	0.01U	0.141	0.05U	124
MW-10S	16Q2	116	0.787	0.002J	0.178	0.065U	121
MW-10S	16Q3	117	1.25J	0.002J	0.02U	0.02U	168
MW-10S	16Q4	118	1.36	0.005U	0.107	0.065U	127
MW-10S	17Q1	119	0.504	0.01U	0.101	0.065U	128
MW-10S	17Q2	120	0.189	0.005U	0.162	0.065U	111
MW-10S	17Q3	121	0.55	0.005U	0.15	0.065U	162
MW-10S	17Q4	122	1.02	0.005U	0.134	0.065U	136
MW-10S	18Q1	123	0.79	0.01U	0.127	0.065U	122
MW-10S	18Q2	124	3.12	---	0.132	0.065U	145
MW-10S	18Q3	125	1.25	0.01U	0.134	0.02U	175
MW-10S	18Q4	126	4.53	0.01U	0.136	0.065U	144
MW-10S	19Q1	127	7	0.005U	0.112	0.065U	142
MW-10S	19Q2	128	---	---	---	---	---
MW-10S	19Q3	129	4.38	0.005U	0.15	0.065U	146
MW-10S	19Q4	130	0.26	0.005U	0.157	0.065U	103
MW-10S	20Q1	131	0.0655	0.004J	0.14	0.065U	86.4
MW-10S	20Q2	132	0.135	0.005U	0.18	0.019	93.4
MW-10S	20Q3	133	0.437	0.005U	0.171	0.021U	158
MW-10S	20Q4	134	0.175	0.005U	0.25U	0.065U	110J

Monitoring Well MW-39S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-39S	99Q1	47	Note 1				
MW-39S	99Q2	48	0.44	0.25	0.3	0.065U	120
MW-39S	99Q3	49	0.64	0.2	0.3	0.065U	100
MW-39S	99Q4	50	0.17	0.26	0.4	0.065U	140
MW-39S	00Q1	51	5.2	0.3	0.4	0.065U	97
MW-39S	00Q2	52	0.4	0.29	0.4	0.065U	130
MW-39S	00Q3	53	0.4	0.29	0.3	0.065U	110
MW-39S	00Q4	54	0.1U	0.228	0.467	0.065U	88
MW-39S	01Q1	55	2.44	0.244	1.366	0.065U	112.34
MW-39S	01Q2	56	5.12	0.233	0.238	0.065U	118.92
MW-39S	01Q3	57	14.4	0.192	1.625	0.087	98.55
MW-39S	01Q4	58	0.43	0.266	0.714	0.065U	111.11
MW-39S	02Q1	59	0.19	0.375	0.629	0.065U	122.83
MW-39S	02Q2	60	0.9	0.382	0.886	0.065U	132.91
MW-39S	02Q3	61	1.02	0.426	0.668	0.065U	130.24
MW-39S	02Q4	62	0.253	0.297	0.573	0.065U	124.48
MW-39S	03Q1	63	12.19	0.318	0.793	0.065U	121.804
MW-39S	03Q2	64	64.28	0.312	2.762	0.065U	132.09
MW-39S	03Q3	65	0.098	0.379	0.436	0.065U	131.47
MW-39S	03Q4	66	12.44	0.294	0.424	0.065U	122.01
MW-39S	04Q1	67	8.646J	0.26	0.524	0.065U	117.48
MW-39S	04Q2	68	13.063	0.01U	1.06	0.065U	98.76
MW-39S	04Q3	69	11.82	0.169	1.546	0.065U	79.42
MW-39S	04Q4	70	24.04J	0.177	2.396	0.065U	77.19
MW-39S	05Q1	71	34.73	0.154	2.6125	0.065U	86.105
MW-39S	05Q2	72	5.41	0.124	2.126	0.065U	52.43
MW-39S	05Q3	73	14.18	0.189	1.409	0.065U	82.41
MW-39S	05Q4	74	29.79	0.11	2.51	0.065U	84.04
MW-39S	06Q1	75	19.12	0.0765	3.988	0.065U	68.33
MW-39S	06Q2	76	7.91	0.0855	2.903	0.065U	71.45
MW-39S	06Q3	77	8.5165	0.112	2.1285	0.065U	76.49
MW-39S	06Q4	78	0.522	0.12	1.759	0.065U	87.92
MW-39S	07Q1	79	1.93	0.162	1.691	0.065U	94.77
MW-39S	07Q2	80	4.115	0.159	1.618	0.065U	110.21
MW-39S	07Q3	81	10.94	0.15	1.311	0.065U	109.74
MW-39S	07Q4	82	0.934	0.16	1.346	0.065U	140
MW-39S	08Q1	83	98.7	0.134	1.786	0.065U	119
MW-39S	08Q2	84	299.5	0.22	1.187	0.065U	132J
MW-39S	08Q3	85	63.02	0.17R	1.04	0.065U	145
MW-39S	08Q4	86	418.9	0.19	0.91	0.065U	175
MW-39S	09Q1	87	101	0.237	0.96	0.513U	207
MW-39S	09Q2	88	22.4	0.206	1.207	0.065U	197R
MW-39S	09Q3	89	43	0.123J	2.119	0.065U	112
MW-39S	09Q4	90	28.565	0.168	1.017	0.065U	159
MW-39S	10Q1	91	41.84	0.0688	2.426	0.065U	131
MW-39S	10Q2	92	9.402	0.068	2.606	0.065U	91.4
MW-39S	10Q3	93	4.244	0.055	2.774	0.065U	83.2
MW-39S	10Q4	94	10.43	0.057	2.693	0.065U	74
MW-39S	11Q1	95	35.2	0.053	2.75	0.065U	70
MW-39S	11Q2	96	15.6	0.059	2.45	0.065U	77
MW-39S	11Q3	97	0.86	0.005	0.45	0.05U	477
MW-39S	11Q4	98	61.1	0.098	1.9	0.063U	130
MW-39S	12Q1	99	37.7	0.05	2.74	0.063U	92.3
MW-39S	12Q2	100	25.9	0.057	2.51	0.061U	83.3
MW-39S	12Q3	101	8.08	0.073	1.27	0.061U	98.3
MW-39S	12Q4	102	48.2	0.072	2.16	0.061U	123
MW-39S	13Q1	103	35.9	0.085	1.96	0.061U	122
MW-39S	13Q2	104	53.4	0.079	1.59	0.061U	125
MW-39S	13Q3	105	38.7	0.695	2.005	0.061U	166.5
MW-39S	13Q4	106	25.4	0.071	1.97	0.061U	174
MW-39S	14Q1	107	24.65	0.149J	1.9	0.061U	153
MW-39S	14Q2	108	61.3	0.068	1.73	0.061U	133
MW-39S	14Q3	109	27.8 J	0.065	1.93	0.061U	120
MW-39S	14Q4	110	22.1J	0.061	1.8	0.061U	129
MW-39S	15Q1	111	32.8	0.0655	1.635	0.061U	131.5
MW-39S	15Q2	112	468	0.059	0.98	0.061U	115
MW-39S	15Q3	113	7.54J	0.087	1.66	0.061U	146
MW-39S	15Q4	114	3.51	0.066	1.23	0.061U	148
MW-39S	16Q1	115	14	0.082	1.6	0.05U	171
MW-39S	16Q2	116	11.9	0.08	1.36	0.065U	175
MW-39S	16Q3	117	30	0.058	1.13	0.02U	184.5
MW-39S	16Q4	118	17.6J	0.035	1.35	0.065U	166
MW-39S	17Q1	119	13.65J	0.065	1.3	0.065U	166
MW-39S	17Q2	120	4.81	0.047	1.09	0.065U	158
MW-39S	17Q3	121	12.2	0.063	1.43	0.065U	149
MW-39S	17Q4	122	14.3	0.03	1.46	0.065U	124
MW-39S	18Q1	123	32.8	0.029	1.76	0.065U	102
MW-39S	18Q2	124	18.3	0.05	1.29	0.065U	123
MW-39S	18Q3	125	23.6	0.054	1.46J	0.065U	149
MW-39S	18Q4	126	2.83	0.035	1.69	0.065U	157
MW-39S	19Q1	127	18.6	0.039J	1.73	0.065U	132
MW-39S	19Q2	128	0.094J	0.073	0.234J	0.065U	65.6
MW-39S	19Q3	129	25.05	0.0359J	1.765	0.065U	132
MW-39S	19Q4	130	4.52	0.061	1.67	0.065U	176
MW-39S	20Q1	131	0.488	0.027	1.57	0.065U	133
MW-39S	20Q2	132	2.04	0.047	1.65	0.065U	142
MW-39S	20Q3	133	0.144	0.048	1.76	0.02U	191
MW-39S	20Q4	134	5.51J	0.022	1.33	0.65U	210J

Monitoring Well MW-40S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-40S	99Q1	47	Note 1				
MW-40S	99Q2	48	0.41	0.43	0.3	0.065U	110
MW-40S	99Q3	49	0.21	0.48	0.3	0.065U	110
MW-40S	99Q4	50	0.22	0.39	0.4	0.065U	97
MW-40S	00Q1	51	Note 1				
MW-40S	00Q2	52	0.57	0.34	0.3	0.065U	100
MW-40S	00Q3	53	0.56	0.11	0.3	0.065U	74
MW-40S	00Q4	54	0.1U	0.316	0.248	0.065U	88
MW-40S	01Q1	55	0.1U	0.0715	0.303	0.065U	88.47
MW-40S	01Q2	56	0.1U	0.383	0.164	0.065U	96.5
MW-40S	01Q3	57	0.12	0.363	0.2U	0.065U	84.36
MW-40S	01Q4	58	0.23	0.363	0.272	0.065U	86.62
MW-40S	02Q1	59	0.1	0.167	0.24	0.065U	88.88
MW-40S	02Q2	60	0.15	0.383	0.224	0.065U	87.65
MW-40S	02Q3	61	0.1	0.046	0.286	0.065U	0.21
MW-40S	02Q4	62	0.011U	0.325	0.294	0.065U	91.97
MW-40S	03Q1	63	0.1U	0.347	0.29	0.065U	83.123
MW-40S	03Q2	64	0.011U	0.32	0.281	0.065U	180.65
MW-40S	03Q3	65	0.053	0.344	0.274	0.065U	83.12
MW-40S	03Q4	66	0.041	0.358	0.286	0.065U	86
MW-40S	04Q1	67	0.17J	0.321	0.22	0.065U	84.56
MW-40S	04Q2	68	0.847	0.0295	0.456	0.065U	82.09
MW-40S	04Q3	69	0.117	0.32	0.351	0.065U	83.53
MW-40S	04Q4	70	0.134J	0.359	0.327	0.065U	76.77
MW-40S	05Q1	71	0.082	0.313	0.304	0.065U	82.51
MW-40S	05Q2	72	0.134	0.3	0.3011	0.065U	89.22
MW-40S	05Q3	73	1.296	0.291	0.29125	0.065U	78.98
MW-40S	05Q4	74	0.138	0.239	0.2466	0.065U	103.81
MW-40S	06Q1	75	1.1	0.253	0.259	0.065U	63.86
MW-40S	06Q2	76	0.788J	0.2605	0.2476	0.065U	80.2
MW-40S	06Q3	77	0.323	0.26	0.2699	0.065U	71.77
MW-40S	06Q4	78	0.138	0.265	0.2709	0.065U	56.02
MW-40S	07Q1	79	0.451	0.28	0.2296	0.065U	30.93
MW-40S	07Q2	80	0.148	0.251	0.2178	0.065U	72.57
MW-40S	07Q3	81	1.278	0.25	0.2445	0.065U	69.6
MW-40S	07Q4	82	0.465	0.24	0.1	0.065U	63
MW-40S	08Q1	83	1.241	0.17	0.2374	0.065U	73
MW-40S	08Q2	84	0.437R	0.2	0.2151	0.065U	90.4J
MW-40S	08Q3	85	0.033	0.17R	0.2272	0.065U	104J
MW-40S	08Q4	86	4.232	0.17	0.223	0.108	82.8
MW-40S	09Q1	87	0.72	0.155	0.15	0.508U	82.7
MW-40S	09Q2	88	1.91	0.103	0.2545	0.065U	79.1
MW-40S	09Q3	89	0.565	0.179J	0.2113	0.065U	69.7
MW-40S	09Q4	90	2.048	0.175	0.2U	0.065U	86.1
MW-40S	10Q1	91	1.849	0.171	0.2U	0.065U	73.2
MW-40S	10Q2	92	0.254	0.162	0.2U	0.065U	69.7
MW-40S	10Q3	93	0.377	0.201	0.2278	0.065U	67
MW-40S	11Q1	94	0.72	0.182	0.26	0.065U	63
MW-40S	11Q2	95	0.72	0.179	0.26	0.065U	60.3
MW-40S	11Q3	96	0.28	0.17	0.27	0.049U	58.5
MW-40S	11Q4	97	0.36	0.127	0.27	0.066U	73.4
MW-40S	12Q1	98	0.39	0.165	0.21	0.061U	58.6
MW-40S	12Q2	99	0.56	0.167	0.18	0.061U	58.9
MW-40S	12Q3	100	0.26	0.168	0.19	0.061U	58.7
MW-40S	12Q4	101	0.38	0.155	0.17	0.061U	58.2
MW-40S	13Q1	103	0.96	0.159	0.18	0.061U	52.2
MW-40S	13Q2	104	0.31	0.143	0.19	0.061U	61.1
MW-40S	13Q3	105	0.1U	0.15	0.21	0.061U	59.5
MW-40S	13Q4	106	0.76	0.14	0.23	0.061U	65.7
MW-40S	14Q1	107	0.11	0.137J	0.18	0.061U	58
MW-40S	14Q2	108	0.14	0.142	0.2	0.061U	61.7
MW-40S	14Q3	109	0.66 J	0.138	0.2	0.061U	57.7
MW-40S	14Q4	110	0.13J	0.13	0.16	0.061U	58.4
MW-40S	15Q1	111	0.1U	0.141	0.21	0.061U	57.7
MW-40S	15Q2	112	0.1U	0.121	0.215	0.061U	68.4
MW-40S	15Q3	113	0.1UJ	0.1435	0.185	0.061U	61
MW-40S	15Q4	114	0.1U	0.109	0.29	0.061U	71.1
MW-40S	16Q1	115	0.045J	0.106	0.237	0.05U	67.25
MW-40S	16Q2	116	0.104	0.13J	0.23	0.065U	54.8
MW-40S	16Q3	117	0.208J	0.127	0.204	0.02U	59.9
MW-40S	16Q4	118	0.068J	0.113	0.111	0.065U	57.9
MW-40S	17Q1	119	0.076J	0.133	0.161	0.065U	54.7
MW-40S	17Q2	120	0.01U	0.12	0.152	0.065U	55.8
MW-40S	17Q3	121	0.087J	0.11	0.194	0.065U	58.6
MW-40S	17Q4	122	0.036J	0.12	0.19	0.065U	56.2
MW-40S	18Q1	123	0.05J	0.071	0.169	0.065U	56.7
MW-40S	18Q2	124	0.084J	0.083	0.179	0.065U	56.3
MW-40S	18Q3	125	0.0485J	0.101	0.1875	0.021U	57
MW-40S	18Q4	126	0.169	0.075	0.212	0.065U	63.7
MW-40S	19Q1	127	0.121	0.116	0.175	0.065U	56.5
MW-40S	19Q2	128	69.2	0.044	0.991J	0.065U	130
MW-40S	19Q3	129	0.113	0.111	0.237	0.065U	58.9
MW-40S	19Q4	130	0.054J	0.085	0.196	0.065U	58.6
MW-40S	20Q1	131	0.0104	0.066	0.201	0.065U	58
MW-40S	20Q2	132	0.1U	0.083	0.311	0.019U	56
MW-40S	20Q3	133	0.1U	0.056	0.192	0.02U	57.60
MW-40S	20Q4	134	0.1U	0.046	0.179	0.065U	57.6J

Note:
1. Missing data indicates that the well was frozen.

Key:
U = Not detected at value listed
J = Estimated
R = Rejected

Monitoring Well MW-03S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-3S	98Q1	43	2.1	15	8.9	0.065U	520
MW-3S	98Q2	44	2.1	6.9	8.4	0.065U	470
MW-3S	98Q3	45	1.6	11	9.3	0.065U	540
MW-3S	98Q4	46	2.2	16	12	0.065U	480
MW-3S	99Q1	47	2.1	9.8	13	0.065U	550
MW-3S	99Q2	48	3.3	14	11	0.065U	450
MW-3S	99Q3	49	2.5	14	10	0.065U	580
MW-3S	99Q4	50	3	14	14	0.065U	490
MW-3S	00Q1	51	3.2	14	12	0.065U	450
MW-3S	00Q2	52	2.7	5.3	12	0.065U	530
MW-3S	00Q3	53	4.1	14	17	0.065U	650
MW-3S	00Q4	54	0.2	12.4	12.63	0.065U	446
MW-3S	01Q1	55	0.75	5.96	13.1	0.065U	637
MW-3S	01Q2	56	0.38	10	15.74	0.065U	686
MW-3S	01Q3	57	4.1	8.37	15.54	0.065U	715
MW-3S	01Q4	58	0.37	7.93	15.01	0.065U	706
MW-3S	02Q1	59	0.19	12.1	14.5	0.065U	679
MW-3S	02Q2	60	0.78	11.2	13.68	0.065U	654
MW-3S	02Q3	61	0.5	10	15.3	2.171	688
MW-3S	02Q4	62	0.427	9.57	18.71	0.065U	701
MW-3S	03Q1	63	15.65	10.3	17.98	0.065U	654
MW-3S	03Q2	64	15.8	9.47	17.51	0.065U	650
MW-3S	03Q3	65	0.658	9.41	20.25	0.065U	650
MW-3S	03Q4	66	3.778	8.6	18.3	0.065U	646
MW-3S	04Q1	67	36.61	8.94	16.67	0.065U	648
MW-3S	04Q2	68	6.67	6.53	16.96	0.065U	637
MW-3S	04Q3	69	3.097	7.74	22	0.065U	622
MW-3S	04Q4	70	0.981J	9.02	21.26	0.065U	476
MW-3S	05Q1	71	13.34	8.06	23.2	0.065U	596
MW-3S	05Q2	72	2.825	8.1	23.61	0.065U	598
MW-3S	05Q3	73	5.58	7.52	20.68	0.065U	614
MW-3S	05Q4	74	8.29	7.15	19.69	0.065U	587
MW-3S	06Q1	75	3.906	6.98	20.06	0.065U	591.92
MW-3S	06Q2	76	16.22	6.38	21.25	0.065U	618.41
MW-3S	06Q3	77	9.16	5.96	24.39	0.065U	505.51
MW-3S	06Q4	78	1.744	6.71	20.89	0.065U	422.86
MW-3S	07Q1	79	2.673	6.02	20.31	0.065U	469.11
MW-3S	07Q2	80	9.786	5.57	22	0.065U	472.52
MW-3S	07Q3	81	1.932	5.7	20.16	0.065U	479.11
MW-3S	07Q4	82	15.09	5.4	22.58	0.065U	470
MW-3S	08Q4	83	5.234	2.5R	17.06	0.065U	402
MW-3S	09Q1	84	6.08	0.746	17.5	0.5U	363
MW-3S	09Q2	85	0.653J	3.54	17.13	0.065U	342
MW-3S	09Q3	86	1.29	4.41	18.39	0.065U	346 J
MW-3S	09Q4	87	3.205	3.69	17.51	0.065U	387
MW-3S	10Q1	88	4.005	2.92 J	20.3	0.065U	379
MW-3S	10Q2	89	5.671	5.92	17.22J	0.065U	349
MW-3S	10Q3	90	2.054	3.79	15.97	0.065U	260
MW-3S	10Q4	91	5.423	3.98	15.81	0.065U	322
MW-3S	11Q3	92	39.4	2.96	14.7	0.051U	283
MW-3S	11Q4	93	16.5	4.77	15	0.064U	333
MW-3S	12Q1	94	31.6	3.83	13.6	0.064U	325
MW-3S	12Q2	95	21.8	3.59	15.1	0.061U	341
MW-3S	13Q4	106	1.45	3.26	12	0.061U	349
MW-3S	14Q2	108	21.8	1.87	8.6	0.061U	260
MW-3S	14Q4	110	NS	NS	NS	NS	NS
MW-3S	16Q4	118	3.24	2.75	14.1	0.065U	345
MW-3S	17Q2	120	---	---	---	---	---
MW-3S	17Q4	122	---	---	---	0.065U	---
MW-3S	18Q2	124	10.8	0.998	32.1	0.017J	218
MW-3S	18Q4	126	16.2	2.31	19.2	0.104	308
MW-3S	19Q2	128	0.84	0.484	16	0.065U	364
MW-3S	19Q4	130	1.28	1.62	15.8	0.065U	275
MW-3S	20Q2	132	1.3	1.77	12.9	0.019U	256
MW-3S	20Q4	134	2.92	0.63	10.1	0.065U	254

Monitoring Well MW-26S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-26S	98Q1	43	0.4	0.09	4.6	0.065U	340
MW-26S	98Q2	44	0.24	0.1	3.6	0.065U	330
MW-26S	98Q3	45	0.58	0.11	3	0.065U	88
MW-26S	98Q4	46	1.2	0.09	4.8	0.065U	300
MW-26S	99Q1	47	1.4	0.06	3.7	0.065U	230
MW-26S	99Q2	48	0.85	0.04	2.7	0.065U	260
MW-26S	99Q3	49	0.26	0.05	3.1	0.065U	360
MW-26S	99Q4	50	0.37	0.05	4.1	0.065U	360
MW-26S	00Q1	51	18	0.05	3.9	0.065U	320
MW-26S	00Q1	51	0.909	NA	4.7	NA	236
MW-26S	00Q2	52	1.2	0.02	3.4	0.065U	400
MW-26S	00Q3	53	0.44	0.02	3.3	0.065U	380
MW-26S	00Q4	54	0.14	0.01U	3.233	0.075	315
MW-26S	01Q1	55	1.16	0.01U	3.455	0.181	336
MW-26S	01Q2	56	0.12	0.01U	3.202	0.065U	447
MW-26S	01Q3	57	3.97	0.01U	3.471	0.065U	343
MW-26S	01Q4	58	0.16	0.01U	3.246	0.065U	347
MW-26S	02Q1	59	0.48	0.01U	3.316	0.065U	326
MW-26S	02Q2	60	0.39	0.01U	2.859	0.065U	351
MW-26S	02Q3	61	0.7	0.01U	3.551	0.435	296
MW-26S	02Q4	62	0.381	0.01U	3.576	0.065U	328
MW-26S	03Q1	63	2.24	0.01U	3.067	0.103	280
MW-26S	03Q2	64	15.21	0.01U	3.341	0.065U	306
MW-26S	03Q3	65	11.1	0.01U	3.546	0.065U	294
MW-26S	03Q4	66	12.43	0.01U	3.343	0.065U	285
MW-26S	04Q1	67	12.8	0.01U	3.659	0.065U	245
MW-26S	04Q2	68	9.177	0.01U	3.593	0.065U	283
MW-26S	04Q3	69	5.623	0.01U	4.053	0.065U	262
MW-26S	04Q4	70	11.28J	0.01U	4.573	0.065U	342
MW-26S	05Q1	71	25.38	0.01U	4.028	0.065U	247
MW-26S	05Q2	72	8.025	0.01U	4.337	0.065U	284
MW-26S	05Q3	73	9.6	0.01U	3.961	0.065U	269
MW-26S	05Q4	74	2.795	0.01U	4.409	0.065U	254
MW-26S	06Q1	75	8.454J	0.0145U	4.0765	0.065U	240.365
MW-26S	06Q2	76	9.571	0.01U	4.637	0.065U	211.37
MW-26S	06Q3	77	6.777	0.01U	4.499	0.065U	205.54
MW-26S	06Q4	78	1.573	0.01U	4.317	0.065U	207.54
MW-26S	07Q1	79	6.789	0.01U	4.825	0.155	198.21
MW-26S	07Q2	80	26.42	0.01U	4.285	0.065U	230.34
MW-26S	07Q3	81	6.118	0.01U	4.692	0.065U	212
MW-26S	07Q4	82	7.833	0.037	4.309	0.065U	220
MW-26S	08Q1	83	23.9	0.005U	5.0035	0.065U	255
MW-26S	08Q2	84	6.598R	0.01U	5.148	0.065U	254
MW-26S	08Q3	85	19.85	0.01U	4.778	0.065U	250J
MW-26S	08Q4	86	34.01	0.01U	5.333	0.065U	209
MW-26S	09Q1	87	46.25	0.005UJ	5.15	0.2U	218
MW-26S	09Q2	88	22.4	0.01U	4.81	0.065U	187
MW-26S	09Q3	89	33.2	0.01U	5.176	0.065U	212
MW-26S	09Q4	90	50.88	0.01U	4.958	0.065U	216
MW-26S	10Q1	91	48.01	0.01UJ	4.126	0.065U	242
MW-26S	10Q2	92	82.42	0.01U	4.109	0.065U	222
MW-26S	10Q3	93	10.71	0.01U	5.635	0.065U	209
MW-26S	10Q4	94	32.53	0.01U	5.489	0.065U	179
MW-26S	11Q1	95	52.6	0.01U	5.45	0.065U	195
MW-26S	11Q2	96	26.4	0.01U	5.97	0.0663U	181
MW-26S	11Q3	97	25.9	0.01U	5.15	0.065U	167
MW-26S	11Q4	98	25.3	0.01U	5.55	0.063U	185
MW-26S	12Q1	99	29.9	0.01U	4.62	0.065U	187
MW-26S	12Q2	100	8.6	0.01U	4.41	0.061U	218
MW-26S	12Q3	101	34.3	0.01U	4.37	0.061U	231
MW-26S	12Q4	102	20.4	0.01U	4.9	0.061U	193
MW-26S	13Q2	104	18.6	0.01U	5.48	0.061U	230
MW-26S	13Q4	106	18	0.01U	5.74	0.061U	190
MW-26S	14Q2	108	49.3	0.01U	4.81	0.061U	208
MW-26S	14Q4	110	20.2	0.01U	5.64	0.061U	191
MW-26S	15Q2	112	15.5	0.01U	5.68	0.061U	195
MW-26S	15Q4	114	6.32	0.01U	6.37	0.061U	257
MW-26S	16Q2	116	1.28	0.003J	6.87	0.065U	202
MW-26S	16Q4	118	14.4	0.004J	5.45	0.065U	243
MW-26S	17Q2	120	3.59	0.001J	6.1	0.065U	170
MW-26S	17Q4	122	23.6	0.01U	5.71	0.065U	188
MW-26S	18Q2	124	11.9	0.005U	5.76	0.065U	171
MW-26S	18Q4	126	16.2	0.005U	5.73	0.065U	216
MW-26S	19Q2	128	16.5	0.005U	6.1	0.065U	162
MW-26S	19Q4	130	6.73	0.005U	6.08	0.065U	174
MW-26S	20Q2	132	0.636	0.005U	5.74	0.02U	132
MW-26S	20Q4	134	6.78	0.005U	4.95	0.065U	190J

Monitoring Well MW-27S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-27S	99Q1	47	1.3	0.17	7.9	0.065U	140
MW-27S	99Q2	48	0.96	0.14	6.7	0.065U	290
MW-27S	99Q3	49	0.89	0.07	6.4	0.065U	260
MW-27S	99Q4	50	0.67	0.07	8.5	0.065U	250
MW-27S	00Q1	51	1.7	0.12	8.9	0.065U	290
MW-27S	00Q2	52	3.3	0.11	7.1	0.065U	280
MW-27S	00Q3	53	0.82	0.08	5.7	0.065U	320
MW-27S	00Q4	54	0.1	0.0295	6.294	0.065U	273
MW-27S	01Q1	55	0.66	0.0455	6.473	0.065U	261
MW-27S	01Q2	56	1.45	0.0535	6.636	0.065U	288
MW-27S	01Q3	57	8.79	0.039	5.919	0.065U	278
MW-27S	01Q4	58	0.3	0.0255	6.134	0.065U	244
MW-27S	02Q1	59	0.19	0.0445	5.26	0.065U	278
MW-27S	02Q2	60	0.39	0.0665	5.54	0.065U	269
MW-27S	02Q3	61	0.21	0.0645	5.289	0.065U	261
MW-27S	02Q4	62	0.142	0.037	6.232	0.065U	293
MW-27S	03Q1	63	4.222	0.0385	5.171	0.065U	281
MW-27S	03Q2	64	0.155	0.0495	5.009	0.065U	293
MW-27S	03Q3	65	0.22	0.0645	5.581	0.065U	282
MW-27S	03Q4	66	12.35	0.0485	5.083	0.065U	277
MW-27S	04Q1	67	5.402	0.0535	4.521	0.066	287
MW-27S	04Q2	68	7.815	0.067	4.927	0.065U	283
MW-27S	04Q3	69	11.64	0.0445	4.895	0.065U	275
MW-27S	04Q4	70	1.933J	0.0315	5.274	0.065U	256
MW-27S	05Q1	71	15.42	0.04	5.889	0.065U	255
MW-27S	05Q2	72	6.588	0.043	5.298	0.065U	258
MW-27S	05Q3	73	4.442	0.03	4.252	0.065U	258
MW-27S	05Q4	74	2.219	0.016	4.49	0.065U	261
MW-27S	06Q1	75	27.79	0.032	3.834	0.065U	283.51
MW-27S	06Q2	76	15.16	0.0355	4.264	0.065U	259.34
MW-27S	06Q3	77	1.817	0.026	3.827	0.065U	257.47
MW-27S	06Q4	78	0.297	0.021	4.24	0.065U	218.27
MW-27S	07Q1	79	6.057	0.027	3.92	0.065U	236.77
MW-27S	07Q2	80	3.398	0.044	3.638	0.065U	255.13
MW-27S	07Q3	81	2.968	0.05	4.116	0.065U	241.17
MW-27S	07Q4	82	3.622	0.04	3.579	0.065U	260
MW-27S	08Q1	83	11.8	0.0475	4.2505	0.065U	140.5J
MW-27S	08Q2	84	1.519	0.086	3.783	0.065U	200
MW-27S	08Q3	85	8.138	0.023R	3.898	0.065U	248J
MW-27S	08Q4	86	4.811	0.01U	3.445	0.065U	236
MW-27S	09Q1	87	6.17	0.0281	3.64	0.495U	228
MW-27S	09Q2	88	1.01J	0.0866	3.551	0.065U	214
MW-27S	09Q3	89	8.9	0.0899	3.738	0.065U	235J
MW-27S	09Q4	90	2.733	0.0419	3.344	0.065U	237
MW-27S	10Q1	91	5.686	0.0405J	3.048	0.065U	250
MW-27S	10Q2	92	3.884	0.099	2.929	0.065U	241
MW-27S	10Q3	93	3.476	0.073	3.468	0.065U	248
MW-27S	10Q4	94	18.74	0.079	3.845	0.065U	239
MW-27S	11Q1	95	15.8	0.048	3.49	0.065U	237
MW-27S	11Q2	96	2.93	0.043	3.66	0.065U	227
MW-27S	11Q3	97	5.66	0.048	3.4	0.064U	235
MW-27S	11Q4	98	7.09	0.036	3.3	0.061U	248
MW-27S	12Q1	99	10.4	0.035	1.98	0.061U	213
MW-27S	12Q2	100	3.47	0.044	2.79	0.061U	256
MW-27S	12Q3	101	0.69	0.032	4.04	0.061U	242
MW-27S	12Q4	102	7.95	0.031	2.86	0.061U	247
MW-27S	13Q2	104	3.32	0.04	3.38	0.061U	265
MW-27S	13Q4	106	13.5	0.028	2.97	0.061U	257
MW-27S	14Q2	108	16.4	0.039	2.2	0.067U	260
MW-27S	14Q4	110	15.1	0.02	3.17	0.061U	247
MW-27S	15Q2	112	6.685J	0.02745	3.24	0.061U	282
MW-27S	15Q4	114	7.63	0.02	2.37	0.061U	280
MW-27S	16Q2	116	1	0.025	3.93	0.065U	276
MW-27S	16Q4	118	0.668	0.017	3	0.065U	250
MW-27S	17Q2	120	2.22	0.024	2.54	0.065U	257
MW-27S	17Q4	122	1.82	0.017	1.89	0.065U	275
MW-27S	18Q2	124	0.799J	0.016	2.78	0.065U	298
MW-27S	18Q4	126	1.5	0.009	2.95	0.02U	270
MW-27S	19Q2	128	4.09J	---	3.145J	0.065U	392
MW-27S	19Q4	130	0.912	0.007	3.05	0.065U	297
MW-27S	20Q2	132	0.539	0.023	2.96	0.019U	289
MW-27S	20Q4	134	0.811	0.01	2.44	0.065U	285

Monitoring Well MW-28S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-28S	99Q1	47	7.4	18	170	0.065U	630
MW-28S	99Q2	48	3.6	9.2	94	0.065U	290
MW-28S	99Q3	49	3.1	14	84	0.065U	440
MW-28S	99Q4	50	3.6	14	130	0.065U	560
MW-28S	00Q1	511	41	3.1	130	0.065U	530
MW-28S	00Q1	51	2.43	NA	88	NA	774
MW-28S	00Q2	52	16	1.4	100	0.065U	690
MW-28S	00Q3	53	12	5.9	100	0.065U	530
MW-28S	00Q4	54	0.77	8.05	126.8	0.065U	409
MW-28S	01Q1	55	3.51	8.83	120.9	0.065U	482
MW-28S	01Q2	56	1.12	12.4	90.7	0.065U	436
MW-28S	01Q3	57	2.73	7.95	81.57	0.065U	523
MW-28S	01Q4	58	0.64	17.2	84.2	0.065U	575
MW-28S	02Q1	59	0.71	14.6	81.04	0.065U	595
MW-28S	02Q2	60	0.97	9.72	68.86	0.065U	484
MW-28S	02Q3	61	0.3	8.12	67.74	0.065U	453
MW-28S	02Q4	62	0.624	11.2	78.91	0.065U	455
MW-28S	03Q1	63	9.921	9.35	69.25	0.065U	461
MW-28S	03Q2	64	10.56	6.53	55.12	0.151	418
MW-28S	03Q3	65	0.888	5.4	45.15	0.065U	409
MW-28S	03Q4	66	8.216	8.02	55.63	0.065U	470
MW-28S	04Q1	67	6.177	7.85	46.04	0.065U	490
MW-28S	04Q2	68	7.177	5.71	50.64	0.065U	386
MW-28S	04Q3	69	14.74	4.19	41.34	0.065U	381
MW-28S	04Q4	70	1.537J	7.63	55.2	0.065U	483
MW-28S	05Q1	71	13.61	6.76	61.21	0.065U	456
MW-28S	05Q2	72	5.3185	4.01	48.815	0.065U	406
MW-28S	05Q3	73	5.502	4.17	43.78	0.065U	361
MW-28S	05Q4	74	3.193	5.5	41.37	0.065U	406
MW-28S	06Q1	75	6.013	2.16	44.21	0.065U	470.32
MW-28S	06Q2	76	1.645	4.9	36.05	0.065U	317.31
MW-28S	06Q3	77	3.801	3.54	34.09	0.065U	283.06
MW-28S	06Q4	78	1.439	4.01	33.77	0.065U	307.86
MW-28S	07Q1	79	1.411	4.03	32.99	0.065U	345.64
MW-28S	07Q2	80	7.876	3.32	31.46	0.065U	312.71
MW-28S	07Q3	81	2.054	1.5	19.23	0.065U	265.82
MW-28S	07Q4	82	5.125	1.9	19.99	0.065U	340
MW-28S	08Q1	83	4.5	2.68	25.87	0.065U	340
MW-28S	08Q2	84	1.983	1.6	21.54	0.065U	276
MW-28S	08Q3	85	2.282	1.2R	16.34	0.065U	281J
MW-28S	08Q4	86	1.918	0.67	14.93	0.065U	304
MW-28S	09Q1	87	4.61	1.35R	16.4	0.2U	310
MW-28S	09Q2	88	14.1	1.5	15.35	0.167	271
MW-28S	09Q3	89	9.81	1.68J	15.38	0.065U	272
MW-28S	09Q4	90	0.647	1.58J	16.15	0.065U	293
MW-28S	10Q1	91	7.932	1.05J	14.56	0.065U	325
MW-28S	10Q2	92	1.746J	4.06	16.03	0.065U	271
MW-28S	10Q3	93	4.588	4.76	19.12	0.065U	258
MW-28S	10Q4	94	1.763	3.56	17.13	0.065U	254
MW-28S	11Q1	95	2.92	3.27	16.4	0.065U	256
MW-28S	11Q2	96	1.05	2.525	15.65	0.0663U	235
MW-28S	11Q3	97	1.54	2.45	12.8	0.065U	221
MW-28S	11Q4	98	2.73	3.25	15.5	0.064U	239
MW-28S	12Q1	99	1.24	3.06	12.7	0.065U	231
MW-28S	12Q2	100	2.4	1.95	11.95	0.061U	203.5
MW-28S	12Q3	101	2.235	1.7	12.25	0.061U	214.5
MW-28S	12Q4	102	2.315	2.15	12.9	0.061U	246
MW-28S	13Q2	104	16	1.84	11.35	0.061U	250
MW-28S	13Q4	106	18.9	2.23	11.4	0.061U	287
MW-28S	14Q2	108	1.69	1.23	9.5	0.061U	179
MW-28S	14Q4	110	10.1J	2.17	9.93	0.061U	197
MW-28S	15Q2	112	10.8	1.98	10	0.061U	209
MW-28S	15Q4	114	8.53	2.63	13.4	0.061U	329
MW-28S	16Q2	116	1.88	3.09	14.8	0.065U	323
MW-28S	16Q4	118	11.3	2.32	26.7	0.042	154
MW-28S	17Q2	120	2.67	3.47	13.3	0.065U	207
MW-28S	17Q4	122	0.391	4.05	15.9	0.065U	248
MW-28S	18Q2	124	0.1U	2.22	15.8	0.065U	212
MW-28S	18Q4	126	0.1I	3.765	15.75	0.065U	194
MW-28S	19Q2	128	0.251	2.46	12.4	0.024	178
MW-28S	19Q4	130	0.036J	3.22	16.6	0.065U	189
MW-28S	20Q2	132	3.63	2.94	14.3	0.02U	169
MW-28S	20Q4	134	0.448	2.34	15.7	0.065U	160

Key:
U = Not detected at value listed
NA = Not available
J = Estimated
R = Rejected value

Collection Date	MW-33S	MW-34S	MW-35S
11/29/95	0.01U	0.01U	0.02
02/07/96	0.01U	0.01U	0.79
05/30/96	0.01U	0.01U	0.11
07/16/96	0.01U	0.01U	0.12
10/02/96	0.02	0.01U	0.37
01/07/97	0.01U	0.01U	1.4
04/02/97	0.01U	0.01U	1.3
07/03/97	0.01U	0.01U	0.09
10/03/97	0.01U	0.01U	1
01/15/98	0.01U	0.01U	Note 3
04/01/98		Note 4	
09/16/98	0.01U	0.01U	0.01U
12/09/98	0.01U	0.01U	0.01U
03/04/99	0.01U	0.01U	0.01U
06/10/99	0.01U	0.01U	0.01U
08/26/99	0.01U	0.01U	0.01U
10/28/99	0.01U	0.01U	0.01U
01/27/00	0.01U	0.01U	0.01U
04/26/00	0.01U	0.01U	0.01U
07/10/00	0.01U	0.01U	0.01U
11/02/00	0.01U	Note 5	0.01U
01/24/01	0.01U	0.01U	0.01U
04/25/01	0.01U	0.0095	0.01U
07/23/01	0.01U	0.011	0.01U
10/23/01	0.01U	0.0115	0.01U
01/23/02	0.01U	0.012	0.01U
05/01/02	0.01U	0.013	0.01U
07/24/02	0.01U	0.0155	0.081
10/23/02	0.01U	0.016	0.01U
01/21/03	0.01U	0.019	0.01U
04/22/03	0.01U	0.019	0.01U
07/29/03	0.01U	0.0305	0.01U
10/21/03	0.01U	0.028	0.01U
01/20/04	0.01U	0.042	0.01U
04/21/04	0.329	0.01U	0.01U
07/21/04	0.017	0.0355	0.01U
10/27/04	0.01U	0.055	0.01U
01/18/05	0.01U	0.043	0.01U
04/27/05	0.01U	0.0945	0.01U
07/19/05	0.01U	0.0445	0.01U
10/25/05	0.01U	0.04	0.01U
01/17/06	0.01U	0.0645	0.01U
04/26/06	0.01U	0.063	0.01U
07/13/06	0.01U	0.0655	0.01U
10/25/06	0.01U	0.0815	0.01U
01/25/07	0.01U	0.0815	0.01U
04/25/07	0.01U	0.0825	0.01U
08/15/07	0.01U	0.042	0.01U
10/25/07	0.005U	0.061	0.01U
01/31/08	0.005U	0.07	0.005U
04/16/08	0.01U	0.072	0.01U
07/23/08	0.01U	0.063R	0.01U
10/22/08	0.01UR	0.047R	0.088R
01/13/09	0.005UJ	0.0651	0.005UR
04/29/09	0.01U	0.0526	0.01U
07/23/08	12Q1	99	
10/22/08	12Q2	100	
01/13/09	12Q3	101	
04/29/09	12Q4	102	
07/29/09	0.01U	0.0536	0.01U
10/29/09	0.01U	0.069	0.01U
02/11/10	0.01UJ	0.066J	0.01U
06/08/10	0.01U	0.073	0.01U
09/21/10	0.01U	0.08	0.01U
12/16/10	0.01U	0.088	0.01U
3/2/11	0.01U	0.083	0.01U
6/22/11	0.01U	0.075	0.01U
9/20/11	0.01U	0.082	0.01U
12/14/11	0.01U	0.085	0.01U
2/15/12	0.01U	0.08	0.01U
7/16/12	0.01U	0.071	0.01U
10/16/12	0.01U	0.085	0.01U
12/19/12	0.01U	0.08	0.01U
6/19/13	0.01U	0.077	0.01U
12/12/13	0.01U	0.078	0.01U
6/17/14	0.01U	0.067	0.01U
12/17/14	0.01U	0.071	0.01U
7/21/15	0.01U	0.075	0.01U
12/15/15	0.01U	0.074	0.01U
6/22/16	0.005U	0.048	0.005U
1/6/17	0.005U	0.052	0.002J
6/13/17-6/15/17	0.005U	0.063	0.005U
12/21/17-1/30/18	0.005U	0.046	0.005U
6/20/18	0.05U	0.068	0.004J
12/19/18	0.05U	0.015	0.05U
6/26/-6/27/19	0.04	0.044	0.05U
12/4-12/6/19	0.005U	0.03	0.05U
6/8/20-6/11/20	0.005U	0.073	0.005U
12/3/20	0.005U	0.053	0.005U

Notes:

1. All results are for cyanide per USEPA Method SW846-9010. Units are mg/l.
2. ID number consists of the monitoring well number followed by the sequence number (e.g. MW-33S-03). Beginning 7/23/01, the sample ID is the laboratory's internal sample ID. The ID presented is for the sample collected at MW-33S. ID for MW-34S is incremented by 1 and ID for MW-35S is incremented by 2.
3. MW-35S was replaced with MW-35SR in later 10/97. Well development precluded CN analysis into 2Q98.
4. Samples were not taken as scheduled during 2Q98.
5. MW-34S was inaccessible due to construction - not sampled.

Key:

U = Not detected at the value listed

R = Rejected value

UJ = Estimated Nondetect

UR = Nondetect result rejected

Table C-3
East Plant
Total Cyanide [(1)] Concentrations

Monitoring Well MW-16S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-16S	99Q1	47	7.8	0.35	640	1.6	3600
MW-16S	99Q2	48	1.3	0.23	190	0.19	220
MW-16S	99Q3	49	0.2	0.04	15	0.065U	480
MW-16S	99Q4	50	0.46	0.03	16	0.065U	350
MW-16S	00Q1	51	0.24	0.03	15	0.065U	280
MW-16S	00Q2	52	0.28	0.04	13	0.065U	2000
MW-16S	00Q3	53	0.2	0.04	22	0.065U	1800
MW-16S	00Q4	54	0.13	0.0495	29.37	0.065U	1250
MW-16S	01Q1	55	0.15	0.129	36.87	0.483	1155.9
MW-16S	01Q2	56	0.1	0.0805	40	0.217	1116.4
MW-16S	01Q3	57	0.11	0.028	30.69	0.065U	793.37
MW-16S	01Q4	58	0.32	0.0175	28.49	0.719	604.7
MW-16S	02Q1	59	0.13	0.0155	27.29	0.277	628.36
MW-16S	02Q2	60	0.11	0.141	21.79	0.209	931.43
MW-16S	02Q3	61	0.11	0.0145	12.75	0.065U	829.38
MW-16S	02Q4	62	0.011U	0.01U	12.36	0.065U	861.48
MW-16S	03Q1	63	0.1U	0.01	11.07	0.065U	728.355
MW-16S	03Q2	64	0.011U	0.01U	10.44	0.065U	760.25
MW-16S	03Q3	65	0.053	0.01U	11.74	0.065U	567.25
MW-16S	03Q4	66	0.031U	0.01U	11.67	0.065U	556.14
MW-16S	04Q1	67	0.041	0.01U	10.4	0.065U	526.31
MW-16S	04Q2	68	0.003U	0.012	1.144	0.065U	475.28
MW-16S	04Q3	69	0.003U	0.01U	8.98	0.065U	428.78
MW-16S	04Q4	70	0.003UJ	0.01U	12.14	0.065U	419.67
MW-16S	05Q1	71	0.046	0.018	9.961	0.065U	360.99
MW-16S	05Q2	72	0.107	0.01U	10.15	0.065U	357
MW-16S	05Q3	73	0.124	0.01U	8.841	0.065U	346.16
MW-16S	05Q4	74	0.0635	0.0115	8.962	0.065U	315.31
MW-16S	06Q1	75	0.115	0.027	9.992	0.065U	359.14
MW-16S	06Q2	76	0.05	0.01	7.302	0.065U	304.28
MW-16S	06Q3	77	0.032	0.01	8.485	0.065U	318.79
MW-16S	06Q4	78	0.041	0.01	9.503	0.065U	246.73
MW-16S	07Q1	79	0.075	0.01U	9.448	0.065U	304.7
MW-16S	07Q2	80	0.122	0.01U	8.08	0.065U	299.4
MW-16S	07Q3	81	0.102	0.01U	9.903	0.065U	308.79
MW-16S	07Q4	82	0.052	0.01U	8.615	0.065U	320
MW-16S	08Q1	83	0.171	0.012	8.993	0.065U	290
MW-16S	08Q2	84	0.18	0.01U	7.597	0.065U	338
MW-16S	08Q3	85	0.069	0.01U	8.047	0.065U	272
MW-16S	08Q4	86	0.139	0.011	7.828	0.065U	267
MW-16S	09Q1	87	0.2U	0.005UR	8.25	0.065U	290J
MW-16S	09Q2	88	0.202	0.01U	6.306	0.065U	229
MW-16S	09Q3	89	0.34	0.01U	7.098	0.065U	257
MW-16S	09Q4	90	0.048	0.01U	7.84	0.065U	278
MW-16S	10Q1	91	0.42	0.01UJ	6.596	0.065U	312
MW-16S	10Q2	92	0.049R	0.01U	6.939J	0.065U	269
MW-16S	10Q3	93	0.083	0.01UJ	8.235	0.065UJ	289J
MW-16S	10Q4	94	0.04	0.01U	8.154	0.065U	257
MW-16S	11Q1	95	0.1U	0.01U	7.22	0.065U	292
MW-16S	11Q2	96	0.1U	0.01U	9.88	0.065U	190
MW-16S	11Q3	97	0.1U	0.01U	7.95	0.08U	136
MW-16S	11Q4	98	0.1U	0.01U	9.09	0.062U	136
MW-16S	12Q1	99	0.1U	0.01U	8.09	0.065U	154
MW-16S	12Q2	100	0.1U	0.01U	7.96	0.061U	203.5
MW-16S	12Q3	101	0.1U	0.01U	7.95	0.061U	198
MW-16S	12Q4	102	0.11	0.038	10.2	0.064U	223
MW-16S	13Q2	104	0.1U	0.016	10.4	0.061U	227
MW-16S	13Q4	106	0.78	0.01U	7.21	0.061U	261
MW-16S	14Q2	108	0.1U	0.01U	7.74	0.061U	268
MW-16S	14Q4	110	0.6	0.01U	7.23	0.061U	255
MW-16S	15Q2	112	0.1U	0.01U	7.99	0.061U	280
MW-16S	15Q4	114	0.1U	0.01U	8.79	0.061U	281
MW-16S	16Q2	116	0.072J	0.007	9.61	0.065U	292
MW-16S	16Q4	118	0.047J	0.076	7.66	0.065U	220
MW-16S	17Q2	120	0.055J	0.004J	8.5	0.065U	217
MW-16S	17Q4	122	0.16J	0.035J	8	0.065U	239
MW-16S	18Q2	124	0.032J	0.005U	7.38	0.065U	226
MW-16S	18Q4	126	0.1U	0.003J	9.37	0.065U	211
MW-16S	19Q2	128	0.066J	0.002J	6.81	0.065U	188
MW-16S	19Q4	130	0.1U	0.002J	11.2	0.065U	208
MW-16S	20Q2	132	0.1U	0.004J	7.42	0.019U	200
MW-16S	20Q4	134	0.052J	0.002J	7.92	0.065U	171

Monitoring Well MW-17S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-17S	99Q1	47	0.61	0.01U	1.4	0.065U	430
MW-17S	99Q2	48	0.49	0.03	1	0.065U	380
MW-17S	99Q3	49	0.56	0.01U	0.9	0.065U	670
MW-17S	99Q4	50	0.52	0.01U	2.5	0.065U	620
MW-17S	00Q1	51	0.34	0.03	1.8	0.065U	410
MW-17S	00Q2	52	0.86	0.02	1.1	0.065U	560
MW-17S	00Q3	53	0.2	0.01U	1.1	0.18	480
MW-17S	00Q4	54	0.18	0.01U	1.162	0.065U	304
MW-17S	01Q1	55	0.82	0.01U	1.359	0.065U	406.77
MW-17S	01Q2	56	0.1	0.0095	0.933	0.065U	405.33
MW-17S	01Q3	57	0.41	0.01U	0.952	0.065U	298.75
MW-17S	01Q4	58	0.14	0.01U	2.391	0.065U	246.28
MW-17S	02Q1	59	0.12	0.01U	1.267	0.065U	503.06
MW-17S	02Q2	60	0.12	0.01U	0.988	0.065U	487.01
MW-17S	02Q3	61	0.1U	0.01U	1.496	0.065U	317.68
MW-17S	02Q4	62	0.838	0.01U	2.349	0.065U	310.48
MW-17S	03Q1	63	0.74	0.01U	1.15	0.065U	601.407
MW-17S	03Q2	64	0.085	0.01U	1.054	0.065U	621.78
MW-17S	03Q3	65	0.083	0.01U	0.931	0.065U	434.13
MW-17S	03Q4	66	0.453	0.01U	1.02	0.065U	314.39
MW-17S	04Q1	67	1.131	0.01U	1.114	0.065U	470.14
MW-17S	04Q2	68	2.974	0.01U	0.791	0.065U	356.36
MW-17S	04Q3	69	2.589	0.01U	0.744	0.065U	338.05
MW-17S	04Q4	70	1.408J	0.01U	1.278	0.065U	272.22
MW-17S	05Q1	71	3.927	0.01U	1.097	0.065U	279.22
MW-17S	05Q2	72	2.527	0.01U	0.7517	0.065U	281.5
MW-17S	05Q3	73	3.142	0.01U	1.014	0.065U	277.7
MW-17S	05Q4	74	2.057	0.01U	1.837	0.065U	215.05
MW-17S	06Q1	75	20.84	0.01U	0.8417	0.065U	216.88
MW-17S	06Q2	76	15.01	0.01U	0.7225	0.065U	215.11
MW-17S	06Q3	77	10.85	0.01U	0.6616	0.065U	200.16
MW-17S	06Q4	78	7.305	0.01U	0.2	0.065U	144.98
MW-17S	07Q1	79	7.112	0.0145	0.7146	0.065U	152.75
MW-17S	07Q2	80	6.852	0.01U	0.6408	0.065U	167.9
MW-17S	07Q3	81	3.015	0.01U	0.8034	0.602	168.67
MW-17S	07Q4	82	4.661	0.005U	1.81	0.065U	150
MW-17S	08Q1	83	3.88	0.005U	0.8118	0.065U	198
MW-17S	08Q2	84	6.569	0.01U	0.7293	0.065U	167J
MW-17S	08Q3	85	11.89	0.01U	0.7726	0.065U	151
MW-17S	08Q4	86	1.901	0.01U	0.6294	0.065U	171
MW-17S	09Q1	87	1.88	0.005UJ	0.5	0.2U	169J
MW-17S	09Q2	88	0.405J	0.01U	0.5536	0.065U	131
MW-17S	09Q3	89	2.76	0.01U	0.5872	0.065U	128
MW-17S	09Q4	90	1.424	0.01U	0.6341	0.065U	151
MW-17S	10Q1	91	3.745	0.01U	0.7306	0.065U	133
MW-17S	10Q2	92	7.285	0.01U	0.4851J	0.065U	102
MW-17S	10Q3	93	2.558	0.01U	0.63	0.065U	112
MW-17S	10Q4	94	11.92	0.01U	0.5836	0.065U	105
MW-17S	11Q1	95	1.88	0.01U	0.95	0.065U	81.6
MW-17S	11Q2	96	1.75	0.01U	0.65	0.065U	98.7
MW-17S	11Q3	97	2.18	0.01U	0.45	0.049U	145
MW-17S	11Q4	98	4.4	0.01U	0.76	0.064U	146
MW-17S	12Q1	99	4.57	0.01U	0.78	0.063U	123
MW-17S	12Q2	100	1.69	0.01U	0.8	0.061U	651
MW-17S	12Q3	101	2.05	0.01U	0.25	0.061U	165
MW-17S	12Q4	102	1.05	0.01U	1	0.061U	145
MW-17S	13Q2	104	1.33	0.01U	0.67	0.063U	157
MW-17S	13Q4	106	2.38	0.01U	0.67	0.061U	144
MW-17S	14Q2	108	2.12	0.01U	0.59	0.061U	133
MW-17S	14Q4	110	2.21	0.01U	0.61	0.061U	145
MW-17S	15Q2	112	0.78	0.01U	0.9J	0.061U	117
MW-17S	15Q4	114	0.71	0.01U	1.01	0.061U	125
MW-17S	16Q2	116	0.663	0.001J	0.708	0.065U	89.7
MW-17S	16Q4	118	0.736	0.005U	1.37	0.065U	111
MW-17S	17Q2	120	0.491	0.003J	1.04	0.065U	116
MW-17S	17Q4	122	0.387	0.005U	1.2	0.065U	88.8
MW-17S	18Q2	124	0.342	0.005U	0.806	0.065U	106
MW-17S	18Q4	126	---	---	---	---	---
MW-17S	19Q2	128	1.13	0.002J	0.806J	0.065U	107
MW-17S	19Q4	130	0.032J	0.002J	0.919	0.065U	130
MW-17S	20Q2	132	0.1U	0.005U	1.05	0.065U	103
MW-17S	20Q4	134	0.1U	0.005U	0.886	0.065U	159

Monitoring Well MW-18S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-18S	99Q1	47	15	0.17	4800	1.1	15000
MW-18S	99Q2	48	18	0.23	2000	0.17	20000
MW-18S	99Q3	49	9.2	0.3	780	0.21	20000
MW-18S	99Q4	50	3.9	0.26	870	0.24	1500
MW-18S	00Q1	51	8.3	0.4	420	0.065U	4800
MW-18S	00Q2	52	1.2	0.22	44	0.24	240
MW-18S	00Q3	53	0.39	0.46	71	0.092	310
MW-18S	00Q4	54	0.38	0.207	122.1	0.065U	3440
MW-18S	01Q1	55	1.29	1.12	NA[1]	0.097	2422.91
MW-18S	01Q2	56	0.56	0.923	126.4	0.065U	1258.57
MW-18S	01Q3	57	1.16	0.749	135.8	0.065U	1958.33
MW-18S	01Q4	58	0.63	0.552	119.7	0.065U	2400.9
MW-18S	02Q1	59	0.62	0.521	127.7	0.134	190.52
MW-18S	02Q2	60	0.57	0.465	69.21	0.13	982.66
MW-18S	02Q3	61	0.15	0.362	89.35	0.065U	1062.29
MW-18S	02Q4	62	0.099	0.246	78.52	0.065U	1150.97
MW-18S	03Q1	63	0.244	0.267	77.38	0.07	1319.269
MW-18S	03Q2	64	0.055	0.299	88.88	0.065U	1281.21
MW-18S	03Q3	65	0.075	0.284	71.09	0.065U	1413.09
MW-18S	03Q4	66	0.102	0.241	88.18	0.19	1753.81
MW-18S	04Q1	67	0.086	0.316	84.25	0.065U	1154.05
MW-18S	04Q2	68	0.129	0.354	81.11	0.065U	827.73
MW-18S	04Q3	69	0.081	0.432	76.42	0.217	790.49
MW-18S	04Q4	70	0.14J	0.337	14.84	0.065U	1162.81
MW-18S	05Q1	71	0.2695	0.31	101.1	0.065U	780.65
MW-18S	05Q2	72	0.231	0.286	85.58	0.065U	797.41
MW-18S	05Q3	73	0.15	0.337	57.37	0.065U	595.18
MW-18S	05Q4	74	0.327	0.288	77.52	1.42	711.67
MW-18S	06Q1	75	0.294	0.183	76.71	0.108	705.46
MW-18S	06Q2	76	0.101	0.08	45.1	0.068	369.47
MW-18S	06Q3	77	0.067	0.088	45.81	0.087	584.56
MW-18S	06Q4	78	0.077	0.14	64.3	0.24	473.31
MW-18S	07Q1	79	0.118	0.148	75.88	0.073	610.75
MW-18S	07Q2	80	0.103	0.022	54.06	0.1045	432.275
MW-18S	07Q3	81	0.07	0.094	57.16	0.095	499.98
MW-18S	07Q4	82	0.053	0.045	52.66	0.149	470
MW-18S	08Q1	83	0.095	0.063	4.868	0.065U	445
MW-18S	08Q2	84	0.289	0.058	39.38	0.101	198
MW-18S	08Q3	85	0.233	0.057R	49.31	0.188	420
MW-18S	08Q4	86	0.124	0.058	51.48	0.133	433
MW-18S	09Q1	87	0.2U	0.0977R	63.2	0.2U	506J
MW-18S	09Q2	88	0.2U	0.0725	63.62	0.109	430
MW-18S	09Q3	89	0.226	0.0627	61.115	0.115	214
MW-18S	09Q4	90	0.081	0.077	57.61	0.0965	545
MW-18S	10Q1	91	0.127	0.0286J	41.23	0.125	418
MW-18S	10Q2	92	0.066R	0.08	44.27J	0.107	423
MW-18S	10Q3	93	0.08	0.074	56.15	0.0825PD	491
MW-18S	10Q4	94	0.281	0.096	60.53	0.117	443
MW-18S	11Q1	95	0.27	0.074	63.1	---	371
MW-18S	11Q2	96	0.16	0.061	48.6	0.0677	417
MW-18S	11Q3	97	1.27	0.103	67.2	0.19	618
MW-18S	11Q4	98	0.39	0.08	73.2	0.67	466
MW-18S	12Q1	99	0.84	0.051	70.6	0.17	389
MW-18S	12Q2	100	1.25	0.038	48.5	0.061U	403
MW-18S	12Q3	101	0.94	0.04	71.7	0.061U	327
MW-18S	12Q4	102	1.18	0.045	73.1	0.064U	371
MW-18S	13Q2	104	3.33	0.022	77.7	0.061U	192
MW-18S	13Q4	106	4.44	0.074	65.9	0.061U	508
MW-18S	14Q2	108	1.19	0.022	32.95	0.061U	257.5
MW-18S	14Q4	110	2.11	0.032	33.8	0.061U	405
MW-18S	15Q2	112	1.82	0.037	53.5	0.091	330
MW-18S	15Q4	114	2.73	0.052	60	0.095	689
MW-18S	16Q2	116	2.05	0.005	57	0.065U	425
MW-18S	16Q4	118	1.61	0.006	55.7	0.065U	285
MW-18S	17Q2	120	4.05	0.026	59.7	0.065U	182.5
MW-18S	17Q4	122	0.819	0.023	31.1	0.065U	270
MW-18S	18Q2	124	0.371	0.018	24.3	0.065U	318
MW-18S	18Q4	126	0.18	0.02	27.4	0.065U	250
MW-18S	19Q2	128	0.1095	0.0365	20.8	0.065U	250
MW-18S	19Q4	130	0.0725J	0.0495	27.65	0.065U	286.5
MW-18S	20Q2	132	0.082J	0.023J	22.1	0.019U	226
MW-18S	20Q4	134	0.051J	0.007	29.1	0.065U	178

Monitoring Well MW-19S

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-19S	99Q1	47	0.09	0.01U	2.7	0.065U	490
MW-19S	99Q2	48	0.16	0.01U	2	0.065U	340
MW-19S	99Q3	49	0.2	0.01U	2.2	0.065U	390
MW-19S	99Q4	50	0.14	0.01U	3.7	0.065U	350
MW-19S	00Q1	51	0.19	0.01U	2.6	0.065U	290
MW-19S	00Q2	52	0.21	0.01U	4.3	0.065U	470
MW-19S	00Q3	53	0.1	0.01U	4.3	0.065U	360
MW-19S	00Q4	54	0.42	0.01U	4.715	0.065U	339
MW-19S	01Q1	55	0.1U	0.01U	NA[1]	0.065U	406.56
MW-19S	01Q2	56	0.1U	0.01U	3.051	0.065U	459.23
MW-19S	01Q3	57	0.16	0.01U	4.359	0.065U	327.97
MW-19S	01Q4	58	0.1U	0.01U	4.455	0.065U	275.71
MW-19S	02Q1	59	0.1U	0.01U	4.768	0.065U	349.78
MW-19S	02Q2	60	0.1U	0.01U	3.771	0.065U	381.46
MW-19S	02Q3	61	0.1U	0.01U	4.755	0.065U	310.48
MW-19S	02Q4	62	0.054	0.01U	8.876	0.07	246.49
MW-19S	03Q1	63	0.1U	0.01U	8.491	0.065U	312.123
MW-19S	03Q2	64	0.011U	0.01U	5.187	0.065U	331.46
MW-19S	03Q3	65	0.083	0.01U	7.794	0.065U	308.42
MW-19S	03Q4	66	0.289	0.01U	6.739	0.065U	225.09
MW-19S	04Q1	67	4.346	0.01U	7.551	0.065U	285.17
MW-19S	04Q2	68	0.972	0.01U	0.457	0.065U	212.75
MW-19S	04Q3	69	0.694	0.01U	4.238	0.065U	181.06
MW-19S	04Q4	70	.497J	0.01U	6.609	0.065U	190.32
MW-19S	05Q1	71	1.157	0.01U	8.789	0.065U	242.64
MW-19S	05Q2	72	1.201	0.01U	5.769	0.065U	197.31
MW-19S	05Q3	73	0.454	0.01U	4.667	0.065U	178.24
MW-19S	05Q4	74	1.507	0.01U	4.569	1.45	290.16
MW-19S	06Q1	75	0.476	0.01U	5.686	0.065U	266.89
MW-19S	06Q2	76	1.555	0.01U	3.592	0.065U	112.62
MW-19S	06Q3	77	0.375	0.01U	3.329	0.065U	106.94
MW-19S	06Q4	78	0.262J	0.01U	4.8325	0.065U	86.695J
MW-19S	07Q1	79	1.119	0.01U	8.192	0.065U	203.42
MW-19S	07Q2	80	0.412	0.01U	6.407	0.065U	247.41
MW-19S	07Q3	81	0.588	0.01U	8.6965	0.065U	176.86
MW-19S	07Q4	82	1.567	0.005U	7.331	0.065U	190
MW-19S	08Q1	83	0.341	0.005U	7.228	0.065U	201
MW-19S	08Q2	84	0.599	0.01U	4.461	0.065U	154J
MW-19S	08Q3	85	0.404	0.01U	5.019	0.065U	140
MW-19S	08Q4	86	0.747	0.01U	6.388	0.065U	186
MW-19S	09Q1	87	0.848	0.005UJ	10.4	0.2U	222J
MW-19S	09Q2	88	0.369J	0.01U	8.525	0.065U	109
MW-19S	09Q3	89	1.06	0.01U	7.853	0.065U	169J
MW-19S	09Q4	90	0.105	0.01U	5.71	0.065U	423
MW-19S	10Q1	91	5.94	0.01U	2.51	0.065U	394
MW-19S	10Q2	92	0.115R	0.01U	2.722J	0.065U	242
MW-19S	10Q3	93	0.816	0.01U	3.605	0.065U	250
MW-19S	10Q4	94	1.635J	0.01U	4.216	0.065U	228
MW-19S	11Q1	95	0.3	0.01U	4.78	0.065U	191
MW-19S	11Q2	96	0.19	0.01U	2.83	0.065U	195
MW-19S	11Q3	97	0.59	0.01U	2.77	0.049U	184
MW-19S	11Q4	98	0.66	0.01U	5.03	0.065U	221
MW-19S	12Q1	99	0.32	0.01U	8.16	0.065U	227
MW-19S	12Q2	100	0.44	0.01U	6.82	0.064	207
MW-19S	12Q3	101	0.3	0.01U	7.65	0.061U	198
MW-19S	12Q4	102	0.61	0.01U	6.72	0.061U	212
MW-19S	13Q2	104	0.69	0.01U	6.01	0.061U	236
MW-19S	13Q4	106	0.84	0.01U	6.04	0.061U	168
MW-19S	14Q2	108	0.9	0.01U	4.5	0.061U	180
MW-19S	14Q4	110	0.68	0.01U	5.44	0.061U	129
MW-19S	15Q2	112	0.2	0.01U	4.68	0.061U	170
MW-19S	15Q4	114	0.71	0.01U	4.63	0.061U	142
MW-19S	16Q2	116	12	0.001J	3.36	0.065U	104
MW-19S	16Q4	118	0.326	0.005U	3.18	0.065U	142
MW-19S	17Q2	120	0.168	0.002J	5.21	0.065U	215
MW-19S	17Q4	122	0.186	0.005U	3.02	0.065U	161
MW-19S	18Q2	124	0.123	0.0068J	3.16	0.065U	117
MW-19S	18Q4	126	0.099J	0.01U	3.49	0.02U	158
MW-19S	19Q2	128	0.042J	0.005U	2.61J	0.065U	272
MW-19S	19Q4	130	0.051J	0.005U	3.38	0.065U	130
MW-19S	20Q2	132	0.1U	0.005U	3.49	0.02U	97.6
MW-19S	20Q4	134	0.033J	0.005U	3.3	0.065U	101

Monitoring Well MW-36

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-36S	99Q1	47	1.1	0.01U	3.6	0.065U	340
MW-36S	99Q2	48	0.47	0.01U	2.9	0.065U	450
MW-36S	99Q3	49	0.46	0.02	2.2	0.065U	630
MW-36S	99Q4	50	0.31	0.01U	2.9	0.065U	610
MW-36S	00Q1	51	0.48	0.06	1.7	0.065U	530
MW-36S	00Q2	52	1	0.01U	3.4	0.065U	500
MW-36S	00Q3	53	0.53	0.01U	3.3	0.065U	510
MW-36S	00Q4	54	0.21	0.01U	3.479	0.065U	513
MW-36S	01Q1	55	0.24	0.01U	3.484	0.065U	625.27
MW-36S	01Q2	56	3.79	0.01U	3.589	0.065U	662.1
MW-36S	01Q3	57	1.7	0.01U	3.697	0.065U	667.04
MW-36S	01Q4	58	1.09	0.01U	3.291	0.065U	643.59
MW-36S	02Q1	59	0.71	0.01U	3.397	0.065U	652.23
MW-36S	02Q2	60	0.14	0.01U	3.081	0.065U	683.09
MW-36S	02Q3	61	0.29	0.01U	3.519	0.065U	664.98
MW-36S	02Q4	62	0.085	0.01U	3.481	0.065U	663.54
MW-36S	03Q1	63	5.672	0.01U	3.748	0.065U	697.287
MW-36S	03Q2	64	62.53	0.01U	3.629	0.065U	719.1
MW-36S	03Q3	65	37.19	0.01U	3.772	0.065U	691.32
MW-36S	03Q4	66	98.57	0.01U	3.541	0.065U	692.35
MW-36S	04Q1	67	54.29	0.01U	3.519	0.065U	680
MW-36S	04Q2	68	65.49	0.01U	3.391	0.065U	690.91
MW-36S	04Q3	69	52.55	0.01U	3.754	0.065U	682.47
MW-36S	04Q4	70	44.15J	0.01U	3.8	0.065U	637.83
MW-36S	05Q1	71	85.78	6.61	3.291	0.065U	675.18
MW-36S	05Q2	72	57.42	0.01U	3.501	0.065U	703.41
MW-36S	05Q3	73	48.23	0.01U	3.516	0.065U	682.1
MW-36S	05Q4	74	51.75	0.01U	2.613	0.065U	656.68
MW-36S	06Q1	75	46.69	0.01U	3.259	0.065U	639.53
MW-36S	06Q2	76	41.55	0.01U	2.61	0.065U	626.05
MW-36S	06Q3	77	77.12	0.01U	2.909	0.065U	665.24
MW-36S	06Q4	78	3.292	0.01U	3.152	0.065U	491.78
MW-36S	07Q1	79	41.7	0.01U	2.833	0.065U	562.15
MW-36S	07Q2	80	39.65	0.01U	2.955	0.065U	575.81
MW-36S	07Q3	81	138	0.01U	2.731	0.065U	514.74
MW-36S	07Q4	82	50.13	0.005U	2.822	0.065U	520
MW-36S	08Q1	83	153	0.005U	2.741	0.065U	498
MW-36S	08Q2	84	4.279	0.01U	3.014	0.065U	629J
MW-36S	08Q3	85	356.4	0.01U	3.608	0.065U	595
MW-36S	08Q4	86	5.046	0.01U	3.899	0.065U	588
MW-36S	09Q1	87	65.7	0.005UJ	2.45	0.2U	589J
MW-36S	09Q2	88	9.73J	0.01U	2.313	0.065U	511
MW-36S	09Q3	89	2.82	0.01U	2.333	0.065U	590
MW-36S	09Q4	90	743	0.01U	2.349	0.065U	566
MW-36S	10Q1	91	0.319	0.01U	2.855	0.065U	613
MW-36S	10Q2	92	347.2	0.01U	2.369J	0.065U	426
MW-36S	10Q3	93	4.344	0.01U	2.431	0.065U	42.5
MW-36S	10Q4	94	4.392	0.01U	2.3	0.065U	432
MW-36S	11Q1	95	7	0.01U	2.08	0.0915U	421
MW-36S	11Q2	96	81.2	0.01U	2.56	0.065U	424
MW-36S	11Q3	97	96.1	0.01U	1.99	0.05U	432
MW-36S	11Q4	98	159	0.01U	2.23	0.063U	443
MW-36S	12Q1	99	50.6	0.01U	2.37	0.046U	424
MW-36S	12Q2	100	104	0.01U	2.1	0.061U	213
MW-36S	12Q3	101	43.7	0.01U	2.03	0.25U	446
MW-36S	12Q4	102	70.6	0.01U	2.09	0.065U	401
MW-36S	13Q2	104	59	0.01U	2.13	0.061U	447
MW-36S	13Q4	106	89.6	0.01U	1.995	0.061U	411
MW-36S	14Q2	108	99.3	0.01U	1.99	0.061U	426
MW-36S	14Q4	110	102J	0.388	41	0.061U	1640
MW-36S	15Q2	112	84.9	0.01U	2.06	0.061U	414
MW-36S	15Q4	114	21.9	0.01U	2.35	0.061U	535
MW-36S	16Q2	116	35	0.005U	0.382	0.065U	413
MW-36S	16Q4	118	78.9	0.005U	2.08	0.065U	403
MW-36S	17Q2	120	36.2	0.005U	5.69	0.065U	393
MW-36S	17Q4	122	22.1	0.005U	2.26	0.065U	367
MW-36S	18Q2	124	24.3	0.01U	2.15	0.065U	406
MW-36S	18Q4	126	47.2	0.01U	2.3	0.02U	386
MW-36S	19Q2	128	5.05	0.005U	2.71J	0.065U	486
MW-36S	19Q4	130	29.7	0.005U	2.15	0.065U	396J
MW-36S	20Q2	132	6.74	0.005U	2.35	0.065U	352
MW-36S	20Q4	134	25.3	0.005U	1.99	0.065U	361

Monitoring Well MW-37

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-37S	99Q1	47	0.29	0.01U	0.5	0.065U	250
MW-37S	99Q2	48	0.25	0.01U	0.4	0.065U	220
MW-37S	99Q3	49	0.21	0.01U	0.4	0.065U	310
MW-37S	99Q4	50	0.1	0.01U	0.5	0.065U	280
MW-37S	00Q1	51	0.4	0.01U	0.6	0.065U	220
MW-37S	00Q2	52	0.26	0.01U	0.5	0.065U	270
MW-37S	00Q3	53	0.22	0.01U	0.4	0.065U	260
MW-37S	00Q4	54	0.1U	0.01U	0.434	0.065U	278
MW-37S	01Q1	55	0.99	0.01U	0.597	0.065U	267.06
MW-37S	01Q2	56	0.24	0.01U	0.772	0.065U	274.68
MW-37S	01Q3	57	6.2	0.01U	0.331	0.065U	260.89
MW-37S	01Q4	58	0.24	0.01U	0.43	0.065U	274.06
MW-37S	02Q1	59	0.44	0.01U	0.48	0.065U	273.24
MW-37S	02Q2	60	0.8	0.01U	0.577	0.065U	275.09
MW-37S	02Q3	61	0.5	0.01U	0.647	0.065U	247.93
MW-37S	02Q4	62	0.4	0.01U	0.504	0.065U	284.96
MW-37S	03Q1	63	0.428	0.01U	0.878	0.065U	285.992
MW-37S	03Q2	64	28.77	0.01U	0.54	0.065U	305.54
MW-37S	03Q3	65	30.82	0.01U	1.486	0.065U	279.2
MW-37S	03Q4	66	53.38	0.01U	0.553	0.065U	284.14
MW-37S	04Q1	67	34.69	0.01U	0.665	0.065U	291.14
MW-37S	04Q2	68	71.34	0.01U	1.05	0.065U	283.52
MW-37S	04Q3	69	95.7	0.01U	0.483	0.065U	290.52
MW-37S	04Q4	70	68.6J	0.01U	0.666	0.065U	265.57
MW-37S	05Q1	71	266.77	0.01U	0.4677	0.065U	275.92
MW-37S	05Q2	72	66.93	0.01U	0.69	0.065U	287.04
MW-37S	05Q3	73	46.11	0.34	0.8815	0.065U	284.8
MW-37S	05Q4	74	3.092	0.01U	0.427	0.065U	306.65
MW-37S	06Q1	75	89.08	0.01U	0.5457	0.407	326.04
MW-37S	06Q2	76	25.75	0.01U	0.5101	0.065U	269
MW-37S	06Q3	77	89.2	0.01U	0.4557	0.065U	297.92
MW-37S	06Q4	78	44.112	0.01U	0.5275	0.065U	256.47
MW-37S	07Q1	79	24.32	0.01U	0.4771	0.065U	280.1
MW-37S	07Q2	80	75.61	0.01U	0.4423	0.065U	278.52
MW-37S	07Q3	81	227.1	0.01U	0.3365	0.065U	293.42
MW-37S	07Q4	82	54.58	0.005U	0.4539	0.025	290
MW-37S	08Q1	83	193	0.005U	0.3342	0.065U	270
MW-37S	08Q2	84	123.2	0.01U	0.3076	0.065U	287J
MW-37S	08Q3	85	5.527	0.01U	0.3784	0.065U	292
MW-37S	08Q4	86	6.868	0.01U	0.3208	0.065U	271
MW-37S	09Q1	87	5.36	0.005UJ	0.1J	0.2U	311J
MW-37S	09Q2	88	50.2J	0.01U	0.2654	0.065U	271
MW-37S	09Q3	89	7.48	0.01U	0.2852	0.065U	270
MW-37S	09Q4	90	2.744	0.01U	0.3339	0.065U	283
MW-37S	10Q1	91	9.296	0.01U	0.2578	0.065U	301
MW-37S	10Q2	92	115.9	0.01U	0.2715J	0.065U	276
MW-37S	10Q3	93	5.113R	0.01U	0.3509	0.065U	28
MW-37S	10Q4	94	5.427	0.01U	0.3146	0.065U	285
MW-37S	11Q1	95	7.72	0.01U	0.33	0.13U	293
MW-37S	11Q2	96	67.7	0.01U	0.34	0.065U	279
MW-37S	11Q3	97	70.3	0.01U	0.25	0.05U	287
MW-37S	11Q4	98	78.3	0.01U	0.3	0.063U	296
MW-37S	12Q1	99	46.2	0.01U	0.38	0.065U	282
MW-37S	12Q2	100	117	0.01U	0.37	0.061U	176
MW-37S	12Q3	101	55.6	0.01U	0.23	0.59	283
MW-37S	12Q4	102	170	0.01U	0.4	0.061U	297
MW-37S	13Q2	104	117	0.01U	0.28	0.061U	304
MW-37S	13Q4	106	293	0.01U	0.28	0.061U	290
MW-37S	14Q2	108	351	0.01U	0.27	0.061U	299
MW-37S	14Q4	110	473J	0.01U	0.3	0.061U	289
MW-37S	15Q2	112	64.4	0.01U	0.3	0.061U	296
MW-37S	15Q4	114	96	0.01U	0.33	0.061U	314
MW-37S	16Q2	116	29.4	0.005U	0.279	0.065U	308
MW-37S	16Q4	118	29.2	0.005U	0.263	0.065U	285
MW-37S	17Q2	120	59.1	0.005U	2.16	0.065U	287
MW-37S	17Q4	122	80.6	0.005U	0.275	0.065U	319
MW-37S	18Q2	124	19	0.01U	0.39	0.065U	272
MW-37S	18Q4	126	300	0.01U	0.316	0.02U	300
MW-37S	19Q2	128	26.6	0.01U	0.324J	0.065U	383
MW-37S	19Q4	130	74.4	0.01U	0.321	0.065U	354J
MW-37S	20Q2	132	12.5	0.003J	0.59	0.065U	292
MW-37S	20Q4	134	25.2	0.005U	0.5U	0.065U	308

Monitoring Well MW-38

Location	Quarter	NQtr	Aluminum mg/l	Cyanide, Total mg/l	Fluoride mg/l	PCBs, Total µg/l	Sulfate mg/l
MW-38S	99Q1	47	0.69	0.01U	0.7	0.065U	180
MW-38S	99Q2	48	0.37	0.01U	0.6	0.065U	170
MW-38S	99Q3	49	0.36	0.01U	0.5	0.065U	170
MW-38S	99Q4	50	0.27	0.01U	0.7	0.065U	180
MW-38S	00Q1	51	0.51	0.01U	0.7	0.065U	160
MW-38S	00Q2	52	3.3	0.01U	0.7	0.065U	190
MW-38S	00Q3	53	0.37	0.01U	0.6	0.065U	200
MW-38S	00Q4	54	0.13	0.01U	0.554	0.065U	178
MW-38S	01Q1	55	0.78	0.01U	0.671	0.065U	193.82
MW-38S	01Q2	56	0.4	0.01U	0.764	0.065U	198.34
MW-38S	01Q3	57	13.47	0.01U	0.486	0.065U	176.33
MW-38S	01Q4	58	0.48	0.01U	0.656	0.065U	177.97
MW-38S	02Q1	59	0.73	0.01U	0.69	0.065U	172.83
MW-38S	02Q2	60	0.86	0.01U	0.863	0.065U	179
MW-38S	02Q3	61	0.54	0.01U	0.764	0.065U	163.37
MW-38S	02Q4	62	1.484	0.01U	0.774	0.065U	184.97
MW-38S	03Q1	63	22.28	0.01U	1.113	0.065U	183.529
MW-38S	03Q2	64	33.63	0.01U	1.071	0.078	284.14
MW-38S	03Q3	65	36.27	0.01U	1.361	0.065U	174.89
MW-38S	03Q4	66	116.7	0.01U	0.698	0.065U	178.18
MW-38S	04Q1	67	106.4	0.01U	0.835	0.065U	182.09
MW-38S	04Q2	68	43.29	0.01U	2.686	0.065U	178.39
MW-38S	04Q3	69	106.25	0.01U	0.814	0.065U	177.15
MW-38S	04Q4	70	148.34J	0.01U	0.911	0.065U	159.68
MW-38S	05Q1	71	109.48	0.01U	0.7393	0.065U	177.08
MW-38S	05Q2	72	116.51	0.0105	0.807	0.065U	181.91
MW-38S	05Q3	73	82.35	0.01U	1.255	0.065U	173.1
MW-38S	05Q4	74	10.798	0.01U	0.4902	0.065U	201.12
MW-38S	06Q1	75	98.23	0.01U	0.5365	0.065U	179.74
MW-38S	06Q2	76	34.74	0.01U	0.7073	0.065U	195.49
MW-38S	06Q3	77	134.6	0.01U	0.4929	0.065U	179.96
MW-38S	06Q4	78	4.045	0.01U	0.9198	0.065U	162.09
MW-38S	07Q1	79	48.55	0.01U	0.7634	0.065U	173.92
MW-38S	07Q2	80	133.3	0.01U	0.5055	0.065U	178.19
MW-38S	07Q3	81	75.3	0.01U	0.3882	0.065U	184.7
MW-38S	07Q4	82	165.8	0.005U	0.6454	0.065U	180
MW-38S	08Q1	83	298	0.005U	0.5192	0.065U	181
MW-38S	08Q2	84	242.7	0.01U	0.5395	0.065U	182J
MW-38S	08Q3	85	469.5	0.01U	0.5061	0.065U	177
MW-38S	08Q4	86	6.278	0.01U	0.5228	0.065U	166
MW-38S	09Q1	87	161	0.005UJ	0.35	0.2U	182J
MW-38S	09Q2	88	202J	0.01U	0.4412	0.065U	152
MW-38S	09Q3	89	156	0.01U	0.4614	0.065U	151 J
MW-38S	09Q4	90	36.06	0.01U	0.4708	0.065U	174
MW-38S	10Q1	91	4.413	0.01U	0.4368	0.065U	180
MW-38S	10Q2	92	100.5	0.01U	0.44J	0.065U	163
MW-38S	10Q3	93	2.151	0.01U	0.5451	0.065U	40.7
MW-38S	10Q4	94	161.6	0.01U	0.4898	0.065UJ	171
MW-38S	11Q1	95	822	0.01U	0.49	0.0677U	177
MW-38S	11Q2	96	368	0.01U	0.49	0.122	176
MW-38S	11Q3	97	352	0.01U	0.41	0.05UJ	179
MW-38S	11Q4	98	251	0.01U	0.44	0.063U	178
MW-38S	12Q1	99	126	0.01U	0.49	0.065U	176
MW-38S	12Q2	100	102	0.01U	0.43	0.061U	120
MW-38S	12Q3	101	104	0.01U	0.41	0.16U	169
MW-38S	12Q4	102	105	0.01U	0.47	0.061U	174
MW-38S	13Q2	104	38	0.01U	0.465	0.061U	186.5
MW-38S	13Q4	106	83.4	0.01U	0.46	0.061U	178
MW-38S	14Q2	108	105	0.01U	0.45	0.061U	174
MW-38S	14Q4	110	179J	0.01U	0.48	0.061U	174
MW-38S	15Q2	112	41.9	0.01U	0.49	0.061U	176
MW-38S	15Q4	114	26.8	0.01U	0.53	0.061U	185
MW-38S	16Q2	116	44.9	0.005U	0.478	0.065U	202
MW-38S	16Q4	118	29.6	0.005U	0.47	0.065U	186
MW-38S	17Q2	120	40.8	0.004J	1.77	0.065U	121
MW-38S	17Q4	122	34.7	0.005U	0.435	0.065U	174
MW-38S	18Q2	124	15	0.01UJ	0.579	0.065U	187
MW-38S	18Q4	126	44.2	0.01U	0.4	0.021U	182
MW-38S	19Q2	128	11.2	0.005U	0.475J	0.065U	213
MW-38S	19Q4	130	39.1	0.005U	0.484	0.065U	219J
MW-38S	20Q2	132	9.6	0.005U	0.756	0.065U	185
MW-38S	20Q4	134	16.2	0.005U	0.453J	0.065U	182

Note:
1. Fluoride samples for MW-18S and MW-19S were lost in processing for 01Q1.

Key:
U = Not detected at value listed
J = Estimated
UJ = Estimated as nondetect
NA = Not available
R = Rejected value

Collection Date	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
5/7/97	0.09U	0.2U	0.09U	0.09U	0.09U	0.09U	0.09U	0.2U
7/2/97	0.1U	0.2U	0.1U	0.1U	0.097J	0.1U	0.1U	0.097J
8/11/97	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
8/21/97	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
9/20/97	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
9/29/97	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
10/27/97	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
11/3/97	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
11/7/97	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
December 1997	No samples taken							
January 1998	No samples taken							
February 1998	No samples taken							
March 1998	No samples taken							
April 1998	No samples taken							
May 1998	No samples taken							
6/3/98	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
7/6/98	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
8/3/98	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
9/16/98	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
10/6/98	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
11/11/98	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
12/9/98	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
January 1999	No samples taken							
2/23/99	0.065U	0.065U	0.065U	0.065U	0.068	0.065U	0.065U	0.068
2/23/99	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
2/23/99	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
3/11/99	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
4/22/99	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
5/10/99	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
5/27/99	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
8/26/99	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
10/28/99	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
1/27/00	0.100U	0.200U	0.100U	0.100U	0.100U	0.100U	0.100U	0.100U
4/26/00	0.100U	0.200U	0.100U	0.100U	0.100U	0.100U	0.100U	0.100U
7/10/00	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
11/10/00	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U

Table C-5
East Plant
Sample Results at Rectifier Pond

Collection Date	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
2/9/01	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
4/26/01	0.048U	0.048U	0.048U	0.048U	0.048U	0.048U	0.048U	0.048U
7/10/01	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
10/2/01	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
1/2/02	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
4/2/02	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
7/2/02	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
10/19/02	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
1/7/03	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
4/1/03	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
7/1/03	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
10/7/03	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
1/6/04	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
4/6/04	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
7/6/04	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
10/18/04	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	
1/4/05	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	
4/5/05	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	
7/6/05	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	
10/18/04	12Q1	99						0.065U
1/4/05	12Q2	100						0.065U
4/5/05	12Q3	101						0.065U
7/6/05	12Q4	102						0.065U
10/4/05	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
1/3/06	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
4/4/06	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
7/5/06	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
10/3/06	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
1/2/07	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
4/3/07	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
7/9/07	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
10/8/07	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
1/4/08	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
4/1/08	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
7/9/08	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
10/7/08	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
1/6/09	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
4/7/09	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
7/7/09	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
10/6/09	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
1/5/10	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
4/6/10	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
7/6/10	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
10/4/10	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
1/4/11	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
4/5/11	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
7/5/11	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
10/4/11	---	---	---	0.065U	0.065U	0.065U	0.065U	0.065U
1/24/12				0.065U	0.065U	0.065U	0.065U	0.065U
4/23/12				0.065U	0.065U	0.065U	0.065U	0.065U
10/2/12				0.065U	0.065U	0.065U	0.065U	0.065U

Key:
U = Not detected at the value listed
J = Estimated
--- = Analysis was not performed
Sampling discontinued per letter from NYSDEC dated January 3, 2013.

Table C-5
East Plant
Sample Results at Rectifier Pond

Black Mud Pond

Sample ID Sample Date Parameter ID	Unit	MW-11SR-0620 6/9/20	MW-11SR-1220 12/3/20	MW-12S-0620 6/9/20	MW-12S-1220 12/4/20	MW-13S-0620 6/9/20	MW-13S-1220 12/3/20	MW-14S-0620 6/26/20
Field Parameters								
pH	SU	7.52	7.94	7.58	7.76	7.34	7.41	7.51
Temperature	deg C	9.8	8.89	9.6	9.74	8.9	8.63	9.1
Specific Conductance	mS/cm	1.32	1.112	2.808	3.163	4.935	1.22	1.091
Turbidity	NTU	25.3	21	29.5	15	8	8	19.3
Redox Potential	mVolt	112.4	156.2	125.3	171	210.9	154.5	190.2

Sample ID Sample Date Parameter ID	Unit	MW-14S-1220 12/3/20	MW-15S-87-0620 6/9/20	MW-15S-87-1220 12/3/20	MW-20-85S-0620 6/9/20	MW-20-85S-1220 12/3/20	MW-20-85S-0620 6/9/20	MW-22-85S-1220 12/3/20
Field Parameters								
pH	SU	8.12	7.66	7.94	10.91	11.38	10.91	7.69
Temperature	deg C	9.3	11.6	9.63	10.3	9.54	10.3	9.11
Specific Conductance	mS/cm	1.178	0.646	0.635	1.338	1.522	1.338	1.619
Turbidity	NTU	4	414	37	9.5	3	9.5	17
Redox Potential	mVolt	155	81.7	152.7	151.2	119.8	151.2	163.6

Sample ID Sample Date Parameter ID	Unit	MW-23-85S-0620 6/9/20	MW-23-85S-1220 12/3/20	MW-30S-0620 6/9/20	MW-30S-1220 12/3/20	MW-31SR-0620 6/9/20	MW-31SR-1220 12/3/20	PZ-44-0620 6/9/20
Field Parameters								
pH	SU	7.39	7.51	7.25	7.71	7.67	7.87	7.3
Temperature	deg C	9	8.35	9.6	8.96	9.4	9.28	17.4
Specific Conductance	mS/cm	0.978	1.075	0.683	0.898	0.625	0.73	2.469
Turbidity	NTU	202	75	8.4	18	184	617	275
Redox Potential	mVolt	184.1	150.1	168.5	149.7	175.4	153.7	-23.5

Sample ID Sample Date Parameter ID	Unit	MW-44-1220 12/3/20	PZ-45-0620 6/9/20	PZ-45-1220 12/3/20	PZ-46-0620 6/9/20	PZ-46-1220 12/3/20
Field Parameters						
pH	SU	7.91	7.43	7.97	7.7	8.25
Temperature	deg C	11.1	13.4	9.45	15.6	6.77
Specific Conductance	mS/cm	1.142	2.035	2.073	2.33	1.948
Turbidity	NTU	22.6	296	132	990	365
Redox Potential	mVolt	29.2	-2.4	-79.4	19.7	106.6

Landfill

Sample ID Sample Date Chemical Name	Unit	MW-10S-0320 3/10/20	MW-10S-0620 6/9/20	MW-10S-0920 9/16/2020	MW-10S-1220 12/3/20	MW-39S-0320 3/10/20	MW-39S-0620 6/9/20	MW-39S-0920 9/16/20
Field Parameters								
pH	SU	6.94	7.25	7.34	7.27	7.07	7.25	7.45
Temperature	deg C	8	9.9	12.61	9.62	6.6	9.4	11
Specific Conductance	mS/cm	0.504	0.678	0.853	0.752	0.581	0.745	0.935
Turbidity	NTU	4	16.9	6.86	4	293	104	13.2
Redox Potential	mVolt	184.2	160.4	244.8	220.3	150.4	152.2	246.4

Sample ID Sample Date Chemical Name	Unit	MW-39S-1220 12/3/20	MW-40S-0320 3/10/20	MW-40S-0620 6/9/20	MW-40S-0920 9/16/20	MW-40S-1220 12/3/20	MW-45-0320 3/10/20	MW-45-0620 6/9/20
Field Parameters								
pH	SU	7.35	7.16	7.33	7.54	6.8	6.91	7.27
Temperature	deg C	10.02	7.9	11.3	12.34	10.53	5.4	9.4
Specific Conductance	mS/cm	1.046	0.792	1.092	1.18	1.214	1.128	1.455
Turbidity	NTU	15	12	15	2.78	2	33.9	76.6
Redox Potential	mVolt	196	146.5	162.1	249.4	234.4	163.3	155.4

Sample ID Sample Date Chemical Name	Unit	MW-45-0920 9/16/20	MW-45-1220 12/3/20	SLPWETW-1220 12/3/20
Field Parameters				
pH	SU	7.48	7.3	7.88
Temperature	deg C	11.38	9.11	5.38
Specific Conductance	mS/cm	2.07	1.941	0.554
Turbidity	NTU	18.3	15	2
Redox Potential	mVolt	256.3	181.5	163.5

Potliner Storage Pad

Sample ID Sample Date Parameter ID	Unit	MW-03S-0620 6/9/20	MW-03S-1220 12/3/20	MW-26S-0620 6/8/20	MW-26S-1220 12/3/20	MW-27S-0620 6/9/20	MW-27S-1220 12/3/20	MW-28S-0620 6/8/20
Field Parameters								
pH	SU	7.94	8.47	7.97	7.98	7.47	7.91	8.43
Temperature	deg C	12	10.4	10.9	11.64	11.9	13.03	9.8
Specific Conductance	mS/cm	1.555	2.405	0.775	1.278	7.762	10.53	1.025
Turbidity	NTU	78.9	44.3	361	286	23.9	31.2	28
Redox Potential	mVolt	210.1	-86.9	171.3	-47.3	228.5	-109.1	166.3

Sample ID Sample Date Parameter ID	Unit	MW-28S-1220 12/3/20	MW-33S-0620 6/8/20	MW-33S-1220 12/3/20	MW-34S-0620 6/8/20	MW-34S-1220 12/3/20	MW-35SR-0620 6/11/20	MW-35SR-1220 12/3/20
Field Parameters								
pH	SU	8.47	7.39	7.9	8.13	7.77	7.71	8.3
Temperature	deg C	11.93	11.6	10.43	11.1	9.5	10.3	10.77
Specific Conductance	mS/cm	1.383	2.137	2.893	2.441	3.524	1.27	2.415
Turbidity	NTU	100	18.4	72.5	70.4	833	1000	845
Redox Potential	mVolt	-59.9	221.6	-13.4	214	25.5	170.1	28.8

North Yard

Sample ID Sample Date Parameter ID	Unit	MW-16S-0620 6/9/20	MW-16S-1220 12/3/20	MW-17S-0620 6/11/20	MW-17S-1220 12/3/20	MW-18S-0620 6/8/20	MW-18S-1220 12/3/20	MW-19S-0620 6/9/20
Field Parameters								
pH	SU	8.18	8.51	7.52	7.9	8.14	8.51	7.52
Temperature	deg C	9.5	11.55	13.2	9.72	12.1	11.85	9.7
Specific Conductance	mS/cm	1.166	1.448	0.927	2.102	1.266	3.022	0.736
Turbidity	NTU	11.4	34.7	4	26.5	36	5.82	1.1
Redox Potential	mVolt	217.1	-127.3	185.7	-118.5	214.5	-128.4	137.5

Sample ID Sample Date Parameter ID	Unit	MW-19S-1220 12/3/20	MW-36-0620 6/11/20	MW-36-1220 12/3/20	MW-37-0620 6/11/20	MW-37-1220 12/3/20	MW-38-0620 6/11/20	MW-38-1220 12/3/20
Field Parameters								
pH	SU	8.25	8.62	8.73	7.7	8.3	8.11	8.05
Temperature	deg C	12.23	10.5	10.15	10.7	9.95	11.9	10.21
Specific Conductance	mS/cm	1.467	1.909	3.391	0.774	1.366	0.44	0.872
Turbidity	NTU	19	1000	1000	1000	1000	1000	1000
Redox Potential	mVolt	-109.4	164.6	38.3	169.3	45.4	164.1	156.2

Sample ID Sample Date Parameter ID	Unit	MW-41-0620 6/9/20	MW-41-1220 12/3/20	MW-42-0620 6/11/20	MW-42-1220 12/3/20	MW-43-0620 6/11/20	MW-43-1220 12/3/20	MW-44-0620 6/11/20
Field Parameters								
pH	SU	7.68	7.9	8.07	8.37	7.36	7.8	7.42
Temperature	deg C	11.8	9.32	10.9	9.6	10.8	10.41	12.1
Specific Conductance	mS/cm	1.215	1.535	2.36	4.643	0.726	1.19	0.7
Turbidity	NTU	918	609	338	1000	1000	1000	72
Redox Potential	mVolt	204.7	-121.5	179.2	30.6	182.9	26.2	197.7

Sample ID Sample Date Parameter ID	Unit	MW-44-1220 12/3/20	FDRAIN-0620 6/8/20	FDRAIN-1220 12/3/20
Field Parameters				
pH	SU	7.91	8.47	7.5
Temperature	deg C	11.1	12.8	10.43
Specific Conductance	mS/cm	1.142	1.214	1.642
Turbidity	NTU	22.6	3.2	7.02
Redox Potential	mVolt	29.2	211.8	79.9

Key:
--- = Not analyzed

Appendix D

Statistical Analysis Results

MW-03S

Date	Aluminum mg/l	Aluminum signs
1/1/98	2.100	
4/1/98	2.100	11
7/1/98	1.600	-2
10/1/98	2.200	3
1/1/99	2.100	0
4/1/99	3.300	5
7/1/99	2.500	4
10/1/99	3.000	5
1/1/00	3.200	6
4/1/00	2.700	3
7/1/00	4.100	10
11/2/00	0.200	-11
1/24/01	0.750	-10
4/27/01	0.380	-11
7/25/01	4.100	13
10/24/01	0.370	-13
1/23/02	0.190	-16
4/30/02	0.790	-7
7/23/02	0.500	-10
10/24/02	0.427	-11
1/23/03	15.650	20
4/23/03	15.800	21
7/29/03	0.658	-10
10/21/03	3.778	15
1/20/04	36.610	24
4/21/04	6.670	19
7/20/04	3.097	8
10/27/04	0.981	-9
1/18/05	13.340	22
4/27/05	2.825	5
7/19/05	5.580	20
10/25/05	8.290	23
1/17/06	3.906	14
4/26/06	16.220	31
7/13/06	9.160	24
10/26/06	1.744	-13
1/25/07	2.673	-2
4/25/07	9.786	27
8/16/07	1.932	-14
10/25/07	15.090	31
10/22/08	5.234	18
1/13/09	6.080	21
4/28/09	0.653	-30
7/28/09	1.290	-21
10/27/09	3.205	8
2/11/10	4.005	15
6/9/10	5.671	24
9/21/10	2.054	-17
12/14/10	5.423	22
9/20/11	39.400	49
12/15/11	16.500	46
2/16/12	31.600	47
7/12/12	21.800	46
12/12/13	14.500	35
6/17/14	21.800	47
1/10/17	3.240	1
6/20/18	10.800	32
1/9/19	8.920	27
6/27/19	0.840	-38
12/5/19	1.280	-35
6/9/20	1.300	-32
12/3/20	2.920	-7
	S	483
	count (n)	62
	g	3
	t_1	3
	t_2	2
	t_3	2
	VARS(S) :	27098.66667
	Z	2.93
	α/2(normal dis	1.96
	Null hypothes	Reject
	Trend Analysis R	Trend exists
	Slope of Dat	Increasing

Date	Cyanide mg/l	Cyanide signs
1/1/98	15.00	
4/1/98	6.90	-1
7/1/98	11.00	0
10/1/98	16.00	3
1/1/99	9.80	-2
4/1/99	14.00	1
7/1/99	14.00	1
10/1/99	14.00	1
1/1/00	14.00	1
4/1/00	5.30	-9
7/1/00	14.00	2
11/2/00	12.40	-3
1/24/01	5.96	-10
4/27/01	10.00	-5
7/25/01	8.37	-8
10/24/01	7.93	-9
1/23/02	12.10	0
4/30/02	11.20	-1
7/23/02	10.00	-5
10/24/02	9.57	-9
1/23/03	10.30	-2
4/23/03	9.47	-11
7/29/03	9.41	-12
10/21/03	8.60	-13
1/20/04	8.94	-12
4/21/04	6.53	-21
7/20/04	7.74	-18
10/27/04	9.02	-9
1/18/05	8.06	-16
4/27/05	8.10	-15
7/19/05	7.52	-22
10/25/05	7.15	-23
1/17/06	6.98	-24
4/26/06	6.38	-29
7/13/06	5.96	-31
10/26/06	6.71	-25
1/25/07	6.02	-30
4/25/07	5.57	-35
8/16/07	5.70	-34
10/25/07	5.40	-37
1/13/09	0.75	-40
4/28/09	3.54	-39
7/28/09	4.41	-38
10/27/09	3.69	-39
2/11/10	2.92	-42
6/9/10	5.92	-27
9/21/10	3.79	-38
12/14/10	3.98	-37
9/20/11	2.96	-44
12/15/11	4.77	-33
2/16/12	3.83	-38
7/12/12	3.59	-43
12/12/13	3.26	-46
6/17/14	1.87	-51
1/10/17	2.75	-50
6/20/18	1.00	-53
1/9/19	2.31	-50
6/27/19	0.484	-57
12/5/19	1.62	-52
6/9/20	1.77	-51
12/3/20	0.63	-58
	S	-1398
	count (n)	61
	g	2
	t_1	5
	t_2	2
	t_3	0
	VARS(S) :	25805.66667
	Z	8.70
	α/2(normal dist.)	1.96
	Null hypothesis	Reject
	Trend Analysis Resu	Trend exists
	Slope of Data	Decreasing

Date	WAD Cyanide mg/l	WAD Cyanide signs
11/2/00	0.104	
1/24/01	0.074	-1.000
4/26/01	0.215	2
7/24/01	0.221	3
10/24/01	0.164	0
1/23/02	0.465	5
5/1/02	0.107	-2
7/24/02	0.210	1
10/23/02	0.144	-2
1/23/03	0.119	-3
4/23/03	0.146	0
7/29/03	0.726	11
10/21/03	0.308	8
1/20/04	0.081	-11
4/21/04	0.209	2
7/20/04	0.363	11
10/27/04	0.436	12
1/18/05	0.193	-1
4/27/05	0.245	8
7/19/05	0.229	7
10/25/05	0.346	12
1/17/06	0.180	-5
4/26/06	0.202	-2
7/13/06	0.138	-13
10/26/06	0.194	-2
1/25/07	0.628	23
4/25/07	0.309	14
8/16/07	0.306	11
10/25/07	0.063	-28
10/22/08	0.100	-23
1/13/09	0.243	10
4/28/09	0.091	-25
7/28/09	0.869	32
10/27/09	0.135	-17
2/11/10	3.17J	0
6/9/10	5.920	34
9/21/10	3.790	33
12/14/10	3.980	34
9/20/11	0.037	-37
12/15/11	0.066	-34
2/16/12	0.103	-25
7/12/12	0.024	-40
12/12/13	0.097	-27
6/17/14	0.129	-16
1/10/17	0.300	17
1/9/19	0.150	-8
6/27/19	0.050	-41
12/5/19	0.026	-44
6/9/20	0.123	-17
12/3/20	0.037	-43.000
	S	-177
	count (n)	50
	g	0
	t_1	0
	t_2	0
	t_3	0
	VARS(S) :	14291.66667
	Z	1.47
	α/2(normal dist.)	1.96
	Null hypothesis	Accept
	Trend Analysis Resu	Trend does not exist
	Slope of Data	Decreasing

Date	Fluoride mg/l	Fluoride signs
1/1/98	8.90	
4/1/98	8.40	-1
7/1/98	9.30	2
10/1/98	12.00	3
1/1/99	13.00	4
4/1/99	11.00	1
7/1/99	10.00	0
10/1/99	14.00	7
1/1/00	12.00	3
4/1/00	12.00	3
7/1/00	17.00	10
11/2/00	12.63	5
1/24/01	13.10	8
4/27/01	15.74	11
7/25/01	15.54	10
10/24/01	15.01	9
1/23/02	14.50	8
4/30/02	13.68	5
7/23/02	15.30	12
10/24/02	18.71	19
1/23/03	17.98	18
4/23/03	17.51	17
7/29/03	20.25	22
10/21/03	18.30	19
1/20/04	16.67	12
4/21/04	16.96	13
7/20/04	22.00	26
10/27/04	21.26	25
1/18/05	23.20	28
4/27/05	23.61	29
7/19/05	20.68	22
10/25/05	19.69	19
1/17/06	20.06	20
4/26/06	21.25	25
7/13/06	24.39	34
10/26/06	20.89	23
1/25/07	20.31	20
4/25/07	22.00	30
8/16/07	20.16	16
10/25/07	22.58	33
10/22/08	17.06	2
1/13/09	17.50	3
4/28/09	17.13	2
7/28/09	18.39	11
10/27/09	17.51	5
2/11/10	20.30	23
6/9/10	17.22	0
9/21/10	15.97	-11
12/14/10	15.81	-12
9/20/11	14.70	-21
12/15/11	15.00	-20
2/16/12	13.60	-29
7/12/12	15.10	-16
12/12/13	12.00	-40
6/17/14	8.60	-52
1/10/17	14.10	-23
6/20/18	32.10	56
1/9/19	19.20	23
6/27/19	16.00	-4
12/5/19	15.80	-9
6/9/20	12.90	-38
12/3/20	10.10	-51
	S	369
	count (n)	62
	g	3
	t_1	4
	t_2	2
	t_3	2
	VARS(S) :	27093.66667
	Z	2.24
	α/2(normal dist.)	1.96
	Null hypothesis	Reject
	Trend Analysis Resu	Trend exists
	Slope of Data	Increasing

Date	Sulfate mg/l	Sulfate signs
1/1/98	520.00	
4/1/98	470.00	-1
7/1/98	540.00	2
10/1/98	480.00	-1
1/1/99	550.00	4
4/1/99	450.00	-5
7/1/99	580.00	6
10/1/99	490.00	-1
1/1/00	450.00	-7
4/1/00	530.00	3
7/1/00	650.00	10
11/2/00	446.00	-11
1/24/01	637.41	10
4/27/01	685.56	13
7/25/01	714.78	14
10/24/01	705.52	13
1/23/02	679.18	10
4/30/02	654.08	9
7/23/02	688.44	14
10/24/02	701.20	15
1/23/03	654.29	8
4/23/03	649.55	3
7/29/03	649.96	4
10/21/03	645.64	1
1/20/04	647.70	2
4/21/04	637.00	-3
7/20/04	621.98	-4
10/27/04	475.73	-19
1/18/05	595.66	-4
4/27/05	598.23	-3
7/19/05	614.00	-2
10/25/05	587.47	-7
1/17/06	591.92	-6
4/26/06	618.41	1
7/13/06	505.51	-20
10/26/06	422.86	-35
1/25/07	469.11	-28
4/25/07	472.52	-25
8/16/07	479.11	-22
10/25/07	470.00	-28
10/22/08	402.00	-40
1/13/09	363.00	-41
4/28/09	342.00	-42
7/28/09	346.00	-41
10/27/09	387.00	-38
2/11/10	379.00	-39
6/9/10	349.00	-42
9/21/10	260.00	-47
12/14/10	322.00	-46
9/20/11	283.00	-47
12/15/11	333.00	-44
2/16/12	325.00	-45
7/12/12	341.00	-42
12/12/13	349.00	-36
6/17/14	260.00	-53
1/10/17	345.00	-39
6/20/18	218.00	-56
1/9/19	308.00	-49
6/27/19	364.00	-28
12/5/19	275.00	-53
6/9/20	256.00	-58
12/3/20	313.00	-47
	S	-1063
	count (n)	62
	g	4
	t_1	2
	t_2	2
	t_3	2
	t_4	2
	t_5	0
	t_6	0
	VARS(S) :	27100.333
	Z	6.45
	α/2(normal dist.)	1.96
	Null hypothesis	Reject
	Trend Analysis Resu	Trend exists
	Slope of Data	Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p (t_p - 1)(2t_p + 5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the p th group

Note: If a result was nondetect, then half of the detection limit was used.

MW-10S

Date	Aluminum mg/l	Aluminum signs
1/1/99	0.830	
4/1/99	0.360	-1
7/1/99	1.600	2
10/1/99	1.500	1
1/1/00	3.800	4
4/1/00	0.230	-5
7/1/00	0.960	0
11/2/00	0.050	-7
1/24/01	0.820	-2
4/27/01	0.670	-3
7/25/01	3.000	8
10/24/01	0.110	-9
1/23/02	0.100	-10
4/30/02	0.050	-12
7/23/02	0.200	-6
10/24/02	0.190	-7
1/23/03	0.558	0
4/23/03	0.006	-17
7/29/03	3.079	16
10/21/03	0.016	-17
1/20/04	3.878	20
4/21/04	1.999	13
7/20/04	1.344	8
10/27/04	2.564	15
1/18/05	10.410	24
4/27/05	13.910	25
7/19/05	2.966	14
10/25/05	2.911	13
1/17/06	2.076	10
4/26/06	0.112	-17
7/12/06	1.537	6
10/25/06	0.311	-11
1/23/07	0.666	-6
4/24/07	2.737	17
8/14/07	0.247	-14
10/23/07	0.892	1
1/29/08	4.230	32
4/15/08	3.272	27
7/23/08	4.768	34
10/16/08	2.522	13
1/13/09	1.570	6
4/28/09	3.440	29
7/28/09	4.125	34
10/27/09	2.000	9
2/9/10	3.551	30
6/8/10	2.062	9
9/21/10	1.060	-6
12/14/10	2.548	15
3/2/11	2.620	18
6/22/11	2.210	11
9/14/11	68.700	50
12/13/11	7.550	45
2/14/12	1.220	-10
7/10/12	1.930	1
9/25/12	1.240	-10
12/18/12	9.430	49
2/7/13	2.450	12
6/18/13	1.700	-1
9/24/13	1.160	-16
12/10/13	2.530	17
2/25/14	6.350	50
6/11/14	1.130	-19
9/25/14	1.740	0
12/16/14	1.810	1
2/11/15	2.370	14
7/15/15	0.630	-37
9/30/15	4.080	48
12/16/15	2.530	20
2/3/16	0.720	-34
6/21/16	0.787	-33
9/15/16	1.250	-14
1/6/17	1.360	-11
2/15/17	0.504	-46
6/13/17	0.189	-59
9/14/17	0.550	-44
12/20/17	1.020	-23
2/20/18	0.790	-32
6/12/18	3.120	47
10/11/18	1.250	-11
12/18/18	4.530	65
2/21/19	7.000	70
9/17/19	4.380	63
12/3/19	0.260	-58
3/10/20	0.067	-75
6/9/20	0.135	-68
9/16/20	0.437	-51
12/3/20	0.201	-62

S	174
count (n)	75
g	4
t_1	2
t_2	2
t_3	2
t_4	2
t_5	0
t_6	0
VARS(S) :	47787.667
Z	0.79
α/2(normal dist.)	1.96
Null hypothesis	Accept
Trend Analysis Result	Trend does not exist
Slope of Data	Increasing

MW-11SR

Date	Aluminum mg/l	Aluminum signs
1/1/99	0.3900	
4/1/99	0.4200	1
7/1/99	0.2200	-2
10/1/99	0.6400	3
1/1/00	2.3000	4
4/1/00	0.5800	1
7/1/00	0.4900	0
11/2/00	0.0500	-7
1/24/01	0.1200	-6
4/27/01	0.9400	7
7/25/01	2.5100	10
10/24/01	0.3300	-5
1/23/02	0.1000	-10
4/30/02	0.1600	-7
7/23/02	0.1600	-7
10/24/02	0.1600	-7
1/23/03	1.0820	12
4/23/03	0.2730	-3
7/29/03	4.5520	18
10/21/03	0.0520	-17
1/20/04	3.2330	18
4/21/04	0.5810	7
7/20/04	0.6720	10
10/27/04	6.4640	23
1/18/05	9.0850	24
4/27/05	0.8910	9
7/19/05	2.3310	16
10/25/05	0.9630	11
1/17/06	0.3140	-10
4/26/06	0.6410	5
7/12/06	1.5070	16
10/25/06	1.3330	15
1/23/07	0.3910	-8
4/24/07	0.4800	-5
8/14/07	4.8980	30
10/23/07	1.6560	19
1/31/08	7.5700	34
7/22/08	2.7130	25
10/17/08	6.2200	32
1/13/09	11.9000	39
4/28/09	7.7400	36
7/28/09	8.1100	37
10/27/09	3.2510	24
2/9/10	2.2900	13
6/8/10	1.3900	8
9/21/10	2.6180	21
12/16/10	10.4200	44
3/2/11	3.9900	27
6/22/11	0.9400	-3
9/14/11	12.7000	49
12/14/11	7.4900	36
2/16/12	1.5700	7
7/10/12	1.8300	10
10/16/12	1.3400	1
12/18/12	2.7700	24
6/19/13	5.6800	35
12/11/13	5.3700	34
6/11/14	1.9700	9
12/16/14	2.6800	20
7/21/15	0.3200	-39
12/15/15	0.2400	-44
6/22/16	0.3975	-31
12/28/16	0.3860	-36
6/13/17	0.1740	-49
12/21/17	1.2800	-2
6/12/18	0.5080	-23
1/9/19	0.4815	-26
6/26/19	0.8100	-11
12/4/19	0.4560	-30
6/9/20	0.1890	-53
12/3/20	0.2740	-46

S	337
count (n)	71
g	2
t_1	3
t_2	2
t_3	0
VARS(S) :	40583.66667
Z	1.67
α/2(normal dist.)	1.96
Null hypothesis	Accept
Trend Analysis Result	Trend does not exist
Slope of Data	Increasing

Date	Sulfate mg/l	Sulfate signs
1/1/99	3200.00	
4/1/99	2900.00	-1
7/1/99	3100.00	0
10/1/99	1900.00	-3
1/1/00	2600.00	-2
4/1/00	2200.00	-3
7/1/00	2200.00	-3
11/2/00	1860.00	-7
1/24/01	1710.19	-8
4/27/01	1859.77	-7
7/25/01	201.74	-10
10/24/01	1570.90	-9
1/23/02	1665.55	-8
4/30/02	1518.64	-11
7/23/02	1622.13	-8
10/24/02	1179.98	-13
1/23/03	1487.37	-12
4/23/03	1562.88	-9
7/29/03	1322.15	-14
10/21/03	1314.33	-15
1/20/04	1322.56	-12
4/21/04	1105.91	-19
7/20/04	1200.76	-16
10/27/04	1032.48	-21
1/18/05	943.35	-22
4/27/05	1059.05	-19
7/19/05	995.67	-22
10/25/05	572.92	-25
1/17/06	748.10	-24
4/26/06	79.62	-29
7/12/06	928.55	-22
10/25/06	602.79	-25
1/23/07	913.90	-22
4/24/07	892.04	-23
8/14/07	827.31	-24
10/23/07	700.00	-27
1/31/08	592.00	-30
4/16/08	788.50	-23
7/22/08	694.00	-28
10/17/08	698.00	-27
1/13/09	488.00	-36
4/28/09	561.00	-35
7/28/09	585.00	-32
10/27/09	579.00	-33
2/9/10	556.00	-38
6/8/10	564.00	-35
9/21/10	537.00	-40
12/16/10	497.00	-41
3/2/11	624.00	-22
6/22/2011	611.00	-23
9/14/2011	110.00	-48
12/14/11	482.00	-45
2/16/12	729.00	-12
7/10/12	600.00	-25
10/16/12	469.00	-48
12/18/12	522.00	-41
6/19/2013	590.00	-26
12/11/2013	332.00	-51
6/11/14	502.00	-42
12/16/14	314.00	-53
7/21/15	453.00	-50
12/15/15	349.00	-51
6/22/16	485.50	-44
12/28/16	433.00	-51
6/13/17	479.50	-46
12/21/17	355.00	-53
6/12/18	458.00	-48
1/9/19	307.00	-61
6/26/19	300.00	-62
12/4/19	303.00	-61
6/9/2020	424	-50
12/3/2020	231	-65

S	-1971
count (n)	72
g	1
t_1	2
t_2	0
t_3	0
VARS(S) :	42315
Z	9.58
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Date	Dissolved Aluminum mg/l	Dissolved Aluminum signs
10/25/2006	0.052	
1/23/2007	0.082	1
4/24/2007	0.088	2
8/14/07	0.100	3
10/23/07	0.100	3
1/31/08	0.100	3
4/16/08	0.068	-4
10/17/08	0.021	-7
7/22/08	0.018	-8
1/13/09	0.108	9
4/28/09	0.211	10
7/28/09	0.100	4
10/27/09	0.029	-8
2/9/10	0.104	9
6/8/10	0.322	14
9/21/10	0.014	-15
3/2/11	0.050	-8
6/22/11	0.050	-8
9/14/11	0.050	-8
12/14/11	0.050	-8
12/16/10	0.308	18
2/16/12	0.050	-9
7/10/12	0.050	-9
9/25/12	0.050	-9
12/18/12	0.050	-9
6/19/13	0.050	-9
12/11/13	0.080	4
6/11/14	0.050	-10
12/16/14	0.050	-10
7/21/15	0.050	-10
12/15/15	0.050	-10
6/22/16	0.050	-10
12/28/16	0.050	-10
6/13/17	0.046	-25
12/21/17	0.050	-9
6/12/18	0.043	-27
1/9/19	0.045	-26
6/26/19	0.050	-7
12/4/19	0.050	-7
6/9/2020	0.050	-7
12/3/2020	0.050	-7

S	-214
count (n)	41
g	2
t_1	17
t_2	4
t_3	0
VARS(S) :	7328.666667
Z	2.49
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Jan-40

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

MW-12S

Date	Aluminum mg/l	Aluminum signs
4/1/99	0.460	
7/1/99	5.700	1
10/1/99	1.000	0
1/1/00	2.200	1
4/1/00	0.340	-4
7/1/00	0.800	-1
11/2/00	0.120	-6
1/24/01	0.390	-3
4/27/01	2.440	6
7/25/01	0.710	-1
10/24/01	0.230	-8
1/23/02	0.280	-7
4/30/02	0.290	-6
7/23/02	0.300	-5
10/24/02	0.286	-8
1/23/03	55.650	15
4/23/03	0.103	-16
7/29/03	0.212	-13
10/21/03	5.777	16
1/20/04	13.390	17
4/21/04	10.103	16
7/20/04	13.910	19
10/27/04	7.731	14
1/18/05	17.010	21
4/27/05	8.279	14
7/19/05	5.946	11
10/25/05	6.791	12
1/17/06	12.350	19
4/26/06	8.010	14
7/12/06	4.826	3
10/25/06	1.317	-2
1/23/07	15.640	27
4/24/07	16.030	28
8/14/07	10.530	19
10/23/07	3.260	0
1/31/08	30.300	33
7/22/08	48.405	34
10/16/08	19.995	31
1/13/09	31.100	34
4/28/09	25.900	31
7/28/09	26.900	32
10/27/09	13.280	17
2/9/10	13.520	20
6/8/10	1.141	-15
9/21/10	47.890	40
12/16/10	18.950	29
3/2/11	1.010	-18
6/22/11	6.010	1
9/20/11	12.700	16
12/15/11	13.300	19
2/16/12	16.700	30
7/10/12	19.000	35
10/16/12	16.000	26
12/18/12	4.890	-11
6/19/13	22.000	40
12/10/13	4.200	-15
6/11/14	18.300	34
12/16/14	13.200	13
7/21/15	4.910	-12
12/15/15	1.280	-27
6/22/16	3.040	-20
12/28/16	5.870	-5
6/13/17	1.550	-26
12/21/17	5.440	-9
6/12/18	3.830	-18
1/9/19	3.200	-21
6/26/19	7.090	6
12/4/19	0.500	-45
6/9/20	0.445	-48
12/3/20	0.306	-53
S		371
count (n)		70
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		38908.333
Z		1.88
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

Date	Fluoride mg/l	Fluoride signs
4/1/99	6.500	
7/1/99	7.500	1
10/1/99	8.200	2
1/1/00	8.200	2
4/1/00	7.000	-2
7/1/00	7.500	0
11/2/00	8.468	6
1/24/01	8.233	5
4/27/01	6.227	-8
7/25/01	6.690	-5
10/24/01	11.010	10
1/23/02	10.190	9
4/30/02	9.073	8
7/23/02	11.970	13
10/24/02	10.690	10
1/23/03	9.798	7
4/23/03	8.556	4
7/29/03	10.550	11
10/21/03	11.690	16
1/20/04	9.071	3
4/21/04	10.800	14
7/20/04	8.830	1
10/27/04	12.880	22
1/18/05	7.345	-15
4/27/05	12.520	22
7/19/05	11.081	17
10/25/05	16.050	26
1/17/06	8.770	-3
4/26/06	14.680	26
7/12/06	5.233	-29
10/25/06	13.200	26
1/23/07	9.006	-1
4/24/07	13.660	28
10/23/07	10.390	7
1/31/08	10.130	4
4/16/08	12.290	23
7/22/08	12.255	22
10/16/08	12.890	29
1/13/09	11.800	18
4/28/09	9.997	-1
7/28/09	13.700	36
10/27/09	15.440	39
2/9/10	13.930	36
6/8/10	0.276	-43
9/21/10	11.100	14
12/16/10	13.750	37
3/2/11	13.300	32
6/22/11	11.800	16
9/20/11	12.300	24
12/15/11	11.800	15
2/16/12	10.800	3
7/10/12	11.800	16
10/16/12	13.800	44
12/18/12	9.540	-15
6/19/13	11.300	10
12/10/13	10.100	-11
6/11/14	10.700	0
12/16/14	12.300	30
7/21/15	12.600	34
12/15/15	14.500	53
6/22/16	13.800	49
12/28/16	13.700	44
6/13/17	9.380	-24
12/21/17	11.300	8
6/12/18	11.000	0
1/9/19	12.500	31
6/26/19	10.600	-10
12/4/19	11.200	7
6/9/20	11.500	12
12/3/20	11.400	11
S		826
count (n)		70
g		6
t_1		4
t_2		2
t_3		2
t_4		2
t_5		2
t_6		2
t_7		0
VARS(S) :		38894.667
Z		4.18
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Date	Sulfate mg/l	Sulfate signs
4/1/99	220.00	
7/1/99	340.00	1
10/1/99	290.00	0
1/1/00	290.00	0
4/1/00	330.00	2
7/1/00	420.00	5
11/2/00	357.00	4
1/24/01	319.53	-1
4/27/01	406.56	6
7/25/01	406.77	7
10/24/01	424.67	10
1/23/02	461.09	11
4/30/02	456.15	10
7/23/02	466.44	13
10/24/02	495.65	14
1/23/03	400.18	-1
4/23/03	353.27	-4
7/29/03	382.08	-1
10/21/03	285.99	-16
1/20/04	370.14	-1
4/21/04	346.07	-6
7/20/04	315.00	-13
10/27/04	409.32	10
1/18/05	363.82	-1
4/27/05	370.07	0
7/19/05	369.95	-1
10/25/05	376.77	4
1/17/06	446.59	19
4/26/06	457.20	22
7/12/06	437.49	17
10/25/06	362.88	-8
1/23/07	413.57	13
4/24/07	570.22	32
8/14/07	526.71	31
10/23/07	380.00	0
1/31/08	383.00	3
4/16/08	595.00	36
7/22/08	583.00	35
10/16/08	584.00	36
1/13/09	497.00	29
4/28/09	483.00	26
7/28/09	570.00	33
10/27/09	628.00	42
2/9/10	395.00	-3
6/8/10	514.00	30
9/21/10	690.00	45
12/16/10	686.00	44
3/2/11	670.00	43
6/22/11	794.00	48
9/20/11	832.00	49
12/15/11	625.00	38
2/16/12	594.00	35
7/10/12	787.00	48
10/16/12	797.00	51
12/18/12	481.00	14
6/19/13	703.00	47
12/10/13	804.00	54
6/11/14	887.00	57
12/16/14	822.00	54
7/21/15	888.00	59
12/15/15	775.00	44
6/22/16	1030.00	61
12/28/16	777.00	44
6/13/17	806.00	53
12/21/17	946.00	62
6/12/18	1020.00	63
1/9/19	955.00	62
6/26/19	1040.00	67
12/4/19	958.00	62
6/9/20	1000.00	63
12/3/20	943.00	56.00
S		1768
count (n)		71
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		40588.333
Z		8.77
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than $\alpha/2$.

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-13S

Date	Aluminum mg/l	Aluminum signs
1/1/99	2.100	
4/1/99	2.800	1
7/1/99	2.000	-2
10/1/99	1.900	-3
1/1/00	1.600	-4
4/1/00	0.480	-5
7/1/00	1.900	-1
11/2/00	0.220	-7
1/24/01	0.190	-8
4/27/01	0.270	-5
7/25/01	2.480	8
10/24/01	0.240	-7
1/23/02	0.120	-12
4/30/02	0.230	-7
7/23/02	0.150	-12
10/24/02	0.216	-9
1/23/03	0.050	-16
4/23/03	0.050	-16
7/29/03	0.084	-14
10/21/03	0.100	-13
1/20/04	2.714	18
4/21/04	2.814	21
7/20/04	0.562	4
10/27/04	1.228	5
1/18/05	1.830	8
4/27/05	1.846	9
7/19/05	1.190	2
10/25/05	0.607	1
1/17/06	1.163	2
4/26/06	2.153	21
7/12/06	1.200	4
10/25/06	0.458	-7
1/23/07	1.085	0
4/24/07	2.797	29
8/14/07	0.612	-2
10/23/07	0.698	-1
1/31/08	1.710	12
7/22/08	4.799	37
10/16/08	1.494	8
1/13/09	2.125	25
4/28/09	2.800	35
7/28/09	2.800	35
10/27/09	2.072	20
2/11/10	2.823	41
6/8/10	2.500	28
9/21/10	1.211	-1
12/14/10	1.922	16
3/15/11	1.660	5
9/14/11	0.880	-12
12/13/11	2.300	29
2/14/12	1.400	0
7/10/12	1.160	-11
9/25/12	0.460	-26
12/18/12	0.760	-15
6/18/13	3.200	52
12/10/13	6.600	55
6/11/14	0.580	-24
12/16/14	0.280	-33
7/21/15	0.720	-16
12/15/15	0.560	-27
6/22/16	0.230	-41
1/6/17	4.130	57
6/13/17	0.363	-34
12/20/17	0.930	-9
6/12/18	1.160	-5
12/19/18	0.422	-35
6/22/11	4.790	62
6/26/19	0.157	-55
12/3/19	0.185	-54
6/9/20	0.259	-41
12/3/20	0.218	-50
S		10
count (n)		71
g		5
t_1		3
t_2		2
t_3		2
t_4		2
t_5		2
t_6		0
t_7		0
VARS(S) :		40580.667
Z		0.04
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

Date	Fluoride mg/l	Fluoride signs
1/1/99	10.000	
4/1/99	5.300	-1
7/1/99	4.100	-2
10/1/99	17.000	3
1/1/00	9.200	0
4/1/00	13.000	3
7/1/00	11.000	2
11/2/00	4.507	-5
1/24/01	6.370	-2
4/27/01	7.978	-1
7/25/01	0.788	-10
10/24/01	6.666	-1
1/23/02	7.777	0
4/30/02	9.637	5
7/23/02	4.768	-8
10/24/02	11.480	11
1/23/03	7.089	-2
4/23/03	7.732	-1
7/29/03	8.380	4
10/21/03	7.738	-1
1/20/04	5.153	-12
4/21/04	11.200	15
7/20/04	7.892	2
10/27/04	5.339	-11
1/18/05	11.890	20
4/27/05	8.765	7
7/19/05	5.903	-12
10/25/05	11.957	23
1/17/06	8.763	6
4/26/06	10.880	15
7/12/06	4.629	-24
10/25/06	8.770	9
1/23/07	9.811	14
4/24/07	10.970	19
8/14/07	3.486	-32
10/23/07	10.615	17
1/31/08	8.820	8
4/16/08	9.618	11
7/22/08	3.796	-34
10/16/08	4.101	-31
1/13/09	8.860	10
4/28/09	5.714	-19
7/28/09	6.771	-12
10/27/09	8.087	1
2/11/10	3.271	-42
6/8/10	12.880	41
9/21/10	4.885	-28
12/14/10	6.731	-13
3/15/11	8.630	6
6/22/11	4.660	-33
9/14/11	12.000	44
12/13/11	11.200	36
2/14/12	12.100	46
7/10/12	7.960	-3
9/25/12	15.000	52
12/18/12	11.300	37
6/18/13	4.620	-42
12/10/13	10.000	24
6/11/14	3.840	-50
12/16/14	9.710	21
7/21/15	2.290	-58
12/15/15	14.800	57
6/22/16	9.640	20
1/6/17	9.680	21
6/13/17	6.990	-18
12/20/17	9.640	20
6/12/18	4.750	-42
12/19/18	12.500	57
6/26/19	2.670	-64
12/3/19	8.600	1
6/9/20	6.560	-26
12/3/20	7.760	-11
S		38
count (n)		71
g		2
t_1		2
t_2		2
t_3		0
VARS(S) :		40586.333
Z		0.18
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

Date	Sulfate mg/l	Sulfate signs
1/1/99	1300.0	
4/1/99	2000.0	1
7/1/99	3500.0	2
10/1/99	310.0	-3
1/1/00	1200.0	-2
4/1/00	270.0	-5
7/1/00	880.0	-2
11/2/00	3680.0	7
1/24/01	2531.6	4
4/27/01	974.4	-3
7/25/01	4132.9	10
10/24/01	3153.1	5
1/23/02	1452.2	0
4/30/02	1867.8	1
7/23/02	3812.1	12
10/24/02	967.9	-9
1/23/03	1621.1	0
4/23/03	1649.9	1
7/29/03	1717.2	2
10/21/03	2075.2	7
1/20/04	1130.2	-10
4/21/04	347.3	-17
7/20/04	3192.2	14
10/27/04	3110.2	11
1/18/05	2260.9	8
4/27/05	377.6	-19
10/25/05	656.1	-18
1/17/06	1541.7	-3
4/26/06	466.6	-20
7/12/06	537.9	-19
10/25/06	977.1	-10
1/23/07	1203.6	-5
4/24/07	578.8	-20
8/14/07	267.8	-33
10/23/07	605.0	-18
1/31/08	57.0	-35
4/16/08	2110.0	18
7/22/08	639.0	-17
10/16/08	2540.0	24
1/13/09	1735.0	11
4/28/09	2170.0	20
7/28/09	2540.0	26
10/27/09	1330.0	-2
2/11/10	2650.0	29
6/8/10	660.0	-20
9/21/10	2770.0	31
12/14/10	1540.0	0
3/15/11	754.0	-21
6/22/11	2580.0	30
9/14/11	1440.0	-3
12/13/11	510.0	-36
2/14/12	900.0	-19
7/10/12	2250.0	24
9/25/12	1140.0	-11
12/18/12	485.0	-40
6/18/13	3200.0	47
12/10/13	852.0	-24
6/11/14	3930.0	55
12/16/14	2270.0	28
7/21/15	3760.0	53
12/15/15	1640.0	6
6/22/16	2710.0	39
1/6/17	758.0	-30
6/13/17	2080.0	19
12/20/17	1400.0	-6
6/12/18	3000.0	45
12/19/18	738.0	-36
6/26/19	3280.0	55
12/3/19	687.0	-38
6/9/20	2540.0	35
12/3/20	1710.0	8
S		658048
count (n)		71
g		2
t_1		2
t_2		2
t_3		0
VARS(S) :		40586.333
Z		3266.38
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the p th group

Note: If a result was nondetect, then half of the detection limit was used.

MW-15S-87		
Date	**Aluminum mg/l**	**Aluminum signs**
1/1/99	1.000	
4/1/99	0.530	-1
7/1/99	0.370	-2
10/1/99	0.310	-3
1/1/00	0.440	0
4/1/00	0.810	3
7/1/00	0.330	-4
11/2/00	0.180	-7
1/24/01	0.300	-6
4/27/01	0.110	-9
7/25/01	0.440	3
10/24/01	0.130	-9
1/23/02	0.050	-12
4/30/02	0.100	-11
7/23/02	0.110	-9
10/24/02	0.044	-15
1/23/03	0.050	-13
4/23/03	0.014	-17
7/29/03	0.970	16
10/21/03	0.066	-11
1/20/04	4.506	20
4/21/04	6.142	21
7/20/04	10.190	22
10/27/04	3.116	17
1/18/05	4.407	18
4/27/05	4.587	21
7/19/05	8.314	24
10/25/05	3.390	15
1/17/06	3.968	16
4/26/06	2.404	11
7/12/06	5.163	24
10/25/06	1.260	9
1/23/07	3.450	16
4/24/07	1.698	9
8/14/07	9.590	32
10/23/07	2.970	11
1/30/08	24.000	36
7/22/08	17.760	35
10/16/08	28.930	38
1/13/09	7.850	27
4/28/09	1.840	4
7/28/09	19.800	37
10/27/09	7.313	26
2/9/10	11.910	35
6/9/10	3.683	12
9/21/10	4.600	21
12/21/10	7.048	26
3/2/11	9.160	33
6/22/11	12.000	40
9/14/11	29.600	49
12/15/11	3.540	6
2/16/12	2.250	-5
7/10/12	5.340	22
12/18/12	1.100	-13
6/19/13	2.080	-6
12/11/13	1.350	-11
6/11/14	4.080	14
12/16/14	7.490	33
7/21/15	1.650	-12
12/15/15	7.980	37
12/28/16	0.226	-40
6/13/17	0.466	-27
12/20/17	1.160	-16
6/19/18	3.370	5
1/9/19	2.480	0
6/26/19	3.410	9
12/4/19	3.410	9
6/9/20	6.240	35
12/3/20	0.713	-30
S		611
count (n)		67
g		3
t_1		2
t_2		2
t_3		2
VARS(S) :		34144.667
Z		3.30
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Date	**Fluoride mg/l**	**Fluoride signs**
1/1/99	1.300	
4/1/99	1.000	-1
7/1/99	1.200	0
10/1/99	1.400	3
1/1/00	1.500	4
4/1/00	1.300	0
7/1/00	1.300	0
11/2/00	1.268	-3
1/24/01	1.232	-4
4/27/01	1.123	-7
7/25/01	1.106	-8
10/24/01	1.021	-9
1/23/02	1.011	-10
4/30/02	1.021	-8
7/23/02	1.241	2
10/24/02	1.089	-7
1/23/03	1.054	-8
4/23/03	0.901	-17
7/29/03	1.263	6
10/21/03	1.142	-1
1/20/04	1.104	-6
4/21/04	1.327	17
7/20/04	1.304	16
10/27/04	1.481	21
1/18/05	1.413	20
4/27/05	1.338	17
6/13/17	2.460	26
12/11/13	2.430	25
7/21/15	2.420	24
4/26/06	1.337	13
7/12/06	1.417	20
12/16/14	2.280	25
1/23/07	1.578	24
7/10/12	2.140	25
4/24/07	2.103	24
10/25/06	2.020	23
7/22/08	1.898	22
4/16/08	1.858	21
12/15/11	1.850	20
10/16/08	1.445	13
1/13/09	1.250	-12
4/28/09	1.507	19
10/25/05	1.841	22
10/27/09	1.584	21
10/23/07	1.795	22
6/9/10	1.597	21
9/21/10	1.524	16
12/21/10	1.504	13
3/2/11	1.550	18
2/9/10	1.793	25
1/30/08	1.786	24
1/17/06	1.697	23
7/28/09	1.683	22
8/14/07	1.680	21
12/18/12	2.060	42
6/19/13	2.510	55
7/19/05	1.654	18
6/11/14	2.610	57
9/14/11	1.630	16
2/16/12	1.630	16
12/15/15	2.540	58
6/22/16	2.660	61
12/28/16	4.250	62
6/22/11	1.600	11
12/20/17	2.910	62
6/19/18	3.100	63
1/9/19	3.090	62
6/26/19	2.870	59
12/4/19	3.260	66
6/9/20	3.000	61
12/3/20	3.620	68
S		1414
count (n)		71
g		3
t_1		3
t_2		2
t_3		2
VARS(S) :		40582.667
Z		7.01
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Mann-Kendall Test
Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .
Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the p th group
Note: If a result was nondetect, then half of the detection limit was used.

MW-16S

Date	Total Aluminum mg/l	Total Aluminum signs
2/15/99	7.8	
5/15/99	1.3	-1
8/15/99	0.2	-2
11/15/99	0.46	-1
2/15/00	0.24	-2
5/15/00	0.28	-1
8/15/00	0.2	-5
11/2/00	0.13	-7
1/24/01	0.15	-6
4/26/01	0.1	-9
7/23/01	0.11	-8
10/23/01	0.32	5
1/22/02	0.13	-7
4/30/02	0.11	-10
7/23/02	0.11	-10
10/22/02	0.0050	-15
1/21/03	0.0055	-14
4/23/03	0.0050	-16
7/29/03	0.0495	-12
10/21/03	0.0050	-17
1/20/04	0.041	-12
4/21/04	0.0050	-18
7/20/04	0.0015	-22
10/27/04	0.0015	-22
1/19/05	0.046	-8
4/28/05	0.107	-3
7/19/05	0.124	4
10/26/05	0.0635	-7
1/17/06	0.115	4
4/27/06	0.05	-9
7/13/06	0.032	-16
10/26/06	0.041	-14
1/24/07	0.075	-4
4/26/07	0.122	9
8/16/07	0.102	-2
10/25/07	0.052	-9
1/31/08	0.171	20
4/16/08	0.18	21
7/23/08	0.069	-8
10/17/08	0.139	17
1/19/09	0.2	26
4/30/09	0.202	29
7/30/09	0.34	36
10/28/09	0.048	-21
2/15/10	0.42	38
6/9/10	0.049	-21
9/23/10	0.083	-8
12/16/10	0.04	-31
3/15/11	0.0500	-17
6/27/11	0.0500	-17
9/21/11	0.0500	-17
12/14/11	0.0500	-17
2/21/12	0.0500	-17
7/16/12	0.105	3
10/17/12	0.0500	-18
12/20/12	0.1100	10
6/20/13	0.0500	-19
12/12/13	0.78	53
6/10/14	0.0500	-20
12/16/14	0.6	53
7/21/15	0.0500	-21
12/15/15	0.0500	-21
6/22/16	0.072	-4
12/28/16	0.047	-39
6/14/17	0.055	-8
12/21/17	0.1605	33
6/12/18	0.032	-51
12/19/18	0.0500	-22
6/25/19	0.066	-4
12/4/19	0.0500	-23
6/8/20	0.050	-23
12/3/20	0.052	-8

S	-352
count (n)	72
g	8
t_1	14
t_2	4
t_3	4
t_4	3
t_5	2
t_6	2
t_7	2
t_8	2
VARS(S) :	41949.333
Z	1.71
α/2(normal dist.)	1.96
Null hypothesis	Accept
Trend Analysis Result	Trend does not exist
Slope of Data	Decreasing

Date	Fluoride mg/l	Fluoride signs
2/15/1999	640.000	
5/15/1999	190.000	-1
8/15/1999	15.000	-2
11/15/1999	16.000	-1
2/15/2000	15.000	-3
5/15/2000	13.000	-5
8/15/2000	22.000	2
11/2/2000	29.370	3
1/24/2001	36.870	4
4/26/2001	40.000	5
7/23/2001	30.690	2
10/23/2001	28.490	-1
1/22/2002	27.290	-2
4/30/2002	21.790	-5
7/23/2002	12.750	-14
10/22/2002	12.360	-15
1/21/2003	11.070	-16
4/23/2003	10.440	-17
7/29/2003	11.740	-14
10/21/2003	11.670	-15
1/20/2004	10.400	-20
4/21/2004	1.144	-21
7/20/2004	8.980	-20
10/27/2004	12.140	-9
1/19/2005	9.961	-20
4/28/2005	10.150	-19
7/19/2005	8.841	-24
10/26/2005	8.962	-23
1/17/2006	9.992	-18
4/27/2006	7.302	-27
7/13/2006	8.485	-26
10/26/2006	9.503	-19
1/24/2007	9.448	-20
4/26/2007	8.080	-29
8/16/2007	9.903	-16
10/25/2007	8.615	-27
1/31/2008	8.993	-20
4/16/2008	7.597	-33
7/23/2008	8.047	-32
10/17/2008	7.828	-33
1/19/2009	8.250	-28
4/30/2009	6.306	-39
7/30/2009	7.098	-38
10/28/2009	7.840	-31
2/15/2010	6.596	-40
6/9/2010	6.939	-39
9/23/2010	8.235	-24
12/16/2010	8.154	-25
3/15/2011	7.220	-38
6/27/2011	9.880	-3
9/21/2011	7.950	-30
12/14/2011	9.090	-7
2/21/2012	8.090	-26
7/16/2012	7.960	-31
10/17/2012	7.950	-33
12/20/2012	10.200	11
6/20/2013	10.400	13
12/12/2013	7.210	-47
6/10/2014	7.740	-40
12/16/2014	7.230	-45
7/21/2015	7.990	-28
12/15/2015	8.790	-11
6/22/2016	9.610	4
12/28/2016	7.660	-43
6/14/2017	8.500	-14
12/21/2017	8.005	-29
6/12/2018	7.380	-48
12/19/2018	9.370	3
6/25/2019	6.810	-62
12/4/2019	11.200	31
6/9/20	7.420	-48
12/3/20	7.920	-37

S	-1373
count (n)	72
g	3
t_1	2
t_2	2
t_3	2
VARS(S) :	42313.000
Z	6.67
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p (t_p - 1)(2t_p + 5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the p th group

Note: If a result was nondetect, then half of the detection limit was used.

MW-18S

Date	Fluoride mg/l	Fluoride signs
1/1/99	4800.000	
4/1/99	2000.000	-1
7/1/99	780.000	-2
10/1/99	870.000	-1
1/1/00	420.000	-4
4/1/00	44.000	-5
7/1/00	71.000	-4
10/1/00	122.100	-3
4/1/01	126.400	-2
7/1/01	135.800	-1
10/1/01	119.700	-6
1/1/02	127.700	-1
4/1/02	69.210	-10
7/1/02	89.350	-7
10/1/02	78.520	-8
1/1/03	77.380	-9
4/1/03	88.880	-6
7/1/03	71.090	-11
10/1/03	88.180	-6
1/20/04	84.250	-7
4/21/04	81.110	-8
7/20/04	76.420	-13
10/27/04	14.840	-22
1/19/05	101.100	3
4/28/05	85.580	-4
7/19/05	57.370	-21
10/25/05	77.520	-10
1/17/06	76.710	-13
4/26/06	45.100	-24
7/13/06	45.810	-23
10/26/06	64.300	-20
1/24/07	75.880	-13
4/26/07	54.060	-24
8/16/07	57.160	-23
10/25/07	52.660	-26
1/31/08	4.868	-35
4/16/08	39.380	-32
7/23/08	49.310	-25
10/17/08	51.480	-24
1/13/09	63.200	-15
4/28/09	63.620	-14
7/28/09	61.120	-17
10/27/09	57.600	-18
2/15/10	41.230	-37
6/9/10	44.270	-34
9/23/10	56.150	-21
12/16/10	60.530	-14
3/15/11	63.100	-11
6/27/11	48.600	-32
9/21/11	67.200	-3
12/14/11	73.200	4
2/21/12	70.600	-1
7/16/12	48.500	-36
10/17/12	71.700	5
12/20/12	73.100	6
6/19/13	77.700	19
12/12/13	65.900	-8
6/11/14	33.400	-53
12/18/14	33.800	-52
7/21/15	53.500	-29
12/15/15	60.000	-18
6/22/16	57.000	-25
12/28/16	55.700	-28
6/14/17	59.650	-17
12/21/17	31.100	-60
6/12/18	24.300	-61
12/19/18	27.400	-60
6/25/19	20.800	-63
12/4/19	27.650	-58
6/8/20	15.120	-65
12/3/20	29.100	-56

S	0
count (n)	0
g	0
t_1	0
t_2	0
t_3	0
VARS(S) :	3727.5.333
Z	6.22
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Date	Aluminum mg/l	Aluminum signs
2/15/99	15.000	
5/15/99	18.000	1
8/15/99	9.200	-2
11/15/99	3.900	-3
2/15/00	8.300	-2
5/15/00	1.200	-5
8/15/00	0.390	-6
11/2/00	0.380	-7
1/24/01	1.290	-2
4/26/01	0.560	-5
7/23/01	1.160	-4
10/23/01	0.630	-5
1/22/02	0.620	-6
4/30/02	0.570	-7
7/23/02	0.150	-14
10/22/02	0.099	-15
1/21/03	0.244	-12
4/23/03	0.055	-17
7/29/03	0.075	-16
10/21/03	0.102	-13
10/21/03	0.102	-13
1/20/04	0.086	-17
4/21/04	0.129	-10
7/20/04	0.081	-19
10/27/04	0.140	-8
1/19/05	0.210	-5
1/19/05	0.329	-2
4/28/05	0.231	-5
7/19/05	0.150	-9
10/26/05	0.327	-1
1/17/06	0.294	-2
4/26/06	0.101	-21
7/13/06	0.067	-30
10/26/06	0.077	-27
1/25/07	0.118	-14
4/26/07	0.113	-15
8/16/07	0.070	-32
10/25/07	0.053	-37
1/31/08	0.095	-22
4/16/08	0.289	5
7/23/08	0.233	2
10/17/08	0.124	-11
1/13/09	0.100	-22
4/28/09	0.100	-22
7/28/09	0.226	2
10/27/09	0.081	-32
2/15/10	0.127	-8
9/23/10	0.080	-35
12/16/10	0.281	12
3/15/11	0.270	11
6/27/11	0.160	0
9/21/11	1.270	39
12/14/11	0.390	25
2/21/12	0.840	35
7/16/12	1.250	40
10/17/12	0.940	35
12/20/12	1.180	38
6/19/13	3.330	47
12/12/13	4.440	50
6/11/14	1.210	39
12/18/14	2.110	46
7/21/15	1.820	45
12/15/15	2.730	48
6/22/16	2.050	45
12/28/16	1.610	42
6/14/17	4.045	55
12/21/17	0.819	22
6/12/18	0.371	7
12/19/18	0.180	-16
6/25/19	0.110	-35
12/4/19	0.073	-62
6/8/20	0.071	-63
12/3/20	0.051	-72

S	-117
count (n)	71
g	4
t_1	2
t_2	2
t_3	2
t_4	2
t_5	0
t_6	0
t_7	0
VARS(S) :	40584.333
Z	0.58
α/2(normal dist.)	1.96
Null hypothesis	Accept
Trend Analysis Result	Trend does not exist
Slope of Data	Decreasing

Date	Aluminum-Dissolved mg/l	Aluminum-Dissolved signs
10/26/06	0.046	
1/25/07	0.005	-1
4/26/07	0.026	0
4/26/07	0.027	1
8/16/07	0.079	4
10/25/07	0.019	-3
1/31/08	0.036	2
4/16/08	0.474	7
4/17/08	0.395	6
7/23/08	0.041	1
10/17/08	0.014	-8
2/15/10	0.193	7
9/23/10	0.031	-2
12/16/10	0.093	7
3/15/11	0.050	4
6/27/11	0.050	4
9/21/11	0.050	4
12/14/11	0.190	11
2/21/12	0.360	14
7/16/12	0.930	19
10/17/12	0.660	18
12/20/12	0.850	19
6/19/13	3.250	22
12/12/13	0.450	13
6/11/14	1.080	22
12/18/14	0.410	11
7/21/15	0.880	20
12/15/15	0.460	13
6/22/16	0.840	18
12/28/16	1.000	25
6/14/17	2.685	28
12/21/17	0.577	13
6/12/18	0.357	0
12/19/18	0.180	-5
6/25/19	0.067	-10
12/4/19	0.056	-11
6/8/20	0.081	-6
12/3/20	0.059	-11

S	256
count (n)	38
g	1
t_1	3
t_2	0
t_3	0
VARS(S) :	6323.333
Z	3.21
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Increasing

Date	Sulfate mg/l	Sulfate signs
1/1/99	15000.000	
4/1/99	20000.000	1
7/1/99	20000.000	1
10/1/99	1500.000	-3
1/1/00	4800.000	-2
4/1/00	240.000	-5
7/1/00	310.000	-4
10/1/00	3440.000	-1
1/1/01	2422.910	-2
4/1/01	1258.570	-5
7/1/01	1958.330	-2
10/1/01	2400.900	-1
1/1/02	190.520	-12
4/1/02	982.660	-7
7/1/02	1062.290	-6
10/1/02	1150.970	-5
1/1/03	1319.269	-2
4/1/03	1281.210	-3
7/1/03	1413.090	0
10/1/03	1753.810	3
1/20/04	1154.050	-8
4/21/04	827.730	-15
7/20/04	790.490	-16
10/27/04	1162.810	-5
1/19/05	0.270	-24
4/28/05	797.410	-15
7/19/05	595.180	-18
10/25/05	711.670	-17
1/17/06	705.460	-18
4/26/06	369.470	-21
7/13/06	584.560	-20
10/26/06	473.310	-21
1/24/07	610.750	-16
4/26/07	432.275	-23
8/16/07	499.980	-20
10/25/07	470.000	-23
1/31/08	445.000	-24
4/16/08	198.000	-33
4/23/08	420.000	-26
10/17/08	433.000	-23
1/13/09	506.000	-14
4/28/09	430.000	-27
7/28/09	514.000	-12
10/27/09	545.000	-11
2/15/10	418.000	-32
6/9/10	423.000	-29
9/23/10	491.000	-16
12/16/10	443.000	-23
3/15/11	371.000	-36
6/27/11	417.000	-35
9/21/11	618.000	2
12/14/11	466.000	-19
2/21/12	389.000	-38
7/16/12	403.000	-37
10/17/12	327.000	-44
12/20/12	371.000	-40
6/19/13	192.000	-52
12/12/13	508.000	-3
6/11/14	263.000	-48
12/18/14	405.000	-33
7/21/15	330.000	-44
12/15/15	689.000	13
6/22/16	425.000	-24
12/28/16	285.000	-51
6/15/17	182.500	-62
12/21/17	270.000	-51
6/12/18	318.000	-46
12/19/18	250.000	-55
6/25/19	250.000	-55
12/4/19	286.500	-47
6/8/20	215.500	-60
12/3/20	178.000	-69

S	-1539
count (n)	72
g	2
t_1	2
t_2	2
t_3	0
VARS(S) :	42314.000
Z	7.48
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p (t_p - 1)(2t_p + 5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-19S

Date	Fluoride mg/l	Fluoride signs
1/1/99	2.70	
4/1/99	2.00	-1
7/1/99	2.20	0
10/1/99	3.70	3
1/1/00	2.60	0
4/1/00	4.30	5
7/1/00	4.30	5
10/1/00	4.72	7
4/1/01	3.05	0
7/1/01	4.36	7
10/1/01	4.46	8
1/1/02	4.77	11
4/1/02	3.77	0
7/1/02	4.76	11
10/1/02	8.88	14
1/1/03	8.49	13
4/1/03	5.19	12
7/1/03	7.79	13
10/1/03	6.74	12
1/20/04	7.55	13
4/21/04	0.46	-20
7/21/04	4.24	-5
10/28/04	6.61	12
1/18/05	8.79	21
4/28/05	5.77	10
7/19/05	4.67	1
10/25/05	4.57	0
1/17/06	5.69	11
4/26/06	3.59	-16
7/13/06	3.33	-17
10/26/06	4.83	10
1/24/07	8.19	25
4/26/07	6.41	16
8/16/07	8.70	29
10/25/07	7.33	20
1/31/08	7.23	19
4/15/08	4.46	-6
7/22/08	5.02	7
10/16/08	6.39	14
1/13/09	10.40	39
4/28/09	8.53	32
7/28/09	7.85	27
10/27/09	5.71	8
2/11/10	2.51	-37
6/9/10	2.72	-32
9/21/10	3.61	-25
12/21/10	4.22	-20
3/15/11	4.78	3
6/28/11	2.83	-34
9/20/11	2.77	-35
12/15/11	5.03	10
2/16/12	6.18	19
7/12/12	6.82	28
10/16/12	7.65	35
12/19/12	6.72	24
6/20/13	6.01	15
12/11/13	6.04	16
6/11/14	4.50	-13
12/18/14	5.44	8
7/21/15	4.68	-9
12/15/15	4.63	-12
6/22/16	3.36	-39
12/28/16	3.18	-42
6/15/17	5.21	11
1/25/18	3.02	-46
6/19/18	3.16	-43
1/9/19	3.49	-36
6/27/19	2.61	-57
12/5/19	3.38	-36
6/9/20	3.49	-34
12/3/20	3.30	-42
S		-53
count (n)		71
g		2
t_1		2
t_2		2
t_3		0
VARS(S) :		40586.333
Z		0.26
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Decreasing

Date	Aluminum mg/l	Aluminum signs
2/15/99	0.090	
5/15/99	0.160	1
8/15/99	0.200	2
11/15/99	0.140	-1
2/15/00	0.190	2
5/15/00	0.210	5
8/15/00	0.100	-4
11/2/00	0.420	7
1/24/01	0.050	-8
4/26/01	0.100	-4
7/24/01	0.160	1
10/23/01	0.050	-10
1/23/02	0.050	-10
4/30/02	0.050	-10
7/23/02	0.050	-10
10/22/02	0.054	-5
1/23/03	0.046	-16
4/23/03	0.006	-17
7/29/03	0.083	-2
10/21/03	0.289	17
1/20/04	4.346	20
4/21/04	0.972	19
7/21/04	0.694	18
10/28/04	0.497	17
1/18/05	1.157	22
4/28/05	1.201	23
7/19/05	0.454	14
10/26/05	1.507	25
1/17/06	0.476	14
4/26/06	1.555	27
7/13/06	0.375	8
10/26/06	0.199	1
10/26/06	0.325	8
1/25/07	1.119	23
4/25/07	0.412	10
8/16/07	0.664	19
8/16/07	0.512	18
10/25/07	1.567	35
1/31/08	0.341	4
4/15/08	0.599	19
7/22/08	0.404	6
10/16/08	0.747	25
1/13/09	0.848	26
4/28/09	0.369	1
7/28/09	1.060	30
10/27/09	0.105	-21
2/11/10	5.940	46
9/21/10	0.816	25
12/21/10	1.635	44
3/15/11	0.300	-7
6/28/11	0.190	-17
9/20/11	0.590	17
12/15/11	0.660	20
2/16/12	0.320	-7
7/12/12	0.440	8
10/16/12	0.300	-10
12/19/12	0.610	22
6/20/13	0.690	27
12/11/13	0.840	34
6/11/14	0.900	37
12/18/14	0.680	24
7/21/15	0.710	29
12/15/15	0.200	-23
6/22/16	12.000	63
12/28/16	0.326	-10
6/15/17	0.168	-33
1/25/18	0.186	-32
6/19/18	0.123	-41
1/9/19	0.099	-48
6/27/19	0.042	-67
12/5/19	0.051	-54
6/9/20	0.050	-60
12/3/20	0.033	-70
S		266
count (n)		73
g		6
t_1		4
t_2		2
t_3		2
t_4		2
t_5		2
t_6		0
t_7		0
VARS(S) :		44079.333
Z		1.26
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

MW-26S

Date	Aluminum mg/l	Aluminum signs
1/1/98	0.40	
4/1/98	0.24	-1.00
7/1/98	0.58	2.00
10/1/98	1.20	3.00
1/1/99	1.40	4.00
4/1/99	0.85	1.00
7/1/99	0.26	-4.00
10/1/99	0.37	-3.00
1/1/00	9.45	8.00
4/1/00	1.20	4.00
7/1/00	0.44	-2.00
10/1/00	0.14	-11.00
1/1/01	1.16	4.00
4/1/01	0.12	-13.00
7/1/01	3.97	12.00
10/1/01	0.16	-11.00
1/1/02	0.48	0.00
4/1/02	0.39	-5.00
7/1/02	0.70	4.00
10/1/02	0.38	-7.00
1/1/03	2.24	16.00
4/1/03	15.21	21.00
7/1/03	11.10	20.00
10/1/03	12.43	21.00
1/20/04	12.80	22.00
4/21/04	9.18	15.00
7/20/04	5.62	14.00
10/27/04	11.28	21.00
1/18/05	25.38	28.00
4/28/05	8.03	13.00
7/19/05	9.60	18.00
10/25/05	2.80	7.00
1/17/06	8.45	14.00
4/27/06	9.57	19.00
7/13/06	6.78	10.00
10/27/06	1.57	1.00
1/25/07	6.79	12.00
4/25/07	26.42	37.00
8/16/07	6.12	8.00
10/25/07	7.83	13.00
1/31/08	23.90	36.00
7/23/08	19.85	35.00
10/17/08	34.01	42.00
1/13/09	46.25	43.00
4/28/09	22.40	34.00
7/28/09	33.20	41.00
10/27/09	50.88	46.00
2/15/10	48.01	45.00
6/9/10	82.42	48.00
9/23/10	10.71	17.00
12/16/10	32.53	38.00
3/15/11	52.60	49.00
6/28/11	26.40	34.00
9/21/11	25.90	33.00
12/14/11	25.30	30.00
2/21/12	29.90	39.00
7/16/12	8.60	2.00
10/17/12	34.30	47.00
12/19/12	20.40	24.00
6/19/13	18.60	21.00
12/12/13	18.00	20.00
6/10/14	49.30	55.00
12/16/14	20.20	24.00
7/21/15	15.50	17.00
12/15/15	6.32	-16.00
6/22/16	1.28	-31.00
12/28/16	14.40	16.00
6/15/17	3.59	-23.00
12/21/17	23.60	34.00
6/12/18	11.90	11.00
12/19/18	16.20	22.00
6/27/19	16.50	23.00
12/4/19	6.73	-18.00
6/8/20	0.64	-49.00
12/3/20	6.78	-14.00
S		1090
count (n)		75
g		1
t_1		2
t_2		0
t_3		0
VARS(S) :		47790.667
Z		4.98
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Date	Fluoride mg/l	Fluoride signs
1/1/98	4.600	
4/1/98	3.600	-1.000
7/1/98	3.000	-2.000
10/1/98	4.800	3.000
1/1/99	3.700	0.000
4/1/99	2.700	-5.000
7/1/99	3.100	-2.000
10/1/99	4.100	3.000
1/1/00	4.300	4.000
4/1/00	3.400	-3.000
7/1/00	3.300	-4.000
10/1/00	3.233	-5.000
1/1/01	3.455	0.000
4/1/01	3.202	-7.000
7/1/01	3.471	2.000
10/1/01	3.246	-5.000
1/1/02	3.316	-2.000
4/1/02	2.859	-15.000
7/1/02	3.551	6.000
10/1/02	3.576	7.000
1/1/03	3.067	-14.000
4/1/03	3.341	-1.000
7/1/03	3.546	6.000
10/1/03	3.343	-1.000
1/20/04	3.659	14.000
4/21/04	3.593	11.000
7/20/04	4.053	18.000
10/27/04	4.573	23.000
1/18/05	4.028	16.000
4/28/05	4.337	23.000
7/19/05	3.961	14.000
10/25/05	4.409	25.000
1/17/06	4.077	18.000
4/27/06	4.637	31.000
7/13/06	4.499	26.000
10/27/06	4.317	21.000
1/25/07	4.825	36.000
4/25/07	4.285	17.000
8/16/07	4.692	34.000
10/25/07	4.309	19.000
1/31/08	5.004	40.000
4/16/08	5.148	41.000
7/23/08	4.778	34.000
10/17/08	5.333	43.000
1/13/09	5.150	42.000
4/28/09	4.810	35.000
7/28/09	5.176	44.000
10/27/09	4.958	37.000
2/15/10	4.126	6.000
6/9/10	4.109	5.000
9/23/10	5.635	50.000
12/16/10	5.489	49.000
3/15/11	5.450	48.000
6/28/11	5.970	53.000
9/21/11	5.150	41.000
12/14/11	5.550	51.000
2/16/12	4.620	20.000
7/12/12	4.410	13.000
10/16/12	4.370	10.000
12/19/12	4.900	35.000
6/19/13	5.480	52.000
12/12/13	5.740	59.000
6/10/14	4.810	29.000
12/16/14	5.640	59.000
7/21/15	5.680	60.000
12/15/15	6.370	65.000
6/22/16	6.870	66.000
12/28/16	5.450	46.000
6/15/17	6.100	64.000
12/21/17	5.710	59.000
6/12/18	5.760	62.000
12/19/18	5.730	59.000
6/27/19	6.100	67.000
12/4/19	6.080	65.000
6/8/20	5.740	59.000
12/3/20	4.950	23.000
S		1901.000
count (n)		76
g		3
t_1		2
t_2		2
t_3		2
VARS(S) :		49713.667
Z		8.52
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .
Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group
Note: If a result was nondetect, then half of the detection limit was used.

MW-27S

Date	Aluminum mg/l	Aluminum signs	Date	Fluoride mg/l	Fluoride signs	Date	Sulfate mg/l	Sulfate signs
1/1/99	1.300		1/1/99	7.900		1/1/99	140.00	
4/1/99	0.960	-1	4/1/99	6.700	-1	4/1/99	290.00	1
7/1/99	0.890	-2	7/1/99	6.400	-2	7/1/99	260.00	0
10/1/99	0.670	-3	10/1/99	8.500	3	10/1/99	250.00	-1
1/1/00	1.700	4	1/1/00	8.900	4	1/1/00	290.00	3
4/1/00	3.300	5	4/1/00	7.100	-1	4/1/00	280.00	1
7/1/00	0.820	-4	7/1/00	5.700	-6	7/1/00	320.00	6
10/1/00	0.100	-7	10/1/00	6.294	-5	10/1/00	273.00	-1
1/1/01	0.660	-6	1/1/01	6.473	-2	1/1/01	260.89	-2
4/1/01	1.450	5	4/1/01	6.636	-1	4/1/01	288.26	3
7/1/01	8.790	10	7/1/01	5.919	-8	7/1/01	278.38	0
10/1/01	0.300	-9	10/1/01	6.134	-7	10/1/01	244.43	-9
1/1/02	0.190	-10	1/1/02	5.26	-12	1/1/02	277.56	0
4/1/02	0.390	-7	4/1/02	5.54	-11	4/1/02	268.71	-3
7/1/02	0.210	-10	7/1/02	5.289	-12	7/1/02	260.89	-5
10/1/02	0.142	-13	10/1/02	6.232	-3	10/1/02	292.58	13
1/1/03	4.222	14	1/1/03	5.171	-16	1/1/03	280.64	6
4/1/03	0.155	-13	4/1/03	5.009	-17	4/1/03	292.99	15
7/1/03	0.220	-8	7/1/03	5.581	-8	7/1/03	282.29	6
10/1/03	12.350	19	10/1/03	5.083	-17	10/1/03	276.94	-3
1/20/04	5.402	16	1/20/04	4.521	-20	1/20/04	286.61	8
4/21/04	7.815	17	4/21/04	4.927	-19	4/21/04	283.11	7
7/20/04	11.640	20	7/20/04	4.895	-20	7/20/04	274.68	-6
10/27/04	1.933	9	10/27/04	5.274	-9	10/27/04	256.01	-17
1/18/05	15.420	24	1/18/05	5.889	0	1/18/05	255.41	-18
4/27/05	6.588	15	4/27/05	5.298	-7	4/27/05	257.88	-15
7/19/05	4.442	12	7/19/05	4.252	-26	7/19/05	257.90	-14
10/25/05	2.219	7	10/25/05	4.49	-25	10/25/05	261.28	-7
1/17/06	27.790	28	1/17/06	3.834	-28	1/17/06	283.51	14
4/26/06	15.160	25	4/26/06	4.264	-25	4/26/06	259.34	-15
7/13/06	1.817	2	7/13/06	3.827	-30	7/13/06	257.47	-20
10/26/06	0.297	-19	10/26/06	4.24	-27	10/26/06	218.27	-29
1/25/07	6.057	16	1/25/07	3.92	-28	1/25/07	236.77	-28
4/24/07	3.398	9	4/24/07	3.638	-33	4/24/07	255.13	-23
8/16/07	2.968	6	8/16/07	4.116	-26	8/16/07	241.17	-28
10/25/07	3.622	11	10/25/07	3.579	-35	10/25/07	260.00	-8
1/30/08	11.800	28	1/30/08	4.2505	-22	1/30/08	140.50	-34
4/16/08	1.519	-5	4/16/08	3.783	-33	4/16/08	200.00	-33
7/23/08	8.138	24	7/23/08	3.898	-28	7/23/08	248.00	-24
10/16/08	4.811	15	10/16/08	3.445	-39	10/16/08	236.00	-31
1/13/09	6.170	20	1/13/09	3.64	-34	1/13/09	228.00	-32
4/28/09	1.010	-13	4/28/09	3.551	-39	4/28/09	214.00	-35
7/28/09	8.900	30	7/28/09	3.738	-32	7/28/09	235.00	-30
10/27/09	2.733	1	10/27/09	3.344	-43	10/27/09	237.00	-25
2/11/10	5.686	18	2/11/10	3.048	-44	2/11/10	250.00	-17
6/9/10	3.884	9	6/9/10	2.929	-45	6/9/10	241.00	-25
9/21/10	3.476	6	9/21/10	3.468	-38	9/21/10	248.00	-19
12/14/10	18.740	45	12/14/10	3.845	-21	12/14/10	239.00	-27
3/2/11	15.800	44	3/2/11	3.49	-38	3/2/11	237.00	-29
6/22/11	2.930	-3	6/22/11	3.66	-29	6/22/11	227.00	-39
9/21/11	5.660	18	9/21/11	3.40	-44	9/21/11	235.00	-35
12/15/11	7.090	27	12/15/11	3.3	-47	12/15/11	248.00	-15
2/16/12	29.900	52	2/16/12	4.62	2	2/16/12	213.00	-46
7/12/12	8.600	31	7/12/12	4.41	-3	7/12/12	256.00	-3
10/16/12	34.300	54	10/16/12	4.37	-4	10/16/12	242.00	-20
12/19/12	20.400	49	12/19/12	4.900	7	12/19/12	247.00	-17
6/19/13	3.320	-4	6/19/13	3.38	-48	6/19/13	265.00	20
12/11/13	13.500	41	12/11/13	2.97	-55	12/11/13	257.00	1
6/10/14	16.400	48	6/10/14	2.20	-58	6/10/14	260.00	12
12/16/14	15.100	41	12/16/14	3.17	-51	12/16/14	247.00	-20
7/21/15	6.685	20	7/21/15	3.24	-50	7/21/15	282.00	40
12/15/15	7.630	23	12/15/15	2.37	-59	12/15/15	280.00	36
6/22/16	1.000	-34	6/22/16	3.93	-10	6/22/16	276.00	28
12/28/16	0.668	-43	12/28/16	3.00	-55	12/28/16	250.00	-13
6/15/17	2.220	-16	6/15/17	2.54	-60	6/15/17	257.00	-1
1/25/18	1.820	-21	1/25/18	1.89	-65	1/25/18	275.00	29
6/19/18	0.799	-42	6/19/18	2.78	-58	6/19/18	298.00	64
1/9/19	1.500	-27	1/9/19	2.95	-55	1/9/19	270.00	23
6/27/19	4.095	6	6/27/19	3.15	-48	6/27/19	392.00	68
12/5/19	0.912	-39	12/5/19	3.05	-49	12/5/19	297.00	63
6/9/20	0.539	-52	6/9/20	2.96	-56	6/9/20	289.00	54
12/3/20	0.811	-43	12/3/20	2.44	-65	12/3/20	285.00	49

	S	470		**S**	-1896		**S**	-252
	count (n)	72		**count (n)**	72		**count (n)**	72
	g	0		**g**	0		**g**	9
	t_1	0		t_1	0		t_1	3
	t_2	0		t_2	0		t_2	3
	t_3	0		t_3	0		t_3	3
	VARS(S) :	42316.000		**VARS(S) :**	42316.000		t_4	2
	Z	2.28		**Z**	9.21		t_5	2
	α/2(normal dist.)	1.96		**α/2(normal dist.)**	1.96		t_6	2
	Null hypothesis	Reject		**Null hypothesis**	Reject		t_7	2
	Trend Analysis Result	Trend exists		**Trend Analysis Result**	Trend exists		t_8	2
	Slope of Data	Increasing		**Slope of Data**	Decreasing		t_9	2
							VARS(S) :	42291.000
							Z	1.22
							α/2(normal dist.)	1.96
							Null hypothesis	Accept
							Trend Analysis Result	Trend does not exist
							Slope of Data	Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than $\alpha/2$.

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p (t_p - 1)(2t_p + 5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-28S

Date	Aluminum mg/l	Aluminum signs
1/1/99	7.400	
4/1/99	3.600	-1
7/1/99	3.100	-2
10/1/99	3.600	0
1/1/00	21.715	4
4/1/00	16.000	3
7/1/00	12.000	2
10/1/00	0.770	-7
1/1/01	3.510	-4
4/1/01	1.120	-7
7/1/01	2.730	-6
10/1/01	0.640	-11
1/1/02	0.710	-10
4/1/02	0.970	-7
7/1/02	0.300	-14
10/1/02	0.624	-13
1/1/03	9.921	10
4/1/03	10.560	11
7/1/03	0.888	-8
10/1/03	8.216	9
1/20/04	6.177	6
4/21/04	7.177	7
7/20/04	14.740	18
10/27/04	1.537	-7
1/19/05	13.610	18
4/28/05	5.319	3
7/19/05	5.502	4
10/26/05	3.193	-5
1/17/06	6.013	6
4/27/06	1.645	-11
7/13/06	3.801	2
10/26/06	1.439	-15
1/25/07	1.411	-16
4/26/07	7.876	17
8/16/07	2.054	-10
10/25/07	5.125	5
1/31/08	4.500	4
4/16/08	1.983	-13
7/23/08	2.282	-10
10/17/08	1.918	-15
1/13/09	4.610	8
4/28/09	14.100	35
7/28/09	9.810	26
10/27/09	0.647	-37
2/15/10	7.932	24
6/9/10	1.746	-19
9/23/10	4.588	6
12/16/10	1.763	-19
3/15/11	2.920	-8
6/28/11	1.050	-33
9/21/11	1.540	-24
12/14/11	2.730	-8
2/21/12	1.240	-32
7/16/12	2.400	-9
10/17/12	2.235	-12
12/19/12	2.315	-9
6/19/13	16.100	54
12/12/13	18.900	55
6/10/14	1.690	-26
12/16/14	12.100	45
7/21/15	10.800	42
12/15/15	8.530	35
6/22/16	1.880	-24
12/28/16	11.300	45
6/15/17	2.670	-10
12/21/17	0.391	-63
6/12/18	0.050	-66
12/19/18	0.050	-66
6/27/19	0.251	-64
12/4/19	0.036	-69
6/8/20	3.630	12
12/3/20	0.448	-59

	S	-333
	count (n)	72
	g	2
	t_1	2
	t_2	2
	t_3	0
	VARS(S) :	42314.000
	Z	1.61
	α/2(normal dist.)	1.96
	Null hypothesis	Accept
	Trend Analysis Result	Trend does not exist
	Slope of Data	Decreasing

Date	Cyanide mg/l	Cyanide signs
1/1/99	18.00	
4/1/99	9.20	-1
7/1/99	14.00	0
10/1/99	14.00	0
1/1/00	2.53	-4
4/1/00	0.67	-5
7/1/00	2.63	-2
10/1/00	8.05	-1
1/1/01	8.83	0
4/1/01	12.40	3
7/1/01	2.68	-4
10/1/01	17.20	9
1/1/02	14.60	8
4/1/02	9.72	1
7/1/02	8.12	-4
10/1/02	11.20	3
1/1/03	9.35	0
4/1/03	3.06	-9
7/1/03	3.09	-8
10/1/03	8.02	-7
1/20/04	3.10	-8
4/21/04	3.25	-7
7/20/04	3.27	-6
10/27/04	3.32	-5
1/19/05	3.47	-4
4/28/05	3.54	-3
7/19/05	3.56	-2
10/26/05	3.77	-1
1/17/06	1.05	-26
4/27/06	4.01	1
7/13/06	4.01	1
10/26/06	4.03	3
1/25/07	4.05	4
4/26/07	4.06	5
8/16/07	1.23	-30
10/25/07	1.40	-29
1/31/08	4.17	8
4/16/08	1.50	-29
10/17/08	1.50	-29
4/28/09	1.58	-27
7/28/09	1.60	-26
10/27/09	1.68	-25
2/15/10	1.70	-24
6/9/10	4.19	15
9/23/10	4.76	16
12/16/10	4.90	17
3/15/11	5.40	18
6/28/11	5.50	19
9/21/11	1.84	-28
12/14/11	5.71	21
2/21/12	5.90	22
7/16/12	1.90	-29
10/17/12	1.95	-28
12/19/12	1.98	-27
6/19/13	2.11	-26
12/12/13	2.15	-25
6/10/14	2.16	-24
12/16/14	2.22	-23
7/21/15	2.23	-22
12/15/15	6.53	31
6/22/16	6.76	32
12/28/16	2.32	-23
6/15/17	7.63	34
12/21/17	7.85	35
6/12/18	2.45	-24
12/19/18	7.95	37
6/27/19	2.46	-24
12/4/19	3.22	-11
6/8/20	2.94	-18
12/3/20	2.34	-29

	S	-344
	count (n)	70
	g	3
	t_1	2
	t_2	2
	t_3	2
	VARS(S) :	38905.333
	Z	1.74
	α/2(normal dist.)	1.96
	Null hypothesis	Accept
	Trend Analysis Result	Trend does not exist
	Slope of Data	Decreasing

Date	WAD mg/l	WAD signs
11/2/2000	0.0490	
1/24/2001	0.0420	-1
4/25/2001	0.0295	-2
7/23/01	0.0300	-1
10/22/01	0.0250	-4
1/22/02	0.1200	5
4/30/02	0.0050	-6
4/30/02	0.1970	7
7/23/02	0.0320	0
10/23/02	0.0195	-7
1/23/2003	0.0640	6
4/23/2003	0.0485	3
7/29/2003	0.0310	-2
10/21/2003	0.0515	7
1/20/2004	0.0350	0
4/21/2004	0.0378	1
7/20/04	0.0250	-11
10/27/04	0.0810	13
1/19/05	0.0320	-3
4/28/05	0.0050	-18
7/19/05	0.0190	-16
10/26/05	0.0305	-5
1/17/06	0.0385	6
4/27/06	0.0340	1
7/13/06	0.1210	22
10/26/06	0.0305	-8
1/25/07	0.0325	0
4/26/07	0.0420	10
8/16/07	0.0185	-24
10/25/07	0.0150	-25
1/31/08	0.0110	-26
4/16/08	0.0420	13
7/23/08	0.0200	-18
10/17/08	0.0050	-31
1/19/09	0.0683	26
7/30/09	0.1150	29
10/29/09	0.1460	34
2/15/10	0.2570	37
6/9/10	0.0635	20
9/23/10	0.0350	2
12/16/10	0.0150	-31
3/15/11	0.0390	9
6/28/11	0.0550	22
9/21/11	0.0190	-28
12/14/11	0.0130	-36
2/21/12	0.0560	25
7/16/12	0.0640	29
10/17/12	0.1760	43
12/19/12	0.0970	34
12/19/12	0.0980	35
6/19/13	0.0220	-26
12/12/13	0.0180	-37
6/10/14	0.0690	32
7/21/15	0.0490	16
12/15/15	0.0170	-40
6/22/16	0.1300	47
12/28/16	0.0860	36
6/15/17	1.3000	57
12/21/17	1.3000	57
6/12/18	0.1600	49
6/27/19	0.1590	48
12/4/19	0.0180	-44
6/8/20	0.0870	34
12/3/20	0.0290	-27

	S	338
	count (n)	64
	g	10
	t_1	3
	t_2	3
	t_3	2
	t_4	2
	t_5	2
	t_6	2
	t_7	2
	t_8	2
	t_9	2
	t_{10}	2
	VARS(S) :	535853.000
	Z	0.46
	α/2(normal dist.)	1.96
	Null hypothesis	Accept
	Trend Analysis Result	Trend does not exist
	Slope of Data	Increasing

Date	Fluoride mg/l	Fluoride signs
1/1/99	170.00	
4/1/99	94.00	-1
7/1/99	84.00	-2
10/1/99	130.00	1
1/1/00	109.00	0
4/1/00	100.00	-1
7/1/00	100.00	-1
10/1/00	126.80	3
1/1/01	120.90	2
4/1/01	90.70	-7
7/1/01	81.57	-10
10/1/01	84.20	-7
1/1/02	81.04	-12
4/1/02	68.86	-13
7/1/02	67.74	-14
10/1/02	78.91	-11
1/1/03	69.25	-12
4/1/03	55.12	-17
7/1/03	45.15	-18
10/1/03	55.63	-15
1/20/04	46.04	-18
4/21/04	50.64	-17
7/20/04	41.34	-22
10/27/04	55.20	-13
1/19/05	61.21	-10
4/28/05	48.82	-19
7/19/05	43.78	-24
10/26/05	41.37	-25
1/17/06	44.21	-22
4/27/06	36.05	-29
7/13/06	34.09	-30
10/26/06	33.77	-31
1/25/07	32.99	-32
4/26/07	31.46	-33
8/16/07	19.23	-34
10/25/07	19.99	-33
1/31/08	25.87	-32
4/16/08	21.54	-33
7/23/08	16.34	-38
10/17/08	14.93	-39
1/13/09	16.40	-36
4/28/09	15.35	-39
7/28/09	15.38	-38
10/27/09	16.15	-37
2/15/10	14.56	-44
6/9/10	16.03	-37
9/23/10	19.12	-30
12/16/10	17.13	-31
3/15/11	16.40	-33
6/28/11	15.65	-41
9/21/11	12.80	-50
12/14/11	15.50	-41
2/21/12	12.70	-52
7/16/12	11.95	-53
10/17/12	12.25	-52
12/19/12	12.90	-47
6/19/13	11.35	-56
12/12/13	10.90	-57
6/10/14	9.50	-58
12/16/14	10.62	-57
7/21/15	10.00	-58
12/15/15	13.40	-41
6/22/16	14.80	-38
12/28/16	26.70	-5
6/15/17	13.30	-44
12/21/17	15.90	-27
6/12/18	15.80	-28
12/19/18	15.75	-29
6/27/19	12.40	-54
12/4/19	16.60	-13
6/8/20	14.30	-44
12/3/20	15.70	-29

	S	-1968
	count (n)	72
	g	2
	t_1	2
	t_2	2
	t_3	0
	VARS(S) :	42314.000
	Z	9.56
	α/2(normal dist.)	1.96
	Null hypothesis	Reject
	Trend Analysis Result	Trend exists
	Slope of Data	Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p (t_p - 1)(2t_p + 5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-35SR

Date	Aluminum mg/l	Aluminum signs
4/16/2008	80.78	
7/23/08	145.10	1
1/19/09	127.00	0
4/28/09	3.51	-3
7/29/09	53.20	-2
10/28/09	32.33	-3
2/11/10	20.55	-4
6/9/10	15.18	-5
9/22/10	23.50	-2
12/16/10	34.73	1
3/2/11	5.39	-8
6/22/11	67.20	5
9/20/11	38.80	2
12/15/11	68.40	7
2/16/12	50.20	2
7/12/12	71.60	9
10/16/12	122.00	12
12/19/12	16.95	-11
6/19/13	51.10	2
12/12/13	49.90	-1
6/11/14	66.30	6
12/16/14	44.65	-3
7/28/15	14.60	-18
12/15/15	17.60	-13
6/23/16	10.20	-20
1/10/17	13.80	-19
1/25/17	12.60	-20
6/15/17	11.70	-21
6/19/18	4.71	-26
12/20/18	2.48	-29
6/26/19	14.50	-14
12/6/19	12.90	-17
6/11/20	5.06	-26
12/3/20	9.75	-23
S		-241
count (n)		34
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		4550.333
Z		3.56
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Decreasing

Date	Sulfate mg/l	Sulfate signs
4/16/08	464.0	
7/23/08	516.0	1.0
10/22/08	632.0	2.0
1/19/09	521.0	1.0
4/28/09	401.0	-4.0
7/29/09	554.0	3.0
10/28/09	530.0	2.0
2/11/10	523.0	1.0
6/9/10	532.0	4.0
9/22/10	51.7	-9.0
12/16/10	502.0	-4.0
3/2/11	538.0	7.0
6/22/11	497.0	-6.0
9/20/11	538.0	8.0
12/15/11	529.0	2.0
2/14/12	558.5	13.0
7/10/12	596.0	14.0
9/25/12	541.0	9.0
12/18/12	545.0	10.0
6/19/13	453.0	-15.0
12/12/13	426.0	-16.0
6/11/14	453.0	-14.0
12/16/14	558.5	17.0
7/28/15	701.0	23.0
12/15/15	682.0	22.0
6/23/16	604.0	19.0
1/10/17	465.0	-14.0
6/15/17	487.0	-13.0
1/25/17	487.0	-13.0
6/19/18	476.0	-15.0
12/20/18	438.0	-24.0
6/26/19	590.0	21.0
12/6/19	366.0	-30.0
6/11/20	574.0	21.0
12/3/20	652.0	30.0
S		53
count (n)		35
g		1
t_1		2
t_2		0
t_3		0
VARS(S) :		4957.333
Z		0.74
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-17S

Date	Aluminum mg/l	Aluminum signs
1/1/99	0.610	
4/1/99	0.490	-1.000
7/1/99	0.560	0.000
10/1/99	0.520	-1.000
1/1/00	0.340	-4.000
4/1/00	0.860	5.000
7/1/00	0.200	-6.000
10/1/00	0.180	-7.000
1/1/01	0.820	6.000
4/1/01	0.100	-9.000
7/1/01	0.410	-2.000
10/1/01	0.140	-9.000
1/1/02	0.120	-10.000
4/1/02	0.120	-10.000
7/1/02	0.050	-14.000
10/1/02	0.838	13.000
1/1/03	0.740	10.000
4/1/03	0.085	-15.000
7/1/03	0.083	-16.000
10/1/03	0.453	3.000
1/20/04	1.131	20.000
4/21/04	2.974	21.000
7/21/04	2.589	20.000
10/28/04	1.408	19.000
1/18/05	3.927	24.000
4/28/05	2.527	19.000
7/19/05	3.142	24.000
10/25/05	2.057	17.000
1/17/06	20.840	28.000
4/26/06	15.010	27.000
7/13/06	10.850	26.000
10/26/06	7.305	25.000
1/24/07	7.112	24.000
4/26/07	6.852	23.000
8/16/07	3.015	18.000
10/25/07	4.661	23.000
1/31/08	3.880	20.000
4/15/08	6.569	25.000
7/22/08	11.890	34.000
10/16/08	1.901	5.000
1/13/09	1.880	4.000
4/28/09	0.405	-21.000
7/28/09	2.760	14.000
10/27/09	1.424	3.000
2/11/10	3.745	22.000
6/9/10	7.285	35.000
9/21/10	2.558	10.000
12/21/10	11.920	43.000
3/15/11	1.880	1.000
6/22/11	1.750	-1.000
9/20/11	2.180	8.000
12/15/11	4.400	29.000
2/16/12	4.570	30.000
7/12/12	1.690	-5.000
10/17/12	2.050	4.000
12/19/12	1.050	-13.000
6/20/13	1.330	-10.000
12/11/13	2.380	11.000
6/11/14	2.120	8.000
12/18/14	2.210	11.000
7/21/15	0.780	-24.000
12/15/15	0.710	-27.000
6/22/16	0.663	-28.000
12/28/16	0.736	-25.000
6/15/17	0.491	-36.000
1/25/18	0.387	-45.000
6/19/18	0.342	-46.000
6/27/19	1.130	-9.000
12/5/19	0.032	-68.000
6/11/20	0.050	-66.000
12/3/20	0.050	-66.000
S		118
count (n)		71
g		2
t_1		2
t_2		2
t_3		0
VARS(S) :		40586.333
Z		0.58
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

MW-31SR

Date	Aluminum mg/l	Aluminum signs
10/1/99	0.97	
1/1/00	4.83	1
4/1/00	2.30	0
7/1/00	0.64	-3
10/1/00	0.05	-4
1/1/01	0.26	-3
4/1/01	3.01	4
7/1/01	2.18	1
10/1/01	0.78	-2
1/1/02	0.12	-7
4/1/02	0.05	-9
7/1/02	0.15	-5
10/1/02	0.21	-4
1/1/03	0.05	-11
4/1/03	0.05	-14
7/1/03	0.08	-7
10/1/03	0.08	-7
1/20/04	12.30	17
4/21/04	33.41	18
7/20/04	4.11	13
10/27/04	4.80	14
1/18/05	16.82	19
4/27/05	6.70	16
7/19/05	4.78	11
10/25/05	6.26	16
1/17/06	6.38	17
4/26/06	13.43	22
7/12/06	10.45	19
10/25/06	2.19	0
1/23/07	5.27	13
4/24/07	6.26	14
8/14/07	3.89	3
10/23/07	4.89	12
1/31/08	6.10	15
7/23/08	6.14	16
10/16/08	11.74	27
1/13/09	24.60	34
4/28/09	9.10	23
7/28/09	22.00	34
10/27/09	17.82	33
2/11/10	15.86	30
6/9/10	2.17	-15
9/21/10	10.49	24
12/14/10	12.51	29
3/15/11	2.73	-10
6/22/11	4.09	-5
9/14/11	6.73	20
12/13/11	4.78	-1
2/14/12	15.50	36
7/10/12	7.50	21
9/25/12	5.54	6
12/18/12	3.34	-13
6/18/13	6.11	10
12/11/13	1.74	-27
6/11/14	2.16	-26
12/16/14	1.40	-29
7/15/15	0.84	-32
12/16/15	1.62	-27
6/21/16	0.66	-36
1/10/17	0.52	-39
6/13/17	0.40	-40
1/30/18	0.44	-39
6/12/18	1.80	-20
12/18/18	1.34	-27
6/26/19	3.96	0
12/3/19	1.08	-29
6/9/20	1.49	-24
12/3/20	1.65	-21
S		52
count (n)		68
g		3
t_1		2
t_2		2
t_3		2
VARS(S) :		35685.667
Z		0.27
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

MW-36

Date	Aluminum mg/l	Aluminum signs
1/1/99	1.100	
4/1/99	0.470	-1
7/1/99	0.460	-2
10/1/99	0.310	-3
1/1/00	0.480	2
4/1/00	1.000	3
7/1/00	0.530	2
10/1/00	0.210	-7
1/1/01	0.240	-6
4/1/01	3.790	9
7/1/01	1.700	8
10/1/01	1.090	5
1/1/02	0.710	2
4/1/02	0.140	-13
7/1/02	0.290	-8
10/1/02	0.085	-15
1/1/03	5.672	16
4/1/03	62.530	17
7/1/03	37.190	16
10/1/03	98.570	19
1/20/04	54.290	16
4/21/04	65.490	19
7/21/04	52.550	14
10/27/04	44.150	13
1/19/05	85.780	22
4/28/05	57.420	17
7/19/05	48.230	12
10/25/05	51.750	13
1/17/06	46.690	10
4/27/06	41.550	7
7/13/06	77.120	26
10/27/06	3.292	-1
1/24/07	41.700	8
4/26/07	39.650	5
8/16/07	138.000	34
10/25/07	50.130	15
1/30/08	153.000	36
4/15/08	4.279	-3
7/22/08	356.400	38
10/16/08	5.046	-3
1/13/09	65.700	28
4/28/09	9.730	-1
7/28/09	2.820	-12
10/27/09	743.000	43
2/11/10	0.319	-32
6/9/10	347.200	41
9/22/10	4.344	-6
12/21/10	4.392	-5
3/17/11	7.000	0
6/22/11	81.200	35
9/20/11	96.100	38
12/15/11	159.000	45
2/16/12	50.600	16
7/12/12	104.000	41
10/16/12	43.700	6
12/20/12	70.600	31
6/20/13	59.000	24
12/12/13	89.600	39
6/11/14	99.300	44
12/16/14	102.000	45
7/28/15	84.900	34
12/15/15	21.900	-9
6/23/16	35.000	-8
1/10/17	78.900	33
6/15/17	36.200	-8
1/25/18	22.100	-11
6/19/18	24.300	-10
1/9/19	47.200	9
6/27/19	5.050	-22
12/6/19	29.700	-9
6/11/20	6.740	-20
12/3/20	25.300	-9

S	732
count (n)	72
g	0
t_1	0
t_2	0
t_3	0
t_4	0
t_5	0
VARS(S) :	42316
Z	3.55
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Increasing

Date	Fluoride mg/l	Fluoride signs
1/1/99	3.60	
4/1/99	2.90	-1
7/1/99	2.20	-2
10/1/99	2.90	0
1/1/00	1.70	-4
4/1/00	3.40	3
7/1/00	3.30	2
10/1/00	3.48	5
1/1/01	3.48	6
4/1/01	3.59	7
7/1/01	3.70	10
10/1/01	3.29	-3
1/1/02	3.40	0
4/1/02	3.08	-5
7/1/02	3.52	8
10/1/02	3.48	5
1/1/03	3.75	16
4/1/03	3.63	13
7/1/03	3.77	18
10/1/03	3.54	7
1/20/04	3.52	5
4/21/04	3.39	-7
7/21/04	3.75	20
10/27/04	3.80	23
1/19/05	3.29	-13
4/28/05	3.50	3
7/19/05	3.52	4
10/25/05	2.61	-23
1/17/06	3.26	-16
4/27/06	2.61	-25
7/13/06	2.91	-18
10/27/06	3.15	-15
1/24/07	2.83	-24
4/26/07	2.96	-17
8/16/07	2.73	-26
10/25/07	2.82	-25
1/30/08	2.74	-26
4/15/08	3.01	-13
7/22/08	3.61	26
10/16/08	3.90	39
1/13/09	2.45	-36
4/28/09	2.31	-37
7/28/09	2.33	-36
10/27/09	2.35	-35
2/11/10	2.86	-20
6/9/10	2.37	-35
9/22/10	2.43	-34
12/21/10	2.30	-43
3/17/11	2.08	-46
6/22/11	2.56	-29
9/20/11	1.99	-48
12/15/11	2.23	-43
2/16/12	2.37	-32
7/12/12	2.10	-47
10/16/12	2.03	-50
12/20/12	2.09	-47
6/20/13	2.13	-44
12/12/13	2.00	-53
6/11/14	1.99	-55
12/16/14	41.00	59
7/28/15	2.06	-50
12/15/15	2.35	-29
6/23/16	0.38	-62
1/10/17	2.08	-48
6/15/17	5.69	62
1/25/18	2.26	-37
6/19/18	2.15	-42
1/9/19	2.30	-34
6/27/19	2.71	-10
12/6/19	2.15	-44
6/11/20	2.35	-25
12/3/20	1.99	-65

S	-1138
count (n)	72
g	10
t_1	2
t_2	2
t_3	2
t_4	2
t_5	3
t_6	2
t_7	2
t_8	2
t_9	2
t_{10}	2
t_{11}	2
VARS(S) :	42302.33333
Z	5.53
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Date	Sulfate mg/l	Sulfate signs
1/1/99	42.50	
4/1/99	213.00	1
7/1/99	340.00	2
10/1/99	401.00	3
1/1/00	411.00	4
4/1/00	421.00	5
7/1/00	424.00	6
10/1/00	424.00	6
1/1/01	426.00	8
4/1/01	432.00	9
7/1/01	432.00	9
10/1/01	443.00	11
1/1/02	446.00	12
4/1/02	447.00	13
7/1/02	450.00	14
10/1/02	491.78	15
1/1/03	498.00	16
4/1/03	500.00	17
7/1/03	510.00	18
10/1/03	511.00	19
1/20/04	513.00	20
4/21/04	514.74	21
7/21/04	520.00	22
10/27/04	530.00	23
1/19/05	562.15	24
4/28/05	566.00	25
7/19/05	575.81	26
10/25/05	588.00	27
1/17/06	589.00	28
4/27/06	590.00	29
7/13/06	595.00	30
10/27/06	610.00	31
1/24/07	613.00	32
4/26/07	625.27	33
8/16/07	626.05	34
10/25/07	629.00	35
1/30/08	630.00	36
4/15/08	637.83	37
7/22/08	639.53	38
10/16/08	643.59	39
1/13/09	652.23	40
4/28/09	656.68	41
7/28/09	662.10	42
10/27/09	663.54	43
2/11/10	664.98	44
6/9/10	665.24	45
9/22/10	667.04	46
12/21/10	675.18	47
3/17/11	680.00	48
6/22/11	682.10	49
9/20/11	682.47	50
12/15/11	683.09	51
2/16/12	690.91	52
7/12/12	691.32	53
10/16/12	692.35	54
12/20/12	697.29	55
6/20/13	703.41	56
12/12/13	719.10	57
6/11/14	426.00	-41
12/16/14	1640.00	59
7/28/15	414.00	-50
12/15/15	535.00	-9
6/23/16	413.00	-52
1/10/17	403.00	-55
6/15/17	393.00	-58
1/25/18	367.00	-59
6/19/18	406.00	-52
1/9/19	386.00	-59
6/27/19	486.00	-22
12/6/19	396.00	-57
6/11/20	352.00	-64
12/3/20	361.00	-63

S	1069
count (n)	72
g	3
t_1	2
t_2	2
t_3	2
t_4	0
t_5	0
t_6	0
VARS(S) :	42313
Z	5.19
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Increasing

Mann-Kendall Test
Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than $\alpha/2$.
Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group
Note: If a result was nondetect, then half of the detection limit was used.

MW-37					
Date	Aluminum mg/l	Aluminum signs	Date	Sulfate mg/l	Sulfate signs
1/1/99	0.05000		1/1/99	250.00	
4/1/99	0.10000	1	4/1/99	220.00	-1
7/1/99	0.21000	2	7/1/99	310.00	2
10/1/99	0.22000	3	10/1/99	280.00	1
1/1/00	0.24000	4	1/1/00	220.00	-3
4/1/00	0.24000	4	4/1/00	270.00	1
7/1/00	0.25000	6	7/1/00	260.00	0
10/1/00	0.26000	7	10/1/00	278.00	3
1/1/01	0.29000	8	1/1/01	267.06	0
4/1/01	0.40000	9	4/1/01	274.68	3
7/1/01	0.40000	9	7/1/01	260.89	-2
10/1/01	0.42800	11	10/1/01	274.06	3
1/1/02	0.44000	12	1/1/02	273.24	2
4/1/02	0.50000	13	4/1/02	275.09	7
7/1/02	0.80000	14	7/1/02	247.93	-10
10/1/02	0.99000	15	10/1/02	284.96	13
1/1/03	2.74400	16	1/1/03	285.99	14
4/1/03	3.09200	17	4/1/03	305.54	15
7/1/03	5.36000	18	7/1/03	279.20	8
10/1/03	5.42700	19	10/1/03	284.14	11
1/20/04	5.52700	20	1/20/04	291.14	16
4/21/04	6.20000	21	4/21/04	283.52	9
7/21/04	6.86800	22	7/21/04	290.52	16
10/27/04	7.48000	23	10/27/04	265.57	-11
1/19/05	7.72000	24	1/19/05	275.92	2
4/28/05	9.29600	25	4/28/05	287.04	17
7/19/05	24.32000	26	7/19/05	284.80	12
10/25/05	25.75000	27	10/25/05	306.65	25
1/17/06	28.77000	28	1/17/06	326.04	28
4/27/06	30.82000	29	4/27/06	269.00	-13
7/13/06	34.69000	30	7/13/06	297.92	22
10/27/06	44.11200	31	10/27/06	256.47	-23
1/24/07	46.11000	32	1/24/07	280.10	6
4/26/07	46.20000	33	4/26/07	278.52	1
8/16/07	50.20000	34	8/16/07	293.42	24
10/25/07	53.38000	35	10/25/07	290.00	19
1/30/08	54.58000	36	1/30/08	270.00	-15
4/15/08	55.60000	37	4/15/08	287.00	17
7/22/08	66.93000	38	7/22/08	292.00	26
10/16/08	67.70000	39	10/16/08	271.00	-15
1/13/09	68.60000	40	1/13/09	311.00	38
4/28/09	70.30000	41	4/28/09	271.00	-16
7/28/09	71.34000	42	7/28/09	270.00	-20
10/27/09	75.61000	43	10/27/09	283.00	7
2/11/10	78.30000	44	2/11/10	301.00	34
6/9/10	89.08000	45	6/9/10	276.00	-5
12/21/10	89.20000	46	9/22/10	28.00	-46
3/17/11	95.70000	47	12/21/10	285.00	17
6/22/11	115.90000	48	3/17/11	293.00	32
9/20/11	117.00000	49	6/22/11	279.00	-1
12/15/11	117.00000	49	9/20/11	287.00	21
2/16/12	123.20000	51	12/15/11	296.00	37
7/12/12	170.00000	52	2/16/12	282.00	4
10/16/12	193.00000	53	7/12/12	176.00	-51
12/20/12	227.10000	54	10/16/12	283.00	7
6/20/13	117.00000	45	12/20/12	297.00	41
12/12/13	293.00000	56	6/20/13	304.00	46
6/11/14	351.00000	57	12/12/13	290.00	26
12/16/14	473.00000	58	6/11/14	299.00	44
7/28/15	64.40000	17	12/16/14	289.00	23
12/15/15	96.00000	38	7/28/15	296.00	39
6/23/16	29.40000	-3	12/15/15	314.00	59
1/10/17	29.20000	-4	6/23/16	308.00	54
6/15/17	59.10000	17	1/10/17	285.00	10
1/25/18	80.60000	34	6/15/17	287.00	16
6/19/18	19.00000	-13	1/25/18	319.00	63
1/9/19	300.00000	62	6/19/18	272.00	-32
6/27/19	26.60000	-9	6/27/19	383.00	67
12/6/19	74.70000	30	12/6/19	254.00	-56
6/11/20	12.50000	-17	6/11/20	292.00	32
12/3/20	25.20000	+12	12/3/20	308.00	57
	S	1838		**S**	777
	count (n)	71		**count (n)**	71
	g	3		**g**	6
	t_1	2		**t_1**	3
	t_2	2		**t_2**	2
	t_3	2		**t_3**	2
				t_4	2
				t_5	2
				t_6	2
	VARS(S) :	40585.3333		**VARS(S) :**	40579.66667
	Z	9.12		**Z**	3.85
	α/2(normal dist.)	1.96		**α**/2(normal dist.)	1.96
	Null hypothesis	Reject		**Null hypothesis**	Reject
	Trend Analysis Result	Trend exists		**Trend Analysis Result**	Trend exists
	Slope of Data	Increasing		**Slope of Data**	Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is

Sample Variance must be modified if ties are present using the e

$$VAR(S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-38

Date	Aluminum mg/l	Aluminum signs
1/1/99	0.69	
4/1/99	0.37	-1
7/1/99	0.36	-2
10/1/99	0.27	-3
1/1/00	0.51	2
4/1/00	3.30	5
7/1/00	0.37	-1
10/1/00	0.13	-7
1/1/01	0.78	6
4/1/01	0.40	1
7/1/01	13.47	10
10/1/01	0.48	1
1/1/02	0.73	6
4/1/02	0.86	9
7/1/02	0.54	2
10/1/02	1.48	11
1/1/03	22.28	16
4/1/03	33.63	17
7/1/03	36.27	18
10/1/03	116.70	19
1/20/04	106.40	18
4/21/04	43.29	17
7/21/04	106.25	18
10/27/04	148.34	23
1/19/05	109.48	20
4/28/05	116.51	21
7/19/05	82.35	14
10/25/05	10.80	3
1/17/06	98.23	16
4/27/06	34.74	9
7/13/06	134.60	28
10/27/06	4.05	-1
1/24/07	48.55	14
4/26/07	133.30	29
8/16/07	75.30	14
10/25/07	165.80	35
1/30/08	298.00	36
4/15/08	242.70	35
7/22/08	469.50	38
10/16/08	6.28	-7
1/13/09	16.00	-2
4/28/09	202.00	35
7/28/09	156.00	32
10/27/09	36.06	3
2/11/10	4.41	-12
6/9/10	100.50	17
9/22/10	2.15	-18
12/21/10	161.60	37
3/23/11	822.00	48
6/22/2011	368.00	45
9/20/2011	352.00	44
12/15/11	251.00	41
2/16/12	126.00	24
7/12/12	102.00	13
10/16/12	104.00	14
12/20/12	105.00	15
6/20/13	38.00	-2
12/12/13	83.50	7
6/11/14	105.00	17
12/16/14	179.00	43
7/28/15	41.90	-4
12/15/15	26.80	-15
6/23/16	44.90	0
1/10/17	29.60	-15
6/15/17	40.80	-4
1/25/18	34.70	-13
6/27/19	11.20	-26
12/6/19	39.10	-3
6/11/20	9.60	-30
12/3/20	16.20	-21

S	759
count (n)	70
g	1
t_1	2
t_2	0
t_3	0
VARS(S) :	38907.3333
Z	3.84
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Increasing

MW-39S

Date	Aluminum mg/l	Aluminum signs
4/1/99	0.44	
7/1/99	0.64	1
10/1/99	0.17	-2
1/1/00	5.20	3
4/1/00	0.40	-2
7/1/00	0.40	-2
10/1/00	0.05	-6
1/1/01	2.44	5
4/1/01	5.12	6
7/1/01	14.40	9
10/1/01	0.43	-2
1/1/02	0.19	-7
4/1/02	0.90	4
7/1/02	1.02	5
10/1/02	0.25	-8
1/1/03	12.19	13
4/1/03	64.28	16
7/1/03	0.10	-15
10/1/03	12.44	14
1/20/04	8.65	11
4/21/04	13.06	16
7/20/04	11.82	11
10/27/04	24.04	20
1/18/05	34.73	21
4/27/05	5.41	6
7/19/05	14.18	17
10/25/05	29.79	22
1/17/06	19.12	19
4/26/06	7.91	4
7/12/06	8.52	5
10/25/06	0.52	-12
1/23/07	1.93	-5
4/24/07	4.12	-2
8/14/07	10.94	11
10/23/07	0.93	-10
1/29/08	98.70	35
4/15/08	299.50	36
7/23/08	63.02	31
10/16/08	418.90	38
1/13/09	101.00	35
4/28/09	22.40	22
7/28/09	43.00	29
10/27/09	28.57	24
2/9/10	41.84	29
6/8/10	9.40	2
9/21/10	4.24	-11
12/14/10	10.43	4
3/2/11	35.20	31
6/22/2011	15.60	18
9/14/2011	0.86	-27
12/13/11	61.10	38
2/14/12	37.70	33
7/10/12	25.90	24
9/25/12	8.08	-7
12/18/12	48.20	40
2/7/13	35.90	33
6/18/13	53.40	42
9/24/13	38.70	35
12/10/13	25.40	20
2/25/14	24.65	19
6/11/14	61.30	48
9/25/14	27.80	23
12/16/14	22.10	12
2/11/15	32.80	29
7/15/15	468.00	64
9/30/15	7.54	-21
12/16/15	3.51	-32
2/3/16	14.00	3
6/21/16	11.90	-4
9/15/16	30.00	31
1/6/17	27.50	24
2/15/17	13.65	1
6/13/17	4.81	-32
9/14/17	12.20	-3
12/20/17	14.30	8
2/20/18	32.80	38
6/12/18	18.30	12
10/11/18	23.60	19
12/18/18	2.83	-44
2/21/19	18.60	13
6/27/19	0.09	-78
9/17/19	25.05	27
12/3/19	4.52	-38
3/10/20	0.49	-63
6/9/20	2.04	-48
9/16/20	0.14	-79
12/3/20	5.51	-26

S	622
count (n)	86
g	1
t_1	2
t_2	0
t_3	0
VARS(S) :	71880.667
Z	2.32
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Increasing

Date	Fluoride mg/l	Fluoride signs
4/1/99	0.30	
7/1/99	0.30	0
10/1/99	0.40	2
1/1/00	0.40	2
4/1/00	0.40	2
7/1/00	0.30	-3
10/1/00	0.47	6
1/1/01	1.37	7
4/1/01	0.24	-8
7/1/01	1.63	9
10/1/01	0.71	6
1/1/02	0.63	5
4/1/02	0.89	8
7/1/02	0.67	5
10/1/02	0.57	2
1/1/03	0.79	9
4/1/03	2.76	16
7/1/03	0.44	-3
10/1/03	0.42	-4
1/20/04	0.52	1
4/21/04	1.06	14
7/20/04	1.55	17
10/27/04	2.40	20
1/18/05	2.61	21
4/27/05	2.13	18
7/19/05	1.41	13
10/25/05	2.51	22
1/17/06	3.99	27
4/26/06	2.90	26
7/12/06	2.13	17
10/25/06	1.76	14
1/23/07	1.69	13
4/24/07	1.62	10
8/14/07	1.31	3
10/23/07	1.35	4
1/29/08	1.79	19
4/15/08	1.19	0
7/23/08	1.04	-3
10/16/08	0.91	-4
1/13/09	0.96	-3
4/28/09	1.21	4
7/28/09	2.12	25
10/27/09	1.02	-4
2/9/10	2.43	33
6/8/10	2.61	36
9/21/10	2.77	41
12/14/10	2.69	38
3/2/11	2.75	39
6/22/2011	2.45	30
9/14/2011	0.45	-31
12/13/11	1.90	20
2/14/12	2.74	41
7/10/12	2.51	33
9/25/12	1.27	-3
12/18/12	2.16	26
2/7/13	1.96	19
6/18/13	1.59	6
9/24/13	2.01	21
12/10/13	1.97	20
2/25/14	1.90	16
6/11/14	1.73	10
9/25/14	1.93	19
12/16/14	1.80	14
2/11/15	1.64	5
7/15/15	0.98	-24
9/30/15	1.66	7
12/16/15	1.23	-14
2/3/16	1.60	1
6/21/16	1.36	-8
9/15/16	1.13	-21
1/6/17	1.25	-14
2/15/17	1.30	-11
6/13/17	1.09	-24
9/14/17	1.43	1
12/20/17	1.46	2
2/20/18	1.76	23
6/12/18	1.29	-14
10/11/18	1.46	2
12/18/18	1.69	18
2/21/19	1.73	22
6/27/19	0.23	-80
9/17/19	1.77	29
12/3/19	1.67	16
3/10/20	1.57	3
6/9/20	1.65	14
9/16/20	1.76	30
12/3/20	1.33	-16

S	710
count (n)	87
g	9
t_1	3
t_2	3
t_3	2
t_4	2
t_5	2
t_6	2
t_7	2
t_8	2
t_9	2
t_{10}	0
VARS(S) :	1338876.000
Z	0.61
α/2(normal dist.)	1.96
Null hypothesis	Accept
Trend Analysis Result	Trend does not exist
Slope of Data	Increasing

MW-40S

Date	Aluminum mg/l	Aluminum signs
4/1/99	0.410	
7/1/99	0.210	-1
10/1/99	0.220	0
4/1/00	0.570	3
7/1/00	0.560	2
10/1/00	0.050	-5
1/1/01	0.050	-5
4/1/01	0.050	-5
7/1/01	0.120	-2
10/1/01	0.230	3
1/1/02	0.100	-4
4/1/02	0.150	-1
7/1/02	0.100	-5
10/1/02	0.006	-13
1/1/03	0.050	-9
4/1/03	0.006	-14
7/1/03	0.053	-4
10/1/03	0.041	-13
1/20/04	0.170	6
4/21/04	0.847	19
7/20/04	0.117	0
10/27/04	0.134	3
1/18/05	0.082	-6
4/27/05	0.134	4
7/19/05	1.296	24
10/25/05	0.138	5
1/17/06	1.100	24
4/26/06	0.788	21
7/12/06	0.323	14
10/25/06	0.138	2
1/23/07	0.451	18
4/24/07	0.148	3
8/14/07	1.278	30
10/23/07	0.465	19
1/31/08	1.241	30
7/23/08	0.033	-31
10/16/08	4.232	36
1/13/09	0.720	23
4/28/09	1.910	36
7/28/09	0.565	19
10/27/09	2.048	38
2/9/10	1.849	35
6/8/10	0.254	6
9/21/10	0.377	9
3/2/11	0.720	23
6/22/2011	0.720	23
9/14/2011	0.280	4
12/13/11	0.360	7
2/14/12	0.390	10
7/10/12	0.560	18
9/25/12	0.260	0
12/18/12	0.380	9
2/7/13	0.960	36
6/18/13	0.310	1
9/24/13	0.050	-42
12/10/13	0.760	33
2/25/14	0.110	-30
6/11/14	0.140	-17
9/25/14	0.660	28
12/16/14	0.130	-27
2/11/15	0.050	-47
7/15/15	0.050	-47
9/30/15	0.050	-47
12/16/15	0.050	-47
2/3/16	0.050	-47
6/21/16	0.050	-47
9/15/16	0.050	-47
1/6/17	0.050	-47
2/15/17	0.076	-32
6/13/17	0.005	-69
9/14/17	0.087	-28
12/20/17	0.036	-63
2/20/18	0.050	-47
6/12/18	0.084	-27
10/11/18	0.049	-62
12/18/18	0.169	3
2/21/19	0.121	-14
6/27/19	69.200	77
9/17/19	0.113	-20
12/3/19	0.054	-35
3/10/20	0.010	-74
6/9/20	0.050	-51
9/16/20	0.050	-51
12/3/20	0.050	-51

S	-529
count (n)	83
g	7
t_1	17
t_2	3
t_3	2
t_4	2
t_5	2
t_6	2
t_7	2
VARS(S) :	64059.000
Z	2.09
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2.

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-14S					
Date	**Aluminum mg/l**	**Aluminum signs**	**Date**	**Sulfate mg/l**	**Sulfate signs**
10/25/06	0.964		10/25/06	460.39	
1/23/07	65.300	1	1/23/07	407.35	-1
4/24/07	8.069	0	4/24/07	455.94	0
8/14/07	31.990	1	8/14/07	454.06	-1
10/23/07	6.008	-2	10/23/07	390	-4
1/31/08	9.660	1	1/31/08	365	-5
10/22/08	22.230	2	4/16/08	390	-3
1/13/09	10.100	1	7/23/08	382.5	-5
4/28/09	2.020	-6	10/22/08	526	8
7/28/09	22.200	3	1/13/09	368	-7
10/27/09	2.909	-6	4/28/09	355	-10
2/11/10	2.577	-7	7/28/09	364	-9
6/8/10	4.030	-4	10/27/09	392	2
9/21/10	1.310	-11	2/11/10	375	-5
12/14/10	4.544	-2	6/8/10	320	-14
3/15/11	5.740	-1	9/21/10	371	-5
6/22/11	3.760	-6	12/14/10	345	-14
9/14/11	14.200	9	3/15/11	273	-17
12/13/11	3.060	-8	6/22/11	281	-16
2/14/12	3.190	-7	9/14/11	310	-15
7/10/12	10.600	10	12/13/11	305	-16
9/25/12	3.410	-7	2/14/12	317	-13
12/18/12	9.830	8	7/10/12	297	-18
6/18/13	11.000	13	9/25/12	368	0
12/10/13	1.360	-20	12/18/12	278	-22
6/11/14	1.930	-19	6/18/13	340	-9
12/16/14	14.800	18	12/10/13	251	-26
7/15/15	4.270	-3	6/11/14	292	-19
12/16/15	0.050	-28	12/16/14	287	-20
6/21/16	2.430	-17	7/15/15	340	-6
1/6/17	1.620	-22	12/16/15	368	6
6/3/17	0.205	-29	6/21/16	357	-1
12/20/17	0.289	-28	1/6/17	327	-10
6/12/18	0.712	-27	6/3/17	363	1
12/18/18	0.128	-32	12/20/17	325	-12
6/26/19	1.250	-23	6/12/18	390	21
12/3/19	0.095	-34	12/18/18	276	-32
6/9/20	0.060	-35	6/26/19	418	29
12/3/20	0.044	-38	12/3/19	302.5	-22
	S	-355.000	6/9/20	330	-9
	count (n)	39	12/3/20	403	28
	g	0		**S**	-271
	t_1	0		**count (n)**	40
	t_2	0		**g**	3
	t_3	0		t_1	3
	VARS(S) :	6833.667		t_2	3
	Z	4.282		t_3	2
	α/2(normal dist.)	1.960		**VARS(S) :**	7358.333
	Null hypothesis	Reject		**Z**	3.148
	Trend Analysis Result	Trend exists		**α**/2(normal dist.)	1.960
	Slope of Data	Decreasing		**Null hypothesis**	Reject
				Trend Analysis Result	Trend exists
				Slope of Data	Decreasing

Mann-Kendall Test
Null hypothesis: no trend currently exists. The null hypothesis is r
Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group
Note: If a result was nondetect, then half of the detection limit was used.

MW-23-85S

Date	Sulfate mg/l	Sulfate signs
10/22/2008	614	
1/19/2009	505	-1
4/30/2009	365	-2
7/29/2009	441	-1
10/28/2009	436	-2
2/11/2010	491	1
6/9/2010	437	-2
9/22/2010	427	-5
12/21/2010	469	2
3/15/11	461	1
6/28/2011	492	6
9/21/11	443	-1
12/13/11	453	0
2/16/12	442	-3
7/16/12	448	0
10/17/12	425	-13
12/20/12	429	-10
6/20/13	458	5
12/12/2013	433	-10
6/11/14	452	3
12/16/14	414	-18
7/28/2015	440	-5
12/16/2015	423	-18
6/23/2016	463	13
1/10/2017	412	-22
6/15/2017	424	-17
1/25/2018	425	-15
6/12/2018	439	-3
12/19/2018	450	8
6/27/2019	490	21
12/5/2019	421	-24
6/8/2020	404	-29
12/3/2020	402	-30
S		-171
count (n)		33
g		1
t_1		2
t_2		0
t_3		0
VARS(S) :		4164.333
Z		2.634
α/2(normal dist.)		1.960
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Decreasing

Date	Aluminum mg/l	Aluminum signs
10/22/2008	10.17	
1/19/2009	3.54	-1.00
4/30/2009	5.45	0
7/29/2009	3.42	-3
10/28/2009	8.56	2
2/11/2010	11.70	5
6/9/2010	3.78	-2
9/22/2010	10.58	5
12/21/2010	4.61	-2
3/15/2011	4.73	-1
6/28/2011	1.63	-10
9/21/2011	3.00	-9
12/13/2011	8.28	4
2/16/12	8.83	7
7/16/12	3.46	-8
10/17/12	4.52	-3
12/20/12	0.65	-16
6/20/13	4.96	3
12/12/2013	3.02	-12
6/11/14	2.20	-15
12/16/14	1.48	-18
7/28/2015	1.95	-15
12/16/2015	0.92	-20
6/23/16	0.92	-21
1/10/17	0.99	-18
6/15/2017	0.56	-25
1/25/2018	0.52	-26
6/12/2018	0.67	-21
12/19/2018	3.07	-2
6/27/2019	1.24	-15
12/5/2019	0.38	-30
6/8/2020	0.275	-31
12/3/2020	0.315	-30
S		-328.00
count (n)		33.00
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		4165.333
Z		5.067
α/2(normal dist.)		1.960
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Decreasing

MW-23-85S

Date	Aluminum mg/l	Aluminum signs
10/25/2006	0.43	
1/23/2007	0.06	-2
4/25/2007	0.65	2
8/15/2007	2.79	3
10/23/2007	2.36	2
1/14/2009	26.70	5
4/29/2009	0.49	-2
7/29/2009	4.81	5
10/27/2009	11.72	6
2/11/2010	8.42	5
6/8/2010	11.78	8
9/21/2010	84.45	11
12/14/2010	6.77	2
3/15/11	5.20	1
6/22/2011	4.16	-2
9/14/2011	5.75	3
12/13/11	10.60	8
2/14/12	10.80	9
7/10/12	6.78	4
9/25/12	4.91	-3
12/18/12	3.37	-8
6/18/13	2.11	-13
12/11/13	2.40	-10
6/11/14	2.30	-13
12/16/14	2.64	-8
7/28/15	2.90	-5
12/16/15	0.81	-18
6/21/16	0.94	-17
1/10/17	0.47	-24
6/13/18	0.25	-27
1/30/18	1.34	-14
6/12/18	1.74	-13
12/19/18	0.69	-20
6/26/19	1.53	-13
12/3/19	2.57	-2
6/9/20	1.02	-17
12/3/20	1.27	-16
S		-173
count (n)		37
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		5846.000
Z		2.25
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Decreasing

Date	Sulfate mg/l	Sulfate signs
10/25/2006	145.09	
1/23/2007	188.46	1
4/25/2007	245.20	2
8/15/2007	288.42	3
10/23/2007	250.00	2
1/14/2009	351.00	5
4/29/2009	378.00	6
7/29/2009	365.00	5
10/27/2009	417.00	8
2/11/2010	439.00	9
6/8/2010	380.00	6
9/21/2010	386.00	7
12/14/2010	361.00	0
3/15/11	372.00	3
6/22/2011	362.00	0
9/14/2011	395.00	11
12/13/11	376.00	4
2/14/12	397.00	13
7/10/12	383.00	8
9/25/12	388.00	11
12/18/12	353.00	-8
6/18/13	363.00	-3
12/11/13	358.00	-8
6/11/14	363.00	-2
12/16/14	339.00	-14
7/28/15	363.00	-1
12/16/15	372.00	5
6/21/16	371.00	3
1/10/17	340.00	-16
1/30/18	364.00	1
6/12/18	382.00	16
6/13/18	334.00	-21
12/19/18	355.00	-12
6/26/19	418.00	31
12/3/19	388.00	23
6/9/20	358.00	-12
12/3/20	389.00	26
S		111
count (n)		37
g		2
t_1		3
t_2		2
t_3		0
VARS(S) :		5841.333
Z		1.44
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than $\alpha/2$.

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-30S

Date	Aluminum mg/l	Aluminum signs
10/25/06	17.03	
1/23/07	71.64	1
4/24/07	78.91	2
8/14/07	74.87	1
10/23/07	104.70	4
1/31/08	49.10	-3
7/22/08	122.30	6
10/17/08	22.19	-5
1/13/09	112.00	6
4/28/09	140.00	9
7/28/09	107.00	4
10/27/09	308.30	11
2/15/10	49.74	-6
6/8/10	150.60	11
9/21/10	21.56	-12
12/14/10	171.70	13
3/23/11	46.10	-10
6/22/2011	41.20	-11
9/14/11	37.40	-12
12/13/11	67.50	-3
2/14/12	54.00	-4
7/10/12	112.00	10
9/25/12	28.00	-16
12/18/12	28.20	-15
6/18/13	60.20	-2
12/10/13	113.00	15
6/11/14	42.50	-12
12/16/14	38.50	-15
7/28/15	15.90	-28
12/16/15	4.86	-29
6/21/16	4.01	-30
1/10/17	3.48	-31
6/13/17	2.32	-32
12/20/17	9.61	-25
6/12/18	11.50	-24
12/18/18	4.02	-29
6/26/19	15.80	-22
12/3/19	2.55	-35
6/9/20	0.22	-38
12/3/20	0.59	-37
S		-394
count (n)		39
g		1
t_1		2
t_2		0
t_3		0
VARS(S) :		6832.667
Z		4.75
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Decreasing

Date	Sulfate mg/l	Sulfate signs
######	143	
1/23/07	79.6	-1
4/24/07	66.44	-2
8/14/07	112.4	1
######	150	4
1/31/08	101	-1
4/16/08	78.7	-4
7/22/08	77.2	-5
######	158	8
1/13/09	119	3
4/28/09	92.9	-2
7/28/09	66.7	-9
######	84.1	-2
2/15/10	127	7
6/8/10	87.3	-2
9/21/10	77.9	-9
######	61.8	-16
3/23/11	46	-17
6/22/11	65.6	-14
9/14/11	147	15
######	103	6
2/14/12	128	13
7/10/12	160	22
9/25/12	342	23
######	143	12
6/18/13	91.8	-3
######	95.3	0
6/11/14	136	13
######	76.9	-18
7/28/15	119	8
######	72.1	-20
6/21/16	76.6	-19
1/10/17	123	12
6/13/17	96	1
######	69.2	-24
6/12/18	77.5	-15
######	145	26
6/26/19	98.6	3
12/3/19	75.1	-24
6/9/20	89.7	-5
12/3/20	273	38
S		6
count (n)		39
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		6833.667
Z		0.06
α/2(normal dist.)		1.96
Null hypothesis		Accept
Analysis Result		rend does not exist
Slope of Data		Increasing

Date	Fluoride mg/l	Fluoride signs
10/25/06	7.99	
1/23/07	7.86	1
4/24/07	7.25	0
8/14/07	6.23	-1
10/23/07	6.90	0
1/31/08	7.66	3
4/16/08	7.30	2
7/22/08	9.12	7
10/17/08	4.93	-8
1/13/09	6.38	-3
4/28/09	8.28	8
7/28/09	6.12	-7
10/27/09	5.19	-8
2/15/10	5.38	-7
6/8/10	6.06	-6
9/21/10	6.02	-7
12/14/10	6.44	2
3/23/11	6.01	-9
6/22/11	5.82	-10
9/14/11	5.58	-11
12/13/11	5.53	-12
2/14/12	5.45	-13
7/10/12	4.26	-22
9/25/12	5.36	-15
12/18/12	5.75	-6
12/10/13	5.95	-3
6/18/13	6.85	12
6/11/14	54.20	27
12/16/14	5.49	-14
7/28/15	5.43	-17
12/16/15	6.58	12
6/21/16	6.68	13
1/10/17	6.74	14
6/13/17	4.60	-31
12/20/17	6.35	6
6/12/18	6.22	3
12/18/18	6.21	2
6/26/19	5.32	-27
12/3/19	6.74	19
6/9/20	6.03	-3
12/3/20	4.78	-36
S		-145
count (n)		41
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		7926.667
Z		1.62
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-45

Date	Aluminum mg/l	Aluminum signs
5/19/06	1.714	
7/12/06	1.506	-1.000
10/25/06	0.586	-2.000
1/23/07	2.079	3
4/24/07	2.259	4
8/14/07	3.254	5
10/23/07	0.712	-4
1/29/08	139.500	7
4/15/08	39.240	6
7/23/08	124.900	7
10/16/08	85.590	6
1/13/09	44.500	5
4/28/09	7.380	2
7/28/09	8.850	3
10/27/09	13.460	4
2/15/10	89.560	11
6/8/10	47.280	8
9/21/10	16.980	3
12/14/10	53.790	10
3/2/11	55.700	11
6/22/11	16.300	0
9/14/11	12.900	-3
12/13/11	54.900	12
2/14/12	29.600	3
7/10/12	22.900	2
9/25/12	120.000	21
12/18/12	10.400	-8
2/7/13	21.900	1
6/18/13	51.000	12
9/24/13	28.900	3
12/10/13	53.300	14
2/25/14	20.900	-3
6/10/14	62.100	22
9/25/14	34.200	5
12/18/14	31.000	4
2/11/15	12.200	-15
7/15/15	30.200	4
9/30/15	6.410	-23
12/16/15	42.700	12
2/3/16	4.600	-25
6/21/16	12.400	-14
9/15/16	3.660	-27
1/6/17	4.980	-24
2/15/17	7.610	-19
6/13/17	2.920	-32
9/14/17	2.890	-33
12/20/17	9.790	-14
2/20/18	8.635	-17
6/12/18	5.830	-24
10/11/18	7.040	-21
12/18/18	1.150	-46
2/21/19	23.800	11
6/26/19	19.600	4
9/17/19	16.300	0
12/3/19	2.230	-42
3/10/20	0.758	-51
6/9/20	0.347	-56
9/16/20	0.448	-55
12/3/20	0.267	-58

S	-392
count (n)	59
g	0
t_1	0
t_2	0
t_3	0
VARS(S) :	23383.667
Z	2.56
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Date	Cyanide mg/l	Cyanide signs
5/19/06	1.640	
7/12/06	1.870	1
10/25/06	1.380	-2
1/23/07	1.980	3
4/24/07	1.920	2
8/14/07	1.600	-3
10/23/07	1.100	-6
1/29/08	1.090	-7
4/15/08	1.300	-4
10/16/08	0.850	-9
1/13/09	0.161	-10
4/28/09	0.937	-7
7/28/09	0.698	-10
10/27/09	1.660	7
2/15/10	1.260	-2
6/8/10	1.850	9
9/21/10	2.490	16
12/14/10	1.040	-9
3/2/11	1.530	2
6/22/11	1.350	-1
9/14/11	0.944	-12
12/13/11	0.908	-15
2/14/12	0.981	-10
7/10/12	1.150	-3
9/25/12	0.680	-22
12/18/12	0.836	-19
2/7/13	0.866	-16
6/18/13	0.843	-19
9/24/13	0.970	-8
12/10/13	0.967	-9
2/25/14	0.895	-16
6/10/14	0.931	-13
9/25/14	0.871	-18
12/18/14	0.883	-17
2/11/15	0.910	-12
7/15/15	0.848	-25
9/30/15	0.660	-34
12/16/15	0.532	-35
2/3/2016	0.709	-28
6/21/2016	0.567	-35
9/15/2016	0.408	-38
1/6/2017	0.566	-35
2/15/2017	0.644	-32
6/13/2017	0.603	-33
9/14/2017	0.475	-40
12/20/2017	0.569	-33
2/20/18	0.374	-44
6/12/18	0.349	-45
10/11/18	0.435	-40
12/18/18	0.499	-37
2/21/19	0.530	-36
6/26/19	0.382	-47
9/17/19	0.350	-48
12/3/19	0.401	-43
3/10/20	0.396	-44
6/9/20	0.458	-37
9/16/20	0.398	-44
12/3/20	0.022	-57

S	-1129
count (n)	58
g	0
t_1	0
t_2	0
t_3	0
VARS(S) :	22223.667
Z	7.57
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

Date	Sulfate mg/l	Sulfate signs
5/19/2006	141.43	
10/25/2006	128.36	-1
12/7/2006	74.13	-2
1/23/2007	135.42	1
4/24/2007	154.60	4
8/14/2007	132.47	-1
10/23/2007	150.00	4
1/29/2008	144.00	3
4/15/2008	204.00	8
7/23/2008	139.00	-1
10/16/2008	188.00	8
1/13/2009	180.00	7
4/28/2009	191.00	10
7/28/2009	164.00	5
10/27/2009	191.00	11
8/6/2010	191.00	11
9/2/2010	113.00	-14
9/21/2010	132.00	-11
12/14/2010	124.00	-14
2/3/2011	124.00	-14
6/22/2011	119.00	-16
9/14/2011	107.00	-19
12/13/2011	109.00	-18
2/14/2012	116.00	-15
9/25/2012	104.00	-22
10/7/2012	134.00	-1
12/18/2012	122.00	-12
6/18/2013	111.00	-19
7/2/2013	119.00	-13
9/24/2013	110.00	-21
10/12/2013	120.00	-10
2/25/2014	115.00	-17
9/25/2014	117.00	-14
10/6/2014	117.00	-14
12/18/2014	170.00	22
7/15/2015	134.00	6
9/30/2015	154.00	18
11/2/2015	700.00	37
12/16/2015	334.00	36
3/2/2016	115.00	-24
6/21/2016	373.00	38
9/15/2016	621.00	39
2/15/2017	608.00	38
6/1/2017	565.00	37
6/13/2017	471.00	36
9/14/2017	500.00	37
12/20/2017	496.00	36
2/20/2018	515.50	39
11/10/2018	471.00	33
12/6/2018	871.00	49
12/18/2018	702.00	48
2/21/2019	635.00	45
3/12/2019	485.00	32
6/26/2019	516.00	39
9/17/2019	742.00	52
3/12/2020	597.50	41
9/6/2020	531.00	38
9/16/2020	844.00	55
10/3/2020	686.00	48

S	678
count (n)	59
g	5
t_1	3
t_2	2
t_3	2
t_4	2
t_5	2
t_6	0
t_7	0
VARS(S) :	23376.000
Z	4.43
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Increasing

Date	WAD Cyanide mg/l	WAD Cyanide signs
5/19/06	0.380	
7/12/06	0.509	1
10/25/06	0.302	-2
1/23/07	0.361	-1
4/24/07	0.579	4
8/14/07	0.341	-3
10/23/07	0.060	-6
1/29/08	0.057	-7
4/15/08	0.096	-4
7/23/08	0.035	-9
10/16/08	0.005	-10
1/13/09	0.033	-9
4/28/09	0.031	-10
7/28/09	0.049	-5
10/27/09	0.027	-12
2/15/10	0.028	-11
6/8/10	0.026	-14
9/21/10	0.026	-14
12/14/10	0.005	-17
3/2/11	0.005	-17
6/22/2011	0.026	-12
9/14/2011	0.072	7
12/13/11	0.005	-19
2/14/12	0.014	-15
7/10/12	0.033	0
9/25/12	0.011	-17
12/18/12	0.017	-14
2/7/2013	0.015	-15
6/18/13	0.021	-12
9/24/13	0.014	-18
12/10/13	0.023	-10
2/25/14	0.026	-6
6/10/14	0.029	2
9/25/14	0.038	11
12/18/14	0.026	-8
2/11/15	0.024	-13
7/15/15	0.037	12
9/30/15	0.024	-14
12/16/15	0.016	-22
2/3/16	0.046	17
6/21/16	0.055	20
9/15/16	0.007	-33
1/6/17	0.025	-12
2/15/17	0.051	21
6/13/17	0.086	30
9/14/17	0.065	27
12/20/17	0.054	20
2/20/18	0.065	28
6/12/18	0.041	12
10/11/18	0.059	25
12/18/18	0.075	34
2/21/19	0.078	35
6/26/19	0.005	-48
9/17/19	0.022	-27
12/3/19	0.013	-40
3/10/20	0.011	-42
6/9/20	0.035	7
9/16/20	0.024	-21
12/3/20	0.013	-41

S	-297
count (n)	59
g	5
t_1	5
t_2	4
t_3	2
t_4	2
t_5	2
t_6	0
t_7	0
VARS(S) :	23365.333
Z	1.94
α/2(normal dist.)	1.96
Null hypothesis	Accept
Trend Analysis Result	Trend does not exist
Slope of Data	Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2.

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{q} t_p (t_p - 1)(2t_p + 5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-41

Date	Aluminum mg/l	Aluminum signs
10/26/06	17.412	
1/25/07	2.224	-1
4/26/07	4.456	0
8/16/07	5.420	1
10/25/07	5.563	2
1/31/08	5.821	3
4/16/08	6.790	4
7/23/08	7.900	5
10/16/08	8.020	6
1/13/09	9.810	7
4/28/09	11.500	8
7/28/09	11.800	9
10/27/09	12.970	10
2/11/10	13.300	11
6/9/10	13.920	12
9/21/10	17.300	13
12/16/10	19.900	16
3/17/11	21.400	17
6/22/11	24.060	18
9/20/11	26.600	19
12/15/11	31.700	20
2/16/12	34.450	21
7/12/12	44.480	22
10/17/12	49.360	23
12/19/12	61.550	24
6/20/13	66.920	25
12/11/13	67.500	26
6/10/14	36.300	17
12/18/14	11.100	-10
7/21/15	8.990	-13
12/15/15	30.300	14
6/22/16	0.183	-31
12/28/16	17.900	6
6/15/17	9.940	-11
1/25/18	3.020	-30
6/19/18	6.470	-21
1/9/19	4.870	-28
6/9/20	5.350	-27
12/3/20	8.660	-12
S		175
count (n)		39
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		6833.667
Z		2.10
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Date	Sulfate mg/l	Sulfate signs
5/22/06	130.96	
7/13/06	178.04	1
10/26/06	167.49	0
1/25/07	169.64	1
4/26/07	163.46	-2
8/16/07	192.71	5
10/25/07	180.00	4
1/31/08	206.00	7
4/16/08	922.00	8
7/23/08	178.00	-1
10/16/08	178.00	-1
1/13/09	198.00	7
4/28/09	173.00	-4
7/28/09	196.00	7
10/27/09	218.00	12
2/11/10	305.00	13
6/9/10	336.00	14
9/21/10	382.00	15
12/16/10	458.00	16
3/17/11	492.00	17
6/22/11	483.00	16
9/20/11	509.00	19
12/15/11	525.50	20
2/16/12	527.00	21
7/12/12	514.00	18
10/17/12	512.50	17
12/19/12	508.00	14
6/20/13	538.00	25
12/11/13	490.00	10
6/10/14	511.00	17
12/18/14	462.00	6
7/21/15	502.00	13
12/15/2015	523.00	24
6/22/16	441.00	1
12/28/16	485.00	8
6/15/17	461.00	3
1/25/18	470.00	6
6/19/18	480.00	7
1/9/19	434.00	-4
6/9/20	359.00	-7
12/3/20	335.00	-10
S		343
count (n)		41
g		1
t_1		2
t_2		0
t_3		0
VARS(S) :		7925.667
Z		3.84
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

MW-42

Date	Aluminum mg/l	Aluminum signs
10/26/06	31.00	
1/25/07	72.52	1
4/26/07	42.43	0
8/16/07	92.93	3
10/25/07	66.69	0
1/31/08	94.90	5
4/16/08	666.10	6
7/23/08	12.31	-7
10/16/08	2.18	-8
4/28/09	10.40	-7
7/28/09	6.44	-8
10/27/09	28.78	-3
2/11/10	9.97	-8
6/9/10	2.50	-11
9/22/10	16.18	-2
12/21/10	331.10	13
3/2/11	7.09	-10
6/22/11	2.49	-15
9/20/11	75.90	10
12/15/11	48.55	5
2/16/12	22.70	-2
7/12/12	38.10	3
10/16/12	2.54	-16
12/19/12	88.40	15
6/20/13	11.00	-8
12/12/13	120.00	21
6/11/14	32.30	2
12/16/14	43.20	7
7/28/15	41.80	4
12/15/15	58.10	11
6/23/16	54.60	10
1/6/17	37.80	-1
6/15/17	33.80	-2
1/25/18	34.00	-1
6/20/18	48.25	10
12/20/18	42.10	5
6/26/19	34.30	-2
12/6/19	28.10	-13
6/11/20	12.70	-18
12/3/20	47.60	13
S		2
count (n)		40
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		7366.667
Z		0.01
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

Date	Cyanide mg/l	Cyanide signs
5/19/06	0.005	
7/13/06	0.011	1
10/26/06	0.005	-1
1/25/07	0.005	-1
4/26/07	0.119	4
8/16/07	0.410	5
10/25/07	0.150	4
1/31/08	0.274	5
4/16/08	0.130	2
10/16/08	0.160	5
4/28/09	0.158	4
7/28/09	0.174	7
10/27/09	0.174	7
2/11/10	0.210	9
6/9/10	0.152	0
9/22/10	0.298	13
12/21/10	0.363	14
3/2/11	0.244	9
6/22/11	0.183	6
9/20/11	0.374	17
12/15/11	0.395	18
2/16/12	0.393	17
7/12/12	0.375	16
10/16/12	0.206	3
12/19/12	0.366	14
6/20/13	0.172	-5
12/12/13	0.229	6
6/11/14	0.391	21
12/16/14	0.005	-25
7/28/15	0.366	16
12/15/15	0.376	22
6/23/16	0.318	11
1/6/17	0.308	10
1/25/17	0.230	3
6/15/17	0.019	-24
6/20/18	0.264	7
12/20/18	0.054	-24
6/26/19	0.083	-23
12/6/19	0.210	1
6/11/20	0.158	-14
12/3/20	0.172	-9
S		151
count (n)		41
g		3
t_1		4
t_2		2
t_3		2
VARS(S) :		7916.000
Z		1.69
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

Date	Fluoride mg/l	Fluoride signs
5/19/06	1.31	
7/13/06	1.44	1
10/26/06	1.54	2
1/25/07	9.95	3
4/26/07	11.21	4
8/16/07	17.07	5
10/25/07	22.71	6
1/31/08	17.39	5
4/16/08	15.15	2
7/23/08	13.01	1
10/16/08	12.30	0
1/13/09	18.00	9
4/28/09	26.83	12
7/28/09	12.14	-3
10/27/09	11.53	-4
2/11/10	26.10	13
6/9/10	10.40	-8
9/22/10	15.47	5
12/21/10	23.84	14
3/2/11	15.30	3
6/22/11	14.80	0
9/20/11	21.50	13
12/15/11	24.95	18
2/16/12	26.70	21
7/12/12	29.60	24
10/16/12	15.20	-1
12/19/12	28.80	24
6/20/13	15.80	3
12/12/13	16.90	4
6/11/14	41.30	29
12/16/14	2.18	-24
7/28/15	39.90	29
12/15/15	42.60	32
6/23/16	38.20	27
1/6/17	45.70	34
1/25/17	45.10	33
6/15/17	44.90	32
6/20/18	48.20	37
12/20/18	12.30	-19
6/26/19	12.40	-17
12/6/19	35.50	24
6/11/20	38.40	27
12/3/20	27.80	18
S		438
count (n)		43
g		1
t_1		2
t_2		0
t_3		2
VARS(S) :		9129.333
Z		4.57
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Date	Sulfate mg/l	Sulfate signs
5/19/06	478.1	
7/13/06	471.7	-1
10/26/06	411.6	-2
1/25/07	545.6	3
4/26/07	1060.0	4
8/16/07	196.8	-5
10/25/07	1200.0	6
1/31/08	1100.0	5
4/16/08	179.0	-8
7/23/08	104.0	-9
10/16/08	928.0	4
1/13/09	1110.0	9
4/28/09	964.0	4
7/28/09	956.0	3
10/27/09	1010.0	6
2/11/10	1420.0	15
6/9/10	994.0	4
9/22/10	66.5	-17
12/21/10	1220.0	16
3/2/11	1140.0	13
6/22/11	1060.0	6
9/20/11	1320.0	19
12/15/11	1385.0	20
2/16/12	1300.0	17
7/12/12	1400.0	22
10/16/12	1080.0	5
12/19/12	1330.0	20
6/20/13	1230.0	15
12/12/13	1280.0	16
6/11/14	1890.0	29
12/16/14	397.0	-22
7/28/15	1850.0	29
12/15/15	1910.0	32
6/23/16	1450.0	27
1/6/17	1460.0	28
1/25/17	1440.0	25
6/15/17	1400.0	21
6/20/18	1465.0	31
12/20/18	1140.0	1
6/26/19	1200.0	4
12/6/19	1330.0	17
6/11/20	1290.0	11
12/3/20	1190.0	0
S		423
count (n)		43
g		3
t_1		2
t_2		2
t_3		2
VARS(S) :		9127.333
Z		4.42
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-43

Date	Aluminum mg/l	Aluminum signs
10/26/06	2.01	
1/24/07	16.71	1
4/25/07	31.85	2
8/16/07	18.48	1
10/25/07	29.01	2
1/31/08	20.90	1
4/16/08	50.98	6
7/23/08	30.02	3
10/16/08	26.91	0
1/13/09	37.90	7
4/28/09	46.10	8
7/28/09	31.80	3
10/27/09	71.88	12
2/15/10	32.96	5
6/9/10	52.39	12
9/23/10	60.07	13
12/16/10	58.89	12
3/2/11	84.90	17
6/28/11	29.40	-6
9/21/11	34.70	3
12/14/11	17.60	-16
2/21/12	35.15	5
7/16/12	20.80	-14
10/17/12	43.60	9
12/19/12	28.50	-10
6/20/13	44.30	11
12/12/13	23.60	-14
6/11/14	90.40	27
12/16/14	18.10	-22
7/28/15	16.50	-27
12/15/15	92.00	30
6/23/16	16.70	-27
1/6/17	10.10	-30
6/15/17	13.70	-29
1/30/18	8.42	-32
6/20/18	22.20	-11
12/20/18	21.60	-12
6/25/19	9.47	-33
12/6/19	8.69	-34
6/11/20	9.83	-31
12/3/20	15.25	-26.00
	S	-184
	count (n)	41
	g	0
	t_1	0
	t_2	0
	t_3	0
	VARS(S) :	7926.667
	Z	2.06
	α/2(normal dist.)	1.96
	Null hypothesis	Reject
	Trend Analysis Result	Trend exists
	Slope of Data	Decreasing

FDRAIN-1

Date	Cyanide mg/l	Cyanide signs
6/28/06	2.090	
7/12/06	2.440	1.000
10/26/06	1.160	-2.000
1/24/07	1.130	-3
4/24/07	1.040	-4
8/15/07	0.018	-5
10/25/07	1.400	2
1/31/08	1.610	3
7/23/08	0.660	-6
4/28/09	0.531	-7
7/28/09	0.806	-4
10/27/09	0.607	-7
2/15/10	1.020	-2
6/9/10	1.700	9
9/23/10	2.420	12
12/21/10	0.647	-9
3/2/11	1.120	0
6/27/11	0.895	-5
9/20/11	2.190	14
12/14/11	1.550	7
2/15/12	0.923	-6
7/12/12	1.610	10
10/16/12	1.380	4
12/19/12	0.298	-21
6/18/13	0.170	-22
12/12/13	0.559	-17
6/11/14	0.560	-16
12/16/14	0.877	-7
7/21/15	0.466	-22
12/15/15	0.729	-9
6/23/16	0.761	-8
1/6/17	0.248	-27
6/13/17	0.402	-24
1/25/18	0.338	-25
6/12/18	0.325	-26
12/20/18	0.346	-23
6/27/19	0.003	-36
12/5/19	1.440	21
6/8/20	1.630	28
12/3/20	0.308	-29
	S	-261
	count (n)	40
	g	1
	t_1	2
	t_2	0
	t_3	0
	VARS(S) :	7365.667
	Z	3.03
	α/2(normal dist.)	1.96
	Null hypothesis	Reject
	Trend Analysis Result	Trend exists
	Slope of Data	Decreasing

Date	WAD mg/l	WAD signs
6/28/2006	0.0520	
7/12/2006	0.2150	1
10/26/2006	0.0585	0
1/24/2007	0.0495	-3
4/24/2007	0.0260	-4
8/15/2007	0.0775	3
10/25/2007	0.0180	-6
1/31/2008	0.0150	-7
7/23/2008	0.0420	-2
10/22/2008	0.0110	-9
1/19/2009	0.0393	-2
4/29/2009	0.0347	-3
7/30/2009	0.0050	-12
10/28/2009	0.0310	-3
2/15/2010	0.0722	10
6/9/2010	0.0440	3
9/23/2010	0.0140	-12
12/21/10	0.0180	-8
3/2/11	0.0550	10
6/27/11	0.0140	-14
9/20/11	0.0870	18
12/14/11	0.0050	-20
2/15/12	0.0050	-20
7/12/12	0.0200	-5
10/16/12	0.0180	-8
12/19/12	0.0050	-22
6/18/13	0.0050	-22
12/12/13	0.0110	-16
6/11/14	0.0100	-18
12/17/14	0.0050	-24
7/21/15	0.0050	-24
12/15/15	0.0110	-13
1/6/17	0.0290	6
6/13/17	0.0100	-18
1/25/18	0.0550	23
6/12/18	0.0390	11
12/20/18	0.0890	34
6/27/19	0.0130	-13
12/5/19	0.0210	2
6/8/20	0.1530	37
12/3/20	0.0110	-19
	S	-169
	count (n)	41
	g	5
	t_1	7
	t_2	5
	t_3	3
	t_4	2
	t_5	2
	t_6	0
	t_7	0
	VARS(S) :	7860.000
	Z	1.89
	α/2(normal dist.)	1.96
	Null hypothesis	Accept
	Trend Analysis Result	end does not exist
	Slope of Data	Decreasing

Date	Fluoride mg/l	Fluoride signs
6/28/06	34.89	
7/12/06	32.62	-1
10/26/06	26.60	-2
1/24/07	31.05	-1
4/24/07	26.83	-2
8/15/07	31.32	1
10/25/07	32.39	2
1/31/08	24.92	-7
4/16/08	23.54	-8
7/23/08	26.78	-3
10/16/08	29.40	0
1/13/09	23.90	-9
4/28/09	20.33	-12
7/28/09	21.66	-11
10/27/09	27.80	2
2/15/10	21.31	-13
6/9/10	19.62	-16
9/23/10	38.11	17
12/21/10	31.34	10
3/2/11	19.10	-19
6/27/11	22.50	-10
9/20/11	19.90	-17
12/14/11	23.00	-8
2/15/12	18.60	-23
7/12/12	21.50	-12
10/16/12	17.60	-25
12/19/12	11.50	-26
6/18/13	20.50	-13
12/12/13	32.80	24
6/11/14	23.40	-3
12/16/14	18.20	-26
7/21/15	28.60	13
12/15/15	26.00	4
6/23/16	26.10	5
1/6/17	19.50	-24
6/13/17	19.40	-25
1/25/18	22.40	-8
6/12/18	19.80	-21
12/20/18	20.60	-14
6/27/19	18.80	-31
12/5/19	23.10	0
6/8/20	21.30	-13
12/3/20	16.50	-40
	S	-365
	count (n)	43
	g	0
	t_1	0
	t_2	0
	t_3	0
	VARS(S) :	9130.333
	Z	3.81
	α/2(normal dist.)	1.96
	Null hypothesis	Reject
	Trend Analysis Result	Trend exists
	Slope of Data	Decreasing

Date	Sulfate mg/l	Sulfate signs
6/28/06	510.06	
7/12/06	313.44	-1
10/26/06	512.87	2
1/24/07	529.47	3
4/24/07	941.48	4
8/15/07	227.20	-5
10/25/07	220.00	-6
1/31/08	310.00	-3
4/16/08	657.00	6
7/23/08	244.00	-5
10/16/08	302.00	-4
1/13/09	67.90	-11
7/28/09	263.00	-4
10/27/09	207.00	-11
2/15/10	231.00	-6
9/23/10	259.00	-3
12/21/10	81.30	-14
3/2/11	217.00	-11
6/27/11	929.00	16
9/20/11	516.00	11
12/14/11	2180.00	20
2/15/12	2060.00	19
7/12/12	587.00	12
10/16/12	764.00	15
12/19/12	407.00	2
6/18/13	2140.00	23
12/12/13	695.00	14
6/11/14	396.00	-1
12/16/14	275.00	-8
7/21/15	201.00	-25
12/15/15	343.00	0
6/23/16	228.00	-17
1/6/17	292.00	-6
6/13/17	113.00	-29
1/25/18	186.00	-28
6/12/18	125.00	-29
12/20/18	202.00	-24
6/27/19	223.00	-17
12/5/19	213.00	-22
6/8/20	205.00	-25
12/3/20	254.00	-6
	S	-174
	count (n)	41
	g	0
	t_1	0
	t_2	0
	t_3	0
	VARS(S) :	7926.667
	Z	1.94
	α/2(normal dist.)	1.96
	Null hypothesis	Accept
	Trend Analysis Result	Trend does not exist
	Slope of Data	Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

MW-20-85S

Date	Aluminum mg/l	Aluminum signs	Date	Sulfate mg/l	Sulfate signs
10/25/06	0.282			164.99	
1/23/07	0.151	-1		241.39	1.00
4/25/07	2.414	2		277.66	2
10/16/08	1.174	1		284.00	3
1/13/09	0.544	0		307.00	4
4/28/09	0.100	-5		270.00	-1
7/28/09	0.100	-5		256.00	-2
10/27/09	0.037	-7		321.00	7
2/9/10	0.125	-2		189.00	-6
6/8/10	0.924	5		225.00	-5
12/14/10	0.132	-2		298.00	6
3/23/11	0.050	-9		233.00	-5
6/28/2011	0.050	-9		216.00	-8
9/20/2011	0.050	-9		230.00	-5
12/15/11	0.050	-9		204.00	-10
2/15/12	0.050	-9		226.00	-5
7/12/12	0.050	-9		248.00	2
10/16/12	0.050	-9		224.00	-9
12/19/12	0.050	-9		216.00	-11
6/20/13	0.050	-9		229.00	-3
12/11/13	5.320	20		262.00	8
6/11/14	2.950	19		260.00	7
12/16/14	2.350	16		217.00	-12
7/21/15	0.150	5		213.00	-17
12/15/15	0.005	-25		240.00	2
6/23/16	0.026	-23		216.00	-15
1/10/17	0.156	10		300.00	22
6/15/17	0.079	-3		218.00	-11
12/21/17	0.050	-13		224.00	-9
6/19/18	0.050	-13		277.00	17
12/20/18	0.067	-2		289.00	22
6/27/19	0.005	-30		296.00	23
12/4/19	0.005	-30		312.00	30
6/9/20	0.005	-30		270.00	12
12/3/20	0.005	-30	6/9/20	281.00	18
	S	-224	12/3/20	268.00	9
	count (n)	35		**S**	61
	g	2		**count (n)**	36
	t_1	15		**g**	1
	t_2	2		t_1	2
	t_3	0		t_2	0
	VARS(S) :	4549.000		t_3	0
	Z	3.31		**VARS(S) :**	5389.000
	α/2(normal dist.)	1.96		**Z**	0.82
	Null hypothesis	Reject		**α**/2(normal dist.)	1.96
	Trend Analysis Result	Trend exists		**Null hypothesis**	Accept
	Slope of Data	Decreasing		**Trend Analysis Result**	Trend does not exist
				Slope of Data	Increasing

SLPWETE

Date	Aluminum mg/l	Aluminum signs
5/19/06	0.109	
7/12/06	4.275	1
10/25/06	0.141	0
4/24/07	0.773	1
8/14/07	1.454	2
10/23/07	1.964	3
7/23/08	1.339	0
10/22/08	2.917	5
6/8/10	0.589	-4
6/27/11	0.400	-5
9/21/11	0.990	0
12/13/11	0.200	-7
6/18/13	0.050	-12
9/24/13	0.260	-5
6/11/14	0.130	-10
9/25/14	0.050	-14
7/21/2015	0.540	0
12/16/2015	0.810	5
6/26/2019	0.140	-10
12/3/2019	0.082	-15
S		-65
count (n)		20
g		1
t_1		2
t_2		0
t_3		0
VARS(S) :		949.000
Z		2.08
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Decreasing

Date	Fluoride mg/l	Fluoride signs
5/19/06	3.222	
7/12/06	4.676	1
10/25/06	3.102	-2
4/24/07	3.285	1
8/14/07	5.929	4
10/23/07	3.620	1
4/16/08	0.732	-6
7/23/08	4.228	3
10/22/08	4.399	4
6/8/10	3.439	-1
9/21/10	2.950	-8
6/27/11	2.480	-9
9/21/11	3.120	-4
12/13/11	0.920	-11
6/18/13	1.050	-10
9/24/13	2.880	-7
6/11/14	3.440	6
9/25/14	3.140	-1
7/21/15	3.930	10
12/16/15	4.520	15
6/26/19	10.800	20
12/3/19	2.340	-15
S		-9
count (n)		22
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		1257.667
Z		0.23
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Decreasing

SLPWETW

Date	Fluoride mg/l	Fluoride signs
5/19/06	2.39	
7/12/06	3.03	1
10/25/06	1.18	-2
4/24/07	1.63	-1
8/14/07	2.38	0
10/23/07	1.63	-1
4/16/08	2.63	4
7/23/08	0.84	-7
4/28/09	1.58	-4
10/27/09	0.80	-9
6/8/10	0.78	-10
9/21/10	0.71	-11
6/27/11	1.14	-4
9/21/11	4.39	13
12/13/11	3.50	12
6/18/13	0.93	-7
9/24/13	1.09	-6
6/10/14	1.35	-1
9/25/14	1.04	-8
7/21/15	4.71	19
12/16/15	6.07	20
6/26/19	4.09	15
12/3/19	1.08	-10
12/3/20	4.21	17
S		20
count (n)		24
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		1625.333
Z		0.47
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

Date	Total Aluminum mg/l	Total Aluminum signs
5/19/06	0.203	
7/12/06	0.053	-1
10/25/06	0.108	0
4/24/07	0.069	-1
8/14/07	0.026	-4
10/23/07	0.055	-1
4/16/08	0.089	2
7/23/08	0.010	-7
4/28/09	1.380	8
10/27/09	0.425	7
6/8/10	0.128	4
6/27/11	0.050	-7
9/21/11	0.880	10
12/13/11	1.620	13
6/18/13	0.050	-9
9/24/13	0.050	-9
6/10/14	0.050	-9
9/25/14	0.050	-9
7/21/15	0.190	8
12/16/15	0.050	-10
6/26/19	4.460	20
12/3/19	0.067	-1
12/3/20	0.050	-12
S		-8
count (n)		23
g		1
t_1		6
t_2		0
t_3		0
VARS(S) :		1405.333
Z		0.19
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Decreasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .
Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{q} t_p (t_p - 1)(2t_p + 5) \right]$$

where q is the quantity of tied groups and t_p is the quantity of data in the p th group
Note: If a result was nondetect, then half of the detection limit was used.

MW-44		
Date	**Total Aluminum mg/l**	**Total Aluminum signs**
10/26/2006	0.149	
1/24/2007	0.487	1
4/25/2007	0.288	0
8/16/2007	0.307	1
10/25/2007	0.150	-2
1/31/2008	0.156	-1
4/16/2008	0.084	-6
7/23/2008	0.035	-7
10/17/2008	0.061	-6
1/13/09	1.050	9
4/28/09	0.367	6
7/28/09	2.630	11
10/27/09	0.182	0
2/15/10	2.908	13
9/21/10	1.262	10
12/14/10	0.184	-1
3/2/11	0.180	-4
6/28/11	0.050	-15
9/21/11	0.050	-15
12/14/11	0.280	3
2/21/12	0.360	8
7/16/12	0.120	-11
10/17/12	0.120	-11
12/19/12	0.050	-19
6/20/13	0.830	16
12/12/13	0.050	-20
6/17/14	0.050	-20
12/16/14	0.050	-20
7/28/15	0.050	-20
12/15/15	10.310	29
6/23/16	0.076	-12
1/6/17	0.050	-22
6/15/17	0.079	-10
1/30/18	0.050	-23
6/20/18	0.048	-32
12/20/18	0.056	-13
6/26/19	7.83	34
12/6/19	0.203	11
6/11/20	0.084	-7
12/3/2020	0.212	13

S	-132
count (n)	40
g	2
t_1	9
t_2	2
t_3	0
VARS(S) :	7273.667
Z	1.54
α/2(normal dist.)	1.96
Null hypothesis	Accept
Trend Analysis Result	Trend does not exist
Slope of Data	Decreasing

PZ-44		
Date	**Total Aluminum mg/l**	**Total Aluminum signs**
6/22/2006	0.992	
10/22/2008	1.101	1
4/30/2009	1.530	2
7/30/2009	3.110	3
10/27/09	1.340	0
6/8/10	1.299	-1
9/22/10	13.240	6
6/28/11	9.850	5
9/20/11	34.800	8
12/13/11	0.560	-9
2/21/12	1.700	2
7/16/12	19.100	9
10/17/12	9.160	4
12/19/12	1.720	1
6/20/13	1.420	-4
12/11/13	1.200	-9
12/16/14	3.910	6
7/21/15	2.820	3
12/15/15	0.130	-18
6/22/16	37.300	19
12/28/16	0.559	-18
6/13/17	2.760	3
12/20/17	2.190	2
6/12/18	25.700	19
12/19/18	8.120	10
6/26/19	12.600	15
12/5/19	1.480	-8
6/9/20	11.700	15
12/3/20	0.397	-26

S	40
count (n)	29
g	0
t_1	0
t_2	0
t_3	0
VARS(S) :	2842.000
Z	0.73
α/2(normal dist.)	1.96
Null hypothesis	Accept
Trend Analysis Result	Trend does not exist
Slope of Data	Increasing

PZ-44		
Date	**Fluoride mg/l**	**Fluoride signs**
6/22/2006	4.156	
10/22/2008	5.740	1
4/30/2009	4.650	0
7/30/2009	4.809	1
10/27/09	5.024	2
6/8/10	2.994	-5
9/22/10	4.392	-2
6/28/11	3.950	-5
9/20/11	1.180	-8
12/13/11	4.450	1
2/21/12	4.510	2
7/16/12	2.550	-9
10/17/12	4.800	6
12/19/12	4.690	5
6/20/13	4.540	2
12/11/13	3.730	-9
6/11/14	3.150	-10
12/16/14	3.680	-9
7/21/15	4.460	2
12/15/15	4.560	7
6/22/16	3.640	-12
12/28/16	1.230	-19
6/13/17	2.630	-16
12/20/17	4.290	-1
6/12/18	3.830	-6
12/19/18	3.650	-11
6/26/19	3.350	-14
12/5/19	4.480	9
6/9/20	4.150	-2
12/3/20	3.320	-17

S	-117
count (n)	30
g	0
t_1	0
t_2	0
t_3	0
VARS(S) :	3141.667
Z	2.07
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Decreasing

PZ-44		
Date	**Sulfate mg/l**	**Sulfate signs**
10/22/2008	1660	
4/30/2009	304	-1
7/30/2009	745	0
10/27/2009	774	1
6/8/2010	815	2
9/22/10	22.6	-5
6/28/11	792	2
9/20/11	811	3
12/13/11	999	6
2/21/12	747	-3
7/16/12	957	6
10/17/12	1100	9
12/19/12	761	-4
6/20/13	774	-2
12/11/13	918	6
6/11/14	997	9
12/16/14	769	-6
7/21/15	907	5
12/15/15	968	10
6/22/16	1060	15
12/28/16	1270	18
6/13/17	964	7
12/20/17	781	-6
6/12/18	1190	19
12/19/18	1040	14
6/26/19	915	1
12/5/19	919	4
6/9/20	1100	20
12/3/20	1000	14

S	144
count (n)	29
g	1
t_1	2
t_2	0
t_3	0
VARS(S) :	2841.000
Z	2.68
α/2(normal dist.)	1.96
Null hypothesis	Reject
Trend Analysis Result	Trend exists
Slope of Data	Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than α/2 .

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p (t_p - 1)(2t_p + 5) \right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

PZ-45

Date	Total Aluminum mg/l	Total Aluminum signs
10/22/2008	3.264	
1/19/2009	4.580	1
7/30/09	10.900	2
10/27/09	2.626	-3
6/8/10	2.867	-2
9/22/10	1.672	-5
6/28/11	2.440	-4
9/20/11	34.500	7
12/19/12	6.420	4
6/20/13	15.800	7
12/11/13	21.800	8
6/11/14	24.600	9
12/16/14	8.590	2
7/21/15	9.010	3
12/15/15	13.800	6
6/22/16	5.940	-3
12/28/16	6.950	0
6/13/17	18.800	11
12/20/17	5.240	-6
6/12/18	8.910	3
12/19/18	6.370	-4
6/26/19	4.200	-11
12/5/19	1.280	-22
6/9/20	0.650	-23
12/3/20	2.520	-16
S		-36
count (n)		25
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		1833.333
Z		0.82
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Decreasing

Date	Sulfate mg/l	Sulfate signs
########	863	
1/19/09	581	-1
7/30/09	646	0
10/27/09	676	1
6/8/10	767	2
9/22/10	66	-5
6/28/11	775	4
7/16/12	899	7
12/19/12	1050	8
6/20/13	1290	9
12/11/13	1400	10
6/11/14	1190	7
12/16/14	998	4
7/21/15	969	3
12/15/15	1180	8
6/22/16	1040	5
12/28/16	933	0
6/13/17	1230	13
12/20/17	1270	14
6/12/18	1210	11
6/26/19	1240	14
12/5/19	1960	21
6/9/20	1240	13
12/3/20	1180	4
S		152
count (n)		24
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		1625.333
Z		3.75
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Date	Fluoride mg/l	Fluoride signs
6/22/2006	0.958	
10/22/08	1.298	1
1/19/09	0.500	-2
4/30/09	0.967	1
7/30/09	1.234	2
10/27/09	1.335	5
6/8/10	1.201	0
9/22/10	1.281	3
6/28/11	1.280	2
7/12/12	1.090	-3
6/20/13	1.530	10
12/11/13	1.250	1
6/11/14	1.230	-2
12/16/14	1.040	-7
7/21/15	1.380	12
12/15/15	1.840	15
6/22/16	1.220	-4
12/28/16	3.800	17
6/13/17	1.120	-8
12/20/17	1.320	9
6/12/18	1.300	8
12/19/18	1.410	15
6/26/19	1.480	16
12/5/19	1.550	19
6/9/20	2.340	22
12/3/20	1.190	-13
S		119
count (n)		26
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		2058.333
Z		2.60
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

PZ-46

Date	Fluoride mg/l	Fluoride signs
10/22/2008	1.517	
4/30/2009	1.187	-1
7/30/2009	1.187	-1
10/27/2009	2.495	3
6/9/2010	2.009	2
9/22/2010	1.308	-1
6/10/14	1.560	2
12/15/15	2.930	7
12/28/16	3.920	8
6/9/20	3.000	7
12/3/20	2.110	2
S		28
count (n)		11
g		1
t_1		2
t_2		0
t_3		0
VARS(S) :		164.000
Z		2.11
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Date	Sulfate mg/l	Sulfate signs
10/22/2008	709	
10/27/2009	718	1
6/9/2010	1030	2
9/22/2010	17	-3
12/15/15	1680	4
12/28/16	1060	3
6/9/20	1480	4
12/3/20	1040	1
S		12
count (n)		8
g		0
t_1		0
t_2		0
t_3		0
VARS(S) :		65.333
Z		1.36
α/2(normal dist.)		1.96
Null hypothesis		Accept
Trend Analysis Result		Trend does not exist
Slope of Data		Increasing

MW-41

Date	Sulfate mg/l	Sulfate signs
5/22/06	130.98	
7/13/06	178.04	1.00
10/26/06	167.49	0
1/25/07	169.64	1
4/26/07	163.46	-2
8/16/07	192.71	5
10/25/07	180.00	4
1/31/08	206.00	7
4/16/08	922.00	8
7/23/08	178.00	-1
10/16/08	178.00	-1
1/13/09	198.00	7
4/28/09	173.00	-4
7/28/09	196.00	7
10/27/09	218.00	12
2/11/10	305.00	13
6/9/10	336.00	14
9/21/10	382.00	15
12/16/10	458.00	16
3/17/11	492.00	17
6/22/2011	483.00	16
9/20/2011	509.00	19
12/15/11	525.50	20
2/16/12	527.00	21
7/12/12	514.00	18
10/17/12	512.50	17
12/19/12	508.00	14
6/20/13	538.00	25
12/11/13	490.00	10
6/17/14	511.00	17
12/16/14	462.00	6
7/21/15	502.00	13
12/15/15	523.00	24
6/22/16	441.00	1
12/28/16	485.00	8
6/15/17	461.00	3
1/25/18	470.00	6
6/27/19	447.00	-1
12/5/19	403.00	-4
6/9/20	359.00	-7
12/3/20	335.00	-10
S		335
count (n)		41
g		1
t_1		2
t_2		0
t_3		0
VARS(S) :		7925.667
Z		3.75
α/2(normal dist.)		1.96
Null hypothesis		Reject
Trend Analysis Result		Trend exists
Slope of Data		Increasing

Mann-Kendall Test

Null hypothesis: no trend currently exists. The null hypothesis is rejected if the probability value (Z) is greater than $\alpha/2$.

Sample Variance must be modified if ties are present using the equation:

$$VAR\ (S) = \frac{1}{18}\left[n(n-1)(2n+5) - \sum_{p=1}^{g} t_p(t_p-1)(2t_p+5)\right]$$

where g is the quantity of tied groups and t_p is the quantity of data in the pth group

Note: If a result was nondetect, then half of the detection limit was used.

Sen's slope estimate

data point	Date	Fluoride mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/1998	8.9	1	1	2	-2.0292	-2.0292
2	4/1/1998	8.4	2	2	3	3.6124	3.6124
3	7/1/1998	9.3	3	1	3	0.8072	0.8072
4	10/1/1998	12	4	3	4	10.7193	10.7193
5	1/1/1999	13	5	2	4	7.1852	7.1852
6	4/1/1999	11	6	1	4	4.1475	4.1475
8	10/1/1999	14	8	4	5	3.9701	3.9701
9	1/1/2000	12	9	3	5	7.3447	7.3447
10	4/1/2000	12	10	2	5	6.1096	6.1096
11	7/1/2000	17	11	1	5	4.1028	4.1028
12	10/1/2000	12.63	12	5	6	-8.1167	-8.1167
13	1/1/2001	13.1	13	4	6	-2.0069	-2.0069
14	4/1/2001	15.74	14	3	6	2.2661	2.2661
15	7/1/2001	15.54	15	2	6	2.6018	2.6018
16	10/1/2001	15.01	16	1	6	1.6858	1.6858
17	1/1/2002	14.5	17	6	7	-4.0137	-4.0137
18	4/1/2002	13.68	18	5	7	-6.0539	-6.0539
19	7/1/2002	15.3	19	4	7	-2.6758	-2.6758
20	10/1/2002	18.71	20	3	7	0.7005	0.7005
21	1/1/2003	17.98	21	2	7	1.2816	1.2816
22	4/1/2003	17.51	22	1	7	0.7359	0.7359
23	7/1/2003	20.25	23	7	8	15.8804	15.8804
24	10/1/2003	18.3	24	6	8	5.9877	5.9877
25	1/20/04	16.67	25	5	8	1.3379	1.3379
26	4/21/04	16.96	26	4	8	2.0014	2.0014
27	7/20/04	22	27	3	8	3.7564	3.7564
28	10/27/04	21.26	28	2	8	3.7325	3.7325
29	1/18/05	23.2	29	1	8	2.9197	2.9197
30	4/27/05	23.61	30	8	9	-7.9402	-7.9402
31	07/19/05	20.68	31	7	9	3.9701	3.9701
32	10/25/05	19.69	32	6	9	1.3282	1.3282
33	1/17/06	20.06	33	5	9	-1.0007	-1.0007
34	4/26/06	21.25	34	4	9	0.0000	0.0000
35	7/13/06	24.39	35	3	9	1.7963	1.7963
36	10/26/06	20.89	36	2	9	2.0545	2.0545
37	1/25/07	20.31	37	1	9	1.5511	1.5511
38	4/25/07	22	38	9	10	0.0000	0.0000
39	8/16/07	20.16	39	8	10	-3.9918	-3.9918
40	10/25/07	22.58	40	7	10	2.6564	2.6564
41	10/22/08	17.06	41	6	10	0.9980	0.9980
42	1/13/09	17.5	42	5	10	-0.8010	-0.8010
43	4/28/09	17.13	43	4	10	0.0000	0.0000
44	7/28/09	18.39	44	3	10	1.5409	1.5409
45	10/27/09	17.51	45	2	10	1.7988	1.7988
46	2/11/10	20.3	46	1	10	1.3791	1.3791
47	6/9/10	17.22	47	10	11	20.0687	20.0687
48	9/21/10	15.97	48	9	11	10.0343	10.0343
49	12/14/10	15.81	49	8	11	3.9991	3.9991
50	9/20/11	14.7	50	7	11	6.9857	6.9857
51	12/15/11	15	51	6	11	4.7954	4.7954
52	2/16/12	13.6	52	5	11	2.6709	2.6709
53	7/12/12	15.1	53	4	11	2.8580	2.8580
54	12/12/13	12	54	3	11	3.8474	3.8474
55	6/17/14	8.6	55	2	11	3.8214	3.8214
56	1/10/17	14.1	56	1	11	3.2440	3.2440
57	6/20/18	32.1	57	11	12	-17.3494	-17.3494
58	1/9/19	19.2	58	10	12	1.2574	1.2574
59	6/27/19	16	59	9	12	0.8398	0.8398
60	12/5/19	15.8	60	8	12	-1.3672	-1.3672
61	6/9/20	12.90	61	7	12	2.0974	2.0974
62	12/3/20	10.10	62	6	12	1.0844	1.0844

Median Slope (umol/L/year)

0.345551

Average Slope

0.4407

Sen's slope estimate

data point	Date	Cyanide mg/l	lope poir	point A	Point B	slope umol/l/year	Sorted slope	
1	1/1/98	15	1	1	2	-32.8725	-32.8725	**Median Slope** (umol/L/year)
2	4/1/98	6.9	2	2	3	16.4563	16.4563	**-0.651747**
3	7/1/98	11	3	1	3	-8.0718	-8.0718	
4	10/1/98	16	4	3	4	19.8505	19.8505	**Average Slope**
5	1/1/99	9.8	5	2	4	18.1627	18.1627	**-0.6385**
6	4/1/99	14	6	1	4	1.3379	1.3379	
8	10/1/99	14	8	3	5	-2.3821	-2.3821	
9	1/1/00	14	9	2	5	3.8517	3.8517	
10	4/1/00	5.3	10	1	5	-5.2036	-5.2036	
11	7/1/00	14	11	5	6	17.0450	17.0450	
12	11/2/00	12.4	12	4	6	-4.0137	-4.0137	
13	1/24/01	5.96	13	3	6	3.9991	3.9991	
14	4/27/01	10.000	14	2	6	7.1049	7.1049	
15	7/25/01	8.370	15	1	6	-0.8027	-0.8027	
16	10/24/01	7.930	16	6	7	0.0000	0.0000	
17	1/23/02	12.1	17	5	7	8.4754	8.4754	
18	4/30/02	11.2	18	4	7	-2.6758	-2.6758	
19	7/23/02	10	19	3	7	3.0021	3.0021	
20	10/24/02	9.57	20	2	7	5.6870	5.6870	
21	1/23/03	10.3	21	1	7	-0.6690	-0.6690	
22	4/23/03	9.47	22	7	8	0.0000	0.0000	
23	7/29/03	9.41	23	6	8	0.0000	0.0000	
24	10/21/03	8.6	24	5	8	5.6192	5.6192	
25	1/20/04	8.94	25	4	8	-2.0014	-2.0014	
26	4/21/04	6.53	26	3	8	2.3977	2.3977	
27	7/20/04	7.74	27	2	8	4.7323	4.7323	
28	10/27/04	9.02	28	1	8	-0.5725	-0.5725	
29	1/18/05	8.06	29	8	9	0.0000	0.0000	
30	4/27/05	8.1	30	7	9	0.0000	0.0000	
31	07/19/05	7.52	31	6	9	0.0000	0.0000	
32	10/25/05	7.15	32	5	9	4.2029	4.2029	
33	1/17/06	6.98	33	4	9	-1.5985	-1.5985	
34	4/26/06	6.38	34	3	9	1.9959	1.9959	
35	7/13/06	5.96	35	2	9	4.0520	4.0520	
36	10/26/06	6.71	36	1	9	-0.5003	-0.5003	
37	1/25/07	6.02	37	9	10	-34.9195	-34.9195	
38	4/25/07	5.57	38	8	10	-17.3643	-17.3643	
39	8/16/07	5.7	39	7	10	-11.5552	-11.5552	
40	10/25/07	5.4	40	6	10	-8.6822	-8.6822	
41	10/22/08	2.5	41	5	10	-3.6044	-3.6044	
42	1/13/09	0.746	42	4	10	-7.1317	-7.1317	
43	4/28/09	3.54	43	3	10	-3.2530	-3.2530	
44	7/28/09	4.41	44	2	10	-0.7995	-0.7995	
45	10/27/09	3.69	45	1	10	-4.3154	-4.3154	
46	2/11/10	2.92	46	10	11	34.9195	34.9195	
47	6/9/10	5.92	47	9	11	0.0000	0.0000	
48	9/21/10	3.79	48	8	11	0.0000	0.0000	
49	12/14/10	3.98	49	7	11	0.0000	0.0000	
50	9/20/2011	2.96	50	6	11	0.0000	0.0000	
51	12/15/11	4.77	51	5	11	2.8045	2.8045	
52	2/16/12	3.83	52	4	11	-1.1432	-1.1432	
53	7/12/12	3.59	53	3	11	1.4990	1.4990	
54	12/12/13	3.26	54	2	11	3.1548	3.1548	
55	6/17/14	1.87	55	1	11	-0.4005	-0.4005	
56	1/10/17	2.75	56	11	12	-4.7129	-4.7129	
57	6/20/18	0.998	57	10	12	12.0617	12.0617	
58	1/9/19	2.31	58	9	12	-1.9098	-1.9098	
59	6/27/19	0.484	59	8	12	-1.4683	-1.4683	
60	12/5/19	1.62	60	7	12	-1.1927	-1.1927	
61	6/9/20	1.77	61	6	12	-1.0059	-1.0059	
62	12/3/20	0.63	62	5	12	1.4153	1.4153	

Sen's slope estimate

data point	MW-03S Date	Aluminum mg/l	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/98	2.100	1	2	0	0
2	4/1/98	2.100	2	3	-2.006868132	-2.006868132
3	7/1/98	1.600	1	3	-1.008977901	-1.008977901
4	10/1/98	2.200	3	4	2.382065217	2.382065217
5	1/1/99	2.100	2	4	0.199590164	0.199590164
6	4/1/99	3.300	1	4	0.133791209	0.133791209
8	10/1/99	3.000	3	5	0.992527174	0.992527174
9	1/1/00	3.200	2	5	0	0
10	4/1/00	2.700	1	5	0	0
11	7/1/00	4.100	5	6	4.87	4.87
12	11/2/00	0.200	4	6	2.207554945	2.207554945
13	1/24/01	0.750	3	6	2.266149635	2.266149635
14	4/27/01	0.380	2	6	1.200821918	1.200821918
15	7/25/01	4.100	1	6	0.963296703	0.963296703
16	10/24/01	0.370	6	7	-3.210989011	-3.210989011
17	1/23/02	0.190	5	7	0.80718232	0.80718232
18	4/30/02	0.780	4	7	0.401373626	0.401373626
19	7/23/02	0.500	3	7	0.900616438	0.900616438
20	10/24/02	0.427	2	7	0.320394737	0.320394737
21	1/23/03	15.650	1	7	0.267582418	0.267582418
22	4/23/03	15.800	7	8	1.985054348	1.985054348
23	7/29/03	0.658	6	8	-0.598770492	-0.598770492
24	10/21/03	3.778	5	8	1.204120879	1.204120879
25	1/20/04	36.610	4	8	0.800547945	0.800547945
26	4/21/04	6.670	3	8	1.11892779	1.11892779
27	7/20/04	3.097	2	8	0.599863139	0.599863139
28	10/27/04	0.981	1	8	0.515242947	0.515242947
29	1/18/05	13.340	8	9	0.794021739	0.794021739
30	4/27/05	2.825	7	9	1.389538043	1.389538043
31	7/19/05	5.580	6	9	-0.132818182	-0.132818182
32	10/25/05	8.290	5	9	1.100753425	1.100753425
33	1/17/06	3.906	4	9	0.799234136	0.799234136
34	4/26/06	16.220	3	9	1.064480874	1.064480874
35	7/13/06	9.160	2	9	0.627773438	0.627773438
36	10/26/06	1.744	1	9	0.550376712	0.550376712
37	1/25/07	2.673	9	10	-2.006868132	-2.006868132
38	4/25/07	9.786	8	10	-0.598770492	-0.598770492
39	8/16/07	1.932	7	10	0.265636364	0.265636364
40	10/25/07	15.090	6	10	-0.598770492	-0.598770492
41	10/22/08	5.234	5	10	0.480592105	0.480592105
42	1/13/09	6.080	4	10	0.333257299	0.333257299
43	4/28/09	0.653	3	10	0.627773438	0.627773438
44	7/28/09	1.290	2	10	0.299794802	0.299794802
45	10/27/09	3.205	1	10	0.266930572	0.266930572
46	2/11/10	4.005	10	11	5.619230769	5.619230769
47	6/9/10	5.671	9	11	1.806181319	1.806181319
48	9/21/10	2.054	8	11	1.466332117	1.466332117
49	12/14/10	5.423	7	11	1.596721311	1.596721311
50	9/20/11	39.400	6	11	0.639387309	0.639387309
51	12/15/11	16.500	5	11	1.335466179	1.335466179
52	2/16/12	31.600	4	11	1.086032864	1.086032864
53	7/12/12	21.800	3	11	1.249145007	1.249145007
54	12/12/13	14.500	2	11	0.888686131	0.888686131
55	6/17/14	21.800	1	11	0.800986842	0.800986842
56	1/10/17	3.240	11	12	-11.48770161	-11.48770161
57	6/20/18	10.800	10	12	-4.247093023	-4.247093023
58	1/9/19	8.920	9	12	-3.580882353	-3.580882353
59	6/27/19	0.840	8	12	-2.56959799	-2.56959799
60	12/5/19	1.280	7	12	-1.714438776	-1.714438776
61	6/9/20	1.300	6	12	-1.94883821	-1.94883821
62	12/3/20	2.920	5	12	-1.03423994	-1.03423994

Median Slope (umol/L/year)

0.286893

Average Slope

0.6956

Sen's slope estimate

data point	Date	Sulfate mg/l	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/98	520.00	1	2	-202.9166667	-202.9166667
2	4/1/98	470.00	2	3	280.9615385	280.9615385
3	7/1/98	540.00	1	3	40.35911602	40.35911602
4	10/1/98	480.00	3	4	-238.2065217	-238.2065217
5	1/1/99	550.00	2	4	19.95901639	19.95901639
6	4/1/99	450.00	1	4	-53.51648352	-53.51648352
8	10/1/99	490.00	3	5	19.85054348	19.85054348
9	1/1/00	450.00	2	5	106.2545455	106.2545455
10	4/1/00	530.00	1	5	30.02054795	30.02054795
11	7/1/00	650.00	5	6	-405.8333333	-405.8333333
12	11/2/00	446.00	4	6	-60.20604396	-60.20604396
13	1/24/01	637.41	3	6	-119.9726277	-119.9726277
14	4/27/01	685.56	2	6	-20.01369863	-20.01369863
15	7/25/01	714.78	1	6	-56.19230769	-56.19230769
16	10/24/01	705.52	6	7	521.7857143	521.7857143
17	1/23/02	679.18	5	7	60.53867403	60.53867403
18	4/30/02	654.08	4	7	133.7912088	133.7912088
19	7/23/02	688.44	3	7	40.02739726	40.02739726
20	10/24/02	701.20	2	7	88.10855263	88.10855263
21	1/23/03	654.29	1	7	40.13736264	40.13736264
22	4/23/03	649.55	7	8	-357.3097826	-357.3097826
23	7/29/03	649.96	6	8	79.83606557	79.83606557
24	10/21/03	645.64	5	8	-80.27472527	-80.27472527
25	1/20/04	647.70	4	8	10.00684932	10.00684932
26	4/21/04	637.00	3	8	-39.96170678	-39.96170678
27	7/20/04	621.98	2	8	13.33029197	13.33029197
28	10/27/04	475.73	1	8	-17.17476489	-17.17476489
29	1/18/05	595.66	8	9	-158.8043478	-158.8043478
30	4/27/05	598.23	7	9	-258.0570652	-258.0570652
31	7/19/05	614.00	6	9	0	0
32	10/25/05	587.47	5	9	-100.0684932	-100.0684932
33	1/17/06	591.92	4	9	-23.97702407	-23.97702407
34	4/26/06	618.41	3	9	-59.87704918	-59.87704918
35	7/13/06	505.51	2	9	-11.4140625	-11.4140625
36	10/26/06	422.86	1	9	-35.0239726	-35.0239726
37	1/25/07	469.11	9	10	321.0989011	321.0989011
38	4/25/07	472.52	8	10	79.83606557	79.83606557
39	8/16/07	479.11	7	10	-66.40909091	-66.40909091
40	10/25/07	470.00	6	10	79.83606557	79.83606557
41	10/22/08	402.00	5	10	-16.01973684	-16.01973684
42	1/13/09	363.00	4	10	33.32572993	33.32572993
43	4/28/09	342.00	3	10	-5.70703125	-5.70703125
44	7/28/09	346.00	2	10	29.97948016	29.97948016
45	10/27/09	387.00	1	10	4.448842875	4.448842875
46	2/11/10	379.00	10	11	481.6483516	481.6483516
47	6/9/10	349.00	9	11	401.3736264	401.3736264
48	9/21/10	260.00	8	11	213.2846715	213.2846715
49	12/14/10	322.00	7	11	69.85655738	69.85655738
50	9/20/11	283.00	6	11	159.8468271	159.8468271
51	12/15/11	333.00	5	11	66.77330896	66.77330896
52	2/16/12	325.00	4	11	97.1713615	97.1713615
53	7/12/12	341.00	3	11	54.9623803	54.9623803
54	12/12/13	349.00	2	11	79.98175182	79.98175182
55	6/17/14	260.00	1	11	52.06414474	52.06414474
56	1/10/17	345.00	11	12	-600.8951613	-600.8951613
57	6/20/18	218.00	10	12	-142.7023256	-142.7023256
58	1/9/19	308.00	9	12	-4.774509804	-4.774509804
59	6/27/19	364.00	8	12	-40.37939698	-40.37939698
60	12/5/19	275.00	7	12	-99.88469388	-99.88469388
61	6/9/20	256.00	6	12	-2.514629948	-2.514629948
62	12/3/20	313.00	5	12	-56.61102832	-56.61102832

ɔdian Slope (umol/L/year)

-18.701489

Average Slope

-15.0166

Sen's slope estimate
MW-10S

data point	Date	Alumnum mg/l	Slope poin	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	0.83	1	1	2	-1.9074	-1.907416667
2	4/1/99	0.36	2	2	3	4.9770	4.977032967
3	7/1/99	1.6	3	1	3	1.5538	1.553825967
4	10/1/99	1.5	4	3	4	-0.3970	-0.39701087
5	1/1/00	3.8	5	2	4	2.2753	2.275327869
6	4/1/00	0.23	6	1	4	0.8964	0.896401099
8	11/2/00	0.05	8	3	5	4.3671	4.367119565
9	1/24/01	0.82	9	2	5	4.5689	4.5689
10	4/27/01	0.67	10	1	5	2.9720	2.972034247
11	7/25/01	3	11	5	6	-14.3290	-14.32903846
12	10/24/01	0.11	12	4	6	-2.5348	-2.534795082
13	1/23/02	0.1	13	3	6	-1.8196	-1.819609091
14	4/30/02	0.05	14	2	6	-0.1297	-0.129733607
15	7/23/02	0.2	15	1	6	-0.4806	-0.480592105
16	10/24/02	0.19	16	6	7	2.9300	2.930027473
17	1/23/03	0.558	2	5	7	-5.6995	-5.699505495
18	4/23/03	0.0055	3	4	7	-0.7198	-0.719835766
19	7/29/03	3.079	4	3	7	-0.6387	-0.638688525
20	10/21/03	0.0155	5	2	7	0.4795	0.479540481
21	1/20/04	3.878	6	1	7	0.0868	0.086805302
22	4/21/04	1.999	7	7	8	-2.6805	-2.68046371
23	7/20/04	1.344	8	6	8	-0.3058	-0.305790698
24	10/27/04	2.564	9	5	8	-4.4761	-4.476102941
25	1/18/05	10.41	10	4	8	-1.3307	-1.330684673
26	4/27/05	13.91	11	3	8	-1.1554	-1.155382653
27	7/19/05	2.966	12	2	8	-0.1949	-0.194883821
28	10/25/05	2.911	13	1	8	-0.4246	-0.424582712
29	1/17/06	2.0755	14	8	9	3.3885	3.388463855
30	4/26/06	0.112	15	7	9	-0.2470	-0.247028986
31	7/12/06	1.537	16	6	9	0.7231	0.723145973
32	10/25/06	0.311	17	5	9	-2.7981	-2.798059126
33	1/23/07	0.666	3	4	9	-0.5164	-0.516361746
34	4/24/07	2.737	4	3	9	-0.4972	-0.497198953
35	8/14/07	0.247	5	2	9	0.2530	0.253034639
36	10/23/07	0.892	6	1	9	-0.0048	-0.004844164
37	1/29/08	4.23	7	9	10	-0.5891	-0.589112903
38	4/15/08	3.272	8	8	10	1.2867	1.286676136
39	7/23/08	4.768	9	7	10	-0.3531	-0.353075
40	10/16/08	2.522	10	6	10	0.4110	0.411023018
41	1/13/09	1.57	11	5	10	-2.3719	-2.37185166
42	4/28/09	3.44	12	4	10	-0.5281	-0.528148955
43	7/28/09	4.125	13	3	10	-0.5100	-0.510033784
44	10/27/09	2	14	2	10	0.1496	0.149573976
45	2/9/10	3.551	15	1	10	-0.0690	-0.068996458
46	6/8/10	2.062	16	10	11	9.5622	9.562162921
47	9/21/10	1.06	17	9	11	4.3750	4.374972527
48	12/14/10	2.548	18	8	11	4.0660	4.065990566
49	3/2/11	2.62	4	7	11	1.9154	1.915449871
50	6/22/2011	2.21	5	6	11	2.1078	2.107796875
51	9/14/2011	68.7	6	5	11	-0.5117	-0.5117338
52	12/13/11	7.55	7	4	11	0.8264	0.826357466
53	2/14/2012	1.22	8	3	11	0.6773	0.677284768
54	7/10/2012	1.93	9	2	11	1.1398	1.139787234
55	9/25/2012	1.24	10	1	11	0.8468	0.846786859
56	12/18/2012	9.43	11	11	12	-11.5997	-11.5996978
57	2/7/2013	2.45	12	10	12	-1.1363	-1.136333333
58	6/18/2013	1.7	13	9	12	-0.9499	-0.949917582
59	9/24/2013	1.16	14	8	12	0.0616	0.061558989
60	12/10/2013	2.53	15	7	12	-0.6468	-0.646796875
61	2/25/14	6.35	16	6	12	-0.0768	-0.07676007
62	6/11/14	1.13	17	5	12	-2.0359	-2.035910121

Median Slope (umol/L/year)

0.027525

Average Slope

0.0573

Sen's slope estimate

data point	Date	Sulfate mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	3200.00	1	1	2	-1217.5000	-1217.5000
2	4/1/99	2900.00	2	2	3	802.7473	802.7472527
3	7/1/99	3100.00	3	1	3	-201.7956	-201.7955801
4	10/1/99	1900.00	4	3	4	-4764.1304	-4764.130435
5	1/1/00	2600.00	5	2	4	-1995.9016	-1995.901639
6	4/1/00	2200.00	6	1	4	-1739.2857	-1739.285714
8	11/2/00	1860.00	8	3	5	-992.5272	-992.5271739
9	1/24/01	1710.19	9	2	5	-398.4545	-398.4545455
10	4/27/01	1859.77	10	1	5	-600.4110	-600.4109589
11	7/25/01	201.74	11	5	6	-1605.4945	-1605.494505
12	10/24/01	1570.9	12	4	6	598.7705	598.7704918
13	1/23/02	1665.55	13	3	6	-1195.3636	-1195.363636
14	4/30/02	1518.64	14	2	6	-698.5656	-698.5655738
15	7/23/02	1622.13	15	1	6	-800.9868	-800.9868
16	10/24/02	1179.98	16	6	7	0.0000	0
17	1/23/03	1487.367	17	5	7	-802.7473	-802.7472527
18	4/23/03	1562.88	18	4	7	399.9088	399.9087591
19	7/29/03	1322.15	19	3	7	-898.1557	-898.1557377
20	10/21/03	1314.33	20	2	7	-559.4639	-559.463895
21	1/20/04	1322.56	21	1	7	-667.7331	-667.7330896
22	4/21/04	1105.91	22	7	8	-1001.4919	-1001.491935
23	7/20/04	1200.76	23	6	8	-577.6047	-577.6046512
24	10/27/04	1032.48	24	5	8	-883.2843	-883.2843137
25	1/18/05	943.35	25	4	8	-36.7085	-36.70854271
26	4/27/05	1059.045	26	3	8	-924.3061	-924.3061224
27	7/19/05	995.67	27	2	8	-653.8038	-653.8037866
28	10/25/05	572.92	28	1	8	-729.4113	-729.4113264
29	1/17/06	748.1	29	8	9	-659.2542	-659.254247
30	4/26/06	79.62	30	7	9	-864.2662	-864.2661957
31	7/12/06	928.55	31	6	9	-600.3460	-600.3459815
32	10/25/06	602.79	32	5	9	-835.4836	-835.4836
33	1/23/07	913.9	33	4	9	-144.1333	-144.1332692
34	4/24/07	892.04	34	3	9	-885.9129	-885.9129188
35	8/14/07	827.31	35	2	9	-654.4851	-654.4850941
36	10/23/07	700	36	1	9	-721.6885	-721.6884649
37	1/31/08	592	37	9	10	587.4634	587.4633871
38	4/16/08	788.5	38	8	10	-0.4773	-0.477315341
39	7/22/08	694	39	7	10	-414.2300	-414.230025
40	10/17/08	698	40	6	10	-317.8235	-317.8235486
41	1/13/09	488	41	5	10	-560.9316	-560.9315508
42	4/28/09	561	42	4	10	-25.5993	-25.5993162
43	7/28/09	585	43	3	10	-680.1712	-680.1711824
44	10/27/09	579	44	2	10	-501.9075	-501.9075396
45	2/9/10	556	45	1	10	-577.9445	-577.9445189
46	6/8/10	564	46	10	11	-6804.4433	-6804.443343
47	9/21/10	537	47	9	11	-3027.2602	-3027.260234
48	12/16/10	497	48	8	11	-2285.5829	-2285.582887
49	3/2/11	624	49	7	11	-1876.2583	-1876.258265
50	6/22/2011	611	50	6	11	-1520.5510	-1520.550969
51	9/14/2011	110	51	5	11	-1534.0884	-1534.08838
52	12/14/11	482	52	4	11	-935.5799	-935.5798869
53	2/16/12	729	53	3	11	-1402.1053	-1402.105252
54	7/10/12	600	54	2	11	-1164.9403	-1164.9403
55	10/16/12	469	55	1	11	-1169.9941	-1169.994087
56	12/18/12	522	56	11	12	5495.4471	5495.447143
57	6/19/2013	590	57	10	12	-586.1654	-586.165375
58	12/11/2013	332	58	9	12	-186.3578	-186.3577747
58	6/11/2014	502	59	8	12	-296.6117	-296.6117275
59	12/16/2014	314	60	7	12	-478.7058	-478.7057813
60	7/21/2015	453	61	6	12	-402.4147	-402.4146673
61	12/15/2015	349	62	5	12	-567.7927	-567.7927115

Median Slope (umol/L/year)

-87.139168

Average Slope

-112.2513

Sen's slope estimate

MW-11SR

data point	Date	Aluminum mg/l	lope poi	point A	Point B	slope umol/l/year	Sorted slope	
1	1/1/99	0.39	1	1	2	0.1218	-33.785625	**Median Slope** (umol/L/year)
2	4/1/99	0.42	2	2	3	-0.8027	-30.90207237	**0.054796**
3	7/1/99	0.22	3	1	3	-0.3431	-30.23089394	
4	10/1/99	0.64	4	3	4	1.6674	-26.22730645	**Average Slope**
5	1/1/00	2.3	5	2	4	0.4391	-20.91156593	**0.1388**
6	4/1/00	0.58	6	1	4	0.3345	-19.56696429	
8	11/2/00	0.05	8	3	5	4.1289	-19.50274451	
9	1/24/01	0.12	9	2	5	2.4970	-18.41792553	
10	4/27/01	0.94	10	1	5	1.9113	-14.47085714	
11	7/25/01	2.51	11	5	6	-6.9036	-13.55438736	
12	10/24/01	0.33	12	4	6	-0.1198	-13.234225	
13	1/23/02	0.1	13	3	6	0.4781	-11.1842761	
14	4/30/02	0.16	14	2	6	0.1597	-11.00713328	
15	7/23/02	0.16	15	1	6	0.1522	-10.84568878	
16	10/24/02	0.16	16	6	7	-0.3612	-10.59485893	
17	1/23/03	1.082	17	5	7	-3.6324	-10.52872826	
18	4/23/03	0.273	18	4	7	-0.2000	-10.42522613	
19	7/29/03	4.552	19	3	7	0.2694	-10.25444653	
20	10/21/03	0.052	20	2	7	0.0559	-9.946540179	
21	1/20/04	3.233	21	1	7	0.0668	-9.89145933	
22	4/21/04	0.581	22	7	8	-1.2960	-9.008831044	
23	7/20/04	0.672	23	6	8	-0.9004	-8.954215561	
24	10/27/04	6.464	24	5	8	-2.6857	-8.801120192	
25	1/18/05	9.085	25	4	8	-0.5415	-8.749945055	
26	4/27/05	0.891	26	3	8	-0.1267	-7.867532538	
27	7/19/05	2.331	27	2	8	-0.2326	-7.792	
28	10/25/05	0.963	28	1	8	-0.1851	-7.570169789	
29	1/17/06	0.314	29	8	9	0.3080	-7.512284736	
30	4/26/06	0.641	30	7	9	-0.6529	-7.316897394	
31	7/12/06	1.507	31	6	9	-0.5638	-7.062742347	
32	10/25/06	1.333	32	5	9	-2.0469	-6.935932056	
33	1/23/07	0.391	33	4	9	-0.3949	-6.903626374	
34	4/24/07	0.48	34	3	9	-0.0637	-6.8234	
35	8/14/07	4.898	35	2	9	-0.1650	-6.661276458	
36	10/23/07	1.656	36	1	9	-0.1308	-5.712653941	
37	1/31/08	7.57	37	9	10	3.2205	-5.696521698	
38	7/22/08	2.713	38	8	10	1.8470	-5.535097107	
39	10/17/08	6.22	39	7	10	0.5479	-5.503653409	
40	1/13/2009	11.9	40	6	10	0.3363	-5.48513549	
41	4/28/2009	7.74	41	5	10	-1.0306	-5.432238764	
42	7/28/2009	8.11	42	4	10	0.1909	-5.139589286	
43	10/27/2009	3.251	43	3	10	0.3949	-5.125675	
44	2/9/10	2.29	44	2	10	0.2509	-5.098591837	
45	6/8/10	1.39	45	1	10	0.2372	-5.025251678	
46	9/21/10	2.618	46	10	11	6.4432	-4.949955224	
47	12/16/10	10.42	47	9	11	4.7964	-4.836552198	
48	3/2/11	3.99	48	8	11	3.3906	-4.776078571	
49	6/22/2011	0.94	49	7	11	1.8967	-4.659405405	
50	9/14/2011	12.7	50	6	11	1.4686	-4.497910112	
51	12/14/11	7.49	51	5	11	0.1343	-4.389795349	
52	2/16/12	1.57	52	4	11	1.0302	-4.320385714	
53	7/10/12	1.83	53	3	11	1.1078	-4.047853022	
54	10/16/12	1.34	54	2	11	0.9023	-3.981451863	
55	12/18/12	2.77	55	1	11	0.8273	-3.972304147	
56	6/19/2013	5.68	56	11	12	-8.7499	-3.969663866	
57	12/11/2013	5.37	57	10	12	-1.2378	-3.915217283	
58	6/11/2014	1.97	58	9	12	0.2810	-3.895331044	
59	12/16/2014	2.68	59	8	12	0.2873	-3.82295	
60	7/21/2015	0.32	60	7	12	-0.1218	-3.811954297	
61	12/15/2015	0.24	61	6	12	-0.1599	-3.805055993	
62	6/22/2016	0.40	62	5	12	-1.0869	-3.795735294	

Sen's slope estimate

data point	Date	Dissolved Aluminum mg/l
1	10/25/2006	0.052
2	1/23/2007	0.082
3	4/24/2007	0.088
4	8/14/07	0.100
5	10/23/07	0.100
6	1/31/08	0.100
8	10/17/08	0.021
9	7/22/08	0.018
10	1/13/09	0.108
11	4/28/09	0.211
12	7/28/09	0.100
13	10/27/09	0.029
14	2/9/10	0.104
15	6/8/10	0.322
16	9/21/10	0.014
17	3/2/11	0.050
18	6/22/11	0.050
19	9/14/11	0.050
20	12/14/11	0.050
21	12/16/10	0.308
22	2/16/12	0.050
23	7/10/12	0.050
24	9/25/12	0.050
25	12/18/12	0.050
26	6/19/13	0.050
27	12/11/13	0.080
28	6/11/14	0.050
29	12/16/14	0.050
30	7/21/15	0.050
31	12/15/15	0.050
32	6/22/16	0.050
33	12/28/16	0.050
34	6/13/17	0.046
35	12/21/17	0.050
36	6/12/18	0.043
37	1/9/19	0.045
38	6/26/19	0.050
39	12/4/19	0.050
40	6/9/2020	0.050
41	12/3/2020	0.050

point A	Point B	slope umol/l/year	Sorted slope
1	2	**0.121750**	0.12175
2	3	**0.024082**	0.024082418
1	3	**0.072646**	0.072646409
3	4	**0.039134**	0.039133929
2	4	**0.032387**	0.0323867
1	4	**0.059836**	0.059836177
3	5	**0.024082**	0.024082418
2	5	**0.024082**	0.024082418
1	5	**0.048298**	0.048297521
5	6	**0.000000**	0
4	6	**0.000000**	0
3	6	**0.015543**	0.015542553
2	6	**0.017626**	0.017626005
1	6	**0.037866**	0.037866091
6	7	**-0.153789**	-0.153789474
5	7	**-0.066409**	-0.066409091
4	7	**-0.047512**	-0.047512195
3	7	**-0.020405**	-0.020405028
2	7	**-0.011389**	-0.011388641
1	7	**0.010842**	0.010842301
7	8	**-0.093298**	-0.093297554
6	8	**-0.110980**	-0.110979808
5	8	**-0.080152**	-0.080152083
4	8	**-0.067104**	-0.06710407
3	8	**-0.045151**	-0.04515083
2	8	**-0.035198**	-0.035197867
1	8	**-0.015661**	-0.015660788
8	9	**0.012595**	0.012594828
7	9	**-0.188273**	-0.188273196
6	9	**-0.173124**	-0.173124277
5	9	**-0.109709**	-0.109708791
4	9	**-0.087319**	-0.087319242
3	9	**-0.056192**	-0.056192308
2	9	**-0.042813**	-0.042813187
1	9	**-0.019526**	-0.019525943
9	10	**0.187843**	0.187842857
8	10	**0.361099**	0.361099432
7	10	**0.053713**	0.053713235
6	10	**0.008397**	0.008396552
5	10	**0.006522**	0.006522321
4	10	**0.005641**	0.005640927
3	10	**0.011595**	0.011595238
2	10	**0.013171**	0.01317129
1	10	**0.025221**	0.025220715
10	11	**0.358293**	0.358292857
9	11	**0.251762**	0.251761607
8	11	**0.359573**	0.359572539
7	11	**0.138543**	0.138543103
6	11	**0.089498**	0.089498344
5	11	**0.073314**	0.073314195
4	11	**0.065077**	0.065076645
3	11	**0.061123**	0.061123469
2	11	**0.057043**	0.057042676
1	11	**0.063400**	0.063400382
11	12	**-0.445525**	-0.445524725
10	12	**-0.014908**	-0.014908163
9	12	**0.080729**	0.080729111
8	12	**0.101601**	0.101601232
7	12	**0.024974**	0.024974359
6	12	**0.000000**	0
5	12	**0.000000**	0

ian Slope (umol/L/y

-0.000291

Average Slope

-0.004592

Sen's slope estimate

ear)		Date	Aluminum mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope	d
		4/1/99	0.46	1	1	2	21.0320	-225.428242	**Median Slope** (umol/L/year)
	2	7/1/99	5.7	2	2	3	-18.6595	-122.910872	**0.295897**
	3	10/1/99	1	3	1	3	1.0778	-120.659913	
	4	1/1/00	2.2	4	3	4	4.7641	-108.281976	**Average Slope**
	5	4/1/00	0.34	5	2	4	-6.9477	-105.697037	**0.3608**
	6	7/1/00	0.8	6	1	4	2.3110	-86.2182237	
	8	1/24/01	0.39	8	3	5	-1.3173	-67.2181301	
	9	4/27/01	2.44	9	2	5	-7.1191	-64.4115476	
	10	7/25/01	0.71	10	1	5	-0.1198	-55.8273	
	11	10/24/01	0.23	11	5	6	1.8463	-54.6670879	
	12	1/23/02	0.28	12	4	6	-2.8096	-42.6394061	
	13	4/30/02	0.29	13	3	6	-0.2666	-37.995208	
	14	7/23/02	0.3	14	2	6	-4.8900	-37.9312125	
	15	10/24/02	0.286	15	1	6	0.2717	-37.3646552	
	16	1/23/03	55.65	16	6	7	-2.0030	-36.6432638	
	17	4/23/03	0.103	17	5	7	-0.3737	-36.1180071	
	18	7/29/03	0.212	18	4	7	-2.4827	-35.3108448	
	19	10/21/03	5.777	19	3	7	-0.8076	-32.2120985	
	20	1/20/04	13.39	20	2	7	-4.1594	-32.0104193	
	21	4/21/04	10.103	21	1	7	-0.2137	-29.8681738	
	22	7/20/04	13.91	22	7	8	1.1882	-29.3569688	
	23	10/27/04	7.731	23	6	8	-0.7234	-28.07555	
	24	1/18/05	17.01	24	5	8	0.0613	-28.0248805	
	25	4/27/05	8.279	25	4	8	-1.6995	-27.7692776	
	26	7/19/05	5.9455	26	3	8	-0.4632	-27.2199296	
	27	10/25/05	6.791	27	2	8	-3.3848	-25.627706	
	28	1/17/06	12.35	28	1	8	-0.0385	-25.3266758	
	29	4/26/06	8.01	29	8	9	8.0512	-25.1649796	
	30	7/12/06	4.826	30	7	9	4.8147	-25.1400798	
	31	10/25/06	1.317	31	6	9	1.9967	-24.9339031	
	32	1/23/07	15.64	32	5	9	1.9617	-22.7967652	
	33	4/24/07	16.03	33	4	9	0.1819	-22.6785889	
	34	8/14/07	10.5295	34	3	9	0.9163	-22.4722	
	35	10/23/07	3.26	35	2	9	-1.7879	-22.2739526	
	36	1/31/08	30.3	36	1	9	0.9553	-22.2069152	
	37	7/22/08	48.405	37	9	10	-7.0998	-22.2049924	
	38	10/16/08	19.995	38	8	10	0.6422	-21.4139428	
	39	1/13/09	31.1	39	7	10	0.8132	-21.1717015	
	40	4/28/09	25.9	40	6	10	-0.0845	-20.9724336	
	41	7/28/09	26.9	41	5	10	0.2815	-19.9940183	
	42	10/27/09	13.28	42	4	10	-0.9531	-19.7936	
	43	2/9/10	13.52	43	3	10	-0.1598	-19.4397521	
	44	6/8/10	1.141	44	2	10	-2.4140	-19.1767399	
	45	9/21/10	47.89	45	1	10	0.1079	-18.6595109	
	46	12/16/10	18.95	46	10	11	-1.9266	-18.1647678	
	47	3/2/11	1.01	47	9	11	-4.4845	-18.0885714	
	48	6/22/2011	6.01	48	8	11	-0.2141	-17.9380145	
	49	9/20/2011	12.7	49	7	11	0.1129	-17.7393139	
	50	12/15/11	13.3	50	6	11	-0.4337	-16.5633516	
	51	2/16/12	16.7	51	5	11	-0.0704	-16.3803444	
	52	7/10/12	19	52	4	11	-1.0869	-16.2479768	
	53	10/16/12	16	53	3	11	-0.3730	-16.0366	
	54	12/18/12	4.89	54	2	11	-2.3616	-16.0119697	
	55	6/19/13	22	55	1	11	-0.0897	-15.7553833	
	56	12/10/13	4.2	56	11	12	0.2007	-15.6144375	
	57	6/11/14	18.300	57	10	12	-0.8630	-15.4071726	
	58	12/16/14	13.200	58	9	12	-2.9112	-15.1033247	
	59	7/21/15	4.910	59	8	12	-0.1104	-14.950295	
	60	12/15/15	1.280	60	7	12	0.1307	-14.6630853	
	61	6/22/16	3.040	61	6	12	-0.3326	-14.6345753	
	62	12/28/16	5.870	62	5	12	-0.0331	-14.5396937	

Sen's slope estimate

MW-12S

ata poin	Date	Fluoride mg/l	ope poi	point A	Point B	slope umol/l/year	Sorted slope	d
1	4/1/99	6.5	1	1	2	4.0137	4.013736264	**Median Slope** (umol/L/year)
2	7/1/99	7.5	2	2	3	2.7791	2.779076087	**0.197566**
3	10/1/99	8.2	3	1	3	3.3930	3.393032787	
4	1/1/00	8.2	4	3	4	0.0000	0	**Average Slope**
5	4/1/00	7	5	2	4	1.3895	1.3895	**0.2138**
6	7/1/00	7.5	6	1	4	2.2579	2.257909091	
8	1/24/01	8.2	8	3	5	-2.3951	-2.395081967	
9	4/27/01	6.227	9	2	5	-0.6641	-0.664090909	
10	7/25/01	6.69	10	1	5	0.4990	0.49897541	
11	10/24/01	11.01	11	5	6	2.0069	2.006868132	
12	1/23/02	10.19	12	4	6	-1.4048	-1.404807692	
13	4/30/02	9.073	13	3	6	-0.9331	-0.933120438	
14	7/23/02	11.97	14	2	6	0.0000	0	
15	10/24/02	10.69	15	1	6	0.7992	0.799234136	
16	1/23/03	9.798	16	6	7	2.8513	2.851306452	
17	4/23/03	8.556	17	5	7	2.4939	2.493893023	
18	7/29/03	10.55	18	4	7	0.3199	0.319892157	
19	10/21/03	11.69	19	3	7	0.2459	0.245947236	
20	1/20/04	9.071	20	2	7	0.7216	0.721555102	
21	4/21/04	10.8	21	1	7	1.2372	1.237197935	
22	7/20/04	8.83	22	7	8	-1.0341	-1.034141566	
23	10/27/04	12.88	23	6	8	1.2934	1.293373188	
24	1/18/05	7.345	24	5	8	1.5113	1.511252517	
25	4/27/05	12.52	25	4	8	0.0310	0.030985219	
26	7/19/05	11.081	26	3	8	0.0251	0.025058732	
27	10/25/05	16.05	27	2	8	0.4672	0.467239529	
28	1/17/06	8.77	28	1	8	0.9533	0.953280497	
29	4/26/06	14.68	29	8	9	-7.8784	-7.878403226	
30	7/12/06	5.233	30	7	9	-4.6507	-4.650711648	
31	10/25/06	13.2	31	6	9	-1.5499	-1.5498775	
32	1/23/07	9.006	32	5	9	-0.7221	-0.722092711	
33	4/24/07	13.66	33	4	9	-1.4951	-1.495100104	
34	10/23/07	10.39	34	3	9	-1.2555	-1.255467334	
35	1/31/08	10.13	35	2	9	-0.6981	-0.698143018	
36	4/16/08	12.29	36	1	9	-0.1317	-0.131721598	
37	7/22/08	12.255	37	9	10	1.9001	1.900120787	
38	10/16/08	12.89	38	8	10	-3.0966	-3.096597527	
39	1/13/09	11.8	39	7	10	-2.4506	-2.450620755	
40	4/28/09	9.997	40	6	10	-0.7605	-0.760546272	
41	7/28/09	13.7	41	5	10	-0.2359	-0.235890625	
42	10/27/09	15.44	42	4	10	-0.9659	-0.965897548	
43	2/9/10	13.93	43	3	10	-0.8319	-0.831866516	
44	6/8/10	0.2761	44	2	10	-0.3919	-0.391857616	
45	9/21/10	11.1	45	1	10	0.0820	0.082030142	
46	12/16/10	13.75	46	10	11	17.3393	17.3393	
47	3/2/11	13.3	47	9	11	9.7055	9.705504167	
48	6/22/11	11.8	48	8	11	3.7154	3.715381868	
49	9/20/11	12.3	49	7	11	2.6080	2.608049157	
50	12/15/11	11.8	50	6	11	2.6709	2.670890625	
51	2/16/12	10.8	51	5	11	2.5651	2.565065674	
52	7/10/12	11.8	52	4	11	1.5504	1.55038142	
53	10/16/12	13.8	53	3	11	1.3612	1.361210212	
54	12/18/12	9.54	54	2	11	1.5154	1.515398936	
55	6/19/13	11.3	55	1	11	1.7580	1.758033618	
56	12/10/13	10.1	56	11	12	-3.2913	-3.291263736	
57	6/11/14	10.7	57	10	12	7.0240	7.024038462	
58	12/16/14	12.3	58	9	12	5.3413	5.34127583	
59	7/21/15	12.6	59	8	12	1.9637	1.963720467	
60	12/15/15	14.5	60	7	12	1.4071	1.40707047	
61	6/22/16	13.8	61	6	12	1.7207	1.720704904	
62	12/28/16	13.7	62	5	12	1.7600	1.760041541	

Sen's slope estimate

ata poin	Date	Sulfate mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope	
1	04/01/99	220	1	1	2	481.6484	481.6483516	**Median Slope** (umol/L/year)
2	07/01/99	340	2	2	3	-198.5054	-198.505435	**31.832687**
3	10/01/99	290	3	1	3	139.7131	139.7131148	
4	01/01/00	290	4	3	4	0.0000	0	**Average Slope**
5	04/01/00	330	5	2	4	-99.2527	-99.2527174	**28.3184**
6	07/01/00	420	6	1	4	92.9727	92.97272727	
8	01/01/01	319.53	8	3	5	79.8361	79.83606557	
9	04/01/01	406.56	9	2	5	-13.2818	-13.2818182	
10	07/01/01	406.77	10	1	5	109.7746	109.7745902	
11	10/01/01	424.67	11	5	6	361.2363	361.2362637	
12	01/01/02	461.09	12	4	6	260.8929	260.8928571	
13	04/01/02	456.15	13	3	6	173.2938	173.2937956	
14	07/01/02	466.44	14	2	6	79.8361	79.83606557	
15	10/01/02	495.65	15	1	6	159.8468	159.8468271	
16	01/01/03	400.184	16	6	7	-250.1168	-250.116848	
17	04/01/03	353.27	17	5	7	53.8893	53.88934426	
18	07/01/03	382.08	18	4	7	89.3130	89.3129562	
19	10/01/03	285.99	19	3	7	66.8627	66.86270492	
20	1/20/04	370.14	20	2	7	13.5573	13.55731441	
21	4/21/04	346.07	21	1	7	91.1462	91.14617486	
22	7/20/04	315	22	7	8	-148.7600	-148.759973	
23	10/27/04	409.32	23	6	8	-199.4384	-199.43841	
24	1/18/05	363.82	24	5	8	-13.9061	-13.9060636	
25	4/27/05	370.07	25	4	8	29.4695	29.4694877	
26	7/19/05	369.945	26	3	8	23.5499	23.54985262	
27	10/25/05	376.77	27	2	8	-13.5939	-13.5939409	
28	1/17/06	446.59	28	1	8	56.7135	56.71346724	
29	4/26/06	457.2	29	8	9	353.1968	353.19675	
30	7/12/06	437.485	30	7	9	99.4604	99.46038462	
31	10/25/06	362.88	31	6	9	-17.9159	-17.9159124	
32	1/23/07	413.57	32	5	9	76.6124	76.61243836	
33	4/24/07	570.22	33	4	9	93.3630	93.36302632	
34	8/14/07	526.705	34	3	9	77.6889	77.68894161	
35	10/23/07	380	35	2	9	37.9860	37.986	
36	1/31/08	383	36	1	9	93.2162	93.21619699	
37	4/16/08	595	37	9	10	0.8429	0.842884615	
38	7/22/08	583	38	8	10	176.0465	176.0464641	
39	10/16/08	584	39	7	10	66.5879	66.58788462	
40	1/13/09	497	40	6	10	-13.2391	-13.2390616	
41	4/28/09	483	41	5	10	61.4918	61.49175987	
42	7/28/09	570	42	4	10	77.9712	77.97119287	
43	10/27/09	628	43	3	10	66.7453	66.74529343	
44	2/9/10	395	44	2	10	33.3622	33.36216484	
45	6/8/10	514	45	1	10	82.9900	82.98995438	
46	9/21/10	690	46	10	11	71.0649	71.06494565	
47	12/16/10	686	47	9	11	36.1458	36.14577869	
48	3/2/11	670	48	8	11	140.6681	140.6680769	
49	6/22/11	794	49	7	11	67.7163	67.71634932	
50	9/20/11	832	50	6	11	3.7324	3.732423414	
51	12/15/11	625	51	5	11	63.0989	63.0989	
52	2/16/12	594	52	4	11	76.9769	76.9768662	
53	7/10/12	787	53	3	11	67.2889	67.28894323	
54	10/16/12	797	54	2	11	37.5768	37.57681349	
55	12/18/12	481	55	1	11	81.7896	81.78962527	
56	6/19/13	703	56	11	12	144.5914	144.5913587	
57	12/10/13	804	57	10	12	107.8282	107.8281522	
58	6/11/14	887	58	9	12	72.4258	72.42575455	
59	12/16/14	822	59	8	12	141.6570	141.6569589	
60	7/21/15	888	60	7	12	83.1923	83.19228118	
61	12/15/15	775	61	6	12	27.3372	27.33719945	
62	6/22/16	1030	62	5	12	74.8135	74.81347266	

Sen's slope estimate

MW-

data point	Date	Fluoride mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope	
1	1/1/99	1.3	1	1	2	-1.2175	-1.2175	**Median Slope** (umol/L/year)
2	4/1/99	1	2	2	3	0.8027	0.802747253	**0.099535**
3	7/1/99	1.2	3	1	3	-0.2018	-0.20179558	
4	10/1/99	1.4	4	3	4	0.7940	0.794021739	**Average Slope**
5	1/1/00	1.5	5	2	4	0.7984	0.798360656	**0.8940**
6	4/1/00	1.3	6	1	4	0.1338	0.133791209	
8	11/2/00	1.268	8	3	5	0.5955	0.595516304	
9	1/24/01	1.232	9	2	5	0.6641	0.664090909	
10	4/27/01	1.123	10	1	5	0.2001	0.200136986	
11	7/25/01	1.106	11	5	6	-0.8027	-0.802747253	
12	10/24/01	1.021	12	4	6	-0.1996	-0.199590164	
13	1/23/02	1.011	13	3	6	0.1328	0.132818182	
14	4/30/02	1.021	14	2	6	0.2994	0.299385246	
15	7/23/02	1.241	15	1	6	0.0000	0	
16	10/24/02	1.089	16	6	7	0.0000	0	
17	1/23/03	1.054	17	5	7	-0.4014	-0.401373626	
18	4/23/03	0.901	18	4	7	-0.1333	-0.13330292	
19	7/29/03	1.263	19	3	7	0.0998	0.0998	
20	10/21/03	1.142	20	2	7	0.2398	0.239770241	
21	1/20/04	1.104	21	1	7	0.0000	0	
22	4/21/04	1.327	22	7	8	-0.0943	-0.094258065	
23	7/20/04	1.304	23	6	8	-0.0544	-0.054362791	
24	10/27/04	1.481	24	5	8	-0.2769	-0.276921569	
25	1/18/05	1.413	25	4	8	-0.1211	-0.121138191	
26	4/27/05	1.338	26	3	8	0.0507	0.050687755	
27	7/19/05	1.654	27	2	8	0.1685	0.1685	
28	10/25/05	1.841	28	1	8	-0.0174	-0.017418778	
29	1/17/06	1.697	29	8	9	-0.1584	-0.1584	
30	4/26/06	1.337	30	7	9	-0.1200	-0.119985507	
31	7/12/06	1.417	31	6	9	-0.0833	-0.083345638	
32	10/25/06	2.02	32	5	9	-0.2516	-0.251637532	
33	1/23/07	1.578	33	4	9	-0.1276	-0.127571726	
34	4/24/07	2.103	34	3	9	0.0204	0.020397906	
35	8/14/07	1.68	35	2	9	0.1276	0.12761747	
36	10/23/07	1.795	36	1	9	-0.0329	-0.032940318	
37	1/30/08	1.786	37	9	10	-0.4281	-0.42808871	
38	4/16/08	1.858	38	8	10	-0.3009	-0.300916193	
39	7/22/08	1.898	39	7	10	-0.2155	-0.2154975	
40	10/16/08	1.445	40	6	10	-0.1653	-0.16534335	
41	1/13/09	1.25	41	5	10	-0.2857	-0.285683091	
42	4/28/09	1.507	42	4	10	-0.1763	-0.17626176	
43	7/28/09	1.683	43	3	10	-0.0422	-0.042228604	
44	10/27/09	1.584	44	2	10	0.0593	0.059347094	
45	2/9/10	1.793	45	1	10	-0.0763	-0.076327332	
46	6/9/10	1.597	46	10	11	-0.0698	-0.069766854	
47	9/21/10	1.524	47	9	11	-0.2529	-0.252865385	
48	12/21/10	1.504	48	8	11	-0.2233	-0.223284906	
49	3/15/11	8.63	49	7	11	-0.1822	-0.182155527	
50	6/22/2011	4.66	50	6	11	-0.1476	-0.147621875	
51	9/14/2011	12	51	5	11	-0.2520	-0.252028897	
52	12/13/11	11.2	52	4	11	-0.1620	-0.161966063	
53	2/16/12	1.63	53	3	11	-0.0455	-0.045474834	
54	7/10/12	2.14	54	2	11	0.0458	0.045764184	
55	12/18/12	247	55	1	11	-0.0757	-0.075703526	
56	6/19/13	2.51	703	11	12	-0.3412	-0.341167582	
57	12/10/13	2.43	804	10	12	-0.2070	-0.206975	
58	6/11/14	2.61	805	9	12	-0.2823	-0.282299451	
59	12/16/14	2.28	806	8	12	-0.2534	-0.253417837	
60	7/21/15	2.42	807	7	12	-0.2123	-0.212301563	
61	12/15/15	2.54	808	6	12	-0.1785	-0.178467163	
62	6/22/16	2.66	809	5	12	-0.2643	-0.2642821	

Sen's slope estimate

15S-87

data point	Date	Aluminum mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	1	1	1	2	-1.9074	-1.90741667
2	4/1/99	0.53	2	2	3	-0.6422	-0.6421978
3	7/1/99	0.37	3	1	3	-1.2713	-1.27131215
4	10/1/99	0.31	4	3	4	-0.2382	-0.23820652
5	1/1/00	0.44	5	2	4	-0.4391	-0.43909836
6	4/1/00	0.81	6	1	4	-0.9232	-0.92315934
8	11/2/00	0.18	8	3	5	0.1390	0.138953804
9	1/24/01	0.3	9	2	5	-0.1195	-0.11953636
10	4/27/01	0.11	10	1	5	-0.5604	-0.56038356
11	7/25/01	0.44	11	5	6	1.4851	1.485082418
12	10/24/01	0.13	12	4	6	0.9980	0.99795082
13	1/23/02	0.05	13	3	6	0.5844	0.5844
14	4/30/02	0.1	14	2	6	0.2794	0.27942623
15	7/23/02	0.11	15	1	6	-0.1522	-0.1521875
16	10/24/02	0.044	16	6	7	-1.9266	-1.92659341
17	1/23/03	0.05	17	5	7	-0.2208	-0.22075549
18	4/23/03	0.014	18	4	7	0.0267	0.026660584
19	7/29/03	0.97	19	3	7	-0.0399	-0.03991803
20	10/21/03	0.066	20	2	7	-0.1598	-0.15984683
21	1/20/04	4.506	21	1	7	-0.4474	-0.4474
22	4/21/04	6.142	22	7	8	-0.4418	-0.44183468
23	7/20/04	10.19	23	6	8	-1.0703	-1.07026744
24	10/27/04	3.116	24	5	8	-0.3103	-0.31034314
25	1/18/05	4.407	25	4	8	-0.1193	-0.11930276
26	4/27/05	4.587	26	3	8	-0.1416	-0.14162755
27	7/19/05	8.314	27	2	8	-0.2200	-0.22003012
28	10/25/05	3.39	28	1	8	-0.4464	-0.44635618
29	1/17/06	3.968	29	8	9	0.5281	0.528072289
30	4/26/06	2.404	30	7	9	-0.0529	-0.05293478
31	7/12/06	5.163	31	6	9	-0.6251	-0.62509228
32	10/25/06	1.26	32	5	9	-0.1315	-0.13145244
33	1/23/07	3.45	33	4	9	-0.0076	-0.00759356
34	4/24/07	1.698	34	3	9	-0.0446	-0.04462042
35	8/14/07	9.59	35	2	9	-0.1265	-0.12651732
36	10/23/07	2.97	36	1	9	-0.3391	-0.33909151
37	1/30/08	24	37	9	10	-0.7462	-0.74620968
38	7/22/08	17.76	38	8	10	-0.1453	-0.14526989
39	10/16/08	28.93	39	7	10	-0.2679	-0.26785
40	1/13/09	7.85	40	6	10	-0.6539	-0.65390026
41	4/28/09	1.84	41	5	10	-0.2501	-0.2501
42	7/28/09	19.8	42	4	10	-0.1273	-0.12726481
43	10/27/09	7.313	43	3	10	-0.1426	-0.14259009
44	2/9/10	11.91	44	2	10	-0.2026	-0.2026
45	6/9/10	3.683	45	1	10	-0.3838	-0.3837928
46	9/21/10	4.6	46	10	11	1.3543	1.3543
47	12/21/10	7.048	47	9	11	0.2810	0.280961538
48	3/2/11	9.16	48	8	11	0.3584	0.358358491
49	6/22/2011	12	49	7	11	0.1033	0.103284062
50	9/14/2011	29.6	50	6	11	-0.2815	-0.28154688
51	12/15/11	3.54	51	5	11	0.0000	0
52	2/16/12	2.25	52	4	11	0.0716	0.071617647
53	7/10/12	5.34	53	3	11	0.0339	0.033864238
54	12/18/12	1.1	54	2	11	-0.0389	-0.03885638
55	6/19/2013	2.08	55	1	11	-0.2185	-0.21852564
56	12/11/2013	1.35	56	11	12	-1.2443	-1.24425824
57	6/11/14	4.08	57	10	12	0.0406	0.040583333
58	12/16/14	7.49	58	9	12	-0.2274	-0.22744505
59	7/21/15	1.65	59	8	12	-0.0513	-0.05129916
60	12/15/15	7.98	60	7	12	-0.1522	-0.1521875
61	12/28/16	0.226	61	6	12	-0.4350	-0.43497373
62	6/13/17	0.466	62	5	12	-0.1710	-0.17103852

Median Slope (umol/L/year)

0.166358

Average Slope

0.3496

Sen's slope estimate
MW-16S

data point	Date	Fluoride mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	640	1	1	2	-1826.2500	-1826.25
2	4/1/99	190	2	2	3	-702.4038	-702.4038
3	7/1/99	15	3	1	3	-1261.2224	-1261.22238
4	10/1/99	16	4	3	4	3.9701	3.970108696
5	1/1/00	15	5	2	4	-347.2869	-347.2869
6	4/1/00	13	6	1	4	-834.8571	-834.857143
8	10/1/00	29.37	8	3	5	0.0000	0
9	1/1/01	36.9	9	2	5	-232.4318	-232.431818
10	4/1/01	40	10	1	5	-625.4281	-625.428082
11	7/1/01	30.69	11	5	6	-8.0275	-8.02747253
12	10/1/01	28.49	12	4	6	-5.9877	-5.98770492
13	1/1/02	27.29	13	3	6	-2.6564	-2.6564
14	4/1/02	21.79	14	2	6	-176.6373	-176.637295
15	7/1/02	12.75	15	1	6	-502.2188	-502.21875
16	10/1/02	12.36	16	6	7	36.1236	36.12362637
17	1/1/03	11.07	17	5	7	14.0481	14.04807692
18	4/1/03	10.44	18	4	7	7.9982	7.998175182
19	7/1/03	11.74	19	3	7	6.9857	6.985655738
20	10/1/03	11.67	20	2	7	-134.2713	-134.271335
21	1/20/04	10.4	21	1	7	-412.6590	-412.659049
22	4/21/04	1.144	22	7	8	29.2597	29.25970109
23	7/20/04	8.98	23	6	8	32.6729	32.67290984
24	10/27/04	12.14	24	5	8	19.1556	19.15562956
25	1/19/05	9.961	25	4	8	13.3426	13.34260246
26	4/28/05	10.15	26	3	8	11.4599	11.45991812
27	7/19/05	8.841	27	2	8	-106.8672	-106.867227
28	10/25/05	8.962	28	1	8	-349.0338	-349.033815
29	1/17/06	9.992	29	8	9	29.7758	29.77581522
30	4/27/06	7.302	30	7	9	29.5178	29.51775815
31	7/13/06	8.485	31	6	9	31.7037	31.7037
32	10/26/06	9.503	32	5	9	21.8252	21.82518443
33	1/24/07	9.448	33	4	9	16.6436	16.64359716
34	4/26/07	8.08	34	3	9	14.5237	14.52366818
35	8/16/07	9.903	35	2	9	-87.2554	-87.2554329
36	10/25/07	8.615	36	1	9	-301.3587	-301.358731
37	1/30/08	8.993	37	9	10	12.7026	12.70258333
38	4/16/08	7.597	38	8	10	21.3330	21.33300824
39	7/23/08	8.047	39	7	10	23.9945	23.99452555
40	10/17/08	7.828	40	6	10	27.0185	27.01849315
41	1/13/09	8.25	41	5	10	20.0247	20.02467105
42	4/28/09	6.306	42	4	10	15.9964	15.99635036
43	7/28/09	7.098	43	3	10	14.2676	14.26757813
44	10/27/09	7.84	44	2	10	-74.9487	-74.9487004
45	2/15/10	6.596	45	1	10	-266.9306	-266.930572
46	6/9/10	6.939	46	10	11	-37.3679	-37.3678846
47	9/23/10	8.235	47	9	11	-12.4710	-12.4709669
48	12/16/10	8.154	48	8	11	1.7660	1.766043956
49	3/15/11	7.22	49	7	11	8.6960	8.695952055
50	6/27/2011	9.88	50	6	11	14.1695	14.16945724
51	9/21/11	7.95	51	5	11	10.4767	10.47673218
52	12/14/11	9.09	52	4	11	8.3967	8.396748826
53	2/21/12	8.09	53	3	11	7.8396	7.839634063
54	7/16/12	7.96	54	2	11	-70.7883	-70.7882938
55	10/17/12	7.95	55	1	11	-244.0246	-244.0246
56	12/20/12	10.2	56	11	12	-8.7342	-8.73423913
57	6/20/2013	10.40	57	10	12	-22.9728	-22.9728279
58	12/12/2013	7.21	58	9	12	-11.2117	-11.2117033
59	6/10/2014	7.74	59	8	12	-0.8806	-0.88060274
60	12/16/2014	7.23	60	7	12	5.1870	5.18702954
61	7/21/2015	7.99	61	6	12	10.3243	10.32431113
62	12/15/2015	8.79	62	5	12	7.7108	7.710833333

Median Slope (umol/L/year)

-0.389351

Average Slope

-6.4757

Sen's slope estimate
MW-18S

data point	Date	Fluoride mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope	
1	1/1/99	4800	1	1	2	-11363.3333	-11363.33333	**Median Slope** (umol/L/year)
2	4/1/99	2000	2	2	3	-4896.7582	-4896.758242	**-3.818457**
3	7/1/99	780	3	1	3	-8112.1823	-8112.1823	
4	10/1/99	870	4	3	4	357.3098	357.3097826	**Average Slope**
5	1/1/00	420	5	2	4	-2255.3689	-2255.368852	**-57.6933**
6	4/1/00	44	6	1	4	-5257.9945	-5257.994505	
8	10/1/00	122.1	8	3	5	-714.6196	-714.6195652	
9	4/1/01	126.4	9	2	5	-2098.5273	-2098.527273	
10	7/1/01	135.8	10	1	5	-4383.0000	-4383	
11	10/1/01	119.7	11	5	6	-1509.1648	-1509.164835	
12	1/1/02	127.7	12	4	6	-1648.6148	-1648.614754	
13	4/1/02	69.21	13	3	6	-977.5418	-977.5418182	
14	7/1/02	89.35	14	2	6	-1951.9918	-1951.991803	
15	10/1/02	78.52	15	1	6	-3809.4934	-3809.493421	
16	1/1/03	77.38	16	6	7	108.3709	108.3708791	
17	4/1/03	88.88	17	5	7	-700.3970	-700.396978	
18	7/1/03	71.09	18	4	7	-1065.0903	-1065.090328	
19	10/1/03	88.18	19	3	7	-707.5471	-707.5471311	
20	1/20/04	84.25	20	2	7	-1541.7226	-1541.722648	
21	4/21/04	81.11	21	1	7	-3157.7098	-3157.709781	
22	7/20/04	76.42	22	7	8	202.8726	202.8725543	
23	10/27/04	14.84	23	6	8	155.8799	155.879918	
24	1/19/05	101	24	5	8	-397.1094	-397.1093978	
25	4/28/05	85.58	25	4	8	-746.3674	-746.367418	
26	7/19/05	57.37	26	3	8	-524.6681	-524.6680677	
27	10/25/05	77.52	27	2	8	-1249.3679	-1249.3679	
28	1/17/06	76.71	28	1	8	-2673.8701	-2673.87007	
29	4/26/06	45.1	29	8	9	8.6295	8.629532967	
30	7/13/06	45.81	30	7	9	73.8498	73.84981752	
31	10/26/06	64.3	31	6	9	82.4564	82.45643836	
32	1/24/07	75.88	32	5	9	-235.1697	-235.1697368	
33	4/26/07	54.06	33	4	9	-495.6203	-495.6202555	
34	8/16/07	57.16	34	3	9	-373.0116	-373.0115625	
35	10/25/07	52.66	35	2	9	-936.1592	-936.1592339	
36	1/31/08	4.868	36	1	9	-2079.2112	-2079.211206	
37	4/16/08	39.38	37	9	10	37.7291	37.72912088	
38	4/23/08	49.31	38	8	10	18.3294	18.3293956	
39	10/17/08	51.48	39	7	10	64.8444	64.84438356	
40	1/13/09	63.2	40	6	10	73.5306	73.53059211	
41	4/28/09	63.62	41	5	10	-189.7697	-189.7697441	
42	7/28/09	61.12	42	4	10	-419.6660	-419.6659624	
43	10/27/09	57.6	43	3	10	-321.8797	-321.8796854	
44	2/15/10	41.23	44	2	10	-828.3443	-828.3443431	
45	6/9/10	44.27	45	1	10	-1867.9814	-1867.981414	
46	9/23/10	56.15	46	10	11	-63.9188	-63.91875	
47	12/16/10	60.53	47	9	11	-13.3725	-13.37254098	
48	3/15/11	63.1	48	8	11	-2.4016	-2.401643836	
49	6/27/2011	48.6	49	7	11	38.9227	38.92270241	
50	9/21/11	67.2	50	6	11	50.4552	50.45515511	
51	12/14/11	73.2	51	5	11	-171.6504	-171.6503521	
52	2/21/12	70.6	52	4	11	-374.8934	-374.8933995	
53	7/16/12	48.5	53	3	11	-293.0432	-293.043226	
54	10/17/12	71.7	54	2	11	-751.4000	-751.3999726	
55	12/20/12	73.1	55	1	11	-1702.6689	-1702.668899	
56	6/19/13	77.7	56	11	12	31.7609	31.76086957	
57	12/12/13	65.90	57	10	12	-16.0789	-16.07894022	
58	6/10/2014	32.95	58	9	12	1.7266	1.726636364	
59	12/16/2014	33.8	59	8	12	4.4757	4.47571116	
60	7/21/2015	53.5	60	7	12	37.7225	37.72254098	
61	12/15/2015	60	61	6	12	47.7679	47.7679	
62	6/22/2016	57	62	5	12	-146.0500	-146.0500342	

Sen's slope estimate
MW-18S

data point	Date	Sulfate mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	15000	1	1	2	20291.6667	20291.66667
2	4/1/99	20000	2	2	3	0.0000	0
3	7/1/99	20000	3	1	3	10089.7790	10089.7790
4	10/1/99	1500	4	3	4	-73447.0109	-73447.0109
5	1/1/00	4800	5	2	4	-36924.1803	-36924.18033
6	4/1/00	240	6	1	4	-18061.8132	-18061.81319
8	10/1/00	3440	8	3	5	-30172.8261	-30172.82609
9	1/1/01	2422.91	9	2	5	-20188.3636	-20188.36364
10	4/1/01	1258.57	10	1	5	-10206.9863	-10206.9863
11	7/1/01	1958.33	11	5	6	-18302.6374	-18302.63736
12	10/1/01	2400.9	12	4	6	-2514.8361	-2514.836066
13	1/1/02	190.52	13	3	6	-26244.8727	-26244.87273
14	4/1/02	982.66	14	2	6	-19719.5082	-19719.5082
15	7/1/02	1062.29	15	1	6	-11822.5658	-11822.56579
16	10/1/02	1150.97	16	6	7	280.9615	280.9615385
17	1/1/03	1319.269	17	5	7	-9010.8379	-9010.837912
18	4/1/03	1281.21	18	4	7	-1586.3047	-1586.304745
19	7/1/03	1413.09	19	3	7	-19649.6516	-19649.65164
20	10/1/03	1753.81	20	2	7	-15736.9201	-15736.92013
21	1/20/04	1154.05	21	1	7	-9808.9991	-9808.9991
22	4/21/04	827.73	22	7	8	12426.4402	12426.44022
23	7/20/04	790.49	23	6	8	6386.8852	6386.885246
24	10/27/04	1162.81	24	5	8	-1812.9197	-1812.9197
25	1/19/05	0.2695	25	4	8	1936.0246	1936.02459
26	4/28/05	797.41	26	3	8	-13206.4192	-13206.41921
27	7/19/05	595.18	27	2	8	-11017.3770	-11017.37705
28	10/25/05	711.67	28	1	8	-6607.6526	-6607.652582
29	1/17/06	705.46	29	8	9	-4037.9579	-4037.957853
30	4/26/06	369.47	30	7	9	4194.2412	4194.241182
31	7/13/06	584.56	31	6	9	2899.3014	2899.301373
32	10/26/06	473.31	32	5	9	-2372.2189	-2372.218914
33	1/24/07	610.75	33	4	9	736.0106	736.0106496
34	4/26/07	432.275	34	3	9	-11672.7857	-11672.78568
35	8/16/07	499.98	35	2	9	-10015.6507	-10015.65074
36	10/25/07	470	36	1	9	-6284.2437	-6284.24367
37	1/31/08	445	37	9	10	-4725.2798	-4725.279833
38	4/16/08	198	38	8	10	-4377.8423	-4377.842349
39	4/23/08	420	39	7	10	1264.4715	1264.471505
40	10/17/08	433	40	6	10	1019.2677	1019.267651
41	1/13/09	506	41	5	10	-2836.6388	-2836.638832
42	4/28/09	430	42	4	10	-160.9166	-160.9166195
43	7/28/09	514	43	3	10	-10695.7927	-10695.7927
44	10/27/09	545	44	2	10	-9364.3055	-9364.305482
45	2/15/10	418	45	1	10	-6113.3463	-6113.346294
46	6/9/10	423	46	10	11	2808.6521	2808.652088
47	9/23/10	491	47	9	11	-937.5019	-937.5019061
48	12/16/10	443	48	8	11	-1982.3442	-1982.344203
49	3/15/11	371	49	7	11	1649.4590	1649.458993
50	6/27/2011	417	50	6	11	1376.3597	1376.35972
51	9/21/11	618	51	5	11	-1897.4771	-1897.477089
52	12/14/11	466	52	4	11	261.9797	261.9797066
53	2/21/12	389	53	3	11	-9014.6648	-9014.664798
54	7/16/12	403	54	2	11	-8016.6910	-8016.690958
55	10/17/12	327	55	1	11	-5223.1030	-5223.103035
56	12/20/12	371	56	11	12	1757.0510	1757.051005
57	6/19/2013	192.00	57	10	12	2279.9783	2279.97832
58	12/12/2013	508	58	9	12	-29.4474	-29.44744505
59	6/12/2018	318	59	8	12	-1039.8117	-1039.811712
60	12/19/2018	250	60	7	12	1671.1187	1671.118654
61	6/25/19	250.000	61	6	12	1440.2714	1440.271396
62	12/4/19	286.500	62	5	12	-1371.3165	-1371.316549

Median Slope (umol/L/year)

-70.392231

Average Slope

-471.0191

Sen's slope estimate
MW-18S

data point	Date	Dissolved Aluminum mg/l
1	10/26/06	0.046
2	1/25/07	0.005
3	4/26/07	0.026
4	4/26/07	0.027
5	8/16/07	0.079
6	10/25/07	0.019
8	4/16/08	0.474
9	4/17/08	0.395
10	7/23/08	0.041
11	10/17/08	0.014
12	2/15/10	0.193
13	9/23/10	0.031
14	12/16/10	0.093
15	3/15/11	0.050
16	6/27/11	0.050
17	9/21/11	0.050
18	12/14/11	0.190
19	2/21/12	0.360
20	7/16/12	0.930
21	10/17/12	0.660
22	12/20/12	0.850
23	6/19/13	3.250
24	12/12/13	0.450
25	6/11/14	1.080
26	12/18/14	0.410
27	7/21/15	0.880
28	12/15/15	0.460
29	6/22/16	0.840
30	12/28/16	1.000
31	6/14/17	2.685
32	12/21/17	0.577
33	6/12/18	0.357
34	12/19/18	0.180
35	6/25/19	0.067
36	12/4/19	0.056
37	6/8/20	0.081
38	12/3/20	0.059

point A	Point B	Slope umol/l/yea	Sorted slope
1	2	-0.164563187	-0.164563187
2	3	0.084288462	0.084288462
1	3	-0.040137363	-0.040137363
3	4	0	0
2	4	0.088302198	0.088302198
1	4	-0.038130495	-0.038130495
4	5	0.169580357	0.169580357
3	5	0.172841518	0.172841518
2	5	0.13314532	0.13314532
1	5	0.040997449	0.040997449
5	6	-0.313071429	-0.313071429
4	6	-0.016054945	-0.016054945
3	6	-0.014048077	-0.014048077
2	6	0.018730769	0.018730769
1	6	-0.02709272	-0.02709272
6	7	0.063359694	0.063359694
5	7	-0.093486607	-0.093486607
4	7	0.011740179	0.011740179
3	7	0.013044643	0.013044643
2	7	0.030519542	0.030519542
1	7	-0.007905844	-0.007905844
7	8	2.104993421	2.104993421
6	8	0.955107759	0.955107759
5	8	0.591285861	0.591285861
4	8	0.458614466	0.458614466
3	8	0.459640449	0.459640449
2	8	0.38322651	0.38322651
1	8	0.290570632	0.290570632
8	9	-28.85475	-28.85475
7	9	1.702918831	1.702918831
6	9	0.784765714	0.784765714
5	9	0.471097959	0.471097959
4	9	0.376504202	0.376504202
3	9	0.377527311	0.377527311
2	9	0.31796317	0.31796317
1	9	0.236497681	0.236497681
9	10	-1.332974227	-1.332974227
8	10	-1.613808673	-1.613808673
7	10	0.01049569	0.01049569
6	10	0.029542279	0.029542279
5	10	-0.040583333	-0.040583333
4	10	0.011263216	0.011263216
3	10	0.012067731	0.012067731
2	10	0.024126606	0.024126606
1	10	-0.002871462	-0.002871462
10	11	-0.114671512	-0.114671512
9	11	-0.760438525	-0.760438525
8	11	-0.913125	-0.913125
7	11	-0.030905769	-0.030905769
6	11	-0.005101257	-0.005101257
5	11	-0.05547021	-0.05547021
4	11	-0.008793056	-0.008793056
3	11	-0.008116667	-0.008116667
2	11	0.005209588	0.005209588
1	11	-0.016188366	-0.016188366
11	12	0.134526235	0.134526235
10	12	0.097059441	0.097059441
9	12	-0.110284753	-0.110284753
8	12	-0.15318694	-0.15318694
7	12	0.076868968	0.076868968
6	12	0.075300355	0.075300355

Median Slope (umol/L/year)

0.025968

Average Slope

0.0284

Sen's slope estimate

MW-19S

data point	Date	Aluminum mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope	
1	2/15/99	0.09	1	1	2	0.2873	-22.56046825	**Median Slope** (umol/L/year)
2	5/15/99	0.16	2	2	3	0.1588	-13.39514674	**0.015999**
3	8/15/99	0.2	3	1	3	0.2220	-12.07161453	
4	11/15/99	0.14	4	3	4	-0.2382	-8.4304	**Average Slope**
5	2/15/00	0.19	5	2	4	-0.0397	-7.414198454	**0.0591**
6	5/15/00	0.21	6	1	4	0.0669	-7.289032787	
8	11/2/00	0.42	8	3	5	-0.0199	-5.967089752	
9	1/24/01	0.05	9	2	5	0.0397	-5.804866071	
10	4/26/01	0.1	10	1	5	0.1001	-5.525576923	
11	7/24/01	0.16	11	5	6	0.0812	-5.188942065	
12	10/23/01	0.05	12	4	6	0.1405	-5.023646166	
13	1/23/02	0.05	13	3	6	0.0133	-4.985273936	
14	4/30/02	0.05	14	2	6	0.0499	-4.669001343	
15	7/23/02	0.05	15	1	6	0.0963	-4.569352041	
16	10/22/02	0.054	16	6	7	-0.4367	-4.537021084	
17	1/23/03	0.046	17	5	7	-0.1806	-4.183640438	
18	4/23/03	0.0055	18	4	7	-0.0533	-3.970599545	
19	7/29/03	0.083	19	3	7	-0.0998	-3.833118132	
20	10/21/03	0.289	20	2	7	-0.0478	-3.461040642	
21	1/20/04	4.346	21	1	7	0.0067	-3.334620307	
22	4/21/04	0.972	22	7	8	1.4795	-3.327338415	
23	7/21/04	0.694	23	6	8	0.4486	-3.199951236	
24	10/28/04	0.497	24	5	8	0.3219	-2.869821429	
25	1/18/05	1.157	25	4	8	0.2897	-2.869241667	
26	4/28/05	1.201	26	3	8	0.1806	-2.792795918	
27	7/19/05	0.454	27	2	8	0.1768	-2.792519841	
28	10/26/05	1.507	28	1	8	0.1925	-2.706442623	
29	1/17/06	0.476	29	8	9	-1.6282	-2.603576923	
30	4/26/06	1.555	30	7	9	-0.1127	-2.475670797	
31	7/13/06	0.375	31	6	9	-0.2301	-2.454959016	
32	10/26/06	0.199	32	5	9	-0.1486	-2.277636054	
33	10/26/06	0.325	33	4	9	-0.0754	-2.106349693	
34	1/25/07	1.119	34	3	9	-0.1038	-2.043710983	
35	4/25/07	0.412	35	2	9	-0.0648	-1.971190476	
36	8/16/07	0.512	36	1	9	-0.0206	-1.941644918	
37	8/16/07	0.664	37	9	10	0.1985	-1.86831334	
38	10/25/07	1.567	38	8	10	-0.6679	-1.666235714	
39	1/31/08	0.341	39	7	10	0.0000	-1.628222892	
40	4/15/08	0.599	40	6	10	-0.1161	-1.607666279	
41	7/22/08	0.404	41	5	10	-0.0754	-1.602660497	
42	10/16/08	0.747	42	4	10	-0.0277	-1.590242308	
43	1/13/09	0.848	43	3	10	-0.0589	-1.567475092	
44	4/28/09	0.369	44	2	10	-0.0308	-1.565357143	
45	7/28/09	1.06	45	1	10	0.0046	-1.499694802	
46	10/27/09	0.105	46	10	11	0.2462	-1.45412896	
47	2/11/10	5.94	47	9	11	0.2220	-1.410828297	
48	9/21/10	0.816	48	8	11	-0.3597	-1.398118132	
49	12/21/10	1.635	49	7	11	0.0639	-1.331504646	
50	3/15/11	0.3	50	6	11	-0.0420	-1.30889589	
51	6/28/2011	0.19	51	5	11	-0.0209	-1.267193878	
52	9/20/2011	0.59	52	4	11	0.0118	-1.232663543	
53	12/15/11	0.66	53	3	11	-0.0206	-1.206459698	
54	2/16/12	0.32	54	2	11	0.0000	-1.182809589	
55	7/12/12	0.44	55	1	11	0.0287	-1.164364326	
56	10/16/12	0.3	56	11	12	-0.4415	-1.146925137	
57	12/19/12	0.61	57	10	12	-0.1015	-1.138160545	
58	6/20/2013	0.69	58	9	12	0.0000	-1.115818681	
59	12/11/2013	0.84	59	8	12	-0.3807	-1.092151478	
60	6/11/14	0.900	60	7	12	-0.0421	-1.084819311	
61	12/18/14	0.680	61	6	12	-0.1111	-1.076965714	
62	7/21/15	0.710	62	5	12	-0.0830	-1.073902224	

Sen's slope estimate

MW-19S

data point	Date	Sulfate mg/l	Slope point	point A	Point B	ope umol/l/ye	Sorted slope
1	1/1/99	490	1	1	2	-608.7500	-608.75
2	4/1/99	340	2	2	3	200.6868	-569.1628
3	7/1/99	390	3	1	3	-201.7956	-526.84302
4	10/1/99	350	4	3	4	-158.8043	-470.49153
5	1/1/00	290	5	2	4	19.9590	-441.51099
6	4/1/00	470	6	1	4	-187.3077	-393.07857
8	10/1/00	339.0	8	3	5	-198.5054	-366.2879
9	1/1/01	406.56	9	2	5	-66.4091	-354.35238
10	4/1/01	459.23	10	1	5	-200.1370	-330.82916
11	7/1/01	327.97	11	5	6	722.4725	-330.06631
12	10/1/01	275.71	12	4	6	239.5082	-322.14596
13	1/1/02	349.78	13	3	6	106.2545	-293.82333
14	4/1/02	381.46	14	2	6	129.7336	-287.51527
15	7/1/02	310.48	15	1	6	-16.0197	-284.895
16	10/1/02	246.49	16	6	7	-441.5110	-269.3868
17	1/1/03	312.123	17	5	7	140.4808	-261.4631
18	4/1/03	331.46	18	4	7	13.3303	-256.4027
19	7/1/03	308.42	19	3	7	-29.9385	-254.04726
20	10/1/03	225.09	20	2	7	15.9847	-236.91892
21	1/20/04	285.17	21	1	7	-86.8053	-233.39086
22	4/21/04	212.75	22	7	8	-83.3723	-230.07489
23	7/21/04	181.06	23	6	8	-261.4631	-228.89
24	10/28/04	190.32	24	5	8	65.3184	-212.3041
25	1/18/05	242.64	25	4	8	-10.9775	-207.7933
26	4/28/05	197.31	26	3	8	-40.6719	-207.47788
27	7/19/05	178.24	27	2	8	-0.6653	-203.0481
28	10/25/05	290.16	28	1	8	-86.3110	-201.79558
29	1/17/06	266.89	29	8	9	268.2205	-200.13699
30	4/26/06	112.62	30	7	9	92.4241	-198.5054
31	7/13/06	106.94	31	6	9	-84.2599	-193.71086
32	10/26/06	86.695	32	5	9	116.3211	-192.06155
33	1/24/07	203.42	33	4	9	45.1060	-187.3077
34	4/26/07	247.41	34	3	9	10.9973	-186.76511
35	8/16/07	176.86	35	2	9	37.9267	-175.0658
36	10/25/07	190	36	1	9	-41.6915	-169.58036
37	1/31/08	201	37	9	10	213.7524	-168.13095
38	4/15/08	154	38	8	10	241.2858	-165.56783
39	7/22/08	140	39	7	10	132.2765	-160.88393
40	10/16/08	186	40	6	10	-10.7774	-158.8043
41	1/13/09	222	41	5	10	135.5510	-158.5911
42	4/28/09	109	42	4	10	72.8034	-145.3695
43	7/28/09	169	43	3	10	39.5098	-144.97036
44	10/27/09	423	44	2	10	59.5742	-144.79034
45	2/11/10	394	45	1	10	-13.6891	-142.74138
46	6/9/10	242	46	10	11	-526.8430	-141.79432
47	9/21/10	250	47	9	11	-158.5911	-138.1929
48	12/21/10	228	48	8	11	-14.7572	-136.74384
49	3/15/11	191	49	7	11	-32.0519	-130.89164
50	6/28/2011	195	50	6	11	-113.7642	-129.49712
51	9/20/2011	184	51	5	11	25.3538	-129.24231
52	12/15/11	221	52	4	11	-12.5923	-128.78757
53	2/16/12	227	53	3	11	-30.9938	-127.1953
54	7/12/12	207	54	2	11	-5.3454	-125.96645
55	10/16/12	198	55	1	11	-64.8919	-123.14143
56	12/19/12	212	56	11	12	-207.4779	-122.8509
57	6/20/13	236	57	10	12	-366.2879	-120.51358
58	12/11/13	168	58	9	12	-175.0658	-119.14679
59	6/11/14	180	59	8	12	-63.3333	-118.45243
60	12/18/14	129	60	7	12	-67.3674	-116.4425
61	7/21/15	170	61	6	12	-129.4971	-115.2143
62	12/15/15	142	62	5	12	-8.1681	-115.16478

Median Slope (umol/L/year)

-10.997906

Average Slope

-11.7965

Sen's slope estimate

MW-26S

data point	Date	Aluminum mg/l	Slope point	point A	Point B	slope mg/l	Sorted slope
1	1/1/98	0.4	1	1	2	-0.6493	-0.649333
2	4/1/98	0.24	2	2	3	1.3647	1.3646703
3	7/1/98	0.58	3	1	3	0.3632	0.3632
4	10/1/98	1.2	4	3	4	2.4615	2.4614674
5	1/1/99	1.4	5	2	4	1.9161	1.9160656
6	4/1/99	0.85	6	1	4	1.0703	1.0703297
8	10/1/99	0.37	8	3	5	1.6277	1.6277446
9	1/1/00	9.4545	9	2	5	1.5407	1.5406909
10	4/1/00	1.2	10	1	5	1.0007	1.0006849
11	7/1/00	0.44	11	5	6	-2.2321	-2.232083
12	10/1/00	0.14	12	4	6	-0.7024	-0.702404
13	1/1/01	1.16	13	3	6	0.3599	0.3599179
14	4/1/01	0.12	14	2	6	0.6104	0.6104178
15	7/1/01	3.97	15	1	6	0.3612	0.3612363
16	10/1/01	0.16	16	6	7	-2.3681	-2.368104
17	1/1/02	0.48	17	5	7	-2.3005	-2.30047
18	4/1/02	0.39	18	4	7	-1.2576	-1.257637
19	7/1/02	0.7	19	3	7	-0.3202	-0.320219
20	10/1/02	0.381	20	2	7	0.0160	0.0160197
21	1/1/03	2.24	21	1	7	-0.0937	-0.093654
22	4/1/03	15.21	22	7	8	0.4367	0.4367
23	7/1/03	11.1	23	6	8	-0.9580	-0.9580
24	10/1/03	12.43	24	5	8	-1.3780	-1.378049
25	1/20/04	12.8	25	4	8	-0.8306	-0.830568
26	4/21/04	9.177	26	3	8	-0.1678	-0.167839
27	7/20/04	5.623	27	2	8	0.0866	0.0866469
28	10/27/04	11.28	28	1	8	-0.0172	-0.017175
29	1/18/05	25.38	29	8	9	36.0665	36.0665
30	4/28/05	8.025	30	7	9	18.2516	18.251582
31	7/19/05	9.6	31	6	9	11.4283	11.42834
32	10/25/05	2.795	32	5	9	8.0600	8.0600168
33	1/17/06	8.454	33	4	9	6.5973	6.5972782
34	4/27/06	9.571	34	3	9	5.9042	5.9042097
35	7/13/06	6.777	35	2	9	5.2587	5.2587439
36	10/27/06	1.573	36	1	9	4.5304	4.5303509
37	1/25/07	6.789	37	9	10	-33.1314	-33.13139
38	4/25/07	26.42	38	8	10	1.6566	1.6565984
39	8/16/07	6.118	39	7	10	1.2485	1.2484909
40	10/25/07	7.833	40	6	10	0.3493	0.3492828
41	1/31/08	23.9	41	5	10	-0.1602	-0.160197
42	7/23/08	19.85	42	4	10	0.0000	0
43	10/17/08	34.01	43	3	10	0.3538	0.3538359
44	1/13/09	46.25	44	2	10	0.4797	0.4796717
45	4/28/09	22.4	45	1	10	0.3559	0.3559074
46	7/28/09	33.2	46	10	11	-3.0504	-3.05044
47	10/27/09	50.88	47	9	11	-18.0909	-18.09091
48	2/15/10	48.01	48	8	11	0.0933	0.093312
49	6/9/10	82.42	49	7	11	0.1796	0.1796311
50	9/23/10	10.71	50	6	11	-0.3277	-0.327686
51	12/16/10	32.53	51	5	11	-0.6410	-0.641024
52	3/15/11	52.6	52	4	11	-0.4344	-0.434413
53	6/28/2011	26.4	53	3	11	-0.0700	-0.069952
54	9/21/11	25.9	54	2	11	0.0889	0.0888686
55	12/14/11	25.3	55	1	11	0.0160	0.0160197
56	2/21/12	29.9	56	11	12	-1.1910	-1.191033
57	7/16/12	8.6	57	10	12	-2.1157	-2.115656
58	10/17/12	34.3	58	9	12	-12.4165	-12.4165
59	12/19/12	20.4	59	8	12	-0.2295	-0.229529
60	6/19/2013	18.6	60	7	12	-0.0957	-0.095699
61	12/12/2013	18	61	6	12	-0.4724	-0.4724
62	6/10/14	49.30	62	5	12	-0.7202	-0.720211

Median Slope (umol/L/year)

0.930268

Average Slope

1.2554

Sen's slope estimate
MW-26S

data point	Date	Fluoride mg/l	Slope point	point A	Point B	ope umol/l/ye	Sorted slope	
1	1/1/98	4.6	1	1	2	-4.0583	-4.058333	**ian Slope** (umol/L/y
2	4/1/98	3.6	2	2	3	-2.4082	-2.408242	**0.142341**
3	7/1/98	3	3	1	3	-3.2287	-3.228729	
4	10/1/98	4.8	4	3	4	7.1462	7.1461957	**Average Slope**
5	1/1/99	3.7	5	2	4	2.3951	2.395082	**0.2000**
6	4/1/99	2.7	6	1	4	0.2676	0.2676	
8	10/1/99	4.1	8	3	5	1.3895	1.389538	
9	1/1/00	4.3	9	2	5	0.1328	0.1328182	
10	4/1/00	3.4	10	1	5	-0.9006	-0.900616	
11	7/1/00	3.3	11	5	6	-4.0583	-4.058333	
12	10/1/00	3.233	12	4	6	-4.2144	-4.214423	
13	1/1/01	3.455	13	3	6	-0.3999	-0.399909	
14	4/1/01	3.202	14	2	6	-0.9006	-0.900616	
15	7/1/01	3.471	15	1	6	-1.5252	-1.52522	
16	10/1/01	3.246	16	6	7	1.6055	1.6054945	
17	1/1/02	3.316	17	5	7	-1.2108	-1.210773	
18	4/1/02	2.859	18	4	7	-2.2745	-2.274451	
19	7/1/02	3.551	19	3	7	0.1001	0.1000685	
20	10/1/02	3.576	20	2	7	-0.4005	-0.400493	
21	1/1/03	3.067	21	1	7	-1.0034	-1.003434	
22	4/1/03	3.341	22	7	8	3.9701	3.9701087	
23	7/1/03	3.546	23	6	8	2.7943	2.7942623	
24	10/1/03	3.343	24	5	8	0.5352	0.5351648	
25	1/20/04	3.659	25	4	8	-0.7005	-0.700479	
26	4/21/04	3.593	26	3	8	0.8792	0.8791575	
27	7/20/04	4.053	27	2	8	0.3333	0.3332573	
28	10/27/04	4.573	28	1	8	-0.2862	-0.286246	
29	1/18/05	4.028	29	8	9	0.7940	0.7940217	
30	4/28/05	4.337	30	7	9	2.3821	2.3820652	
31	7/19/05	3.961	31	6	9	2.1251	2.1251	
32	10/25/05	4.409	32	5	9	0.6004	0.600411	
33	1/17/06	4.0765	33	4	9	-0.3996	-0.399617	
34	4/27/06	4.637	34	3	9	0.8649	0.8648907	
35	7/13/06	4.499	35	2	9	0.3995	0.3994922	
36	10/27/06	4.317	36	1	9	-0.1501	-0.150103	
37	1/25/07	4.825	37	9	10	-3.6124	-3.612363	
38	4/25/07	4.285	38	8	10	-1.3971	-1.397131	
39	8/16/07	4.692	39	7	10	0.3985	0.3984545	
40	10/25/07	4.309	40	6	10	0.6986	0.6985656	
41	1/31/08	5.0035	41	5	10	-0.2403	-0.240296	
42	4/16/08	5.148	42	4	10	-0.9331	-0.93312	
43	7/23/08	4.778	43	3	10	0.2283	0.2282813	
44	10/17/08	5.333	44	2	10	-0.0999	-0.099932	
45	1/13/09	5.15	45	1	10	-0.5339	-0.533861	
46	4/28/09	4.81	46	10	11	-0.4014	-0.401374	
47	7/28/09	5.176	47	9	11	-2.0069	-2.006868	
48	10/27/09	4.958	48	8	11	-1.0664	-1.066423	
49	2/15/10	4.126	49	7	11	0.1996	0.1995902	
50	6/9/10	4.109	50	6	11	0.4795	0.4795405	
51	9/23/10	5.635	51	5	11	-0.2671	-0.267093	
52	12/16/10	5.489	52	4	11	-0.8574	-0.857394	
53	3/15/11	5.45	53	3	11	0.1499	0.1499	
54	6/28/2011	5.97	54	2	11	-0.1333	-0.133303	
55	9/21/11	5.15	55	1	11	-0.5206	-0.520641	
56	12/14/11	5.55	56	11	12	-0.2660	-0.265997	
57	2/21/12	4.62	57	10	12	-0.3333	-0.333316	
58	7/16/12	4.41	58	9	12	-1.4223	-1.422342	
59	10/17/12	4.37	59	8	12	-0.8652	-0.865223	
60	12/19/12	4.9	60	7	12	0.1061	0.106066	
61	6/19/2013	5.48	61	6	12	0.3546	0.3546052	
62	12/12/2013	5.74	62	5	12	-0.2669	-0.266935	

Sen's slope estimate
MW-27S

data point	Date	Fluoride mg/l	Slope point	point A	Point B	ope umol/l/ye	Sorted slope	
1	1/1/99	7.9	1	1	2	-4.8700	-4.87	**n Slope** (umol/l
2	4/1/99	6.7	2	2	3	-1.2041	-1.204121	**-0.220500**
3	7/1/99	6.4	3	1	3	-3.0269	-3.026934	
4	10/1/99	8.5	4	3	4	8.3372	8.3372283	**Average Slope**
5	1/1/00	8.9	5	2	4	3.5926	3.592623	**-0.2535**
6	4/1/00	7.1	6	1	4	0.8027	0.8027473	
8	10/1/00	6.3	8	3	5	4.9626	4.9626359	
9	1/1/01	6.473	9	2	5	2.9220	2.922	
10	4/1/01	6.636	10	1	5	1.0007	1.0006849	
11	7/1/01	5.919	11	5	6	-7.2247	-7.224725	
12	10/1/01	6.134	12	4	6	-2.7943	-2.794262	
13	1/1/02	5.26	13	3	6	0.9297	0.9297273	
14	4/1/02	5.54	14	2	6	0.3992	0.3991803	
15	7/1/02	5.289	15	1	6	-0.6408	-0.640789	
16	10/1/02	6.232	16	6	7	-5.6192	-5.619231	
17	1/1/03	5.171	17	5	7	-6.4220	-6.421978	
18	4/1/03	5.009	18	4	7	-3.7325	-3.732482	
19	7/1/03	5.581	19	3	7	-0.6986	-0.698566	
20	10/1/03	5.083	20	2	7	-0.7992	-0.799234	
21	1/20/04	4.521	21	1	7	-1.4690	-1.469013	
22	4/21/04	4.927	22	7	8	2.3582	2.3582	
23	7/20/04	4.895	23	6	8	-1.6087	-1.608697	
24	10/27/04	5.274	24	5	8	-3.4739	-3.473874	
25	1/18/05	5.889	25	4	8	-2.2015	-2.20148	
26	4/27/05	5.298	26	3	8	-0.0845	-0.084534	
27	7/19/05	4.252	27	2	8	-0.2701	-0.270112	
28	10/25/05	4.49	28	1	8	-0.9180	-0.917984	
29	1/17/06	3.834	29	8	9	0.7106	0.7106495	
30	4/26/06	4.264	30	7	9	1.5344	1.534447	
31	7/13/06	3.827	31	6	9	-0.8328	-0.83277	
32	10/26/06	4.24	32	5	9	-2.4220	-2.422027	
33	1/25/07	3.92	33	4	9	-1.6165	-1.61651	
34	4/24/07	3.638	34	3	9	0.0485	0.0484786	
35	8/16/07	4.116	35	2	9	-0.1293	-0.129348	
36	10/25/07	3.579	36	1	9	-0.7130	-0.713012	
37	1/30/08	4.2505	37	9	10	0.6615	0.6615083	
38	4/16/08	3.783	38	8	10	0.6863	0.6863489	
39	7/23/08	3.898	39	7	10	1.2477	1.2477153	
40	10/16/08	3.445	40	6	10	-0.4643	-0.464318	
41	1/13/09	3.64	41	5	10	-1.8134	-1.813434	
42	4/28/09	3.551	42	4	10	-1.2424	-1.242383	
43	7/28/09	3.738	43	3	10	0.1347	0.1346859	
44	10/27/09	3.344	44	2	10	-0.0320	-0.031978	
45	2/11/10	3.048	45	1	10	-0.5623	-0.562334	
46	6/9/10	2.929	46	10	11	-2.8778	-2.877849	
47	9/21/10	3.468	47	9	11	-1.1179	-1.117948	
48	12/14/10	3.845	48	8	11	-0.5017	-0.501717	
49	3/2/11	3.49	49	7	11	0.2191	0.2191	
50	6/22/2011	3.66	50	6	11	-0.9460	-0.945965	
51	9/21/11	3.4	51	5	11	-1.9905	-1.990512	
52	12/15/11	3.3	52	4	11	-1.4753	-1.47529	
53	2/16/12	1.98	53	3	11	-0.2403	-0.240335	
54	7/12/12	2.79	54	2	11	-0.3470	-0.347032	
55	10/16/12	4.04	55	1	11	-0.7934	-0.793377	
56	12/19/12	2.86	56	11	12	0.8536	0.8535734	
57	6/19/2013	3.38	57	10	12	-1.0019	-1.001943	
58	12/11/2013	2.97	58	9	12	-0.4536	-0.453552	
59	6/10/2014	2.2	59	8	12	-0.1601	-0.16011	
60	12/16/2014	3.17	60	7	12	0.3469	0.3468676	
61	7/21/2015	3.24	61	6	12	-0.6439	-0.643853	
62	12/15/2015	2.37	62	5	12	-1.5810	-1.581035	

Sen's slope estimate
MW-27S

data point	Date	Aluminum mg/l	Slope point	point A	Point B	ope umol/l/ye	Sorted slope	
1	1/1/99	1.3	1	1	2	-1.3798	-1.379833	**lian Slope** (umol/L/y
2	4/1/99	0.96	2	2	3	-0.2810	-0.280962	**0.151284**
3	7/1/99	0.89	3	1	3	-0.8274	-0.827362	
4	10/1/99	0.67	4	3	4	-0.8734	-0.873424	**Average Slope**
5	1/1/00	1.7	5	2	4	-0.5788	-0.578811	**0.4679**
6	4/1/00	3.3	6	1	4	-0.8429	-0.842885	
8	10/1/00	0.1	8	3	5	1.6079	1.607894	
9	1/1/01	0.66	9	2	5	0.9829	0.9828545	
10	4/1/01	1.45	10	1	5	0.4003	0.400274	
11	7/1/01	8.79	11	5	6	6.4220	6.4220	
12	10/1/01	0.3	12	4	6	5.2492	5.2492	
13	1/1/02	0.19	13	3	6	3.2009	3.2009182	
14	4/1/02	0.39	14	2	6	2.3352	2.3352049	
15	7/1/02	0.21	15	1	6	1.6020	1.6019737	
16	10/1/02	0.142	16	6	7	-9.9541	-9.954066	
17	1/1/03	4.222	17	5	7	-1.7660	-1.766044	
18	4/1/03	0.155	18	4	7	0.2000	0.1999544	
19	7/1/03	0.22	19	3	7	-0.0699	-0.069857	
20	10/1/03	12.35	20	2	7	-0.1119	-0.111893	
21	1/20/04	5.402	21	1	7	-0.3205	-0.3205	
22	4/21/04	7.815	22	7	8	-2.8585	-2.858478	
23	7/20/04	11.64	23	6	8	-6.3869	-6.386885	
24	10/27/04	1.933	24	5	8	-2.1328	-2.132847	
25	1/18/05	15.42	25	4	8	-0.5688	-0.568832	
26	4/27/05	6.588	26	3	8	-0.6300	-0.630016	
27	7/19/05	4.442	27	2	8	-0.5722	-0.572158	
28	10/25/05	2.219	28	1	8	-0.6859	-0.685915	
29	1/17/06	27.79	29	8	9	2.2233	2.2232609	
30	4/26/06	15.16	30	7	9	-0.3176	-0.317609	
31	7/13/06	1.817	31	6	9	-3.5064	-3.5064	
32	10/26/06	0.297	32	5	9	-1.0379	-1.037869	
33	1/25/07	6.057	33	4	9	-0.0080	-0.0080	
34	4/24/07	3.398	34	3	9	-0.1527	-0.152741	
35	8/16/07	2.968	35	2	9	-0.1709	-0.170944	
36	10/25/07	3.622	36	1	9	-0.3198	-0.319781	
37	1/30/08	11.8	37	9	10	3.2061	3.2060833	
38	4/16/08	1.519	38	8	10	2.7093	2.709272	
39	7/23/08	8.138	39	7	10	0.8398	0.8398084	
40	10/16/08	4.811	40	6	10	-1.8513	-1.851267	
41	1/13/09	6.17	41	5	10	-0.2002	-0.200247	
42	4/28/09	1.01	42	4	10	0.5199	0.5198814	
43	7/28/09	8.9	43	3	10	0.3196	0.3195938	
44	10/27/09	2.733	44	2	10	0.2448	0.2448324	
45	2/11/10	5.686	45	1	10	0.0667	0.0667326	
46	6/9/10	3.884	46	10	11	29.4608	29.460824	
47	9/21/10	3.476	47	9	11	16.4060	16.405981	
48	12/14/10	18.74	48	8	11	11.6265	11.626456	
49	3/2/11	15.8	49	7	11	7.9755	7.9754589	
50	6/22/2011	2.93	50	6	11	4.3974	4.3974178	
51	9/21/11	5.66	51	5	11	4.7342	4.7342276	
52	12/15/11	7.09	52	4	11	4.6414	4.6413615	
53	2/16/12	29.9	53	3	11	3.9473	3.9472982	
54	7/12/12	8.6	54	2	11	3.4792	3.4792062	
55	10/16/12	34.3	55	1	11	2.9997	2.9996957	
56	12/19/12	20.4	56	11	12	-33.7062	-33.70622	
57	6/19/2013	3.32	57	10	12	-2.2953	-2.295287	
58	12/11/2013	13.50	58	9	12	-0.4816	-0.481648	
59	6/10/14	16.400	59	8	12	0.2001	0.200137	
60	12/16/14	15.100	60	7	12	-0.4156	-0.4156	
61	7/21/15	6.685	61	6	12	-1.9995	-1.999544	
62	12/15/15	7.630	62	5	12	-0.8002	-0.8002	

Sen's slope estimate
MW-28S

data point	Date	Fluoride mg/l	Slope point	point A	Point B	slope umol/l/yea	Sorted slope	
1	1/1/99	170	1	1	2	-308.4333	-308.4333	**ian Slope** (umol/L/y
2	4/1/99	94	2	2	3	-40.1374	-40.13736	**-4.727892**
3	7/1/99	84	3	1	3	-173.5442	-173.5442	
4	10/1/99	130	4	3	4	182.6250	182.625	**Average Slope**
5	1/1/00	109	5	2	4	71.8525	71.852459	**-5.9046**
6	4/1/00	100	6	1	4	-53.5165	-53.51648	
8	10/1/00	126.8	8	3	5	49.6264	49.626359	
9	1/1/01	120.9	9	2	5	19.9227	19.922727	
10	4/1/01	90.7	10	1	5	-61.0418	-61.04178	
11	7/1/01	81.57	11	5	6	-36.1236	-36.1236	
12	10/1/01	84.2	12	4	6	-59.8770	-59.8770	
13	1/1/02	81.04	13	3	6	21.2509	21.250909	
14	4/1/02	68.86	14	2	6	5.9877	5.9877049	
15	7/1/02	67.74	15	1	6	-56.0691	-56.06908	
16	10/1/02	78.91	16	6	7	0.0000	0	
17	1/1/03	69.25	17	5	7	-18.0618	-18.0618	
18	4/1/03	55.12	18	4	7	-39.9909	-39.99088	
19	7/1/03	45.15	19	3	7	15.9672	15.967213	
20	10/1/03	55.63	20	2	7	4.7954	4.7954048	
21	1/20/04	46.04	21	1	7	-46.7413	-46.74132	
22	4/21/04	50.64	22	7	8	106.3989	106.39891	
23	7/20/04	41.34	23	6	8	53.4902	53.490164	
24	10/27/04	55.2	24	5	8	23.7279	23.7279	
25	1/19/05	61.2	25	4	8	-3.1934	-3.193443	
26	4/28/05	48.815	26	3	8	34.1325	34.132533	
27	7/19/05	43.78	27	2	8	21.8219	21.821858	
28	10/26/05	41.37	28	1	8	-24.6930	-24.6930	
29	1/17/06	44.21	29	8	9	-23.4236	-23.4236	
30	4/27/06	36.05	30	7	9	41.4876	41.487636	
31	7/13/06	34.09	31	6	9	27.7590	27.759	
32	10/26/06	33.77	32	5	9	11.8756	11.875615	
33	1/25/07	32.99	33	4	9	-7.2572	-7.257151	
34	4/26/07	31.46	34	3	9	24.5050	24.504955	
35	8/16/07	19.23	35	2	9	15.3280	15.327964	
36	10/25/07	19.99	36	1	9	-24.5332	-24.53321	
37	1/31/08	25.87	37	9	10	-122.5617	-122.5617	
38	4/16/08	21.54	38	8	10	-72.4479	-72.44794	
39	7/23/08	16.34	39	7	10	-12.3972	-12.39717	
40	10/17/08	14.93	40	6	10	-9.3064	-9.3064	
41	1/13/09	16.4	41	5	10	-14.6581	-14.65806	
42	4/28/09	15.35	42	4	10	-26.1940	-26.19402	
43	7/28/09	15.38	43	3	10	3.8237	3.8237109	
44	10/27/09	16.15	44	2	10	-1.6489	-1.648871	
45	2/15/10	14.56	45	1	10	-35.2793	-35.27932	
46	6/9/10	16.03	46	10	11	-36.6454	-36.64541	
47	9/23/10	19.12	47	9	11	-79.3662	-79.3662	
48	12/16/10	17.13	48	8	11	-60.5138	-60.51376	
49	3/15/11	16.4	49	7	11	-18.4426	-18.44262	
50	6/28/2011	15.65	50	6	11	-14.7622	-14.76219	
51	9/21/11	12.8	51	5	11	-18.3159	-18.3159	
52	12/14/11	15.5	52	4	11	-27.6824	-27.68241	
53	2/21/12	12.7	53	3	11	-1.2142	-1.214169	
54	7/16/12	11.95	54	2	11	-5.5232	-5.523184	
55	10/17/12	12.25	55	1	11	-35.4156	-35.41563	
56	12/19/12	12.9	56	11	12	10.4414	10.441386	
57	6/18/2013	11.35	57	10	12	-12.9734	-12.97336	
58	12/11/2013	10.9	58	9	12	-49.1014	-49.10137	
59	6/10/14	9.5	59	8	12	-42.6292	-42.62918	
60	12/16/14	10.615	60	7	12	-12.6279	-12.6279	
61	7/21/15	10	61	6	12	-10.5309	-10.53093	
62	12/15/15	13.4	62	5	12	-14.1756	-14.17559	

Sen's slope estimate
MW-36

data point	Date	Aluminum mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	1.1	1	1	2	-2.5568	-2.55675
2	4/1/99	0.47	2	2	3	-0.0401	-0.04013736
3	7/1/99	0.46	3	1	3	-1.2915	-1.29149171
4	10/1/99	0.31	4	3	4	-0.5955	-0.5955163
5	1/1/00	0.48	5	2	4	-0.3193	-0.31934426
6	4/1/00	1	6	1	4	-1.0570	-1.05695055
7	7/1/00	0.53	7	4	5	0.6749	0.674918478
8	10/1/00	0.2100	8	3	5	0.0397	0.039701087
9	1/1/01	0.24	9	2	5	0.0133	0.013281818
10	4/1/01	3.79	10	1	5	-0.6204	-0.62042466
11	7/1/01	1.7	11	5	6	2.0871	2.0871
12	10/1/01	1.09	12	4	6	1.3772	1.377172131
13	1/1/02	0.71	13	3	6	0.7172	0.717218182
14	4/1/02	0.14	14	2	6	0.5289	0.5289
15	7/1/02	0.29	15	1	6	-0.0801	-0.08009868
16	10/1/02	0.085	16	6	7	-1.8865	-1.88645604
17	1/1/03	5.672	17	5	7	0.1003	0.100343407
18	4/1/03	62.53	18	4	7	0.2933	0.2933
19	7/1/03	37.19	19	3	7	0.0699	0.069856557
20	10/1/03	98.57	20	2	7	0.0480	0.047954048
21	1/20/04	54.29	21	1	7	-0.3806	-0.38060786
22	4/21/04	65.49	22	7	8	-1.2704	-1.27043478
23	7/21/04	52.55	23	6	8	-1.5768	-1.5767623
24	10/27/04	44.15	24	5	8	-0.3599	-0.35991788
25	1/19/05	85.78	25	4	8	-0.0998	-0.09979508
26	4/28/05	57.42	26	3	8	-0.1994	-0.19937227
27	7/19/05	48.23	27	2	8	-0.1730	-0.17297814
28	10/25/05	51.75	28	1	8	-0.5087	-0.50872066
29	1/17/06	46.69	29	8	9	0.1191	0.119103261
30	4/27/06	41.55	30	7	9	-0.5757	-0.57566576
31	7/13/06	77.12	31	6	9	-1.0094	-1.00941818
32	10/27/06	3.292	32	5	9	-0.2395	-0.2395082
33	1/24/07	41.7	33	4	9	-0.0558	-0.05582424
34	4/26/07	39.65	34	3	9	-0.1461	-0.1461
35	8/16/07	138	35	2	9	-0.1311	-0.13105694
36	10/25/07	50.13	36	1	9	-0.4297	-0.42970588
37	1/30/08	153	37	9	10	14.4071	14.40708333
38	4/15/08	4.279	38	8	10	7.1846	7.184587912
39	7/22/08	356.4	39	7	10	4.3457	4.345675182
40	10/16/08	5.046	40	6	10	2.7919	2.7919
41	1/13/09	65.7	41	5	10	2.6513	2.651266447
42	4/28/09	9.73	42	4	10	2.3195	2.319470803
43	7/28/09	2.82	43	3	10	1.9004	1.900441406
44	10/27/09	743	44	2	10	1.6589	1.658864569
45	2/11/10	0.319	45	1	10	1.1967	1.196738733
46	6/9/10	347.2	46	10	11	-8.3887	-8.38870879
47	9/22/10	4.344	47	9	11	2.9462	2.94621547
48	12/21/10	4.392	48	8	11	1.9935	1.993489011
49	3/17/11	7	49	7	11	1.1708	1.17080137
50	6/22/2011	81.2	50	6	11	0.5607	0.560690789
51	9/20/2011	96.1	51	5	11	0.8146	0.814634369
52	12/15/11	159	52	4	11	0.7945	0.794518779
53	2/14/12	15.5	53	3	11	0.6196	0.619575923
54	7/10/12	7.5	54	2	11	0.5465	0.546541971
55	9/25/12	5.54	55	1	11	0.2403	0.240296053
56	12/18/12	3.34	56	11	12	-2.4218	-2.4218
57	6/20/2013	59	57	10	12	-5.3889	-5.38893443
58	12/12/2013	89.6	58	9	12	1.1372	1.137225275
59	6/11/14	99.300	59	8	12	0.8806	0.88060274

Median Slope (umol/L/year)

1.200696

Average Slope

3.3087

Sen's slope estimate
MW-36

data point	Date	Sulfate mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope	
1	1/1/99	340	1	1	2	446.4167	446.4166667	**Median Slope** (umol/L/year)
2	4/1/99	450	2	2	3	722.4725	722.4725275	**-13.725694**
3	7/1/99	630	3	1	3	585.2072	585.2071823	
4	10/1/99	610	4	3	4	-79.4022	-79.4022	**Average Slope**
5	1/1/00	530	5	2	4	319.3443	319.3442623	**-7.9777**
6	4/1/00	500	6	1	4	361.2363	361.2362637	
7	7/1/00	510	7	4	5	-317.6087	-317.608696	
8	10/1/00	513	8	3	5	-198.5054	-198.505435	
9	1/1/01	625.27	9	2	5	106.2545	106.2545455	
10	4/1/01	662.1	10	1	5	190.1301	190.130137	
11	7/1/01	667.04	11	5	6	-120.4121	-120.412088	
12	10/1/01	643.59	12	4	6	-219.5492	-219.54918	
13	1/1/02	652.2	13	3	6	-172.6636	-172.663636	
14	4/1/02	683.09	14	2	6	49.8975	49.89754098	
15	7/1/02	664.98	15	1	6	128.1579	128.1578947	
16	10/1/02	663.54	16	6	7	40.1374	40.13736264	
17	1/1/03	697.287	17	5	7	-40.1374	-40.1373626	
18	4/1/03	719.1	18	4	7	-133.3029	-133.30292	
19	7/1/03	691.32	19	3	7	-119.7541	-119.754098	
20	10/1/03	692.35	20	2	7	47.9540	47.95404814	
21	1/20/04	680	21	1	7	113.5146	113.5146252	
22	4/21/04	690.91	22	7	8	11.9103	11.91032609	
23	7/21/04	682.47	23	6	8	25.9467	25.94672131	
24	10/27/04	637.83	24	5	8	-22.6615	-22.6614964	
25	1/19/05	675.18	25	4	8	-96.8012	-96.8012295	
26	4/28/05	703.41	26	3	8	-93.3062	-93.3062227	
27	7/19/05	682.1	27	2	8	41.9139	41.91393443	
28	10/25/05	656.68	28	1	8	98.8862	98.88615023	
29	1/17/06	639.53	29	8	9	445.7241	445.7241033	
30	4/27/06	626.05	30	7	9	228.8172	228.8172147	
31	7/13/06	665.24	31	6	9	166.3813	166.3813364	
32	10/27/06	491.78	32	5	9	95.0748	95.07477459	
33	1/24/07	562.15	33	4	9	12.1777	12.1776583	
34	4/26/07	575.81	34	3	9	-3.1412	-3.14115	
35	8/16/07	514.74	35	2	9	99.8711	99.87108814	
36	10/25/07	520	36	1	9	142.5374	142.5374384	
37	1/30/08	498	37	9	10	149.4684	149.4684167	
38	4/15/08	629	38	8	10	299.2240	299.2240385	
39	7/22/08	595	39	7	10	202.7537	202.7537409	
40	10/16/08	588	40	6	10	162.2110	162.2110274	
41	1/13/09	589	41	5	10	105.8104	105.8103618	
42	4/28/09	511	42	4	10	34.7254	34.72541058	
43	7/28/09	590	43	3	10	18.3196	18.31957031	
44	10/27/09	566	44	2	10	105.9775	105.9774624	
45	2/11/10	613	45	1	10	143.2972	143.297229	
46	6/9/10	426	46	10	11	19.8279	19.82785714	
47	9/22/10	42.5	47	9	11	84.2900	84.29001381	
48	12/21/10	432	48	8	11	206.0920	206.091978	
49	3/17/11	421	49	7	11	157.1476	157.1475616	
50	6/22/11	424	50	6	11	133.7968	133.7968421	
51	9/20/11	432	51	5	11	91.5061	91.5061426	
52	12/15/11	443	52	4	11	32.6038	32.60384977	
53	2/14/12	424	53	3	11	18.5073	18.50733242	
54	7/10/12	213	54	2	11	96.4402	96.44021898	
55	9/25/12	446	55	1	11	130.9774	130.9773684	
56	12/18/12	401	56	11	12	-93.0990	-93.0990489	
57	6/20/13	447	57	10	12	-36.9441	-36.9441393	
58	12/12/13	411	58	9	12	24.5105	24.51054945	
59	6/17/14	426	59	8	12	130.6794	130.6794452	

Sen's slope estimate
MW-36

data point	Date	Fluoride mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope	
1	1/1/99	3.6	1	1	2	-2.8408	-2.84083333	**Median Slope** (umol/L/year)
2	4/1/99	2.9	2	2	3	-2.8096	-2.80961538	**-0.079567**
3	7/1/99	2.2	3	1	3	-2.8251	-2.82513812	
4	10/1/99	2.9	4	3	4	2.7791	2.7791	**Average Slope**
5	1/1/00	1.7	5	2	4	0.0000	0	**0.0313**
6	4/1/00	3.4	6	1	4	-0.9365	-0.93653846	
7	7/1/00	3.3	7	4	5	-4.7641	-4.76413043	
8	10/1/00	3.479	8	3	5	-0.9925	-0.99252717	
9	1/1/01	3.484	9	2	5	-1.5938	-1.59381818	
10	4/1/01	3.589	10	1	5	-1.9013	-1.90130137	
11	7/1/01	3.697	11	5	6	6.8234	6.823351648	
12	10/1/01	3.291	12	4	6	0.9980	0.99795082	
13	1/1/02	3.397	13	3	6	1.5938	1.593818182	
14	4/1/02	3.081	14	2	6	0.4990	0.49897541	
15	7/1/02	3.519	15	1	6	-0.1602	-0.16019737	
16	10/1/02	3.481	16	6	7	-0.4014	-0.40137363	
17	1/1/03	3.748	17	5	7	3.2110	3.210989011	
18	4/1/03	3.629	18	4	7	0.5332	0.533211679	
19	7/1/03	3.772	19	3	7	1.0977	1.097745902	
20	10/1/03	3.541	20	2	7	0.3197	0.319693654	
21	1/20/04	3.519	21	1	7	-0.2003	-0.20031993	
22	4/21/04	3.391	22	7	8	0.7106	0.710649457	
23	7/21/04	3.754	23	6	8	0.1577	0.15767623	
24	10/27/04	3.8	24	5	8	2.3715	2.371458942	
25	1/19/05	3.291	25	4	8	0.5778	0.577813525	
26	4/28/05	3.501	26	3	8	1.0200	1.019988537	
27	7/19/05	3.516	27	2	8	0.3852	0.385209016	
28	10/25/05	2.613	28	1	8	-0.0692	-0.0692	
29	1/17/06	3.259	29	8	9	0.0199	0.019850543	
30	4/27/06	2.61	30	7	9	0.3653	0.36525	
31	7/13/06	2.909	31	6	9	0.1116	0.111567273	
32	10/27/06	3.152	32	5	9	1.7803	1.780344262	
33	1/24/07	2.833	33	4	9	0.4657	0.465733624	
34	4/26/07	2.955	34	3	9	0.8527	0.852692727	
35	8/16/07	2.731	35	2	9	0.3328	0.332770671	
36	10/25/07	2.822	36	1	9	-0.0580	-0.05796033	
37	1/30/08	2.741	37	9	10	0.4261	0.426125	
38	4/15/08	3.014	38	8	10	0.2208	0.220755495	
39	7/22/08	3.608	39	7	10	0.3852	0.385245438	
40	10/16/08	3.899	40	6	10	0.1891	0.189129452	
41	1/13/09	2.45	41	5	10	1.5131	1.513064145	
42	4/28/09	2.313	42	4	10	0.4592	0.459228558	
43	7/28/09	2.333	43	3	10	0.7927	0.792706641	
44	10/27/09	2.349	44	2	10	0.3443	0.344264364	
45	2/11/10	2.855	45	1	10	-0.0049	-0.00489373	
46	6/9/10	2.369	46	10	11	0.4335	0.433483516	
47	9/22/10	2.431	47	9	11	0.4298	0.4298	
48	12/21/10	2.3	48	8	11	0.2917	0.291664835	
49	3/17/11	2.08	49	7	11	0.3973	0.397271918	
50	6/22/2011	2.56	50	6	11	0.2379	0.237893092	
51	9/20/2011	1.99	51	5	11	1.3335	1.33346298	
52	12/15/11	2.23	52	4	11	0.4556	0.455562207	
53	2/16/12	2.37	53	3	11	0.7480	0.74798803	
54	7/12/12	2.1	54	2	11	0.3541	0.354141423	
55	10/16/12	2.03	55	1	11	0.0388	0.038847862	
56	12/20/12	2.09	56	11	12	-1.6119	-1.61186413	
57	6/20/13	2.13	57	10	12	-0.5948	-0.59477869	
58	12/12/13	1.995	58	9	12	-0.2582	-0.25821703	
59	6/11/14	1.99	59	8	12	-0.1881	-0.18812877	

Sen's slope estimate

MW-37

data point	Date	Aluminum mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	0.29	1	1	2	-0.1623	-0.16233333
2	4/1/99	0.25	2	2	3	-0.1605	-0.16054945
3	7/1/99	0.21	3	1	3	-0.1614	-0.16143646
4	10/1/99	0.1	4	3	4	-0.4367	-0.43671196
5	1/1/00	0.4	5	2	4	-0.2994	-0.29938525
6	4/1/00	0.26	6	1	4	-0.2542	-0.2542033
7	7/1/00	0.22	7	4	5	1.1910	1.191032609
8	10/1/00	0.0500	8	3	5	0.3772	0.377160326
9	1/1/01	0.99	9	2	5	0.1992	0.199227273
10	4/1/01	0.24	10	1	5	0.1101	0.110075342
11	7/1/01	6.2	11	5	6	-0.5619	-0.56192308
12	10/1/01	0.24	12	4	6	0.3193	0.319344262
13	1/1/02	0.44	13	3	6	0.0664	0.066409091
14	4/1/02	0.8	14	2	6	0.0100	0.009979508
15	7/1/02	0.5	15	1	6	-0.0240	-0.02402961
16	10/1/02	0.4	16	6	7	-0.1605	-0.16054945
17	1/1/03	0.428	17	5	7	-0.3612	-0.3612
18	4/1/03	28.77	18	4	7	0.1600	0.159963504
19	7/1/03	30.82	19	3	7	0.0100	0.009979508
20	10/1/03	53.38	20	2	7	-0.0240	-0.02397702
21	1/20/04	34.69	21	1	7	-0.0467	-0.04674132
22	4/21/04	71.34	22	7	8	-0.6749	-0.67491848
23	7/21/04	95.7	23	6	8	-0.4191	-0.41913934
24	10/27/04	68.6	24	5	8	-0.4666	-0.46656022
25	1/19/05	266.77	25	4	8	-0.0499	-0.04989754
26	4/28/05	66.93	26	3	8	-0.1276	-0.12759825
27	7/19/05	46.11	27	2	8	-0.1331	-0.13306011
28	10/25/05	3.092	28	1	8	-0.1372	-0.1371831
29	1/17/06	89.08	29	8	9	3.7319	3.731902174
30	4/27/06	25.75	30	7	9	1.5285	1.528491848
31	7/13/06	89.2	31	6	9	0.9696	0.969572727
32	10/27/06	44.112	32	5	9	0.5888	0.588790984
33	1/24/07	24.32	33	4	9	0.7098	0.709765284
34	4/26/07	75.61	34	3	9	0.5180	0.517990909
35	8/16/07	227.1	35	2	9	0.4217	0.421661466
36	10/25/07	54.58	36	1	9	0.3498	0.349760602
37	1/30/08	193	37	9	10	-3.0438	-3.04375
38	4/15/08	123.2	38	8	10	0.3813	0.381304945
39	7/22/08	5.527	39	7	10	0.0267	0.026660584
40	10/16/08	6.868	40	6	10	-0.0200	-0.0200137
41	1/13/09	5.36	41	5	10	-0.1282	-0.12815789
42	4/28/09	50.2	42	4	10	0.0933	0.093312044
43	7/28/09	7.48	43	3	10	0.0171	0.017121094
44	10/27/09	2.744	44	2	10	-0.0050	-0.00499658
45	2/11/10	9.296	45	1	10	-0.0222	-0.02224421
46	6/9/10	115.9	46	10	11	23.9219	23.92186813
47	9/22/10	5.427	47	9	11	10.5135	10.51354972
48	3/17/11	7.72	48	8	11	8.2282	8.228159341
49	6/22/2011	67.7	49	7	11	5.9841	5.98409589
50	9/20/2011	70.3	50	6	11	4.7579	4.757861842
51	12/15/11	78.3	51	5	11	3.8729	3.87285192
52	2/14/12	46.2	52	4	11	3.4867	3.486737089
53	7/10/12	117	53	3	11	2.9930	2.992951436
54	9/25/12	55.6	54	2	11	2.6438	2.643841241
55	12/18/12	170	55	1	11	2.3669	2.366916118
56	6/20/2013	117	56	11	12	-23.6618	-23.6618478
57	12/12/2013	293	57	10	12	0.0000	0
58	6/11/14	351.00000	58	9	12	-1.0034	-1.00343407
59	12/16/14	473.00000	59	8	12	0.1901	0.190130137

Median Slope (umol/L/year)

3.497304

Average Slope

6.1576

Sen's slope estimate
MW-37

data point	Date	Sulfate mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	250	1	1	2	-121.7500	-121.75
2	4/1/99	220	2	2	3	361.2363	361.2362637
3	7/1/99	310	3	1	3	121.0773	121.0773481
4	10/1/99	280	4	3	4	-119.1033	-119.103261
5	1/1/00	220	5	2	4	119.7541	119.7540984
6	4/1/00	270	6	1	4	40.1374	40.13736264
7	7/1/00	260	7	4	5	-238.2065	-238.206522
8	10/1/00	278	8	3	5	-178.6549	-178.654891
9	1/1/01	267.06	9	2	5	0.0000	0
10	4/1/01	274.68	10	1	5	-30.0205	-30.0205
11	7/1/01	260.89	11	5	6	200.6868	200.6868132
12	10/1/01	274.06	12	4	6	-19.9590	-19.9590164
13	1/1/02	273.24	13	3	6	-53.1273	-53.1272727
14	4/1/02	275.09	14	2	6	49.8975	49.89754098
15	7/1/02	247.93	15	1	6	16.0197	16.01973684
16	10/1/02	284.96	16	6	7	-40.1374	-40.1373626
17	1/1/03	285.992	17	5	7	80.2747	80.27472527
18	4/1/03	305.54	18	4	7	-26.6606	-26.6605839
19	7/1/03	279.2	19	3	7	-49.8975	-49.897541
20	10/1/03	284.14	20	2	7	31.9694	31.96936543
21	1/20/04	291.14	21	1	7	6.6773	6.677330896
22	4/21/04	283.52	22	7	8	71.4620	71.46195652
23	7/21/04	290.52	23	6	8	15.9672	15.96721311
24	10/27/04	265.57	24	5	8	77.3157	77.31569343
25	1/19/05	275.92	25	4	8	-1.9959	-1.99590164
26	4/28/05	287.04	26	3	8	-25.5197	-25.5196507
27	7/19/05	284.8	27	2	8	38.5874	38.58743169
28	10/25/05	306.65	28	1	8	16.0047	16.00469484
29	1/17/06	326.04	29	8	9	-43.4330	-43.4329891
30	4/27/06	269	30	7	9	14.0145	14.0144837
31	7/13/06	297.92	31	6	9	-3.9049	-3.90485455
32	10/27/06	256.47	32	5	9	46.9636	46.96356557
33	1/24/07	280.1	33	4	9	-10.3195	-10.3195087
34	4/26/07	278.52	34	3	9	-28.5161	-28.5160636
35	8/16/07	293.42	35	2	9	26.8154	26.81539002
36	10/25/07	290	36	1	9	8.5242	8.524165527
37	1/30/08	270	37	9	10	30.9245	30.9245
38	4/15/08	287	38	8	10	-6.6628	-6.6628022
39	7/22/08	292	39	7	10	19.5689	19.56886861
40	10/16/08	271	40	6	10	4.6832	4.683205479
41	1/13/09	311	41	5	10	43.7980	43.79796053
42	4/28/09	271	42	4	10	-3.5459	-3.54585766
43	7/28/09	270	43	3	10	-20.1572	-20.1572344
44	10/27/09	283	44	2	10	27.3213	27.32129959
45	2/11/10	301	45	1	10	10.9797	10.97974421
46	6/9/10	276	46	10	11	-55.3494	-55.3494231
47	9/22/10	28	47	9	11	-12.4508	-12.4507873
48	12/21/10	285	48	8	11	-22.8917	-22.8916758
49	3/17/11	293	49	7	11	0.8906	0.890609589
50	6/22/2011	279	50	6	11	-7.2970	-7.29699013
51	9/20/2011	287	51	5	11	27.3036	27.3036
52	12/15/11	296	52	4	11	-10.9232	-10.9232042
53	2/14/12	282	53	3	11	-24.5382	-24.5382045
54	7/10/12	176	54	2	11	18.1692	18.16918796
55	9/25/12	283	55	1	11	4.3614	4.361373355
56	12/18/12	297	56	11	12	52.2863	52.28633152
57	6/20/2013	304	57	10	12	-1.2375	-1.23745902
58	12/12/2013	290	58	9	12	9.3654	9.3654
59	6/11/14	299.00	59	8	12	-3.9427	-3.94269863

Median Slope (umol/L/year)

1.482131

Average Slope
1.5744

Sen's slope estimate
MW-38

data point	Date	Aluminum mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1/1/99	0.69	1	1	2	-1.2987	-1.29866667
2	4/1/99	0.37	2	2	3	-0.0401	-0.04013736
3	7/1/99	0.36	3	1	3	-0.6659	-0.66592541
4	10/1/99	0.27	4	3	4	-0.3573	-0.35730978
5	1/1/00	0.51	5	2	4	-0.1996	-0.19959016
6	4/1/00	3.3	6	1	4	-0.5619	-0.5619
7	7/1/00	0.37	7	4	5	0.9528	0.952826087
8	10/1/00	0.1300	8	3	5	0.2978	0.297758152
9	1/1/01	0.78	9	2	5	0.1859	0.185945455
10	4/1/01	0.4	10	1	5	-0.1801	-0.18012329
11	7/1/01	13.47	11	5	6	11.1983	11.19832418
12	10/1/01	0.48	12	4	6	6.0476	6.047581967
13	1/1/02	0.73	13	3	6	3.9049	3.904854545
14	4/1/02	0.86	14	2	6	2.9240	2.923995902
15	7/1/02	0.54	15	1	6	2.0906	2.090575658
16	10/1/02	1.484	16	6	7	-11.7602	-11.7602473
17	1/1/03	22.28	17	5	7	-0.2810	-0.28096154
18	4/1/03	33.63	18	4	7	0.1333	0.13330292
19	7/1/03	36.27	19	3	7	0.0100	0.0100
20	10/1/03	116.7	20	2	7	0.0000	0
21	1/20/04	106.4	21	1	7	-0.2137	-0.2137
22	4/21/04	43.29	22	7	8	-0.9528	-0.95282609
23	7/21/04	106.25	23	6	8	-6.3270	-6.3270082
24	10/27/04	148.34	24	5	8	-0.5066	-0.50655109
25	1/19/05	109.48	25	4	8	-0.1397	-0.13971311
26	4/28/05	116.51	26	3	8	-0.1834	-0.1834
27	7/19/05	82.35	27	2	8	-0.1597	-0.15967213
28	10/25/05	10.798	28	1	8	-0.3201	-0.3200939
29	1/17/06	98.23	29	8	9	2.5806	2.580570652
30	4/27/06	34.74	30	7	9	0.8139	0.813872283
31	7/13/06	134.6	31	6	9	-3.3470	-3.34701818
32	10/27/06	4.045	32	5	9	0.2694	0.269446721
33	1/24/07	48.55	33	4	9	0.4067	0.406719432
34	4/26/07	133.3	34	3	9	0.2789	0.278918182
35	8/16/07	75.3	35	2	9	0.2336	0.233623245
36	10/25/07	165.8	36	1	9	0.0450	0.04496922
37	1/30/08	298	37	9	10	-1.5422	-1.54216667
38	4/15/08	242.7	38	8	10	0.5419	0.541854396
39	7/22/08	469.5	39	7	10	0.0400	0.039990876
40	10/16/08	6.278	40	6	10	-2.9020	-2.9019863
41	1/13/09	16	41	5	10	-0.0881	-0.08810855
42	4/28/09	202	42	4	10	0.0866	0.086646898
43	7/28/09	156	43	3	10	0.0228	0.022828125
44	10/27/09	36.06	44	2	10	0.0150	0.01498974
45	2/11/10	4.413	45	1	10	-0.1290	-0.12901644
46	6/9/10	100.5	46	10	11	52.4595	52.45953297
47	9/22/10	2.151	47	9	11	25.6079	25.60785912
48	12/21/10	161.6	48	8	11	17.8477	17.84774725
49	3/23/11	822	49	7	11	13.1090	13.1089726
50	6/22/2011	368	50	6	11	8.1460	8.146036184
51	9/20/2011	352	51	5	11	8.6538	8.653820841
52	12/15/11	251	52	4	11	7.5451	7.545070423
53	2/14/12	126	53	3	11	6.5505	6.550516416
54	7/10/12	102	54	2	11	5.8209	5.820894161
55	9/25/12	104	55	1	11	5.1183	5.118305921
56	12/18/12	105	56	11	12	-51.5717	-51.571712
57	6/20/2013	38	57	10	12	0.1597	0.1597
58	12/12/2013	83.5	58	9	12	-0.4014	-0.40137363
59	6/11/14	105.00	59	8	12	0.3502	0.350239726

Median Slope (umol/L/year)

2.625140

Average Slope

6.9419

slope estimate

MW-39S

data point	Date	Aluminum mg/l	Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	4/1/99	0.44	1	1	2	0.8027	0.802747253
2	7/1/99	0.64	2	2	3	-1.8660	-1.86595109
3	10/1/99	0.17	3	1	3	-0.5389	-0.53889344
4	1/1/00	5.2	4	3	4	19.9696	19.96964674
5	4/1/00	0.4	5	2	4	9.0518	9.051847826
6	7/1/00	0.4	6	1	4	6.3221	6.322145455
7	10/1/00	0.05	7	4	5	-19.2659	-19.2659341
8	1/1/01	2.44	8	3	5	0.4591	0.459057377
9	4/1/01	5.12	9	2	5	-0.3188	-0.31876364
10	7/1/01	14.4	10	1	5	-0.0399	-0.03991803
11	10/1/01	0.43	11	5	6	0.0000	0
12	1/1/02	0.19	12	4	6	-9.6330	-9.63296703
13	4/1/02	0.9	13	3	6	0.3066	0.306596715
14	7/1/02	1.02	14	2	6	-0.2395	-0.2395082
15	10/1/02	0.253	15	1	6	-0.0320	-0.03196937
16	1/1/03	12.19	16	6	7	-1.3895	-1.38953804
17	4/1/03	64.28	17	5	7	-0.6986	-0.69856557
18	7/1/03	0.098	18	4	7	-6.8651	-6.86510036
19	10/1/03	12.44	19	3	7	-0.1198	-0.1197541
20	1/20/04	8.646	20	2	7	-0.4705	-0.47051856
21	4/21/04	13.063	21	1	7	-0.2595	-0.25946721
22	7/20/04	11.82	22	7	8	9.4886	9.4886
23	10/27/04	24.04	23	6	8	4.0495	4.04951087
24	1/18/05	34.73	24	5	8	2.7095	2.709490909
25	4/27/05	5.41	25	4	8	-2.7543	-2.75434426
26	7/19/05	14.18	26	3	8	1.8103	1.810300218
27	10/25/05	29.79	27	2	8	1.1954	1.195363636
28	1/17/06	19.12	28	1	8	1.1396	1.139625585
29	4/26/06	7.91	29	8	9	10.8763	10.87633333
30	7/12/06	8.5165	30	7	9	10.1748	10.17482143
31	10/25/06	0.522	31	6	9	6.2919	6.29189781
32	1/23/07	1.93	32	5	9	4.7232	4.723232877
33	4/24/07	4.115	33	4	9	-0.0641	-0.06407895
34	8/14/07	10.94	34	3	9	3.2992	3.299247263
35	10/23/07	0.934	35	2	9	2.5568	2.55675
36	1/29/08	98.7	36	1	9	2.3384	2.338399453
37	4/15/08	299.5	37	9	10	37.2475	37.24747253
38	7/23/08	63.02	38	8	10	24.1348	24.13475138
39	10/16/08	418.9	39	7	10	19.1990	19.19903846
40	1/13/09	101	40	6	10	14.0096	14.00958904
41	4/28/09	22.4	41	5	10	11.2138	11.21381579
42	7/28/09	43	42	4	10	6.1431	6.143144424
43	10/27/09	28.565	43	3	10	8.1338	8.133814554
44	2/9/10	41.84	44	2	10	6.8753	6.875294118
45	6/8/10	9.402	45	1	10	6.2030	6.203029197
46	9/21/10	4.244	46	10	11	-55.4624	-55.4624185
47	12/14/10	10.43	47	9	11	-9.3608	-9.36077869
48	3/2/11	35.2	48	8	11	-2.6892	-2.6892033
49	6/22/2011	15.6	49	7	11	0.3803	0.380260274
50	9/14/2011	0.86	50	6	11	0.0240	0.023977024
51	12/13/11	61.1	51	5	11	0.0200	0.019995438
52	2/14/12	37.7	52	4	11	-2.7265	-2.72651408
53	7/10/12	25.9	53	3	11	0.1299	0.129911081
54	9/25/12	8.08	54	2	11	-0.0932	-0.09319866
55	12/18/12	48.2	55	1	11	-0.0040	-0.00399617
56	2/7/2013	35.9	56	11	12	-0.9528	-0.95282609
57	6/18/2013	53.4	57	10	12	-28.2076	-28.2076
58	9/24/2013	38.7	58	9	12	-6.5479	-6.54793636
59	12/10/2013	25.4	59	8	12	-2.2515	-2.2515411

Median Slope (umol/L/year)

0.466170

Average Slope

0.4914

Sen's slope estimate
MW-35SR

data point	Date	Aluminum mg/l
1	4/16/2008	80.78
2	7/23/2008	145.1
3	1/19/2009	127
4	4/28/2009	3.51
5	7/29/2009	53.2
6	10/28/2009	32.33
7	2/11/2010	20.55
8	6/9/2010	15.18
9	9/22/2010	23.5
10	12/16/2010	34.73
11	3/2/2011	5.39
12	6/22/2011	67.2
13	9/20/2011	38.8
14	12/15/2011	68.4
15	2/16/12	50.2
16	7/12/12	71.6
17	10/16/12	122
18	12/19/12	16.95
19	6/19/2013	51.1
20	12/12/2013	49.9
21	6/11/14	66.30
22	12/16/14	44.65
23	7/28/15	14.60
24	12/15/15	17.60
25	6/23/16	10.20
26	1/10/17	13.80
27	1/25/17	12.60
28	6/15/17	11.70
29	6/19/18	4.71
30	12/20/18	2.48
31	6/26/19	14.50
32	12/6/19	12.90
33	6/11/20	5.06
34	12/3/20	9.75

Slope poin	point A	Point B	lope umol/l/ye	Sorted slope
1	1	2	239.7233	239.72327
2	2	3	-36.7279	-36.72792
3	1	3	60.7261	60.726097
4	3	4	-455.6033	-455.6033
5	2	4	-185.3611	-185.3611
6	1	4	-74.8617	-74.86172
7	4	5	197.2747	197.2747
8	3	5	-141.1280	-141.128
9	2	5	-90.4757	-90.47567
10	1	5	-21.4789	-21.47888
11	5	6	-83.7667	-83.76668
12	4	6	57.5219	57.521885
13	3	6	-122.6178	-122.6178
14	2	6	-89.1542	-89.1542
15	1	6	-31.6006	-31.60065
16	6	7	-40.5910	-40.59099
17	5	7	-60.5351	-60.53509
18	4	7	21.5358	21.535848
19	3	7	-100.2084	-100.2084
20	2	7	-80.0914	-80.09135
21	1	7	-33.0315	-33.03154
22	7	8	-16.6220	-16.62197
23	6	8	-27.9645	-27.96445
24	5	8	-44.0851	-44.0851
25	4	8	10.4729	10.472893
26	3	8	-80.7159	-80.71592
27	2	8	-69.1739	-69.17388
28	1	8	-30.5617	-30.56173
29	8	9	28.9417	28.941714
30	7	9	4.8318	4.8317825
31	6	9	-9.8029	-9.80291
32	5	9	-25.8284	-25.82839
33	4	9	14.2604	14.260444
34	3	9	-61.8713	-61.87132
35	2	9	-56.1497	-56.14968
36	1	9	-23.5338	-23.53377
37	9	10	48.2560	48.255971
38	8	10	37.5823	37.5823
39	7	10	16.8157	16.815731
40	6	10	2.1174	2.1173913
41	5	10	-13.3587	-13.35875
42	4	10	19.1007	19.100678
43	3	10	-48.4219	-48.42186
44	2	10	-46.0190	-46.019
45	1	10	-17.2688	-17.26875
46	10	11	-141.0057	-141.0057
47	9	11	-41.0850	-41.08495
48	8	11	-13.4428	-13.44285
49	7	11	-14.4198	-14.41977
50	6	11	-20.0813	-20.0813
51	5	11	-30.0561	-30.05611
52	4	11	1.0203	1.0203
53	3	11	-57.5363	-57.53634
54	2	11	-53.6020	-53.60197
55	1	11	-26.2250	-26.22495
56	11	12	201.5723	201.57234
57	10	12	63.0833	63.083338
58	9	12	58.4668	58.466758
59	8	12	50.2654	50.265357

dian Slope (umol/L/ye

-3.892008

Average Slope

-5.8388

Sen's slope estimate
FDRAIN

data point	Date	Cyanide mg/l
1	6/28/06	2.09
2	7/12/06	2.44
3	10/26/06	1.16
4	1/24/07	1.13
5	4/24/07	1.04
6	8/15/07	0.018
7	10/25/07	1.4
8	1/31/08	1.61
9	7/23/08	0.66
10	4/28/09	0.531
11	7/28/09	0.806
12	10/27/09	0.607
13	2/15/10	1.02
14	6/9/10	1.7
15	9/23/10	2.42
16	12/21/10	0.647
17	3/2/11	1.12
18	6/27/2011	0.895
19	9/20/2011	2.19
20	12/14/11	1.55
21	2/15/12	0.923
22	7/12/12	1.61
23	10/16/12	1.38
24	12/19/12	0.298
25	6/18/13	0.17
26	12/12/13	0.559
27	6/10/14	0.56
28	12/17/14	0.877
29	7/21/15	0.466
30	12/15/15	0.729
31	6/23/16	0.761
32	1/6/17	0.248
33	6/13/17	0.402
34	1/25/18	0.338
35	6/12/18	0.325
36	12/20/18	0.346
37	6/27/19	0.003
38	12/5/19	1.440
39	6/8/20	1.630
40	12/3/20	0.308

Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1	2	9.1313	9.13125
2	2	3	-4.4106	-4.410566038
3	1	3	-2.8307	-2.8306875
4	3	4	-0.1218	-0.12175
5	2	4	-2.4412	-2.441211735
6	1	4	-1.6697	-1.669714286
7	4	5	-0.3652	-0.36525
8	3	5	-0.2435	-0.2435
9	2	5	-1.7879	-1.787937063
10	1	5	-1.2784	-1.278375
11	5	6	-3.3034	-3.303411504
12	4	6	-2.0008	-2.000778325
13	3	6	-1.4236	-1.423602389
14	2	6	-2.2171	-2.217131579
15	1	6	-1.8324	-1.8324
16	6	7	7.1095	7.109514085
17	5	7	0.7146	0.714619565
18	4	7	0.3599	0.359917883
19	3	7	0.2408	0.240824176
20	2	7	-0.8082	-0.808212766
21	1	7	-0.5207	-0.520707645
22	7	8	0.7827	0.782678571
23	6	8	3.4407	3.440698225
24	5	8	0.7383	0.738271277
25	4	8	0.4713	0.471290323
26	3	8	0.3558	0.355762987
27	2	8	-0.5337	-0.533727993
28	1	8	-0.3012	-0.301237113
29	8	9	-1.9942	-1.9942
30	7	9	-0.9937	-0.993694853
31	6	9	0.6836	0.683645773
32	5	9	-0.3044	-0.304375
33	4	9	-0.3144	-0.314409341
34	3	9	-0.2871	-0.287146226
35	2	9	-0.8762	-0.8762
36	1	9	-0.6909	-0.690882937
37	9	10	-0.1689	-0.1689
38	8	10	-0.8700	-0.869988411
39	7	10	-0.5760	-0.576047641
40	6	10	0.3012	0.301243167
41	5	10	-0.2529	-0.252941837
42	4	10	-0.2652	-0.265193636
43	3	10	-0.2511	-0.251084426
44	2	10	-0.6829	-0.682920911
45	1	10	-0.5502	-0.5502
46	10	11	1.1038	1.103777473
47	9	11	0.1441	0.144125676
48	8	11	-0.5398	-0.539818015
49	7	11	-0.3379	-0.337941589
50	6	11	0.4037	0.403670407
51	5	11	-0.1035	-0.10347276
52	4	11	-0.1292	-0.129193231
53	3	11	-0.1285	-0.128527336
54	2	11	-0.5367	-0.536707284
55	1	11	-0.4165	-0.416501776
56	11	12	-0.7987	-0.798733516
57	10	12	0.1525	0.152521978
58	9	12	-0.0420	-0.041991866
59	8	12	-0.5769	-0.576922441

Median Slope (umol/L/year)

-0.065898

Average Slope

-0.0700

Sen's slope estimate
FDRAIN

data point	Date	Fluoride mg/l
1	6/28/06	34.89
2	7/12/06	32.62
3	10/26/06	26.6
4	1/24/07	31.05
5	4/24/07	26.83
6	8/15/07	31.32
7	10/25/07	32.39
8	1/31/08	24.92
9	4/16/08	23.54
10	7/23/08	26.78
11	10/16/08	29.4
12	1/13/09	23.9
13	4/28/09	20.33
14	7/28/09	21.66
15	10/27/09	27.8
16	2/15/10	21.31
17	6/9/10	19.62
18	9/23/10	38.11
19	12/21/10	31.34
20	3/2/11	19.1
21	6/27/2011	22.5
22	9/20/2011	19.9
23	12/14/11	23
24	2/15/12	18.6
25	7/12/12	21.5
26	10/16/12	17.6
27	12/19/12	11.5
28	6/18/13	20.5
29	12/12/13	32.8
30	6/10/14	23.4
31	12/17/14	18.2
32	7/21/15	28.6
33	12/15/15	26
34	6/23/16	26.1
35	1/6/17	19.5
36	6/13/17	19.4
37	1/25/18	22.40
38	6/12/18	19.80
39	12/20/18	20.60
40	6/27/19	18.80
41	12/5/19	23.10
42	6/8/20	21.30
43	12/3/20	16.50

Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1	2	-59.2227	-59.22267857
2	2	3	-20.7434	-20.7434434
3	1	3	-25.2327	-25.2326875
4	3	4	18.0596	18.05958333
5	2	4	-2.9257	-2.925727041
6	1	4	-6.6789	-6.678857143
7	4	5	-17.1262	-17.12616667
8	3	5	0.4667	0.466708333
9	2	5	-7.3944	-7.394396853
10	1	5	-9.8131	-9.81305
11	5	6	14.5130	14.5130
12	4	6	0.4858	0.485800493
13	3	6	5.8839	5.883890785
14	2	6	-1.1900	-1.190037594
15	1	6	-3.1572	-3.157245763
16	6	7	5.5045	5.504471831
17	5	7	11.0369	11.03690217
18	4	7	1.7863	1.786259124
19	3	7	5.8099	5.809883242
20	2	7	-0.1787	-0.178739362
21	1	7	-1.8866	-1.886621901
22	7	8	-27.8410	-27.8409949
23	6	8	-13.8320	-13.83195266
24	5	8	-2.4739	-2.4739
25	4	8	-6.0188	-6.018770161
26	3	8	-1.3282	-1.328181818
27	2	8	-4.9515	-4.951452465
28	1	8	-6.2569	-6.256945876
29	8	9	-6.6322	-6.632171053
30	7	9	-18.5774	-18.5774
31	6	9	-11.5986	-11.5986
32	5	9	-3.3566	-3.356627095
33	4	9	-6.1228	-6.122829241
34	3	9	-2.0774	-2.077444238
35	2	9	-5.1498	-5.149798137
36	1	9	-6.3003	-6.300284954
37	9	10	12.0756	12.07561224
38	8	10	3.9044	3.904396552
39	7	10	-7.5333	-7.53328125
40	6	10	-4.8345	-4.834504373
41	5	10	-0.0400	-0.040049342
42	4	10	-2.8564	-2.856442308
43	3	10	0.1034	0.103372642
44	2	10	-2.8747	-2.874743935
45	1	10	-3.9182	-3.918224206
46	10	11	11.2583	11.25829412
47	9	11	11.6960	11.69598361
48	8	11	6.3178	6.3178
49	7	11	-3.0591	-3.059096639
50	6	11	-1.6385	-1.638504673
51	5	11	1.7351	1.735106285
52	4	11	-0.9551	-0.955091125
53	3	11	1.4184	1.418446602
54	2	11	-1.4221	-1.42213422
55	1	11	-2.3843	-2.384331153
56	11	12	-22.5716	-22.57162921
57	10	12	-6.0455	-6.045517241
58	9	12	0.4834	0.483419118
59	8	12	-1.0706	-1.070560345

Median Slope (umol/L/year)
-0.711106

Average Slope
-1.1368

Sen's slope estimate
FDRAIN

data point	Date	WAD mg/l
1	6/28/2006	0.0520
2	7/12/2006	0.2150
3	10/26/2006	0.0585
4	1/24/2007	0.0495
5	4/24/2007	0.0260
6	8/15/2007	0.0775
7	10/25/2007	0.0180
8	1/31/2008	0.0150
9	7/23/2008	0.0420
10	10/22/2008	0.0110
11	1/19/2009	0.0393
12	4/29/2009	0.0347
13	7/30/2009	0.0050
14	10/28/2009	0.0310
15	2/15/2010	0.0722
16	6/9/2010	0.0440
17	9/23/2010	0.0140
18	12/21/10	0.0180
19	3/2/11	0.0550
20	6/27/11	0.0140
21	9/20/11	0.0870
22	12/14/11	0.0050
23	2/15/12	0.0050
24	7/12/12	0.0200
25	10/16/12	0.0180
26	12/19/12	0.0050
27	6/18/13	0.0050
28	12/12/13	0.0110
29	6/11/14	0.0100
30	12/17/14	0.0050
31	7/21/15	0.0050
32	12/15/15	0.0110
33	1/6/17	0.0290
34	6/13/17	0.0100
35	1/25/18	0.0550
36	6/12/18	0.0390
37	12/20/18	0.0890
38	6/27/19	0.0130
39	12/5/19	0.0210
40	6/8/20	0.1530
41	12/3/20	0.0110

Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	2	4.252553571	4.252553571	
2	3	-0.539260613	-0.539260613	
1	3	0.019784375	0.019784375	
3	4	-0.036525	-0.036525	
2	4	-0.308412628	-0.308412628	
1	4	-0.004348214	-0.004348214	
4	5	-0.095370833	-0.095370833	
3	5	-0.065947917	-0.065947917	
2	5	-0.241371503	-0.241371503	
1	5	-0.031655	-0.031655	
5	6	0.166463496	0.166463496	
4	6	0.05037931	0.05037931	
3	6	0.023685154	0.023685154	
2	6	-0.125869361	-0.125869361	
1	6	0.022551755	0.022551755	
6	7	-0.306089789	-0.306089789	
5	7	-0.015880435	-0.015880435	
4	7	-0.04199042	-0.04199042	
3	7	-0.04063908	-0.04063908	
2	7	-0.153094149	-0.153094149	
1	7	-0.025658058	-0.025658058	
7	8	-0.011181122	-0.011181122	
6	8	-0.135077663	-0.135077663	
5	8	-0.01424734	-0.01424734	
4	8	-0.033873992	-0.033873992	
3	8	-0.034390422	-0.034390422	
2	8	-0.128609155	-0.128609155	
1	8	-0.023220361	-0.023220361	
8	9	0.056676724	0.056676724	
7	9	0.032227941	0.032227941	
6	9	-0.037802843	-0.037802843	
5	9	0.012815789	0.012815789	
4	9	-0.00501717	-0.00501717	
3	9	-0.009475825	-0.009475825	
2	9	-0.085159367	-0.085159367	
1	9	-0.004831349	-0.004831349	
9	10	-0.124425824	-0.124425824	
8	10	-0.005513208	-0.005513208	
7	10	-0.007043388	-0.007043388	
6	10	-0.055965726	-0.055965726	
5	10	-0.010015996	-0.010015996	
4	10	-0.022075549	-0.022075549	
3	10	-0.02386434	-0.02386434	
2	10	-0.08944898	-0.08944898	
1	10	-0.017680342	-0.017680342	
10	11	0.116141292	0.116141292	
9	11	-0.00547875	-0.00547875	
8	11	0.025072246	0.025072246	
7	11	0.017212002	0.017212002	
6	11	-0.026677916	-0.026677916	
5	11	0.00763809	0.00763809	
4	11	-0.005131612	-0.005131612	
3	11	-0.008594118	-0.008594118	
2	11	-0.069603498	-0.069603498	
1	11	-0.004955849	-0.004955849	
11	12	-0.0168015	-0.0168015	
10	12	0.04580119	0.04580119	
9	12	-0.009522589	-0.009522589	
8	12	0.015848954	0.015848954	

Median Slope (umol/L/year)

-0.001679

Average Slope

0.0003

Sen's slope estimate
MW-20-85S

data point	Date	Aluminum mg/l
1	10/25/06	0.282
2	1/23/07	0.151
3	4/25/07	2.414
4	10/16/08	1.174
5	1/13/09	0.544
6	4/28/09	0.1
7	7/28/09	0.1
8	10/27/09	0.037
9	2/9/10	0.125
10	6/8/10	0.924
11	12/14/10	0.132
12	3/23/11	0.05
13	6/28/11	0.05
14	9/20/11	0.05
15	12/15/11	0.05
16	2/15/12	0.05
17	7/12/12	0.05
18	10/16/12	0.05
19	12/19/12	0.05
20	6/20/13	0.05
21	12/11/13	5.32
22	6/11/14	2.950
23	12/16/14	2.350
24	7/21/15	0.150
25	12/15/15	0.005
26	6/23/16	0.026
27	1/10/17	0.156
28	6/15/17	0.079
29	12/21/17	0.050
30	6/19/18	0.050
31	12/20/18	0.067
32	6/27/19	0.005
33	12/4/19	0.005
34	6/9/20	0.005
35	12/3/20	0.005

Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1	2	-0.5316	-0.531641667
2	2	3	8.9844	8.984355978
3	1	3	4.2786	4.278642857
4	3	4	-0.8387	-0.838722222
5	2	4	0.5912	0.591219541
6	1	4	0.4513	0.4513
7	4	5	-2.5855	-2.585477528
8	3	5	-1.0859	-1.085878378
9	2	5	0.1991	0.199089112
10	1	5	0.1180	0.117996917
11	5	6	-1.5445	-1.544485714
12	4	6	-2.0221	-2.022054124
13	3	6	-1.1515	-1.15148297
14	2	6	-0.0226	-0.022551755
15	1	6	-0.0726	-0.072571507
16	6	7	0.0000	0
17	5	7	-0.8274	-0.8274
18	4	7	-1.3764	-1.376415789
19	3	7	-1.0245	-1.024470909
20	2	7	-0.0203	-0.0203
21	1	7	-0.0660	-0.066013406
22	7	8	-0.2529	-0.252865385
23	6	8	-0.1264	-0.126432692
24	5	8	-0.6452	-0.645232578
25	4	8	-1.1045	-1.104492686
26	3	8	-0.9478	-0.947815775
27	2	8	-0.0413	-0.041308036
28	1	8	-0.0815	-0.081499317
29	8	9	0.3061	0.306114286
30	7	9	0.0466	0.04658801
31	6	9	0.0318	0.031816202
32	5	9	-0.3904	-0.390407526
33	4	9	-0.7966	-0.796563929
34	3	9	-0.8189	-0.818861166
35	2	9	-0.0085	-0.008532345
36	1	9	-0.0477	-0.047667706
37	9	10	2.4524	2.452392857
38	8	10	1.4463	1.446324777
39	7	10	0.9554	0.955447619
40	6	10	0.7413	0.741295567
41	5	10	0.2716	0.2716
42	4	10	-0.1522	-0.1521875
43	3	10	-0.4774	-0.477388158
44	2	10	0.2292	0.229170657
45	1	10	0.1774	0.177375567
46	10	11	-1.5306	-1.530571429
47	9	11	0.0083	0.008301136
48	8	11	0.0840	0.084016344
49	7	11	0.0232	0.0232
50	6	11	0.0196	0.019643697
51	5	11	-0.2150	-0.214975714
52	4	11	-0.4824	-0.482370722
53	3	11	-0.6272	-0.627163657
54	2	11	-0.0049	-0.004883709
55	1	11	-0.0363	-0.0362591
56	11	12	-0.3025	-0.302530303
57	10	12	-1.1084	-1.1084
58	9	12	-0.0673	-0.067306511
59	8	12	0.0093	0.009273926

Median Slope (umol/L/year)
-0.008857

Average Slope
0.0032

Sen's slope estimate
SLPWETE

data point	Date	Aluminum mg/l
1	5/19/06	0.109
2	7/12/06	4.275
3	10/25/06	0.141
4	4/24/07	0.773
5	8/14/07	1.454
6	10/23/07	1.964
7	7/23/08	1.339
8	10/22/08	2.917
9	6/8/10	0.589
10	6/27/11	0.4
11	9/21/11	0.99
12	12/13/11	0.2
13	6/18/13	0.05
14	9/24/13	0.26
15	6/11/14	0.130
16	9/25/14	0.050
17	7/21/2015	0.540
18	12/16/2015	0.810
19	6/26/2019	0.140
20	12/3/2019	0.082
21	12/3/20	0.050

Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1	2	28.1784	28.17836111
2	2	3	-14.3804	-14.38041429
3	1	3	0.0735	0.073509434
4	3	4	1.2753	1.275348066
5	2	4	-4.4724	-4.472396853
6	1	4	0.7133	0.7133
7	4	5	2.2209	2.220850446
8	3	5	1.6368	1.6368
9	2	5	-2.5889	-2.588869975
10	1	5	1.0869	1.086861173
11	5	6	2.6611	2.661107143
12	4	6	2.3902	2.390179945
13	3	6	1.8343	1.834299587
14	2	6	-1.8036	-1.803616987
15	1	6	1.2980	1.297966954
16	6	7	-0.8331	-0.833143248
17	5	7	-0.1221	-0.122103924
18	4	7	0.4534	0.453358553
19	3	7	0.6869	0.686922292
20	2	7	-1.4452	-1.445247978
21	1	7	0.5644	0.564393844
22	7	8	6.3337	6.333675824
23	6	8	0.9537	0.95365274
24	5	8	1.2284	1.2284
25	4	8	1.4316	1.431619744
26	3	8	1.3928	1.392766484
27	2	8	-0.5954	-0.5954
28	1	8	1.1563	1.156281849
29	8	9	-1.4315	-1.431484848
30	7	9	-0.3999	-0.399908759
31	6	9	-0.5237	-0.523690042
32	5	9	-0.3070	-0.307037172
33	4	9	-0.0589	-0.058900964
34	3	9	0.1238	0.123776097
35	2	9	-0.9435	-0.943455851
36	1	9	0.1184	0.118379473
37	9	10	-0.1798	-0.179771484
38	8	10	-0.9400	-0.940014571
39	7	10	-0.3208	-0.32083232
40	6	10	-0.4254	-0.42535443
41	5	10	-0.2725	-0.272451168
42	4	10	-0.0893	-0.089336557
43	3	10	0.0555	0.055451202
44	2	10	-0.7815	-0.781526091
45	1	10	0.0570	0.056990751
46	10	11	2.5058	2.505784884
47	9	11	0.3116	0.311628191
48	8	11	-0.6615	-0.661500705
49	7	11	-0.1104	-0.110365584
50	6	11	-0.2490	-0.248952764
51	5	11	-0.1131	-0.113059373
52	4	11	0.0492	0.04919879
53	3	11	0.1730	0.17304534
54	2	11	-0.6325	-0.632496705
55	1	11	0.1649	0.1649
56	11	12	-3.4765	-3.476475904
57	10	12	-0.4322	-0.432248521
58	9	12	-0.2569	-0.256929928
59	8	12	-0.8652	-0.865199869

Median Slope (umol/L/year)
-0.089746

Average Slope
0.0321

Sen's slope estimate
PZ-44

data point	Date	Sulfate mg/l
1	10/22/08	1660
2	4/30/09	304
3	7/30/09	745
4	10/27/09	774
5	6/8/10	815
6	9/22/10	22.6
7	6/28/11	792
8	9/20/11	811
9	12/13/11	999
10	2/21/12	747
11	7/16/12	957
12	10/17/12	1100
13	12/19/12	761
14	6/20/13	774
15	12/11/13	918
16	6/11/14	997
17	12/16/14	769
18	7/21/15	907
19	12/15/15	968
20	6/22/16	1060
21	12/28/16	1270
22	6/13/17	964
23	12/20/17	781
24	6/12/18	1190
25	12/19/18	1040
26	6/26/19	915
27	12/5/19	919
28	12/3/20	1000

Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1	2	-2606.7316	-2606.731579
2	2	3	1770.0577	1770.057692
3	1	3	-1189.3372	-1189.337189
4	3	4	119.0140	119.0140449
5	2	4	953.7083	953.7083333
6	1	4	-874.6257	-874.6257
7	4	5	66.8538	66.85379464
8	3	5	81.6853	81.68530351
9	2	5	461.9870	461.987005
10	1	5	-519.5896	-519.5896465
11	5	6	-2730.4160	-2730.416038
12	4	6	-831.6632	-831.6631818
13	3	6	-629.7294	-629.7293556
14	2	6	-201.5321	-201.5320588
15	1	6	-854.3719	-854.3719286
16	6	7	1007.2522	1007.2522
17	5	7	-21.8201	-21.82012987
18	4	7	10.7956	10.7955665
19	3	7	24.5942	24.59419771
20	2	7	225.9087	225.9087452
21	1	7	-323.8376	-323.8375894
22	7	8	82.6161	82.61607143
23	6	8	793.2868	793.2867769
24	5	8	-3.1151	-3.115138593
25	4	8	19.5011	19.50108225
26	3	8	30.8267	30.82672634
27	2	8	212.1211	212.121134
28	1	8	-291.7190	-291.7189558
29	8	9	817.4643	817.4642857
30	7	9	450.0402	450.0401786
31	6	9	797.8302	797.8302013
32	5	9	121.5298	121.5298373
33	4	9	105.7674	105.7674
34	3	9	107.1288	107.1288
35	2	9	265.2547	265.2547022
36	1	9	-210.4884	-210.4884481
37	9	10	-1314.9000	-1314.9
38	8	10	-151.7922	-151.7922078
39	7	10	-69.0599	-69.05987395
40	6	10	511.7739	511.7738878
41	5	10	-39.8668	-39.86677368
42	4	10	-11.6432	-11.6431523
43	3	10	0.7804	0.780448718
44	2	10	157.5519	157.5519
45	1	10	-274.0125	-274.0125308
46	10	11	525.3596	525.359589
47	9	11	-71.0208	-71.02083333
48	8	11	177.7550	177.755
49	7	11	156.9434	156.9433594
50	6	11	514.7656	514.7656109
51	5	11	67.4454	67.44538362
52	4	11	67.3119	67.31193353
53	3	11	71.5647	71.5647
54	2	11	203.3318	203.3318414
55	1	11	-188.3865	-188.3864637
56	11	12	561.6210	561.6209677
57	10	12	539.4697	539.4696653
58	9	12	119.3859	119.3859223
59	8	12	268.5935	268.5935115

Median Slope (umol/L/year)

24.445545

Average Slope

12.0406

Sen's slope estimate
PZ-45

data point	Date	Sulfate mg/l
1	10/22/08	803
2	1/19/09	581
3	7/30/09	646
4	10/27/09	676
5	6/8/10	767
6	9/22/10	66
7	6/28/11	775
8	7/16/12	899
9	12/19/12	1050
10	6/20/13	1290
11	12/11/13	1400
12	6/10/14	1190
13	12/17/14	998
14	7/21/15	969
15	12/15/15	1180
16	6/22/16	1040
17	12/28/16	933
18	6/13/17	1230
19	12/20/17	1270
20	6/12/18	1210
21	6/26/19	1240
22	12/5/19	1960
23	6/9/20	1240
24	12/3/20	1180

Slope point	point A	Point B	slope umol/l/year	Sorted slope
1	1	2	-911.0730	-911.0730337
2	2	3	123.6523	123.6523
3	1	3	-204.0721	-204.0720641
4	3	4	123.1180	123.1179775
5	2	4	123.4831	123.4830961
6	1	4	-125.3696	-125.3695946
7	4	5	148.3828	148.3828125
8	3	5	141.1989	141.1988818
9	2	5	134.5277	134.5277228
10	1	5	-22.1364	-22.13636364
11	5	6	-2415.4741	-2415.474057
12	4	6	-675.1591	-675.1590909
13	3	6	-505.5967	-505.5966587
14	2	6	-307.8621	-307.8621113
15	1	6	-384.5561	-384.5560714
16	6	7	928.1801	928.1801075
17	5	7	7.5896	7.58961039
18	4	7	59.3756	59.37561576
19	3	7	67.5032	67.5032235
20	2	7	79.6163	79.61629213
21	1	7	-10.4464	-10.44637385
22	7	8	117.9453	117.9453125
23	6	8	458.9038	458.9038462
24	5	8	62.6957	62.69570871
25	4	8	82.0249	82.0249
26	3	8	85.4050	85.4050
27	2	8	91.1692	91.16915228
28	1	8	25.7256	25.72560528
29	8	9	353.5433	353.5433
30	7	9	186.0069	186.0069444
31	6	9	438.8352	438.8351648
32	5	9	111.7468	111.7467568
33	4	9	118.8890	118.8890339
34	3	9	119.1931	119.1930533
35	2	9	119.7918	119.7917832
36	1	9	59.3922	59.39219882
37	9	10	479.0164	479.0163934
38	8	10	421.2765	421.2765487
39	7	10	260.1712	260.1711618
40	6	10	446.1737	446.1736527
41	5	10	172.4059	172.4059116
42	4	10	168.3660	168.365991
43	3	10	165.5320	165.5320197
44	2	10	160.5470	160.5469622
45	1	10	104.5104	104.5104289
46	10	11	230.9052	230.9051724
47	9	11	358.0882	358.0882353
48	8	11	356.7061	356.7061404
49	7	11	254.4941	254.4941472
50	6	11	414.3227	414.3227041
51	5	11	180.3457	180.3457488
52	4	11	175.5916	175.5916335
53	3	11	172.6636	172.6636364
54	2	11	167.3977	167.3977336
55	1	11	116.2336	116.2336087
56	11	12	-423.7707	-423.7707182
	10	12	-102.8873	-102.8873
	9	12	95.0465	95.0464684
	8	12	153.1524	153.1523775

Median Slope (umol/L/year)
57.501823

Average Slope
50.4185

Groundwater Extraction Wells
Parameters Collected at FTC Sampling Ports

Well	Date	Fluoride	Total Cyanide	Sulfate
		mg/l	mg/l	mg/l
EW-01	10/16/2012	0.280	<0.01	---
EW-02	10/16/2012	<0.1	0.047	---
EW-04	10/16/2012	0.320	0.181	---
EW-05	10/16/2012	1.100	0.087	---
EW-06	10/16/2012	0.160	0.498	---
EW-01	10/23/2012	0.170	<0.01	---
EW-02	10/23/2012	<0.2	0.038	---
EW-04	10/23/2012	0.420	0.168	---
EW-05	10/23/2012	0.590	0.040	---
EW-06	10/23/2012	0.200	0.448	---
EW-01	10/30/2012	0.250	<0.01	---
EW-02	10/30/2012	<0.1	0.042	---
EW-04	10/30/2012	0.350	0.177	---
EW-05	10/30/2012	1.410	0.057	---
EW-06	10/30/2012	0.210	0.401	---
EW-01	11/6/2012	0.240	<0.01	---
EW-02	11/6/2012	<0.1	0.038	---
EW-04	11/6/2012	0.150	0.171	---
EW-05	11/6/2012	1.070	0.044	---
EW-06	11/6/2012	0.260	0.417	---
EW-01	11/13/2012	0.210	<0.01	---
EW-02	11/13/2012	<0.1	0.044	---
EW-04	11/13/2012	0.200	0.172	---
EW-05	11/13/2012	1.030	0.051	---
EW-06	11/13/2012	0.220	0.441	---
EW-01	11/20/2012	0.260	<0.01	170
EW-02	11/20/2012	0.110	0.037	209
EW-04	11/20/2012	0.310	0.138	241
EW-05	11/20/2012	1.220	0.050	78
EW-06	11/20/2012	0.280	0.442	111
EW-01	11/27/2012	0.270	<0.01	166
EW-02	11/27/2012	0.120	0.034	213
EW-04	11/27/2012	0.280	0.122	430
EW-05	11/27/2012	1.020	0.040	75
EW-06	11/27/2012	0.380	0.439	111
EW-01	12/4/2012	0.270	<0.01	171
EW-02	12/4/2012	0.160	0.038	218
EW-04	12/4/2012	0.250	0.137	258
EW-05	12/4/2012	0.770	0.031	78
EW-06	12/5/2012	0.410	0.442	117

Groundwater Extraction Wells
Parameters Collected at FTC Sampling Ports

Well	Date	Fluoride	Total Cyanide	Sulfate
		mg/l	mg/l	mg/l
EW-01	1/8/2013	0.250	<0.01	160
EW-02	1/8/2013	0.150	0.036	205
EW-04	1/8/2013	0.310	0.164	246
EW-05	1/8/2013	0.490	0.037	74
EW-06	1/10/2013	0.270	0.426	114
EW-01	2/12/2013	0.310	<0.0100	178
EW-02	---	---	---	---
EW-04	2/12/2013	0.270	0.124	262
EW-05	2/12/2013	0.350	0.041	85
EW-06	2/12/2013	0.240	0.446	124
EW-01	3/12/2013	0.290	<0.0100	173
EW-02	---	---	---	---
EW-04	3/12/2013	0.170	0.102	243
EW-05	3/12/2013	0.250	0.029	82
EW-06	3/12/2013	0.260	0.418	122
EW-01	4/9/2013	0.220	<0.0100	160
EW-02	---	---	---	---
EW-04	4/9/2013	0.140	0.090	234
EW-05	4/9/2013	0.200	0.033	78
EW-06	4/9/2013	0.150	0.420	118
EW-01	5/14/2013	0.230	<0.0100	187
EW-02	---	---	---	---
EW-04	5/14/2013	0.160	0.096	265
EW-05	5/14/2013	0.160	0.023	88
EW-06	5/14/2013	0.180	0.405	132
EW-01	6/12/2013	0.160	0.010	182
EW-02	---	---	---	---
EW-04	6/12/2013	0.260	0.142	262
EW-05	6/12/2013	0.210	0.020	88
EW-06	6/12/2013	0.250	0.418	129
EW-01	7/10/2013	0.280	0.010	186
EW-02	---	---	---	---
EW-04	7/9/2013	0.280	0.092	266
EW-05	7/10/2013	0.210	0.019	86
EW-06	7/10/2013	0.250	0.445	131
EW-01	8/13/2013	0.290	<0.0100	192
EW-02	---	---	---	---
EW-04	8/13/2013	0.250	0.114	275
EW-05[3]	8/15/2013	0.270	0.021	88
EW-06[3]	8/20/2013	0.430	0.449	134

Groundwater Extraction Wells
Parameters Collected at FTC Sampling Ports

Well	Date	Fluoride	Total Cyanide	Sulfate
		mg/l	mg/l	mg/l
EW-01	9/10/2013	0.250	<0.0100	177
EW-02	---	---	---	---
EW-04	9/10/2013	0.190	0.106	250
EW-05	9/10/2013	0.160	0.018	84
EW-06	9/10/2013	0.280	0.475	122
EW-01	10/8/2013	0.270	<0.0100	176
EW-02	---	---	---	---
EW-04	10/8/2013	0.270	0.124	249
EW-05	10/22/2013	0.230	0.028	84
EW-06	10/8/2013	0.250	0.512	121
EW-01	11/13/2013	0.270	<0.0100	182
EW-02	---	---	---	---
EW-04	11/13/2013	0.230	0.120	251
EW-05	11/13/2013	0.180	0.031	85
EW-06	11/13/2013	0.240	0.451	123
EW-01	2/11/2014	0.280	0.01U	181
EW-02	2/11/2014	---	---	---
EW-04	2/11/2014	0.230	0.112	253
EW-05	2/11/2014	0.160	0.025	87
EW-06	2/11/2014	0.250	0.523	121
EW-01	5/19/2014	0.260	0.01U	158
EW-02	5/19/2014	---	---	---
EW-04	5/19/2014	0.210	0.102	242
EW-05	5/19/2014	0.150	0.024	86
EW-06	5/19/2014	0.210	0.472	116
EW-01	8/12/2014	0.240	0.01U	166
EW-02	8/12/2014	---	---	---
EW-04	8/12/2014	0.130	0.098	226
EW-05	8/12/2014	0.140	0.027	84
EW-06	8/12/2014	0.460	0.477	98
EW-01	11/14/2014	0.220	0.01U	169
EW-02	11/14/2014	0.250	0.04	199
EW-04	11/14/2014	0.110	0.150	230
EW-05	11/14/2014	0.100	0.027	83
EW-06	11/14/2014	0.510	0.541	103
EW-01	5/13/2015	0.250	0.035	---
EW-02	5/13/2015	0.280	0.01U	---
EW-04	5/13/2015	---	---	---
EW-05	5/13/2015	---	---	---
EW-06	5/13/2015	0.230	0.098	
EW-01	6/17/2015	---	---	---
EW-02	6/17/2015	---	---	---
EW-04	6/17/2015	0.240	0.098	
EW-05	6/17/2015	---	---	---
EW-06	6/17/2015	---	---	---

Groundwater Extraction Wells
Parameters Collected at FTC Sampling Ports

Well	Date	Fluoride	Total Cyanide	Sulfate
		mg/l	mg/l	mg/l
EW-01	8/12/2015	0.290	0.01U	---
EW-02	8/12/2015	1.630	0.071	---
EW-04	8/12/2015	0.190	0.097	---
EW-05	8/12/2015	---	---	---
EW-06	8/12/2015	0.310	0.475	---
EW-01	11/11/2015	0.310	0.01U	---
EW-02	11/11/2015	---	---	---
EW-04	11/11/2015	0.200	0.084	---
EW-05	11/11/2015	0.140	0.030	---
EW-06	11/11/2015	0.290	0.578	---
EW-01	2/10/2016	0.32	0.01U	---
EW-02	2/10/2016	0.96	0.040	---
EW-04	2/10/2016	0.21	0.106	---
EW-05	2/10/2016	0.15	0.029	---
EW-06	2/10/2016	0.36	0.556	---
EW-01	5/11/2016	0.27	0.01U	---
EW-02	5/11/2016	---	---	---
EW-04	5/11/2016	---	---	---
EW-05	5/11/2016	0.13	0.032	---
EW-06	5/11/2016	0.57	0.54	---
EW-01	8/9/2016	0.24	0.01U	---
EW-02	8/9/2016	---	---	---
EW-04	8/9/2016	0.19	0.104	---
EW-05	8/9/2016	0.12	0.032	---
EW-06	8/9/2016	0.64	0.586	---
EW-01	11/22/2016	0.31	0.01U	---
EW-02	11/22/2016	1.1	0.053	---
EW-04	11/22/2016	0.23	0.113	---
EW-05	11/22/2016	0.15	0.034	---
EW-06	11/22/2016	0.29	0.686	---
EW-01	3/28/2017	0.25	0.01U	---
EW-02	3/28/2017	---	---	---
EW-04	3/28/2017	0.16	0.104	---
EW-05	3/28/2017	0.12	0.033	---
EW-06	3/28/2017	0.57	0.681	---

Groundwater Extraction Wells
Parameters Collected at FTC Sampling Ports

Well	Date	Fluoride	Total Cyanide	Sulfate
		mg/l	mg/l	mg/l
EW-01	5/9/2017	0.26	0.01U	---
EW-02	6/15/2017	0.490	0.024	---
EW-04	5/9/2017	0.170	0.096	---
EW-05	5/16/2017	0.11	0.028	---
EW-06	5/9/2017	0.29	0.574	---
EW-01	8/8/2017	0.26	0.01U	---
EW-02	8/8/2017	---	---	---
EW-04	8/8/2017	0.2	0.101	---
EW-05	8/8/2017	0.12	0.036	---
EW-06	8/8/2017	0.71	0.606	---
EW-01	11/21/2017	0.23	0.01U	---
EW-02	11/21/2017	1.57	0.067	---
EW-04	11/21/2017	0.16	0.103	---
EW-05	11/21/2017	0.11	0.041	---
EW-06	11/21/2017	0.34	0.684	---
EW-01	2/22/2018	0.24	0.01U	---
EW-02	2/22/2018	0.86	0.023	---
EW-04	2/22/2018	0.16	0.103	---
EW-05	2/22/2018	0.1	0.044	---
EW-06	2/22/2018	0.43	0.719	---
EW-01	5/8/2018	0.35	0.01U	---
EW-02	5/8/2018	2.05	0.033	---
EW-04	5/8/2018	0.3	0.1	---
EW-05	5/8/2018	0.1U	0.034	---
EW-06	5/8/2018	0.52	0.643	---
EW-01	8/14/2018	0.26	0.01U	---
EW-02	8/14/2018	0.34	0.021	---
EW-04	8/14/2018	0.17	0.088	---
EW-05	8/14/2018	0.14	0.041	---
EW-06	8/14/2018	0.75	0.637	---
EW-01	11/27/2018	0.36	0.01U	---
EW-02	11/27/2018	1.57	0.039	---
EW-04	11/27/2018	0.33	0.109	---
EW-05	11/27/2018	0.21	0.034	---
EW-06	11/27/2018	0.51	0.723	---
EW-01	Feb-19	0.32	0.01U	---
EW-02	Feb-19	0.32	0.032	---
EW-04	Feb-19	0.2	0.098	---
EW-05	Feb-19	NS	NS	---
EW-06	Feb-19	0.69	0.665	---
EW-01	May-19	0.34	0.01U	---
EW-02	May-19	2	0.026	---
EW-04	May-19	0.33	0.097	---
EW-05	May-19	NS	NS	---
EW-06	May-19	0.6	0.617	---
EW-01	Aug-19	1.5	0.005U	---
EW-02	Aug-19	0.34	0.0304	---
EW-04	Aug-19	0.34	0.0891	---
EW-05	Aug-19	0.23	0.0659	---
EW-06	Aug-19	0.66	0.174	---
EW-01	Nov-19	0.29	0.005U	---
EW-02	Nov-19	0.29	0.0338	---
EW-04	Nov-19	0.2	0.114	---
EW-05	Nov-19	0.16	0.0618	---
EW-06	Nov-19	0.78	0.148	---
EW-01	Feb-20	0.38	0.01U	---
EW-02	Feb-20	0.39	0.0298	---
EW-04	Feb-20	0.35	0.0915	---
EW-05	Feb-20	0.13	0.0439	---
EW-06	Feb-20	0.99	0.723	---
EW-01	May-20	0.27	0.005U	---
EW-02	May-20	0.28	0.0504	---
EW-04	May-20	0.24	0.144	---
EW-05	May-20	0.1U	0.0607	---
EW-06	May-20	0.86	0.513	---
EW-01	Aug-20	0.12	0.0055	---
EW-02	Aug-20	0.1U	0.0325	---
EW-04	Aug-20	0.1U	0.0978	---
EW-05	Aug-20	0.1U	0.0571	---
EW-06	Aug-20	0.4	0.564	---
EW-01	Nov-20	0.42	0.0091	---
EW-02	Nov-20	0.34	0.078	---
EW-04	Nov-20	0.32	0.102	---
EW-05	Nov-20	0.22	0.0637	---
EW-06	Nov-20	0.61	0.636	---

Notes:

1. Alcoa Lab collects the analytical samples.
2. Sampling frequency reduced to quarterly after the November 2013 round.
3. Samples results for EW-05 and EW-06 appear to be switched in the lab report and have been corrected in this table.

Key:

--- = Indicates that parameters were not measured.

ND = Nondetect values only in the average.

Appendix E

Data Quality Assessment

Memorandum

To: *Robyn Gross*

From: *Paul Rodrigue*

Date: *July 24, 2020*

Subject: *Reynolds Metals Company, LLC. – NYSDEC Site Code #645009*
Data Quality Assessment – March 2020

This memorandum presents the data quality assessment for the March 2020 quarterly sampling round for the Massena East Plant. Samples were collected on March 10, 2020 and analyzed for polychlorinated biphenyls (PCBs), conventional inorganics (total cyanide, weak acid dissociable (WAD) cyanide, fluoride and sulfate) and metals (total aluminum and dissolved aluminum).

Laboratory quality control data associated with these samples were reviewed in accordance with the *Quality Assurance Project Plan* (QAPP) (CDM, March 2008) and United States Environmental Protection Agency (USEPA) Region II Contract Laboratory Program (CLP) data validation criteria as referenced in *Validating PCB Compounds PCBs by Gas Chromatography SW-846 Method 8082A* (SOP No. HW-45, Revision No. 1, October 2006) and in *Validation of Metals for the (CLP) Based on SOW ILMO5.3* (SOP No. HW-2. Revision No. 13, September 2006). All analyses were performed by Alpha Analytical in Westborough, Massachusetts except WAD cyanide which was subcontracted by Alpha Analytical to ALS Environmental in Rochester, New York.

The intent of this review is to provide a general assessment of the overall quality of the data packages based on the review of the following information:

- field and laboratory method blanks;
- surrogate spike recovery;
- field duplicate precision;
- matrix spike/matrix spike duplicate (MS/MSD) samples;
- laboratory control sample/laboratory control sample duplicates (LCS/LCSD);
- sample holding time data; and
- sample receipt conditions.

All applicable data were evaluated and are summarized below. Field quality assurance sample results (field blanks and duplicate samples) were also evaluated. Analytical results, hold times and field quality assurance data are summarized in Tables 1 through 4.

PCB Analysis

A field blank sample was collected on the day of sampling (MW-1201-0320FBW). PCB Aroclors were not detected in the field blank sample. In addition, the laboratory blank sample analyzed with the field samples was non-detect for Aroclors. No qualification is required.

PCB analysis surrogate spike recovery data were reviewed. Tetrachloro-m-xylene (TCX) and decachlorobiphenyl (DCB) were the compounds used for the surrogate spike standards. The QAPP specifies that at least one surrogate is recovered within range (30 to 150 percent), with both surrogate recoveries greater than 10 percent. All surrogate recoveries were within the acceptable range; no qualification is required.

A field duplicate sample was collected at MW-45 (MW-1200-0320BD). All Aroclors were non-detect in both the parent and duplicate samples. No qualification is required.

Sample MW-10S-0320 was analyzed as a MS/MSD sample. The QAPP specifies that MS/MSD recoveries be within the range of 29 to 135 percent, with a relative percent difference (RPD) of less than 30 percent between the spiked pair. The MS and MSD samples were spiked with Aroclor 1260. Recoveries and precision between the spiked pairs were acceptable. No qualification is required.

The QAPP specifies a recovery range of 50 to 150 percent for compounds in a LCS/LCSD. Recovery and precision for Aroclor 1260 was within the acceptable range in the LCS sample; no qualification is required.

USEPA Region II guidance specifies a holding time of up to 365 days beyond the verified time of sample receipt (VTSR) for sample extraction and 40 days from the time of sample extraction to analysis. In addition, VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding PCB analysis holding times. No qualification is required.

The condition of the samples upon receipt at the laboratory was reviewed. All samples were delivered at temperatures below 10°C. No qualification is required.

Based on the results of this assessment, the PCB results for the March 2020 quarterly sampling event can be used without qualification.

Conventional Inorganics Analysis

Samples were analyzed for total cyanide, WAD cyanide, fluoride and sulfate. All associated conventional inorganics quality control data were reviewed.

A field blank sample was collected on the day of sampling (MW-1201-0320FBW) and analyzed for conventional inorganics. All results were non-detect in the field blank. Additionally, the

laboratory method blanks analyzed with the field samples. All method blanks were non-detect; no qualification is required.

A field duplicate was collected at MW-45 (MW-1200-0320BD). The RPD quantified between the parent and duplicate sample collected at the monitoring well was acceptable for all conventional inorganic parameters. WAD cyanide was non-detect in the parent sample and detected at 0.017 mg/l in the field duplicate. When one or both results are less than five times the contract required quantitation limit (CRQL), the absolute difference is used to determine qualification. Since the absolute difference is less than the CRQL, no further qualifications were made.

MS/MSD analysis was requested on MW-10S-0320. The USEPA Region II guidance specifies acceptable MS/MSD recovery limits as 75 to 125 percent for total and WAD cyanide and 80 to 120 percent for fluoride and sulfate. Recoveries and precision between the spiked pairs were acceptable for all conventional inorganics. Sulfate was under-recovered in the MS and MSD at 77 and 73 percent, respectively, however the native concentration was more than four times the spike amount. Therefore, the out of range recoveries can be disregarded. The WAD cyanide recoveries were low at 68 and 64 percent, however were within the laboratory limits. No qualification is necessary.

All LCS recoveries for conventional inorganics were acceptable. No qualification is required.

The QAPP specifies holding times for conventional inorganic parameters beyond the VTSR. The VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding conventional inorganic parameter analysis holding times. All hold time requirements were met. No qualification is required.

Sample receipt conditions were reviewed. All samples were received within the QAPP-specified temperature limits. No qualification is required.

Conventional results for the March 2020 quarterly sampling round can be used as reported by the laboratory.

Metals Analysis

Samples were analyzed for total aluminum and dissolved aluminum. All associated metals quality control data were reviewed.

Laboratory and field blank samples were reviewed for metals analysis. The field blank samples were non-detect for both total and dissolved aluminum. Additionally, laboratory blanks were non-detect. No qualification is required.

A field duplicate sample was collected at MW-45 (MW-1200-0320BD). The calculated RPD between the pair for total aluminum was acceptable at 1.2 percent. Dissolved aluminum was detected in both samples at concentrations less than five times the CRQL. Since the absolute difference was less than the CRQL no further qualification is required.

Sample MW-10S-0320 was requested to be analyzed as a MS/MSD sample. Recoveries and precision between the spiked pair collected from MW-10S were acceptable for both total and dissolved aluminum. No qualification is required.

The LCS had acceptable recoveries for total and dissolved aluminum. No qualification is required.

The QAPP specifies a holding time of up to 180 days beyond the VTSR for sample analysis. In addition, VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding metals analysis holding times. All holding times were within acceptance limits. No qualification is required.

All samples were delivered to the laboratory within the QAPP-specific temperature limits.

Metals results for the March 2020 quarterly sampling round can be used as reported by the laboratory.

Summary

Based on this review of the data in accordance with the QAPP and USEPA Region II CLP data validation criteria, all of the data collected in the March 2020 quarterly sampling round for the Reynolds Metals plant is usable as reported by the laboratory.

AR:jhr

Attachments

cc: Richard Towne, Alcoa
pw:\\1902\80599\02 Project Information\03 Data\40 Field Data\2020 Database\March 2020\20024.docx

Sample ID Sample Date Parameter ID	Unit	MW-10S-0320 3/10/20	MW-39S-0320 3/10/20	MW-40S-0320 3/10/20	MW-45-0320 3/10/20	MW-45-0320D 3/10/20
Field Parameters						
pH	SU	6.94	7.07	7.16	6.91	---
Temperature	deg C	8	6.6	7.9	5.4	---
Specific Conductance	mS/cm	0.504	0.581	0.792	1.128	---
Turbidity	NTU	4	293	12	33.9	---
Redox Potential	mVolt	184.2	150.4	146.5	163.3	---
Inorganics						
Aluminum	mg/l	0.0665	0.488	0.0104	0.747	0.756
Dissolved Aluminum	mg/l	0.00552J	0.0292	0.01U	0.0186	0.00827J
Conventionals						
Total Cyanide	mg/l	0.004J	0.027	0.066	0.439	0.352
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.01U	0.01U	0.017
Fluoride	mg/l	0.14	1.57	0.201	0.397	0.365
Sulfate	mg/l	86.4	133	58	594	601
PCBs						
Aroclor 1242	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1248	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1254	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1260	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U

Key:
U = Nondetect
J = Estimated

Sample ID	Sample Date	VTSR[1]	Days	Total Cyanide Target - 12 Days VTSR to Analysis	Days	Weak Acid Dissociable Cyanide Target - 12 Days VTSR to Analysis	Days	Fluoride Target - 26 Days VTSR to Analysis	Days	Sulfate Target - 26 Days VTSR to Analysis	Days
MW-10S-0320	3/10/20	3/11/20	1	3/12/20	1	3/12/20	1	3/12/20	1	3/12/20	1
MW-1201-0320FBW	3/10/20	3/11/20	1	3/12/20	1	3/12/20	1	3/12/20	1	3/12/20	1
MW-39S-0320	3/10/20	3/11/20	1	3/12/20	1	3/12/20	1	3/12/20	1	3/12/20	1
MW-40S-0320	3/10/20	3/11/20	1	3/12/20	1	3/12/20	1	3/12/20	1	3/12/20	1
MW-45-0320	3/10/20	3/11/20	1	3/12/20	1	3/12/20	1	3/12/20	1	3/12/20	1
MW-45-0320D	3/10/20	3/11/20	1	3/12/20	1	3/12/20	1	3/12/20	1	3/12/20	1

Sample ID	Sample Date	VTSR[1]	Days	Aluminum Target - 180 Days VTSR to Analysis	Days	Dissolved Aluminum Target - 180 Days VTSR to Analysis	Days	PCBs Target - 365 Days from VTSR to Extraction	Days	PCBs Target - 40 Days from Extraction to Analysis	Days
MW-10S-0320	3/10/20	3/11/20	1	3/13/20	2	3/17/20	6	3/12/20	1	3/13/20	1
MW-1201-0320FBW	3/10/20	3/11/20	1	3/14/20	3	3/17/20	6	3/12/20	1	3/13/20	1
MW-39S-0320	3/10/20	3/11/20	1	3/13/20	2	3/17/20	6	3/12/20	1	3/13/20	1
MW-40S-0320	3/10/20	3/11/20	1	3/14/20	3	3/17/20	6	3/12/20	1	3/13/20	1
MW-45-0320	3/10/20	3/11/20	1	3/13/20	2	3/17/20	6	3/12/20	1	3/13/20	1
MW-45-0320D	3/10/20	3/11/20	1	3/14/20	3	3/17/20	6	3/12/20	1	3/13/20	1

Key:

1. VTSR = Verified time of sample receipt; date shown is the VTSR at Alpha Analytical

Sample ID Sample Date Parameter ID	Unit	MW-1201-0320FBW 3/10/20
Inorganics		
Aluminum	mg/l	0.1U
Dissolved Aluminum	mg/l	0.1U
Conventionals		
Total Cyanide	mg/l	0.005U
Cyanide, Weak Acid Dissociable	mg/l	0.01U
Fluoride	mg/l	0.05U
Sulfate	mg/l	1U
PCBs		
Aroclor 1242	µg/l	0.065U
Aroclor 1248	µg/l	0.065U
Aroclor 1254	µg/l	0.065U
Aroclor 1260	µg/l	0.065U

Key:
U = Nondetect

Sample ID Sample Location Sample Date Parameter ID	Unit	Original Sample MW-45-0320 MW-45 3/10/20	Duplicate Sample MW-1200-0320BD MW-45 3/10/20	Relative Percent Difference[1,2] %
Inorganics				
Aluminum	mg/l	0.747	0.756	1.2
Dissolved Aluminum	mg/l	0.0186	0.00827J	---[3]
Conventionals				
Total Cyanide	mg/l	0.439	0.352	22.0
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.017	---[3]
Fluoride	mg/l	0.397	0.365	8.4
Sulfate	mg/l	594	601	1.2
PCBs				
Aroclor 1242	µg/l	0.065U	0.065U	---
Aroclor 1248	µg/l	0.065U	0.065U	---
Aroclor 1254	µg/l	0.065U	0.065U	---
Aroclor 1260	µg/l	0.065U	0.065U	---

Notes:

1. Precision is evaluated by calculating the relative percent difference (RPD) using the following formula:

$$| 2 * (X1 - X2) / (X1 + X2) * 100 |$$

where X1 is the original sample value and X2 is the duplicate sample value.

2. --- = RPD not calculated for nondetected parameters.

3. Values reported are less than the five times the CRQL, therefore the absolute difference was calculated.

Key:

U = Nondetect

J = Estimated

CDM Smith

Memorandum

To: *Robyn Gross*

From: *Paul Rodrigue*

Date: *July 24, 2020*

Subject: *Reynolds Metals Company, LLC. – Massena East Plant – NYSDEC Site Code #645009*
Data Quality Assessment – June 2020

This memorandum presents the data quality assessment for the June 2020 quarterly sampling round for the Massena East Plant. Samples were collected between June 8 and June 11, 2020 and analyzed for polychlorinated biphenyls (PCBs), conventional inorganics (total cyanide, weak acid dissociable (WAD) cyanide, fluoride and sulfate), and metals (total aluminum and dissolved aluminum).

Laboratory quality control data associated with these samples were reviewed in accordance with the *Quality Assurance Project Plan* (QAPP) (CDM, March 2008) and United States Environmental Protection Agency (USEPA) Region II Contract Laboratory Program (CLP) data validation criteria as referenced in *Validating PCB Compounds PCBs by Gas Chromatography SW-846 Method 8082A* (SOP No. HW-45, Revision No. 1, October 2006) and in *Validation of Metals for the (CLP) Based on SOW ILM05.3* (SOP No. HW-2. Revision No. 13, September 2006). All analyses were performed by Alpha Analytical in Westborough, Massachusetts except WAD cyanide which was subcontracted by Alpha Analytical to ALS Environmental in Rochester, NY. Additionally, PCB analyses were performed at Alpha's Mansfield, Massachusetts laboratory.

The intent of this review is to provide a general assessment of the overall quality of the data packages based on the review of the following information:

- field and laboratory method blanks;
- surrogate spike recovery;
- field duplicate precision;
- matrix spike/matrix spike duplicate (MS/MSD) samples;
- laboratory control sample/laboratory control sample duplicates (LCS/LCSD);
- sample holding time data; and
- sample receipt conditions.

All applicable data were evaluated and are summarized below. Field quality assurance sample results (field blanks and duplicate samples) were also evaluated. Analytical results, hold times and field quality assurance data are summarized in Tables 1 through 4.

PCB Analysis

A field blank sample was collected on each day of sampling (MW-1204-0620FBW, MW-1205-0620FBW, and MW-1206-0620FBW). PCB Aroclors were not detected in the field blank samples. In addition, the laboratory blank samples analyzed with the field samples were non-detect for Aroclors. No qualification is required.

PCB analysis surrogate spike recovery data were reviewed. Tetrachloro-m-xylene (TCX) and decachlorobiphenyl (DCB) were the compounds used for the surrogate spike standards. The QAPP specifies that at least one surrogate is recovered within range (30 to 150 percent), with both surrogate recoveries greater than 10 percent. All surrogate recoveries were within the acceptable range. No qualification is required.

A field duplicate sample was collected at MW-18S (MW-1203-0620BD), and at MW-40S (MW-1202-0620BD). All Aroclors were nondetect in both the parent and duplicate samples. No qualification is required.

Samples MW-10S-0620 and MW-43-0620 were analyzed as a MS/MSD sample. The QAPP specifies that MS/MSD recoveries be within the range of 29 to 135 percent, with a relative percent difference (RPD) of less than 30 percent between the spiked pair. The MS and MSD samples were spiked with Aroclor 1260. Recoveries and precision between the spiked pair were acceptable. No qualification is required.

The QAPP specifies a recovery range of 50 to 150 percent for compounds in a LCS/LCSD. Recovery and precision for Aroclor 1260 was within the acceptable range in the LCS/LCSD samples; no qualification is required.

USEPA Region II guidance specifies a holding time of up to 365 days beyond the verified time of sample receipt (VTSR) for sample extraction and 40 days from the time of sample extraction to analysis. In addition, VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding PCB analysis holding times. No qualification is required.

The condition of the samples upon receipt at the laboratory was reviewed. All samples were delivered at temperatures below 10°C. No qualification is required.

Based on the results of this assessment, the PCB results for the June 2020 Massena East Plant sampling event can be used without qualification.

Conventional Inorganics Analysis

Samples were analyzed for total cyanide, WAD cyanide, fluoride, and sulfate. All associated conventional inorganics quality control data were reviewed.

A field blank sample was collected on each day of sampling (MW-1204-0620FBW, MW-1205-0620FBW, and MW-1206-0620FBW) and analyzed for conventional inorganics. All field blanks were non-detect for conventional inorganics. No qualification is required.

Laboratory method blanks analyzed with the field samples were non-detect for total cyanide, WAD cyanide, fluoride, and sulfate. No qualification is required.

A field duplicate was collected at MW-18S (MW-1203-0620BD), and MW-40S (MW-1202-06120BD). The RPD quantified between the parent and duplicate samples collected at each monitoring well was acceptable for all conventional inorganic parameters except total cyanide and fluoride in the MW-18S pair. The RPD between the pair for total cyanide was high at 32.7 percent while the RPD between the pair for fluoride was high at 92.3 percent. Consequently, the total cyanide and fluoride results for MW-18S-0620 and MW-18S-0620D are qualified as estimated ("J").

MS/MSD analysis was requested on MW-10S-0620 and MW-43-0620. The laboratory also performed MS analyses for fluoride and sulfate on MW-19S-0620 and MW-30S-0620. The QAPP specifies acceptable MS/MSD recovery limits as 75 to 125 percent for total and WAD cyanide and 80 to 120 percent for fluoride and sulfate. Recoveries and precision between the spiked pairs were acceptable for all conventional inorganics with one exception. Sulfate was under-recovered in the MS and MSD at 77 and 76 percent, respectively, in MW-10S-0620. The under-recoveries are disregarded, however, because the native sample concentration was more than four times the spike amount. The WAD cyanide MS and MSD recoveries were below the QAPP limits but were within the laboratory limits. No qualification is required.

All LCS recoveries for conventional inorganics were acceptable. No qualification is required.

The QAPP specifies holding times for conventional inorganic parameters beyond the VTSR. The VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding conventional inorganic parameter analysis holding times. All hold time requirements were met. No qualification is required.

Sample receipt conditions were reviewed. All samples were received within the QAPP-specified temperature limits. No qualification is required.

Conventional results for the June 2020 quarterly sampling round can be used as reported by the laboratory with the exceptions noted above.

Metals Analysis

Samples were analyzed for total aluminum and dissolved aluminum. All associated metals quality control data were reviewed.

Laboratory and field blank samples were reviewed for metals analysis. The field blank samples were non-detect for both total and dissolved aluminum. Additionally, laboratory blanks were non-detect. No qualification was required.

A field duplicate sample was collected at MW-18S (MW-1203-0620BD) and MW-40S (MW-1202-0620BD). Total and dissolved aluminum were non-detect in the pair collected from MW-40S. In

MW-18S, total and dissolved aluminum were detected in both samples at concentrations less than five times the contract required quantitation limit (CRQL) of 0.1 mg/l. In such case, the absolute difference is used to determine qualification. The absolute differences are less than the CRQL, therefore no qualification is required.

Samples MW-10S-0620 and MW-43-0620 were requested to be analyzed as a MS/MSD sample. The laboratory also performed MS analysis for total and dissolved aluminum on MW-39S-0620 and MW-44-0620. Recoveries and precision between the spiked pair were acceptable. No qualification is required.

The LCS had acceptable recoveries for total and dissolved aluminum. No qualification is required.

The QAPP specifies a holding time of up to 180 days beyond the VTSR for sample analysis. In addition, VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding metals analysis holding times. All holding times were within acceptance limits. No qualification is required.

All samples were delivered to the laboratory within the QAPP-specific temperature limits.

Metals results for the June 2020 quarterly sampling round can be used as reported by the laboratory.

Summary

Based on this review of the data in accordance with the QAPP and USEPA Region II CLP data validation criteria, all the data collected in the June 2020 quarterly sampling round for the Massena East Plant is usable as reported by the laboratory with the following exceptions:

- due to the lack of precision between the field duplicate pair, the total cyanide and fluoride results for MW-18S-0620 and MW-18S-0620D are qualified as estimated ("J").

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Attachments
pw:\\1902\80599\02 Project Information\03 Data\40 Field Data\2020 Database\June\20053

Sample ID Sample Date Parameter ID	Unit	FDRAIN-0620 6/8/20	MW-03S-0620 6/9/20	MW-10S-0620 6/9/20	MW-11SR-0620 6/9/20	MW-12S-0620 6/9/20	MW-13S-0620 6/9/20	MW-14S-0620 6/9/20
Field Parameters								
pH	SU	8.47	7.94	7.25	7.52	7.58	7.34	7.51
Temperature	deg C	12.8	12	9.9	9.8	9.6	8.9	9.1
Specific Conductance	mS/cm	1.214	1.555	0.678	1.32	2.808	4.935	1.091
Turbidity	NTU	3.2	78.9	16.9	25.3	29.5	8	19.3
Redox Potential	mVolt	211.8	210.1	160.4	112.4	125.3	210.9	190.2
Inorganics								
Aluminum	mg/l	---	1.3	0.135	0.189	0.445	0.259	0.06J
Dissolved Aluminum	mg/l	---	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
Conventionals								
Total Cyanide	mg/l	1.63	1.77	0.005U	0.005U	0.028	0.069	0.005U
WAD Cyanide	mg/l	0.153	0.123	0.01U	0.01U	0.01U	0.013	0.01U
Fluoride	mg/l	21.3	12.9	0.18	0.473	11.5	6.56	0.766
Sulfate	mg/l	205	256	93.4	424	1000	2540	330
PCBs								
Aroclor 1242	µg/l	---	0.019U	0.019U	0.019U	0.02U	0.019U	0.019U
Aroclor 1248	µg/l	---	0.019U	0.019U	0.019U	0.02U	0.019U	0.019U
Aroclor 1254	µg/l	---	0.019U	0.019U	0.019U	0.02U	0.019U	0.019U
Aroclor 1260	µg/l	---	0.019U	0.019U	0.019U	0.02U	0.019U	0.019U

Key:
U = Nondetect
J = Estimated
--- = Not Analyzed

Sample ID Sample Date Parameter ID	Unit	MW-15S-87-0620 6/9/20	MW-16S-0620 6/9/20	MW-17S-0620 6/11/20	MW-18S-0620 6/8/20	MW-18S-0620D 6/8/20	MW-19S-0620 6/9/20	MW-20-85S-0620 6/9/20	MW-22-85S-0620 6/8/20
Field Parameters									
pH	SU	7.66	8.18	7.52	8.14	---	7.52	10.91	7.7
Temperature	deg C	11.6	9.5	13.2	12.1	---	9.7	10.3	12.8
Specific Conductance	mS/cm	0.646	1.166	0.927	1.266	---	0.736	1.338	1.784
Turbidity	NTU	414	11.4	4	36	---	1.1	9.5	52.1
Redox Potential	mVolt	81.7	217.1	185.7	214.5	---	137.5	151.2	106.7
Inorganics									
Aluminum	mg/l	6.24	0.1U	0.1U	0.082J	0.059J	0.1U	0.1U	0.275
Dissolved Aluminum	mg/l	0.1U	0.1U	0.1U	0.073J	0.088J	0.1U	0.1U	0.1U
Conventionals									
Total Cyanide	mg/l	0.005U	0.004J	0.005U	0.023J	0.032J	0.005U	0.005U	0.005U
Cyanide, Weak Acid Diss	mg/l	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U
Fluoride	mg/l	3	7.42	1.05	22.1J	8.14J	3.49	0.567	0.699
Sulfate	mg/l	121	200	103	226	205	97.6	281	404
PCBs									
Aroclor 1242	µg/l	0.019U	0.019U	0.065U	0.019U	0.019U	0.02U	0.02U	0.019U
Aroclor 1248	µg/l	0.019U	0.019U	0.065U	0.019U	0.019U	0.02U	0.02U	0.019U
Aroclor 1254	µg/l	0.019U	0.019U	0.065U	0.019U	0.019U	0.02U	0.02U	0.019U
Aroclor 1260	µg/l	0.019U	0.019U	0.065U	0.019U	0.019U	0.02U	0.02U	0.019U

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Sample ID Sample Date Parameter ID	Unit	MW-23-85S-0620 6/9/20	MW-26S-0620 6/8/20	MW-27S-0620 6/9/20	MW-28S-0620 6/8/20	MW-30S-0620 6/9/20	MW-31SR-0620 6/9/20	MW-33S-0620 6/8/20
Field Parameters								
pH	SU	7.39	7.97	7.47	8.43	7.25	7.67	7.39
Temperature	deg C	9	10.9	11.9	9.8	9.6	9.4	11.6
Specific Conductanc	mS/cm	0.978	0.775	7.762	1.025	0.683	0.625	2.137
Turbidity	NTU	202	361	23.9	28	8.4	184	18.4
Redox Potential	mVolt	184.1	171.3	228.5	166.3	168.5	175.4	221.6
Inorganics								
Aluminum	mg/l	1.02	0.636	0.539	3.63	0.222	1.49	---
Dissolved Aluminum	mg/l	0.1U	0.041J	0.1U	0.1U	0.1U	0.1U	---
Conventionals								
Total Cyanide	mg/l	0.005U	0.005U	0.023	2.94	0.004J	0.002J	0.005U
Cyanide, Weak Acic	mg/l	0.01U	0.01U	0.01U	0.087	0.01U	0.01U	0.01U
Fluoride	mg/l	0.81	5.74	2.96	14.3	6.03	0.998	---
Sulfate	mg/l	358	132	289	169	89.7	193	---
PCBs								
Aroclor 1242	µg/l	0.02U	0.02U	0.019U	0.02U	0.019U	0.02U	---
Aroclor 1248	µg/l	0.02U	0.02U	0.019U	0.02U	0.019U	0.02U	---
Aroclor 1254	µg/l	0.02U	0.02U	0.019U	0.02U	0.019U	0.02U	---
Aroclor 1260	µg/l	0.02U	0.02U	0.019U	0.02U	0.019U	0.02U	---

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Sample ID Sample Date Parameter ID	Unit	MW-34S-0620 6/8/20	MW-35SR-0620 6/11/20	MW-36-0620 6/11/20	MW-37-0620 6/11/20	MW-38-0620 6/11/20	MW-39S-0620 6/9/20	MW-40S-0620 6/9/20
Field Parameters								
pH	SU	8.13	7.71	8.62	7.7	8.11	7.25	7.33
Temperature	deg C	11.1	10.3	10.5	10.7	11.9	9.4	11.3
Specific Conductance	mS/cm	2.441	1.27	1.909	0.774	0.44	0.745	1.092
Turbidity	NTU	70.4	1000	1000	1000	1000	104	15
Redox Potential	mVolt	214	170.1	164.6	169.3	164.1	152.2	162.1
Inorganics								
Aluminum	mg/l	---	5.06	6.74	12.5	9.6	2.04	0.1U
Dissolved Aluminum	mg/l	---	0.04J	1.46	0.054J	4.06	0.066J	0.1U
Conventionals								
Total Cyanide	mg/l	0.073	0.005U	0.005U	0.003J	0.005U	0.047	0.082
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U
Fluoride	mg/l	---	1.25	2.35	0.59	0.756	1.65	0.31
Sulfate	mg/l	---	574	352	292	185	142	56.2
PCBs								
Aroclor 1242	µg/l	---	0.065U	0.065U	0.065U	0.065U	0.019U	0.019U
Aroclor 1248	µg/l	---	0.065U	0.065U	0.065U	0.065U	0.019U	0.019U
Aroclor 1254	µg/l	---	0.065U	0.065U	0.065U	0.065U	0.019U	0.019U
Aroclor 1260	µg/l	---	0.065U	0.065U	0.065U	0.065U	0.019U	0.019U

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Sample ID Sample Date Parameter ID	Unit	MW-40S-0620D 6/9/20	MW-41-0620 6/9/20	MW-42-0620 6/11/20	MW-43-0620 6/11/20	MW-44-0620 6/11/20	MW-45-0620 6/9/20	PZ-44-0620 6/9/20	PZ-45-0620 6/9/20	PZ-46-0620 6/9/20
Field Parameters										
pH	SU	---	7.68	8.07	7.36	7.42	7.27	7.3	7.43	7.7
Temperature	deg C	---	11.8	10.9	10.8	12.1	9.4	17.4	13.4	15.6
Specific Conductance	mS/cm	---	1.215	2.36	0.726	0.7	1.455	2.469	2.035	2.33
Turbidity	NTU	---	918	338	1000	72	76.6	275	296	990
Redox Potential	mVolt	---	204.7	179.2	182.9	197.7	155.4	-23.5	-2.4	19.7
Inorganics										
Aluminum	mg/l	0.1U	5.35	12.7	9.83	0.084J	0.347	11.7	0.65	---
Dissolved Aluminum	mg/l	0.1U	0.143	2.36	0.512	0.036J	0.1U	0.1U	0.1U	---
Conventionals										
Total Cyanide	mg/l	0.083	0.005U	0.158	0.005U	0.005U	0.458	0.005U	0.005U	---
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.01U	0.01U	0.01U	0.035	0.01U		
Fluoride	mg/l	0.311	0.385	38.4	0.537	0.613	0.43	4.15	2.34	3
Sulfate	mg/l	56	359	1290	123	110	531	1100	1240	1480
PCBs										
Aroclor 1242	µg/l	0.019U	0.019U	0.065U	0.065U	0.065U	0.02U	0.02U	0.02U	---
Aroclor 1248	µg/l	0.019U	0.019U	0.065U	0.065U	0.065U	0.02U	0.02U	0.02U	---
Aroclor 1254	µg/l	0.019U	0.019U	0.065U	0.065U	0.065U	0.02U	0.02U	0.02U	---
Aroclor 1260	µg/l	0.019U	0.019U	0.065U	0.065U	0.065U	0.02U	0.02U	0.02U	---

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Sample ID	Sample Date	VTSR[1]	Days	Total Cyanide		Weak Acid Dissociable Cyanide		Fluoride		Sulfate	
				Target - 12 Days VTSR to Analysis	Days	Target - 12 Days VTSR to Analysis	Days	Target - 26 Days VTSR to Analysis	Days	Target - 26 Days VTSR to Analysis	Days
FDRAIN-0620	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	6/13/20	3	6/11/20	1
MW-03S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-10S-0620	6/9/20	6/10/20	1	6/22/20	12	6/12/20	2	6/11/20	1	6/11/20	1
MW-11SR-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-1204-0620FBW	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	6/12/20	2	6/12/20	2
MW-1205-0620FBW	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-1206-0620FBW	6/11/20	6/12/20	1	6/15/20	3	6/12/20	0	6/16/20	4	6/16/20	4
MW-12S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-13S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-14S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-15S-87-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-16S-0620	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	6/12/20	2	6/12/20	2
MW-17S-0620	6/11/20	6/12/20	1	6/15/20	3	6/18/20	6	6/16/20	4	6/16/20	4
MW-18S-0620	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-18S-0620D	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	6/12/20	2	6/12/20	2
MW-19S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/12/20	2	6/12/20	2
MW-20-85S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/12/20	2	6/12/20	2
MW-22-85S-0620	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	6/12/20	2	6/12/20	2
MW-23-85S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/12/20	2	6/12/20	2
MW-26S-0620	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-27S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-28S-0620	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-30S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-31SR-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-33S-0620	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	--	--	--	--
MW-34S-0620	6/8/20	6/10/20	2	6/12/20	2	6/12/20	2	--	--	--	--
MW-35SR-0620	6/11/20	6/12/20	1	6/15/20	3	6/18/20	6	6/16/20	4	6/16/20	4
MW-36-0620	6/11/20	6/12/20	1	6/15/20	3	6/18/20	6	6/16/20	4	6/16/20	4
MW-37-0620	6/11/20	6/12/20	1	6/15/20	3	6/18/20	6	6/16/20	4	6/16/20	4
MW-38-0620	6/11/20	6/12/20	1	6/15/20	3	6/18/20	6	6/16/20	4	6/16/20	4
MW-39S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/13/20	3
MW-40S-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-40S-0620D	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
MW-41-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/13/20	3	6/11/20	1
MW-42-0620	6/11/20	6/12/20	1	6/15/20	3	6/18/20	6	6/16/20	4	6/16/20	4
MW-43-0620	6/11/20	6/12/20	1	6/15/20	3	6/18/20	6	6/16/20	4	6/16/20	4
MW-44-0620	6/11/20	6/12/20	1	6/15/20	3	6/18/20	6	6/16/20	4	6/16/20	4
MW-45-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/11/20	1	6/11/20	1
PZ-44-0620	6/9/20	6/10/20	1	6/12/20	2	6/12/20	2	6/12/20	2	6/12/20	2
PZ-45-0620	6/9/20	6/10/20	1	6/12/20	--	--	--	6/12/20	2	6/12/20	2
PZ-46-0620	6/9/20	6/10/20	1	--	--	--	--	6/12/20	2	6/12/20	2

Key:

1. VTSR = Verified time of sample receipt; date shown is the VTSR at ALS Environmental

--- = Not sampled

Table 2
East Plant
Summary of Sample Hold Times

Sample ID	Sample Date	VTSR[1]	Days	Aluminum		Dissolved Aluminum		PCBs			
				Target - 180 Days VTSR to Analysis	Days	Target - 180 Days VTSR to Analysis	Days	Target - 365 Days from VTSR to Extraction	Days	Target - 40 Days from Extraction to Analysis	Days
FDRAIN-0620	6/8/20	6/10/20	2	---	---	---	---	---	---	---	---
MW-03S-0620	6/9/20	6/10/20	1	6/22/20	12	6/23/20	13	6/12/20	2	6/20/20	8
MW-10S-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-11SR-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-1204-0620FBW	6/8/20	6/10/20	2	6/21/20	11	6/23/20	13	6/13/20	3	6/20/20	7
MW-1205-0620FBW	6/9/20	6/10/20	1	6/22/20	12	6/23/20	13	6/13/20	3	6/20/20	7
MW-1206-0620FBW	6/11/20	6/12/20	1	6/24/20	12	6/25/20	13	6/17/20	5	6/24/20	7
MW-12S-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-13S-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-14S-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-15S-87-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-16S-0620	6/8/20	6/10/20	2	6/21/20	11	6/23/20	13	6/13/20	3	6/20/20	7
MW-17S-0620	6/11/20	6/12/20	1	6/24/20	12	6/25/20	13	6/13/20	1	6/21/20	8
MW-18S-0620	6/8/20	6/10/20	2	6/22/20	12	6/23/20	13	6/13/20	3	6/20/20	7
MW-18S-0620D	6/8/20	6/10/20	2	6/21/20	11	6/23/20	13	6/13/20	3	6/20/20	7
MW-19S-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-20-85S-0620	6/9/20	6/10/20	1	6/21/20	11	6/23/20	13	6/13/20	3	6/21/20	8
MW-22-85S-0620	6/8/20	6/10/20	2	6/21/20	11	6/23/20	13	6/13/20	3	6/20/20	7
MW-23-85S-0620	6/9/20	6/10/20	1	6/21/20	11	6/23/20	13	6/13/20	3	6/21/20	8
MW-26S-0620	6/8/20	6/10/20	2	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-27S-0620	6/9/20	6/10/20	1	6/22/20	12	6/23/20	13	6/13/20	3	6/20/20	7
MW-28S-0620	6/8/20	6/10/20	2	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-30S-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-31SR-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-33S-0620	6/8/20	6/10/20	2	---	---	---	---	---	---	---	---
MW-34S-0620	6/8/20	6/10/20	2	---	---	---	---	---	---	---	---
MW-35SR-0620	6/11/20	6/12/20	1	6/24/20	12	6/25/20	13	6/13/20	1	6/21/20	8
MW-36-0620	6/11/20	6/12/20	1	6/24/20	12	6/25/20	13	6/13/20	1	6/21/20	8
MW-37-0620	6/11/20	6/12/20	1	6/24/20	12	6/25/20	13	6/13/20	1	6/21/20	8
MW-38-0620	6/11/20	6/12/20	1	6/24/20	12	6/25/20	13	6/13/20	1	6/21/20	8
MW-39S-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-40S-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-40S-0620D	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
MW-41-0620	6/9/20	6/10/20	1	6/22/20	12	6/23/20	13	6/13/20	3	6/20/20	7
MW-42-0620	6/11/20	6/12/20	1	6/24/20	12	6/25/20	13	6/17/20	5	6/24/20	7
MW-43-0620	6/11/20	6/12/20	1	6/17/20	5	6/25/20	13	6/17/20	5	6/24/20	7
MW-44-0620	6/11/20	6/12/20	1	6/24/20	12	6/25/20	13	6/17/20	5	6/24/20	7
MW-45-0620	6/9/20	6/10/20	1	6/22/20	12	6/22/20	12	6/12/20	2	6/20/20	8
PZ-44-0620	6/9/20	6/10/20	1	6/21/20	11	6/23/20	13	6/13/20	3	6/21/20	8
PZ-45-0620	6/9/20	6/10/20	1	6/21/20	11	6/23/20	13	6/13/20	3	6/21/20	8
PZ-46-0620	6/9/20	6/10/20	1	---	---	---	---	---	---	---	---

Sample ID Sample Date Parameter ID	Unit	MW-1204-0620FBW 6/8/20	MW-1205-0620FBW 6/9/20	MW-1206-0620FBW 6/11/20
Inorganics				
Aluminum	mg/l	0.1U	0.1U	0.1U
Dissolved Aluminum	mg/l	0.1U	0.1U	0.1U
Conventionals				
Total Cyanide	mg/l	0.005U	0.005U	0.005U
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.01U
Fluoride	mg/l	0.05U	0.05U	0.05U
Sulfate	mg/l	1U	1U	1U
PCBs				
Aroclor 1242	µg/l	0.019U	0.02U	0.065U
Aroclor 1248	µg/l	0.019U	0.02U	0.065U
Aroclor 1254	µg/l	0.019U	0.02U	0.065U
Aroclor 1260	µg/l	0.019U	0.02U	0.065U

Key:
U = Nondetect

Sample ID Sample Location Sample Date Parameter ID	Unit	Original Sample MW-18S-0620 MW-18S 6/8/20	Duplicate Sample MW-1203-0620BD MW-18S 6/8/20	Relative Percent Difference[1,2] %	Original Sample MW-40S-0620 MW-40S 6/9/20	Duplicate Sample MW-1202-0620BD MW-40S 6/9/20	Relative Percent Difference[1,2] %
Inorganics							
Aluminum	mg/l	0.082J	0.059J	--[3]	0.1U	0.1U	--
Dissolved Aluminum	mg/l	0.073J	0.088J	--	0.1U	0.1U	--
Conventionals							
Total Cyanide	mg/l	0.023J	0.032J	32.7	0.082	0.083	1.2
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	---	0.01U	0.01U	--
Fluoride	mg/l	22.1J	8.14J	92.3	0.31	0.311	0.3
Sulfate	mg/l	226	205	9.7	56.2	56	0.4
PCBs							
Aroclor 1242	µg/l	0.019U	0.019U	--	0.019U	0.019U	--
Aroclor 1248	µg/l	0.019U	0.019U	--	0.019U	0.019U	--
Aroclor 1254	µg/l	0.019U	0.019U	--	0.019U	0.019U	--
Aroclor 1260	µg/l	0.019U	0.019U	--	0.019U	0.019U	--

Notes:

1. Precision is evaluated by calculating the relative percent difference (RPD) using the following formula:

$$| 2 * (X1 - X2) / (X1 + X2) * 100 |$$

where X1 is the original sample value and X2 is the duplicate sample value.

2. --- = RPD not calculated for nondetected parameters.

3. When one or both results are less than five times the CRQL, the absolute difference is used to determine qualification.

Key:

U = Nondetect

J = Estimated

--- = Not Analyzed

Table 4
East Plant
Summary of Field Duplicate Samples

CDM Smith

Memorandum

To: *Robyn Gross*

From: *Paul Rodrigue*

Date: *October 13, 2020*

Subject: *Reynolds Metals Company, LLC. – Massena East Plant – NYSDEC Site Code #645009*
Data Quality Assessment –September 2020

This memorandum presents the data quality assessment for the September 2020 quarterly sampling round for the Massena East Plant. Samples were collected on September 16, 2020 and analyzed for polychlorinated biphenyls (PCBs), conventional inorganics (total cyanide, weak acid dissociable (WAD) cyanide, fluoride, and sulfate), and metals (total aluminum and dissolved aluminum).

Laboratory quality control data associated with these samples were reviewed in accordance with the *Quality Assurance Project Plan* (QAPP) (CDM, March 2008) and United States Environmental Protection Agency (USEPA) Region II Contract Laboratory Program (CLP) data validation criteria as referenced in *Validating PCB Compounds PCBs by Gas Chromatography SW-846 Method 8082A* (SOP No. HW-45, Revision No. 1, October 2006) and in *Validation of Metals for the (CLP) Based on SOW ILMO5.3* (SOP No. HW-2. Revision No. 13, September 2006). All analyses were performed by Alpha Analytical in Westborough, Massachusetts except WAD cyanide which was subcontracted by Alpha Analytical to ALS Environmental in Rochester, NY. Additionally, metals and PCB analyses were performed at Alpha's Mansfield, Massachusetts laboratory.

The intent of this review is to provide a general assessment of the overall quality of the data packages based on the review of the following information:

- field and laboratory method blanks;
- surrogate spike recovery;
- field duplicate precision;
- matrix spike/matrix spike duplicate (MS/MSD) samples;
- laboratory control sample/laboratory control sample duplicates (LCS/LCSD);
- sample holding time data; and
- sample receipt conditions.

All applicable data were evaluated and are s0ummarized below. Field quality assurance sample results (field blanks and duplicate samples) were also evaluated. The Analytical results hold times and field quality assurance data are summarized in Tables 1 through 4.

PCB Analysis

A field blank sample was collected on the day of sampling (MW-1209-0920FBW). PCB Aroclors were not detected in the field blank sample. In addition, the laboratory blank sample analyzed with the field samples was non-detect for Aroclors. No qualification is required.

PCB analysis surrogate spike recovery data were reviewed. Tetrachloro-m-xylene (TCX) and decachlorobiphenyl (DCB) were the compounds used for the surrogate spike standards. The QAPP specifies that at least one surrogate is recovered within range (30 to 150 percent), with both surrogate recoveries greater than 10 percent. All surrogate recoveries were within the acceptable range. No qualification is required.

A field duplicate sample was collected at MW-40S (MW-1208-0920BD). All Aroclors were non-detect in both the parent and duplicate samples. No qualification is required.

Samples MW-10S-0920 was analyzed as a MS/MSD sample. The QAPP specifies that MS/MSD recoveries be within the range of 29 to 135 percent, with a relative percent difference (RPD) of less than 30 percent between the spiked pair. The MS and MSD samples were spiked with Aroclor 1260. Recoveries and precision between the spiked pair were acceptable. No qualification is required.

The QAPP specifies a recovery range of 50 to 150 percent for compounds in a LCS/LCSD. Recovery and precision for Aroclor 1260 was within the acceptable range in the LCS/LCSD samples; no qualification is required.

USEPA Region II guidance specifies a holding time of up to 365 days beyond the verified time of sample receipt (VTSR) for sample extraction and 40 days from the time of sample extraction to analysis. In addition, VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding PCB analysis holding times. No qualification is required.

The condition of the samples upon receipt at the laboratory was reviewed. All samples were delivered at temperatures below 10°C. No qualification is required.

Based on the results of this assessment, the PCB results for the September 2020 Massena East Plant sampling event can be used without qualification.

Conventional Inorganics Analysis

Samples were analyzed for total cyanide, WAD cyanide, fluoride, and sulfate. All associated conventional inorganics quality control data were reviewed.

A field blank sample was collected on the day of sampling (MW-1209-0920FBW) and analyzed for conventional inorganics. The field blank was non-detect for conventional inorganics. No qualification is required.

Laboratory method blanks analyzed with the field samples were non-detect for total cyanide, WAD cyanide, fluoride, and sulfate. No qualification is required.

A field duplicate was collected at MW-40S (MW-1208-0920BD). The RPD quantified between the parent and duplicate sample was acceptable for all conventional inorganic parameters. No qualification is required.

MS/MSD analysis was requested on MW-10S-0920. Recoveries and precision between the spiked pairs were acceptable for all conventional inorganics. The WAD cyanide MS and MSD recoveries were below the QAPP limits but were within the laboratory limits. No qualification is required.

All LCS recoveries for conventional inorganics were acceptable. No qualification is required.

The QAPP specifies holding times for conventional inorganic parameters beyond the VTSR. The VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding conventional inorganic parameter analysis holding times. All hold time requirements were met. No qualification is required.

Sample receipt conditions were reviewed. All samples were received within the QAPP-specified temperature limits. No qualification is required.

Conventional results for the September 2020 quarterly sampling round can be used as reported by the laboratory with the exceptions noted above.

Metals Analysis

Samples were analyzed for total aluminum and dissolved aluminum. All associated metals quality control data were reviewed.

Laboratory and field blank samples were reviewed for metals analysis. The field blank sample was non-detect for both total and dissolved aluminum. Additionally, the laboratory blank was non-detect. No qualification was required.

A field duplicate sample was collected at MW-40S (MW-1208-0920BD). Total and dissolved aluminum were non-detect in both samples. No qualification is required.

Sample MW-10S-0920 was requested to be analyzed as a MS/MSD sample. Recoveries and precision between the spiked pair were acceptable. No qualification is required.

The LCS had acceptable recoveries for total and dissolved aluminum. No qualification is required.

The QAPP specifies a holding time of up to 180 days beyond the VTSR for sample analysis. In addition, VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of

the relevant information regarding metals analysis holding times. All holding times were within acceptance limits. No qualification is required.

All samples were delivered to the laboratory within the QAPP-specific temperature limits.

Metals results for the September 2020 quarterly sampling round can be used as reported by the laboratory.

Summary

Attachments
pw:\\1902\80599\02 Project Information\03 Data\40 Field Data\2020 Database\Sept\20083

Sample ID Sample Date Parameter ID	Unit	MW-10S-0920 9/16/20	MW-39S-0920 9/16/20	MW-40S-0920 9/16/20	MW-40S-0920D 9/16/20	MW-45-0920 9/16/20
Field Parameters						
pH	SU	7.34	7.45	7.54	---	7.48
Temperature	deg C	12.61	11	12.34	---	11.38
Specific Conductance	mS/cm	0.853	0.935	1.18	---	2.07
Turbidity	NTU	6.86	13.2	2.78	---	18.3
Redox Potential	mVolt	244.8	246.4	249.4	---	256.3
Inorganics						
Aluminum	mg/l	0.437	0.144	0.1U	0.1U	0.448
Dissolved Aluminum	mg/l	0.1U	0.1U	0.1U	0.1U	0.038J
Conventionals						
Total Cyanide	mg/l	0.005U	0.048	0.056	0.047	0.398
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.01U	0.01U	0.024
Fluoride	mg/l	0.171	1.76	0.192	0.222	1.25U
Sulfate	mg/l	158	191	57.6	57.9	844
PCBs						
Aroclor 1242	µg/l	0.021U	0.02U	0.02U	0.02U	0.02U
Aroclor 1248	µg/l	0.021U	0.02U	0.02U	0.02U	0.02U
Aroclor 1254	µg/l	0.021U	0.02U	0.02U	0.02U	0.02U
Aroclor 1260	µg/l	0.021U	0.02U	0.02U	0.02U	0.02U

Key:
U = Nondetect
J = Estimated

Table 1
East Plant
Summary of Analytical Results

Sample ID	Sample Date	VTSR[1]	Days	Total Cyanide		Weak Acid Dissociable Cyanide		Fluoride		Sulfate	
				Target - 12 Days VTSR to Analysis	Days	Target - 12 Days VTSR to Analysis	Days	Target - 26 Days VTSR to Analysis	Days	Target - 26 Days VTSR to Analysis	Days
MW-10S-0920	9/16/20	9/17/20	1	9/22/20	5	9/25/20	8	9/22/20	5	9/22/20	5
MW-1209-0920FBW	9/16/20	9/17/20	1	9/22/20	5	9/25/20	8	9/22/20	5	9/22/20	5
MW-39S-0920	9/16/20	9/17/20	1	9/22/20	5	9/25/20	8	9/22/20	5	9/22/20	5
MW-40S-0920	9/16/20	9/17/20	1	9/22/20	5	9/25/20	8	9/22/20	5	9/22/20	5
MW-45-0920	9/16/20	9/17/20	1	9/22/20	5	9/25/20	8	9/22/20	5	9/22/20	5
MW-40S-0920D	9/16/20	9/17/20	1	9/22/20	5	9/25/20	8	9/22/20	5	9/22/20	5

Sample ID	Sample Date	VTSR[1]	Days	Aluminum		Dissolved Aluminum		PCBs			
				Target - 180 Days VTSR to Analysis	Days	Target - 180 Days VTSR to Analysis	Days	Target - 365 Days from VTSR to Extraction	Days	Target - 40 Days from Extraction to Analysis	Days
MW-10S-0920	9/16/20	9/17/20	1	9/30/20	13	9/30/20	13	9/22/20	5	9/30/20	8
MW-1209-0920FBW	9/16/20	9/17/20	1	9/30/20	13	9/30/20	13	9/22/20	5	9/30/20	8
MW-39S-0920	9/16/20	9/17/20	1	9/30/20	13	9/30/20	13	9/22/20	5	9/30/20	8
MW-40S-0920	9/16/20	9/17/20	1	9/30/20	13	9/30/20	13	9/22/20	5	9/30/20	8
MW-45-0920	9/16/20	9/17/20	1	9/30/20	13	9/30/20	13	9/22/20	5	9/30/20	8
MW-40S-0920D	9/16/20	9/17/20	1	9/30/20	13	9/30/20	13	9/22/20	5	9/30/20	8

Key:

1. VTSR = Verified time of sample receipt; date shown is the VTSR at Alpha Analytical

Table 2
East Plant
Summary of Sample Hold Times

Sample ID Sample Date Parameter ID	Unit	MW-1209-0920FBW 9/16/20
Inorganics		
Aluminum	mg/l	0.1U
Dissolved Aluminum	mg/l	0.1U
Conventionals		
Total Cyanide	mg/l	0.005U
Cyanide, Weak Acid Dissociable	mg/l	0.01U
Fluoride	mg/l	0.05U
Sulfate	mg/l	1U
PCBs		
Aroclor 1242	µg/l	0.019U
Aroclor 1248	µg/l	0.019U
Aroclor 1254	µg/l	0.019U
Aroclor 1260	µg/l	0.019U

Key:
U = Nondetect

Sample ID Sample Location Sample Date Parameter ID	Unit	Original Sample MW-40S-0920 MW-40S 9/16/20	Duplicate Sample MW-1208-0920BD MW-40S 9/16/20	Relative Percent Difference[1,2] %
Inorganics				
Aluminum	mg/l	0.1U	0.1U	---
Dissolved Aluminum	mg/l	0.1U	0.1U	---
Conventionals				
Total Cyanide	mg/l	0.056	0.047	17.5
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	---
Fluoride	mg/l	0.192	0.222	14.5
Sulfate	mg/l	57.6	57.9	0.5
PCBs				
Aroclor 1242	µg/l	0.02U	0.02U	---
Aroclor 1248	µg/l	0.02U	0.02U	---
Aroclor 1254	µg/l	0.02U	0.02U	---
Aroclor 1260	µg/l	0.02U	0.02U	---

Notes:

1. Precision is evaluated by calculating the relative percent difference (RPD) using the following formula:

$$| 2 * (X1 - X2) / (X1 + X2) * 100 |$$

where X1 is the original sample value and X2 is the duplicate sample value.

2. --- = RPD not calculated for nondetected parameters.

3. Values reported are less than the five times the CRQL, therefore the absolute difference was calculated.

Key:

U = Nondetect

Table 4
East Plant
Summary of Field Duplicate Samples

Memorandum

To: *Robyn Gross*

From: *Paul Rodrigue*

Date: *March 24, 2021*

Subject: *Reynolds Metals Company, LLC. – NYSDEC Site Code #645009*
Data Quality Assessment – December 2020

This memorandum presents the data quality assessment for the December 2020 quarterly sampling round for the Massena East Plant. Samples were collected on December 3, 2020 and analyzed for polychlorinated biphenyls (PCBs), conventional inorganics (total cyanide, weak acid dissociable (WAD) cyanide, fluoride and sulfate), and metals (total aluminum and dissolved aluminum).

Laboratory quality control data associated with these samples were reviewed in accordance with the *Quality Assurance Project Plan* (QAPP) (CDM, March 2008) and United States Environmental Protection Agency (USEPA) Region II Contract Laboratory Program (CLP) data validation criteria as referenced in *Validating PCB Compounds PCBs by Gas Chromatography SW-846 Method 8082A* (SOP No. HW-45, Revision No. 1, October 2006) and in *Validation of Metals for the (CLP) Based on SOW ILMO5.3* (SOP No. HW-2. Revision No. 13, September 2006). All analyses were performed by Alpha Analytical in Westborough, Massachusetts except WAD cyanide which was subcontracted by Alpha Analytical to ALS Environmental in Rochester, NY. Additionally, PCB analyses were performed at Alpha's Mansfield, Massachusetts laboratory.

The intent of this review is to provide a general assessment of the overall quality of the data packages based on the review of the following information:

- field and laboratory method blanks;
- surrogate spike recovery;
- field duplicate precision;
- matrix spike/matrix spike duplicate (MS/MSD) samples;
- laboratory control sample/laboratory control sample duplicates (LCS/LCSD);
- sample holding time data; and
- sample receipt conditions.

All applicable data were evaluated and are summarized below. Field quality assurance sample results (field blanks and duplicate samples) were also evaluated. Analytical results hold times and field quality assurance data are summarized in Tables 1 through 4.

PCB Analysis

A field blank sample was collected on the day of sampling (MW-1212-1220FBW).PCB Aroclors were not detected in the field blank sample. In addition, the laboratory blank samples analyzed with the field samples were non-detect for Aroclors. No qualification is required.

PCB analysis surrogate spike recovery data were reviewed. Tetrachloro-m-xylene (TCX) and decachlorobiphenyl (DCB) were the compounds used for the surrogate spike standards. The QAPP specifies that at least one surrogate is recovered within range (30 to 150 percent), with both surrogate recoveries greater than 10 percent. All surrogate recoveries were within the acceptable range with two exceptions. DCB was under-recovered in sample MW-39S-1220 at 29 percent and TCX was under-recovered in MW-38-1220. No qualification is required since one surrogate was recovered within range and both were above 10 percent.

A field duplicate sample was collected at MW-11S (MW-1211-1220BD), and at MW-43 (MW-1210-1220BD). All Aroclors were nondetect in both the parent and duplicate samples. No qualification is required.

Samples MW-10S-1220 and MW-43-1220 were analyzed as a MS/MSD sample. The QAPP specifies that MS/MSD recoveries be within the range of 29 to 135 percent, with a relative percent difference (RPD) of less than 30 percent between the spiked pair. The MS and MSD samples were spiked with Aroclor 1260. Recoveries and precision between the spiked pair were acceptable. No qualification is required.

The QAPP specifies a recovery range of 50 to 150 percent for compounds in a LCS/LCSD. Recovery and precision for Aroclor 1260 was within the acceptable range in the LCS/LCSD samples; no qualification is required.

USEPA Region II guidance specifies a holding time of up to 365 days beyond the verified time of sample receipt (VTSR) for sample extraction and 40 days from the time of sample extraction to analysis. In addition, VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding PCB analysis holding times. No qualification is required.

The condition of the samples upon receipt at the laboratory was reviewed. All samples were delivered at temperatures below 10°C. No qualification is required.

Based on the results of this assessment, the PCB results for the December 2020 Massena East Plant sampling event can be used without qualification.

Conventional Inorganics Analysis

Samples were analyzed for total cyanide, WAD cyanide, fluoride, and sulfate. All associated conventional inorganics quality control data were reviewed.

A field blank sample was collected on the day of sampling (MW-1212-1220FBW) and analyzed for conventional inorganics. The field blank was non-detect for conventional inorganics. No qualification is required.

Laboratory method blanks analyzed with the field samples were non-detect for total cyanide, WAD cyanide, fluoride, and sulfate. No qualification is required.

A field duplicate was collected at MW-10S (MW-1211-1220BD), and MW-43 (MW-1210-1220BD). The RPD quantified between the parent and duplicate samples collected at each monitoring well was acceptable for all detected conventional inorganic parameters. No qualification is required.

MS/MSD analysis was requested on MW-10S-1220 and MW-43-1220. The laboratories also performed MS analyses for fluoride and sulfate on MW-15S-87-1220 and MW-1210-1220BD and for WAD cyanide on MW-26S-1220 and MW-34S-1220. The QAPP specifies acceptable MS/MSD recovery limits as 75 to 125 percent for total and WAD cyanide and 80 to 120 percent for fluoride and sulfate. Recoveries and precision between the spiked pairs were acceptable for all conventional inorganics with one exception. Sulfate was under-recovered in the MS and MSD at 74 and 75 percent, respectively, in MW-10S-1220. Consequently, the following associated samples have sulfate results qualified as estimated ("J"): PZ-44-1220, PZ-45-1220, PZ-46-1220, MW-10S-1220, MW-39S-1220, MW-40S-1220, MW-45-1220, SLPWETW-1220, MW-03S-1220 and MW-26S-1220. The WAD cyanide MS and MSD recoveries were below the QAPP limits but were within the laboratory limits. No qualification is required.

All LCS recoveries for conventional inorganics were acceptable. No qualification is required.

The QAPP specifies holding times for conventional inorganic parameters beyond the VTSR. The VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding conventional inorganic parameter analysis holding times. All hold time requirements were met. No qualification is required.

Sample receipt conditions were reviewed. All samples were received within the QAPP-specified temperature limits. No qualification is required.

Conventional results for the December 2020 quarterly sampling round can be used as reported by the laboratory with the exceptions noted above.

Metals Analysis

Samples were analyzed for total aluminum and dissolved aluminum. All associated metals quality control data were reviewed.

Laboratory and field blank samples were reviewed for metals analysis. The field blank sample was non-detect for both total and dissolved aluminum. Additionally, laboratory blanks were non-detect. No qualification was required.

A field duplicate sample was collected at MW-10S (MW-1211-1220BD) and MW-43 (MW-1210-1220BD). Precision between the pairs for total aluminum was acceptable. Dissolved aluminum

was non-detect in the MW-10S pair. In MW-18S, dissolved aluminum was detected in both samples at concentrations less than five times the contract required quantitation limit (CRQL) of 0.1 mg/l. In such case, the absolute difference is used to determine qualification. The absolute difference is less than the CRQL, therefore no qualification is required.

Samples MW-10S-1220 and MW-43-1220 were requested to be analyzed as a MS/MSD sample. The laboratory also performed MS analysis for total and dissolved aluminum on MW-39S-1220 and MW-44-1220. The MS and MSD recoveries for total aluminum in MW-43-1220 were high at 150 and 140 percent, respectively. The over-recoveries can be disregarded, however, since the native sample concentration was more than four times the spike amount. Additionally, the MS recovery for total aluminum was high in MW-39S-1220 at 168 percent. The laboratory case narrative stated that this sample required preparation dilution due to the sample matrix and that a post-digestion spike was performed and was within acceptance criteria. No further qualifications were made.

The laboratory performed duplicate analyses on samples MW-39S-1220 and MW-44-1220. The total aluminum result for sample MW-39S-1220 yielded a RPD of 33 percent with the initial result. Due to lack of precision with the duplicate analysis as well as the high MS recovery, the total aluminum result for sample MW-39S-1220 is qualified as estimated ("J").

The LCS had acceptable recoveries for total and dissolved aluminum. No qualification is required.

The QAPP specifies a holding time of up to 180 days beyond the VTSR for sample analysis. In addition, VTSR must be within 48 hours of sample collection. Table 2 presents a compilation of the relevant information regarding metals analysis holding times. All holding times were within acceptance limits. No qualification is required.

All samples were delivered to the laboratory within the QAPP-specific temperature limits.

Metals results for the December 2020 quarterly sampling round can be used as reported by the laboratory with the qualification noted above.

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Attachments
pw:\\1902\80599\02 Project Information\03 Data\40 Field Data\2020 Database\21025.doc

Sample ID Sample Date Parameter ID	Unit	FDRAIN-1220 12/3/20	MW-03S-1220 12/3/20	MW-10S-1220 12/3/20	MW-10S-1220D 12/3/20	MW-11SR-1220 12/3/20	MW-12S-1220 12/3/20	MW-13S-1220 12/3/20	MW-14S-1220 12/3/20
Field Parameters									
pH	SU	7.5	8.47	7.27	---	7.94	7.76	7.41	8.12
Temperature	deg C	10.43	10.4	9.62	---	8.89	9.74	8.63	9.3
Specific Conductance	mS/cm	1.642	2.405	0.752	---	1.112	3.163	1.22	1.178
Turbidity	NTU	7.02	44.3	4	---	21	15	8	4
Redox Potential	mVolt	79.9	-86.9	220.3	---	156.2	171	154.5	155
Inorganics									
Aluminum	mg/l	---	2.92	0.175	0.226	0.274	0.306	0.218	0.044J
Dissolved Aluminum	mg/l	---	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
Conventionals									
Total Cyanide	mg/l	0.308	0.63	0.005U	0.005U	0.005U	0.027	0.01	0.005U
WAD Cyanide	mg/l	0.011	0.037	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U
Fluoride	mg/l	16.5	10.1	0.25U	0.5U	0.5U	11.4	7.76	0.389J
Sulfate	mg/l	254	313J	110J	109	231	943	1710	403
PCBs									
Aroclor 1242	µg/l	---	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1248	µg/l	---	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1254	µg/l	---	0.065U	0.065U	0.065U	0.065U	0.065U	0.116	0.065U
Aroclor 1260	µg/l	---	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U

Key:
U = Nondetect
J = Estimated
--- = Not Analyzed

Sample ID Sample Date Parameter ID	Unit	MW-15S-87-1220 12/3/20	MW-16S-1220 12/3/20	MW-17S-1220 12/3/20	MW-18S-1220 12/3/20	MW-19S-1220 12/3/20	MW-20-85S-1220 12/3/20	MW-22-85S-1220 12/3/20	MW-23-85S-1220 12/3/20
Field Parameters									
pH	SU	7.94	8.51	7.9	8.51	8.25	11.38	7.69	7.51
Temperature	deg C	9.63	11.55	9.72	11.85	12.23	9.54	9.11	8.35
Specific Conductance	mS/cm	0.635	1.448	2.102	3.022	1.467	1.522	1.619	1.075
Turbidity	NTU	37	34.7	26.5	5.82	19	3	17	75
Redox Potential	mVolt	152.7	-127.3	-118.5	-128.4	-109.4	119.8	163.6	150.1
Inorganics									
Aluminum	mg/l	0.713	0.052J	0.1U	0.051J	0.033J	0.1U	0.315	1.27
Dissolved Aluminum	mg/l	0.1U	0.1U	0.1U	0.059J	0.1U	0.1U	1U	0.1U
Conventionals									
Total Cyanide	mg/l	0.005U	0.002J	0.005U	0.007	0.005U	0.005U	0.005U	0.005U
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U
Fluoride	mg/l	3.62	7.92	0.886	29.1	3.3	0.5U	0.5U	0.398J
Sulfate	mg/l	106	171	159	178	101	268	402	389
PCBs									
Aroclor 1242	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1248	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1254	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1260	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U

Key:
U = Nondetect
J = Estimated
--- = Not Analyzed

Sample ID Sample Date Parameter ID	Unit	MW-26S-1220 12/3/20	MW-27S-1220 12/3/20	MW-28S-1220 12/3/20	MW-30S-1220 12/3/20	MW-31SR-1220 12/3/20	MW-33S-1220 12/3/20	MW-34S-1220 12/3/20	MW-35SR-1220 12/3/20
Field Parameters									
pH	SU	7.98	7.91	8.47	7.71	7.87	7.9	7.77	8.3
Temperature	deg C	11.64	13.03	11.93	8.96	9.28	10.43	9.5	10.77
Specific Conductance	mS/cm	1.278	10.53	1.383	0.898	0.73	2.893	3.524	2.415
Turbidity	NTU	286	31.2	100	18	617	72.5	833	845
Redox Potential	mVolt	-47.3	-109.1	-59.9	149.7	153.7	-13.4	25.5	28.8
Inorganics									
Aluminum	mg/l	6.78	0.811	0.448	0.558	1.65	---	---	9.75
Dissolved Aluminum	mg/l	0.1U	0.1U	0.036J	0.1U	0.1U	---	---	0.1U
Conventionals									
Total Cyanide	mg/l	0.005U	0.01	2.34	0.005U	0.005U	0.005U	0.053	0.005U
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.029	0.01U	0.01U	0.01U	0.01U	0.01U
Fluoride	mg/l	4.95	2.44	15.7	4.78	0.913	---	---	1.39
Sulfate	mg/l	190J	285	160	273	178	---	---	652
PCBs									
Aroclor 1242	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	---	---	0.065U
Aroclor 1248	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	---	---	0.065U
Aroclor 1254	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	---	---	0.206
Aroclor 1260	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	---	---	0.065U

Key:
U = Nondetect
J = Estimated
--- = Not Analyzed

Sample ID Sample Date Parameter ID	Unit	MW-36-1220 12/3/20	MW-37-1220 12/3/20	MW-38-1220 12/3/20	MW-39S-1220 12/3/20	MW-40S-1220 12/3/20	MW-41-1220 12/3/20	MW-42-1220 12/3/20	MW-43-1220 12/3/20
Field Parameters									
pH	SU	8.73	8.3	8.05	7.35	6.8	7.9	8.37	7.8
Temperature	deg C	10.15	9.95	10.21	10.02	10.53	9.32	9.6	10.41
Specific Conductance	mS/cm	3.391	1.366	0.872	1.046	1.214	1.535	4.643	1.19
Turbidity	NTU	1000	1000	1000	15	2	609	1000	1000
Redox Potential	mVolt	38.3	45.4	156.2	196	234.4	-121.5	30.6	26.2
Inorganics									
Aluminum	mg/l	25.3	25.2	16.2	5.51J	0.1U	8.66	47.6	14.9
Dissolved Aluminum	mg/l	0.229	0.032J	0.1U	0.136	0.1U	0.1U	0.1U	0.118
Conventionals									
Total Cyanide	mg/l	0.005U	0.005U	0.005U	0.022	0.046	0.005U	0.172	0.005U
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U	0.01U
Fluoride	mg/l	1.99	0.5U	0.453J	1.33	0.179	0.5U	27.8	0.5U
Sulfate	mg/l	361	308	182	210J	57.6J	335	1190	111
PCBs									
Aroclor 1242	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1248	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1254	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U
Aroclor 1260	µg/l	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U	0.065U

Key:
U = Nondetect
J = Estimated
--- = Not Analyzed

Sample ID Sample Date Parameter ID	Unit	MW-43-1220D 12/3/20	MW-44-1220 12/3/20	MW-45-1220 12/3/20	PZ-44-1220 12/3/20	PZ-45-1220 12/3/20	PZ-46-1220 12/3/20	SLPWETW-1220 12/3/20
Field Parameters								
pH	SU	---	7.91	7.3	7.77	7.97	8.25	7.88
Temperature	deg C	---	11.1	9.11	7.68	9.45	6.77	5.38
Specific Conductance	mS/cm	---	1.142	1.941	7.486	2.073	1.948	0.554
Turbidity	NTU	---	22.6	15	555	132	365	2
Redox Potential	mVolt	---	29.2	181.5	-42.7	-79.4	106.6	163.5
Inorganics								
Aluminum	mg/l	15.6	0.212	0.267	0.397	2.52	6	0.1U
Dissolved Aluminum	mg/l	0.034J	0.1U	0.1U	0.041J		0.125	0.1U
Conventionals								
Total Cyanide	mg/l	0.005U	0.005U	0.022	0.005U	0.005U	0.005U	0.004J
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	0.013	0.01U	0.01U	0.01U	0.01U
Fluoride	mg/l	0.5U	0.376J	1.25U	3.32	1.19J	2.11	4.21
Sulfate	mg/l	111	100	686J	1000J	1180J	1040J	107J
PCBs								
Aroclor 1242	µg/l	0.065U	0.065U	0.065U	0.065U	---	0.065U	0.065U
Aroclor 1248	µg/l	0.065U	0.065U	0.065U	0.065U	---	0.065U	0.065U
Aroclor 1254	µg/l	0.065U	0.065U	0.065U	0.065U	---	0.065U	0.065U
Aroclor 1260	µg/l	0.065U	0.065U	0.065U	0.065U	---	0.065U	0.065U

Key:
U = Nondetect
J = Estimated
--- = Not Analyzed

Sample ID	Sample Date	VTSR[1]	Days	Total Cyanide		Weak Acid Dissociable Cyanide		Fluoride		Sulfate	
				Target - 12 Days VTSR to Analysis	Days	Target - 12 Days VTSR to Analysis	Days	Target - 26 Days VTSR to Analysis	Days	Target - 26 Days VTSR to Analysis	Days
FDRAIN-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/15/20	11	12/15/20	11
MW-03S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-10S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-10S-1220D	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/15/20	11	12/15/20	11
MW-11SR-1220	12/3/20	12/4/20	1	12/15/20	11	12/10/20	6	12/13/20	9	12/13/20	9
MW-1212-1220FBW	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/15/20	11	12/15/20	11
MW-12S-1220	12/3/20	12/4/20	1	12/15/20	11	12/10/20	6	12/13/20	9	12/13/20	9
MW-13S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-14S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-15S-87-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-16S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-17S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-18S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-19S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-20-85S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-22-85S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-23-85S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-26S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-27S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-28S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-30S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-31SR-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-33S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	---	---	---	---
MW-34S-1220	12/3/20	12/4/20	1	12/18/20	14	12/10/20	6	---	---	---	---
MW-35SR-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-36-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/15/20	11	12/15/20	11
MW-37-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/15/20	11	12/15/20	11
MW-38-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/15/20	11	12/15/20	11
MW-39S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-40S-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
MW-41-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/15/20	11	12/15/20	11
MW-42-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-43-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-43-1220D	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/15/20	11	12/15/20	11
MW-44-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10
MW-45-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
PZ-44-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
PZ-45-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
PZ-46-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/13/20	9	12/13/20	9
SLPWETW-1220	12/3/20	12/4/20	1	12/16/20	12	12/10/20	6	12/14/20	10	12/14/20	10

Key:

1. VTSR = Verified time of sample receipt; date shown is the VTSR at ALS Environmental

--- = Not sampled

Sample ID	Sample Date	VTSR[1]	Days	Aluminum		Dissolved Aluminum		PCBs			
				Target - 180 Days VTSR to Analysis	Days	Target - 180 Days VTSR to Analysis	Days	Target - 365 Days from VTSR to Extraction	Days	Target - 40 Days from Extraction to Analysis	Days
FDRAIN-1220	12/3/20	12/4/20	1	---	---		---		---		---
MW-03S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-10S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-10S-1220D	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/10/20	1
MW-11SR-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-1212-1220FBW	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/10/20	1
MW-12S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-13S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-14S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-15S-87-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-16S-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-17S-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-18S-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-19S-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-20-85S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-22-85S-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/14/20	5
MW-23-85S-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/14/20	5
MW-26S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-27S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-28S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/10/20	1
MW-30S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-31SR-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-33S-1220	12/3/20	12/4/20	1	---	---	---	---	---	---	---	---
MW-34S-1220	12/3/20	12/4/20	1	---	---	---	---	---	---	---	---
MW-35SR-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-36-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-37-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-38-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/14/20	10	12/15/20	1
MW-39S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-40S-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
MW-41-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-42-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-43-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-43-1220D	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-44-1220	12/3/20	12/4/20	1	12/19/20	15	12/19/20	15	12/9/20	5	12/10/20	1
MW-45-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
PZ-44-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5
PZ-45-1220	12/3/20	12/4/20	1	12/18/20	14	---	---	---	---	---	---
PZ-46-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/15/20	6
SLPWETW-1220	12/3/20	12/4/20	1	12/18/20	14	12/19/20	15	12/9/20	5	12/14/20	5

Sample ID Sample Date Parameter ID	Unit	MW-1212-1220FBW 12/3/20
Inorganics		
Aluminum	mg/l	0.1U
Dissolved Aluminum	mg/l	0.1U
Conventionals		
Total Cyanide	mg/l	0.005U
Cyanide, Weak Acid Dissociable	mg/l	0.01U
Fluoride	mg/l	0.05U
Sulfate	mg/l	1U
PCBs		
Aroclor 1242	µg/l	0.065U
Aroclor 1248	µg/l	0.065U
Aroclor 1254	µg/l	0.065U
Aroclor 1260	µg/l	0.065U

Key:
U = Nondetect

Sample ID Sample Location Sample Date Parameter ID	Unit	Original Sample MW-10S-1220 MW-10S 12/3/20	Duplicate Sample MW-1211-1220BD MW-10S 12/3/20	Relative Percent Difference[1,2] %	Original Sample MW-43-1220 MW-43 12/3/20	Duplicate Sample MW-1210-1220BD MW-43 12/3/20	Relative Percent Difference[1,2] %
Inorganics							
Aluminum	mg/l	0.175	0.226	25.4	14.9	15.6	4.6
Dissolved Aluminum	mg/l	0.1U	0.1U	--	0.118	0.034J	--[3]
Conventionals							
Total Cyanide	mg/l	0.005U	0.005U	---	0.005U	0.005U	--
Cyanide, Weak Acid Dissociable	mg/l	0.01U	0.01U	---	0.01U	0.01U	--
Fluoride	mg/l	0.25U	0.5U	---	0.5U	0.5U	--
Sulfate	mg/l	110J	109	0.9	111	111	0.0
PCBs							
Aroclor 1242	µg/l	0.065U	0.065U	--	0.065U	0.065U	--
Aroclor 1248	µg/l	0.065U	0.065U	--	0.065U	0.065U	--
Aroclor 1254	µg/l	0.065U	0.065U	--	0.065U	0.065U	--
Aroclor 1260	µg/l	0.065U	0.065U	--	0.065U	0.065U	--

Notes:

1. Precision is evaluated by calculating the relative percent difference (RPD) using the following formula:

$$| 2 * (X1 - X2) / (X1 + X2) * 100 |$$

where X1 is the original sample value and X2 is the duplicate sample value.

2. --- = RPD not calculated for nondetected parameters.

3. When one or both results are less than five times the CRQL, the absolute difference is used to determine qualification.

Key:

U = Nondetect

J = Estimated

--- = Not Analyzed

Appendix F

Institutional and Engineering Controls Certification Form

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Environmental Remediation
625 Broadway, 11th Floor, Albany, NY 12233-7020
P: (518)402-9543 | F: (518)402-9547
www.dec.ny.gov

3/5/2021

Robyn Gross
Alcoa Asset Planning & Management
Reynolds Metals Company, LLC
Alcoa Corp, Inc., Massena East Plant
194 County Route 45
Massena, NY 13662-0500
ROBYN.GROSS@alcoa.com

Re: Reminder Notice: Site Management Periodic Review Report and IC/EC Certification Submittal
Site Name: Reynolds Metals Company
Site No.: 645009
Site Address: Route 37
Massena, NY 13662

Dear Robyn Gross:

This letter serves as a reminder that sites in active Site Management (SM) require the submittal of a periodic progress report. This report, referred to as the Periodic Review Report (PRR), must document the implementation of, and compliance with, site-specific SM requirements. Section 6.3(b) of DER-10 *Technical Guidance for Site Investigation and Remediation* (available online at http://www.dec.ny.gov/regulations/67386.html) provides guidance regarding the information that must be included in the PRR. Further, if the site is comprised of multiple parcels, then you as the Certifying Party must arrange to submit one PRR for all parcels that comprise the site. The PRR must be received by the Department no later than **May 17, 2021**. Guidance on the content of a PRR is enclosed.

Site Management is defined in regulation (6 NYCRR 375-1.2(at)) and in Chapter 6 of DER-10. Depending on when the remedial program for your site was completed, SM may be governed by multiple documents (e.g., Operation, Maintenance, and Monitoring Plan; Soil Management Plan) or one comprehensive Site Management Plan.

A Site Management Plan (SMP) may contain one or all of the following elements, as applicable to the site: a plan to maintain institutional controls and/or engineering controls ("IC/EC Plan"); a plan for monitoring the performance and effectiveness of the selected remedy ("Monitoring Plan"); and/or a plan for the operation and maintenance of the selected remedy ("O&M Plan"). Additionally, the technical requirements for SM are stated in the decision document (e.g., Record of Decision) and, in some cases, the legal agreement directing the remediation of the site (e.g., order on consent, voluntary agreement, etc.).

When you submit the PRR (by the due date above), include the enclosed forms documenting that all SM requirements are being met. The Institutional Controls (ICs) portion of the form (Box 6) must be signed by you or your designated representative. The Engineering Controls (ECs) portion of the form (Box 7) must be signed by a Professional Engineer (PE). If you cannot certify that all SM requirements are being met, you must submit a Corrective Measures Work Plan that identifies the actions to be taken to restore compliance. The work plan must include a schedule to be approved by the Department. The Periodic Review process will not be considered complete until all necessary corrective measures are completed and all required controls are certified. Instructions for completing the certifications are enclosed.

All site-related documents and data, including the PRR, must be submitted in electronic format to the Department of Environmental Conservation. The required format for documents is an Adobe PDF file with optical character recognition and no password protection. Data must be submitted as an electronic data deliverable (EDD) according to the instructions on the following webpage:

https://www.dec.ny.gov/chemical/62440.html

Documents may be submitted to the project manager either through electronic mail or by using the Department's file transfer service at the following webpage:

https://fts.dec.state.ny.us/fts/

The Department will not approve the PRR unless all documents and data generated in support of the PRR have been submitted using the required formats and protocols.

You may contact Kelly Hale, the Project Manager, at 315-785-2381 or kelly.hale@dec.ny.gov with any questions or concerns about the site. Please notify the project manager before conducting inspections or field work. You may also write to the project manager at the following address:

New York State Department of Environmental Conservation
317 Washington St

Watertown, NY 13601-3787

Enclosures

PRR General Guidance
Certification Form Instructions
Certification Forms

ec: w/ enclosures
Kelly Hale, Project Manager
Pete Taylor, Hazardous Waste Remediation Supervisor, Region 6

Enclosure 1

Certification Instructions

I. Verification of Site Details (Box 1 and Box 2):

Answer the three questions in the Verification of Site Details Section. The Owner and/or Qualified Environmental Professional (QEP) may include handwritten changes and/or other supporting documentation, as necessary.

II. Certification of Institutional Controls/ Engineering Controls (IC/ECs)(Boxes 3, 4, and 5)

1.1.1. Review the listed IC/ECs, confirming that all existing controls are listed, and that all existing controls are still applicable. If there is a control that is no longer applicable the Owner / Remedial Party should petition the Department separately to request approval to remove the control.

2. In Box 5, complete certifications for all Plan components, as applicable, by checking the corresponding checkbox.

3. If you cannot certify "YES" for each Control listed in Box 3 & Box 4, sign and date the form in Box 5. Attach supporting documentation that explains why the **Certification** cannot be rendered, as well as a plan of proposed corrective measures, and an associated schedule for completing the corrective measures. Note that this **Certification** form must be submitted even if an IC or EC cannot be certified; however, the certification process will not be considered complete until corrective action is completed.

If the Department concurs with the explanation, the proposed corrective measures, and the proposed schedule, a letter authorizing the implementation of those corrective measures will be issued by the Department's Project Manager. Once the corrective measures are complete, a new Periodic Review Report (with IC/EC Certification) must be submitted within 45 days to the Department. If the Department has any questions or concerns regarding the PRR and/or completion of the IC/EC Certification, the Project Manager will contact you.

III. IC/EC Certification by Signature (Box 6 and Box 7**):**

If you certified "YES" for each Control, please complete and sign the IC/EC Certifications page as follows:

- For the Institutional Controls on the use of the property, the certification statement in Box 6 shall be completed and may be made by the property owner or designated representative.

- For the Engineering Controls, the certification statement in Box 7 must be completed by a Professional Engineer or Qualified Environmental Professional, as noted on the form.

Enclosure 2

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Site Management Periodic Review Report Notice
Institutional and Engineering Controls Certification Form

Site Details **Box 1**

Site No. 645009

Site Name Reynolds Metals Company

Site Address: Route 37 Zip Code: 13662
City/Town: Massena
County: St Lawrence
Site Acreage: 112.000

Reporting Period: April 17, 2020 to April 17, 2021

	YES	NO
1. Is the information above correct?	☑	☐
If NO, include handwritten above or on a separate sheet.		
2. Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment during this Reporting Period?	☐	☑
3. Has there been any change of use at the site during this Reporting Period (see 6NYCRR 375-1.11(d))?	☐	☑
4. Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property during this Reporting Period?	☐	☑
If you answered YES to questions 2 thru 4, include documentation or evidence that documentation has been previously submitted with this certification form.		
5. Is the site currently undergoing development?	☐	☑

Box 2

	YES	NO
6. Is the current site use consistent with the use(s) listed below? Industrial	☑	☐
7. Are all ICs in place and functioning as designed?	☑	☐

IF THE ANSWER TO EITHER QUESTION 6 OR 7 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

Signature of Owner, Remedial Party or Designated Representative Date

SITE NO. 645009 **Box 3**

Description of Institutional Controls

Parcel	Owner	Institutional Control
6.003-1-1	REYNOLDS METALS COMPANY	

IC/EC controls include:

RI/FS Consent order executed 9/8/1987, RD/RA Consent order Executed 3/1/1993, Decision Documents dated 1/22/1992, 6/27/1995, and 2/5/1999.

Pursuant to the orders on consent and the decision documents the following engineering controls are required at the Reynolds Metals Company Site.

Black Mud Pond: Multi layer cover system, leachate collection/groundwater containment system, surface water runoff controls, and fencing/access control.

Industrial Landfill: Multi layer cover system, leachate collection/groundwater containment system, and surface water runoff controls, and fencing/access control.

North Yard: Cover system, groundwater collection system, and surface water runoff controls.

Potliner Storage Pad: Cover system and surface water runoff controls.

Miscellaneous Areas - Surface water runoff controls.

Wetlands and site-wide: Longterm groundwater monitoring, SPDES surface water/process water discharge monitoring, and fencing/access control.

The Consultant will certify that all controls are in place and/if any changes to current conditions have been conducted. In addition, the consultant will verify that all deed restrictions are in place and no change of use of the site has occurred.

Box 4

Description of Engineering Controls

Parcel	Engineering Control
6.003-1-1	Groundwater Treatment System
	Cover System
	Groundwater Containment
	Leachate Collection
	Fencing/Access Control

Box 5

Periodic Review Report (PRR) Certification Statements

1. I certify by checking "YES" below that:

   a) the Periodic Review report and all attachments were prepared under the direction of, and reviewed by, the party making the Engineering Control certification;

   b) to the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and the information presented is accurate and compete.

YES	NO
☑	☐

2. For each Engineering control listed in Box 4, I certify by checking "YES" below that all of the following statements are true:

   (a) The Engineering Control(s) employed at this site is unchanged since the date that the Control was put in-place, or was last approved by the Department;

   (b) nothing has occurred that would impair the ability of such Control, to protect public health and the environment;

   (c) access to the site will continue to be provided to the Department, to evaluate the remedy, including access to evaluate the continued maintenance of this Control;

   (d) nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan for this Control; and

   (e) if a financial assurance mechanism is required by the oversight document for the site, the mechanism remains valid and sufficient for its intended purpose established in the document.

YES	NO
☑	☐

IF THE ANSWER TO QUESTION 2 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

Signature of Owner, Remedial Party or Designated Representative

Date

IC CERTIFICATIONS
SITE NO. 645009

Box 6

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements in Boxes 1,2, and 3 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I Robyn L. Gross (print name) at 201 Isabella Street, Pittsburgh, PA 15212 (print business address),

am certifying as Director, Asset Planning & Mgmt Americas/Owner (Owner or Remedial Party)

for the Site named in the Site Details Section of this form.

Robyn L Gross — 5/14/2021

Signature of Owner, Remedial Party, or Designated Representative Rendering Certification — Date

EC CERTIFICATIONS

Box 7

Professional Engineer Signature

I certify that all information in Boxes 4 and 5 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I Paul Rodrigue (print name) at 4 Highland Rd, Massena, NY (print business address),

am certifying as a Professional Engineer for the Owner, Alcoa (Owner or Remedial Party)

Paul Rodrigue Digitally signed by Paul Rodrigue DN: cn=Paul Rodrigue, o, ou, email=rodriguepd@hotmail.com, c=CA Date: 2021.05.14 16:06:15 -04'00'

License 083832-01

May 14, 2021

Signature of Professional Engineer, for the Owner or Remedial Party, Rendering Certification	Stamp (Required for PE)	Date

Enclosure 3
Periodic Review Report (PRR) General Guidance

I. Executive Summary: (1/2-page or less)
   A. Provide a brief summary of site, nature and extent of contamination, and remedial history.
   B. Effectiveness of the Remedial Program - Provide overall conclusions regarding;
      1. progress made during the reporting period toward meeting the remedial objectives for the site
      2. the ultimate ability of the remedial program to achieve the remedial objectives for the site.
   C. Compliance
      1. Identify any areas of non-compliance regarding the major elements of the Site Management Plan (SMP, i.e., the Institutional/Engineering Control (IC/EC) Plan, the Monitoring Plan, and the Operation & Maintenance (O&M) Plan).
      2. Propose steps to be taken and a schedule to correct any areas of non-compliance.
   D. Recommendations
      1. recommend whether any changes to the SMP are needed
      2. recommend any changes to the frequency for submittal of PRRs (increase, decrease)
      3. recommend whether the requirements for discontinuing site management have been met.

II. Site Overview (one page or less)
   A. Describe the site location, boundaries (figure), significant features, surrounding area, and the nature and extent of contamination prior to site remediation.
   B. Describe the chronology of the main features of the remedial program for the site, the components of the selected remedy, cleanup goals, site closure criteria, and any significant changes to the selected remedy that have been made since remedy selection.

III. Evaluate Remedy Performance, Effectiveness, and Protectiveness
   Using tables, graphs, charts and bulleted text to the extent practicable, describe the effectiveness of the remedy in achieving the remedial goals for the site. Base findings, recommendations, and conclusions on objective data. Evaluations and should be presented simply and concisely.

IV. IC/EC Plan Compliance Report (if applicable)
   A. IC/EC Requirements and Compliance
      1. Describe each control, its objective, and how performance of the control is evaluated.
      2. Summarize the status of each goal (whether it is fully in place and its effectiveness).
      3. Corrective Measures: describe steps proposed to address any deficiencies in ICECs.
      4. Conclusions and recommendations for changes.
   B. IC/EC Certification
      1. The certification must be complete (even if there are IC/EC deficiencies), and certified by the appropriate party as set forth in a Department-approved certification form(s).

V. Monitoring Plan Compliance Report (if applicable)
   A. Components of the Monitoring Plan (tabular presentations preferred) - Describe the requirements of the monitoring plan by media (i.e., soil, groundwater, sediment, etc.) and by any remedial technologies being used at the site.
   B. Summary of Monitoring Completed During Reporting Period - Describe the monitoring tasks actually completed during this PRR reporting period. Tables and/or figures should be used to show all data.
   C. Comparisons with Remedial Objectives - Compare the results of all monitoring with the remedial objectives for the site. Include trend analyses where possible.
   D. Monitoring Deficiencies - Describe any ways in which monitoring did not fully comply with the monitoring plan.
   E. Conclusions and Recommendations for Changes - Provide overall conclusions regarding the monitoring completed and the resulting evaluations regarding remedial effectiveness.

VI. Operation & Maintenance (O&M) Plan Compliance Report (if applicable)
   A. Components of O&M Plan - Describe the requirements of the O&M plan including required activities, frequencies, recordkeeping, etc.
   B. Summary of O&M Completed During Reporting Period - Describe the O&M tasks actually completed during this PRR reporting period.
   C. Evaluation of Remedial Systems - Based upon the results of the O&M activities completed, evaluated

the ability of each component of the remedy subject to O&M requirements to perform as designed/expected.

D. O&M Deficiencies - Identify any deficiencies in complying with the O&M plan during this PRR reporting period.

E. Conclusions and Recommendations for Improvements - Provide an overall conclusion regarding O&M for the site and identify any suggested improvements requiring changes in the O&M Plan.

VII. Overall PRR Conclusions and Recommendations

A. Compliance with SMP - For each component of the SMP (i.e., IC/EC, monitoring, O&M), summarize;
   1. whether all requirements of each plan were met during the reporting period
   2. any requirements not met
   3. proposed plans and a schedule for coming into full compliance.

B. Performance and Effectiveness of the Remedy - Based upon your evaluation of the components of the SMP, form conclusions about the performance of each component and the ability of the remedy to achieve the remedial objectives for the site.

C. Future PRR Submittals
   1. Recommend, with supporting justification, whether the frequency of the submittal of PRRs should be changed (either increased or decreased).
   2. If the requirements for site closure have been achieved, contact the Departments Project Manager for the site to determine what, if any, additional documentation is needed to support a decision to discontinue site management.

VIII. Additional Guidance

Additional guidance regarding the preparation and submittal of an acceptable PRR can be obtained from the Departments Project Manager for the site.