# 2013 Annual Report

January 2014

Flambeau Mining Company
4700 Daybreak Parkway
South Jordan UT  84095

**Flambeau Mining Company**
4700 Daybreak Parkway
South Jordan, UT 84095
801-204-2526

January 31, 2014

Mr. Phil Fauble
Division of Air and Waste
Waste and Material Management
101 South Webster Street, GEF2
Madison, WI 53707

Dear Mr. Fauble:

The Flambeau Mining Company (Flambeau) is submitting one copy of the attached 2013 Annual Report pursuant to Part 1-8 of the Flambeau Mine Permit (Docket No. IH-89-14). This submittal also addresses other requirements of the Mining Permit and associated approvals. An additional 14 copies of the 2013 Annual Report will be provided by February 5, 2014.

Monitoring and evaluations conducted during 2013 continue to document that the Flambeau River remains fully protected and Flambeau remains in full compliance with its permit standards.

If you have any comments or questions regarding this submittal, please contact me at (801) 204-2526 or dave.cline@riotinto.com.

Sincerely,

Dave Cline
Vice President – Flambeau Mining Company

## Distribution

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**FLAMBEAU MINING COMPANY**
**2013 ANNUAL REPORT**

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Appendix A Backfilled Pit Water Quality Assessment
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# 1 Purpose and Need

This report serves to document the work that was done at the Flambeau Mine site in 2013 and to satisfy the requirements of the Mining Permit (MP).

**Mining Permit, Part 1, Condition 8:**

> *In accordance with sec. 144.89, Stats., Flambeau shall submit a report annually to the Department summarizing the activities which took place on the mining site during the year and shall include other additional information specified in this permit and associated plan approvals.*

**Mining Permit, Part 2, Condition 4:**

> *The annual report required under sec. 144.89, Stats., shall include discussion of all modifications received during the previous year and shall include an inventory of all modifications received subsequent to permit issuance. The annual report shall also discuss deviations from the approved Mining Plan as a result of final engineering refinements of subsequent plan approvals if these deviations do not require modifications, under Part 2, Conditions 2 and 3.*

**Mining Permit, Part 2, Condition 6:**

> *Flambeau shall keep a log of all incidents, such as spills, pond overflows and embankment failure or leakage, reported to its environmental compliance staff. This log shall, at all reasonable times, be available for inspection by any duly authorized Department employee. A summary of incidents subject to various Department reporting requirements shall be included in the annual report required under sec. 144.89, Stats.*

**Mining Permit, Part 2, Condition 7 (Excerpt):**

> *The annual report required under sec. 144.89, Stats, shall include a summary of all exploration drilling activities conducted on the mining site during the previous year.*

**Mining Permit, Part 4, Condition 9:**

> *Monitoring data and results shall be submitted to the Department within 30 days after completion of the required analyses. The annual report required in this permit shall summarize the year's monitoring activities and any observed trends in the monitoring data.*

**Water Withdrawal Approval, Condition 1 (Excerpt):**

> *Flambeau Mining Company shall maintain records which document the withdrawal. At a minimum, such information shall include the dates and duration of withdrawal, approximate pumping rate and approximate volume of water withdrawn. Monthly summaries shall be submitted to the department for those months in which a withdrawal occurs. This information shall be available for department review in a separate file at the Flambeau Mining Company office and shall also be summarized in the annual report submitted as a condition of the mining permit.*

The primary location of the information which fulfills the requirements of the above conditions is referenced in Table 1-1.

**Table 1-1 Location Information Key**

| Condition No. | Location of Information |
|---|---|
| MP, Part 1-8 | Section 2 and 3 |
| WWA, Condition 1 | Section 2.6.2 |
| MP, Part 2-4 | Section 2.8 |
| MP, Part 2-6 | Section 2.10 |
| MP, Part 2-7 | Section 2.11 |
| MP, Part 4-9 | Section 4 and Appendices A and B |

# 2 2013 Summary

## 2.1 Introduction

On January 14, 1991, after an exhaustive permitting process including extensive opportunity for public input, the Flambeau Mining Company (Flambeau), wholly owned by Kennecott Minerals Company, received from the Wisconsin Department of Natural Resources (Department) eleven permits to operate an open pit copper mine in Rusk County, Wisconsin. Over the life of the mine (1993 – 1997), 181,000 tons of copper, 3.3 million ounces of silver, and 334,000 ounces of gold were mined.

Backfilling of the open pit began in earnest in early 1997. Waste rock and soils were replaced to their approximate original location in the open pit. Over 30,000 tons of limestone was added to the sulfide-bearing waste rock to neutralize and buffer the groundwater as it resaturated the backfilled materials.

In 1998, the surface reclamation of the mine site began by returning the land surface to its approximate original contour. Stockpiled topsoil was spread across the site where grasslands and woodlands were created. Hydric (wetland) soils had been stockpiled as well and were used to create over ten acres of wetlands. Reclamation activities since 1998 have included seeding, plug planting, tree planting, erosion control, mowing, invasive species control, trail construction, and prescribed burning. During 2001, Flambeau completed the planting plan and submitted the Notice of Completion (NOC) to the Department. Concurrent with the submittal of the NOC, the reclaimed Flambeau Mine nature trails were opened to the public for non-motorized recreational activities. The City of Ladysmith had partnered with Flambeau to develop the four-mile nature trail system.

During 2006, monitoring of the reclaimed mine site documented the continued development of high quality native grassland, woodland and wetland communities. Ecological monitoring has documented that 272 native plant species are established on the site. Fifty-two bird species were found to be using the reclaimed mine site and 33 bird species were recorded as nesting on the site.

During 2007, Flambeau petitioned the Department for Certificate of Completion (COC). The COC process included a preconference hearing, public hearing and contested case hearing. At the contested case hearing, the parties negotiated an agreement and entered into a stipulation which was subsequently accepted by the administrative law judge and resulted in a signed order. The order granted a COC to Flambeau for 149 acres of the Flambeau Mine site that includes the backfilled pit and not including the 32-acre Industrial Outlot. Among the other aspects of the stipulation included in the Order was an agreement by Flambeau to withdraw the COC petition for the Industrial Outlot and that it would not apply for a COC for the Industrial Outlot for at least three years, a reduction of the reclamation bond to 20 percent of the $11 million bond on file with the Department at that time (maximum reduction allowed by Wisconsin law), and a commitment by Flambeau to conduct further environmental monitoring.

Between 2007 and 2012, Flambeau completed extensive monitoring as required by the 2007 COC stipulation and also supplemental monitoring on a voluntary basis.

In 2012, the former 0.9-acre Biofilter was removed and a series of infiltration basins were installed in the Industrial Outlot area in order to manage stormwater from the Industrial Outlot. In 2013, Flambeau commenced sampling in accordance with the Copper Park Business and Recreation Area Maintenance and Monitoring Plan (MMP).

Throughout each phase of the project, samples have been collected from numerous monitoring wells and the Flambeau River including water quality, sediments, fish, and macroinvertebrates. Continued protection of the Flambeau River, located 140 feet from the backfilled pit, has been documented throughout the Flambeau project by extensive monitoring.

## 2.2 Groundwater Quality Assessments

Assessments of the backfill groundwater quality have been routinely performed with the most recent completed during January 2014. Further detail on groundwater quality can be found in Section 4 of this report.

## 2.3 Notice of Completion/Certificate of Completion

Data obtained during monitoring of the reclaimed vegetation during 2000 documented that Flambeau met the vegetative performance standards for NOC.

During September 2001, Flambeau submitted the NOC to the Department. In a letter dated March 8, 2002, the Department accepted Flambeau's NOC. The four-year monitoring period prior to COC began November 19, 2001. For Flambeau to receive the COC, the performance standards were met during the final year of the 4-year monitoring period. The final year of the 4-year monitoring period was 2005. All performance standards were met in 2005 and again in 2006 even during extreme regional climatic conditions such as the regional drought experienced in 2005 and 2006. On January 9, 2007, Flambeau Mining Company petitioned the Department for COC.

The COC process included a preconference hearing in April, public hearing in mid-May and contested case hearing in late May 2007. The contested case portion of the process had just started when the parties began negotiating an agreement. At the hearing, the parties entered into a stipulation which was subsequently accepted by the administrative law judge and incorporated into an order. The order was signed by the judge granting a COC to Flambeau for 149 acres of the Flambeau Mine site that includes the backfilled pit and not including the 32-acre Industrial Outlot. Among the other aspects of the Stipulation included in the Order was an agreement by Flambeau to withdraw the COC petition for the Industrial Outlot and that it would not apply for a COC for the Industrial Outlot for at least three years, a reduction of the reclamation bond to 20 percent of the $11 million bond on file with the Department at that time (maximum reduction allowed by Wisconsin law), and a commitment by Flambeau to conduct further environmental monitoring.

During 2012, Flambeau completed the five-year term of environmental monitoring as agreed to in the Order's Stipulation.

## 2.4 Industrial Outlot

### 2.4.1 Reuse of Industrial Outlot Facilities

On January 8, 1998, Flambeau submitted a request for modification of the Mining Permit and Reclamation Plan. The requested modifications included modification of the final land use for 32 acres of the mining site to allow for alternative use of the on-site buildings and related ancillary facilities, railroad spur and a portion of the former Type II waste rock stockpile area by the Ladysmith Community Industrial Development Corporation (LCIDC).

On July 30, 1998, the Department approved the request for modification of the final land use for the 32 acre Industrial Outlot with the following condition: "If the portion of the site covered by the lease agreement with the LCIDC has not been put to an acceptable alternative use by the end of 2004, the site shall be reclaimed in a manner consistent with reclamation of the remainder of the mining site. Any demolition waste resulting from such reclamation shall be disposed of in a properly licensed solid waste facility."

A long-term lease agreement exists between Flambeau and the LCIDC, where the LCIDC leases a 32-acre portion of the former mine site referred as the Industrial Outlot. The 32-acre area includes the former administration building now occupied by the Ladysmith Department of Natural Resources Service Center; the former Water Treatment Plant (WTP) building now occupied by Xcel Energy and the Department; the rail spur for which the LCIDC has installed major improvements and purchased adjacent property outside of the mine project area; an approximate eight-acre area north of the former rail spur in the former Type II stockpile area now occupied by the Copper Park Equestrian Trails Trailhead; and three stormwater infiltration basins constructed in 2012 to capture precipitation runoff from the Industrial Outlot.

During 2000, the LCIDC completed renovations on the administration building, now serving as the Department's Ladysmith Service Center, and the WTP building, now housing Xcel Energy's line maintenance shop and the Department's equipment storage area. In addition, the LCIDC constructed another building for the Department between the Service Center and the former WTP to house additional Department equipment. The Department and Xcel Energy continue to occupy the former mine buildings.

During 2003, the LCIDC submitted a request to the Department for the retention of the rail spur located east of Highway 27 as part of the communities' on-going efforts to increase industrial development. The LCIDC had committed to remove and reclaim about 200 feet of the rail spur east of Highway 27. In a letter dated June 12, 2003, the Department stated that it "…is satisfied that the portion of the rail spur east of the highway is being used for alternate purposes. Therefore, the rail spur east of Highway 27 will not need to be removed and revegetated…"

During early 2004, the Flambeau Riders, Inc. (Flambeau Riders) approached Flambeau about the possibility of developing non-motorized trails on property owned by Flambeau south of the Industrial Outlot and east and south of the Flambeau River. In addition, the Flambeau Riders inquired about using a portion of the Industrial Outlot as driveway access and as an equestrian trailhead. In documents dated May 19 and 28, 2004, Flambeau proposed to the Department an

alternate use plan for Flambeau's former rail spur area west of Highway 27 and the eight-acre area north of the west rail spur area within the Industrial Outlot as a driveway and equestrian trailhead.

During 2004, a Community Advisory Group was formed to advise Kennecott Minerals on development of a land use management plan for the 2,177 acres owned by Flambeau as of year end 2004. The Advisory Group is represented by Rusk County, City of Ladysmith, Town of Grant, Ladysmith Area Trails Association, Flambeau Riders, LCIDC and the Department's Northern Rivers Initiative. During a late December 2004 meeting, the Advisory Group agreed that the expansion of trails south of the reclaimed mine site and using a portion of the Industrial Outlot as an equestrian trailhead were acceptable and beneficial uses of the property. It was agreed to formalize the agreement with 1) a Trail Easement & License between Flambeau and the City of Ladysmith and 2) a Sublease between the LCIDC and the City of Ladysmith. Fully executed documents, Trail Easement & License and Sublease, dated January 1, 2005, are in place.

In a letter to the Department dated December 30, 2004, Flambeau provided notice that the 32-acre Industrial Outlot has met the condition of "acceptable alternative use."

The Department responded in a letter dated February 18, 2005 that the only portion of the Industrial Outlot for which an acceptable alternate use had not been designated was the section lying north of the rail spur in the area of the former Type II waste rock stockpile. The Department conceptually found the proposed use as an equestrian trail head acceptable, but required further details to review and approve the proposed construction plans.

In submittals dated March 1 and July 21, 2005, Flambeau provided to the Department drawings and detail regarding the proposed equestrian trailhead and access via Copper Park Lane. The Department provided approval for the project in a letter dated July 28, 2005.

The construction of the equestrian trailhead initiated on August 11, 2005 and was complete by September 8, 2005. The trails remain open to the public since September 2005.

### 2.4.2 Industrial Outlot Projects and Improvements

During spring 2003, Flambeau and the LCIDC agreed that the Wisconsin Department of Transportation should remove the rail crossing as part of the renovation of Highway 27 during 2004. In addition, stormwater sampling had measured copper concentrations entering the 0.9-acre Biofilter that may have been associated with the west rail spur area.

During fall 2003, the top two feet of ballast and gravel were excavated from the rail spur area west of Highway 27. Reclamation of the west rail spur area and 200 feet east of Highway 27 was completed during spring 2004.

A submittal, Rail Spur Reclamation Documentation, dated November 10, 2004, was made to the Department and included a topographic drawing showing the east and west reclaimed rail spur areas and details regarding the reclamation of the rail spur areas.

As discussed in Section 2.4.3, during 2006, the remaining gravel parking lot area around the buildings was asphalted and the drainage swale was lined with rocks.

The Flambeau Riders have been making improvements to the equestrian trailhead since 2005. The trailhead improvements include an information kiosk, split rail fence, trees and horse hitching tie lines. During 2011, two concrete manure bunkers were installed by the Flambeau Riders.

Pursuant to discussions with the Department in 2010, the Copper Park Business and Recreation Area Work Plan was submitted to the Department in May 2011. This Work Plan was composed of the following elements.

- Removal of a portion of the remaining rail spur berm and culverts between Copper Park Lane and Highway 27.
- Conversion of the 0.9-acre Biofilter to an infiltration basin.
- Creation of two additional infiltration basins in the area north of the 0.9-acre Biofilter and in areas on the west side of the asphalted area of the Industrial Outlot.

During October and November 2011, Flambeau constructed an infiltration basin in the west portion of the Industrial Outlot.

Construction of the North and East Infiltration Basins began in March 2012 and was completed in April 2012. The Copper Park Business and Recreation Area Construction Documentation Report was submitted to the Department on January 31, 2013.

In 2013, the infiltration basins were pumped down three times: in April 2013, during the spring snowmelt; in May 2013, in preparation for investigation activities; and again in October 2013, to make room for winter precipitation.

Flambeau continues to evaluate the infiltration basins and is working on solutions to improve the stormwater management plan in the Industrial Outlot.

### 2.4.3 Intermittent Stream C

The Flambeau Mine remains committed to the protection of water quality in the Flambeau River. Since final reclamation in 1999, Flambeau has continued its monitoring of water quality in the Flambeau River as well as surface runoff into the Flambeau River. This monitoring indicates that the water quality of the Flambeau River remains fully protected.

Copper and zinc concentrations have been measured in offsite background stormwater runoff and in runoff from the Industrial Outlot located on the reclaimed mine site. The non-point sources of runoff from the Industrial Outlot were passively treated by the 0.9-acre Biofilter that substantially reduced the concentrations of metals. The 0.9-acre Biofilter itself supports populations of aquatic biota, including fish and frogs. As set forth in other parts of this report, the biofilter was replaced by an infiltration basin in 2012.

An expanded surface runoff monitoring program including bioassessment of the intermittent stream was conducted during 2004 and 2005. The work plan evaluated 1) the biological conditions within Stream C, 2) areas of the Stream C watershed that contribute to the water in Stream C, 3) aspects of the Industrial Outlot bio-filter that may influence copper levels that are discharged from the bio-filter; and 4) the hydrology and water quality within Stream C.

In a submittal dated January 20, 2005, Flambeau provided a memorandum prepared by Foth & Van Dyke that summarized and assessed the data that was collected in 2004.

In summary, Stream C is an intermittent stream with poor aquatic habitat that lacks aquatic vegetation and aquatic macroinvertebrates. As a result of the poor habitat and very limited food source, no fish were observed in the stream during the 2004 biological assessment. Stream C does not possess the types of characteristics that are needed for it to support any type of fishery. The sediment sampling of the 0.9-acre Biofilter indicates that it was functioning as designed. This was supported by the fish and amphibians that were observed in the 0.9-acre Biofilter. The surface water sampling that has been completed within the watershed of Stream C suggests that some areas, particularly those affected by highway runoff, may naturally exhibit elevated copper levels in the water. In addition, the 2004 sampling indicated that there appeared to be localized areas at the Industrial Outlot that were contributing elevated copper levels to stormwater that flowed to the 0.9-acre Biofilter. Based on this last point, Foth and Van Dyke advised that Flambeau consider implementing measures to minimize stormwater contacting the localized areas that appeared to be contributing to the elevated copper levels.

In a document dated October 24, 2005, Flambeau submitted to the Department the results of the 2005 surface runoff monitoring program. The 2005 results were consistent with the 2004 results.

Monitoring of the surface water at the site since the completion of reclamation has indicated that the Industrial Outlot 0.9-acre Biofilter was working well in lowering copper levels of surface water runoff flowing from the Outlot area. During 2003 and 2004, the former rail spur was reclaimed in an effort to reduce the concentration of copper in surface water runoff.

During 2006, Flambeau further reduced sources of copper from the Outlot area to the 0.9-acre Biofilter. Foth & Van Dyke oversaw the design and implementation of the work plan. The work plan was implemented starting May 18, 2006 and complete by June 21, 2006. The work consisted of excavation of approximately 900 linear feet of the existing drainage ditch collecting stormwater runoff from the area around the Copper Park buildings and replacement of the cobbled drainage way with limestone cobbles. Approximately 2.2 acres of gravel parking lot was excavated to a minimum depth of four inches. Soil sampling was conducted following completion of excavation. The average copper concentration of the exposed subgrade after removal was approximately 38 mg/kg (ppm). A non-woven geotextile fabric was placed on the exposed subgrade of all excavated areas within the area of asphalt and the drainage ditch prior to backfilling. Crushed limestone gravel was placed on the non-woven geotextile fabric as subgrade material and the parking lot was paved with three inches of bituminous concrete (asphalt). All excavated material (2,300 cubic yards) was appropriately disposed at the licensed Timberline Trail Landfill.

Stormwater samples collected during 2006, 2007, 2008, 2009, 2010, and 2011 indicate a marked reduction in copper concentrations in stormwater reaching the 0.9-acre Biofilter.

A report prepared by Foth & Van Dyke titled Construction Documentation Report – Flambeau Industrial Outlot, was submitted to the Department on September 12, 2006. Included with the report were results of soil sampling following excavation. The report provides further detail on the completion of the work plan.

On January 12, 2007, the Biofilter Management Plan was submitted to the Department. The report presents surface water data collected during 2006 and post 2006 construction which documents a dramatic reduction in copper loading to the 0.9-acre Biofilter. The report also presents a Biofilter Management Plan including monitoring of the 0.9-acre Biofilter.

In a document dated October 14, 2008, Foth Infrastructure & Environment, LLC, on behalf of Flambeau Mining Company, provided a summary of stipulation and supplemental monitoring results. The voluntary supplemental monitoring Flambeau conducted included stormwater and soils within the Industrial Outlot in the vicinity of the Copper Park Lane. Based upon elevated copper concentrations within the stormwater and soils, Foth proposed a work plan in the vicinity of Copper Park Lane that included removal of surficial soils and replacement with clean fill and topsoil. The work plan was proposed to eliminate any possibility that this area could be considered a potential source of copper to Stream C.

Following review and concurrence by the Department, the work along the Copper Park Lane was completed November 5 – 7, 2008. A total of 303.85 tons of surficial soils were excavated and disposed as special non-hazardous waste at the Timberline Trail landfill. Analyses of the sub-base soils indicated that materials of concern were removed. Gravel covered with topsoil was used as clean fill materials in the area of excavation. Seeding and placement of a net free erosion control blanket completed the work. A January 23, 2009 documentation report provided to the Department contains further detail on the Copper Park Lane work.

Additional samples were collected October 27, 2008 and results submitted December 9, 2008. These include samples that were collected just prior to the completion of the work described in the work plan.

Pursuant to NR 103.08(1) and previous discussions with the Department, Flambeau requested in a document dated August 30, 2010 a meeting with Department officials to discuss a conceptual plan for stormwater activities at the site. Flambeau was exploring the possibility of promoting infiltration of stormwater at the site. In early November 2010, the Department and Flambeau met on site.

During spring 2010, as part of the exploration to promote stormwater infiltration, Flambeau had Natural Resource Consulting complete a preliminary wetland determination regarding certain areas on the site. Results of the preliminary wetland determination were discussed with the Department during the November 2010 site meeting.

During 2013, monitoring began in accordance with the MMP. Also, surface water samples were voluntarily collected and analyzed from the Flambeau River in the fall 2013. Consistent with

previous years' results, the monitoring results document that the Flambeau River remains protected.

## 2.5 Community Involvement

Flambeau's involvement with the surrounding communities has included promotion of community activities, partnering with the communities, economic development, promoting tourism, enhancing communication, restoration projects, and maintaining an open door policy.

The major achievements for 2013 are set forth below:

- Flambeau's partnership with the City of Ladysmith and Flambeau Riders, Inc. continued on the non-motorized multi-use recreational trails in 2013. These trails, the Copper Park Equestrian Trails and Trailhead, were opened to the public in September 2005.

- The Reclaimed Flambeau Mine nature recreation trails were open to the public for the twelfth year.

- During 2013, geocaching continues to be enjoyed on the reclaimed mine site. Geocache sites can be searched out along the Reclaimed Flambeau Mine Nature Trails, Copper Park Equestrian Trails and Sisters Farm Trails. Details on geocache sites can be found at www.geocaching.com.

- Flambeau continued its open-door policy and upon request conducted tours of the mine site.

## 2.6 Water Management

### 2.6.1 Precipitation Runoff

Since 2000, the reclaimed mine site surface remains stabilized by vegetative growth and there is minimal evidence of erosion. Aerial photographs (color and infrared) taken during September 2012 document surface stabilization of the reclaimed mine site.

Flambeau River water quality samples were voluntarily collected upstream and downstream from the reclaimed mine site during 2013. Comparing analytical results, there was no notable difference between downstream and upstream samples and this further confirms that the reclaimed site is stable and functioning as designed. A summary of Flambeau River water quality results is found in Appendix B.

### 2.6.2 River Water Withdrawal

On May 5, 1998, the Department approved Flambeau's application to withdraw water from the Flambeau River for use on site. The Department's approval requires submittal of monthly summaries for months during which a withdrawal occurs. When the irrigation pump system operates it is powered with a portable generator since electrical supply had been removed during 2001. During 2013, no water was withdrawn from the Flambeau River.

Wetland 1 is located immediately west of the reclaimed mine site. With the backfilling of the open pit being complete in 1997, the hydrogeologic system has equilibrated, and Wetland 1 has been documented to be notably moister with groundwater seeps again flowing.

During 2013, Flambeau continued to monitor the staff gauge within Wetland 1 and maintain the ability to add mitigation water to the wetland. Mitigation water was not added during 2013 as was also the case between 2002 and 2012.

## 2.7 2013 Milestones

The following is a summary of significant milestones throughout the year:

**Table 2-1 2013 Milestones**

| Milestone | Month |
|---|---|
| Investigation activities were undertaken to gather data to be used to improve stormwater runoff management at the Industrial Outlot. | Summer/Fall |

## 2.8 Modifications & Deviations

Condition 2-4 in the Mine Permit requires an inventory of deviations and modifications to the Permit received subsequent to permit issuance. Activities during 2013 were consistent with permits, approved plans, and modifications received subsequent to permit issuance. During 2013, there were no modifications or deviations to the Permit.

## 2.9 Construction Reports

The Copper Park Construction Documentation Report was submitted to the Department on January 31, 2013.

## 2.10 Incident Log

Mine Permit Condition 2-6 requires a log of all incidents such as spills, pond overflow, embankment failure or leakage. This log is maintained on-site and is available for inspection. Spills are reported in accordance with Wis. Adm. Code ch. NR 706, CERCLA Reportable Quantities and SARA Section 302 Extremely Hazardous Substances Reportable Quantities.

During 2013, there were no reportable or recordable incidents that occurred on the reclaimed Flambeau Mine site.

## 2.11 Drill Holes

Mine Permit Condition 2-7 requires a summary of all exploration drilling activities conducted on the mine site during the previous year. No exploration drilling activities were conducted on the reclaimed mine site during 2013.

# 3 Reclamation Activities

Upon receipt of the COC, on May 31, 2007, for the 149-acre Reclaimed Flambeau Mine Nature Area, Flambeau has met the requirements for reclamation within the nature area.

There were no reclamation activities undertaken during 2013, and thus, no reports were submitted.

## 3.1 Other Activities

Also reported are post-COC management activities during 2013 within the Reclaimed Flambeau Mine Nature area that included mowing grass trails and routine inspections.

# 4 Site Monitoring

Environmental monitoring at the reclaimed Flambeau Mine during 2013 included assessing the quality of groundwater and backfill pore water. All data obtained during environmental monitoring continues to show that Flambeau remains in compliance with all permit standards and the Flambeau River remains fully protected.

## 4.1 Groundwater Quality Sampling and Analysis

Quarterly groundwater monitoring was performed in accordance with descriptions provided in the Updated Monitoring Plan (July 1991), the Revised Mining Permit Quality Assurance/Quality Control Document (August 1991) and the Local Agreement. As a result of regulatory changes with respect to arsenic in groundwater, the Department requested that Flambeau consider analyzing groundwater samples for arsenic on a quarterly basis. In a letter dated August 5, 2004, Flambeau notified the Department that arsenic will be included in the quarterly monitoring program. Results of the 2013 monitoring were submitted to the Department Mine Reclamation Unit on October 28, 2013, October 29, 2013, and January 6, 2014. Those reports are incorporated by reference.

Figure 4-1 shows the groundwater potentiometric surface using data obtained during 2013. The map was generated using the shallowest measured water levels, and thus represents shallow groundwater flow in the native formations and in the replaced till and sandstone in the backfilled pit footprint. The potentiometric surface shows a direction of regional shallow groundwater flow to the west-northwest toward the Flambeau River. Figure 4-2 shows the potentiometric surface using the lowest water level for nested wells, where available, and the water levels for the B completion in the backfill monitor wells. Beyond the pit footprint, the groundwater levels generally mimic the shallow groundwater conditions. Within the pit backfill, the surface reflects a general direction of groundwater flow in the backfilled Type I and Type II stockpile materials along the axis of the pit toward the Flambeau River. Figure 4-3 shows hydraulic head in cross section along the axis of the pit. The cross section is interpreted to show predominantly horizontal flow in the backfilled Type I and Type II stockpile materials but with a downward hydraulic gradient at the eastern pit area and an upward hydraulic gradient with convergent groundwater flow near the Flambeau River.

38,000 E
39,000 E
40,000 E
41,000 E
42,000 E
43,000 E

43,000 N
42,000 N
41,000 N
40,000 N
39,000 N

PZ-1012
1106.89
PZ-1007S
1114.89
PZ-1011
1134.57
1090.67•
MW-1002
MW-1002G
1090.62
1109.62•
MW-1003
MW-1003P
1109.56
MW-1014 1118.83•
MW-1014A 1115.77
MW-1014B 1112.96
MW-1014C 1108.19
PZ-1006G 1133.43•
PZ-1006 DRY
PZ-1006S 1132.23
1140.83
PZ-1009G
PZ-1009
1140.64•
1087.76•
MW-1015A
1093.72
OW-10
WT-5
MW-1015B
1087.79
OW-43
1087.64
MW-1004 1106.16•
MW-1004S 1106.27
MW-1004P 1104.77
1120.78•
ST-9-23
ST-9-23A
1120.99
OW-42
1101.19
MW-1005 1137.63•
MW-1005P 1136.64
MW-1005S 1136.84
MW-1013 1110.51•
MW-1013A 1096.77
MW-1013B 1097.19
MW-1013C 1099.24
PZ-S3
1119.22
PZ-S1
1094.92•
PZ-R1
1091.02
MW-1010P
1087.50•
ST-9-26
1112.35
OW-39
1096.93•
MW-1000PR
1087.73
MW-1000R
1088.30
1110.11
OW-7
MW-1001 1115.16•
MW-1001P 1114.14
MW-1001G 1114.19
PZ-1008
1135.68•
PZ-1008G
1135.77

1090
1095
1100
1105
1110
1115
1120
1125
1130
1135
1140

N

LEGEND

1130 — POTENTIOMETRIC SURFACE CONTOUR

MW-1001G 1114.19 — GROUNDWATER MONITORING WELL AND MEASURED GROUNDWATER ELEVATION (FT MSL) (OCTOBER 14, 2013)

WT-5 — WETLAND STAFF GAUGE

1140.64• — ASTERISK DENOTES ELEVATION FROM WELL NEST REPRESENTED BY GROUNDWATER CONTOUR

SLURRY WALL LOCATION

APPROXIMATE LIMITS OF FORMER MINE PIT

NOTE:
FOR THE PURPOSE OF THIS POTENTIOMETRIC SURFACE MAP THE SHALLOWEST, NON DRY WELL OF THE NESTED WELL SET WAS USED TO GENERATE THE POTENTIOMETRIC SURFACE.

Flambeau Mining Company
2013 Annual Report

Foth Infrastructure & Environment, LLC

| REVISED | DATE | BY | DESCRIPTION |
|---|---|---|---|
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| | | | |
|---|---|---|---|
| CHECKED BY: | SVF | DATE: JAN. '14 | |
| APPROVED BY: | DRD | DATE: JAN. '14 | |
| APPROVED BY: | | DATE: | |

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FIGURE 4-1
OCTOBER, 2013
POTENTIOMETRIC SURFACE,
SHALLOW GROUNDWATER LEVELS

| | | | |
|---|---|---|---|
| Scale: 0 250' 500' | | Date: JANUARY, 2014 | |
| Prepared By: JOW | Checked By: SVF | 08F777 | |

X:\GB\IE\2008\08F777\cad\2013 mon rpt\October_2013_mon_rpt_Fig 4-1.dgn
1/31/2014 JOW

38,000 E | 39,000 E | 40,000 E | 41,000 E | 42,000 E | 43,000 E

43,000 N | 42,000 N | 41,000 N | 40,000 N | 39,000 N

N

1106.89 PZ-1012

PZ-1007S 1114.89

PZ-1011 1134.57

MW-1002 MW-1002G 1090.62

1140.83 PZ-1009G PZ-1009

PZ-1006G PZ-1006 PZ-1006S 1137.23

MW-1014 MW-1014A MW-1014B 1112.96 MW-1014C

MW-1003 MW-1003P 1109.56

MW-1015A MW-1015B 1087.79

OW-10 1093.72

OW-43 1087.64

MW-1004 MW-1004S MW-1004P 1104.77

ST-9-23 ST-9-23A 1120.99

OW-42 1101.19

MW-1005 MW-1005P 1136.64 MW-1005S

MW-1013 MW-1013A MW-1013B 1097.19 MW-1013C

PZ-S3 1119.22

PZ-S1 1094.92

PZ-R1 1091.02

MW-1010P 1087.50

ST-9-26 1112.35

OW-39 1096.93

MW-1000PR 1087.73

MW-1000R 1089.00

OW-7 1110.11

MW-1001 MW-1001P 1114.14 MW-1001G

PZ-1008 PZ-1008G 1135.77

1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140

## LEGEND

1120 — POTENTIOMETRIC SURFACE CONTOUR

MW-1002G 1090.62 — GROUNDWATER MONITORING WELL AND MEASURED GROUNDWATER ELEVATION (FT MSL) (OCTOBER 14, 2013)

SLURRY WALL LOCATION

APPROXIMATE LIMITS OF FORMER MINE PIT

## NOTE:

1. B COMPLETION WELLS IN THE BACKFILLED PIT AND DEEPER WELLS IN AREAS WITH WELL NESTS OUTSIDE OF THE BACKFILLED PIT WERE USED.

Flambeau Mining Company
2013 Annual Report

| Foth Infrastructure & Environment, LLC | | | |
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| APPROVED BY: | DRD | DATE: | JAN. '14 |
| APPROVED BY: | | DATE: | |

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# FIGURE 4-2

OCTOBER, 2013
POTENTIOMETRIC SURFACE,
DEEP GROUNDWATER LEVELS

Scale: 0 250' 500' | Date: JANUARY, 2014

Prepared By: JOW | Checked By: SVF | 08F777

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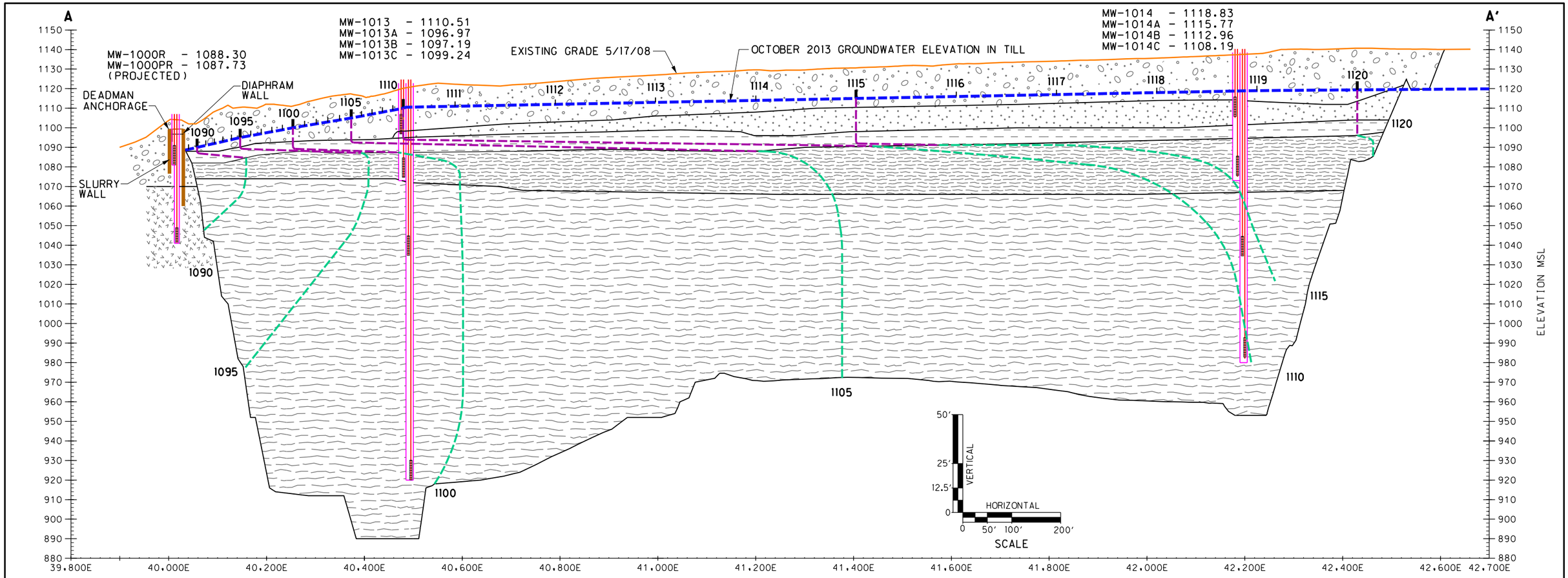
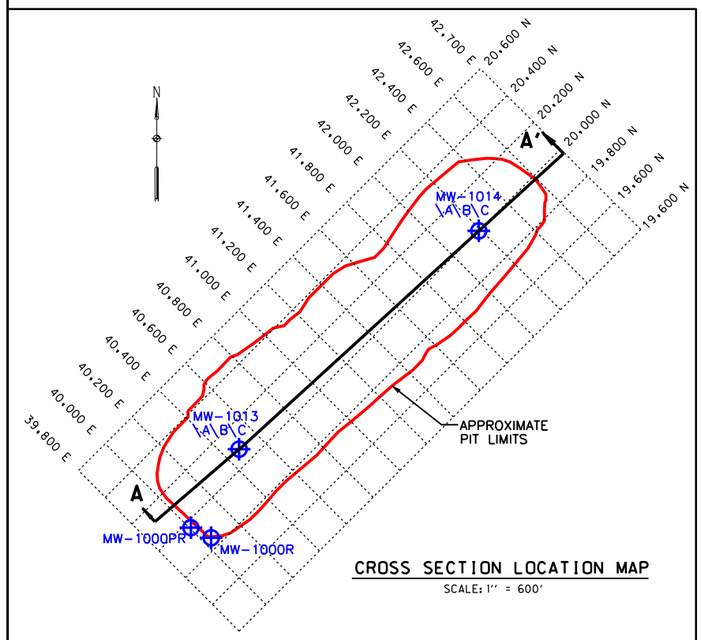
1/31/2014 JOW




## MINE PIT COORDINATES
## SECTION A - A'

### LEGEND

- TILL
- SANDSTONE
- SAPROLITE
- TYPE I MATERIAL
- TYPE II MATERIAL
- PRECAMBRIAN
- WATER TABLE
- GROUNDWATER EQUIPOTENTIAL LINE IN TYPE 1 AND II BACKFILL
- GROUNDWATER EQUIPOTENTIAL LINE IN SHALLOW FLOW SYSTEM

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| APPROVED BY: DRD | | | DATE: JAN. '14 |
| APPROVED BY: | | | DATE: |

Foth Infrastructure & Environment, LLC

FLAMBEAU MINING COMPANY

FIGURE 4-3
MINE PIT CROSS SECTION A - A'
WITH IN-PIT GROUNDWATER
MONITORING WELLS

| Scale: SEE BAR SCALE | Date: JANUARY, 2014 | |
|---|---|---|
| Prepared By: JOW | Checked By: SVF | 08F777 |

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1/31/2014 JOW

## 4.2 Backfilled Pit Water Quality Assessment

The porewater chemistry of the backfill placed in the mined out Flambeau pit has been monitored since February 1999 through sample collection from groundwater wells completed in the backfilled areas. SRK Consulting, Inc. reviewed the results annually through 2009 to assess geochemical interactions between the groundwater and the backfill (SRK, 2010). Interralogic, Inc. conducted the 2010, 2011, 2012, and 2013 reviews and assessments. The 2013 memorandum is included as Appendix A.

There were no significant changes in porewater chemistry conditions in the backfilled pit during 2013 compared to 2012. The 2013 data show continuation of established trends for most analytes (alkalinity, major cations, major anions, iron, and manganese) and fluctuations in concentrations that are within the ranges observed in previous years of monitoring or no change. Other specific observations about the monitoring trends are:

- Alkalinity concentrations are stable or within historical ranges at all wells.

- Redox potentials measured for the 2013 samples are generally within the upper end of ranges observed in previous years although values for MW-1013, MW-1014, and MW-1005P in the October 2013 samples were higher than previously measured.

- Manganese concentrations continue to be stable or decreasing very slowly at all wells. A general condition of stable concentrations for manganese and iron concentrations appears to have been reached for the deepest wells (MW-1013C and MW-1014C).

- Iron concentrations are stable and less than background levels for most wells with the exceptions of MW-1013, MW-1013C, and MW-1014C. Iron concentrations at MW-1013 are greater than background and have fluctuated from an annual average of 8.15 mg/L in 2009 down to 2.78 mg/L in 2011 and back up to 13.5 mg/L in 2013. Iron concentrations in MW-1013C have increased slightly over the last few years and remain above background. Iron concentrations at MW-1014C continue to show a slow decline but remain above background.

- Geochemical modeling indicates that conditions of saturation with calcite and gypsum are prevalent for wells that sample porewater from limestone-amended backfill; conditions of supersaturation with rhodochrosite and siderite also occur.

- Consistency of decreasing trends for manganese, iron, and sulfate suggest there may be a slow rinse out of easily solubilized constituents by inflow of background groundwater at the upgradient location of the MW-1014 well cluster, such that concentrations of sulfate, manganese, and iron in the deep wells are relatively stable over the last few years.

### 4.2.1 Trend Analysis

A detailed analysis of statistical trends occurring in the groundwater and surface water data was performed. The complete trend memorandum is included in Appendix B.

Statistical tests evaluated long-term trends occurring during the post-mining period (October 1997 to the present) and short-term trends for the most recent five years. Historical trend graphs of the data are also presented. Many short-term statistical trends appear to be well within historical concentration ranges. Many long-term statistical trends either appear to be generally stabilizing due to the completion of well recoveries during the post-mining period, or are noted as statistical trends due only to relatively small consecutive concentration increases or decreases.

The majority of the statistically significant trends with notable concentration changes occur with the quarterly groundwater monitoring parameters. For the intervention boundary wells, several trends which appeared prominent in previous annual reports have stabilized or decreased. The intervention boundary well MW-1000PR, where concentration increases of hardness, iron, manganese, sulfate, TDS and conductivity were observed around 1999 to 2000 and associated with well recovery, have subsequently followed long-term statistically decreasing trends. Iron and manganese in MW-1010P also increased during late 2000 subsequent to post-mining groundwater level recovery, however, concentrations now continue a steady decrease first beginning with 2004. Additionally, with the intervention boundary well MW-1004P, the concentration increases of iron and manganese observed around 2006 to 2007 have also decreased and fairly stabilized.

In one intervention boundary well, MW-1005, a short-term statistically increasing trend in total dissolved solids and conductivity began in 2011. The concentration levels of these parameters remained consistent during 2012 and 2013.

MW1015B, located adjacent to the compliance boundary approximately 1,000 feet northwest of the backfilled pit, exhibits stronger decreasing trends for iron and manganese (following initial increases observed from 2002 to 2003), with redox in MW-1015B following a stronger increasing trend.

Several stronger trends have previously been reported for the in-pit wells. Iron in MW-1013C continues to have an increasing trend which began in 1999. Copper in MW-1013B had a similar increasing trend through 2010, but in the last three years has stabilized and somewhat decreased. The in-pit wells MW-1014A (manganese), MW-1014B (manganese) and MW-1014C (alkalinity, hardness, iron, manganese, sulfate, TDS and conductivity) had stronger decreasing trends from 1999 through 2010, but now have fairly stabilized.

Few significant trends were noted for the annual groundwater parameters of barium, cadmium, calcium, chloride, chromium, lead, magnesium, mercury, potassium, selenium, silver, sodium and zinc. The somewhat more notable trends include long-term decreasing trends of calcium, magnesium and zinc in MW-1000PR, long-term decreasing trends of calcium and zinc in MW-1014B and MW-1014C, and a long-term decreasing trend of cadmium in MW-1014B.

No statistically significant trends were observed in the surface water monitoring results.

## 4.3 Wetland Monitoring and Infiltration Basin Management

During 2013, Flambeau monitored wetland surface flows.

In accordance with Section 3.1.4.3 of the Updated Monitoring Plan, Flambeau continues to monitor water level measurements at least three times per year (spring, summer, and fall) in Wetland 1. Wetland surface flows will be monitored in Wetland 1 until the Department approves a future request from Flambeau to discontinue monitoring.

Surface water monitoring and site inspections associated with the infiltration basins were completed in accordance with the MMP. Section 4.3.2 of this report summarizes 2013 monitoring activities and results.

### 4.3.1 Wetland Surface Flows

In May 2001, Flambeau submitted a Wetland Area Hydrographic Assessment, prepared by Foth & Van Dyke, evaluating the wetland water elevations and recommending cessation of monitoring of wetland surface water elevations, with the exception of Wetland 1, in accordance with the Updated Monitoring Plan. Based upon the Wetland Area Hydrographic Assessment, Flambeau requested the Department's approval of cessation of monitoring wetland surface water elevations for Wetlands 5C, 6C, 7 and 10A. During April 2002, the Department concurred with Flambeau's request to decrease the extent of wetland water level monitoring.

In accordance with Section 3.1.4.3 of the Updated Monitoring Plan, Flambeau monitors water level measurements at least three times per year (spring, summer, and autumn). Water levels in Wetland 1 (Staff Gauge WT-5) were measured three times during 2013: spring, summer and autumn. Standing water at the staff gauge was observed during spring and summer. Mitigation water was not added during 2013 as was also the case between 2002 and 2012.

Measurements from Wetland 1 were provided to the Department on January 31, 2013. The report is incorporated by reference. Figure 4-1 shows the staff gauge location.

### 4.3.2 Infiltration Basin Management

The MMP requires surface water sampling and completion of a site inspection annually. Required monitoring occurred on April 24, May 5, October 6, and November 7, 2013.

The MMP is composed of six elements:

- Routine inspections,
- Vegetation monitoring,
- Structure inspection,
- Sediment accumulation,
- Prescribed burning, and
- Surface water monitoring.

**Routine Inspections**
Routine inspections were completed in order to evaluate the functionality of the basins and assess the need for maintenance activities. In 2013, the pumping was completed in April 2013 during the spring snowmelt; in May 2013, in preparation for some investigation activities; and again in October 2013, to accommodate winter precipitation.

**Vegetation Observation Monitoring**
Vegetation was monitored by general observation in order to evaluate the success of the native species and determine any required maintenance activities. Vegetative monitoring in 2013 indicates that seeding after construction was successful, and no vegetative maintenance activities were required in 2013.

**Structure Inspection**
Structures were inspected for integrity and found to be free from erosion or defects in 2013.

**Prescribed Burning**
Prescribed burning was not required in 2013.

**Sediment Accumulation**
Sediment accumulation was evaluated within the infiltration basins. No significant sedimentation was observed in 2013.

**Surface Water Monitoring**
Surface water monitoring occurred in conjunction with the semi-annual site inspections and surface water samples were collected at five locations, shown on Figure 4-1; NB-1, EB-1, SW-C5, SW-C9 and SW-C1. Sampling occurred on April 24, May 5, October 6, and November 7, 2013. Surface water was collected from these locations and was sent to Northern Lake Services (NLS) (Crandon, Wisconsin), a state-certified laboratory and analyzed for the following parameters:

- Hardness, total
- Copper, total
- Zinc, total
- Total Suspended Solids (TSS), total

Surface water sampling results were provided to the Department on July 24, 2013 and January 8, 2014.

## 4.4 Surface Subsidence

Pursuant to Section 3.1.7 of the Updated Monitoring Plan (July 1991), with 2008 being the tenth year after reclamation activities were performed in the area of the pit, a review of the surface topography in the area of the pit was performed in 2008.

The results of the 2008 subsidence analysis indicated a general increase of 0.6 feet. These results were consistent with the results of the review of the surface topography in the area of the pit completed in 2001 when the general subsidence across the site was less than a half a foot which is

within the accuracy of the mapping technique and the largest settlement observed in isolated areas by mapping was 1.5 feet.

Subsequent subsidence surveys are to occur in the twentieth (2018) and fortieth (2038) year after reclamation activities in the area of the pit are completed.

Aerial Photography (Color and Infrared)

In accordance with Section 3.1.6 of the Updated Monitoring Plan (July 1991), aerial and color infrared photography was completed in the late summer for four consecutive years following completion of closure and will continue every five years throughout the long-term care and maintenance period to monitor success of revegetation.

In the November 7, 2002 submittal of the 2002 Aerial and Color Infrared Photography, Flambeau requested a reduction of the area of coverage for the photography based upon the substantial rebound of groundwater around the reclaimed mine site. Flambeau proposed that the photography cover the reclaimed mine site and 500 feet beyond the site's perimeter including the area of Wetland 1. In a letter dated July 9, 2003, the Department authorized Flambeau to reduce the breadth of the aerial and color infrared photography as requested.

Year 2005 was the fourth year of the four consecutive years for aerial and color infrared photography since the submittal of the NOC in 2001. Aerial and color infrared photography was completed on August 3, 2006 for a fifth additional year and these results were presented in the 2006 Annual Reclamation Report.

With the long-term care phase of the Flambeau project beginning with the May 2007 COC, aerial and color infrared photography will be conducted every five years. The first of the long-term care phase aerial and color infrared photography occurred in 2012. The results were presented in the 2012 Annual Report. Subsequent aerial and color infrared photography will occur in 2017, 2022, 2027, 2032, 2037, 2042, and 2047.

## 4.5 Other Activities

Investigative activities, as described in the November 14, 2013 letter to the Department from Dave Cline, were started. These investigation activities have been initiated to determine the next steps at the site. Investigation activities may extend into the summer of 2014.

## REFERENCES


| | |
|---|---|
| 2000 Annual Report | January 2001 |
| 2005 Annual Report | January 2006 |
| 2006 Annual Report | January 2007 |
| 2007 Annual Report | January 2008 |
| 2008 Annual Report | January 2009 |
| 2009 Annual Report | February 2010 |
| 2010 Annual Report | January 2011 |
| 2011 Annual Report | January 2012 |
| 2012 Annual Report | January 2013 |
| 2001 Annual Reclamation Report | November 2001 |
| 2004 Annual Reclamation Report | November 2004 |
| 2005 Annual Reclamation Report | November 2005 |
| 2006 Annual Reclamation Report | November 2006 |
| 2007 Annual Reclamation Report | November 2007 |
| 2008 Annual Reclamation Report | November 2008 |
| 2009 Annual Reclamation Report | November 2009 |
| 2010 Annual Reclamation Report | November 2010 |
| 2011 Annual Reclamation Report | November 2011 |
| 2012 Annual Reclamation Report | November 2012 |
| 2008 Monitoring Results and Copper Park Lane Work Plan | October 2008 |
| Biofilter Management Plan | January 2007 |
| Construction Documentation Report – Flambeau Industrial Outlot | September 2006 |
| COC Stipulation Monitoring Work Plan | December 2007 |
| Copper Park Business and Recreation Area Work Plan | May 2011 |
| Copper Park Business and Recreation Area Construction Documentation Report | January 2013 |
| Copper Park Business and Recreation Area Maintenance and Monitoring Plan | March 2013 |
| Local Agreement | August 1988 |
| Mine Permit Application | December 1989 |
| Mining Permit | January 1991 |
| Revised Mining Permit Quality Assurance/Quality Control Plan | August 1991 |
| Stipulation and Order | May 2007 |

Stipulation Monitoring Work Plan QAPP for the Flambeau Mine December 2007

Updated Monitoring Plan July 1991

## SUBMITTALS

| DOCUMENT | DATE | SUBMITTEE |
|---|---|---|
| **Section 2.0 Operating Activities** | | |
| 2013 Annual Report | January 2014 | Phil Fauble [1] |
| **Section 4.0 Site Monitoring** | | |
| Environmental Monitoring (First Quarter 2013), Groundwater | October 2013 | Phil Fauble [1] |
| Spring 2013 Surface Water Analytical Report | July 2013 | Phil Fauble [1] |
| Environmental Monitoring (Second Quarter 2013), Groundwater | October 2013 | Phil Fauble [1] |
| Environmental Monitoring (Third Quarter 2013), Groundwater | October 2013 | Phil Fauble [1] |
| Environmental Monitoring (Fourth Quarter 2013) Groundwater | January 2014 | Phil Fauble [1] |
| 2013 Wetland 1 Water Measurements | January 2014 | Phil Fauble [1] |
| Fall 2013 Surface Water Analytical Report | January 2014 | Phil Fauble [1] |

1. Wisconsin Department of Natural Resources
   Division of Air & Waste
   Waste & Materials Management

# Appendix A

# Backfilled Pit Water Quality Assessment

4715 Innovation Drive, Suite 110
Fort Collins, CO 80525 USA
970-225-8222

## FINAL TECHNICAL MEMORANDUM

**TO:** **Sharon Kozicki, Foth Infrastructure & Environment LLC**

**FROM:** **Ted Eary, Interralogic, Inc.**

**DATE:** **January 27, 2014**

**SUBJECT:** **Flambeau Mine Backfilled Pit 2013 Monitoring Results**

# 1.0 INTRODUCTION

## 1.1 TERMS OF REFERENCE

The porewater chemistry of the backfill placed in the mined out Flambeau pit has been monitored since February 1999 through sample collection from groundwater wells completed in the backfilled areas. SRK Consulting, Inc. reviewed the results annually through 2009 to assess geochemical interactions between the groundwater and the backfill (SRK, 2010). Interralogic, Inc. conducted the 2010, 2011, and 2012 reviews and assessments.

This technical memorandum provides the outcomes from Interralogic's review of monitoring results for 2013. The format established for previous reviews has been retained.

## 1.2 SUMMARY OF PREVIOUS RESULTS

The results from the 2012 monitoring period were summarized by Interralogic (2013) as follows. There were no significant changes in porewater chemistry in the backfilled pit during 2012 compared to previous years. The 2012 data showed continuation of established trends for most analytes (alkalinity, major cations, major anions, iron, and manganese) and fluctuations in concentrations that were within the ranges observed in previous years of monitoring. The limestone amendments to the waste rock continued to provide acid neutralization capacity. Other specific observations about the monitoring trends were:

- Alkalinity concentrations were stable or fluctuating within historical ranges at all wells.
- $CO_2(g)$ partial pressures were stable at most wells.
- Redox conditions were relatively stable at most wells but fluctuated at MW-1013A, MW-1014, and MW-1014A.
- Manganese concentrations continued to be stable or decreased slowly at all wells, although MW-1014 and MW-1014A showed fluctuations in previous years.
- Iron concentrations were stable and less than background levels for most wells with the exceptions of MW-1013, MW-1013C, and MW-1014C. Iron concentrations at MW-1013 were greater than background and fluctuated from an annual average of 8.15 mg/L in 2009 down to 2.78 mg/L in 2011 and back up to 6.3 mg/L in 2012. Iron concentrations in MW-1013C increased slightly compared to the previous few years and remained above

background. Iron concentrations at MW-1014C continued to show a slow decline but remained above background.

- Geochemical modeling indicated that conditions of saturation with calcite and gypsum were prevalent for wells that sample porewater from limestone-amended backfill; conditions of supersaturation with rhodochrosite and siderite also occurred.
- Consistency of decreasing trends for manganese, iron, and sulfate suggested that a process of dilution and displacement by background groundwater slowly occurred at the upgradient location of the MW-1014 well cluster, explaining the slow decreases observed for sulfate, manganese, and iron over time. A similar dilution and displacement process did not appear to be occurring at the MW-1013 well cluster.

## 2.0 SUMMARY OF DATA COLLECTED IN 2013

Well locations, sampling procedures, and analytical methods were previously presented in an SRK memorandum dated January 15, 2010 and are not repeated in this memorandum. All the monitoring wells located in the backfill were sampled during 2013. These wells are the MW-1013 cluster, which includes MW-1013, MW-1013A MW-1013B, MW-1013C), and the MW-1014 cluster, which includes MW-1014, MW-1014A, MW-1014B, and MW-1014C. The wells in each cluster are located at approximately the same location but completed at different depths. The background well MW-1005P, which is located upgradient of the backfill, was also sampled.

The routine monitoring program for the backfill groundwater is given in Table 1. The annual sampling program with the detailed analyte list was completed in June 2013. The quarterly sampling events with the target list of analytes occurred in March, May, and October. The analytical results of the monitoring program for the wells located in the backfilled pit area (MW-1013 and MW-1014 clusters) are provided in Attachment 1.

## 3.0 RESULTS AND DISCUSSION

### 3.1 ALKALINITY TRENDS

Concentration trends for alkalinity are shown in Figure 1 for the MW-1013 well cluster and Figure 2 for the MW-1014 well cluster. The alkalinities measured in 2013 are similar to those measured in previous years for both well clusters with one possible exception. The exception is the October 2013 sample from MW-1013C for which an alkalinity of 100 mg/L is reported, which is substantially less than the range of 440 to 620 mg/L reported in samples from the previous five years.

Alkalinities in MW-1013A, MW-1013B, and MW-1013C remained elevated above background levels during 2013 (with the single exception noted above) as has been observed in previous years (Figure 1). Background conditions are indicated by the data for well MW-1005P. Wells MW-1013A, MW-1013B, and MW-1013C sample porewater from limestone-amended backfill material; hence, the high alkalinities are most likely due to reactions with the limestone. These wells also show elevated $CO_2(g)$ levels relative to ambient atmospheric $CO_2(g)$ and relative to the background well MW-1005P as a result of limestone dissolution and subsequent trapping of at least a portion of the produced $CO_2(g)$ (Table 2). Well MW-1013, which samples porewater from the replaced till, also has higher alkalinity than background (Well MW-1005P) (Figure 1), although lower than for the deeper wells completed in waste rock (MW-1013A, MW-1013B, and MW-1013C). These observations for the MW-1013 well cluster in 2013 are similar to those made in previous annual monitoring reports.

Alkalinities in wells MW-1014A, MW-1014B, and MW-1014C, which also sample porewater from limestone-amended waste rock in the backfilled pit, were also greater than background levels during 2013, continuing the trend from previous years (Figure 2). Alkalinities in MW-1014A appear to have peaked in 2007 at 560 mg/L and have declined slightly since

that time and now appear stabilized at about 400 to 500 mg/L. Alkalinities in MW-1014B have followed a trend similar to MW-1014A. Alkalinities in MW-1014C have shown a very slowly decreasing concentration trend since 1999 and ranged from 280 to 290 mg/L in 2012 and 260 to 270 mg/L in 2013. Alkalinities for MW-1014 during 2013, which samples porewater from the upper sandstone backfill layer remain slightly below background concentrations, also similar to observations in previous years.

## 3.2 Carbon Dioxide Partial Pressure Trends

Previous annual reports have established that limestone amendments to the waste rock during backfilling neutralized the acidity in the waste rock that may have remained from oxidation processes that occurred when the waste rock was stockpiled above ground during the period of active mining operations. The neutralization reactions have resulted in elevated $CO_2(g)$ levels relative to atmospheric $CO_2(g)$ in the porewater of the waste rock according to geochemical equilibrium modeling results (Table 2).

The previously observed trends of elevated $CO_2(g)$ in the porewater continued during 2013 for both the MW-1013 well cluster (Figure 3) and MW-1014 well cluster (Figure 4), where elevated $CO_2(g)$ is in reference to the background well (MW-1005P) (Table 2). The $CO_2(g)$ partial pressures determined for 2013 are generally within the ranges reported for past monitoring years. The upward trend for MW-1005P, which started in 2008, continued through about 2012, may have ended in 2013 because most of the $CO_2(g)$ partial pressures calculated from the 2013 water quality data are lower than those calculated for 2011 and 2012 (Figures 3 and 4).

The $CO_2(g)$ partial pressures shown in Figures 3 and 4 were calculated with the PHREEQC geochemical model (Parkhurst and Appelo, 1999) using the measured groundwater chemical compositions from the annual (June) samples with the detailed analyte list. There is a potential for some loss of $CO_2(g)$ by degassing during sample collection and analysis because the samples are collected from the monitoring wells depth (i.e. under a hydrostatic pressure greater than atmospheric conditions) and then brought to the surface resulting in depressurization. Degassing loss of $CO_2(g)$ during sample collection and analysis would cause the pH to increase, which in turn, would affect the calculation of $CO_2(g)$ partial pressure. The potential for this effect to occur during sampling has been noted in previous monitoring reports (SRK, 2010).

## 3.3 pH Trends

The elevated $CO_2(g)$ levels have persisted in the pore water of the waste rock probably due to slow rates of loss through the overlying backfill material. Carbon dioxide is a weak acid, hence porewater samples from zones with the highest $CO_2(g)$ partial pressures tend to have lower pH values than porewater from zones with comparatively lower $CO_2(g)$ (Figures 5 and 6). Within the backfilled pit, the elevated $CO_2(g)$ levels relative to the background well (MW-1005P) and have resulted in pH values from 6.0 to 7.1 in the amended backfill (MW-1013 and MW-1014 well clusters) compared to a range of 6.4 to 8.5 observed in the background well (MW-1005P) where $CO_2(g)$ levels are much lower (Figures 5 and 6). Overall, there were no significant changes in pH for any of the monitoring well samples during 2013 compared to previous years.

## 3.4 Major Ions

The ionic charge balances of the annual samples were checked with the PHREEQC geochemical model using the measured total alkalinity (mg $CaCO_3$/L) and pH fixed at the measured (field) value. The results are shown in Table 3. Eight of the nine samples had ionic charge balances within plus or minus 10%. Typically, charge imbalances less than 10% are considered to provide a reliable indication of chemical composition for geochemical modeling and assessment (Alpers and

Nordstrom, 1999). Thus, with the possible exception of the MW-1013 annual sample, the analytical data for 2013 are suitable for use in geochemical modeling and related interpretation of water quality trends.

The classification of the groundwater types based on major cations and anions remain the same as reported in previous annual reports. The chemical composition MW-1005P upgradient of the backfill falls into the Ca-Mg-$CO_3$ classification, as does MW-1013. The chemical compositions for MW-1013A and MW-1014 fall into Ca-Mg-$CO_3$-$SO_4$ classification. The chemical compositions for all the other wells (MW-1013B, MW-1013C, MW-1014A, MW-1014B, and MW-1014C) are classified as Ca-Mg-$CO_3$-$SO_4$ waters.

The geochemical model PHREEQC (Parkhurst and Appelo, 1999) was used to calculate saturation indices for mineral phases that are potential solubility controlling phases in the porewater of the backfill. The saturation index for mineral does not indicate the abundance of the mineral nor does it account for any kinetic constraints that may prevent the mineral from forming or dissolving. However, the values of the saturation indices in combination with information on the backfill mineralogy provide useful information for determining the water-rock reactions most likely to be affecting water chemistry. They are also useful for interpreting causes of trends or changes in water quality trends. The geochemical model calculations were conducted with the laboratory-measured alkalinities and field-measured values for pH, temperature, and redox potentials.

The saturation indices obtained from the PHREEQC calculations are given in Table 4 using the data for the detailed analyte listed from the June 2013 samples. Time series charts showing trends in saturation indices for each monitoring well are provided in Figures 7 to 15. Complete sets of input data and results from the PHREEQC model calculations for the 2013 water quality data are included in Attachment 2.

Saturation indices for calcite for porewater in most backfilled areas that were amended with limestone are generally near a value of 0.0 (MW01013B, MW-1013C, MW-1014A, and MW-1014B), indicating a condition of approximate solubility equilibrium with calcite. This result is consistent with observations in previous years and is due to the presence of limestone, which is comprised primarily of calcite, in the amended waste rock. The results indicate there is a reservoir of acid neutralization capacity in the form of limestone remaining in the waste rock. Dissolution of the calcite is the most likely reason for the elevated $CO_2$(g) levels found in the porewater in the limestone-amended portions of the backfilled pit. The porewater in the till (MW-1013 – Figure 7) and sandstone (MW-1014 – Figure 11) layers of the backfilled pit, which were not amended with limestone, are undersaturated with respect to calcite solubility. A similar condition of calcite solubility undersaturation exists at the background well (MW-1005P – Figure 15), located upgradient of the lime amended backfill.

Other carbonate minerals indicated to be at near-saturation conditions by the geochemical modeling are siderite (iron carbonate – MW-1013, MW-1013C, and MW-1014C, and MW-1005P) and rhodochrosite (manganese carbonate – MW-1013, MW-1013B, MW-1013C, MW-1014B, and MW-1014C). The siderite saturation indices tend to be variable due to fluctuations in measured redox potentials that are used to speciate dissolved iron. The rhodochrosite saturation indices are less variable than siderite. Rhodochrosite solubility may partially limit dissolved manganese concentrations, although it is relatively soluble under the groundwater conditions.

Conditions of near solubility equilibrium with gypsum solubility continued in 2013 for porewater sampled from wells completed in limestone-amended waste rock (MW-1013B, MW-1013C, MW-1014A, and MW-1014B). The gypsum likely formed due to acid neutralization reactions with the calcite in the limestone.

There are no significant changes in major ion chemistry in 2013 compared to previous years. Overall, the conditions of equilibrium with calcite and gypsum indicate that acidity that had previously been present in the backfill has been

neutralized and there is excess acid neutralizing capacity in the backfilled waste rock in the form of the limestone amendments. This observation is consistent with conclusions made in previous annual reports.

## 3.5 REDOX POTENTIAL

Time trends for measured redox potentials are shown in Figures 16 and 17 for the MW-1013 and MW-1014 wells clusters, respectively. The values for the background well MW-1005P are included in both Figure 16 and 17 for comparison. The redox potentials in the MW-1013 well cluster in 2013 were generally within the ranges reported in previous years (Figure 16).

The redox potentials for the MW-1014 well cluster during 2013 showed values for MW-1014, MW-1014A, and MW-1014B toward the upper ends of ranges established in earlier years (Figure 17). Redox potentials for MW-1014C were within the historical range of measurements except for the last value from October 2013, which was higher than previously measured (Figure 17). The redox potentials measured in the upgradient well (MW-1005P) showed a higher than previously measured value in October 2013 compared to previous measurements.

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## 3.6 MANGANESE AND IRON

Time trends for manganese concentrations at the MW-1013 and MW-1014 well clusters are shown in Figures 18 and 19, respectively. Annual average concentrations of manganese are provided in Table 5.

Most wells in the MW-1013 well cluster located (MW-1013, MW-1013A, MW-1013B, and MW-1013C) showed no significant changes in 2013 compared to previous years (Figure 18). The manganese concentrations at these wells appear to have reached nearly stable values. For example at MW-1013B, the average annual manganese concentration was 31,000 µg/L in 2013 (Table 5) with a range of 18,000 µg/L in June 2013 to 37,000 in March 2013. This variability during a single year is similar to that observed in previous years (Figure 18).

Manganese concentrations in the MW-1014 cluster (MW-1014, MW-1014A, MW-1014B, and MW-1014C) showed little change in 2013 compared to previous years (Figure 19) (Table 5). Concentrations may have stabilized.

Saturation indices for rhodochrosite (Table 3 and Figures 7 to 15) show that conditions of oversaturation exist in all of the wells of the MW-1013 cluster. This result is the same as observed for previous years. Oversaturation conditions also exist for MW-1014B and MW-1014C. Oversaturation conditions indicate that rhodochrosite solubility may have a partial limiting effect on manganese concentrations, depending on pH and $CO_2$(g) partial pressure. Porewater at MW-1014 and MW-1014A remain undersaturated with rhodochrosite solubility.

Time trends for iron concentrations at the MW-1013 and MW-1014 well clusters are shown in Figures 20 and 21, respectively. Annual average concentrations of iron are provided in Table 5. Iron concentrations measured in 2013 at MW-1013A and MW-1013B remained at low concentrations (<0.5 mg/L) that approximate or are less than the range observed for the background well MW-1005P (Figure 20). Iron concentrations at MW-1013 and MW-1013C had averages of 13.5 and 13.3 mg/L, respectively, in 2013 (Table 5), which is greater than reported for background groundwater. The average and the fluctuation in the quarterly samples during 2013 for MW-1013C are similar to observations for previous years (Figure 20). However, the average value of 13.5 mg/L and range from 11 to 17 mg/L for MW-1013 are higher than observed in the previous years but near the range observed previously at MW-1013C (Table 5).

Iron concentrations for most wells in the MW-1014 cluster, with the exception of MW-1014C, measured during 2013 remained less than those measured for the background well MW-1005P, which is the same set of trends that has been observed in previous years (Table 5). Iron concentrations at MW-1014C may have reached nearly stable values over the last few years after a slow decline from 1999 through 2009 (Figure 21).

The geochemical modeling results indicate that the only iron mineral potentially affecting iron concentrations is siderite under the measured redox conditions. Conditions of siderite oversaturation occur at MW-1013C (Figure 10) and MW-1014C (Figure 14). These conditions are similar to those observed in previous years. Oversaturation with siderite solubility also is predicted for MW-1013, which is a result of the increased iron concentrations observed in this well during 2013. Both of these wells also show high partial pressures of $CO_2(g)$, which depending on the fluctuating iron concentrations and redox conditions, result in conditions of near saturation to oversaturation with respect to siderite solubility.

Manganese and iron concentrations in the deep wells of the MW-1014 cluster (MW-1014B and MW-1014C) have generally shown a slow downward trend with time (Figures 19 and 21), although the rate of decrease has slowed in recent years and appears to have reached nearly constant values. The rates of decrease in manganese and iron at MW-1014C approximately parallel the rate of decline in sulfate (Figures 22 and 23, respectively). The concentrations of manganese, iron, and sulfate in the upgradient background groundwater in well MW-1005P are much lower than those observed in the wells located in the backfilled pit. The decreasing concentrations of sulfate, manganese, and iron observed for the MW-1014 cluster may be caused by a slow process of dilution and displacement of backfill pore water by inflowing natural groundwater. This effect is not seen at the MW-1013 well cluster. However, the effects of inflowing groundwater would be expected to be more pronounced and occur earlier at the MW-1014 cluster because it is located in an upgradient position relative to the MW-1013 cluster and therefore more likely to show an earlier influence from groundwater inflow.

## 4.0 CONCLUSIONS

There were no significant changes in porewater chemistry in the backfilled pit during 2013 compared to 2012. The 2013 data show continuation of established trends for most analytes (alkalinity, major cations, major anions, iron, and manganese) and fluctuations in concentrations that are within the ranges observed in previous years of monitoring or no change. Other specific observations about the monitoring trends are:

- Alkalinity concentrations are stable or within historical ranges at all wells.
- Redox potentials measured for the 2013 samples are generally within the upper end of ranges observed in previous years although values for MW-1013, MW-1014, and MW-1005P in the October 2013 samples were higher than previously measured.
- Manganese concentrations continue to be stable or decreasing very slowly at all wells. A general condition of stable concentrations for manganese and iron concentrations appears to have been reached for the deepest wells (MW-1013C and MW-1014C).
- Iron concentrations are stable and less than background levels for most wells with the exceptions of MW-1013, MW-1013C, and MW-1014C. Iron concentrations at MW-1013 are greater than background and have fluctuated from an annual average of 8.15 mg/L in 2009 down to 2.78 mg/L in 2011 and back up to 13.5 mg/L in 2013. Iron concentrations in MW-1013C have increased slightly over the last few years and remain above background. Iron concentrations at MW-1014C continue to show a slow decline but remain above background.
- Geochemical modeling indicates that conditions of saturation with calcite and gypsum are prevalent for wells that sample porewater from limestone-amended backfill; conditions of supersaturation with rhodochrosite and siderite also occur.

- Consistency of decreasing trends for manganese, iron, and sulfate suggest there may be a slow rinse out of easily solubilized constituents by inflow of background groundwater at the upgradient location of the MW-1014 well cluster, such that concentrations of sulfate, manganese, and iron in the deep wells are relatively stable over the last few years.

## 5.0 RECOMMENDATIONS

The porewater in the backfilled pit area appears to have reached a condition of near constant concentrations particularly for the deeper wells. Interralogic recommends continuation of groundwater monitoring in and around the backfilled pit from the MW-1013 and MW-1014 well clusters as well as the background well MW-1005P on an annual basis. Quarterly samples for the limited suite of water quality parameters can be discontinued. An annual sampling program would be sufficient to identify changes in water quality because the long historical record provides information that is sufficient to determine if significant changes are taking place given that there will always be some amount of year-to-year variability. An annual monitoring event was previously recommended by SRK (2010) and Interralogic (2011, 2012, 2013) in previous annual groundwater reviews. The annual event should include all the parameters in the detailed list that are part of the annual sampling program currently being followed. An annual review of the data should be included in the project's annual report to determine if the conclusions reached in this memorandum and previous reviews remain valid.

## 6.0 REFERENCES

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| Table 1: Summary of routine groundwater monitoring parameters | | | |
|---|---|---|---|
| **Parameter** | **Units** | **Quarterly Samples** | **Annual Sample** |
| Alkalinity | mg/L as CaCO3 | x | X |
| As | µg/L | x | X |
| Ba | µg/L | | X |
| Cd | µg/L | | X |
| Ca | mg/L | | X |
| Cl | mg/L | | X |
| Cr | µg/L | | X |
| Cu | µg/L | X | X |
| Hardness | mg/L | X | X |
| Fe | mg/L | X | X |
| Pb | µg/L | | X |
| Mg | mg/L | | X |
| Mn | µg/L | X | X |
| Hg | µg/L | | X |
| Field pH | s.u. | X | X |
| Laboratory pH | s.u. | X | X |
| K | mg/L | | X |
| Se | µg/L | | X |
| Ag | µg/L | | X |
| Na | mg/L | | X |
| TDS | mg/L | X | X |
| Sulfate | mg/L | X | X |
| Zn | µg/l | | X |
| Field Conductivity | µmhos/cm | X | X |
| Redox Potential | mV | X | X |
| Groundwater Elevation | feet | X | X |

**Table 2: Estimates of Carbon Dioxide Gas in Equilibrium with Annual Samples**

| Well | Sample Date | pH | Alkalinity (mg $CaCO_3$/L) | Tempera-ture (°C) | $pCO_2$ (atm) | Log10 $pCO_2$ (atm) | $CO_2$(g) Over-saturation[1] (atm/atm) | $CO_2$(g) Over-saturation[2] (atm/atm) |
|---|---|---|---|---|---|---|---|---|
| MW-1013 | Jun-2013 | 6.11 | 560 | 10.2 | 0.39 | -0.41 | 1233 | 19.5 |
| MW-1013A | Jun-2013 | 6.64 | 320 | 11.9 | 0.07 | -1.16 | 221 | 3.5 |
| MW-1013B | Jun-2013 | 6.18 | 510 | 11.5 | 0.28 | -0.55 | 885 | 14.0 |
| MW-1013C | Jun-2013 | 6.39 | 530 | 14.1 | 0.19 | -0.73 | 601 | 9.5 |
| MW-1014 | Jun-2013 | 6.49 | 150 | 10.1 | 0.05 | -1.33 | 158 | 2.5 |
| MW-1014A | Jun-2013 | 6.58 | 430 | 10.5 | 0.10 | -1.01 | 316 | 5.0 |
| MW-1014B | Jun-2013 | 6.30 | 460 | 10.7 | 0.19 | -0.72 | 601 | 9.5 |
| MW-1014C | Jun-2013 | 6.62 | 270 | 11.9 | 0.06 | -1.21 | 190 | 3.0 |
| MW-1005P | Jun-2013 | 7.10 | 220 | 10.3 | 0.02 | -1.77 | 63 | 1.0 |
| MW-1013 | Jun-2012 | 6.10 | 610 | 10.8 | 0.45 | -0.35 | 1413 | 15.0 |
| MW-1013A | Jun-2012 | 6.62 | 340 | 13.2 | 0.08 | -1.10 | 251 | 2.7 |
| MW-1013B | Jun-2012 | 6.17 | 580 | 12.6 | 0.33 | -0.48 | 1047 | 11.0 |
| MW-1013C | Jun-2012 | 6.38 | 560 | 13.7 | 0.20 | -0.70 | 631 | 6.7 |
| MW-1014 | Jun-2012 | 6.35 | 170 | 10.5 | 0.07 | -1.13 | 234 | 2.3 |
| MW-1014A | Jun-2012 | 6.56 | 500 | 11.7 | 0.12 | -0.91 | 389 | 4.0 |
| MW-1014B | Jun-2012 | 6.33 | 470 | 12.0 | 0.19 | -0.72 | 603 | 6.3 |
| MW-1014C | Jun-2012 | 6.60 | 290 | 14.3 | 0.07 | -1.15 | 224 | 2.3 |
| MW-1005P | Jun-2012 | 6.97 | 250 | 13.1 | 0.03 | -1.57 | 85 | 1.0 |
| MW-1013 | Jul-2011 | 6.10 | 660 | 15.0 | 0.50 | -0.30 | 1593 | 16.7 |
| MW-1013A | Jul-2011 | 6.55 | 350 | 14.6 | 0.10 | -1.01 | 307 | 3.3 |
| MW-1013B | Jul-2011 | 6.14 | 620 | 15.6 | 0.39 | -0.41 | 1237 | 13.0 |
| MW-1013C | Jul-2011 | 6.38 | 520 | 16.4 | 0.19 | -0.72 | 605 | 6.3 |
| MW-1014 | Jul-2011 | 6.23 | 170 | 11.8 | 0.10 | -1.02 | 304 | 3.3 |
| MW-1014A | Jul-2011 | 6.50 | 500 | 14.3 | 0.14 | -0.84 | 455 | 4.7 |
| MW-1014B | Jul-2011 | 6.33 | 550 | 14.8 | 0.23 | -0.64 | 721 | 7.7 |
| MW-1014C | Jul-2011 | 6.53 | 290 | 14.5 | 0.08 | -1.08 | 264 | 2.7 |
| MW-1005P | Jul-2011 | 6.97 | 250 | 11.6 | 0.03 | -1.58 | 84 | 1.0 |
| MW-1013 | Jun-2010 | 6.18 | 590 | 11.2 | 0.36 | -0.44 | 1139 | 18.0 |
| MW-1013A | Jun-2010 | 6.65 | 350 | 13.2 | 0.08 | -1.12 | 241 | 4.0 |
| MW-1013B | Jun-2010 | 6.22 | 690 | 12.6 | 0.35 | -0.46 | 1108 | 17.5 |
| MW-1013C | Jun-2010 | 6.37 | 620 | 14.1 | 0.23 | -0.64 | 728 | 11.5 |
| MW-1014 | Jun-2010 | 6.44 | 190 | 12.5 | 0.07 | -1.17 | 216 | 3.5 |
| MW-1014A | Jun-2010 | 6.59 | 510 | 12.1 | 0.12 | -0.93 | 370 | 6.0 |
| MW-1014B | Jun-2010 | 6.37 | 550 | 13.1 | 0.20 | -0.69 | 645 | 10.0 |
| MW-1014C | Jun-2010 | 6.52 | 310 | 13.5 | 0.09 | -1.04 | 287 | 4.5 |
| MW-1005P | Jun-2010 | 7.01 | 240 | 12.7 | 0.02 | -1.62 | 75 | 1.0 |
| MW-1013 | Jun-2009 | 6.11 | 580 | 11.3 | 0.084 | -1.08 | 266 | 4.9 |
| MW-1013A | Jun-2009 | 6.61 | 320 | 12.8 | 0.22 | -0.66 | 696 | 12.9 |
| MW-1013B | Jun-2009 | 6.17 | 580 | 12 | 0.13 | -0.89 | 411 | 7.6 |
| MW-1013C | Jun-2009 | 6.35 | 550 | 14.2 | 0.3 | -0.52 | 949 | 17.6 |
| MW-1014 | Jun-2009 | 6.34 | 170 | 11.6 | 0.06 | -1.22 | 190 | 3.5 |
| MW-1014A | Jun-2009 | 6.54 | 500 | 11 | 0.22 | -0.66 | 696 | 12.9 |
| MW-1014B | Jun-2009 | 6.33 | 510 | 11.2 | 0.25 | -0.60 | 791 | 14.7 |
| MW-1014C | Jun-2009 | 6.59 | 300 | 13.8 | 0.13 | -0.89 | 411 | 7.6 |
| MW-1005P | Jun-2009 | 7.09 | 240 | 12.9 | 0.017 | -1.77 | 54 | 1.0 |
| MW-1013 | Jun-2008 | 6.2 | 470 | 11.9 | 0.2 | -0.70 | 632 | 20.0 |
| MW-1013A | Jun-2008 | 6.6 | 340 | 12.6 | 0.045 | -1.35 | 142 | 4.5 |
| MW-1013B | Jun-2008 | 6.2 | 550 | 12 | 0.22 | -0.66 | 696 | 22.0 |
| MW-1013C | Jun-2008 | 6.4 | 480 | 14.3 | 0.07 | -1.15 | 221 | 7.0 |
| MW-1014 | Jun-2008 | 6.3 | 160 | 11.7 | 0.051 | -1.29 | 161 | 5.1 |
| MW-1014A | Jun-2008 | 6.6 | 530 | 11.2 | 0.088 | -1.06 | 278 | 8.8 |
| MW-1014B | Jun-2008 | 6.4 | 580 | 12.6 | 0.13 | -0.89 | 411 | 13.0 |
| MW-1014C | Jun-2008 | 6.5 | 280 | 14.9 | 0.043 | -1.37 | 136 | 4.3 |
| MW-1005P | Jun-2008 | 7.2 | 250 | 11.8 | 0.01 | -2.00 | 32 | 1.0 |
| MW-1013 | Jun-2007 | 6.1 | 610 | 11.4 | 0.23 | -0.64 | 727 | 20.9 |
| MW-1013A | Jun-2007 | 6.6 | 360 | 13.2 | 0.047 | -1.33 | 149 | 4.3 |
| MW-1013B | Jun-2007 | 6.2 | 620 | 12.4 | 0.18 | -0.74 | 569 | 16.4 |
| MW-1013C | Jun-2007 | 6.4 | 590 | 14.2 | 0.11 | -0.96 | 348 | 10.0 |
| MW-1014 | Jun-2007 | 6.4 | 180 | 13.4 | 0.034 | -1.47 | 108 | 3.1 |
| MW-1014A | Jun-2007 | 6.5 | 490 | 13.1 | 0.065 | -1.19 | 206 | 5.9 |
| MW-1014B | Jun-2007 | 6.3 | 570 | ND | 0.12 | -0.92 | 379 | 10.9 |

**Table 2: Estimates of Carbon Dioxide Gas in Equilibrium with Annual Samples**

| Well | Sample Date | pH | Alkalinity (mg $CaCO_3$/L) | Tempera-ture (°C) | $pCO_2$ (atm) | Log10 $pCO_2$ (atm) | $CO_2$(g) Over-saturation[1] (atm/atm) | $CO_2$(g) Over-saturation[2] (atm/atm) |
|---|---|---|---|---|---|---|---|---|
| MW-1014C | Jun-2007 | 6.6 | 360 | 16.5 | 0.057 | -1.24 | 180 | 5.2 |
| MW-1005P | Jun-2007 | 7 | 260 | 12.1 | 0.011 | -1.96 | 35 | 1.0 |
| MW-1013 | Jul-2006 | 6.05 | 520 | 13 | 0.2 | -0.70 | 632 | 12.5 |
| MW-1013A | Jul-2006 | 6.52 | 320 | 13.2 | 0.057 | -1.24 | 180 | 3.6 |
| MW-1013B | Jul-2006 | 6.17 | 610 | 13.6 | 0.23 | -0.64 | 727 | 14.4 |
| MW-1013C | Jul-2006 | 6.09 | 520 | 14.7 | 0.14 | -0.85 | 443 | 8.8 |
| MW-1014 | Jul-2006 | 6.54 | 170 | 12.1 | 0.04 | -1.40 | 126 | 2.5 |
| MW-1014A | Jul-2006 | 6.62 | 450 | 12.8 | 0.088 | -1.06 | 278 | 5.5 |
| MW-1014B | Jul-2006 | 6.41 | 520 | 13.7 | 0.17 | -0.77 | 538 | 10.6 |
| MW-1014C | Jul-2006 | 6.55 | 350 | 13 | 0.072 | -1.14 | 228 | 4.5 |
| MW-1005P | Jul-2006 | 6.59 | 240 | 14.7 | 0.016 | -1.80 | 51 | 1.0 |
| MW-1013B | Jul-2005 | 6.4 | 640 | 15.8 | 0.31 | -0.51 | 980 | 22.1 |
| MW-1013C | Jul-2005 | 6.6 | 510 | 14.1 | 0.14 | -0.85 | 443 | 10.0 |
| MW-1014A | Jul-2005 | 6.8 | 500 | 14.1 | 0.11 | -0.96 | 348 | 7.9 |
| MW-1014B | Jul-2005 | 6.5 | 570 | 15 | 0.26 | -0.59 | 822 | 18.6 |
| MW-1014C | Jul-2005 | 6.9 | 350 | 15 | 0.092 | -1.04 | 291 | 6.6 |
| MW-1005P | Jul-2005 | 7.4 | 240 | 13.3 | 0.014 | -1.85 | 44 | 1.0 |
| MW-1013B | Jul-2004 | 6.1 | 550 | 13.3 | 0.16 | -0.80 | 506 | 16.0 |
| MW-1013C | Jul-2004 | 6.2 | 520 | 14.9 | 0.14 | -0.85 | 443 | 14.0 |
| MW-1014A | Jul-2004 | 6.7 | 440 | 17.1 | 0.073 | -1.14 | 231 | 7.3 |
| MW-1014B | Jul-2004 | 6.3 | 450 | 14.3 | 0.23 | -0.64 | 727 | 23.0 |
| MW-1014C | Jul-2004 | 6.4 | 300 | 15.5 | 0.094 | -1.03 | 297 | 9.4 |
| MW-1005P | Jul-2004 | 7 | 240 | 11.4 | 0.01 | -2.00 | 32 | 1.0 |
| MW-1013B | Jul-2003 | 6.25 | 620 | 14.9 | 0.16 | -0.80 | 506 | 16.0 |
| MW-1013C | Jul-2003 | 6.32 | 500 | 14.6 | 0.14 | -0.85 | 443 | 14.0 |
| MW-1014A | Jul-2003 | 6.62 | 420 | 13.6 | 0.073 | -1.14 | 231 | 7.3 |
| MW-1014B | Jul-2003 | 6.28 | 530 | 12.6 | 0.23 | -0.64 | 727 | 23.0 |
| MW-1014C | Jul-2003 | 6.43 | 340 | 13 | 0.094 | -1.03 | 297 | 9.4 |
| MW-1005P | Jul-2003 | 7.11 | 240 | 13.4 | 0.01 | -2.00 | 32 | 1.0 |
| MW-1013B | Jul-2002 | 6.37 | 690 | 16.1 | 0.11 | -0.96 | 348 | 11.0 |
| MW-1013C | Jul-2002 | 6.43 | 520 | 16.5 | 0.079 | -1.10 | 250 | 7.9 |
| MW-1014A | Jul-2002 | 6.49 | 460 | 15.1 | 0.056 | -1.25 | 177 | 5.6 |
| MW-1014B | Jul-2002 | 6.25 | 550 | 14.1 | 0.1 | -1.00 | 316 | 10.0 |
| MW-1014C | Jul-2002 | 6.6 | 350 | 17.2 | 0.053 | -1.28 | 168 | 5.3 |
| MW-1005P | Jul-2002 | 7.19 | 250 | 13.6 | 0.01 | -2.00 | 32 | 1.0 |
| MW-1013B | Apr-2001 | 6 | 530 | 14 | 0.14 | -0.85 | 443 | 17.5 |
| MW-1013C | Apr-2001 | 6.3 | 440 | 13.8 | 0.092 | -1.04 | 291 | 11.5 |
| MW-1014A | Apr-2001 | 6.3 | 430 | 12.1 | 0.063 | -1.20 | 199 | 7.9 |
| MW-1014B | Apr-2001 | 6.1 | 520 | 13.5 | 0.17 | -0.77 | 538 | 21.3 |
| MW-1014C | Apr-2001 | 6.2 | 330 | 12.8 | 0.077 | -1.11 | 243 | 9.6 |
| MW-1005P | Apr-2001 | 6.7 | 240 | 12.8 | 0.008 | -2.10 | 25 | 1.0 |
| MW-1013B | Apr-2000 | 6.63 | 520 | 8.7 | 0.14 | -0.85 | 443 | 10.8 |
| MW-1013C | Apr-2000 | 6.73 | 460 | 8.5 | 0.1 | -1.00 | 316 | 7.7 |
| MW-1014A | Apr-2000 | 6.87 | 390 | 11.2 | 0.055 | -1.26 | 174 | 4.2 |
| MW-1014B | Apr-2000 | 6.43 | 480 | 14.2 | 0.21 | -0.68 | 664 | 16.2 |
| MW-1014C | Apr-2000 | 6.65 | 320 | 11.9 | 0.071 | -1.15 | 225 | 5.5 |
| MW-1005P | Apr-2000 | 7.27 | 250 | 6.4 | 0.013 | -1.89 | 41 | 1.0 |

Notes: [1]Oversaturation relative to atmospheric $CO_2$(g) at $10^{-3.5}$ atm
[2]Multiple of CO2(g) for background well MW-1005P

**Table 3: Charge imbalances calculated for the annual samples (June 2013 annual sample) with the PHREEQC geochemical model.**

| Sample | Charge Balance (%)[a] |
|---|---|
| MW-1005P | 6.9 |
| MW-1013 | 10.0 |
| MW-1013A | 3.9 |
| MW-1013B | 1.8 |
| MW-1013C | 1.7 |
| MW-1014 | 6.8 |
| MW-1014A | -0.1 |
| MW-1014B | 6.6 |
| MW-1014C | 4.4 |

Notes:
[a]Charge Balance = 100*(Cations-|Anions|)/(Cations+|Anions|)

**Table 4: Saturation indices for secondary minerals determined with PHREEQC**

| Date | Monitoring Well | T (°C) | pH | pE | Calcite /Aragonite | Gypsum | Ferrihydrite | Siderite | Rhodo-chrosite |
|---|---|---|---|---|---|---|---|---|---|
| Jun-2013 | MW-1013 | 10.2 | 6.11 | 0.8 | -0.63/-0.79 | -2.00 | -3.11 | 0.42 | 0.92 |
| Jun-2013 | MW-1013A | 11.9 | 6.64 | 0.8 | -0.43/-0.58 | -1.14 | -3.64 | -1.43 | 0.35 |
| Jun-2013 | MW-1013B | 11.5 | 6.18 | 1.7 | -0.27/-0.43 | -0.02 | -4.51 | -2.09 | 0.62 |
| Jun-2013 | MW-1013C | 14.1 | 6.39 | 1.6 | -0.04/-0.19 | -0.06 | -1.58 | 0.51 | 0.62 |
| Jun-2013 | MW-1014 | 10.1 | 6.49 | 1.0 | -1.06/-1.21 | -1.51 | -4.69 | -2.65 | -0.19 |
| Jun-2013 | MW-1014A | 10.5 | 6.58 | 1.4 | -0.16/-0.32 | -0.36 | -4.25 | -2.40 | -2.04 |
| Jun-2013 | MW-1014B | 10.7 | 6.30 | 1.6 | -0.26/-0.41 | -0.12 | -4.21 | -2.00 | 0.57 |
| Jun-2013 | MW-1014C | 11.9 | 6.62 | 1.1 | -0.43/-0.58 | -1.08 | -1.73 | 0.22 | 0.03 |
| Jun-2013 | MW-1005P | 10.3 | 7.10 | 1.7 | -1.77/-0.39 | -3.16 | -1.15 | -0.81 | -0.70 |
| Jun-2012 | MW-1013 | 10.8 | 6.10 | 2.5 | -0.63/-0.79 | -1.90 | -2.05 | -0.20 | 0.87 |
| Jun-2012 | MW-1013A | 13.2 | 6.62 | 3.0 | -0.43/-0.58 | -1.22 | -1.86 | -1.79 | 0.42 |
| Jun-2012 | MW-1013B | 12.6 | 6.17 | 6.1 | -0.22/-0.38 | -0.03 | -0.80 | -2.75 | 0.94 |
| Jun-2012 | MW-1013C | 13.7 | 6.38 | 0.7 | -0.04/-0.20 | -0.09 | -2.65 | 0.38 | 0.63 |
| Jun-2012 | MW-1014 | 10.5 | 6.35 | 5.3 | -1.16/-1.32 | -1.50 | -0.84 | -2.75 | -0.48 |
| Jun-2012 | MW-1014A | 11.7 | 6.56 | 5.1 | -0.11/-0.26 | -0.44 | -0.30 | -2.04 | -0.61 |
| Jun-2012 | MW-1014B | 12.0 | 6.33 | 2.6 | -0.22/-0.37 | -0.16 | -3.83 | -2.62 | 0.56 |
| Jun-2012 | MW-1014C | 14.3 | 6.60 | 1.0 | -0.41/-0.56 | -1.11 | -1.86 | 0.22 | 0.09 |
| Jun-2012 | MW-1005P | 13.1 | 6.97 | -0.7 | -0.44/-0.60 | -3.26 | -2.89 | 0.06 | -0.96 |
| Jul-2011 | MW-1013 | 15 | 6.10 | 1.7 | -0.52/-0.67 | -1.85 | -2.94 | -0.24 | 0.97 |
| Jul-2011 | MW-1013A | 14.6 | 6.55 | 1.8 | -0.45/-0.61 | -1.32 | -2.60 | -1.18 | 0.30 |
| Jul-2011 | MW-1013B | 15.6 | 6.14 | 4.3 | -0.18/-0.33 | -0.04 | -1.59 | -1.65 | 0.99 |
| Jul-2011 | MW-1013C | 16.4 | 6.38 | 0.8 | -0.02/-0.17 | -0.06 | -2.48 | 0.43 | 0.63 |
| Jul-2011 | MW-1014 | 11.8 | 6.23 | 2.9 | -1.27/-1.42 | -1.50 | -3.06 | -2.33 | -0.50 |
| Jul-2011 | MW-1014A | 14.3 | 6.50 | 2.8 | -0.14/-0.29 | -0.40 | -2.14 | -1.47 | -1.11 |
| Jul-2011 | MW-1014B | 14.8 | 6.33 | 2.9 | -0.11/-0.27 | -0.17 | -2.50 | -1.60 | 0.65 |
| Jul-2011 | MW-1014C | 14.5 | 6.53 | 1.0 | -0.48/-0.63 | -1.09 | -1.98 | 0.18 | -0.03 |
| Jul-2011 | MW-1005P | 11.6 | 6.97 | -0.2 | -0.47/-0.63 | -3.27 | -2.45 | 0.03 | -0.94 |
| Jun-2010 | MW-1005P | 11.2 | 6.2 | 1.7 | -0.56/-0.71 | -1.78 | -2.84 | -0.32 | 0.97 |
| Jun-2010 | MW-1013A | 13.2 | 6.7 | 1.8 | -0.41/-0.57 | -1.29 | -2.69 | -1.43 | 0.33 |
| Jun-2010 | MW-1013B | 12.6 | 6.2 | 4.3 | -0.08/-0.23 | -0.11 | -1.93 | -2.06 | 1.10 |
| Jun-2010 | MW-1013C | 14.1 | 6.4 | 0.8 | -0.03/-0.18 | -0.08 | -2.7 | 0.33 | 0.64 |
| Jun-2010 | MW-1014 | 12.5 | 6.4 | 2.9 | -1.01/-1.17 | -1.45 | -2.39 | -2.03 | -1.30 |
| Jun-2010 | MW-1014A | 12.1 | 6.6 | 2.8 | -0.07/-0.22 | -0.37 | -2.27 | -1.75 | -1.04 |
| Jun-2010 | MW-1014B | 13.1 | 6.4 | 2.9 | -0.06/-0.21 | -0.24 | -2.78 | -1.94 | 0.73 |
| Jun-2010 | MW-1014C | 13.5 | 6.5 | 1.0 | -0.50/-0.65 | -1.14 | -2.06 | 0.15 | -0.02 |
| Jun-2010 | MW-1005P | 12.7 | 7.0 | -0.2 | -0.50/-0.66 | -3.32 | -3.11 | -0.72 | -1.06 |
| Jun-2009 | MW-1013 | 11.3 | 6.1 | 1.5 | -0.67/-0.83 | -1.73 | -2.93 | 0.21 | 0.85 |
| Jun-2009 | MW-1013A | 12.8 | 6.6 | 1.6 | -0.48/-0.63 | -1.19 | -3.3 | 0.15 | 0.25 |
| Jun-2009 | MW-1013B | 10.7 | 6.2 | 3.8 | -0.21/-0.37 | -0.04 | -2.85 | -0.04 | 0.73 |
| Jun-2009 | MW-1013C | 12.6 | 6.4 | 0.6 | -0.09/-0.25 | -0.05 | -2.77 | -1.78 | 0.6 |
| Jun-2009 | MW-1014 | 11.6 | 6.3 | 3.0 | -1.22-/1.38 | -1.37 | -3.04 | -2.32 | -1.13 |
| Jun-2009 | MW-1014A | 11 | 6.3 | 2.9 | -0.41/-0.56 | -0.4 | -2.74 | 0.31 | -1.15 |
| Jun-2009 | MW-1014B | 11.2 | 6.3 | 3.6 | -0.21/-0.36 | -0.14 | -2.72 | -2.4 | 0.63 |
| Jun-2009 | MW-1014C | 11.2 | 6.6 | 0.9 | -0.45/-0.61 | -1.01 | -2 | -1.66 | 0.01 |
| Jun-2009 | MW-1005P | 12.9 | 7.1 | -0.1 | -0.37/-0.52 | -3.3 | -1.99 | -2.26 | -0.85 |
| Jun-2008 | MW-1013 | 11.9 | 6.2 | 1.5 | -0.50/-0.65 | -1.64 | -2.4 | 0.45 | 1.04 |
| Jun-2008 | MW-1013A | 12.6 | 6.6 | 1.6 | -0.14/-0.30 | -1 | -1.8 | 0.35 | 0.61 |
| Jun-2008 | MW-1013B | 12 | 6.2 | 3.7 | -0.08/-0.23 | -0.02 | -1.38 | -0.04 | 0.89 |
| Jun-2008 | MW-1013C | 14.3 | 6.4 | 0.6 | 0.32/0.17 | -0.03 | -1.52 | -0.69 | 0.99 |

**Table 4: Saturation indices for secondary minerals determined with PHREEQC**

| Date | Monitoring Well | T (°C) | pH | pE | Calcite /Aragonite | Gypsum | Ferrihydrite | Siderite | Rhodo-chrosite |
|---|---|---|---|---|---|---|---|---|---|
| Jun-2008 | MW-1014 | 11.7 | 6.3 | 2.8 | -1.06/-1.21 | -1.41 | -3.43 | -1.2 | -0.59 |
| Jun-2008 | MW-1014A | 11.2 | 6.6 | 2.8 | 0.09/-0.07 | -0.39 | -1.04 | 0.71 | 0.40 |
| Jun-2008 | MW-1014B | 12.6 | 6.4 | 3.4 | 0.05/-0.10 | -0.14 | -1.2 | -3.1 | 0.89 |
| Jun-2008 | MW-1014C | 14.9 | 6.5 | 0.9 | -0.23/-0.38 | -1.07 | -1.38 | -0.78 | 0.25 |
| Jun-2008 | MW-1005P | 11.8 | 7.2 | -0.1 | -0.10/-0.26 | -3.27 | -1.38 | -1.03 | -0.59 |
| Jun-2007 | MW-1013 | 11.4 | 6.1 | 1.5 | -0.65/-0.81 | -1.64 | -2.71 | 0.2 | 0.88 |
| Jun-2007 | MW-1013A | 13.2 | 6.6 | 1.8 | -0.50/-0.65 | -1.28 | -2.47 | -1.06 | -0.05 |
| Jun-2007 | MW-1013B | 12.4 | 6.2 | 3.8 | -0.20/-0.35 | -0.02 | -1.82 | -1.49 | 0.76 |
| Jun-2007 | MW-1013C | 14.2 | 6.4 | 1.3 | -0.05/-0.21 | -0.02 | -2.13 | 0.36 | 0.61 |
| Jun-2007 | MW-1014 | 13.4 | 6.4 | 3.3 | -1.07/-1.23 | -1.32 | -1.43 | -1.47 | -1.05 |
| Jun-2007 | MW-1014A | 13.1 | 6.5 | 3.2 | -0.19/-0.35 | -0.35 | -1.45 | -1.2 | -0.47 |
| Jun-2007 | MW-1014B | NA | 6.3 | 3.5 | -0.18/-0.34 | -0.11 | -1.83 | -1.4 | 0.67 |
| Jun-2007 | MW-1014C | 16.5 | 6.6 | 0.9 | -0.35/-0.51 | -0.96 | -1.97 | 0.31 | 0.11 |
| Jun-2007 | MW-1005P | 12.1 | 7 | 0.1 | -0.45/-0.60 | -4.25 | 2.49 | -0.68 | -0.93 |
| Jul-2006 | MW-1013 | 13 | 6.4 | 2.9 | -0.36/-0.51 | -1.69 | -0.74 | 0.07 | 1.13 |
| Jul-2006 | MW-1013A | 13.2 | 6.7 | 2.7 | -0.39/-0.54 | -1.17 | -1.03 | -0.8 | 0.18 |
| Jul-2006 | MW-1013B | 13.6 | 6.4 | 4.2 | 0.00/-0.15 | -0.04 | -0.72 | -1.12 | 1.20 |
| Jul-2006 | MW-1013C | 14.7 | 6.7 | 0.9 | 0.25/0.10 | -0.05 | -1.69 | 0.05 | 0.92 |
| Jul-2006 | MW-1014 | 12.1 | 6.6 | 2.9 | -0.89/-1.04 | -1.32 | -1.02 | -1.11 | -0.37 |
| Jul-2006 | MW-1014A | 12.8 | 6.7 | 3.2 | -0.05/-0.2 | -0.38 | -0.8 | -0.88 | 0.03 |
| Jul-2006 | MW-1014B | 13.7 | 6.4 | 3.8 | -0.1/-0.25 | -0.16 | -0.97 | -1.09 | 0.75 |
| Jul-2006 | MW-1014C | 13 | 6.6 | 1.1 | -0.31/-0.46 | -1.01 | -1.63 | 0.39 | 0.18 |
| Jul-2006 | MW-1005P | 14.7 | 7.1 | 0.0 | -0.35/-0.5 | -3.3 | -2.1 | -0.12 | -0.70 |
| Jul-2005 | MW-1013B | 15.8 | 6.4 | 4.0 | 0.04/-0.11 | 0.01 | -0.76 | -1.11 | 1.24 |
| Jul-2005 | MW-1013C | 14.1 | 6.6 | 0.3 | 0.08/-0.07 | -0.01 | -2.47 | 0.4 | 0.79 |
| Jul-2005 | MW-1014A | 14.1 | 6.8 | 4.7 | 0.11/-0.05 | -0.35 | 1.18 | -0.76 | 0.16 |
| Jul-2005 | MW-1014B | 15 | 6.5 | 5.2 | 0.05/-0.10 | -0.06 | 0.77 | -1.05 | 0.95 |
| Jul-2005 | MW-1014C | 15 | 6.9 | 1 | -0.04/-0.19 | -0.9 | -0.76 | 0.69 | 0.46 |
| Jul-2005 | MW-1005P | 13.3 | 7.4 | -0.02 | -0.08/-0.23 | -3.23 | -1.8 | -0.47 | -0.53 |
| Jul-2004 | MW-1013B | 13.3 | 6.3 | 3.2 | -0.06/-0.21 | -0.03 | -1.77 | -1.18 | 0.96 |
| Jul-2004 | MW-1013C | 14.9 | 6.5 | 0.8 | 0.09/-0.06 | -0.11 | -2.35 | 0.35 | 0.76 |
| Jul-2004 | MW-1014A | 17.1 | 6.7 | 2.9 | 0.04/-0.11 | 0.39 | -0.8 | -0.69 | 0.27 |
| Jul-2004 | MW-1014B | 14.3 | 6.4 | 3.2 | -0.11/-0.26 | -0.15 | -1.52 | -1.15 | 0.79 |
| Jul-2004 | MW-1014C | 15.5 | 6.6 | 0.5 | -0.32/-0.47 | -0.92 | -2.13 | 0.42 | 0.20 |
| Jul-2004 | MW-1005P | 11.4 | 7.2 | -0.1 | -0.25/-0.4 | -3.25 | -2.11 | -0.21 | -0.63 |
| Jul-2003 | MW-1013B | 14.9 | 6.8 | 3.5 | 0.49/0.34 | -0.02 | 0.18 | -0.4 | 1.67 |
| Jul-2003 | MW-1013C | 14.6 | 6.5 | 0.5 | 0.06/-0.09 | -0.03 | -2.9 | 0.07 | 0.71 |
| Jul-2003 | MW-1014A | 12 | 6.6 | 3.5 | -0.1/-0.26 | -0.34 | -0.46 | -0.75 | 0.53 |
| Jul-2003 | MW-1014B | 12.6 | 6.2 | 4.2 | -0.3/-0.45 | -0.11 | -1.23 | -1.4 | 0.63 |
| Jul-2003 | MW-1014C | 13 | 6.6 | 0.7 | -0.26/-0.41 | -0.83 | -1.94 | 0.48 | 0.25 |
| Jul-2003 | MW-1005P | 13.4 | 7 | -0.1 | -0.41/-0.56 | -3.25 | -2.24 | 0.02 | -0.88 |
| Jul-2002 | MW-1013B | 16.1 | 6.4 | 3.5 | 0.14/-0.01 | -0.08 | -1 | -0.7 | 1.32 |
| Jul-2002 | MW-1013C | 16.5 | 6.4 | 0.9 | 0.05/-0.10 | -0.08 | -2.68 | 0.04 | 0.71 |
| Jul-2002 | MW-1014A | 15.1 | 6.5 | 3.1 | -0.07/-0.22 | -0.37 | -1.2 | -0.86 | 0.60 |
| Jul-2002 | MW-1014B | 14.1 | 6.3 | 4.3 | -0.16/-0.31 | -0.1 | -1.27 | -1.59 | 0.80 |
| Jul-2002 | MW-1014C | 17.2 | 6.6 | 0.8 | -0.17/-0.32 | -0.84 | -1.71 | 0.61 | 0.34 |
| Jul-2002 | MW-1005P | 13.6 | 7.2 | 0.5 | -0.23/-0.38 | -2.97 | -2.12 | -0.74 | -0.71 |
| Oct-2001 | MW-1013B | 14.4 | 6.1 | 3.4 | -0.3/-0.45 | -0.04 | -1.99 | -1.1 | 0.90 |
| Oct-2001 | MW-1013C | 12.6 | 6.2 | 0.4 | -0.33/-0.48 | -0.05 | -4.11 | -0.47 | 0.32 |
| Oct-2001 | MW-1014A | 14.3 | 6.3 | 2.6 | -0.38/-0.53 | -0.36 | -1.76 | -0.56 | 0.33 |
| Oct-2001 | MW-1014B | 13.4 | 6.1 | 3.7 | -0.4/-0.55 | -0.08 | -2.35 | -1.178 | 0.59 |
| Oct-2001 | MW-1014C | 12.2 | 6.2 | 0.9 | -0.68/-0.83 | -0.75 | -2.91 | 0.13 | -0.10 |
| Jul-2001 | MW-1005P[5] | 9.9 | 6.6 | 0.1 | -0.86/-1.01 | -2.98 | -3.52 | -0.59 | -1.28 |
| Apr-2000 | MW-1013B[1] | 8.7 | 6.6 | 4.1 | 0.24/0.08 | -0.03 | -0.23 | -1.01 | 1.36 |
| Apr-2000 | MW-1013C[2] | 8.5 | 6.7 | 3.1 | 0.15/0.00 | -0.01 | -0.08 | -0.25 | 0.73 |
| Apr-2000 | MW-1014A | 11.2 | 6.9 | 2.9 | 0.13/-0.02 | -0.36 | -0.23 | -0.49 | 0.91 |

**Table 4: Saturation indices for secondary minerals determined with PHREEQC**

| Date | Monitoring Well | T (°C) | pH | pE | Calcite /Aragonite | Gypsum | Ferrihydrite | Siderite | Rhodo-chrosite |
|---|---|---|---|---|---|---|---|---|---|
| Apr-2000 | MW-1014B[3] | 14.2 | 6.4 | 5.1 | -0.02/-0.17 | -0.07 | -0.34 | -1.16 | 0.99 |
| Apr-2000 | MW-1014C | 11.9 | 6.7 | 1.6 | -0.02/0.17 | -0.64 | -0.82 | 0.76 | 0.49 |
| Apr-2000 | MW-1005P[4] | 15.9 | 6.9 | 1.1 | -0.37/-0.52 | -2.83 | -2.66 | -1.24 | -1.00 |

Notes:

1. April 2000 data with sulfate adjusted upwards to 1500 mg/L to improve ion balance.
2. April 2000 data with calcium adjusted upwards to 290 mg/L to improve ion balance.
3. In the April 2000 data, the iron detection limit was anomalously high (0.15 mg/L). In the PHREEQ runs, the iron concentration was set to 0.06 mg/L, as measured in other samples from this well.
4. Combination of analytical data from the July 1999 sample with Eh and alkalinity data from the April 2000 sample.
5. July 2001 data

Mineral formulas: Calcite – $CaCO_3$; Aragonite – $CaCO_3$; Gypsum – $CaSO_4 \bullet 2H_2O$; Ferrihydrite – $Fe(OH)_3(am)$; Siderite – $FeCO_3$; Rhodochrosite – $MnCO_3$

**Table 5: Summary of Annual Average[1] Dissolved Manganese and Iron Concentrations in the Backfilled Pit Area**

**Manganese (µg/L)**

| Year | MW-1005P | MW-1013 | MW-1013A | MW-1013B | MW-1013C | MW-1014 | MW-1014A | MW-1014B | MW-1014C |
|---|---|---|---|---|---|---|---|---|---|
| **1999** | 47 | - | - | 28,000 | 7,450 | - | - | 23,000 | 4,200 |
| **2000** | 60 | - | - | 32,750 | 7,925 | - | 7,000 | 21,000 | 3,375 |
| **2001** | 46 | - | - | 36,000 | 8,600 | - | 6,150 | 18,750 | 2,975 |
| **2002** | 44 | - | - | 36,250 | 9,233 | - | 5,900 | 17,750 | 2,625 |
| **2003** | 77 | - | - | 36,125 | 9,625 | - | 4,275 | 17,750 | 2,425 |
| **2004** | 61 | - | - | 32,500 | 9,738 | - | 2,670 | 15,967 | 2,244 |
| **2005** | 60 | - | - | 28,917 | 10,375 | - | 1,725 | 16,000 | 2,175 |
| **2006** | 60 | 21,200 | 2,725 | 26,500 | 10,375 | 1,030 | 1,455 | 13,750 | 1,975 |
| **2007** | 62 | 23,750 | 1,800 | 26,500 | 10,750 | 700 | 808 | 14,000 | 1,950 |
| **2008** | 67 | 23,250 | 2,775 | 28,000 | 10,250 | 550 | 760 | 13,800 | 1,825 |
| **2009** | 67 | 23,000 | 1,790 | 22,000 | 9,725 | 295 | 325 | 12,500 | 1,683 |
| **2010** | 63 | 23,500 | 2,875 | 30,750 | 10,025 | 238 | 148 | 12,500 | 1,650 |
| **2011** | 64 | 24,250 | 3,125 | 33,500 | 9,825 | 1,965 | 195 | 11,333 | 1,600 |
| **2012** | 62 | 22,250 | 2,975 | 32,400 | 9,475 | 1,025 | 156 | 10,500 | 1,625 |
| **2013** | 80 | 26,500 | 3,000 | 31,000 | 9,675 | 1,110 | 128 | 11,833 | 1,600 |

**Iron (µg/L)**

| Year | MW-1005P | MW-1013 | MW-1013A | MW-1013B | MW-1013C | MW-1014 | MW-1014A | MW-1014B | MW-1014C |
|---|---|---|---|---|---|---|---|---|---|
| **1999** | 0.28 | - | - | 0.33 | 1.1 | - | - | 0.04 | 14.3 |
| **2000** | 0.17 | - | - | 0.47 | 1.7 | - | 0.9 | 0.23 | 12.5 |
| **2001** | 0.1 | - | - | 0.67 | 2.7 | - | 0.93 | 0.2 | 10.9 |
| **2002** | 0.13 | - | - | 0.48 | 4.2 | - | 0.53 | 0.15 | 9.2 |
| **2003** | 0.84 | - | - | 0.6 | 5.1 | - | 0.62 | 0.26 | 8.1 |
| **2004** | 0.35 | - | - | < 0.64 | 6.6 | - | 0.42 | < 0.028 | 7.1 |
| **2005** | 0.29 | - | - | < 0.33 | 8.1 | - | < 0.33 | < 0.33 | 6.8 |
| **2006** | 0.33 | 6.32 | < 0.33 | < 0.33 | 8.2 | < 0.33 | <0.33 | < 0.33 | 6.1 |
| **2007** | 0.3 | 9.98 | < 0.33 | < 0.33 | 9.9 | <0.33 | <0.33 | < 0.33 | 5.9 |
| **2008** | 0.95 | 8.93 | < 0.33 | < 0.33 | 9.5 | <0.005 | < 0.33 | < 0.33 | 5.5 |
| **2009** | 0.8 | 8.15 | 0.04 | 0.031 | 10.5 | <0.33 | 0.1 | 0.01 | 4.8 |
| **2010** | 0.95 | 4.55 | 0.09 | 0.16 | 10.25 | 0.16 | 0.15 | 0.15 | 4.88 |
| **2011** | 1.25 | 2.78 | 0.14 | 0.07 | 11 | 0.28 | 0.04 | 0.04 | 4.85 |
| **2012** | 1.33 | 6.3 | 0.075 | 0.03 | 12.3 | <0.014 | <0.028 | <0.014 | 4.8 |
| **2013** | 0.72 | 13.5 | 0.12 | 0.06 | 13.3 | <0.018 | <0.014 | <0.018 | 4.8 |

Notes:

[1]Annual averages are calculated from four quarterly samples

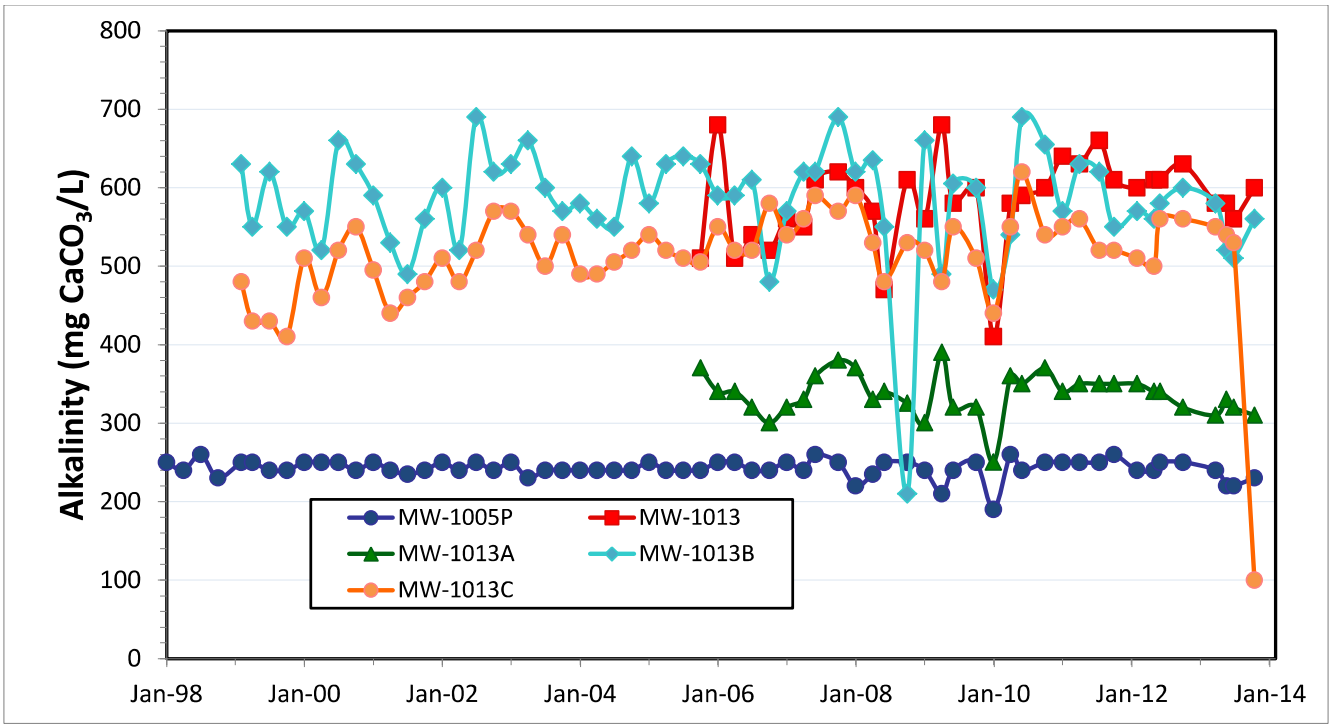


**Figure 1. Alkalinities for the MW-1013 well cluster in the backfilled pit area (MW-1013, MW-1013A, MW-1013B, and MW-1013C) compared to MW-1005P (background)**

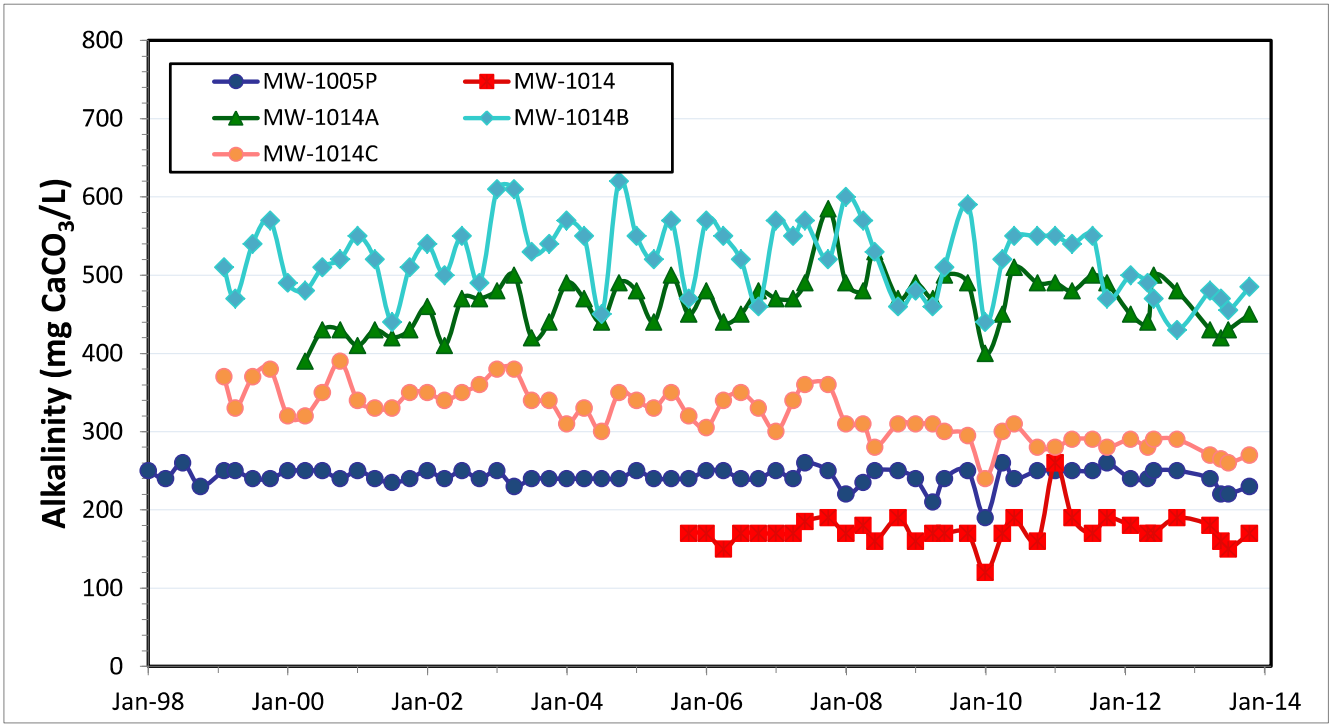


**Figure 2. Alkalinities for the MW-1014 well cluster in the backfilled pit are (MW-1014, MW-1014A, MW-1014B, and MW1014C) compared to MW-1005P (background)**

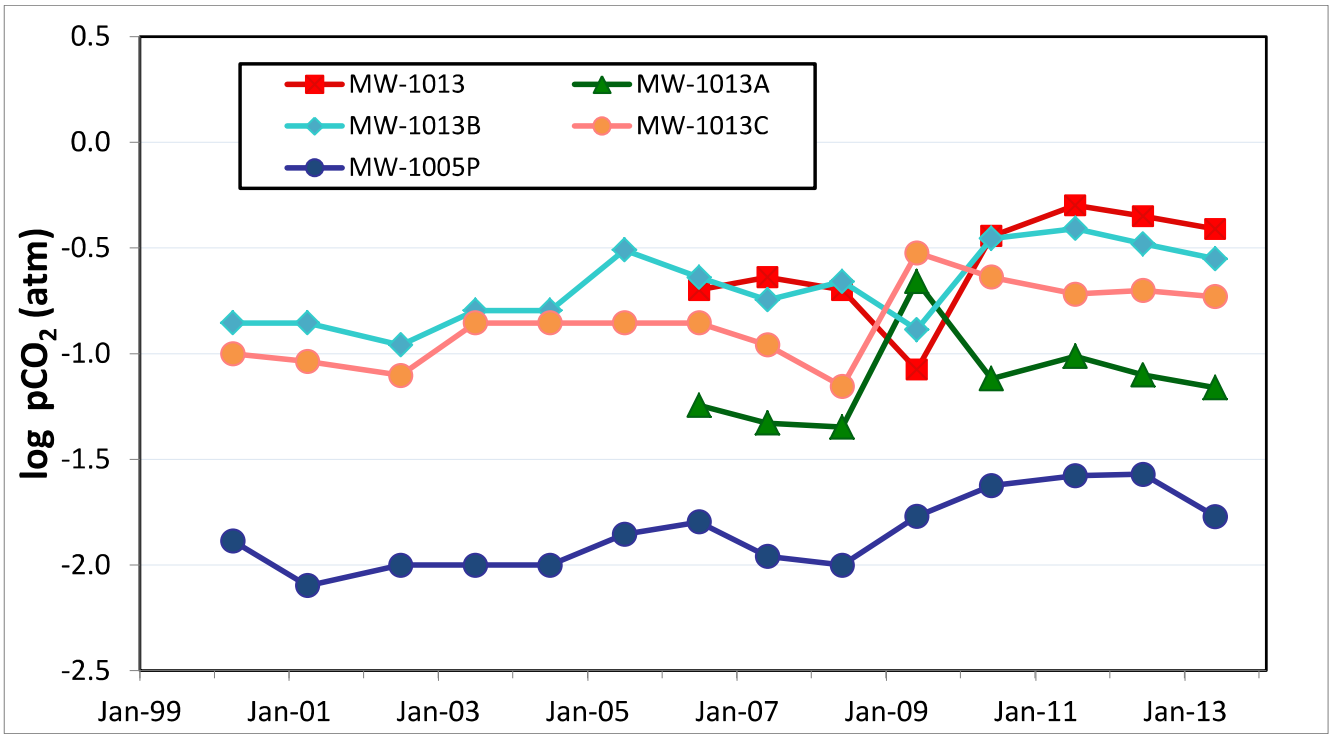


**Figure 3. $CO_2$(g) partial pressures for the MW-1013 well cluster in the backfilled pit (MW-1013, MW-1013A, MW-1013B, and MW-1013C) compared to MW-1005P (background)**

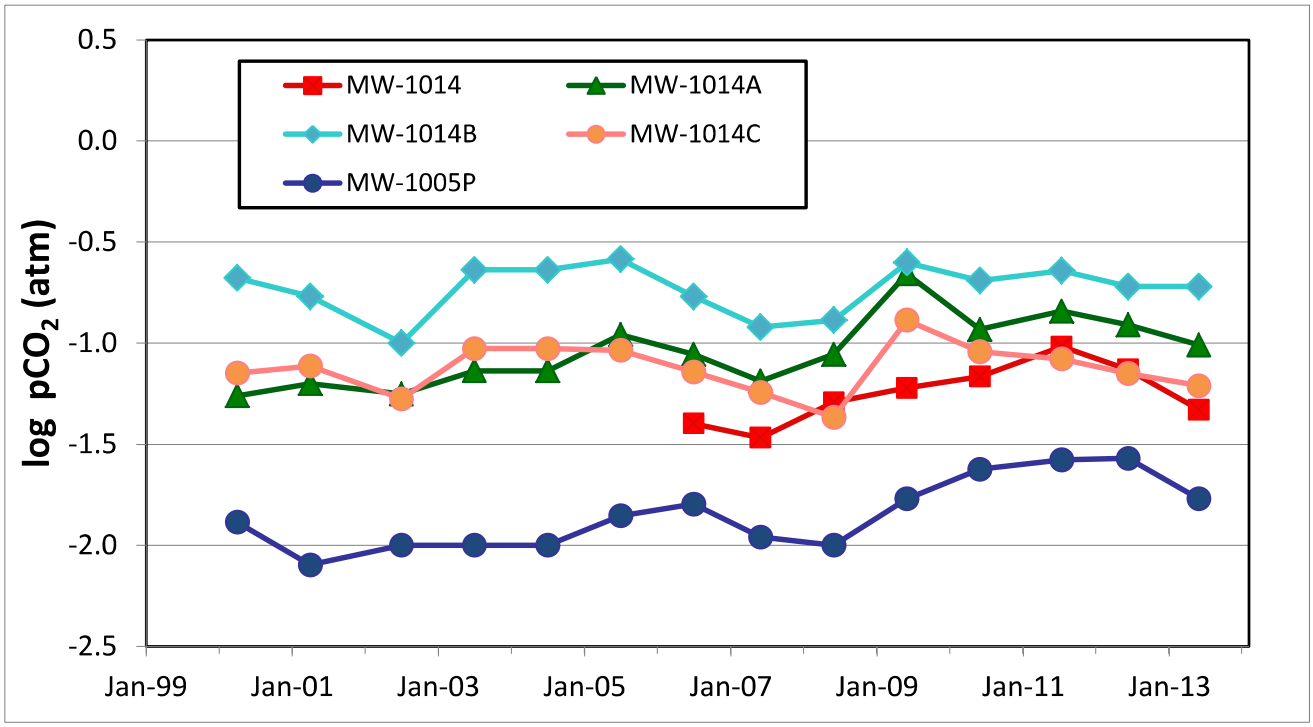


**Figure 4. $CO_2$(g) partial pressures for the MW-1014 well cluster in the backfilled pit (MW-1014, MW-1014A, MW-1014B, and MW-1014C) compared to MW-1005P (background)**

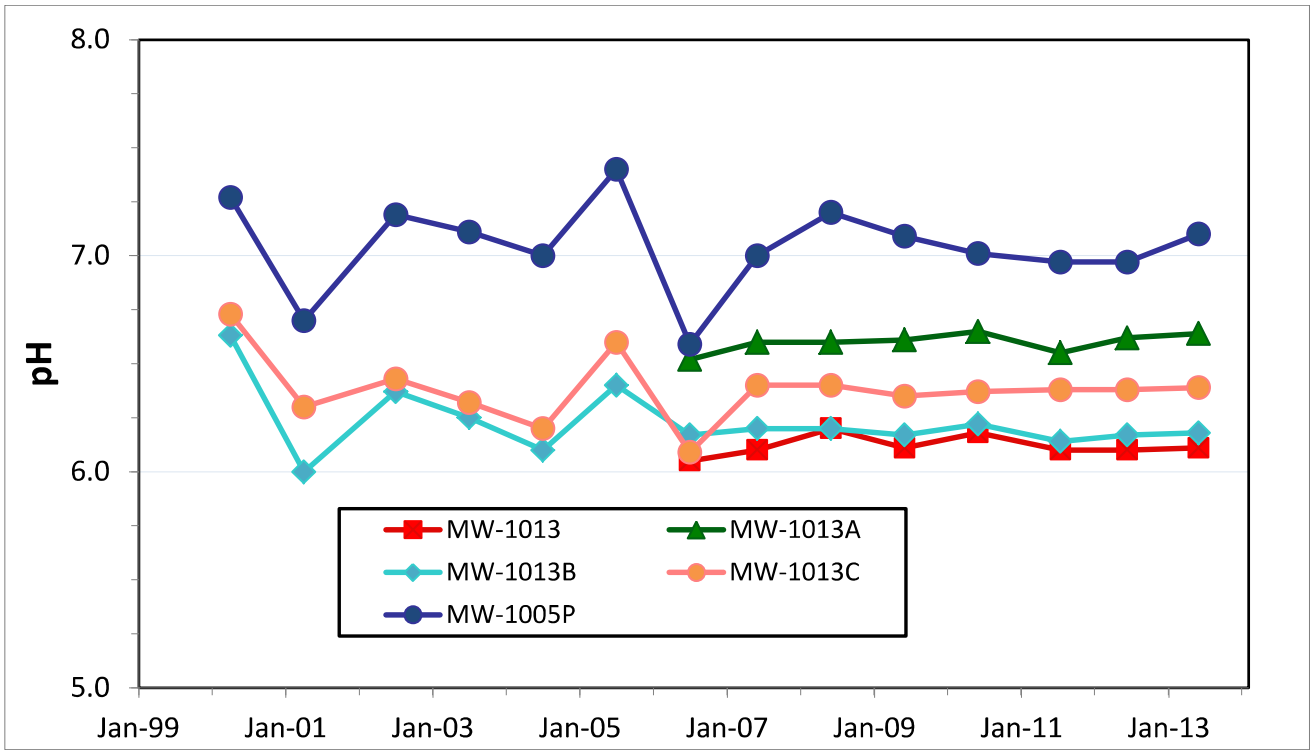


**Figure 5. pH of porewater sampled from the MW-1013 well cluster in the backfilled pit area (MW-1013, MW-1013A, MW-1013B, and MW-1013C) compared to MW-1005P (background)**

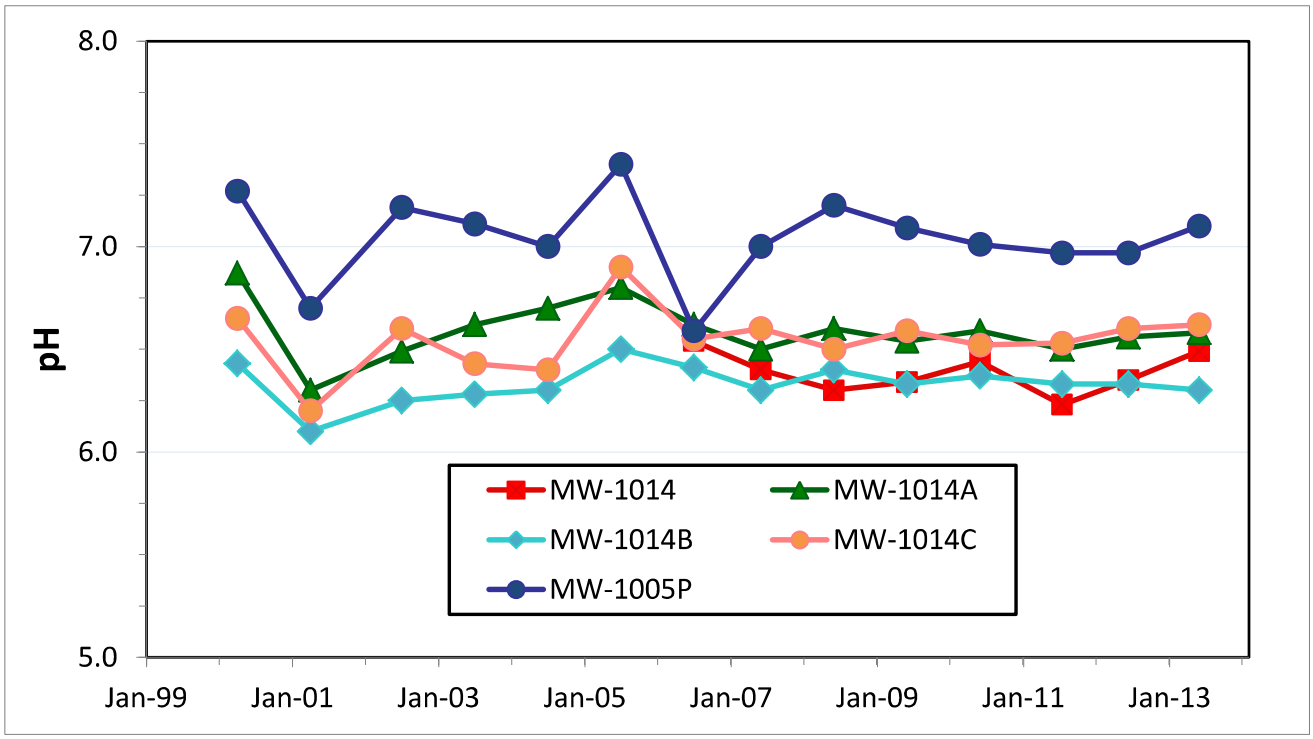


**Figure 6. pH of porewater sampled from the MW-1014 well cluster in the backfilled pit area (MW-1014, MW-1014A, MW-1014B, and MW-1014C) compared to MW-1005P (background)**

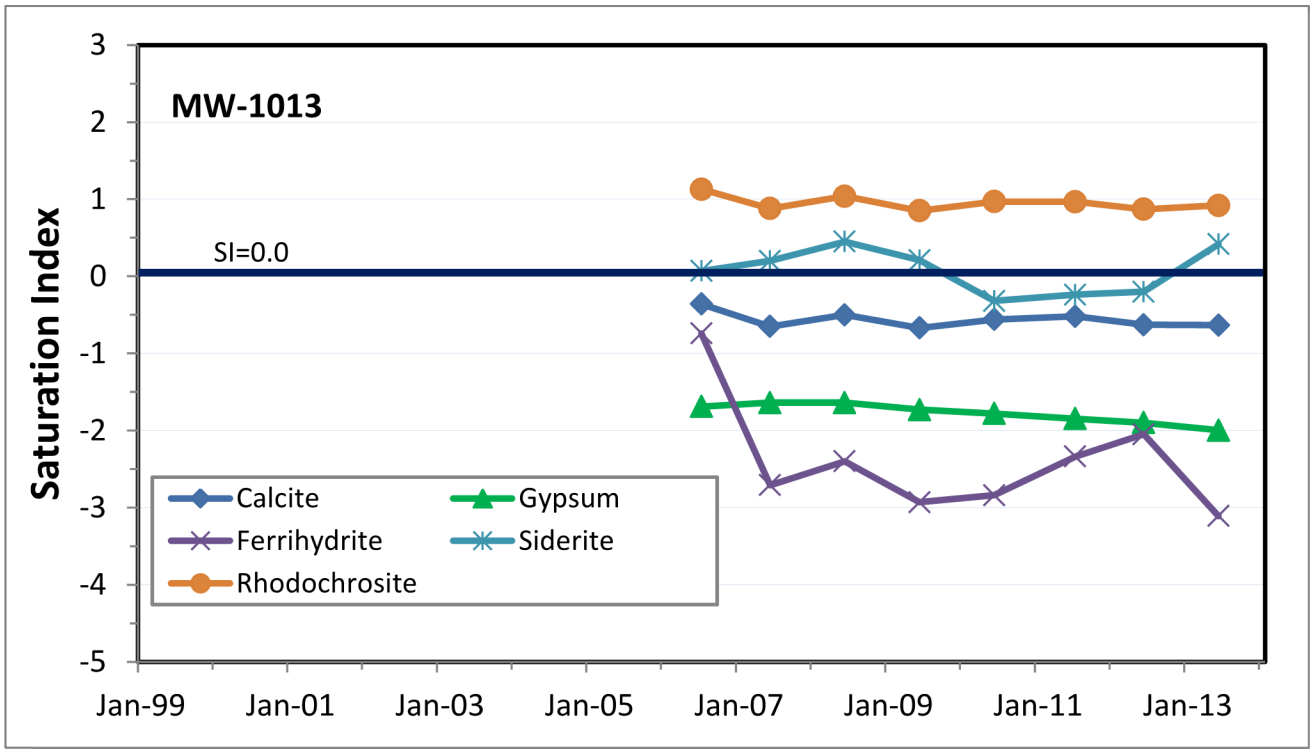


**Figure 7. Saturation indices for well MW-1013 located in the backfilled pit area**

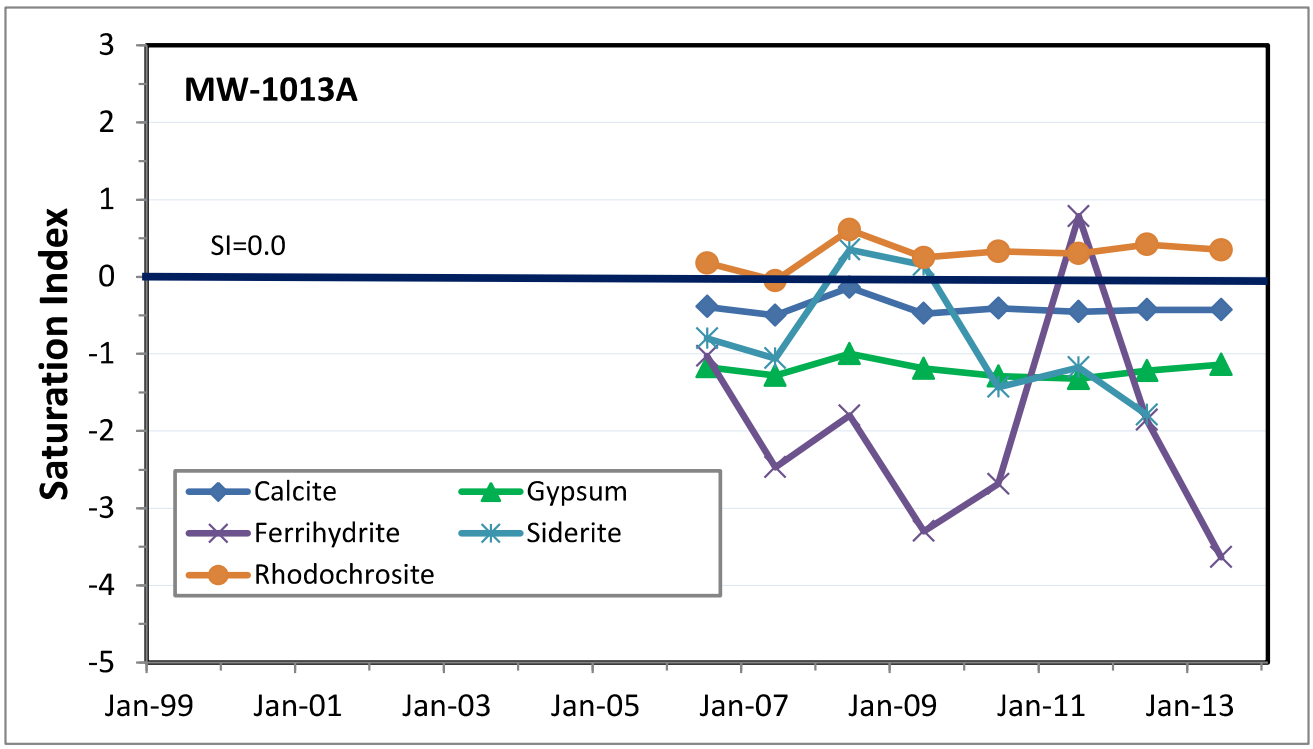


**Figure 8. Saturation indices for well MW-1013A located in the backfilled pit area**

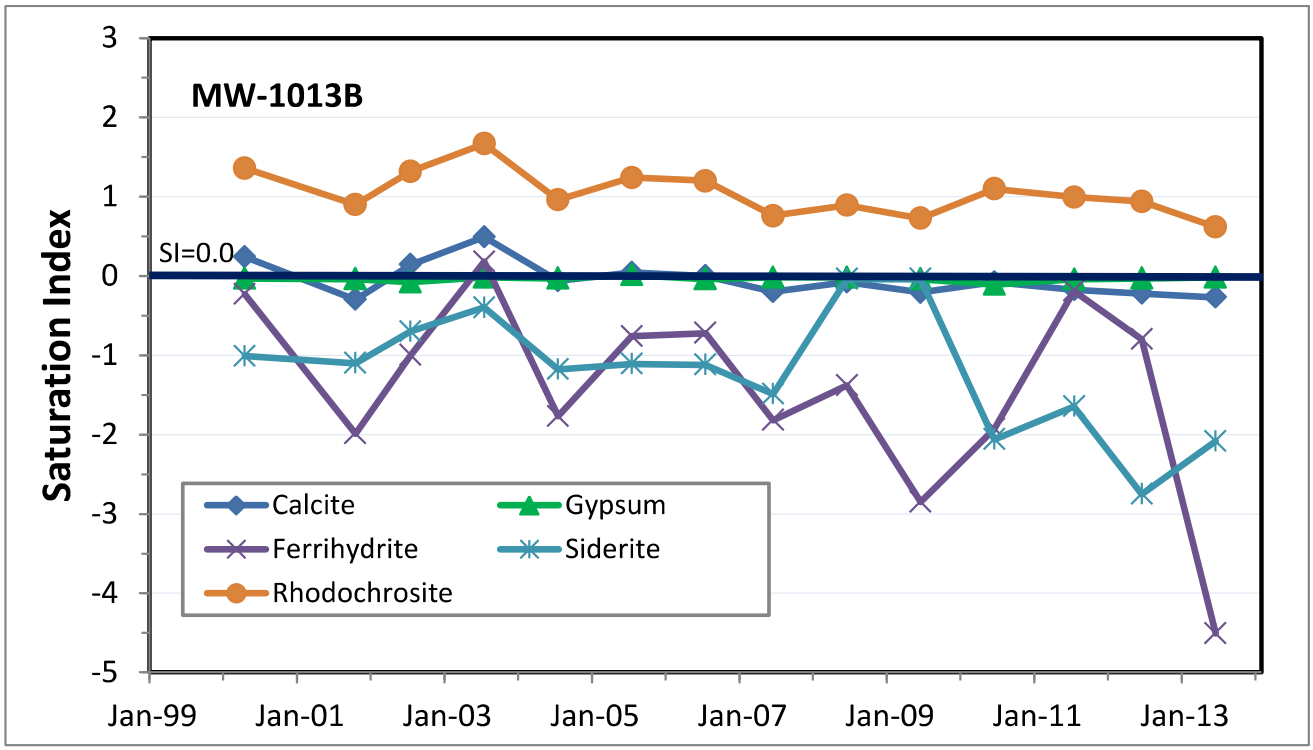


**Figure 9. Saturation indices for well MW-1013B located in the backfilled pit area**

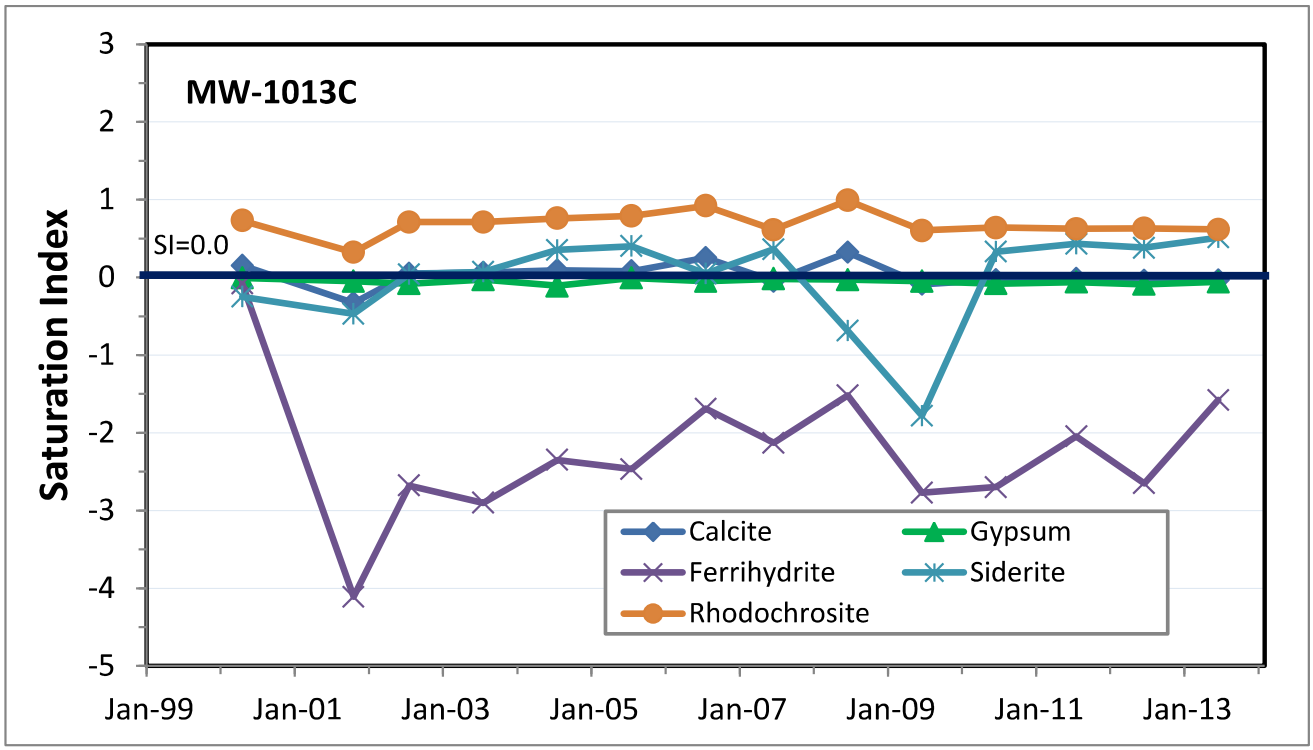


**Figure 10. Saturation indices for well MW-1013C located in the backfilled pit area**

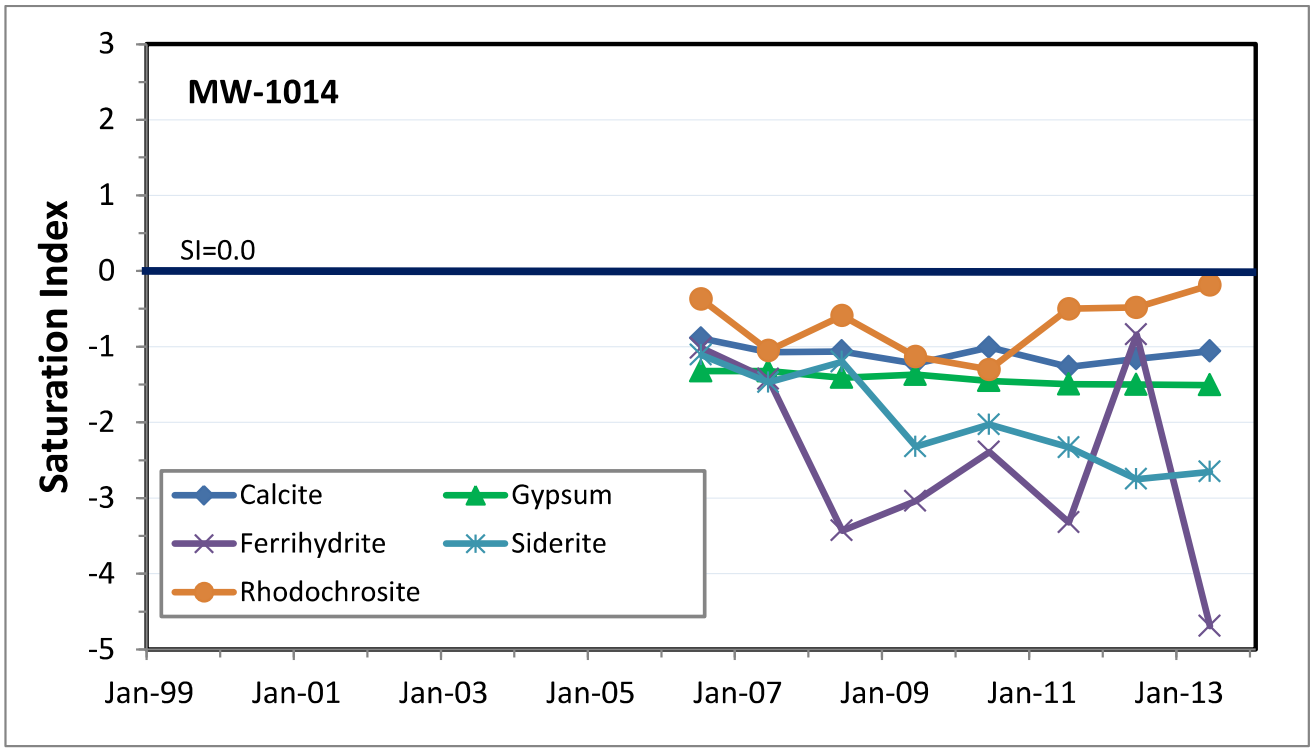


**Figure 11. Saturation indices for well MW-1014 located in the backfilled pit area**

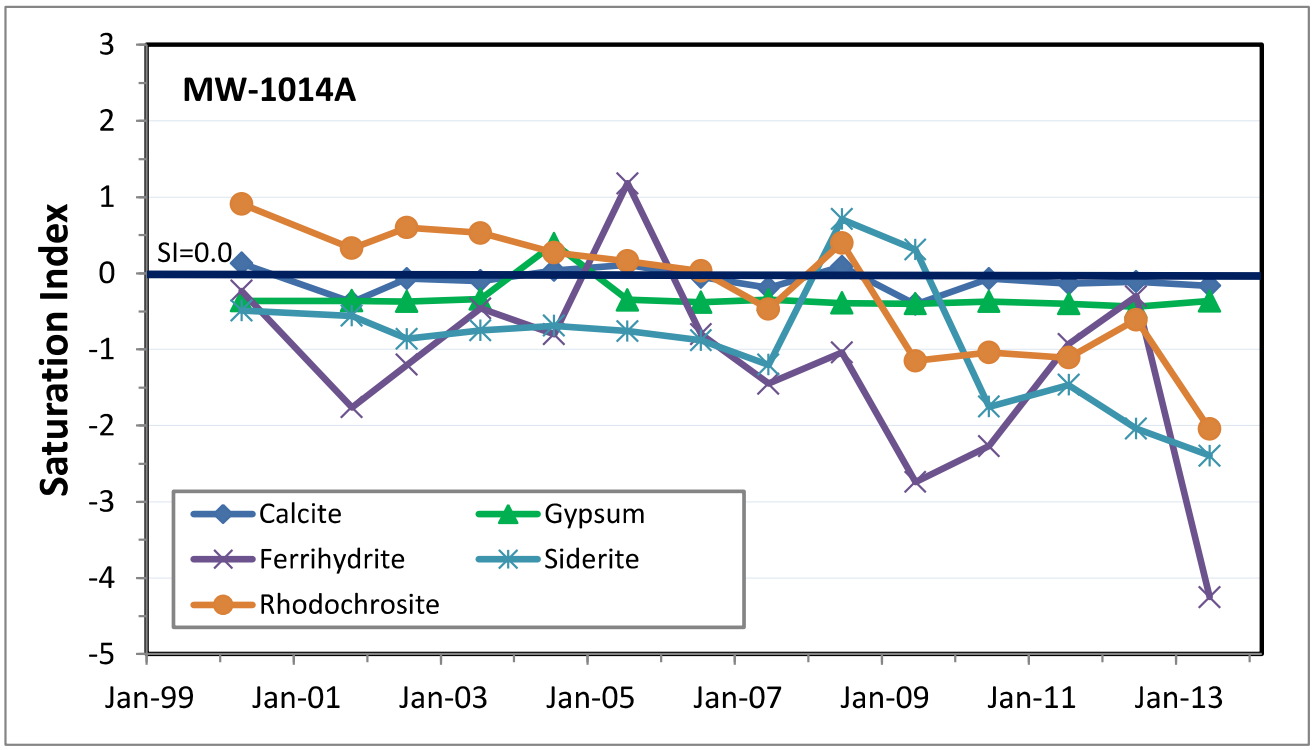


**Figure 12. Saturation indices for well MW-1014A located in the backfilled pit area**

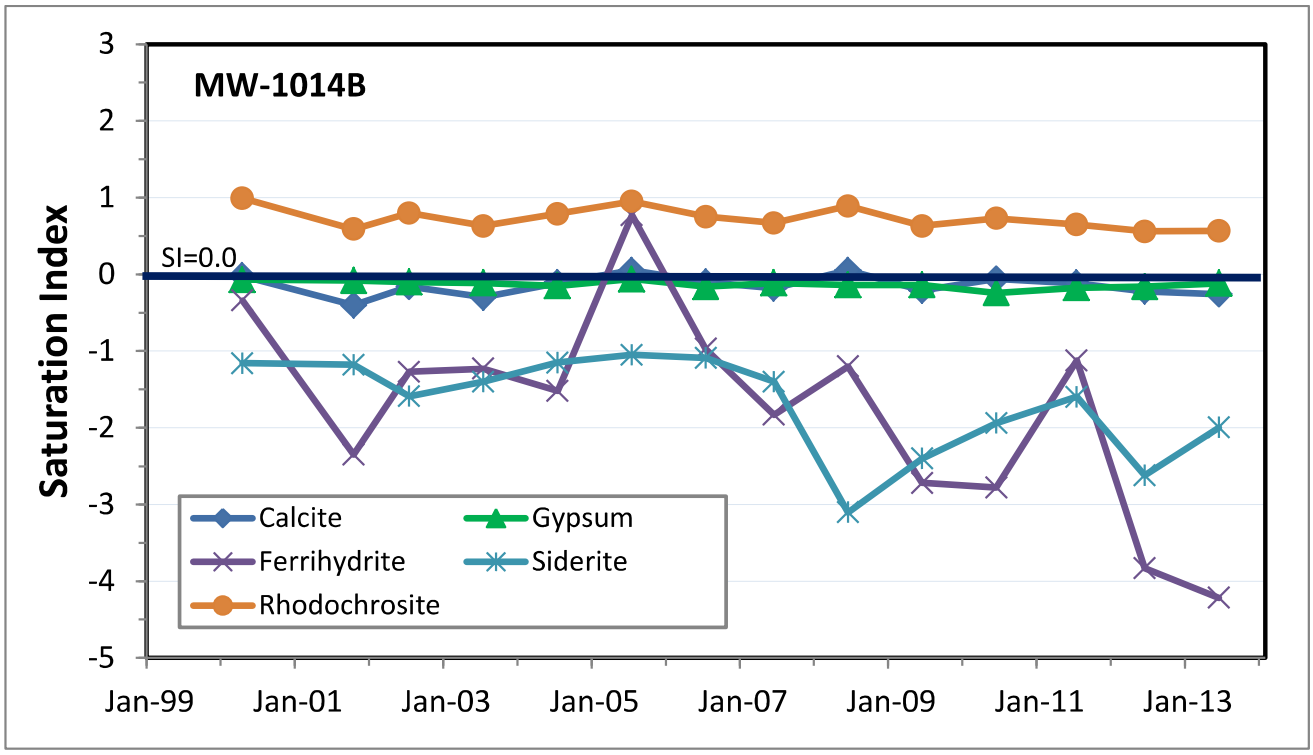


**Figure 13. Saturation indices for well MW-1014B located in the backfilled pit area**

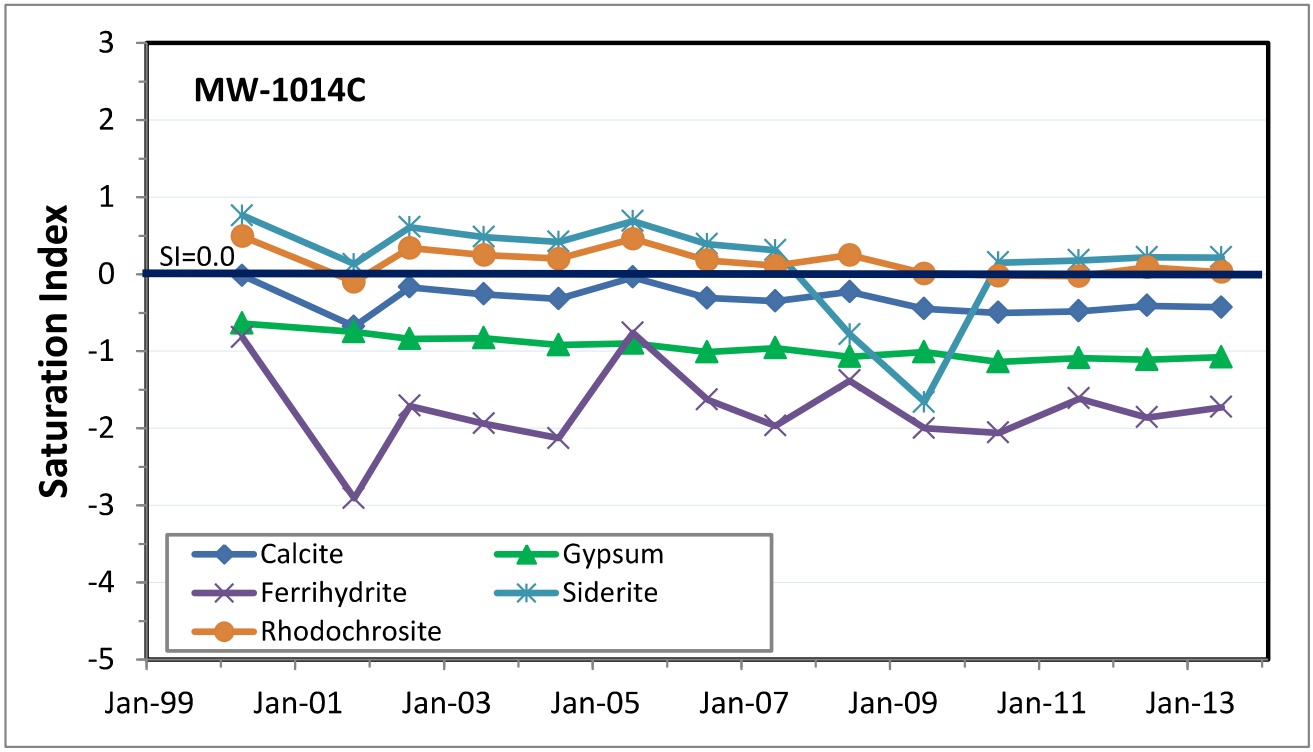


**Figure 14. Saturation indices for well MW-1014C located in the backfilled pit area**

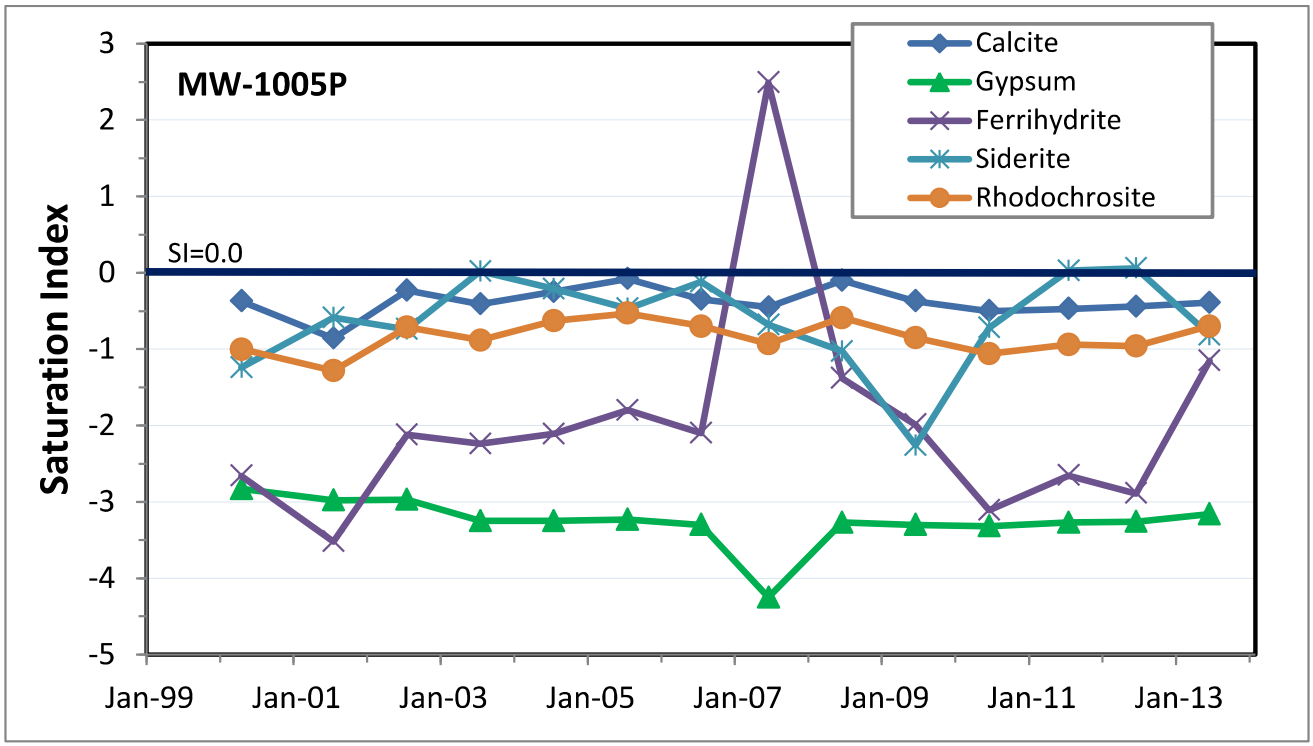


**Figure 15. Saturation indices for well MW-1005P located in the upgradient background location**

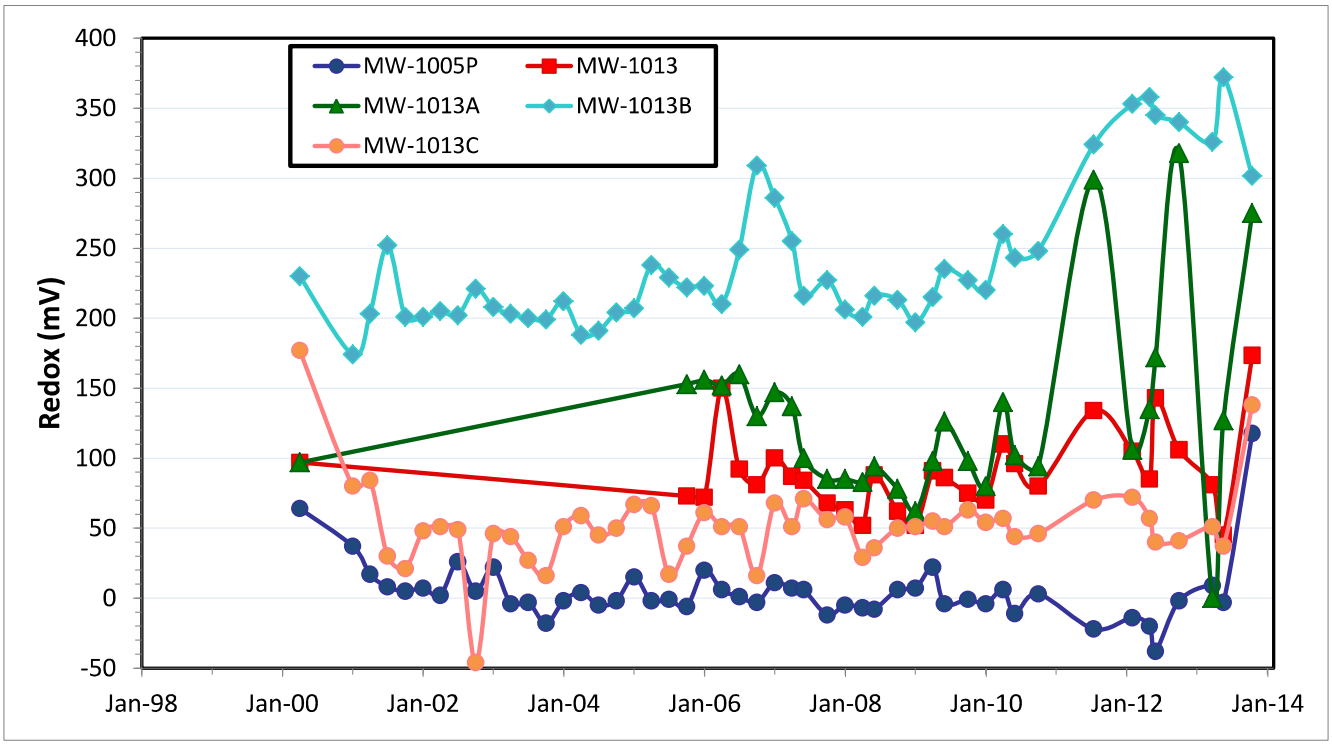


**Figure 16. Field measured redox potential for the MW-1013 well cluster in the backfilled pit area (MW-1013, MW-1013A, MW-1013B, and MW-1013C)**

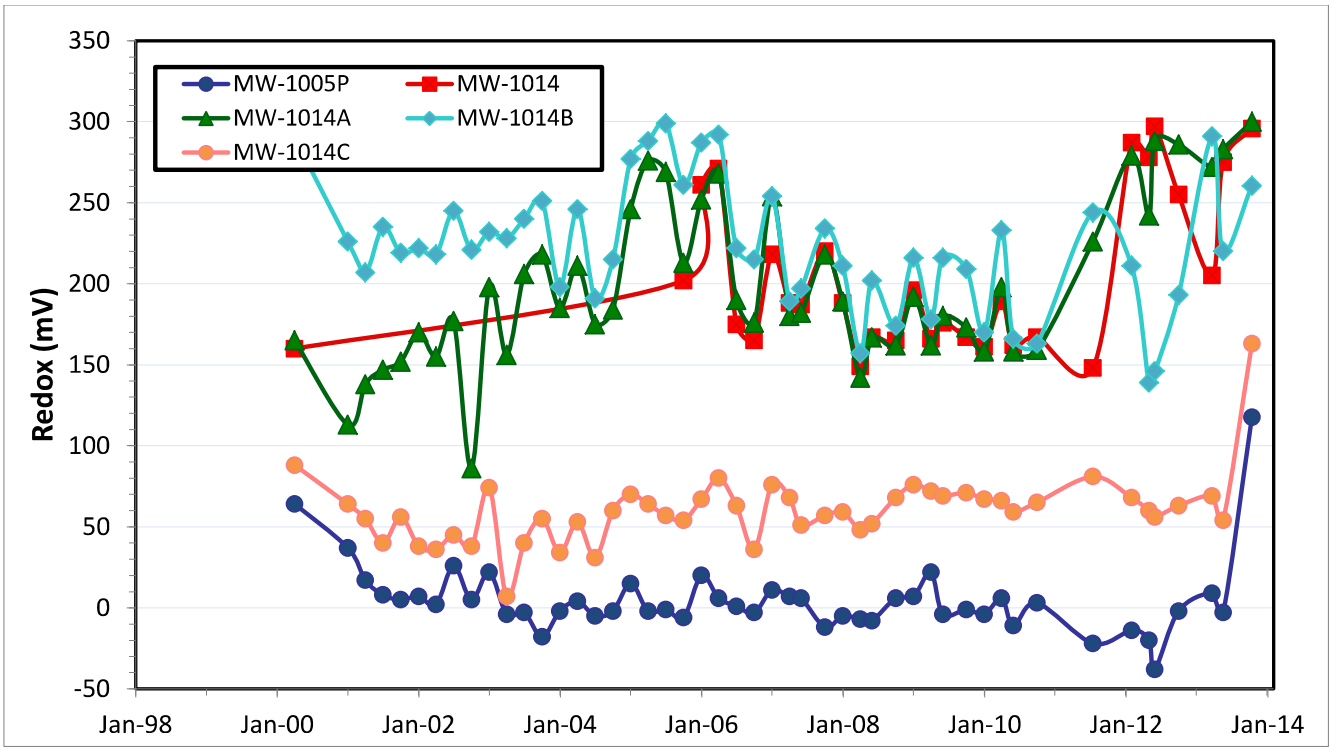


**Figure 17. Field measured redox potential for the MW-1014 well cluster in the backfilled pit area (MW-1014, MW-1014A, MW-1014B, and MW-1014C)**

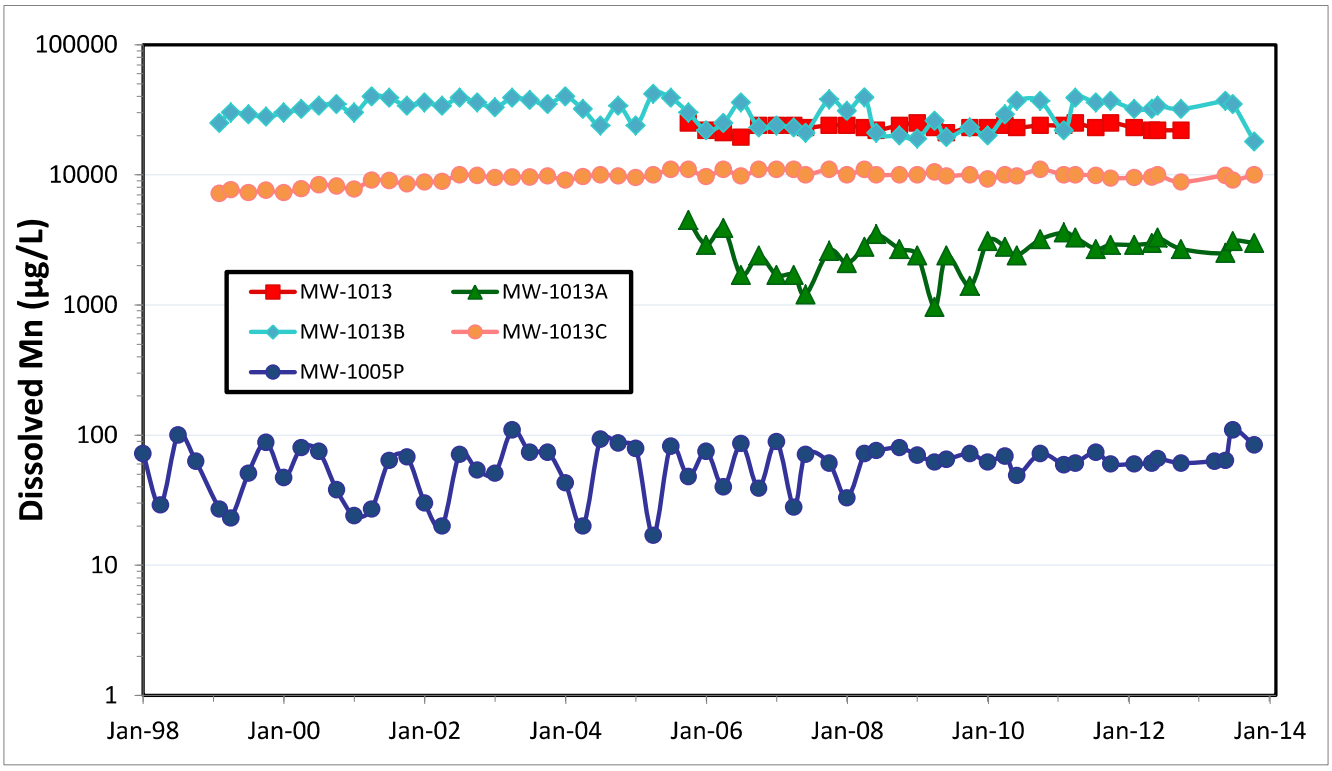


**Figure 18. Dissolved Mn for the MW-1013 well cluster in the backfilled pit area (MW-1013, MW-1013A, MW-1013B, and MW-1013C)**

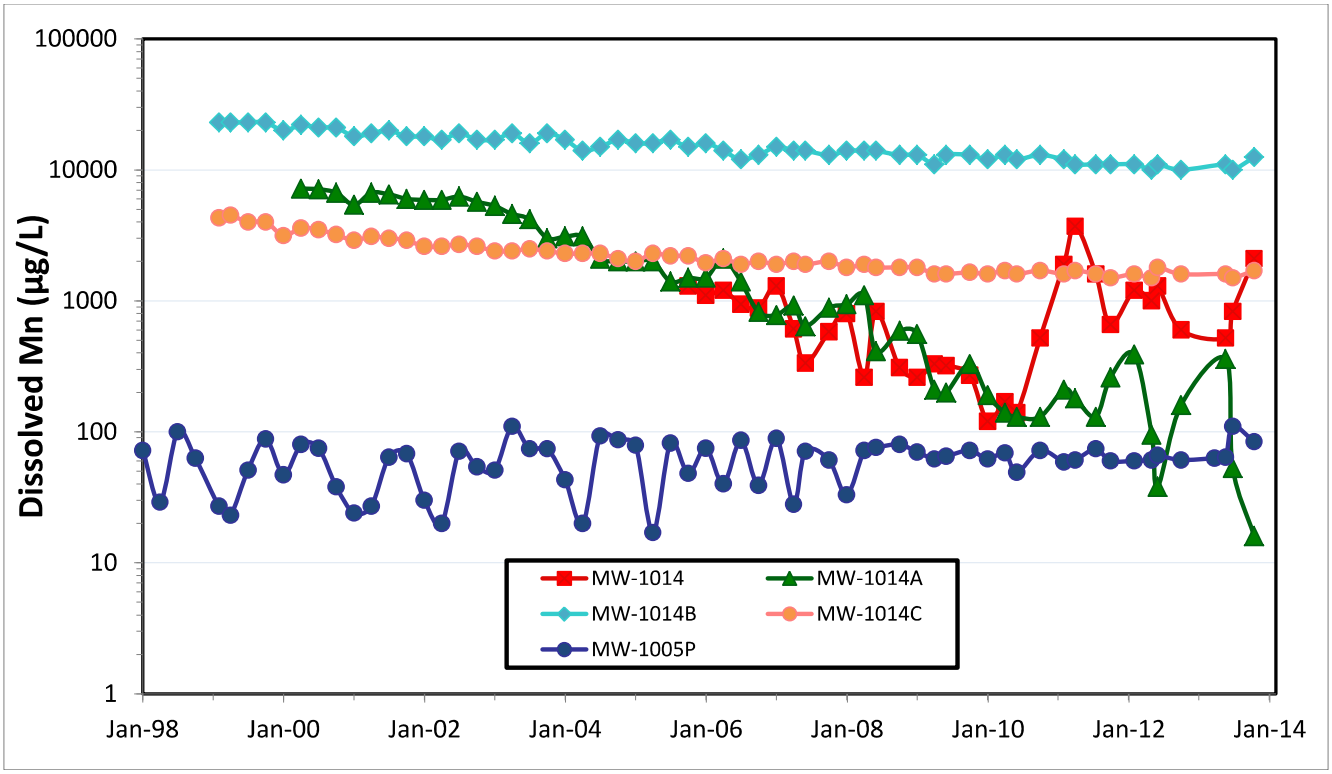


**Figure 19. Dissolved Mn for the MW-1014 well cluster in the backfilled pit area (MW-1014, MW-1014A, MW-1014B, and MW-1014C)**

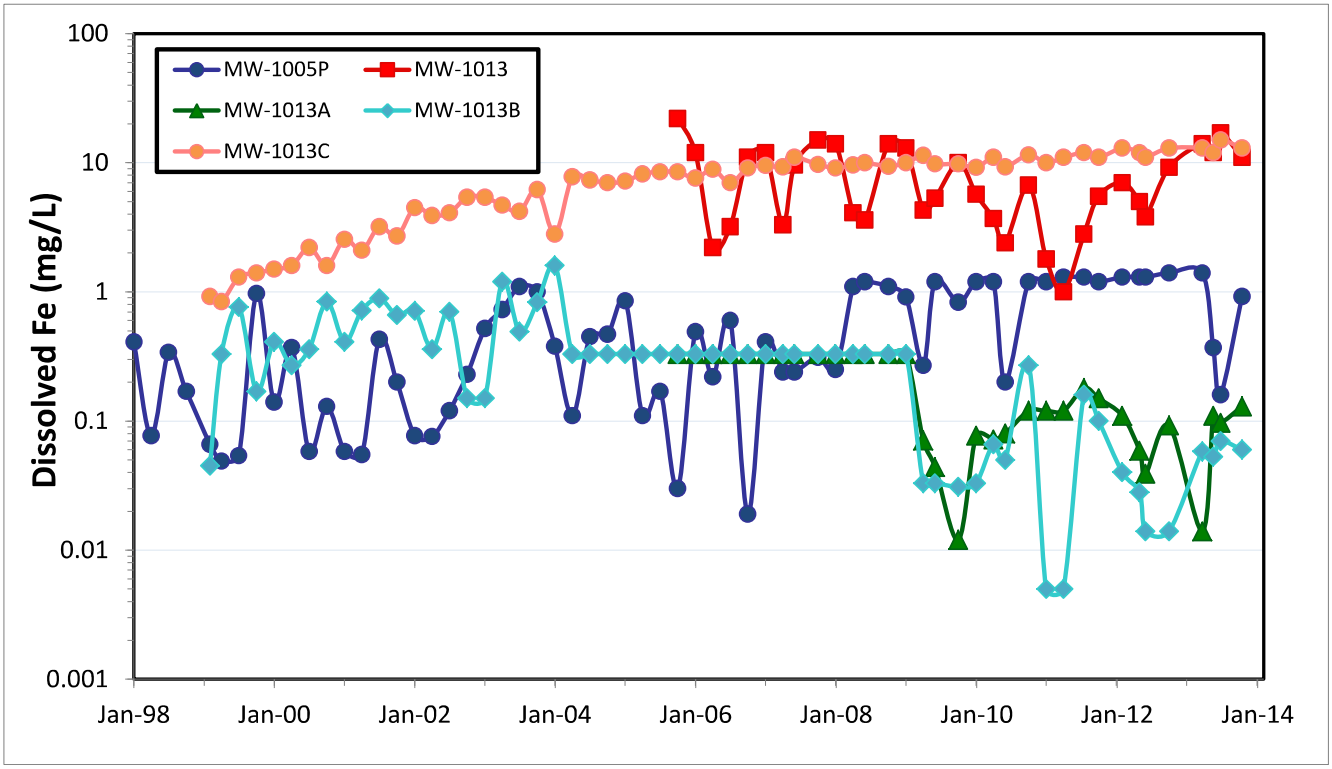


**Figure 20. Dissolved Fe for the MW-1013 well cluster in the backfilled pit area (MW-1013, MW-1013A, MW-1013B, and MW-1013C)**

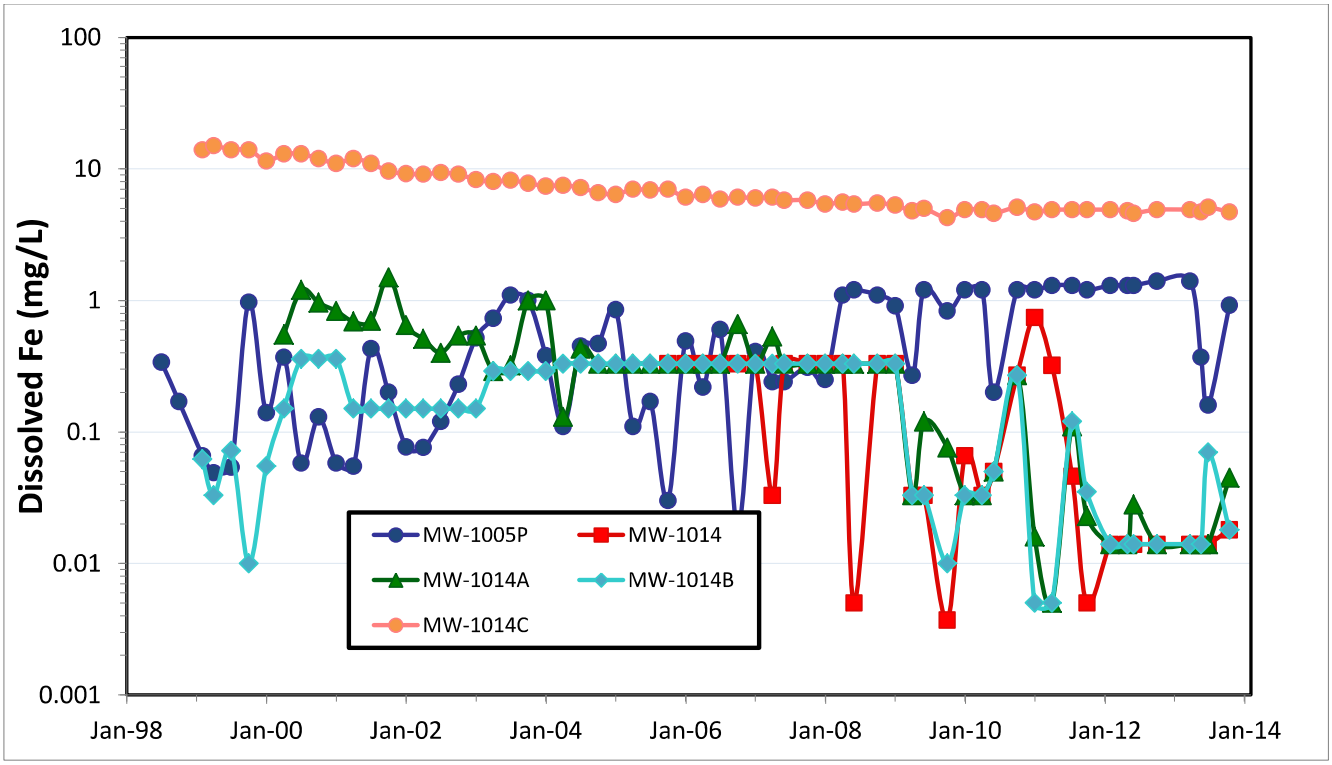


**Figure 21. Dissolved Fe for the MW-1014 well cluster in the backfilled pit area (MW-1014, MW-1014A,MW-1014B, and MW-1014C)**

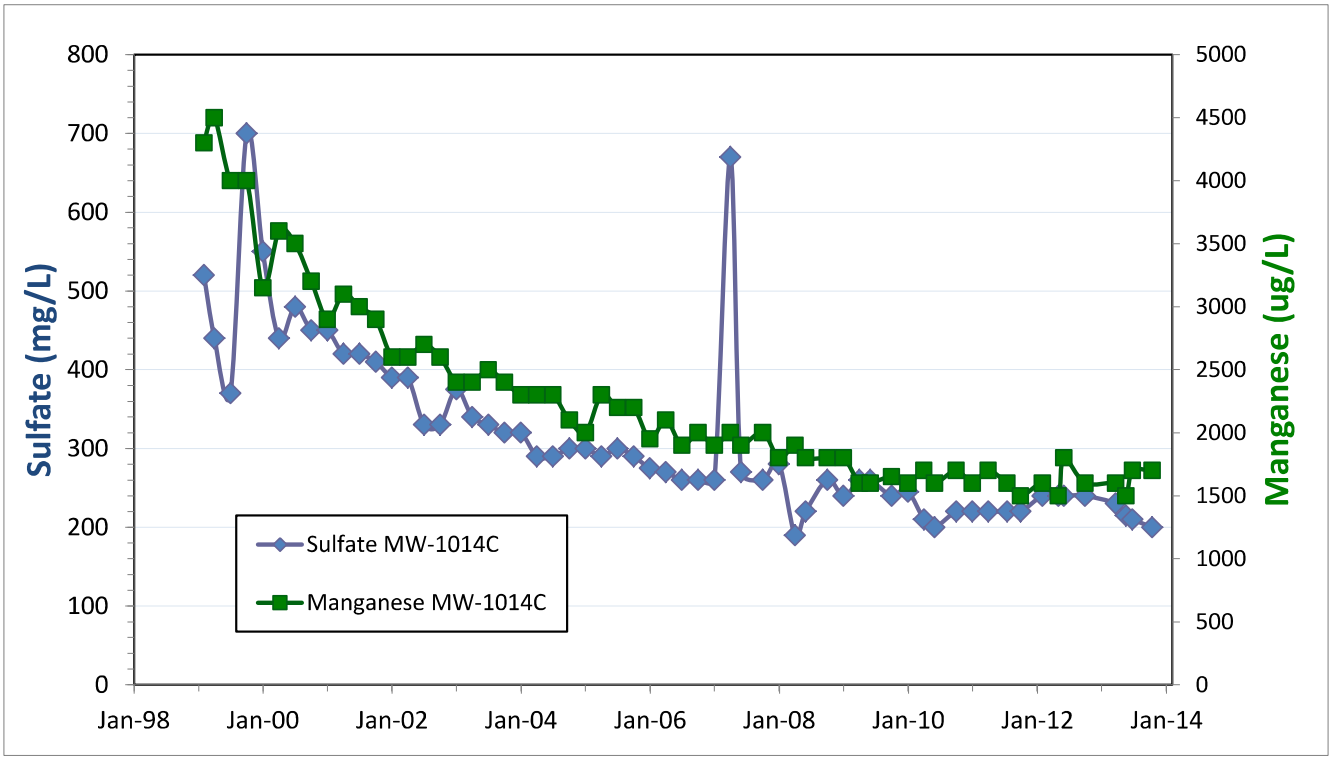


**Figure 22. Comparison of decreases in concentrations of sulfate and manganese for MW-1014C**

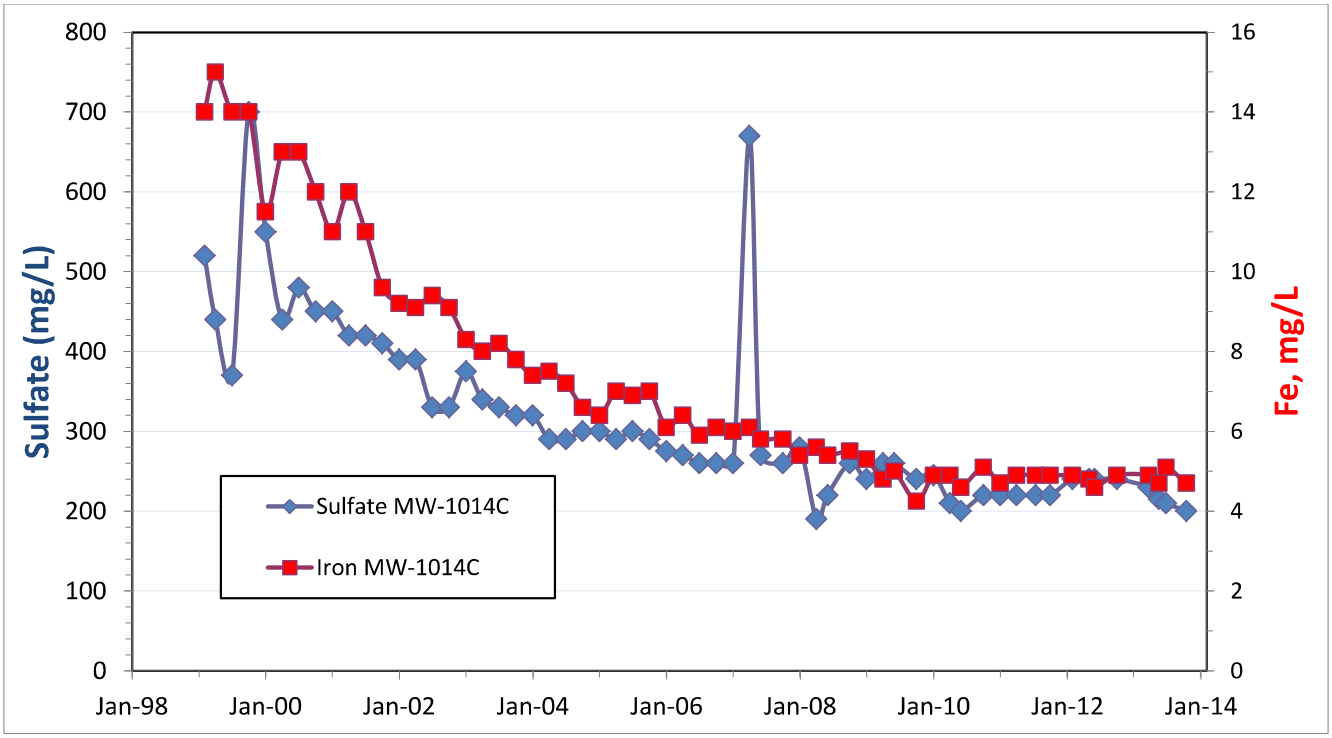


**Figure 23. Comparison of decreases in concentrations of sulfate and iron for MW-1014C**

# ATTACHMENT 1
# MONITORING RESULTS

Flambeau Mine Backfilled Pit Groundwater Monitoring Results through 2013
January 2014
Final Technical Memorandum

## Monitoring Well MW-1013 (dissolved concentrations)

| Date | | Alk (mg CaCO3/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water El (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1105.11 |
| Jul-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1106.07 |
| Oct-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1105.8 |
| Jan-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1104.64 |
| Apr-00 | | | Well not recovered sufficiently to collect groundwater sample. | | | | | | | | | | | | | | | | | | | | | | | | 97 | | | | 1103.87 |
| Jul-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1104.58 |
| Oct-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1105.06 |
| Jan-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1103.78 |
| Apr-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1104.08 |
| Jul-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1106.08 |
| Oct-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1106.69 |
| Jan-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1105.28 |
| Apr-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1105.35 |
| Jul-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1106.66 |
| Oct-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1107.28 |
| Jan-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1105.97 |
| Apr-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1106.02 |
| Oct-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1109.3 |
| Jan-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1108.22 |
| Apr-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1108.2 |
| Jul-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1111.69 |
| Oct-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1110.47 |
| Jan-05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1109.19 |
| Apr-05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1108.43 |
| Jul-05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1110.98 |
| Oct-05 | | 510 | 2.5 | | | | | | <13 | 600 | 22 | | | 25000 | | 6.1 | 6.37 | | | | | 760 | 62 | | None | 1332 | 1040 | 73 | None | None | 12.9 | 1109.89 |
| Jan-06 | | 680 | 0.98 | | | | | | <13 | 560 | 12 | | | 22000 | | 6.4 | 6.64 | | | | | 700 | 79 | | None | 1211 | 1190 | 72 | None | None | 8.4 | 1108.54 |
| Apr-06 | | 510 | <1.0 | 150 | <1.7 | 150 | 18 | <10 | 23 | 550 | 2.2 | 14 | 44 | 21000 | <0.025 | 6 | 6.28 | 3.1 | <2.4 | <12 | | 640 | 65 | <50 | None | 1040 | 888 | 150 | None | None | 9 | 1108.42 |
| Jul-06 | | 520 | <1.0 | 160 | <1.7 | 140 | 17 | <10 | 24 | 530 | 3.2 | <13 | 45 | 20000 | <0.025 | 6.1 | 6.38 | 3.1 | <2.4 | <12 | 19 | 630 | 58 | <50 | None | 1091 | 942 | 92 | None | None | 13 | 1111.08 |
| Jul-06 | Dup | 560 | <1.0 | 150 | <1.7 | 140 | 17 | <10 | 29 | 520 | 3.2 | <13 | 43 | 19000 | <0.025 | | 6.39 | | 3.4 | <12 | 18 | 670 | 58 | <50 | | | 961 | | | | | |
| Oct-06 | | 520 | <1.0 | | | | | | <13 | 580 | 11 | | | 24000 | | 6.5 | 6.42 | | | | | 620 | 55 | | None | 1233 | 998 | 81 | None | None | 12.3 | 1109.73 |
| Jan-07 | | 560 | 4 | | | | | | <13 | 600 | 12 | | | 24000 | | 6.4 | 6.52 | | | | | 680 | 72 | | None | 1168 | 1032 | 100 | None | None | 9.6 | 1108.4 |
| Apr-07 | | 550 | 1.4 | | | | | | <13 | 620 | 3.3 | | | 24000 | | 6.1 | 6.18 | | | | | 670 | 74 | | None | 1149 | 945 | 87 | None | None | 8.5 | 1108.02 |
| Jun-07 | | 610 | 3 | 140 | <1.7 | 150 | 18 | <10 | <13 | 560 | 9.6 | 23 | 45 | 23000 | <0.025 | 6.1 | 6.36 | 2.9 | <2.4 | <12 | 17 | 700 | 61 | <50 | None | 1144 | 969 | 84 | None | None | 11.4 | 1110.51 |
| Oct-07 | | 620 | <1.0 | | | | | | <13 | 610 | 15 | | | 24000 | | 6.2 | 6.28 | | | | | 740 | 53 | | None | 1261 | 1130 | 68 | None | None | 14.4 | 1110.28 |
| Jan-08 | | 600 | 2.2 | | | | | | <13 | 590 | 14 | | | 24000 | | 6.2 | 6.96 | | | | | 800 | 78 | | None | 1183 | 1150 | 63 | None | None | 9.8 | 1109.61 |
| Apr-08 | | 570 | 5.1 | | | | | | <13 | 580 | 4.1 | | | 23000 | | 6.2 | 6.69 | | | | | 770 | 66 | | None | 1155 | 1200 | 52 | None | None | 9.2 | 1110.52 |
| Jun-08 | | 470 | 1.7 | 130 | <1.7 | 150 | 17 | <10 | 22 | 550 | 3.6 | <13 | 44 | 22000 | <0.025 | 6.2 | 6.31 | 2.6 | 2.8 | <12 | 13 | 660 | 60 | <50 | None | 1150 | 1080 | 88 | None | None | 11.9 | 1112.75 |
| Oct-08 | | 610 | <2.4 | | | | | | <13 | 590 | 14 | | | 24000 | | 6.2 | 6.18 | | | | | 760 | 51 | | None | 1389 | 1153 | 62 | None | None | 12.8 | 1111.19 |
| Jan-09 | | 560 | <2.4 | | | | | | <13 | 620 | 13 | | | 25000 | | 6.1 | 6.15 | | | | | 800 | 73 | | None | 1230 | 1250 | 52 | None | None | 8.4 | 1109.57 |
| Apr-09 | | 680 | <2.4 | | | | | | 4.4 | 570 | 4.3 | | | 23000 | | 6.2 | 6.11 | | | | | 730 | 65 | | Vslight | 1172 | 1040 | 91 | None | None | 9.5 | 1108.25 |
| Jun-09 | | 580 | 3.2 | 130 | <1.7 | 140 | 15 | <10 | 14 | 520 | 5.3 | 19 | 42 | 21000 | <0.025 | 6.1 | 5.82 | 2.6 | <3.1 | <12 | 15 | 710 | 51 | <50 | Vslight | 1154 | 1120 | 86 | None | None | 11.3 | 1110.6 |
| Oct-09 | | 600 | <2.4 | | | | | | 6.8 | 1100 | 10 | | | 23000 | | 6.1 | 5.71 | | | | | 700 | 40 | | None | 1153 | 1160 | 75 | None | None | 12 | 1110.93 |
| Jan-10 | | 410 | <2.4 | | | | | | 8 | 550 | 5.7 | | | 23000 | | 6.24 | 6.32 | | | | | 900 | 56 | | None | 1133 | 1150 | 70 | None | None | 8.6 | 1110.28 |
| Apr-10 | | 580 | <2.4 | | | | | | <13 | 570 | 3.7 | | | 24000 | | 6.15 | 6.23 | | | | | 700 | 51 | | None | 1133 | 1126 | 110 | None | None | 10.1 | 1110.58 |
| Jun-10 | | 590 | <1.3 | 140 | <1.7 | 150 | 13 | <11 | <13 | 550 | 2.4 | <13 | 45 | 23000 | <0.025 | 6.18 | 6 | 3.3 | <2.4 | <14 | 18 | 690 | 44 | <50 | None | 1096 | 1107 | 96 | None | None | 11.2 | 1113.03 |
| Oct-10 | | 600 | <1.3 | | | | | | <13 | 560 | 6.8 | | | 24000 | | 6.15 | 6..09 | | | | | 730 | 40 | | None | 870 | 1124 | 80 | None | None | 12.6 | 1112.84 |
| Feb-11 | | 640 | <1.3 | | | | | | <13 | 580 | 1.8 | | | 24000 | | | 6.22 | | | | | 690 | 56 | | | | 1196 | | | | | |
| Apr-11 | | 630 | 2.2 | | | | | | <13 | 600 | 1 | | | 25000 | | | 6.13 | | | | | 710 | 53 | | | | 1180 | | | | | |
| Jul-11 | | 660 | <1.3 | 150 | 0.14 | 160 | 16 | <0.67 | 13 | 610 | 2.8 | 3.4 | 51 | 23000 | <0.025 | 6.01 | 6.1 | 3.6 | <12 | 1 | | 700 | 38 | <5 | None | 1081 | 1147 | 134 | None | None | 15 | 1115.09 |
| Oct-11 | | 610 | 2.2 | | | | | | 5.7 | 600 | 5.5 | | | 25000 | | | 5.98 | | | | | 760 | 30 | | | | 1155 | | | | | |
| Feb-12 | | 600 | < 1.3 | | | | | | 8.6 | 610 | 7 | | | 23000 | | 6.16 | 5.99 | | | | | 740 | 45 | | | 1190 | 1162 | 105 | | | 8.5 | 1110.98 |
| May-12 | | 610 | 1.8 | | | | | | 7.6 | 600 | 5 | | | 22000 | | 6.12 | 5.93 | | | | | 730 | 31 | | | 1148 | 1136 | 85 | | | 9.3 | 1112 |
| Jun-12 | | 610 | < 1.3 | 140 | 0.18 | 150 | 14 | < 0.67 | 9.3 | 570 | 3.8 | 5.3 | 49 | 22000 | < 0.025 | 6.1 | 5.99 | 3.4 | < 2.7 | < 0.28 | 17 | 700 | 34 | < 5 | | 1134 | 1122 | 143 | | | 10.8 | 1113.7 |
| Oct-12 | | 630 | < 1.3 | | | | | | 6.4 | 630 | 9.2 | | | 22000 | | 6.15 | 6.18 | | | | | 810 | 27 | | | 1252 | 1265 | 106 | | | 12.3 | 1111.26 |
| Mar-13 | | 580 | 1.6 J | | | | | | 5.3 | 590 | 14 | | | 27000 | | 6.17 | 6.58 | | | | | 760 | 39 | | | | 1133 | 81 | | | 9.6 | 1108.36 |
| May-13 | | 580 | < 1 | | | | | | 6.3 | 540 | 12 | | | 24000 | | 6.12 | 6.08 | | | | | 760 | 31 | | | | 1181 | 45 | | | 10.9 | 1108.56 |
| Jun-13 | | 560 | 1.3 J | 160 | < 0.12 | 170 | 15 | < 0.67 | 5.2 | 600 | 17 | 4.7 J | 45 | 27000 | < 0.025 | 6.11 | 5.95 | 3.4 | < 2 | 2.5 | 20 | 780 | 28 | < 5 | | | 1168 | 46 | | | 10.2 | 1110.7 |
| Oct-13 | | 600 | 1.2 J | | | | | | 3.9 | 570 | 11 | | | 28000 | | 5.97 | 6.07 | | | | | 760 | 24 | | | | 1296 | 173.4 | | | 12.3 | 1110.51 |

D – Duplicate, DNR – Dept Nat. Res. sample

## Monitoring Well MW-1013A (dissolved concentrations)

| Date | | Alk (mg CaCO3/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water Elrv (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1094.73 |
| Jul-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1095.38 |
| Oct-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1095.51 |
| Jan-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1095.62 |
| Apr-00 | | | | Well not recovered sufficiently to collect groundwater sample. | | | | | | | | | | | | | | | | | | | | | | | 97 | | | | 1095.36 |
| Jul-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1095.79 |
| Oct-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1096.2 |
| Jan-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1095.72 |
| Apr-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.1 |
| Jul-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.19 |
| Oct-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1096.9 |
| Jan-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.02 |
| Apr-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.18 |
| Jul-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.44 |
| Oct-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.85 |
| Jan-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.39 |
| Apr-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.95 |
| Oct-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097 |
| Jan-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1096.91 |
| Apr-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.43 |
| Jul-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.86 |
| Oct-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.11 |
| Jan-05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.27 |
| Apr-05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1097.16 |
| Jul-05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1096.86 |
| Oct-05 | | 370 | 0.86 | | | | | | <13 | 680 | <0.33 | | | 4500 | | 6.7 | 6.82 | | | | | 870 | 380 | | None | 1576 | 1180 | 153 | None | None | 11.4 | 1096.84 |
| Jan-06 | | 340 | <0.85 | | | | | | <13 | 500 | <0.33 | | | 2900 | | 6.8 | 6.78 | | | | | 650 | 240 | | None | 1271 | 1000 | 156 | Slight | None | 8.4 | 1097.01 |
| Apr-06 | | 340 | <1.0 | 120 | <1.7 | 190 | 11 | <10 | 17 | 730 | <0.33 | 19 | 62 | 3900 | <0.025 | 6.2 | 6.72 | | <2.4 | <12 | | 640 | 270 | 61 | None | 1571 | 929 | 152 | VSI | None | 11 | 1097.29 |
| Jul-06 | | 320 | <1.0 | 99 | <1.7 | 120 | 6.7 | <10 | 16 | 460 | <0.33 | <13 | 42 | 1700 | <0.025 | 6.52 | 6.69 | 7.1 | <2.4 | <12 | 35 | 600 | 220 | <50 | None | 1104 | 899 | 160 | None | None | 13.2 | 1096.52 |
| Oct-06 | | 300 | <1.0 | | | | | | <13 | 490 | <0.33 | | | 2400 | | 7 | 6.87 | | | | | 560 | 200 | | None | 1015 | 951 | 130 | Moderate | None | 10.9 | 1096.36 |
| Jan-07 | | 320 | 1.9 | | | | | | <13 | 400 | <0.33 | | | 1700 | | 7 | 7.06 | | | | | 510 | 170 | | None | 885 | 786 | 147 | None | None | 10.3 | 1096.32 |
| Apr-07 | | 330 | <1.0 | | | | | | <13 | 460 | <0.33 | | | 1700 | | 6.3 | 6.73 | | | | | 540 | 180 | | None | 1006 | 787 | 137 | Vslight | None | 10.6 | 1096.2 |
| Jun-07 | | 360 | 2.1 | 84 | <1.7 | 110 | 6.1 | <10 | <13 | 430 | <0.33 | <13 | 37 | 1200 | <0.025 | 6.6 | 6.83 | 7.2 | <2.4 | <12 | 32 | 530 | 170 | <50 | None | 974 | 761 | 100 | None | None | 13.2 | 1096.07 |
| Oct-07 | | 380 | <1.0 | | | | | | <13 | 490 | <0.33 | | | 2600 | | 6.6 | 6.74 | | | | | 610 | 210 | | None | 912 | 925 | 85 | Vslight | None | 13.9 | 1095.72 |
| Jan-08 | | 370 | <1.0 | | | | | | <13 | 410 | <0.33 | | | 2100 | | 6.6 | 7.87 | | | | | 590 | 170 | | None | 963 | 877 | 85 | Slight | None | 9.9 | 1097.1 |
| Apr-08 | | 330 | 1.5 | | | | | | <13 | 500 | <0.33 | | | 2800 | | 6.7 | 6.76 | | | | | 640 | 180 | | None | 862 | 975 | 83 | None | None | 12.4 | 1096.94 |
| Jun-08 | | 340 | 2 | 81 | <1.7 | 160 | 7 | <10 | <13 | 630 | <0.33 | <13 | 53 | 3500 | <0.025 | 6.6 | 6.82 | 6.4 | <2.4 | 14 | 19 | 740 | 270 | <50 | None | 1195 | 1070 | 94 | None | None | 12.6 | 1097.88 |
| Oct-08 | | 310 | <2.4 | | | | | | <13 | 450 | <0.33 | | | 2700 | | 6.7 | 6.53 | | | | | 620 | 210 | | None | 854 | 924 | 78 | None | None | 13 | 1096.84 |
| Oct-08 | D | 340 | <2.4 | | | | | | <13 | 460 | <0.33 | | | 2700 | | | 6.71 | | | | | 620 | 200 | | | | 918 | | | | | |
| Jan-09 | | 340 | <2.4 | | | | | | <13 | 440 | <0.33 | | | 2400 | | 6.6 | 6.64 | | | | | 620 | 180 | | None | 953 | 935 | 62 | None | None | 9.4 | 1096.69 |
| Apr-09 | | 390 | <2.4 | | | | | | <1.3 | 370 | 0.071 | | | 960 | | 6.7 | 6.59 | | | | | 530 | 150 | | None | 856 | 795 | 98 | None | None | 9.9 | 1096 |
| Jun-09 | | 320 | <2.4 | 72 | <1.7 | 120 | 14 | <10 | <13 | 460 | 0.044 | <13 | 40 | 2400 | <0.025 | 6.6 | 6.31 | 6.4 | <3.1 | <12 | 26 | 610 | 200 | <50 | None | 887 | 924 | 126 | None | None | 12.8 | 1096.57 |
| Oct-09 | | 320 | <2.4 | | | | | | 1.4 | 380 | 0.012 | | | 1400 | | 6.6 | 6.21 | | | | | 520 | 170 | | None | 862 | 922 | 98 | None | None | 11.4 | 1096.23 |
| Jan-10 | | 250 | <2.4 | | | | | | <1.3 | 450 | 0.077 | | | 3100 | | 6.69 | 6.79 | | | | | 610 | 180 | | None | 959 | 961 | 80 | None | None | 8.4 | 1096.36 |
| Apr-10 | | 360 | <2.4 | | | | | | <13 | 450 | 0.072 | | | 2800 | | 6.61 | 6.64 | | | | | 590 | 170 | | None | 922 | 931 | 140 | Vslight | None | 12.2 | 1096.1 |
| Jun-10 | | 350 | <1.3 | 74 | <1.7 | 110 | 6.9 | <11 | <13 | 450 | 0.08 | <13 | 39 | 2400 | <0.025 | 6.65 | 6.49 | 7.5 | <2.4 | <14 | 35 | 580 | 170 | <50 | None | 900 | 944 | 102 | Vslight | None | 13.2 | 1096.58 |
| Oct-10 | | 370 | <1.3 | | | | | | <13 | 470 | <0.5 | | | 3200 | | 6.67 | 6.62 | | | | | 630 | 180 | | None | 697 | 953 | 94 | Moderate | None | 11.5 | 1097.84 |
| Feb-11 | | 340 | 1.4 | | | | | | <13 | 500 | 0.12 | | | 3600 | | | 6.59 | | | | | 570 | 180 | | | | 961 | | | | | |
| Apr-11 | | 350 | <1.3 | | | | | | 18 | 470 | 0.12 | | | 3300 | | | 6.59 | | | | | 560 | 190 | | | | 941 | | | | | |
| Jul-11 | | 350 | <1.3 | 79 | <0.12 | 120 | 7.8 | <0.67 | <0.73 | 480 | 0.18 | <1.4 | 43 | 2700 | <0.025 | 6.52 | 6.55 | 7.8 | <12 | <0.28 | | 540 | 150 | <5 | None | 856 | 890 | 299 | None | None | 14.6 | 1099.12 |
| Oct-11 | | 350 | <1.3 | | | | | | <0.73 | 440 | 0.15 | | | 2900 | | | 6.61 | | | | | 580 | 160 | | | | 889 | | | | | |
| Feb-12 | | 350 | < 1.3 | | | | | | 2.1 | 440 | 0.11 | | | 2900 | | 6.69 | 6.37 | | | | | 570 | 190 | | | 920 | 926 | 106 | | | 8.9 | 1097.52 |
| May-12 | | 340 | 3.8 | | | | | | 1.2 | 510 | 0.059 | | | 3000 | | 6.69 | 6.45 | | | | | 610 | 190 | | | 938 | 924 | 135 | | | 10 | 1097.79 |
| Jun-12 | | 340 | < 1.3 | 76 | < 0.12 | 120 | 8.2 | < 0.67 | 0.99 | 480 | 0.039 | 2.3 | 43 | 3300 | < 0.025 | 6.62 | 6.45 | 7.7 | < 2.7 | < 0.28 | 26 | 610 | 190 | < 5 | | 934 | 938 | 172 | | | 13.2 | 1097.96 |
| Oct-12 | | 320 | < 1.3 | | | | | | 1.1 | 430 | 0.092 | | | 2700 | | 6.61 | 6.7 | | | | | 530 | 150 | | | 881 | 910 | 318 | | | 11 | 1097.36 |

**Monitoring Well MW-1013A (dissolved concentrations)**

| Date | | Alk (mg CaCO3/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water Elrv (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mar-13 | | 310 | < 1 | | | | | | 0.87 J | 410 | 0.14 | | | 2500 | | 6.73 | 6.2 | | | | | 490 | 150 | | | 868 | | | | | 8.7 | 1096.32 |
| May-13 | | 330 | < 1 | | | | | | 1.7 J | 470 | 0.11 | | | 3100 | | 6.69 | 6.53 | | | | | 640 | 190 | | | 870 | | 127 | | | 11.2 | 1097.63 |
| Jun-13 | | 320 | < 1 | 94 | < 0.12 | 130 | 8.2 J | < 0.67 | 2.5 | 520 | 0.097 | < 1.4 | 47 | 3000 | < 0.025 | 6.64 | 6.46 | 8.1 | < 2 | 0.64 J | 31 | 670 | 220 | < 5 | | 934 | | 47 | | | 11.9 | 1098.36 |
| Oct-13 | | 310 | < 1 | | | | | | < 1 | 410 | 0.13 | | | 3400 | | 6.53 | 6.57 | | | | | 570 | 160 | | | 975 | | 275 | | | 9.41 | 1096.77 |

D – Duplicate, DNR – Dept Nat. Res. sample

## Well MW-1013B Well Depth: 86.3' (dissolved concentrations)

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (mg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water El (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb-99 | | 630 | | | | | | | | | 36 | 2300 | 0.045 | | | 25000 | | | 6.2 | 6.5 | | | | | 3100 | 1400 | | None | 3540 | | | None | None | | 1093.95 |
| Apr-99 | | 550 | | | | | | | | | 16 | 2300 | 0.33 | | | 30000 | | | 6.2 | 6.4 | | | | | 3700 | 770 | | Slight | 3130 | | | None | Moderate | 16 | 1094.58 |
| Jul-99 | | 620 | | | <42 | <50 | <21 | 630 | 35 | 16 | 33 | 2200 | 0.76 | <14 | 150 | 29000 | <0.050 | | 6.4 | 6.5 | 8.2 | 1.7 | <4.5 | 35 | 3800 | 2600 | <120 | None | 3020 | | | Slight | Slight | 18.3 | 1095.2 |
| Oct-99 | | 540 | | | <42 | <50 | <4.2 | 650 | 35 | 14 | <9.4 | 2200 | 0.17 | <14 | 150 | 28000 | <0.050 | | 6.6 | 6.8 | 5.9 | <1.3 | <4.5 | 26 | 3700 | 1900 | <120 | None | 3200 | | | Slight | Slight | 14.2 | 1095.49 |
| Jan-00 | | 560 | | | 17 | <50 | <2.1 | 600 | 28 | 18 | <4.7 | 2100 | 0.41 | <14 | 150 | 30000 | <0.050 | | 6.4 | 6.4 | 6.4 | <1.3 | <4.5 | 33 | 3300 | 1700 | <120 | None | 3000 | | | None | Slight | 12.6 | 1095.59 |
| Apr-00 | | 520 | | | 12 | <50 | <3.1 | 630 | 35 | <6.2 | 19 | 2200 | 0.27 | <24 | 150 | 32000 | <0.050 | | 6.6 | 6.3 | 8.5 | <7.8 | <4.7 | 27 | 3600 | 1200 | <120 | None | 3120 | | 230 | None | Slight | 8.7 | 1095.54 |
| Jul-00 | | 660 | | | <21 | <50 | <2.3 | 670 | <40 | 5.1 | 14 | 2300 | <0.36 | <9.6 | 160 | 34000 | <0.050 | | 6.3 | 6.3 | 7.2 | <17 | <5.5 | 34 | 3200 | 1600 | <120 | None | 3000 | 2800 | | None | Slight | 16 | 1096.09 |
| Oct-00 | | 620 | | | | | | | | | <12 | 2200 | 0.84 | | | 35000 | | | 6.3 | 6.9 | | | | | 3200 | 1500 | <120 | None | 3180 | 1800 | | None | Slight | 13.9 | 1096.45 |
| Jan-01 | | 590 | | | | | | | | | <12 | 1900 | 0.41 | | | 30000 | | | 6.1 | 6.3 | | | | | 3300 | 1600 | <120 | None | 3230 | 2700 | 174 | None | Vslight | 11.2 | 1095.86 |
| Apr-01 | | 530 | | | | | | | | | 35 | 2300 | 0.72 | | | 40000 | | | 6 | 6.5 | | | | | 3300 | 1600 | <120 | None | 3400 | 2600 | 203 | None | Vslight | 14 | 1097.57 |
| Jul-01 | | 490 | | | <15 | <50 | 3.3 | 700 | | 6.4 | 33 | 2400 | 0.89 | <7.9 | 160 | 40000 | <0.050 | | 6.1 | 6.3 | | <10 | 6.5 | | 3500 | 1600 | 130 | None | 3290 | 2700 | 252 | None | Vslight | 15.7 | 1097.63 |
| Oct-01 | | 560 | | | 18 | <50 | <1.7 | 600 | | 4.8 | 69 | 2000 | 0.66 | <7.9 | 130 | 34000 | <0.050 | | 6.1 | 6.3 | | <16 | 6 | | 3200 | 1600 | 130 | None | 3320 | 3000 | 201 | None | Vslight | 14.4 | 1097.19 |
| Jan-02 | | 600 | | | | | | | | | 52 | 2100 | 0.71 | | | 36000 | | | 6.2 | 6.4 | | | | | 3600 | 1600 | <120 | None | 3380 | 2900 | 201 | None | Moderate | 13 | 1097.33 |
| Apr-02 | | 520 | | | | | | | | | 110 | 2200 | 0.36 | | | 34000 | | | 6.2 | 6.4 | | | | | 3200 | 1600 | <120 | None | 3370 | 3100 | 205 | None | None | 12.3 | 1097.63 |
| Jul-02 | | 690 | | | 28/<15 | <50 | <1.7 | | | <4.5 | 150 | 2300 | 0.7 | <7.4 | | 39000 | <0.050 | | 6.4 | 6.3 | | <15 | 4.3 | | 3900 | 1400 | 130 | None | 3340 | 3000 | 202 | None | None | 16.1 | 1097.95 |
| Oct-02 | | 620 | | | | | | | | | 210 | 2300 | <0.15 | | | 36000 | | | 6.1 | 6.4 | | | | | 3000 | 1600 | 130 | None | 3390 | 2900 | 221 | None | Slight | 13.6 | 1097.3 |
| Jan-03 | | 630 | | | <27 | <50 | 2.4 | 640 | <50 | <4.5 | 92 | 2200 | 0.15 | <7.4 | 150 | 33000 | <0.050 | | 6.1 | 6.4 | | <30 | 5.8 | | 3400 | 1600 | 130 | None | 3420 | 2800 | 208 | None | None | 9.8 | 1098.58 |
| Apr-03 | | 660 | | | | | | | | | 160 | 2200 | 1.2 | | | 39000 | | | 6.2 | 6.3 | | | | | 3500 | 1500 | 130 | None | 3340 | 3000 | 203 | None | None | 12.1 | 1097.87 |
| Jul-03 | | 620 | | | <2.6 | <25 | <2.1 | 660 | | <6.4 | 120 | 2300 | 0.61 | <10 | 150 | 38000 | <0.050 | | 6.3 | 6.8 | | <2.7 | <7.7 | | 3100 | 1600 | 140 | None | 3290 | 2800 | 200 | None | Vslight | 14.9 | 1098.71 |
| Jul-03 | D | 580 | | | 4.3 | <25 | <2.1 | 660 | | <6.4 | 110 | 2300 | 0.36 | <10 | 150 | 37000 | <0.050 | | | 6.6 | | <2.7 | <7.7 | | 3100 | 1500 | 130 | | | 2800 | | | | | |
| Oct-03 | | 590 | | | | | | | | | 110 | 2300 | <0.29 | | | 35000 | | | 6.3 | 6.4 | | | | | 3200 | 1500 | 140 | None | 3350 | 2890 | 199 | None | None | 16.1 | 1097.29 |
| Oct-03 | D | 550 | | | | | | | | | 140 | 2200 | 0.83 | | | 37000 | | | | 6.5 | | | | | 3200 | 1500 | 150 | | | 2830 | | | | | |
| Jan-04 | | 580 | | | | | | | | | 170 | 2200 | 1.6 | | | 40000 | | | 6.2 | 6.33 | | | | | 3200 | 1600 | | None | 3370 | 2820 | 212 | None | Vslight | 12.1 | 1097.13 |
| Apr-04 | | 560 | | | | | | | | | 230 | 2200 | <0.33 | | | 32000 | | | 6.3 | 6.52 | | | | | 3100 | 1500 | | None | 3260 | | 188 | None | None | 14.7 | 1097.77 |
| Jul-04 | | 550 | | | <2.6 | <25 | <1.7 | 640 | 47 | <5.1 | 150 | 2200 | <0.33 | 20 | 150 | 24000 | <0.050 | | 6.1 | 6.34 | 6.8 | <8.0 | <6.7 | 31 | 3100 | 1600 | 150 | None | 3340 | 2480 | 191 | None | Vslight | 13.3 | 1098.27 |
| Oct-04 | | 640 | | | 4.2 | | | 640 | | | 380 | 2200 | <0.33 | | 140 | 34000 | | | 6.3 | 6.26 | | | | | 3100 | 1600 | | None | 3250 | 3010 | 204 | None | None | 13.1 | 1097.1 |
| Jan-05 | | 580 | | | 4.8 | | | | | | 180 | 2200 | <0.33 | | | 24000 | | | 6.3 | 6.52 | | | | | 3000 | 1700 | | None | 3390 | 2990 | 207 | None | None | 9 | 1097.29 |
| Apr-05 | | 630 | | | 1.7 | | | | | | 450 | 2200 | <0.33 | | | 42000 | | | 6.2 | 6.55 | | | | | 3100 | 1700 | | None | 3420 | 2930 | 238 | None | None | 11.3 | 1097.61 |
| Jul-05 | | 640 | 0.081 | 0.06 | 1.9 | <25 | <1.7 | 690 | | <4.5 | 400 | 2300 | <0.33 | <10 | 150 | 39000 | <0.050 | 45 | 6.4 | 6.25 | | <1.9 | <6.7 | | 3100 | 1700 | 200 | None | 3200 | 2810 | 229 | None | None | 15.8 | 1097.22 |
| Oct-05 | | 630 | | | <0.85 | | | | | | 230 | 2300 | <0.33 | | | 30000 | | | 6.4 | 6.46 | | | | | 3100 | 1500 | | None | 3260 | 2620 | 222 | None | None | 11.9 | 1096.98 |
| Jan-06 | | 590 | | | 1.1 | | | | | | 210 | 2200 | <0.33 | | | 22000 | | | 6.4 | 6.51 | | | | | 3000 | 1500 | | None | 3480 | 2510 | 223 | None | None | 14.6 | 1097.17 |
| Apr-06 | | 590 | 0.2 | 0.082 | <1.0 | <25 | <1.7 | 650 | 48 | <10 | 280 | 2200 | <0.22 | <13 | 150 | 25000 | <0.050 | | 6.1 | 6.3 | | <2.4 | <12 | | 3000 | 1600 | 210 | None | 3300 | 2490 | 210 | None | None | 9.7 | 1097.65 |
| Jul-06 | | 610 | | | 1.4 | <25 | <1.7 | 630 | 46 | <10 | 470 | 2200 | <0.33 | <13 | 150 | 36000 | <0.050 | | 6.17 | 6.36 | 6.3 | <4.8 | <12 | 31 | 3000 | 1600 | 210 | None | 3280 | 2780 | 249 | None | None | 13.6 | 1096.73 |
| Oct-06 | | 480 | | | <1.0 | | | | | | 200 | 2400 | <0.33 | | | 23000 | | | 6.5 | 6.46 | | | | | 3000 | 1600 | | None | 3360 | 2720 | 309 | None | None | 10.9 | 1096.54 |
| Jan-07 | | 570 | | | <1.0 | | | | | | 290 | 2200 | <0.33 | | | 24000 | | | 6.5 | 6.77 | | | | | 2900 | 1600 | | None | 3370 | 2610 | 286 | None | None | 9.1 | 1096.44 |
| Apr-07 | | 620 | | | 3.2 | | | | | | 230 | 2400 | <0.33 | | | 23000 | | | 5.9 | 6.27 | | | | | 3000 | 1700 | | None | 3260 | 2550 | 255 | None | None | 9.9 | 1096.45 |
| Jun-07 | | 620 | | | 3.8 | <25 | <1.7 | 630 | 47 | <10 | 240 | 2100 | <0.33 | <13 | 140 | 21000 | <0.050 | | 6.2 | 6.47 | 6.4 | <2.4 | <12 | 28 | 3000 | 1600 | 170 | None | 3131 | 2580 | 216 | None | None | 12.4 | 1096.39 |
| Oct-07 | | 690 | | | 3.7 | | | | | | 500 | 2300 | <0.33 | | | 38000 | | | 6.3 | 6.26 | | | | | 3100 | 1600 | | None | 3182 | 2920 | 227 | None | None | 14.1 | 1095.86 |
| Jan-08 | | 620 | | | 3.9 | | | | | | 400 | 2200 | <0.33 | | | 31000 | | | 6.2 | 7.25 | | | | | 3200 | 1500 | | None | 3141 | 2850 | 206 | None | None | 10.1 | 1097.27 |
| Apr-08 | | 640 | | | <1.0 | | | | | | 530 | 2200 | <0.33 | | | 40000 | | | 6.2 | 6.71 | | | | | 3200 | 1500 | | None | 3200 | 3090 | 201 | None | None | 11.4 | 1097.36 |
| Apr-08 | D | 630 | | | 2.9 | | | | | | 550 | 2200 | <0.33 | | | 39000 | <0.050 | | 6.2 | 6.61 | | | | | 3200 | 1400 | | | 3209 | 3100 | | | | 11.3 | |
| Jun-08 | | 550 | | | 2.7 | <25 | <1.7 | 630 | <50 | <10 | 270 | 2200 | <0.33 | <13 | 140 | 21000 | | | 6.2 | 6.34 | 5.6 | <2.4 | <12 | 19 | 3100 | 1600 | 170 | None | 3159 | 2940 | 216 | None | None | 12 | 1098.29 |
| Oct-08 | | 210 | | | <2.4 | | | | | | 260 | 2200 | <0.33 | | | 20000 | | | 6.3 | 6.2 | | | | | 3100 | 1700 | | None | 3134 | 2850 | 213 | None | None | 12.7 | 1097.1 |
| Jan-09 | | 660 | | | <2.4 | | | | | | 240 | 2200 | <0.33 | | | 19000 | | | 6.2 | 6.2 | | | | | 3200 | 1500 | | None | 3075 | 2820 | 197 | None | None | 10.3 | 1096.95 |
| Apr-09 | | 490 | | | <2.4 | | | | | | 390 | 2100 | <0.033 | | | 26000 | | | 6.2 | 6.2 | | | | | 3000 | 1700 | | None | 3181 | 2550 | 215 | None | None | 9.3 | 1096.3 |
| Jun-09 | | 580 | | | 3.9 | <25 | <1.7 | 590 | 76 | <10 | 300 | 2000 | <0.033 | <13 | 130 | 20000 | <0.050 | | 6.2 | 5.92 | 3.6 | <3.1 | <12 | 27 | 3200 | 1700 | 160 | None | 3160 | 3030 | 235 | None | None | 12 | 1096.97 |
| Jun-09 | D | 630 | | | 3.9 | <25 | <1.7 | 580 | 77 | <10 | 270 | 2000 | <0.033 | <13 | 130 | 19000 | <0.050 | | | 5.95 | 2.7 | <3.1 | <12 | 27 | 3200 | 1600 | 160 | | | | | | | | |
| Oct-09 | | 600 | | | <2.4 | | | | | | 360 | 2100 | 0.031 | | | 23000 | | | 6.2 | 5.89 | | | | | 3000 | 1600 | | None | 3185 | 3090 | 227 | None | None | 10.7 | 1096.47 |
| Jan-10 | | 470 | | | <2.4 | | | | | | 290 | 2100 | <0.033 | | | 20000 | | | 6.31 | 6.38 | | | | | 3100 | 2400 | | None | 3180 | 3110 | 220 | None | None | 8.8 | 1096.54 |
| Apr-10 | | 540 | | | <2.4 | | | | | | 400 | 2100 | <0.066 | | | 29000 | | | 6.23 | 6.25 | | | | | 3000 | 1400 | | None | 3181 | 3030 | 260 | None | None | 10.7 | 1096.39 |
| Jun-10 | | 690 | | | 5 | <25 | 1.9 | 620 | <50 | <11 | 590 | 2100 | <0.05 | <13 | 140 | 37000 | <0.025 | | 6.22 | 6.12 | 8.6 | <2.4 | <14 | 35 | 3100 | 1300 | 180 | None | 3251 | 2980 | 243 | None | None | 12.6 | 1096.97 |
| Oct-10 | | 640 | | | <1.3 | | | | | | 530 | 2200 | <0.5 | | | 37000 | | | | 6.21 | | | | | 3100 | 1500 | | None | 2334 | 3257 | | None | None | 12 | 1098.15 |
| Oct-10 | D | 670 | | | <1.3 | | | | | | 520 | 2200 | <0.5 | | | 37000 | | | 6.23 | 6.21 | | | | | 3100 | 1300 | | None | | 3329 | 248 | None | None | | |
| Feb-11 | | 570 | | | <1.3 | | | | | | 310 | 2100 | <0.005 | | | 22000 | | | | 6.2 | | | | | 3000 | 1600 | | | | 3828 | | | | | |
| Apr-11 | | 630 | | | <1.3 | | | | | | 610 | 1800 | <0.05 | | | 39000 | | | | 6.15 | | | | | 3200 | 1600 | | | | 3260 | | | | | |

**Well MW-1013B Well Depth: 86.3' (dissolved concentrations)**

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (mg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water El (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jul-11 | | 620 | | | 3.2 | 20 | 0.92 | 640 | 54 | <0.67 | 560 | 2200 | 0.16 | 5.5 | 150 | 36000 | <0.025 | | 6.16 | 6.14 | 8.3 | <12 | 1.2 | | 3100 | 1600 | 160 | None | 3062 | 3293 | 324 | None | None | 15.6 | 1099.58 |
| Oct-11 | | 550 | | | <1.3 | | | | | | 520 | 2200 | 0.1 | | | 37000 | | | | 6.13 | | | | | 3100 | 1600 | | | | 3185 | | | | | |
| Feb-12 | | 570 | | | 1.9 | | | | | | 550 | 2200 | 0.04 | | | 32000 | | | 6.24 | 6.16 | | | | | 3100 | 1700 | | | 3157 | 3170 | 353 | | | 9.8 | 1097.87 |
| Feb-12 | D | 590 | | | 6 | | | | | | 550 | 2200 | 0.046 | | | 32000 | | | | 6.17 | | | | | 3200 | 1700 | | | | 3205 | | | | | |
| May-12 | | 560 | | | < 1.3 | | | | | | 540 | 2100 | < 0.028 | | | 32000 | | | 6.2 | 6.09 | | | | | 3100 | 1700 | | | 3236 | 3154 | 358 | | | 10.6 | 1098.26 |
| Jun-12 | | 580 | | | 16 | 16 | 1.9 | 630 | 53 | < 0.67 | 570 | 2200 | < 0.014 | 7.1 | 150 | 34000 | < 0.025 | | 6.17 | 6.13 | 8.4 | < 2.7 | < 0.28 | 30 | 3100 | 1600 | 170 | | 3257 | 3184 | 345 | | | 12.6 | 1098.44 |
| Oct-12 | | 600 | | | < 1.3 | | | | | | 550 | 2200 | < 0.014 | | | 32000 | | | 6.21 | 6.22 | | | | | 3100 | 1700 | | | 3240 | 3417 | 340 | | | 11.1 | 1097.7 |
| Mar-13 | | 580 | | | < 5 | | | | | | 510 | 2400 | 0.058 | | | 37000 | | | 6.26 | 6.59 | | | | | 3200 | 1700 | | | 3222 | | 326 | | | 9.8 | 1096.68 |
| May-13 | | 520 | | | < 1 | | | | | | 550 | 2100 | 0.053 | | | 35000 | | | 6.22 | 6.14 | | | | | 3200 | 1600 | | | 3229 | | 372 | | | 12.2 | 1098.09 |
| Jun-13 | | 510 | | | < 1 | 16 J | < 0.6 | 640 | 60 J | < 3.4 | 310 | 2200 | < 0.07 | 28 | 150 | 18000 | < 0.025 | | 6.18 | 6.11 | 6.6 | < 2 | 2 J | 29 | 3100 | 1600 | 150 | | 3147 | | 96 | | | 11.5 | 1098.83 |
| Oct-13 | | 560 | | | < 1 | | | | | | 500 | 2200 | 0.06 J | | | 34000 | | | 6.1 | 6.15 | | | | | 3100 | 1500 | | | 3490 | | 301.6 | | | 10.75 | 1097.19 |

D – Duplicate, DNR – Dept Nat. Res. sample

## Well MW-1013C Well Depth: 201.5' (dissolved concentrations)

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb-99 | | 480 | | | | | | | | | 100 | 2100 | 0.92 | | | 7200 | | | 6.3 | 6.6 | | | | | 3000 | 1300 | | None | 3170 | | | None | None | | 1095.27 |
| Apr-99 | | 430 | | | | | | | | | 75 | 2200 | 0.84 | | | 7700 | | | 6.4 | 6.6 | | | | | 3300 | 920 | | None | 3030 | | | None | None | 13.5 | 1095.73 |
| Jul-99 | | 430 | | | 83 | <50 | <21 | 570 | 50 | <4.2 | 50 | 2100 | 1.3 | <14 | 160 | 7300 | <0.050 | | 6.4 | 6.7 | 23 | 3 | <4.5 | 35 | 2700 | 870 | 660 | Slight | 3020 | | | None | Vslight | | 1096.67 |
| Oct-99 | | 400 | | | <42 | <50 | <4.2 | 610 | 50 | 7.2 | <9.4 | 2200 | 1.4 | <14 | 170 | 7600 | <0.050 | | 6.8 | 6.7 | 26 | <1.3 | <4.5 | 29 | 3000 | 2000 | 660 | None | 3300 | | | None | Moderate | 9.6 | 1096.97 |
| Jan-00 | | 510 | | | <15 | <50 | 2.1 | 550 | 58 | <4.2 | <4.7 | 2100 | 1.5 | <14 | 170 | 7300 | <0.050 | | 6.5 | 6.4 | 23 | <1.3 | 5.2 | 39 | 2900 | 1700 | 630 | None | 2700 | | | Vslight | Slight | 10.4 | 1097.1 |
| Apr-00 | | 460 | | | 14 | <50 | <3.1 | 590 | 50 | <6.2 | 11 | 2200 | 1.6 | <24 | 170 | 7800 | <0.050 | | 6.7 | 6.4 | 25 | <7.8 | <4.7 | 34 | 2900 | 1700 | 610 | None | 3370 | | 177 | None | Moderate | 8.5 | 1097.39 |
| Jul-00 | | 520 | | | <21 | <50 | <2.3 | 620 | 56 | <4.0 | <12 | 2300 | 2.2 | <9.6 | 180 | 8400 | <0.050 | | 6.3 | 6.4 | 24 | <17 | <5.5 | 45 | 3300 | 1600 | 620 | None | 3100 | 2800 | | None | Vslight | 13.8 | 1097.84 |
| Oct-00 | | 540 | | | | | | | | | <12 | 2200 | 1.6 | | | 8200 | | | 6.4 | 6.9 | | | | | 3200 | 1600 | 370 | None | 3310 | 2500 | | None | Vslight | 11.9 | 1097.86 |
| Jan-01 | | 520 | | | | | | | | | <12 | 2100 | 2.6 | | | 7800 | | | 6.3 | 6.4 | | | | | 3200 | 1600 | 480 | None | 3310 | 2800 | 80 | None | Vslight | 11.4 | 1098.03 |
| Jan-01 | D | 470 | | | | | | | | | <12 | 2000 | 2.5 | | | 7700 | | | | 6.4 | | | | | 3000 | 1600 | 470 | | | 2800 | | | | | |
| Apr-01 | | 440 | | | | | | | | | <13 | 2300 | 2.1 | | | 9100 | | | 6.3 | 6.5 | | | | | 3000 | 1600 | 330 | None | 3000 | 2700 | 84 | None | Vslight | 13.8 | 1100.12 |
| Jul-01 | | 460 | | | <15 | <50 | <1.7 | 630 | | <3.4 | <13 | 2300 | 3.2 | <7.9 | 180 | 9000 | <0.050 | | 6.3 | 6.6 | | <10 | <3.1 | | 3500 | 1600 | 570 | None | 3400 | 2800 | 30 | None | Vslight | 15 | 1099.39 |
| Oct-01 | | 480 | | | 22 | <50 | <1.7 | 550 | | <3.4 | <13 | 2000 | 2.7 | <7.9 | 160 | 8500 | <0.050 | | 6.2 | 6.5 | | <16 | 6.8 | | 3200 | 1700 | 510 | None | 3380 | 3100 | 21 | None | Vslight | 12.6 | 1099.04 |
| Jan-02 | | 510 | | | | | | | | | <13 | 2100 | 4.5 | | | 8800 | | | 6.3 | 6.5 | | | | | 3400 | 1700 | 500 | None | 3430 | 3000 | 48 | None | Slight | 11.5 | 1099.65 |
| Apr-02 | | 480 | | | | | | | | | 14 | 2100 | 3.9 | | | 8900 | | | 6.3 | 6.6 | | | | | 3200 | 1700 | 360 | None | 3420 | 3500 | 51 | None | Slight | 14.4 | 1101.39 |
| Jul-02 | | 520 | | | <27/<15 | <50 | <1.7 | | | <4.5 | <13 | 2300 | 4.1 | <7.4 | | 10000 | <0.050 | | 6.4 | 6.6 | | <15 | <4.3 | | 3500 | 1500 | 440 | None | 3400 | 3100 | 49 | Vslight | Vslight | 16.5 | 1099.76 |
| Oct-02 | | 570 | | | | | | | | | <13 | 2300 | 5.4 | | | 9900 | | | 6.4 | 6.5 | | | | | 3400 | 1600 | 480 | None | 3520 | 3000 | -46 | None | Vslight | 11.7 | 1101.33 |
| Jan-03 | | 570 | | | <27 | <50 | <1.7 | 600 | 53 | <4.5 | <13 | 2300 | 5.4 | <7.4 | 180 | 9500 | <0.050 | | 6.5 | 6.4 | | <30 | 5.7 | | 3500 | 1800 | 440 | None | 3510 | 3000 | 46 | Slight | Moderate | 11.6 | 1099.8 |
| Apr-03 | | 540 | | | | | | | | | <13 | 2200 | 4.7 | | | 9600 | | | 6.4 | 6.5 | | | | | 3500 | 1700 | 310 | None | 3450 | 3000 | 44 | Vslight | Vslight | 16.5 | 1099.98 |
| Jul-03 | | 500 | | | 17 | <50 | <2.1 | 610 | | <6.4 | <13 | 2300 | 4.2 | <10 | 180 | 9600 | <0.025 | | 6.3 | 6.5 | | <27 | <7.7 | | 3200 | 1700 | 320 | None | 3430 | 2900 | 27 | Slight | Vslight | 14.6 | 1100.31 |
| Oct-03 | | 540 | | | | | | | | | <13 | 2200 | 6.2 | | | 9800 | | | 6.4 | 6.5 | | | | | 3200 | 1700 | 400 | None | 3520 | 2950 | 16 | None | Vslight | 12.7 | 1099.27 |
| Jan-04 | | 490 | | | | | | | | | 40 | 2200 | 2.8 | | | 9100 | | | 6.3 | 6.6 | | | | | 3300 | 1700 | | None | 3510 | 2860 | 51 | None | Slight | 10.9 | 1099.18 |
| Apr-04 | | 490 | | | | | | | | | <13 | 2200 | 7.8 | | | 9700 | | | 6.7 | 6.6 | | | | | 3200 | 1600 | | None | 3520 | 2870 | 59 | Vslight | Vslight | 12.1 | 1099.81 |
| Apr-04 | DNR | | 527 | 6.25 | <0.019 | 9.9 | 15 | 0.1 | 576 | 52.4 | 5.4 | 2.3 | 2180 | 7.2 | <1 | 180 | 9830 | <0.03 | | | 6.8 | | <1 | 0.3 | | 3210 | 1840 | 454 | | | | 3210 | | | | |
| Jul-04 | | 520 | | | 16 | <25 | <1.7 | 600 | 57 | <5.1 | <13 | 2300 | 7.4 | <8.7 | 180 | 10000 | <0.025 | | 6.2 | 6.5 | 26 | <16 | <6.7 | 42 | 3200 | 1400 | 460 | None | 3490 | 2660 | 45 | None | Vslight | 14.9 | 1099.75 |
| Jul-04 | D | 490 | | | 9.7 | <25 | <1.7 | 590 | 61 | <5.1 | <13 | 2200 | 7.3 | 14 | 180 | 10000 | <0.025 | | | 6.6 | 25 | <8.0 | <6.7 | 41 | 3200 | 1600 | 460 | | | 2640 | | | | | |
| Oct-04 | | 520 | | | 17 | | | 580 | | | <13 | 2200 | 7 | | 170 | 9800 | | | 6.3 | 6.5 | | | | | 3200 | 1700 | | None | 3450 | 3120 | 50 | Slight | None | 12.1 | 1099.48 |
| Jan-05 | | 540 | | | 20 | | | | | | <13 | 2100 | 7.2 | | | 9500 | | | 6.3 | 6.6 | | | | | 3000 | 1700 | | None | 3540 | 3060 | 67 | None | Slight | 10.7 | 1099.34 |
| Apr-05 | | 520 | | | 16 | | | | | | <13 | 2200 | 8.2 | | | 10000 | | | 6.3 | 6.7 | | | | | 3100 | 1700 | | None | 3390 | 3010 | 66 | Vslight | Vslight | 12.4 | 1099.38 |
| Jul-05 | | 510 | 7.2 | 0.048 | 13 | <25 | <1.7 | 630 | | 32 | <13 | 2300 | 8.5 | <10 | 190 | 11000 | <0.025 | 200 | 6.6 | 6.5 | | <1.9 | <6.7 | | 3100 | 1800 | 460 | None | 3400 | 2910 | 17 | None | Slight | 14.1 | 1098.89 |
| Oct-05 | | 510 | | | 9.2 | | | | | | <13 | 2200 | 8.3 | | | 11000 | | | 6.7 | 6.7 | | | | | 3200 | 1700 | | None | 3410 | 2950 | 37 | Vslight | None | 11.9 | 1099.2 |
| Oct-05 | D | 500 | | | 9.4 | | | | | | <13 | 2300 | 8.7 | | | 11000 | | | | 6.7 | | | | | 3100 | 1700 | | | | 2930 | | | | | |
| Jan-06 | | 550 | | | 13 | | | | | | <13 | 2100 | 7.6 | | | 9700 | | | 6.3 | 6.7 | | | | | 3100 | 1700 | | None | 3480 | 2860 | 61 | None | Vslight | 11.4 | 1099.3 |
| Apr-06 | | 520 | 6.4 | 0.079 | 12 | <25 | <1.7 | 620 | 61 | <10 | <13 | 2300 | 8.9 | <13 | 180 | 11000 | <0.025 | | 6.2 | 6.5 | | <2.4 | <12 | | 3000 | 1600 | 470 | None | 3380 | 2550 | 51 | None | None | 12 | 1099.24 |
| Jul-06 | | 520 | | | 18 | <25 | <1.7 | 580 | 53 | <10 | 14 | 2200 | 7 | <13 | 180 | 9800 | <0.025 | | 6.1 | 6.7 | 24 | 2.7 | <12 | 43 | 3100 | 1700 | 440 | Vslight | 3300 | 2750 | 51 | None | Slight | 14.7 | 1096.2 |
| Oct-06 | | 580 | | | 15 | | | | | | <13 | 2200 | 9.1 | | | 11000 | | | 6.7 | 6.6 | | | | | 3000 | 1600 | | None | 3390 | 2790 | 16 | None | Slight | 12.4 | 1097.94 |
| Jan-07 | | 540 | | | 9 | | | | | | <13 | 2300 | 9.5 | | | 11000 | | | 6.6 | 7 | | | | | 3000 | 1700 | | None | 3460 | 2780 | 68 | None | Vslight | 10.7 | 1098.06 |
| Apr-07 | | 560 | | | 16 | | | | | | <13 | 2300 | 9.3 | | | 11000 | | | 6.2 | 6.4 | | | | | 3100 | 1700 | | None | 3320 | 2710 | 51 | None | None | 12.5 | 1098.24 |
| Jun-07 | | 590 | | | 22 | <25 | <1.7 | 600 | 60 | <10 | <13 | 2200 | 11 | 15 | 170 | 10000 | <0.025 | | 6.4 | 6.7 | 25 | <2.4 | <12 | 38 | 3100 | 1700 | 470 | None | NA | 2660 | 71 | None | Vslight | 14.2 | 1097.64 |
| Oct-07 | | 570 | | | 16 | | | | | | <13 | 2300 | 9.7 | | | 11000 | | | 6.3 | 6.5 | | | | | 3100 | 1800 | | None | 3108 | 3030 | 56 | None | None | 14.6 | 1097.98 |
| Jan-08 | | 590 | | | 22 | | | | | | <13 | 2100 | 9.1 | | | 10000 | | | 6.5 | 7.3 | | | | | 3200 | 1800 | | None | 3203 | 2900 | 58 | None | Vslight | 10.6 | 1098.85 |
| Apr-08 | | 530 | | | 16 | | | | | | <13 | 2200 | 9.6 | | | 11000 | | | 6.4 | 6.8 | | | | | 3200 | 1600 | | Slight | 3156 | 3160 | 29 | None | Slight | 12.5 | 1099.98 |
| Jun-08 | | 480 | | | 18 | <25 | 1.8 | 610 | 60 | <10 | <13 | 2200 | 10 | <13 | 170 | 10000 | <0.025 | | 6.4 | 6.8 | 22 | <2.4 | <12 | 28 | 3100 | 1700 | 450 | None | 3288 | 3040 | 36 | None | None | 14.3 | 1100 |
| Oct-08 | | 530 | | | 17 | | | | | | <13 | 2200 | 9.4 | | | 10000 | | | 6.5 | 6.5 | | | | | 3000 | 1700 | | None | 3163 | 2930 | 50 | None | Slight | 12.7 | 1097.61 |
| Jan-09 | | 520 | | | 17 | | | | | | <13 | 2100 | 10 | | | 10000 | | | 6.3 | 6.4 | | | | | 3100 | 1600 | | None | 3277 | 2920 | 51 | None | Vslight | 9.6 | 1098.87 |
| Apr-09 | | 500 | | | 15 | | | | | | <1.3 | 2100 | 9.8 | | | 9100 | | | 6.3 | 6.4 | | | | | 3100 | 1500 | | None | 3241 | 2660 | | None | None | 12.2 | 1097.96 |
| Apr-09 | D | 460 | | | 14 | | | | | | <1.3 | 2700 | 13 | | | 12000 | | | 6.4 | 6.4 | | | | | 3100 | 1700 | | | 3265 | 2620 | 55 | | | 12.2 | |
| Jun-09 | | 550 | | | 18 | <25 | <1.7 | 560 | 91 | <10 | <13 | 2000 | 9.8 | <13 | 260 | 9800 | <0.025 | | 6.4 | 6.1 | 20 | <24 | <12 | 36 | 3100 | 1900 | 450 | None | 3251 | 3110 | 51 | None | Slight | 14.2 | 1098.14 |
| Oct-09 | | 510 | | | 15 | | | | | | <0.31 | 2100 | 9.8 | | | 10000 | | | 6.3 | 6 | | | | | 3000 | 1700 | | Vslight | 3289 | 3150 | 63 | None | Slight | 12.6 | 1097.8 |
| Jan-10 | | 440 | | | 18 | | | | | | <1.3 | 2000 | 9.2 | | | 9300 | | | 6.46 | 6.61 | | | | | 3100 | 1700 | | None | 3249 | 3160 | 54 | None | Moderate | 11.7 | 1098.23 |
| Apr-10 | | 550 | | | 16 | | | | | | <13 | 2100 | 11 | | | 10000 | | | 6.39 | 6.49 | | | | | 3100 | 1600 | | None | 3280 | 3050 | 57 | None | Slight | 13.4 | 1097.76 |
| Jun-10 | | 620 | | | 23 | <5 | <1.7 | 550 | 64 | <11 | <13 | 2000 | 9.3 | <13 | 150 | 9800 | <0.025 | | 6.37 | 6.29 | 30 | <2.4 | <14 | 34 | 3000 | 1600 | 400 | None | 3245 | 3030 | 44 | None | Vslight | 14.1 | 1099.95 |
| Oct-10 | | 540 | | | 18 | | | | | | <13 | 2200 | 12 | | | 11000 | | | 6.37 | 6.41 | | | | | 3000 | 1600 | | None | 2511 | 3256 | 46 | None | Vslight | 12.9 | 1100.78 |
| Feb-11 | | 550 | | | 22 | | | | | | <13 | 2000 | 10 | | | 10000 | | | | 6.44 | | | | | 3000 | 1600 | | | | 3190 | | | | | |
| Apr-11 | | 560 | | | 20 | | | | | | <13 | 2000 | 11 | | | 10000 | | | | 6.42 | | | | | 3000 | 1600 | | | | 3239 | | | | | |

**Well MW-1013C Well Depth: 201.5' (dissolved concentrations)**

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jul-11 | | 520 | | | 20 | 20 | <0.12 | 610 | 76 | <0.67 | <1.5 | 2300 | 12 | 2.5 | 170 | 9900 | <0.025 | | 6.24 | 6.38 | 32 | <12 | <0.28 | | 3000 | 1600 | 410 | None | 3054 | 3292 | 70 | None | Slight | 16.4 | 1101.68 |
| Oct-11 | | 520 | | | 16 | | | | | | <0.73 | 2100 | 11 | | | 9400 | | | | 6.35 | | | | | 3100 | 1600 | | | | 3198 | | | | | |
| Feb-12 | | 510 | | | 20 | | | | | | 9.9 | 2200 | 13 | | | 9500 | | | 6.34 | 6.36 | | | | | 3100 | 1700 | | | 3169 | 3225 | 72 | | | 11.4 | 1099.83 |
| May-12 | | 500 | | | 10 | | | | | | 6.7 | 2000 | 12 | | | 9600 | | | 6.41 | 6.28 | | | | | 3000 | 1700 | | | 3220 | 3217 | 57 | | | 11.5 | 1100.12 |
| Jun-12 | | 560 | | | 6.3 | 18 | < 0.6 | 570 | 66 | < 0.67 | 5 | 2100 | 11 | 3.6 | 160 | 10000 | < 0.025 | | 6.38 | 6.34 | 31 | < 2.7 | < 0.28 | 32 | 3000 | 1700 | 350 | | 3234 | 3172 | 40 | | | 13.7 | 1100.99 |
| Oct-12 | | 560 | | | 20 | | | | | | 9.5 | 2200 | 13 | | | 8800 | | | 6.42 | 6.39 | | | | | 3100 | 1700 | | | 3250 | 3284 | 41 | | | 11.5 | 1099.48 |
| Mar-13 | | 550 | | | 20 | | | | | | 8.1 | 2300 | 13 | | | 9900 | | | 6.34 | 6.2 | | | | | 3000 | 1600 | | | 3157 | | 51 | | | 12.2 | 1098.53 |
| May-13 | | 540 | | | 15 | | | | | | 6.4 | 2100 | 12 | | | 9100 | | | 6.32 | 6.37 | | | | | 3100 | 1500 | | | 3202 | | 37 | | | 13.6 | 1100.47 |
| Jun-13 | | 530 | | | 19 | 21 J | < 0.6 | 600 | 71 J | < 3.4 | 9.3 J | 2200 | 15 | 12 J | 170 | 10000 | < 0.025 | | 6.39 | 6.28 | 27 | < 2 | 1.7 J | 35 | 3100 | 1600 | 390 | | 3162 | | 91 | | | 14.1 | 1100.81 |
| Oct-13 | | 100 | | | 18 | | | | | | < 1 | 2000 | 13 | | | 9700 | | | 6.31 | 6.5 | | | | | 3200 | 1500 | | | 3192 | | 138 | | | 9.61 | 1099.24 |

D – Duplicate, DNR – Dept Nat. Res. sample

## Well MW-1014 (dissolved concentrations)

| Date | Alk (mg CaCO3/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Dry |
| Jul-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Dry |
| Oct-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1111.6 |
| Jan-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1112.07 |
| Apr-00 | | | Well not recovered sufficiently to collect groundwater sample. | | | | | | | | | | | | | | | | | | | | | | | 160 | | | | 1112.41 |
| Jul-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1113 |
| Oct-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1113.98 |
| Jan-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1113.86 |
| Apr-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1114.62 |
| Jul-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1115.67 |
| Oct-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1116.86 |
| Jan-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1116.91 |
| Apr-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1117.24 |
| Jul-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1117.37 |
| Oct-02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1118.56 |
| Jan-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1119.07 |
| Apr-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1118.91 |
| Oct-03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1119.25 |
| Jan-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1118.37 |
| Apr-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1117.83 |
| Jul-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1118.45 |
| Oct-04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1119.12 |
| Jan-05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1118.5 |
| Jul-05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oct-05 | 170 | <0.85 | | | | | | <13 | 350 | <0.33 | | | 1300 | | 7.1 | 6.78 | | | | | 500 | 200 | | None | 726 | 688 | 202 | None | None | 11 | 1117.7 |
| Jan-06 | 170 | <0.85 | | | | | | <13 | 310 | <0.33 | | | 1100 | | 6.9 | 6.5 | | | | | 540 | 190 | | None | 748 | 696 | 261 | None | None | 9.9 | 1117.27 |
| Apr-06 | 150 | <1.0 | 40 | <1.7 | 91 | 30 | <10 | 36 | 340 | <0.33 | <13 | 28 | 1200 | <0.025 | 6.5 | 6.3 | | <2.4 | <12 | | 410 | 170 | 79 | None | 677 | 630 | 271 | None | None | 10.4 | 1117.25 |
| Jul-06 | 170 | <1.0 | <25 | <1.7 | 84 | 26 | <10 | 26 | 320 | <0.33 | <13 | 28 | 940 | <0.025 | 6.54 | 6.59 | 3.7 | <2.4 | <12 | 20 | 490 | 180 | 59 | None | 713 | 661 | 175 | None | None | 12.1 | 1117.53 |
| Oct-06 | 170 | <1.0 | | | | | | <13 | 350 | <0.33 | | | 880 | | 6.7 | 6.8 | | | | | 430 | 180 | | None | 739 | 647 | 165 | None | None | 10.7 | 1117.45 |
| Jan-07 | 170 | 2.1 | | | | | | 39 | 330 | <0.33 | | | 1300 | | 6.8 | 6.63 | | | | | 420 | 170 | | None | 710 | 644 | 218 | None | None | 11.5 | 1117.15 |
| Apr-07 | 170 | 1.1 | | | | | | 17 | 350 | <0.033 | | | 610 | | 6.2 | 6.39 | | | | | 420 | 180 | | None | 677 | 602 | 188 | None | None | NA | 1116.26 |
| Jun-07 | 180 | 1.8 | 31 | <1.7 | 70 | 24 | <10 | <13 | 260 | <0.33 | <13 | 22 | 310 | <0.025 | 6.4 | 6.67 | 3.8 | <2.4 | <12 | 16 | 450 | 170 | <50 | None | 701 | 624 | 187 | None | None | 13.4 | 1115.87 |
| Jun-07 D | 190 | 2.8 | 39 | <1.7 | 86 | 24 | <10 | 15 | 330 | <0.33 | <13 | 27 | 380 | <0.025 | | 6.61 | 3.8 | <2.4 | <12 | 20 | 430 | 170 | <50 | | | | | | | | |
| Oct-07 | 190 | <1.0 | | | | | | 33 | 350 | <0.33 | | | 580 | | 6.4 | 7.89 | | | | | 470 | 180 | | None | 739 | 740 | 220 | None | None | 12.3 | 1115.95 |
| Jan-08 | 170 | <1.0 | | | | | | <13 | 310 | <0.33 | | | 800 | | 6.3 | 7.38 | | | | | 480 | 160 | | None | 661 | 672 | 188 | None | None | 9.6 | 1117.28 |
| Apr-08 | 180 | <1.0 | | | | | | <13 | 320 | <0.33 | | | 260 | | 6.3 | 6.46 | | | | | 490 | 160 | | None | 683 | 745 | 149 | None | None | 11.9 | 1116.86 |
| Jun-08 | 160 | <1.5 | 35 | 0.25 | 83 | 27 | <0.88 | 22 | 310 | <0.0050 | <13 | 26 | 830 | <0.025 | 6.3 | 6.44 | 3.5 | <1.8 | 1.2 | 14 | 410 | 140 | 12 | None | 676 | 662 | 167 | None | None | 11.7 | 1118.17 |
| Oct-08 | 190 | <2.4 | | | | | | 14 | 320 | <0.33 | | | 310 | | 6.4 | 6.37 | | | | | 540 | 180 | | None | 739 | 706 | 165 | None | None | 12.5 | 1117.04 |
| Jan-09 | 160 | <2.4 | | | | | | <13 | 320 | <0.33 | | | 260 | | 6.4 | 6.31 | | | | | 540 | 140 | | None | 729 | 707 | 196 | None | None | 8.7 | 1118.33 |
| Apr-09 | 170 | <2.4 | | | | | | 6.3 | 300 | <0.033 | | | 330 | | 6.4 | 6.46 | | | | | 470 | 160 | | None | 711 | 655 | 166 | None | None | 8.7 | 1117.03 |
| Jun-09 | 170 | <2.4 | 34 | <1.7 | 76 | 30 | <10 | 30 | 290 | <0.033 | <13 | 24 | 320 | <0.025 | 6.3 | 6.11 | 3 | <3.1 | <12 | 19 | 460 | 170 | <50 | None | 710 | 715 | 176 | None | None | 11.6 | 1117.02 |
| Oct-09 | 170 | <2.4 | | | | | | 7.1 | 310 | <0.0037 | | | 270 | | 6.3 | 6.33 | | | | | 440 | 170 | | None | 735 | 747 | 167 | None | None | 10.1 | 1117.09 |
| Jan-10 | 120 | <2.4 | | | | | | 4.2 | 300 | 0.066 | | | 120 | | 6.45 | 6.53 | | | | | 480 | 140 | | None | 691 | 730 | 161 | None | None | 8.6 | 1116.71 |
| Apr-10 | 170 | <2.4 | | | | | | <13 | 310 | <0.033 | | | 170 | | 6.38 | 6.4 | | | | | 460 | 150 | | None | 718 | 707 | 189 | None | None | 10.7 | 1115.93 |
| Jun-10 | 190 | <1.3 | 57 | <1.7 | 76 | 28 | <11 | <13 | 290 | <0.05 | <13 | 24 | 140 | <0.025 | 6.44 | 6.42 | 3.5 | 3 | <14 | 23 | 450 | 140 | <50 | None | 691 | 712 | 162 | None | None | 12.5 | 1116.51 |
| Oct-10 | 160 | <1.3 | | | | | | <13 | 310 | <0.5 | | | 520 | | 6.42 | 6.28 | | | | | 400 | 130 | | None | 488 | 661 | 167 | None | None | 10.7 | 1118.04 |
| Feb-11 | 260 | <1.3 | | | | | | <13 | 290 | 0.74 | | | 1900 | | | 6.56 | | | | | 420 | 110 | | | | 779 | | | | | |
| Apr-11 | 190 | 2 | | | | | | 15 | 260 | 0.32 | | | 3700 | | | 6.42 | | | | | 410 | 120 | | | | 696 | | | | | |
| Jul-11 | 170 | 2 | 68 | <0.12 | 79 | 36 | <0.67 | 6.3 | 300 | 0.046 | <1.4 | 26 | 1600 | <0.025 | 6.34 | 6.23 | 3.2 | <12 | <0.28 | | 440 | 120 | 7.2 | None | 638 | 663 | 148 | None | None | 11.8 | 1123.51 |
| Oct-11 | 190 | <1.3 | | | | | | 1.6 | 310 | <0.014 | | | 660 | | | 6.44 | | | | | 460 | 140 | | | | 689 | | | | | |
| Feb-12 | 180 | < 1.3 | | | | | | 9.2 | 320 | < 0.014 | | | 1200 | | 6.49 | 6.45 | | | | | 430 | 130 | | | 684 | 707 | 287 | | | 8.8 | 1120.98 |
| May-12 | 170 | < 1.3 | | | | | | 7 | 310 | < 0.014 | | | 1000 | | 6.38 | 6.16 | | | | | 440 | 130 | | | 670 | 680 | 278 | | | 9.3 | 1120.13 |
| Jun-12 | 170 | < 1.3 | 52 | 0.22 | 78 | 38 | < 0.67 | 7.1 | 300 | < 0.014 | 3.5 | 26 | 1300 | < 0.025 | 6.35 | 6.38 | 3.7 | < 2.7 | < 0.28 | 17 | 380 | 120 | 7 | | 664 | 701 | 297 | | | 10.5 | 1120.6 |
| Oct-12 | 190 | < 1.3 | | | | | | 4.1 | 330 | < 0.014 | | | 600 | | 6.49 | 6.44 | | | | | 420 | 130 | | | 686 | 719 | 255 | | | 10.7 | 1120.8 |
| Mar-13 | 180 | < 1 | | | | | | 3.6 | 310 | < 0.014 | | | 520 | | 6.46 | 6.4 | | | | | 420 | 120 | | | 691 | | 205 | | | 9.1 | 1118.33 |

**Well MW-1014 (dissolved concentrations)**

| Date | Alk (mg CaCO3/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (°C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May-13 | 160 | < 1 | | | | | | 5 | 290 | < 0.014 | | | 830 | | 6.63 | 6.34 | | | | | 400 | 120 | | | 673 | | 275 | | | 10.5 | 1117.71 |
| Jun-13 | 150 | < 1 | 44 | < 0.12 | 82 | 38 | < 0.67 | 6.4 | 320 | 0.014 J | < 1.4 | 27 | 2100 | < 0.025 | 6.49 | 6.14 | 3.6 | < 2 | 0.95 | 17 | 440 | 110 | 7.8 J | | 633 | | 57 | | | 10.1 | 1118.1 |
| Oct-13 | 170 | < 1 | | | | | | 4.6 | 300 | < 0.018 | | | 990 | | 6.31 | 6.33 | | | | | 420 | 120 | | | 735 | | 295.8 | | | 9.49 | 1118.83 |

D – Duplicate, DNR – Dept Nat. Res. sample

## Well MW-1014A Well Depth: 63.9' (dissolved concentrations)

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp( (deg C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1103.93 |
| Jul-99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1106.42 |
| Oct-99 | | | | | Previous to April 2000, well not recovered sufficiently to collect groundwater sample. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1107.87 |
| Jan-00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1109.22 |
| Apr-00 | | 390 | | | 15 | 59 | <3.1 | 330 | <50 | <6.2 | <6.0 | 1300 | 0.55 | <24 | 120 | 7200 | <0.050 | | 6.9 | 6.6 | 12 | <7.8 | <4.7 | 34 | 1800 | 970 | <120 | None | 2220 | | 165 | None | None | 11.2 | 1109.24 |
| Jul-00 | | 430 | | | <21 | 58 | <2.3 | 360 | <25 | 12 | <12 | 1400 | 1.2 | <9.6 | 130 | 7100 | <0.050 | | 6.6 | 6.6 | 12 | <17 | <5.5 | 35 | 2200 | 960 | <120 | None | 2000 | 2000 | | None | None | 15.4 | 1110.5 |
| Oct-00 | | 430 | | | | | | | | | <12 | 1400 | 0.96 | | | 6700 | | | 6.7 | 6.9 | | | | | 2300 | 880 | <120 | None | 2250 | 1800 | | None | Vslight | 14.1 | 1111.39 |
| Jan-01 | | 410 | | | | | | | | | <12 | 1200 | 0.83 | | | 5400 | | | 6.5 | 6.6 | | | | | 1900 | 970 | <120 | None | 2310 | 1900 | 113 | Slight | Vslight | NA | 1111.59 |
| Apr-01 | | 430 | | | | | | | | | <13 | 1400 | 0.69 | | | 6700 | | | 6.3 | 6.7 | | | | | 1700 | 920 | <120 | None | 2300 | 1900 | 138 | None | Slight | 12.1 | 1112.51 |
| Jul-01 | | 420 | | | <15 | <50 | <1.7 | 370 | | 5.3 | <13 | 1500 | 0.7 | <7.9 | 130 | 6500 | <0.050 | | 6.2 | 6.6 | | <10 | <3.1 | | 2000 | 960 | <120 | None | 2250 | 2000 | 147 | None | Slight | 17.4 | 1112.88 |
| Oct-01 | | 430 | | | 37 | <50 | <1.7 | 330 | | <3.4 | <13 | 1300 | 1.5 | <7.9 | 110 | 6000 | <0.050 | | 6.3 | 6.7 | | <16 | <3.1 | | 1900 | 1000 | <120 | None | 2280 | 2200 | 152 | Vslight | Slight | 14.3 | 1114.03 |
| Jan-02 | | 460 | | | | | | | | | <13 | 1300 | 0.65 | | | 5900 | | | 6.6 | 6.7 | | | | | 2100 | 1000 | <120 | None | 2280 | 2000 | 170 | Vslight | None | 13.5 | 1114.51 |
| Apr-02 | | 410 | | | | | | | | | 16 | 1400 | 0.51 | | | 5900 | | | 6.8 | 6.7 | | | | | 1900 | 1000 | <120 | None | 2250 | 2200 | 155 | None | Slight | 11.5 | 1115.15 |
| Jul-02 | | 460 | | | <27/<15 | <50 | <1.7 | | | <4.5 | <13 | 1400 | 0.38 | <7.4 | | 6100 | <0.050 | | 6.5 | 6.6 | | <15 | 4.8 | | 2100 | 910 | <120 | None | 2280 | 2100 | 177 | None | Vslight | 15.1 | 1114.8 |
| Jul-02 | D | 480 | | | <27/<15 | <50 | <1.7 | | | <4.5 | <13 | 1500 | 0.42 | <7.4 | | 6400 | <0.050 | | | 6.6 | | <15 | 4.3 | | 2200 | 910 | <120 | | | 2100 | | | | | |
| Oct-02 | | 470 | | | | | | | | | <13 | 1400 | 0.54 | | | 5700 | | | 6.5 | 6.7 | | | | | 1800 | 930 | <120 | None | 2370 | 2100 | 86 | None | None | 12.7 | 1115.5 |
| Jan-03 | | 480 | | | <27 | <50 | <1.7 | 350 | <20 | <4.5 | <13 | 1400 | 0.54 | <7.4 | 120 | 5300 | <0.050 | | 6.5 | 6.6 | | <30 | <4.3 | | 2100 | 1000 | <120 | None | 2370 | 2000 | 198 | None | Vslight | 12 | 1116.36 |
| Apr-03 | | 500 | | | | | | | | | <13 | 1400 | <0.29 | | | 4600 | | | 6.4 | 6.7 | | | | | 2000 | 930 | <120 | None | 2280 | 2100 | 156 | None | None | 14.3 | 1116.82 |
| Jul-03 | | 420 | | | <2.6 | 27 | <2.1 | 340 | | <6.4 | <13 | 1400 | 0.32 | <10 | 120 | 4200 | <0.025 | | 6.6 | 6.9 | | <2.7 | <7.7 | | 1900 | 910 | <50 | None | 2230 | 1900 | 206 | None | Vslight | 13.6 | 1116.45 |
| Oct-03 | | 440 | | | | | | | | | <13 | 1400 | 1 | | | 3000 | | | 6.6 | 6.8 | | | | | 2000 | 980 | 77 | None | 2310 | 2080 | 218 | None | Vslight | 12.9 | 1116.5 |
| Jan-04 | | 490 | | | | | | | | | <13 | 1300 | 1 | | | 3100 | | | 6.6 | 6.79 | | | | | 2000 | 1000 | | None | 2310 | 1951 | 185 | None | None | 7 | 1116.08 |
| Apr-04 | | 470 | | | | | | | | | <13 | 1300 | 0.13 | | | 3100 | | | 6.8 | 6.72 | | | | | 1800 | 910 | | None | 2250 | 1942 | 211 | None | Slight | 9.5 | 1116.64 |
| Apr-04 | DNR | 463 | 0.024 | <0.19 | <1 | 20 | 1.05 | 331 | 10.9 | 1.5 | 6 | 1320 | 0.1 | <1 | 119 | 3050 | <0.03 | | | 7 | | <1 | <0.1 | | 1920 | 1040 | <16 | | | 2190 | | | | | |
| Jul-04 | | 440 | | | <2.6 | 25 | <1.7 | 340 | 15 | <5.1 | <13 | 1400 | 0.43 | <8.7 | 120 | 2100 | <0.025 | | 6.7 | 6.66 | 11 | <8.0 | <6.7 | 52 | 1900 | 940 | <50 | None | 2250 | 1810 | 175 | None | None | 17.1 | 1115.52 |
| Oct-04 | | 490 | | | 2.9 | | | 320 | | | <13 | 1300 | <0.33 | | 110 | 2000 | | | 6.7 | 6.64 | | | | | 1800 | 930 | | None | 2220 | 2100 | 184 | None | Slight | 12.6 | 1114.83 |
| Jan-05 | | 480 | | | 2.3 | | | | | | <13 | 1300 | <0.33 | | | 2000 | | | 6.7 | 6.89 | | | | | 1800 | 990 | | None | 2330 | 1980 | 246 | None | Vslight | 8.9 | 1115.84 |
| Apr-05 | | 440 | | | 1.9 | | | | | | <13 | 1300 | <0.33 | | | 2000 | | | 6.6 | 6.92 | | | | | 1800 | 1000 | | None | 2250 | 1760 | 276 | None | Vslight | 10 | 1115.68 |
| Jul-05 | | 500 | 0.059 | 0.044 | 1.2 | <25 | <1.7 | 340 | | 8.1 | <13 | 1300 | <0.33 | 13 | 120 | 1400 | <0.025 | 13 | 6.8 | 6.59 | | <7.4 | 14 | | 1800 | 1000 | <50 | None | 2170 | 1920 | 269 | None | None | 14.1 | 1114.86 |
| Oct-05 | | 450 | | | <0.85 | | | | | | <13 | 1300 | <0.33 | | | 1500 | | | 6.7 | 6.85 | | | | | 1800 | 890 | | None | 2270 | 1890 | 213 | None | None | 11.2 | 1114.97 |
| Jan-06 | | 480 | | | <0.85 | | | | | | 17 | 1200 | <0.33 | | | 1500 | | | 6.8 | 6.72 | | | | | 1800 | 970 | | None | 2390 | 1910 | 252 | None | None | 11.2 | 1114.81 |
| Apr-06 | | 440 | 0.038 | 0.059 | <1.0 | <25 | <1.7 | 340 | 17 | <10 | 22 | 1300 | <0.33 | <13 | 120 | 2100 | <0.025 | | 6.4 | 6.63 | | <2.4 | <12 | | 1700 | 880 | 55 | None | 2200 | 1680 | 268 | None | None | 11.5 | 1114.95 |
| Jul-06 | | 450 | | | <1.0 | <25 | <1.7 | 320 | <18 | <10 | 31 | 1300 | <0.33 | <13 | 120 | 1400 | <0.025 | | 6.6 | 6.65 | 9.6 | 2.8 | <12 | 58 | 1800 | 1000 | 57 | None | 2190 | 1820 | 190 | None | None | 12.8 | 1114.77 |
| Oct-06 | | 480 | | | <1.0 | | | | | | <13 | 1400 | <0.66 | | | 820 | | | 6.7 | 6.79 | | | | | 1800 | 1000 | | None | 2290 | 1860 | 176 | None | None | 10.6 | 1114.6 |
| Jan-07 | | 470 | | | <1.0 | | | | | | <13 | 1300 | <0.33 | | | 780 | | | 6.6 | 6.8 | | | | | 1700 | 1000 | | None | 3150 | 1860 | 254 | None | Slight | 9.3 | 1111.42 |
| Apr-07 | | 470 | | | 3.7 | | | | | | <13 | 1400 | 0.53 | | | 920 | | | 6.2 | 6.63 | | | | | 1800 | 950 | | None | 2180 | 1849 | 180 | None | None | 9.8 | 1113.98 |
| Jun-07 | | 490 | | | 4.4 | <25 | <1.7 | 330 | 15 | <10 | <13 | 1300 | <0.33 | <13 | 110 | 640 | <0.025 | | 6.5 | 6.82 | 10 | <2.4 | <12 | 60 | 1800 | 1000 | <50 | None | 2187 | 1785 | 182 | None | None | 13.1 | 1113.49 |
| Oct-07 | | 560 | | | <1.0 | | | | | | <13 | 1400 | <0.33 | | | 890 | | | 6.6 | 7.87 | | | | | 1900 | 940 | | None | 2175 | 1980 | 218 | None | Vslight | 12.7 | 1113.14 |
| Oct-07 | D | 510 | | | 1.5 | | | | | | 27 | 1400 | <0.33 | | | 880 | | | | 7.84 | | | | | 1800 | 860 | | | | 2030 | | | | | |
| Jan-08 | | 490 | | | <1.0 | | | | | | <13 | 1300 | <0.33 | | | 940 | | | 6.6 | 7.81 | | | | | 1900 | 940 | | None | 2202 | 2030 | 189 | None | None | 9.5 | 1114.15 |
| Apr-08 | | 480 | | | 1.2 | | | | | | <13 | 1700 | <0.33 | | | 1100 | | | 6.6 | 6.74 | | | | | 1900 | 880 | | None | 2202 | 2170 | 142 | None | None | 10.8 | 1114.25 |
| Jun-08 | | 530 | | | 2 | <25 | <1.7 | 330 | 13 | <10 | <13 | 1300 | <0.33 | <13 | 120 | 410 | <0.025 | | 6.6 | 6.72 | 8 | <2.4 | <12 | 40 | 1900 | 910 | <50 | None | 2211 | 2100 | 167 | None | None | 11.2 | 1114.85 |
| Oct-08 | | 470 | | | <2.4 | | | | | | <13 | 1300 | <0.33 | | | 590 | | | 6.6 | 6.51 | | | | | 2000 | 970 | | None | 2185 | 2050 | 162 | None | None | 11.5 | 1119.04 |
| Jan-09 | | 490 | | | <2.4 | | | | | | <13 | 1300 | <0.33 | | | 560 | | | 6.6 | 6.54 | | | | | 2100 | 1000 | | None | 2138 | 2080 | 192 | None | None | 9.5 | 1115.84 |
| Apr-09 | | 470 | | | <2.4 | | | | | | 4.8 | 1200 | <0.033 | | | 210 | | | 6.6 | 6.58 | | | | | 1900 | 1100 | | None | 2203 | 1880 | 162 | None | None | 9.1 | 1114.88 |
| Jun-09 | | 500 | | | 4.1 | <25 | <1.7 | 300 | <50 | <10 | 18 | 1200 | 0.12 | <13 | 110 | 200 | <0.025 | | 6.3 | 6.5 | 6.3 | <3.1 | <12 | 62 | 1900 | 970 | <50 | None | 2195 | 2150 | 180 | None | None | 11 | 1114.7 |
| Oct-09 | | 490 | | | <2.4 | | | | | | 19 | 1300 | 0.076 | | | 330 | | | 6.5 | 6.3 | | | | | 1800 | 940 | | None | 2173 | 2180 | 173 | None | None | 11 | 1114.28 |
| Jan-10 | | 400 | | | <2.4 | | | | | | 7.6 | 1200 | <0.033 | | | 190 | | | 6.67 | 6.71 | | | | | 1900 | 1100 | | None | 2167 | 2150 | 158 | None | None | 8.8 | 1113.9 |
| Apr-10 | | 450 | | | <2.4 | | | | | | <13 | 1300 | <0.033 | | | 140 | | | 6.55 | 6.62 | | | | | 1800 | 870 | | None | 2216 | 2140 | 198 | None | None | 11 | 1113.52 |
| Jun-10 | | 510 | | | 3.7 | <25 | <1.7 | 320 | 13 | <11 | <13 | 1300 | <0.05 | <13 | 110 | 130 | <0.025 | | 6.59 | 6.45 | 12 | <2.4 | <14 | 63 | 1800 | 1000 | <50 | None | 2186 | 2100 | 158 | None | None | 12.1 | 1113.64 |
| Oct-10 | | 490 | | | <1.3 | | | | | | <13 | 1300 | <0.5 | | | 130 | | | 6.56 | 6.59 | | | | | 1800 | 630 | | None | 1595 | 2224 | 159 | None | None | 10.9 | 1114.4 |
| Feb-11 | | 490 | | | 3.7 | | | | | | <13 | 1300 | 0.016 | | | 210 | | | | 6.58 | | | | | 1800 | 960 | | | | 2231 | | | | | |
| Apr-11 | | 480 | | | 2.1 | | | | | | 14 | 1200 | <0.05 | | | 180 | | | | 6.6 | | | | | 1800 | 990 | | | | 2221 | | | | | |
| Jul-11 | | 500 | | | 2.4 | 16 | <0.12 | 320 | <25 | <0.67 | 2.1 | 1300 | 0.11 | <1.4 | 13 | 130 | <0.025 | | 6.52 | 6.5 | 12 | <12 | <0.28 | | 1900 | 980 | 13 | None | 2164 | 2238 | 226 | None | None | 14.3 | 1119.85 |
| Oct-11 | | 490 | | | <1.3 | | | | | | 4.2 | 1300 | 0.023 | | | 260 | | | | 6.53 | | | | | 1900 | 1000 | | | | 2183 | | | | | |
| Feb-12 | | 450 | | | 8.2 | | | | | | 12 | 1300 | < 0.014 | | | 390 | | | 6.66 | 6.49 | | | | | 1900 | 1100 | | | 2189 | 2183 | 279 | | | 9.2 | 1118.66 |

**Well MW-1014A Well Depth: 63.9' (dissolved concentrations)**

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp( (deg C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May-12 | | 440 | | | < 2.6 | | | | | | 7.1 | 1300 | < 0.014 | | | 95 | | | 6.53 | 6.81 | | | | | 1900 | 930 | | | 2178 | 2169 | 242 | | | 10.7 | 1117.79 |
| May-12 | D | 500 | | | < 2.6 | | | | | | 7.4 | 1300 | < 0.014 | | | 97 | | | | 6.47 | | | | | 1800 | 940 | | | | 2132 | | | | | |
| Jun-12 | | 500 | | | < 1.3 | 15 | 0.25 | 310 | < 25 | < 0.67 | 6 | 1300 | < 0.028 | 1.9 | 120 | 38 | < 0.025 | | 6.56 | 6.49 | 13 | < 2.7 | < 0.28 | 56 | 1800 | 1200 | 7.2 | | 2179 | 2179 | 288 | | | 11.7 | 1117.63 |
| Oct-12 | | 480 | | | < 1.3 | | | | | | 12 | 1500 | < 0.014 | | | 160 | | | 6.55 | 6.55 | | | | | 1800 | 930 | | | 2197 | 2326 | 286 | | | 11 | 1118.09 |
| Mar-13 | | 430 | | | < 2 | | | | | | 10 | 1300 | < 0.014 | | | 360 | | | 6.63 | 6.55 | | | | | 1900 | 890 | | | 2180 | | 272 | | | 9.2 | 1116.13 |
| May-13 | | 420 | | | < 1 | | | | | | 6.5 | 1300 | < 0.014 | | | 53 | | | 6.6 | 6.53 | | | | | 1800 | 970 | | | 2251 | | 283 | | | 12.3 | 1115.45 |
| Jun-13 | | 430 | | | < 1 | 17 | < 0.12 | 330 | < 25 | < 0.67 | 5.9 | 1300 | < 0.014 | 1.9 J | 130 | 16 | < 0.025 | | 6.58 | 6.4 | 11 | < 2 | 0.35 J | 60 | 1900 | 1000 | 7.6 J | | 2155 | | 80 | | | 10.5 | 1115.44 |
| Oct-13 | | 450 | | | < 1 | | | | | | 3.8 | 1200 | 0.045 J | | | 81 | | | 6.48 | 6.62 | | | | | 1900 | 800 | | | 2213 | | 300 | | | 8.67 | 1115.77 |

D – Duplicate, DNR – Dept Nat. Res. sample

## Well MW-1014B Well Depth: 104.9' (dissolved concentrations)

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (deg C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan-99 | | 510 | | | | | | | | | 810 | 2100 | 0.062 | | | 23000 | | | 6.2 | 6.3 | | | | | 2900 | 1200 | | None | 3280 | | | None | Slight | | 1105.62 |
| Apr-99 | | 460 | | | | | | | | | 420 | 2100 | 0.033 | | | 23000 | | | 6.2 | 6.4 | | | | | 3300 | 770 | | None | 2890 | | | None | None | 14.2 | 1106.23 |
| Jul-99 | | 540 | | | 70 | <50 | 31 | 580 | 49 | 13 | 520 | 2100 | 0.072 | <14 | 170 | 23000 | <0.050 | | 6.3 | 6.4 | 25 | 2.2 | <45 | 93 | 3100 | 580 | 2500 | None | 3540 | | | None | Moderate | 17.4 | 1107.13 |
| Oct-99 | | 570 | | | <42 | <50 | 10 | 640 | 43 | 7.4 | 530 | 2200 | <0.010 | <14 | 150 | 23000 | <0.050 | | 6.4 | 6.5 | 17 | 1.4 | <4.5 | 24 | 3100 | 1600 | 5000 | None | 3200 | | | None | Moderate | 12.1 | 1108.33 |
| Jan-00 | | 490 | | | <15 | <50 | 10 | 550 | <100 | <4.2 | 500 | 1900 | 0.055 | <14 | 140 | 20000 | <0.050 | | 6.5 | 6.2 | 18 | 2.6 | <4.5 | 27 | 3200 | 1400 | 4100 | None | 3000 | | | None | Slight | 12.1 | 1108.88 |
| Apr-00 | | 480 | | | <7.5 | <50 | 10 | 600 | 42 | <6.2 | 520 | 2100 | <0.15 | <24 | 150 | 22000 | <0.050 | | 6.4 | 6.2 | 23 | <7.8 | <4.7 | 26 | 3200 | 1500 | 3700 | None | 2940 | | 290 | None | Slight | 14.2 | 1108.85 |
| Jul-00 | | 510 | | | <21 | <50 | 8.9 | 600 | 38 | <4.0 | 330 | 2200 | <0.36 | <9.6 | 160 | 21000 | <0.050 | | 6.3 | 6.4 | 22 | <17 | <5.5 | 42 | 3000 | 1600 | 2500 | None | 3000 | 2700 | | None | Slight | 15.1 | 1109.47 |
| Oct-00 | | 520 | | | | | | | | | 430 | 2200 | <0.36 | | | 21000 | | | 6.3 | 6.6 | | | | | 2900 | 1500 | 2100 | None | 3240 | 2400 | | None | Moderate | 13.1 | 1110.09 |
| Jan-01 | | 550 | | | | | | | | | 450 | 1900 | <0.36 | | | 18000 | | | 6.3 | 6.3 | | | | | 2600 | 1400 | 2800 | None | 3140 | 2600 | 226 | None | Slight | 10.5 | 1109.89 |
| Apr-01 | | 520 | | | | | | | | | 530 | 2000 | <0.15 | | | 19000 | | | 6.1 | 6.3 | | | | | 3300 | 1400 | 3500 | None | 3200 | 2500 | 207 | None | Moderate | 13.5 | 1111.14 |
| Jul-01 | | 440 | | | <15 | <50 | 6.2 | 600 | | 8.9 | 480 | 2200 | <0.15 | <7.9 | 160 | 20000 | <0.050 | | 6 | 6.3 | | <10 | <3.1 | | 3000 | 1500 | 1900 | None | 2990 | 2700 | 235 | None | Moderate | 16.5 | 1112.02 |
| Oct-01 | | 510 | | | 20 | <50 | 4.3 | 530 | | <3.4 | 490 | 1900 | <0.15 | <7.9 | 140 | 18000 | <0.050 | | 6.1 | 6.4 | | <16 | 7.2 | | 2900 | 1600 | 1600 | None | 3150 | 2900 | 219 | None | Moderate | 13.4 | 1112.38 |
| Jan-02 | | 540 | | | | | | | | | 540 | 1900 | <0.15 | | | 18000 | | | 6.2 | 6.3 | | | | | 3100 | 1500 | 2800 | None | 3110 | 2700 | 222 | None | Vslight | 12.6 | 1112.61 |
| Apr-02 | | 500 | | | | | | | | | 470 | 1900 | <0.15 | | | 17000 | | | 6.4 | 6.4 | | | | | 3100 | 1500 | 1500 | None | 3140 | 3000 | 218 | None | Slight | 13.1 | 1113 |
| Jul-02 | | 550 | | | <27/<15 | <50 | 4.7 | | | <4.5 | 550 | 2100 | <0.15 | <7.4 | | 19000 | <0.050 | | 6.3 | 6.3 | | <15 | 4.6 | | 3000 | 1400 | 1900 | None | 3100 | 3000 | 245 | None | Moderate | 14.1 | 1113.19 |
| Oct-02 | | 490 | | | | | | | | | 450 | 2000 | <0.15 | | | 17000 | | | 6.3 | 6.5 | | | | | 3300 | 1300 | 1500 | None | 3110 | 2600 | 221 | None | Moderate | 12.2 | 1114.21 |
| Jan-03 | | 610 | | | <27 | <50 | 6.9 | 580 | 46 | <4.5 | 590 | 2000 | <0.15 | <74 | 140 | 17000 | <0.050 | | 6.2 | 6.3 | | <30 | <4.3 | | 2800 | 1500 | 2500 | None | 3160 | 2700 | 232 | None | Slight | 11.5 | 1114.14 |
| Apr-03 | | 610 | | | | | | | | | 690 | 2100 | <0.29 | | | 19000 | | | 6.3 | 6.2 | | | | | 3400 | 1500 | 2500 | Moderate | 2970 | 3000 | 228 | None | Moderate | 13.6 | 1113.96 |
| Jul-03 | | 530 | | | <2.6 | <50 | 4.2 | 530 | | <6.4 | 500 | 1900 | <0.29 | <10 | 140 | 16000 | <0.025 | | 6.3 | 6.2 | | <2.7 | <7.7 | | 3800 | 1400 | 1600 | None | 2900 | 2600 | 240 | None | Moderate | 12.6 | 1114.33 |
| Oct-03 | | 540 | | | | | | | | | 640 | 2100 | <0.29 | | | 19000 | | | 6.4 | 6.4 | | | | | 3000 | 1500 | 2600 | None | 2930 | 2760 | 251 | None | Slight | 12.4 | 1113.77 |
| Jan-04 | | 570 | | | | | | | | | 590 | 2000 | <0.29 | | | 17000 | | | 6.3 | 6.4 | | | | | 3100 | 1600 | | None | 3130 | 2820 | 198 | None | Moderate | 10 | 1113.07 |
| Apr-04 | | 530 | | | | | | | | | 440 | 1700 | <0.33 | | | 14000 | | | 6.5 | 6.47 | | | | | 2800 | 1400 | | | 2880 | 2750 | 246 | None | Slight | 11.3 | 1112.89 |
| Apr-04 | D | 570 | | | | | | | | | 440 | 1700 | <0.33 | | | 14000 | | | | 6.42 | | | | | 2800 | 1400 | | | | 2750 | | | | | |
| Apr-04 | DNR | 461 | 3.58 | 0.03 | <1 | 15 | 4.39 | 538 | 39 | 4.3 | 492 | 1920 | <0.1 | <1 | 139 | 18800 | <0.03 | | | 6.84 | | <1 | <0.1 | | 2530 | 1480 | 1470 | | | 2710 | | | | | |
| Jul-04 | | 450 | | | <2.6 | <25 | 2.9 | 530 | 49 | <5.1 | 520 | 1900 | <0.33 | <8.7 | 140 | 15000 | <0.025 | | 6.3 | 6.4 | 20 | <8.0 | <6.7 | 32 | 2600 | 1300 | 1200 | None | 2950 | 2290 | 191 | None | Vslight | 14.3 | 1113.85 |
| Oct-04 | | 620 | | | 3.6 | | | 560 | | | 550 | 2000 | <0.33 | | 140 | 17000 | | | 6.3 | 6.33 | | | | | 2800 | 1500 | | None | 2950 | 2910 | 215 | None | Vslight | 13.1 | 1113.33 |
| Jan-05 | | 550 | | | 5.3 | | | | | | 520 | 2000 | <0.33 | | | 16000 | | | 6.4 | 6.56 | | | | | 2700 | 1500 | | None | 3210 | 2750 | 277 | None | Moderate | 9.1 | 1113.05 |
| Apr-05 | | 520 | | | 2.6 | | | | | | 460 | 1900 | <0.33 | | | 16000 | | | 6.4 | 6.61 | | | | | 2700 | 1400 | | None | 2790 | 2470 | 288 | None | Vslight | 10.2 | 1112.91 |
| Jul-05 | | 570 | 3.9 | 0.14 | 2.3 | <25 | 2.8 | 610 | | 14 | 560 | 2100 | <0.33 | <10 | 150 | 17000 | <0.025 | 440 | 6.5 | 6.28 | | <1.9 | 11 | | 2800 | 1500 | 2200 | None | 3010 | 2630 | 299 | None | Vslight | 15 | 1112.42 |
| Oct-05 | | 470 | | | 1.2 | | | | | | 400 | 1800 | <0.33 | | | 15000 | | | 6.5 | 6.67 | | | | | 2400 | 1300 | | None | 2820 | 2290 | 261 | None | Vslight | 12 | 1112.41 |
| Jan-06 | | 570 | | | 2.4 | | | | | | 560 | 1900 | <0.33 | | | 16000 | | | 6.5 | 6.46 | | | | | 2800 | 1400 | | None | 3350 | 2650 | 287 | None | None | 14.6 | 1112.12 |
| Apr-06 | | 550 | 4 | 0.13 | 1.1 | <25 | <1.7 | 540 | 45 | 14 | 530 | 1900 | <0.33 | <13 | 130 | 14000 | <0.025 | | 6.2 | 6.33 | | <2.4 | <12 | | 2700 | 1400 | 1300 | None | 2740 | 2260 | 292 | None | Vslight | 12 | 1112.27 |
| Jul-06 | | 520 | | | 1.8 | <25 | <1.7 | 470 | 42 | <10 | 510 | 1700 | <0.33 | <13 | 130 | 12000 | <0.025 | | 6.4 | 6.42 | 18 | <2.4 | <12 | 29 | 2400 | 1400 | 1100 | Slight | 2780 | 2220 | 222 | None | None | 13.7 | 1112.1 |
| Oct-06 | | 460 | | | <1.0 | | | | | | 460 | 1900 | <0.33 | | | 13000 | | | 6.5 | 6.58 | | | | | 2400 | 1300 | | None | 2900 | 2300 | 215 | None | Vslight | 10.9 | 1111.88 |
| Jan-07 | | 570 | | | <1.0 | | | | | | 600 | 1900 | <0.33 | | | 15000 | | | 6.6 | 6.56 | | | | | 2600 | 1400 | | None | 3150 | 2470 | 254 | None | Sight | 9.3 | 1111.42 |
| Apr-07 | | 550 | | | 3.2 | | | | | | 470 | 1900 | <0.33 | | | 14000 | | | 6 | 6.39 | | | | | 2500 | 1300 | | None | 2750 | 2100 | 189 | None | Vslight | 9.9 | 1111.12 |
| Jun-07 | | 570 | | | 6.6 | <25 | <1.7 | 530 | 47 | <10 | 600 | 1900 | <0.33 | <13 | 140 | 14000 | <0.025 | | 6.3 | 6.63 | 21 | <2.4 | <12 | 27 | 2500 | 1400 | 1400 | None | 2888 | 2410 | 197 | None | Vslight | NA | 1110.64 |
| Oct-07 | | 520 | | | 1.9 | | | | | | 490 | 1900 | <0.33 | | | 13000 | | | 6.4 | 7.68 | | | | | 2500 | 1300 | | None | 2670 | 2500 | 234 | None | Vslight | 14.2 | 1110.47 |
| Jan-08 | | 600 | | | 4.4 | | | | | | 500 | 1900 | <0.33 | | | 14000 | | | 6.4 | 7.54 | | | | | 2800 | 1400 | | None | 2882 | 2730 | 211 | None | Vslight | 9.3 | 1112.06 |
| Apr-08 | | 570 | | | 1.9 | | | | | | 570 | 1900 | <0.33 | | | 14000 | | | 6.4 | 6.74 | | | | | 2800 | 1400 | | Vslight | 2815 | 2800 | 157 | None | Vslight | 11.3 | 1111.97 |
| Jun-08 | | 580 | | | 4.8 | <25 | <1.7 | 540 | 56 | <10 | 580 | 1900 | <0.33 | <13 | 140 | 14000 | <0.025 | | 6.4 | 6.47 | 18 | <2.4 | <12 | 18 | 2600 | 1300 | 1700 | None | 2972 | 2730 | 202 | None | None | 12.6 | 1113.44 |
| Jun-08 | D | 480 | | | 5.5 | <25 | 4.2 | 550 | 36 | <10 | 570 | 2000 | <0.33 | <13 | 140 | 14000 | <0.025 | | 6.5 | 6.51 | 21 | <2.4 | <12 | 29 | 2700 | 1400 | 1700 | | 2975 | 2720 | | | | | |
| Oct-08 | | 460 | | | 2.8 | | | | | | 480 | 1100 | <0.33 | | | 13000 | | | 6.4 | 6.27 | | | | | 2700 | 1400 | | None | 2814 | 2560 | 174 | None | None | 12.6 | 1116.11 |
| Jan-09 | | 480 | | | <2.4 | | | | | | 480 | 1800 | <0.33 | | | 13000 | | | 6.4 | 6.31 | | | | | 2700 | 1300 | | Slight | 2908 | 2630 | 216 | None | Slight | 8.7 | 1112.54 |
| Apr-09 | | 460 | | | <2.4 | | | | | | 550 | 1700 | <0.033 | | | 11000 | | | 6.4 | 6.34 | | | | | 2600 | 1400 | | None | 2850 | 2360 | 178 | None | Slight | 9.87 | 1111.43 |
| Jun-09 | | 510 | | | 2.4 | <25 | 12 | 520 | 53 | 35 | 490 | 1800 | <0.033 | <13 | 130 | 13000 | <0.025 | | 6.3 | 6.04 | 12 | <3.1 | <12 | 25 | 2800 | 1300 | 1100 | None | 2893 | 2570 | 216 | None | Slight | 11.2 | 1111.48 |
| Oct-09 | | 590 | | | 2.7 | | | | | | 490 | 1900 | 0.01 | | | 13000 | | | 6.3 | 6.05 | | | | | 2600 | 1500 | | Vslight | 2964 | 2890 | 209 | None | Vslight | 10.2 | 1111.21 |
| Jan-10 | | 440 | | | 3.9 | | | | | | 530 | 1700 | <0.033 | | | 12000 | | | 6.4 | 6.44 | | | | | 2700 | 1400 | | None | 2899 | 2830 | 170 | None | | 9 | 1111.26 |
| Apr-10 | | 520 | | | <2.4 | | | | | | 510 | 1900 | <0.033 | | | 13000 | | | 6.36 | 6.34 | | | | | 2700 | 1400 | | None | 2879 | 2810 | 233 | None | Vslight | 10.9 | 1110.65 |
| Jun-10 | | 550 | | | 3.9 | <25 | <1.7 | 510 | | <11 | 560 | 1800 | <0.05 | 17 | 130 | 12000 | <0.025 | | 6.37 | 6.42 | 25 | <2.4 | <14 | 31 | 2800 | 1000 | 1200 | Slight | 2888 | 2910 | 166 | None | Slight | 13.1 | 1111.55 |
| Oct-10 | | 550 | | | <1.3 | | | | | | 460 | 1900 | <0.5 | | | 13000 | | | 6.39 | 6.34 | | | | | 2700 | 1300 | | None | 1943 | 2926 | 163 | None | Vslight | 11.6 | 1113.34 |
| Feb-11 | | 550 | | | 1.7 | | | | | | 370 | 1800 | <0.005 | | | 12000 | | | | 6.42 | | | | | 2500 | 1300 | | | | 2848 | | | | | |
| Apr-11 | | 540 | | | 3.3 | | | | | | 420 | 1600 | <0.05 | | | 11000 | | | | 6.4 | | | | | 2500 | 1300 | | | | 2792 | | | | | |
| Jul-11 | | 550 | | | 3.4 | 31 | 2.7 | 500 | 54 | <0.67 | 360 | 1800 | 0.12 | <1.4 | 140 | 11000 | <0.025 | | 6.28 | 6.33 | 22 | <12 | <0.28 | | 2500 | 1300 | 1300 | None | 2720 | 2820 | 244 | None | None | 14.8 | 1117.57 |
| Oct-11 | | 470 | | | <1.3 | | | | | | 380 | 1800 | 0.035 | | | 11000 | | | | 6.27 | | | | | 2600 | 1400 | | | | 2859 | | | | | |

**Well MW-1014B Well Depth: 104.9' (dissolved concentrations)**

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (deg C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb-12 | | 500 | | | 6 | | | | | | 440 | 1900 | < 0.014 | | | 11000 | | | 6.4 | 6.33 | | | | | 2600 | 1400 | | | 2859 | 2900 | 211 | | | 9.5 | 1114.78 |
| May-12 | | 490 | | | 2.9 | | | | | | 520 | 1800 | < 0.014 | | | 10000 | | | 6.32 | 6.24 | | | | | 2600 | 1400 | | | 2857 | 2873 | 139 | | | 10.3 | 1114.33 |
| Jun-12 | | 470 | | | < 1.3 | 23 | 2.6 | 500 | 59 | < 0.67 | 400 | 1800 | < 0.014 | 3.2 | 130 | 11000 | < 0.025 | | 6.33 | 6.33 | 22 | < 2.7 | < 0.56 | 25 | 2400 | 1300 | 1200 | | 2919 | 2668 | 146 | | | 12 | 1114.98 |
| Oct-12 | | 430 | | | < 1.3 | | | | | | 350 | 1800 | < 0.014 | | | 10000 | | | 6.33 | 6.36 | | | | | 2300 | 1200 | | | 2702 | 2712 | 193 | | | 11.6 | 1114.32 |
| Mar-13 | | 480 | | | 2.3 J | | | | | | 370 | 1900 | < 0.014 | | | 11000 | | | 6.37 | 6.35 | | | | | 2600 | 1300 | | | 2752 | | 291 | | | 10.3 | 1112.33 |
| May-13 | | 470 | | | < 1 | | | | | | 430 | 1800 | < 0.014 | | | 10000 | | | 6.41 | 6.3 | | | | | 2700 | 1300 | | | 2828 | | 220 | | | 11.6 | 1112.67 |
| Jun-13 | | 460 | | | < 1 | 23 J | 2.2 J | 540 | 44 | < 3.4 | 610 | 1900 | < 0.07 | 29 | 170 | 13000 | < 0.025 | | 6.3 | 6.28 | 24 | < 2 | < 1.4 | 36 | 2800 | 1400 | 1200 | | 2908 | | 92 | | | 10.7 | 1113.25 |
| Jun-13 | Dup | 450 | | | < 1 | 23 J | 2.8 | 560 | 61 J | < 3.4 | 560 | 2000 | < 0.07 | 160 | 150 | 12000 | < 0.025 | | | 6.23 | 22 | < 2 | 4 J | 25 | 2800 | 1400 | 1000 | | | | | | | | |
| Oct-13 | | 510 | | | < 1 | | | | | | 460 | 1800 | < 0.018 | | | 13000 | | | 6.22 | 6.46 | | | | | 2600 | 1200 | | | 2942 | | 260.5 | | | 9 | 1112.96 |
| Oct-13 | Dup | 460 | | | < 1 | | | | | | 510 | 1800 | < 0.018 | | | 12000 | | | | 6.5 | | | | | 2600 | 1300 | | | | | | | | | |

D – Duplicate, DNR – Dept Nat. Res. sample

## Well MW-1014C Well Depth: 156.6' (dissolved concentrations)

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (deg C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan-99 | | 360 | | | | | | | | | <4.7 | 980 | 14 | | | 4300 | | | 6.3 | 6.5 | | | | | 1200 | 520 | | None | 1900 | | | None | None | | 1103.39 |
| Apr-99 | | 330 | | | | | | | | | <4.7 | 1000 | 15 | | | 4500 | | | 6.3 | 6.5 | | | | | 1200 | 440 | | None | 1623 | | | None | None | 13.5 | 1102.83 |
| Jul-99 | | 370 | | | <42 | <50 | <21 | 280 | 32 | <4.2 | 16 | 930 | 14 | <14 | 56 | 4000 | <0.050 | | 6.4 | 6.5 | 4.8 | 1.8 | <45 | 11 | 1200 | 370 | 2200 | None | 1657 | | | None | None | 13.2 | 1103.9 |
| Oct-99 | | 380 | | | <42 | <50 | <4.2 | 290 | 33 | <4.2 | <9.4 | 960 | 14 | <14 | 56 | 4000 | <0.050 | | 6.6 | 6.7 | 4 | <1.3 | <4.5 | 9.6 | 1200 | 700 | 2100 | None | 1600 | | | None | None | 9.9 | 1104.81 |
| Jan-00 | | 320 | | | <15 | 25 | <0.21 | 250 | 31 | <0.42 | <0.47 | 810 | 12 | <1.4 | 48 | 3200 | <0.050 | | 6.6 | 6.5 | 6.3 | 1.9 | <0.45 | 12 | 1200 | 540 | 1700 | None | 1500 | | | None | None | 10.5 | 1105.18 |
| Jan-00 | D | 300 | | | <15 | 25 | <0.21 | 230 | 30 | 2 | <0.47 | 820 | 11 | 2 | 46 | 3100 | <0.050 | | | 6.4 | 6.3 | 1.6 | <0.45 | 11 | 1300 | 560 | 1600 | | | | | | | | |
| Apr-00 | | 320 | | | 14 | <50 | <3.1 | 260 | 33 | <6.2 | <6.0 | 870 | 13 | <24 | 51 | 3600 | <0.050 | | 6.7 | 6.3 | 7.6 | <7.8 | <4.7 | 9.4 | 1000 | 440 | 1800 | None | 1470 | | 88 | None | None | 11.9 | 1105.25 |
| Jul-00 | | 350 | | | 39 | <50 | <2.3 | 270 | 36 | 4.2 | <12 | 890 | 13 | <9.6 | 54 | 3500 | <0.050 | | 6.4 | 6.5 | 7.4 | <17 | <5.5 | 12 | 1400 | 480 | 1700 | None | 1400 | 1400 | | None | None | 13.7 | 1105.82 |
| Oct-00 | | 390 | | | | | | | | | <12 | 840 | 12 | | | 3200 | | | 6.4 | 6.7 | | | | | 1300 | 450 | 1500 | None | 1490 | 1200 | | None | None | 11.5 | 1106.21 |
| Jan-01 | | 340 | | | | | | | | | <12 | 760 | 11 | | | 2900 | | | 6.5 | 6.4 | | | | | 1100 | 450 | 1200 | None | 1452 | 1300 | 64 | None | None | 10.9 | 1106.15 |
| Apr-01 | | 330 | | | | | | | | | <13 | 830 | 12 | | | 3100 | | | 6.2 | 6.5 | | | | | 1100 | 420 | 1300 | None | 1400 | 1300 | 55 | None | None | 12.8 | 1107.65 |
| Apr-01 | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Jul-01 | | 330 | | | 21 | <50 | <1.7 | 240 | | 4.7 | <13 | 810 | 11 | <7.9 | 49 | 3000 | <0.050 | | 6.2 | 6.5 | | <10 | <3.1 | | 1100 | 420 | 1200 | None | 1360 | 1300 | 40 | None | None | 13.7 | 1108.11 |
| Oct-01 | | 350 | | | 15 | <50 | <1.7 | 210 | | <3.4 | <13 | 710 | 9.6 | <7.9 | 44 | 2900 | <0.050 | | 6.2 | 6.6 | | <1.6 | 4.6 | | 990 | 410 | 1100 | None | 1354 | 1300 | 56 | None | None | 12.2 | 1108.1 |
| Jan-02 | | 350 | | | | | | | | | <13 | 690 | 9.2 | | | 2600 | | | 6.6 | 6.5 | | | | | 1100 | 390 | 980 | None | 1341 | 1200 | 38 | None | None | 13.9 | 1108.48 |
| Apr-02 | | 340 | | | | | | | | | 15 | 710 | 9.1 | | | 2600 | | | 6.4 | 6.6 | | | | | 1000 | 390 | 950 | None | 1310 | 1300 | 36 | None | None | 13.5 | 1109.25 |
| Jul-02 | | 350 | | | <27/18 | <50 | <1.7 | | | <4.5 | <13 | 740 | 9.4 | <7.4 | | 2700 | <0.050 | | 6.6 | 6.6 | | <15 | <4.3 | | 1200 | 330 | 1000 | None | 1269 | 1300 | 45 | None | None | 17.2 | 1108.93 |
| Oct-02 | | 360 | | | | | | | | | <13 | 730 | 9.1 | | | 2600 | | | 6.5 | 6.6 | | | | | 810 | 330 | 940 | None | 1299 | 1200 | 38 | None | None | 11.6 | 1110.1 |
| Jan-03 | | 390 | | | <27 | <50 | <1.7 | 210 | 39 | <4.5 | <13 | 700 | 8.3 | <7.4 | 45 | 2400 | <0.050 | | 6.4 | 6.5 | | <30 | <4.3 | | 110 | 380 | 840 | None | 1311 | 1200 | 74 | None | None | 11 | 1109.58 |
| Jan-03 | D | 370 | | | <27 | <50 | <1.7 | 200 | 42 | <4.5 | <13 | 690 | 8.3 | <7.4 | 45 | 2400 | <0.050 | | | 6.4 | | <30 | <4.3 | | 1000 | 370 | 860 | | | 1400 | | | | | |
| Apr-03 | | 380 | | | | | | | | | <13 | 690 | 8 | | | 2400 | | | 6.4 | 6.5 | | | | | 990 | 340 | 810 | None | 1287 | 1300 | 7 | None | None | 13.3 | 1109.35 |
| Jul-03 | | 340 | | | 13 | 26 | <2.1 | 210 | | <6.4 | <13 | 700 | 8.2 | <10 | 45 | 2500 | <0.025 | | 6.4 | 6.6 | | <13 | <7.7 | | 920 | 330 | 820 | None | 1239 | 1100 | 40 | None | None | 13 | 1109.74 |
| Oct-03 | | 340 | | | | | | | | | <1.3 | 680 | 7.8 | | | 2400 | | | 6.6 | 6.6 | | | | | 910 | 320 | 770 | None | 1256 | 1160 | 55 | None | None | 12.7 | 1109.01 |
| Jan-04 | | 310 | | | | | | | | | <1.3 | 650 | 7.4 | | | 2300 | | | 6.4 | 6.54 | | | | | 930 | 320 | | None | 1259 | 1096 | 34 | None | None | 10.6 | 1108.52 |
| Apr-04 | | 330 | | | | | | | | | <13 | 640 | 7.5 | | | 2300 | | | 6.8 | 6.69 | | | | | 820 | 290 | | None | 1233 | 1108 | 53 | None | None | 11.6 | 1108.53 |
| Apr-04 | DNR | | | | 8.4 | 26 | <0.05 | 185 | 38.2 | <1 | 1.2 | 657 | 6.9 | <1 | 47.3 | 2220 | <0.03 | | | | | <1 | <0.1 | | 868 | 330 | 638 | | | | | | | | |
| Jul-04 | | 300 | | | 15 | 27 | <1.7 | 190 | 40 | <5.1 | <13 | 660 | 7.2 | 11 | 43 | 2300 | <0.025 | | 6.4 | 6.59 | 6.2 | <8.0 | <6.7 | 12 | 820 | 290 | 630 | None | 1171 | 1029 | 31 | None | None | 15.5 | 1109.22 |
| Oct-04 | | 350 | | | 17 | | | 180 | | | <13 | 610 | 6.6 | | 41 | 2100 | | | 6.5 | 6.59 | | | | | 780 | 300 | | None | 1175 | 1190 | 60 | None | None | 13 | 1108.87 |
| Jan-05 | | 340 | | | 21 | | | | | | <13 | 600 | 6.4 | | | 2000 | | | 6.5 | 6.8 | | | | | 730 | 300 | | None | 1174 | 1110 | 70 | None | None | 11.4 | 1108.62 |
| Apr-05 | | 330 | | | 16 | | | | | | <13 | 660 | 7 | | | 2300 | | | 6.3 | 6.82 | | | | | 750 | 290 | | None | 1202 | 1090 | 64 | None | None | 11.2 | 1108.19 |
| Jul-05 | | 350 | 0.85 | 0.037 | 15 | 27 | <1.7 | 190 | | <4.5 | <13 | 650 | 6.9 | <10 | 43 | 2200 | <0.025 | 81 | 6.9 | 6.52 | | <1.9 | <6.7 | | 760 | 300 | 550 | None | 1150 | 1090 | 57 | None | None | 15 | 1107.8 |
| Oct-05 | | 320 | | | 14 | | | | | | <13 | 630 | 7 | | | 2200 | | | 6.7 | 6.77 | | | | | 790 | 290 | | None | 1157 | 1040 | 54 | None | None | 11.4 | 1108.06 |
| Jan-06 | | 300 | | | 16 | | | | | | <13 | 590 | 6.2 | | | 2000 | | | 6.9 | 6.69 | | | | | 740 | 280 | | None | 1182 | 1110 | 67 | None | None | 9.6 | 1107.25 |
| Jan-06 | D | 310 | | | 18 | | | | | | <13 | 570 | 6 | | | 1900 | | | | 6.76 | | | | | 750 | 270 | | | | 1070 | | | | | |
| Apr-06 | | 340 | 0.76 | 0.041 | 16 | 28 | <1.7 | 180 | 40 | <10 | <13 | 620 | 6.4 | <13 | 42 | 2100 | <0.025 | | 6.4 | 6.66 | | <2.4 | <12 | | 700 | 270 | 560 | None | 1124 | 961 | 80 | None | None | 12.8 | 1107.9 |
| Jul-06 | | 350 | | | 16 | <25 | <1.7 | 160 | 38 | <10 | 16 | 580 | 5.9 | <13 | 41 | 1900 | <0.025 | | 6.6 | 6.63 | 5.4 | <2.4 | <12 | 12 | 770 | 260 | 470 | None | 1080 | 989 | 63 | None | None | 13 | 1107.35 |
| Oct-06 | | 330 | | | 20 | | | | | | <13 | 620 | 6.1 | | | 2000 | | | 7 | 6.71 | | | | | 700 | 260 | | None | 1113 | 997 | 36 | None | None | 11.1 | 1106.97 |
| Jan-07 | | 300 | | | 21 | | | | | | <13 | 580 | 6 | | | 1900 | | | 6.8 | 6.8 | | | | | 680 | 260 | | None | 1122 | 986 | 76 | None | None | 9.8 | 1106.92 |
| Apr-07 | | 320 | | | 19 | | | | | | <13 | 620 | 6.1 | | | 2000 | | | 6.2 | 6.63 | | | | | 670 | 670 | | None | 1072 | 934 | 68 | Vslight | None | 11.6 | 1106.71 |
| Jun-07 | | 360 | | | 19 | 31 | 4.7 | 170 | 41 | <10 | <13 | 580 | 5.8 | <13 | 39 | 1900 | <0.025 | | 6.6 | 6.74 | 5.4 | <2.4 | <12 | 10 | 720 | 270 | 470 | None | 1050 | 952 | 51 | None | None | 16.5 | 1106.19 |
| Oct-07 | | 360 | | | 19 | | | | | | <13 | 600 | 5.8 | | | 2000 | | | 6.6 | 6.76 | | | | | 670 | 260 | | None | 1041 | 1060 | 57 | None | None | 16.2 | 1106.22 |
| Jan-08 | | 310 | | | 24 | | | | | | <13 | 550 | 5.4 | | | 1800 | | | 6.6 | 7.85 | | | | | 750 | 280 | | None | 1081 | 1020 | 59 | None | None | 9.9 | 1107.58 |
| Apr-08 | | 310 | | | 24 | | | | | | <13 | 570 | 5.6 | | | 1900 | | | 6.6 | 6.98 | | | | | 780 | 190 | | None | 1069 | 1110 | 48 | None | None | 12.1 | 1107.87 |
| Jun-08 | | 280 | | | 22 | 28 | <1.7 | 160 | 35 | <10 | <13 | 550 | 5.4 | <13 | 38 | 1800 | <0.025 | | 6.5 | 6.76 | 4.8 | <2.4 | <12 | 7.8 | 690 | 220 | 390 | None | 1061 | 1080 | 52 | Vslight | None | 14.9 | 1108.96 |
| Oct-08 | | 310 | | | 17 | | | | | | <13 | 570 | 5.5 | | | 1800 | | | 6.6 | 6.42 | | | | | 730 | 260 | | None | 1058 | 1036 | 68 | None | None | 12.6 | 1113.25 |
| Jan-09 | | 300 | | | 23 | | | | | | <13 | 540 | 5.3 | | | 1800 | | | 6.6 | 6.65 | | | | | 810 | 240 | | None | 1061 | 1050 | 76 | None | None | 9.4 | 1107.83 |
| Jan-09 | D | 320 | | | 22 | | | | | | <13 | 540 | 5.3 | | | 1800 | | | | 6.59 | | | | | 730 | 240 | | | | 1050 | | | | | |
| Apr-09 | | 310 | | | 20 | | | | | | <1.3 | 510 | 4.8 | | | 1600 | | | 6.6 | 6.54 | | | | | 720 | 260 | | None | 1059 | 960 | 71 | None | None | 10.4 | 1106.8 |
| Jun-09 | | 300 | | | 19 | 26 | <1.7 | 150 | 53 | <10 | <13 | 510 | 5 | <13 | 35 | 1600 | <0.025 | | 6.6 | 6.3 | 3.6 | <3.1 | <12 | 9.5 | 720 | 260 | 360 | None | 1026 | 1010 | 69 | None | None | 13.8 | 1106.86 |
| Oct-09 | | 300 | | | 20 | | | | | | <0.31 | 540 | 4.3 | | | 1700 | | | 6.6 | 6.31 | | | | | 670 | 230 | | None | 1034 | 1063 | 71 | None | None | 11.2 | 1106.57 |
| Oct-09 | D | 290 | | | 20 | | | | | | <0.31 | 520 | 4.2 | | | 1600 | | | 6.6 | 6.3 | | | | | 670 | 250 | | None | 1045 | 1059 | | None | None | 11.3 | |
| Jan-10 | | 240 | | | 21 | | | | | | <1.3 | 500 | 4.9 | | | 1600 | | | 6.69 | 6.77 | | | | | 710 | 250 | | None | 1026 | 1060 | 67 | None | None | 9.1 | 1106.72 |
| Jan-10 | D | 240 | | | 18 | | | | | | <1.3 | 510 | 4.9 | | | 1600 | | | | 6.74 | | | | | 700 | 240 | | None | | 1070 | | None | None | | 1106.17 |
| Apr-10 | | 300 | | | 20 | | | | | | <13 | 530 | 4.9 | | | 1700 | | | 6.59 | 6.61 | | | | | 690 | 210 | | None | 1051 | 1050 | 66 | None | None | 12.7 | |
| Jun-10 | | 310 | | | 24 | <25 | <1.7 | 140 | 37 | <11 | 16 | 500 | 4.6 | 20 | 36 | 1600 | <0.025 | | 6.52 | 6.65 | 5.4 | <2.4 | <14 | 9.8 | 730 | 200 | 330 | None | 1011 | 1018 | 59 | None | None | 13.5 | 1107.56 |

**Well MW-1014C Well Depth: 156.6' (dissolved concentrations)**

| Date | | Alk (mg CaCO3/L) | NH3–N (mg/L) | (NO3+NO2)-N (mg/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Cu (µg/L) | Hard (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | Field pH (s.u.) | Lab pH (s.u.) | K (mg/L) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | TDS (mg/L) | SO4 (mg/L) | Zn (µg/L) | Color after filter | Field Cond (µmhos/cm) | Lab Cond (µmhos/cm) | Redox (mv) | Odor | Turbidity (Purging) | Temp (deg C) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct-10 | | 280 | | | 20 | | | | | | <13 | 530 | 5.2 | | | 1700 | | | 6.62 | | | | | 640 | 220 | | None | 750 | 1031 | 65 | None | None | 11.8 | 1109.12 |
| Feb-11 | | 280 | | | 23 | | | | | | <13 | 510 | 4.7 | | | 1600 | | | | 6.6 | | | | 600 | 220 | | | | 1059 | | | | | |
| Apr-11 | | 290 | | | 21 | | | | | | 16 | 500 | 4.9 | | | 1700 | | | | 6.54 | | | | 640 | 220 | | | | 1050 | | | | | |
| Jul-11 | | 290 | | | 22 | 29 | <0.12 | 150 | 45 | <0.67 | <0.73 | 540 | 4.9 | <1.4 | 39 | 1600 | <0.025 | | 6.56 | 6.53 | 5.2 | <12 | <0.28 | | 690 | 220 | 310 | None | 1017 | 1041 | 81 | None | None | 14.5 | 1112.18 |
| Oct-11 | | 280 | | | 18 | | | | | | <0.73 | 530 | 4.9 | | | 1500 | | | | 6.41 | | | | 690 | 220 | | | | 1011 | | | | | |
| Feb-12 | | 290 | | | 22 | | | | | | 2.9 | 530 | 4.9 | | | 1600 | | | 6.76 | 6.55 | | | | 650 | 240 | | | 1035 | 1037 | 68 | | | 10.1 | 1109.59 |
| May-12 | | 280 | | | 28 | | | | | | 0.86 | 540 | 4.8 | | | 1500 | | | 6.56 | 6.44 | | | | 690 | 240 | | | 1016 | 1018 | 60 | | | 11.9 | 1109.42 |
| Jun-12 | | 290 | | | 24 | 30 | 0.18 | 150 | 50 | < 0.67 | 0.79 | 530 | 4.6 | < 1.4 | 38 | 1800 | < 0.025 | | 6.6 | 6.46 | 5.6 | < 2.7 | < 0.28 | 11 | 720 | 240 | 310 | | 1033 | 1032 | 56 | | | 14.3 | 1110.19 |
| Oct-12 | | 290 | | | 24 | | | | | | 1.3 | 550 | 4.9 | | | 1600 | | | 6.53 | 6.58 | | | | 670 | 240 | | | 1032 | 1078 | 63 | | | 11.3 | 1109.18 |
| Mar-13 | | 270 | | | 21 | | | | | | 1.5 J | 530 | 4.9 | | | 1600 | | | 6.68 | 6.57 | | | | 710 | 230 | | | 898 | | 69 | | | 11.1 | 1107.49 |
| May-13 | | 270 | | | 19 | | | | | | 2.5 | 510 | 4.7 | | | 1500 | | | 6.72 | 6.61 | | | | 670 | 220 | | | 1028 | | 54 | | | 14.3 | 1108.37 |
| May-13 | Dup | 260 | | | 19 | | | | | | 1.9 J | 510 | 4.7 | | | 1500 | | | | 6.52 | | | | 720 | 210 | | | | | | | | | |
| Jun-13 | | 270 | | | 21 | 34 | < 0.12 | 160 | 49 | < 0.67 | 1.6 J | 550 | 5.1 | < 1.4 | 39 | 1700 | < 0.025 | | 6.62 | 6.44 | 5.4 | < 2 | 0.65 J | 11 | 700 | 210 | 290 | | 1017 | | 60 | | | 11.9 | 1109.06 |
| Oct-13 | | 260 | | | 20 | | | | | | < 1 | 490 | 4.7 | | | 1700 | | | 6.39 | 6.58 | | | | 680 | 200 | | | 1155 | | 163 | | | 9.27 | 1108.19 |

D – Duplicate, DNR – Dept Nat. Res. sample

## Well MW-1005P (dissolved concentrations)

| Date | Alk. (mg CaCO3/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Lab Cond. (umhos/cm) | Cu (µg/L) | Hard-ness (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | pH (s.u.) | K (mg/L) | Redox (mV) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | SO4 (mg/L) | Temp. (deg C) | TDS (mg/L) | Zn (µg/L) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jul-91 | 260 | | | | | | | 512 | <0.014 | 230 | 1.2 | | | 220 | | | 8.49 | | | | | | <10 | | 290 | | 1140.19 |
| Oct-91 | 260 | | | | | | | 479 | <0.014 | 230 | 1 | | | 150 | | | 7.66 | | | | | | <10 | | 440 | | 1138.88 |
| Jan-92 | 260 | | | | | | | 391 | <0.014 | 240 | 0.75 | | | 160 | | | 6.85 | | | | | | <10 | | 280 | | 1140.95 |
| Apr-92 | 260 | | | | | | | 417 | <0.014 | 240 | 1 | | | 130 | | | 6.97 | | | | | | <10 | | 350 | | 1141.48 |
| Jul-92 | 270 | | | | | | | 426 | <0.014 | 260 | 0.95 | | | 150 | | | 6.81 | | | | | | <10 | | 270 | | 1140.29 |
| Oct-92 | 270 | | | | | | | 501 | <0.014 | 260 | 12 | | | 100 | | | 7.26 | | | | | | <10 | | 320 | | 1137.84 |
| Jan-93 | 260 | | | | | | | 440 | <0.014 | 240 | 1.1 | | | 110 | | | 6.39 | | | | | | <10 | | 220 | | 1139.08 |
| Apr-93 | | | | | | | | 458 | | | | | | | | | 6.52 | | | | | | | | | | |
| Apr-93 | 250 | | | | | | | | <0.012 | 250 | 0.46 | | | 150 | | | | | | | | | 2 | | 250 | | 1139.42 |
| Jul-93 | | | | | | | | 519 | | | | | | | | | 7.59 | | | | | | | | | | |
| Jul-93 | 250 | | | | | | | | <0.012 | 230 | 0.61 | | | 140 | | | | | | | | | 3 | | 260 | | 1141.08 |
| Oct-93 | | | | | | | | 462 | | | | | | | | | 7.53 | | | | | | | | | | |
| Oct-93 | 250 | | | | | | | | <0.012 | 220 | 0.17 | | | 69 | | | | | | | | | <2 | | 240 | | 1139.85 |
| Dec-93 | | | | | | | | | | | | | | | | | | | | | | | | | 300 | | |
| Jan-94 | 250 | | | | | | | 487 | <0.012 | 230 | 0.19 | | | 35 | | | 7.34 | | | | | | <2 | | 260 | | 1138.88 |
| Apr-94 | | | | | | | | 487 | | | | | | | | | 7.24 | | | | | | | | | | |
| Apr-94 | 250 | | | | | | | | <0.012 | 230 | 0.2 | | | 160 | | | | | | | | | <2 | | 270 | | 1139.44 |
| Jul-94 | 240 | | | | | | | 456 | <0.012 | 230 | 0.22 | | | 100 | | | 6.89 | | | | | | <2 | | 270 | | 1138.96 |
| Oct-94 | 250 | | | | | | | 452 | <0.0016 | 250 | 0.24 | | | 62 | | | 7.15 | | | | | | 2.5 | | 280 | | 1137.79 |
| Jan-95 | 270 | | | | | | | 511 | 0.0044 | 230 | 0.035 | | | 41 | | | 7.05 | | | | | | <0.56 | | 340 | | 1137.14 |
| Apr-95 | 270 | | | | | | | 420 | 0.0037 | 200 | 0.078 | | | 41 | | | 7.5 | | | | | | <0.56 | | 300 | | 1137.45 |
| Jul-95 | 280 | | | | | | | 454 | 0.0018 | 200 | 0.071 | | | 90 | | | 7.17 | | | | | | <0.56 | | 290 | | 1137.47 |
| Oct-95 | 260 | | | | | | | 470 | 0.0021 | 230 | 0.17 | | | 72 | | | 7.22 | | | | | | 5.3 | | 260 | | 1137.79 |
| Jan-96 | 240 | | | | | | | 464 | <0.00068 | 210 | 0.28 | | | 97 | | | 7.31 | | | | | | 0.93 | | 270 | | 1137.39 |
| Apr-96 | | | | | | | | 486 | | | | | | | | | 6.85 | | | | | | | | | | |
| Apr-96 | 250 | | | | | | | | <0.00068 | 210 | 0.049 | | | 35 | | | | | | | | | 2.2 | | 300 | | 1139.37 |
| Jul-96 | | | | | | | | 441 | | | | | | | | | 6.9 | | | | | | | | | | |
| Jul-96 | 240 | | | | | | | | 0.0039 | 210 | 0.064 | | | 140 | | | | | | | | | 2.6 | | 300 | | 1139.57 |
| Oct-96 | | | | | | | | 471 | | | | | | | | | 7.19 | | | | | | | | | | |
| Oct-96 | 260 | | | | | | | | 0.0082 | 200 | 0.37 | | | 67 | | | | | | | | | 3.6 | | 280 | | 1137.46 |
| Jan-97 | 260 | | | | | | | 462 | 0.0027 | 210 | 0.073 | | | 24 | | | 7.04 | | | | | | 5.5 | | 280 | | 1137.41 |
| Apr-97 | | | | | | | | 480 | | | | | | | | | 7 | | | | | | | | | | |
| Apr-97 | 250 | | | | | | | | 0.0016 | 220 | 0.41 | | | 77 | | | | | | | | | 5.8 | | 320 | | 1138.85 |
| Jul-97 | 240 | | | | | | | 448 | 0.002 | 230 | 0.087 | | | 66 | | | 7.03 | | | | | | 6.7 | | 280 | | 1137.66 |
| Oct-97 | 240 | | | | | | | 505 | <0.00054 | 230 | 0.17 | | | 62 | | | 6.9 | | | | | | 5 | | 260 | | 1137.77 |
| Jan-98 | 250 | | | | | | | 456 | 0.00073 | 220 | 0.41 | | | 72 | | | 7.06 | | | | | | 11 | | 270 | | 1136 |
| Apr-98 | 240 | | | | | | | 461 | 0.0011 | 210 | 0.077 | | | 29 | | | 7.36 | | | | | | 9.6 | | 290 | | 1137.92 |
| Jul-98 | 260 | | | | | | | 458 | <0.00054 | 220 | 0.34 | | | 100 | | | 7.01 | | | | | | 12 | | 270 | | 1137.63 |
| Oct-98 | 230 | | | | | | | 477 | 0.0019 | 220 | 0.17 | | | 63 | | | 6.96 | | | | | | 9.4 | | 250 | | 1136.19 |
| Feb-99 | 250 | | | | | | | 449 | <0.00054 | 220 | 0.066 | | | 27 | | | 7.6 | | | | | | 7.8 | 6.7 | 250 | | 1135.35 |
| Apr-99 | 250 | | | | | | | 464 | 0.0011 | 210 | 0.049 | | | 23 | | | 7 | | | | | | 7.8 | 11 | 230 | | 1136.65 |
| Jul-99 | | | | | | | | 501 | | | | | | | | | 6.91 | | | | | | | 15.9 | | | |
| Jul-99 | 240 | <4.2 | 65 | <2.1 | 52 | 3.5 | <0.42 | | <0.0047 | 220 | 0.054 | <1.4 | 21 | 51 | <0.05 | | | 8.1 | | <1.3 | <0.45 | 9 | 7.3 | | 250 | <12 | 1138.09 |
| Oct-99 | 240 | | | | | | | 460 | <0.00047 | 220 | 0.97 | | | 88 | | | 7.3 | | | | | | <1.5 | 9.8 | 260 | | 1137.64 |
| Jan-00 | 250 | | | | | | | 480 | <0.00047 | 210 | 0.14 | | | 47 | | | 6.7 | | | | | | <5 | | 280 | | 1136.65 |
| Apr-00 | 250 | | | | | | | 483 | <0.0006 | 220 | 0.37 | | | 80 | | | 7.27 | | 64 | | | | <5 | 6.4 | 220 | | 1137.05 |
| Jul-00 | 250 | <1.7 | 70 | 0.28 | | | <0.74 | 460 | <0.00053 | 230 | 0.058 | <1.4 | | 75 | <0.05 | | 6.5 | | | <1.6 | <0.55 | | <5 | 12.5 | 290 | <12 | 1138.08 |
| Oct-00 | 240 | | | | | | | 448 | 0.00074 | 220 | 0.13 | | | 38 | | | 7.26 | | | | | | <5 | 10.5 | 260 | <12 | 1137.56 |
| Jan-01 | 250 | | | | | | | 454 | <0.00053 | 210 | 0.058 | | | 24 | | | 7.17 | | 37 | | | | <5 | 8.4 | 260 | <12 | 1136.65 |
| Apr-01 | 240 | | | | | | | 430 | <0.0027 | 220 | 0.055 | | | 27 | | | 6.7 | | 17 | | | | <5 | 12.8 | 290 | <12 | 1138.8 |
| Jul-01 | 230 | <2.3 | 69 | 0.4 | 56 | | 0.58 | 428 | <0.0027 | 230 | 0.087 | <0.92 | 22 | 48 | <0.05 | | 7.13 | | 8 | <1.6 | <0.56 | | <5 | 12.2 | 250 | <12 | 1140.03 |
| Oct-01 | 240 | | | | | | | 424 | <0.0027 | 200 | 0.2 | | | 68 | | | 6.63 | | 5 | | | | <5 | 9.9 | 270 | <12 | 1138.59 |
| Jan-02 | 250 | | | | | | | 418 | <0.0027 | 200 | 0.077 | | | 30 | | | 7.03 | | 7 | | | | <5 | 8.6 | 270 | <12 | 1138.67 |
| Apr-02 | 240 | | | | | | | 434 | <0.0027 | 210 | 0.076 | | | 20 | | | 7.2 | | 2 | | | | <5 | 13.7 | 270 | <10 | 1139.89 |

## Well MW-1005P (dissolved concentrations)

| Date | Alk. (mg CaCO3/L) | As (µg/L) | Ba (µg/L) | Cd (µg/L) | Ca (mg/L) | Cl (mg/L) | Cr (µg/L) | Lab Cond. (umhos/cm) | Cu (µg/L) | Hard-ness (mg/L) | Fe (mg/L) | Pb (µg/L) | Mg (mg/L) | Mn (µg/L) | Hg (µg/L) | Ni (µg/L) | pH (s.u.) | K (mg/L) | Redox (mV) | Se (µg/L) | Ag (µg/L) | Na (mg/L) | SO4 (mg/L) | Temp. (deg C) | TDS (mg/L) | Zn (µg/L) | Grd Water Elev (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jul-02 | 250 | 4.6 | 70 | <0.23 | 51 | | <0.44 | 426 | <0.0027 | 220 | 0.12 | <0.92 | 21 | 71 | <0.05 | | 7.19 | | 26 | <2.5 | <0.47 | | <5 | 13.6 | 270 | <10 | 1141.25 |
| Oct-02 | 240 | | | | | | | 428 | <0.0027 | 210 | 0.23 | | | 54 | | | 7.18 | | 5 | | | | <5 | 10.2 | 300 | <10 | 1142.14 |
| Jan-03 | 250 | | | | | | | 298 | <0.0027 | 190 | 0.52 | | | 51 | | | 7.2 | | 22 | | | | <5 | 9.8 | 290 | <10 | 1140.7 |
| Apr-03 | 230 | | | | | | | 381 | <0.0013 | 200 | 0.73 | | | 110 | | | 7.06 | | -4 | | | | <5 | 10.4 | 220 | <10 | 1138.93 |
| Jul-03 | 240 | <1.2 | 67 | <0.17 | 55 | | <0.43 | 439 | <0.0013 | 230 | 1.1 | <0.94 | 22 | 74 | <0.025 | | 7.11 | | -3 | <2 | <0.4 | | <2.5 | 13.4 | 260 | <5 | 1140.27 |
| Oct-03 | 240 | | | | | | | 436 | <0.0013 | 210 | 1 | | | 74 | | | 7.3 | | -18 | | | | <2.5 | 11.6 | 260 | <5 | 1138.32 |
| Jan-04 | 240 | | | | | | | 438 | <0.0013 | 220 | 0.38 | | | 43 | | | 7.28 | | -2 | | | | <2.5 | 5.9 | 260 | | 1137.38 |
| Apr-04 | 240 | | | | | | | 436 | <0.0013 | 220 | 0.11 | | | 20 | | | 7.05 | | 4 | | | | <2.5 | 12.4 | 220 | | 1137.86 |
| Jul-04 | 240 | <1.8 | 69 | <0.16 | 54 | 4.2 | <0.45 | 428 | <0.0013 | 220 | 0.45 | <1 | 21 | 93 | <0.025 | | 7 | 8.7 | -5 | <2.1 | <0.67 | 7.4 | <2.5 | 11.4 | 170 | <5 | 1139.37 |
| Oct-04 | 240 | 2.6 | | | 51 | | | 436 | <0.0013 | 210 | 0.47 | | 20 | 87 | | | 7.1 | | -2 | | | | <2.5 | 9.9 | 210 | | 1138.05 |
| Jan-05 | 250 | <0.73 | | | | | | 428 | <0.0013 | 210 | 0.85 | | | 79 | | | 7.1 | | 15 | | | | <2.5 | 9.5 | 210 | | 1137.86 |
| Apr-05 | 240 | <0.66 | | | | | | 437 | <0.0013 | 220 | 0.11 | | | 17 | | | 6.7 | | -2 | | | | <2.5 | 9.7 | 200 | | 1137.9 |
| Jul-05 | 240 | <0.66 | 69 | <0.17 | 57 | | <0.55 | 428 | <0.0013 | 230 | 0.17 | <1.2 | 23 | 82 | <0.025 | 1.8 | 7.4 | | -1 | <2 | <0.47 | | <2.5 | 13.3 | 230 | 7.1 | 1138.3 |
| Oct-05 | 240 | <0.66 | | | | | | 427 | <0.0027 | 220 | 0.03 | | | 48 | | | 6.5 | | -6 | | | | <2.5 | 9.2 | 210 | | 1137.53 |
| Jan-06 | 250 | <0.66 | | | | | | 434 | <0.0027 | 200 | 0.49 | | | 75 | | | 6.9 | | 20 | | | | <2.5 | 8.4 | 200 | | 1137.24 |
| Apr-06 | | | | | | | | 439 | | | | | | | | | 6.71 | | 6 | | | | | 10.2 | | | |
| Apr-06 | 250 | <0.57 | | | | | | | <0.0027 | 230 | 0.22 | | | 40 | | | | | | | | | <2.5 | | 210 | | 1138.47 |
| Jul-06 | 240 | <0.57 | 67 | <0.17 | 48 | 4 | <0.88 | 423 | <0.0027 | 210 | 0.6 | <1.3 | 21 | 86 | <0.025 | | 6.59 | 9.2 | 1 | <1.8 | <1.1 | 7.2 | <2.5 | 14.7 | 200 | <5 | 1136.8 |
| Oct-06 | | | | | | | | 456 | | | | | | | | | 7 | | -3 | | | | | 10.3 | | | |
| Oct-06 | 240 | <0.57 | | | | | | | <0.0027 | 230 | 0.019 | | | 39 | | | | | | | | | <2.5 | | 140 | | 1136.78 |
| Jan-07 | | | | | | | | 441 | | | | | | | | | 6.9 | | 11 | | | | | 7.6 | | | |
| Jan-07 | 250 | <0.57 | | | | | | | <0.0027 | 230 | 0.41 | | | 89 | | | | | | | | | 3.7 | | 180 | | 1136.27 |
| Apr-07 | | | | | | | | 427 | | | | | | | | | 6.8 | | 7 | | | | | 9.8 | | | |
| Apr-07 | 240 | 2 | | | | | | | <0.0027 | 230 | 0.24 | | | 28 | | | | | | | | | <2.5 | | 170 | | 1135.62 |
| Jun-07 | 260 | <0.83 | 67 | <0.17 | 53 | 4.4 | <0.88 | 464 | <0.0027 | 220 | 0.24 | <1.3 | 21 | 71 | <0.025 | | 7 | 8.8 | 6 | <1.8 | <1.1 | 7.6 | <2.5 | 12.1 | 200 | <5 | 1135.99 |
| Oct-07 | 250 | <0.83 | | | | | | 457 | <0.0027 | 230 | 0.31 | | | 61 | | | 7.1 | | -12 | | | | <2.5 | 11.9 | 220 | | 1136 |
| Jan-08 | 220 | <0.83 | | | | | | 520 | <0.0027 | 170 | 0.25 | | | 33 | | | 7.3 | | -5 | | | | <2.5 | 8.5 | 410 | | 1136.5 |
| Apr-08 | 260 | <1.5 | | | | | | 478 | <0.0027 | 220 | 1.1 | | | 72 | | | 6.9 | | -7 | | | | <0.25 | 10.8 | 350 | | 1137.53 |
| Jun-08 | 250 | <1.5 | 70 | <0.17 | 55 | 3.9 | <0.88 | 460 | <0.0027 | 230 | 1.2 | 1.7 | 22 | 76 | <0.025 | | 7.2 | 10 | -8 | 2 | <1.1 | 9 | <2.5 | 11.8 | 230 | <5 | 1139 |
| Oct-08 | | | | | | | | 468 | | | | | | | | | 7 | | 6 | | | | | 11.3 | | | |
| Oct-08 | 250 | <1.5 | | | | | | | <0.0027 | 220 | 1.1 | | | 80 | | | | | | | | | <2.5 | | 240 | | 1137.23 |
| Jan-09 | 240 | <1.5 | | | | | | 472 | <0.0027 | 210 | 0.91 | | | 70 | | | 7.2 | | 7 | | | | <2.5 | 7.5 | 260 | | 1136.22 |
| Apr-09 | 210 | <1.5 | | | | | | 540 | <0.0027 | 210 | 0.27 | | | 62 | | | 7.1 | | 22 | | | | 2.7 | 10.7 | 280 | | 1135.83 |
| Jun-09 | 240 | <2.1 | 64 | <0.17 | 49 | 5.2 | <0.88 | 488.1 | <0.0027 | 200 | 1.2 | <1.3 | 20 | 65 | <0.025 | | 7.09 | 8.2 | -4 | <1.8 | <1.1 | 10 | <2.5 | 12.9 | 270 | <5 | 1136.49 |
| Oct-09 | 250 | <1.5 | | | | | | 468.6 | <0.00031 | 220 | 0.83 | | | 72 | | | 7.05 | | -1 | | | | <2.5 | 9 | 230 | | 1135.44 |
| Jan-10 | 190 | <1.5 | | | | | | 563 | <0.0027 | 200 | 1.2 | | | 62 | | | 7.22 | | -4 | | | | <2.5 | 7.6 | 220 | | 1135.48 |
| Apr-10 | 260 | <1.5 | | | | | | 469.5 | <0.0027 | 210 | 1.2 | | | 69 | | | 6.98 | | 6 | | | | <2.5 | 9.4 | 240 | | 1136.03 |
| Jun-10 | 240 | <2.5 | 60 | <0.16 | 44 | 19 | <1.3 | 617 | 0.0031 | 160 | 0.2 | <1.2 | 12 | 49 | <0.025 | | 7.01 | 6.8 | -11 | <1.8 | <0.77 | 43 | <2.5 | 12.7 | 300 | <5 | 1137.87 |
| Oct-10 | 250 | <2.5 | | | | | | 303.5 | <0.0027 | 220 | 1.2 | | | 72 | | | 7.02 | | 3 | | | | <2.5 | 9.3 | 220 | | 1139.28 |
| Feb-11 | 250 | <2.5 | | | | | | 464 | <0.0027 | 200 | 1.2 | | | 59 | | | 7.07 | | -4 | | | | <2.5 | | 200 | | 1140.33 |
| Apr-11 | 250 | <2.5 | | | | | | 470 | <0.0027 | 210 | 1.3 | | | 61 | | | 7.09 | | 5 | | | | <2.5 | | 200 | | 1140.97 |
| Jul-11 | 250 | <2.5 | 72 | <0.13 | 54 | 4.7 | <0.18 | 467 | <0.0013 | 230 | 1.3 | <1.4 | 23 | 74 | <0.025 | | 6.97 | 9.4 | -22 | <1.8 | <0.26 | | <2.5 | 11.6 | 230 | <5 | 1140.79 |
| Oct-11 | 260 | <2.5 | | | | | | 465 | | 220 | 1.2 | | | 60 | | | 7.08 | | -33 | | | | <2.5 | | 220 | | 1139.25 |
| Feb-12 | 240 | <1.9 | | | | | | 466 | <0.0013 | 230 | 1.3 | | | 60 | | | 6.85 | | -14 | | | | <2.5 | 8.4 | 230 | | 1138.16 |
| May-12 | 240 | <1.9 | | | | | | 472 | <0.0013 | 230 | 1.3 | | | 61 | | | 6.99 | | -20 | | | | <2.5 | 9.4 | 240 | | 1139.63 |
| Jun-12 | 250 | <1.9 | 68 | 0.25 | 52 | 4.8 | <0.23 | 490 | <0.0013 | 220 | 1.3 | 1.5 | 22 | 66 | <0.025 | | 6.97 | 9.6 | -38 | <1.8 | <0.26 | 9.1 | <2.5 | 13.1 | 210 | <5 | 1139.98 |
| Oct-12 | 250 | <1.9 | | | | | | 468.4 | <0.0013 | 240 | 1.4 | | | 61 | | | 6.74 | | -2 | | | | <2.5 | 9.8 | 210 | | 1134.07 |
| Mar-13 | 240 | < 0.5 | | | | | | 468.3 | < 1.3 | 230 | 1.4 | | | 63 | | | 6.83 | | 9 | | | | < 2.5 | 8.4 | 250 | | 1135.2 |
| May-13 | 220 | < 0.5 | | | | | | 556 | < 1.3 | 220 | 0.37 | | | 64 | | | 6.66 | | -3 | | | | 4.1 J | 10.4 | 250 | | 1137.03 |
| Jun-13 | 220 | < 0.5 | 72 | < 0.13 | 56 | 19 | < 0.23 | 472 | < 1.3 | 230 | 0.16 | 2.8 J | 21 | 110 | < 0.025 | | 7.1 | 8.9 | 94 | < 2 | < 0.26 | 22 | 3 J | 10.3 | 240 | < 5 | 1138.5 |
| Oct-13 | 230 | < 1 | | | | | | 503 | < 1 | 210 | 0.96 | | | 84 | | | 7.05 | | 117.6 | | | | < 2.5 | 8.85 | 250 | | 1136.64 |

# ATTACHMENT 2
# PHREEQC OUTPUTS

Flambeau Mine Backfilled Pit 2013 Monitoring Results
January 2014
Final Technical Memorandum

```
                  Input file: June 2013 Phreeqc.inp
  Output file: June 2013 Phreeqc.inp.out
Database file: wateq4f.dat

------------
Reading data base.
------------

               SOLUTION_MASTER_SPECIES
               SOLUTION_SPECIES
               PHASES
               EXCHANGE_MASTER_SPECIES
               EXCHANGE_SPECIES
               SURFACE_MASTER_SPECIES
               SURFACE_SPECIES
               RATES
               END
-----------------------
Reading input data for simulation 1.
-----------------------

               TITLE  Flambeau MW-1005P, MW-1013, -A, -B, -C, MW-1014, -A, B, C  June 2013 Annual Sample
               SELECTED_OUTPUT
               file                                    June_2013_phreeqc.sel
               ionic_strength          True
               charge_balance          True
               temperature             True
               si     CO2(g) Calcite Aragonite Gypsum Fe(OH)3(a) Manganite Birnessite Rhodochrosite Rhodochrosite(d) Siderite Hydrozincite Hydrozincite_PG
               USER_PUNCH
               headings Alk(mg/L) As(mg/L) Ba(mg/L) Cd(mg/L) Ca(mg/L) Cl(mg/L) Cu(mg/L) Fe(mg/L) Pb(mg/L) Mg(mg/L) Mn(mg/L) K(mg/L) Na(mg/L)
SO4(mg/L) Zn(mg/L)
               start
               5          Alk_ppm = ALK*50*1000
               10         As_ppm = TOT("As")*74.9216*1000
               15         Ba_ppm = TOT("Ba")*137.33*1000
               20         Cd_ppm = TOT("Cd")*112.4*1000
               25         Ca_ppm = TOT("Ca")*40.078* 1000
               30         Cl_ppm = TOT("Cl") *35.4527* 1000
               35         Cu_ppm = TOT("Cu")*63.546*1000
               40         Fe_ppm = TOT("Fe") *55.847* 1000
               45         Pb_ppm = TOT("Pb")*207.19*1000
               50         Mg_ppm = TOT("Mg")*24.305* 1000
               55         Mn_ppm = TOT("Mn")*54.938* 1000
               60         K_ppm = TOT("K")*39.0983* 1000
               65         Na_ppm = TOT("Na")*22.9898* 1000
               70         SO4_ppm = mol("SO4-2")*96.16* 1000
               75         Zn_ppm = TOT("Zn")*65.37* 1000
               80         PUNCH Alk_ppm
               85         PUNCH As_ppm
               90         PUNCH Ba_ppm
               95         PUNCH Cd_ppm
               100        PUNCH Ca_ppm
               105        PUNCH Cl_ppm
               110        PUNCH Cu_ppm
               115        PUNCH Fe_ppm
               120        PUNCH Pb_ppm
               125        PUNCH Mg_ppm
               130        PUNCH Mn_ppm
               135        PUNCH K_ppm
               140        PUNCH Na_ppm
               145        PUNCH SO4_ppm
               150        PUNCH Zn_ppm
               end
               Solution 1 - MW-1013, Sample Date June 2013
               Units                   mg/L
               pH                      6.11  #Field value
               pe                      0.81
               Temperature 10.2
               Alkalinity      560
               As                      0.0013
               Ba                      0.160
               Cd                      0.00012  #Detection Limit
               Ca                      170
               Cl                      15
               Cu                      0.0052
               Fe                      17
               Pb                      0.0047   #Detection Limit
               Mg                      45
               Mn                      27
               K                       3.4
               Se                      0.002    #Detection Limit
               Ag                      0.0025   #Detection Limit
               Na                      20
               S(6)                    28
               Zn                      0.005    #Detection Limit
               END
---
TITLE
---

 Flambeau MW-1005P, MW-1013, -A, -B, -C, MW-1014, -A, B, C  June 2013 Annual Sample

-----------------------
```

Beginning of initial solution calculations.

Initial solution 1. - MW-1013, Sample Date June 2013

----------Solution composition----------

| Elements | Molality | Moles |
|---|---|---|
| Ag | 2.320e-008 | 2.320e-008 |
| Alkalinity | 1.120e-002 | 1.120e-002 |
| As | 1.737e-008 | 1.737e-008 |
| Ba | 1.166e-006 | 1.166e-006 |
| Ca | 4.245e-003 | 4.245e-003 |
| Cd | 1.069e-009 | 1.069e-009 |
| Cl | 4.235e-004 | 4.235e-004 |
| Cu | 8.190e-008 | 8.190e-008 |
| Fe | 3.047e-004 | 3.047e-004 |
| K | 8.703e-005 | 8.703e-005 |
| Mg | 1.853e-003 | 1.853e-003 |
| Mn | 4.919e-004 | 4.919e-004 |
| Na | 8.707e-004 | 8.707e-004 |
| Pb | 2.270e-008 | 2.270e-008 |
| S(6) | 2.917e-004 | 2.917e-004 |
| Se | 2.535e-008 | 2.535e-008 |
| Zn | 7.656e-008 | 7.656e-008 |

----------Description of solution----------

pH = 6.110
pe = 0.810
Activity of water = 0.999
Ionic strength = 1.903e-002
Mass of water (kg) = 1.000e+000
Total carbon (mol/kg) = 3.194e-002
Total CO2 (mol/kg) = 3.194e-002
Temperature (deg C) = 10.200
Electrical balance (eq) = 2.544e-003
Percent error, 100*(Cat-|An|)/(Cat+|An|) = 10.05
Iterations = 11
Total H = 1.110236e+002
Total O = 5.558246e+001

----------Distribution of species----------

| Species | Molality | Log Activity | Log Molality | Log Activity | Gamma |
|---|---|---|---|---|---|
| H+ | 8.687e-007 | 7.762e-007 | -6.061 | -6.110 | -0.049 |
| OH- | 4.376e-009 | 3.833e-009 | -8.359 | -8.416 | -0.057 |
| H2O | 5.551e+001 | 9.993e-001 | 1.744 | -0.000 | 0.000 |
| **Ag** | **2.320e-008** | | | | |
| Ag+ | 1.290e-008 | 1.130e-008 | -7.889 | -7.947 | -0.057 |
| AgCl | 9.802e-009 | 9.845e-009 | -8.009 | -8.007 | 0.002 |
| AgCl2- | 4.634e-010 | 4.059e-010 | -9.334 | -9.392 | -0.057 |
| AgSO4- | 2.807e-011 | 2.459e-011 | -10.552 | -10.609 | -0.057 |
| AgCl3-2 | 1.885e-013 | 1.110e-013 | -12.725 | -12.955 | -0.230 |
| AgOH | 1.449e-014 | 1.455e-014 | -13.839 | -13.837 | 0.002 |
| AgCl4-3 | 2.240e-016 | 6.804e-017 | -15.650 | -16.167 | -0.517 |
| Ag(OH)2- | 2.139e-020 | 1.873e-020 | -19.670 | -19.727 | -0.057 |
| **As(3)** | **1.733e-008** | | | | |
| H3AsO3 | 1.732e-008 | 1.740e-008 | -7.761 | -7.760 | 0.002 |
| H2AsO3- | 1.014e-011 | 8.880e-012 | -10.994 | -11.052 | -0.057 |
| H4AsO3+ | 7.637e-015 | 6.690e-015 | -14.117 | -14.175 | -0.057 |
| HAsO3-2 | 1.981e-020 | 1.166e-020 | -19.703 | -19.933 | -0.230 |
| AsO3-3 | 5.788e-030 | 1.758e-030 | -29.237 | -29.755 | -0.517 |
| **As(5)** | **3.722e-011** | | | | |
| H2AsO4- | 3.311e-011 | 2.900e-011 | -10.480 | -10.538 | -0.057 |
| HAsO4-2 | 4.102e-012 | 2.415e-012 | -11.387 | -11.617 | -0.230 |
| H3AsO4 | 3.854e-015 | 3.871e-015 | -14.414 | -14.412 | 0.002 |
| AsO4-3 | 1.563e-017 | 4.747e-018 | -16.806 | -17.324 | -0.517 |
| **Ba** | **1.166e-006** | | | | |
| Ba+2 | 1.085e-006 | 6.388e-007 | -5.965 | -6.195 | -0.230 |
| BaHCO3+ | 4.068e-008 | 3.564e-008 | -7.391 | -7.448 | -0.057 |
| BaSO4 | 4.056e-008 | 4.073e-008 | -7.392 | -7.390 | 0.002 |
| BaCO3 | 9.537e-011 | 9.578e-011 | -10.021 | -10.019 | 0.002 |
| BaOH+ | 3.181e-014 | 2.786e-014 | -13.497 | -13.555 | -0.057 |
| **C(4)** | **3.194e-002** | | | | |
| CO2 | 2.075e-002 | 2.084e-002 | -1.683 | -1.681 | 0.002 |
| HCO3- | 1.053e-002 | 9.273e-003 | -1.978 | -2.033 | -0.055 |
| CaHCO3+ | 2.352e-004 | 2.060e-004 | -3.629 | -3.686 | -0.057 |
| MnHCO3+ | 1.725e-004 | 1.511e-004 | -3.763 | -3.821 | -0.057 |
| MgHCO3+ | 1.233e-004 | 1.080e-004 | -3.909 | -3.966 | -0.057 |
| FeHCO3+ | 1.159e-004 | 1.015e-004 | -3.936 | -3.994 | -0.057 |
| MnCO3 | 5.648e-006 | 5.673e-006 | -5.248 | -5.246 | 0.002 |
| NaHCO3 | 3.947e-006 | 3.964e-006 | -5.404 | -5.402 | 0.002 |
| CaCO3 | 1.263e-006 | 1.268e-006 | -5.899 | -5.897 | 0.002 |
| FeCO3 | 1.021e-006 | 1.026e-006 | -5.991 | -5.989 | 0.002 |
| CO3-2 | 6.499e-007 | 3.907e-007 | -6.187 | -6.408 | -0.221 |
| MgCO3 | 3.070e-007 | 3.083e-007 | -6.513 | -6.511 | 0.002 |
| BaHCO3+ | 4.068e-008 | 3.564e-008 | -7.391 | -7.448 | -0.057 |
| ZnHCO3+ | 3.252e-008 | 2.849e-008 | -7.488 | -7.545 | -0.057 |
| PbHCO3+ | 1.124e-008 | 9.844e-009 | -7.949 | -8.007 | -0.057 |

| | | | | | |
|---|---|---|---|---|---|
| PbCO3 | 9.034e-009 | 9.074e-009 | -8.044 | -8.042 | 0.002 |
| CuHCO3+ | 4.673e-009 | 4.094e-009 | -8.330 | -8.388 | -0.057 |
| NaCO3- | 2.878e-009 | 2.521e-009 | -8.541 | -8.598 | -0.057 |
| ZnCO3 | 1.894e-009 | 1.902e-009 | -8.723 | -8.721 | 0.002 |
| CuCO3 | 1.840e-009 | 1.848e-009 | -8.735 | -8.733 | 0.002 |
| CdHCO3+ | 1.699e-010 | 1.489e-010 | -9.770 | -9.827 | -0.057 |
| BaCO3 | 9.537e-011 | 9.578e-011 | -10.021 | -10.019 | 0.002 |
| Zn(CO3)2-2 | 2.699e-011 | 1.589e-011 | -10.569 | -10.799 | -0.230 |
| Pb(CO3)2-2 | 1.512e-011 | 8.905e-012 | -10.820 | -11.050 | -0.230 |
| Cu(CO3)2-2 | 1.544e-012 | 9.091e-013 | -11.811 | -12.041 | -0.230 |
| CdCO3 | 1.569e-013 | 1.576e-013 | -12.804 | -12.803 | 0.002 |
| Cd(CO3)2-2 | 3.306e-016 | 1.947e-016 | -15.481 | -15.711 | -0.230 |
| Ca | 4.245e-003 | | | | |
| Ca+2 | 3.957e-003 | 2.378e-003 | -2.403 | -2.624 | -0.221 |
| CaHCO3+ | 2.352e-004 | 2.060e-004 | -3.629 | -3.686 | -0.057 |
| CaSO4 | 5.198e-005 | 5.221e-005 | -4.284 | -4.282 | 0.002 |
| CaCO3 | 1.263e-006 | 1.268e-006 | -5.899 | -5.897 | 0.002 |
| CaOH+ | 5.801e-010 | 5.082e-010 | -9.237 | -9.294 | -0.057 |
| CaHSO4+ | 2.317e-010 | 2.030e-010 | -9.635 | -9.693 | -0.057 |
| Cd | 1.069e-009 | | | | |
| Cd+2 | 8.621e-010 | 5.077e-010 | -9.064 | -9.294 | -0.230 |
| CdHCO3+ | 1.699e-010 | 1.489e-010 | -9.770 | -9.827 | -0.057 |
| CdCl+ | 1.940e-011 | 1.700e-011 | -10.712 | -10.770 | -0.057 |
| CdSO4 | 1.686e-011 | 1.694e-011 | -10.773 | -10.771 | 0.002 |
| CdCO3 | 1.569e-013 | 1.576e-013 | -12.804 | -12.803 | 0.002 |
| Cd(SO4)2-2 | 4.414e-014 | 2.599e-014 | -13.355 | -13.585 | -0.230 |
| CdCl2 | 2.460e-014 | 2.471e-014 | -13.609 | -13.607 | 0.002 |
| CdOH+ | 1.955e-014 | 1.713e-014 | -13.709 | -13.766 | -0.057 |
| CdOHCl | 6.457e-015 | 6.486e-015 | -14.190 | -14.188 | 0.002 |
| Cd(CO3)2-2 | 3.306e-016 | 1.947e-016 | -15.481 | -15.711 | -0.230 |
| CdCl3- | 5.199e-018 | 4.554e-018 | -17.284 | -17.342 | -0.057 |
| Cd(OH)2 | 3.742e-018 | 3.758e-018 | -17.427 | -17.425 | 0.002 |
| Cd2OH+3 | 1.702e-022 | 5.171e-023 | -21.769 | -22.286 | -0.517 |
| Cd(OH)3- | 6.197e-025 | 5.429e-025 | -24.208 | -24.265 | -0.057 |
| Cd(OH)4-2 | 1.058e-032 | 6.229e-033 | -31.976 | -32.206 | -0.230 |
| Cl | 4.235e-004 | | | | |
| Cl- | 4.231e-004 | 3.693e-004 | -3.374 | -3.433 | -0.059 |
| MnCl+ | 3.139e-007 | 2.750e-007 | -6.503 | -6.561 | -0.057 |
| FeCl+ | 6.369e-008 | 5.580e-008 | -7.196 | -7.253 | -0.057 |
| AgCl | 9.802e-009 | 9.845e-009 | -8.009 | -8.007 | 0.002 |
| CuCl2- | 3.163e-009 | 2.770e-009 | -8.500 | -8.557 | -0.057 |
| AgCl2- | 4.634e-010 | 4.059e-010 | -9.334 | -9.392 | -0.057 |
| MnCl2 | 4.414e-011 | 4.433e-011 | -10.355 | -10.353 | 0.002 |
| CdCl+ | 1.940e-011 | 1.700e-011 | -10.712 | -10.770 | -0.057 |
| PbCl+ | 1.524e-011 | 1.335e-011 | -10.817 | -10.874 | -0.057 |
| ZnCl+ | 1.393e-011 | 1.221e-011 | -10.856 | -10.913 | -0.057 |
| CuCl3-2 | 2.593e-012 | 1.527e-012 | -11.586 | -11.816 | -0.230 |
| CuCl+ | 4.662e-013 | 4.084e-013 | -12.331 | -12.389 | -0.057 |
| ZnOHCl | 3.825e-013 | 3.842e-013 | -12.417 | -12.415 | 0.002 |
| AgCl3-2 | 1.885e-013 | 1.110e-013 | -12.725 | -12.955 | -0.230 |
| CdCl2 | 2.460e-014 | 2.471e-014 | -13.609 | -13.607 | 0.002 |
| PbCl2 | 1.041e-014 | 1.046e-014 | -13.983 | -13.981 | 0.002 |
| CdOHCl | 6.457e-015 | 6.486e-015 | -14.190 | -14.188 | 0.002 |
| MnCl3- | 5.148e-015 | 4.510e-015 | -14.288 | -14.346 | -0.057 |
| ZnCl2 | 4.415e-015 | 4.434e-015 | -14.355 | -14.353 | 0.002 |
| AgCl4-3 | 2.240e-016 | 6.804e-017 | -15.650 | -16.167 | -0.517 |
| CuCl2 | 6.815e-017 | 6.845e-017 | -16.167 | -16.165 | 0.002 |
| CdCl3- | 5.199e-018 | 4.554e-018 | -17.284 | -17.342 | -0.057 |
| PbCl3- | 3.181e-018 | 2.786e-018 | -17.497 | -17.555 | -0.057 |
| ZnCl3- | 1.910e-018 | 1.673e-018 | -17.719 | -17.776 | -0.057 |
| FeCl+2 | 3.323e-019 | 1.957e-019 | -18.478 | -18.708 | -0.230 |
| PbCl4-2 | 7.418e-022 | 4.368e-022 | -21.130 | -21.360 | -0.230 |
| FeCl2+ | 6.038e-022 | 5.289e-022 | -21.219 | -21.277 | -0.057 |
| ZnCl4-2 | 4.649e-022 | 2.738e-022 | -21.333 | -21.563 | -0.230 |
| CuCl3- | 7.770e-023 | 6.806e-023 | -22.110 | -22.167 | -0.057 |
| FeCl3 | 1.945e-026 | 1.953e-026 | -25.711 | -25.709 | 0.002 |
| CuCl4-2 | 1.492e-028 | 8.784e-029 | -27.826 | -28.056 | -0.230 |
| Cu(1) | 7.383e-008 | | | | |
| Cu+ | 7.066e-008 | 6.190e-008 | -7.151 | -7.208 | -0.057 |
| CuCl2- | 3.163e-009 | 2.770e-009 | -8.500 | -8.557 | -0.057 |
| CuCl3-2 | 2.593e-012 | 1.527e-012 | -11.586 | -11.816 | -0.230 |
| Cu(2) | 8.074e-009 | | | | |
| CuHCO3+ | 4.673e-009 | 4.094e-009 | -8.330 | -8.388 | -0.057 |
| CuCO3 | 1.840e-009 | 1.848e-009 | -8.735 | -8.733 | 0.002 |
| Cu+2 | 1.496e-009 | 8.808e-010 | -8.825 | -9.055 | -0.230 |
| Cu(OH)2 | 3.037e-011 | 3.050e-011 | -10.518 | -10.516 | 0.002 |
| CuSO4 | 2.046e-011 | 2.055e-011 | -10.689 | -10.687 | 0.002 |
| CuOH+ | 1.294e-011 | 1.134e-011 | -10.888 | -10.945 | -0.057 |
| Cu(CO3)2-2 | 1.544e-012 | 9.091e-013 | -11.811 | -12.041 | -0.230 |
| CuCl+ | 4.662e-013 | 4.084e-013 | -12.331 | -12.389 | -0.057 |
| CuCl2 | 6.815e-017 | 6.845e-017 | -16.167 | -16.165 | 0.002 |
| Cu2(OH)2+2 | 2.036e-017 | 1.199e-017 | -16.691 | -16.921 | -0.230 |
| Cu(OH)3- | 2.701e-018 | 2.366e-018 | -17.569 | -17.626 | -0.057 |
| CuCl3- | 7.770e-023 | 6.806e-023 | -22.110 | -22.167 | -0.057 |
| Cu(OH)4-2 | 1.032e-024 | 6.077e-025 | -23.986 | -24.216 | -0.230 |
| CuCl4-2 | 1.492e-028 | 8.784e-029 | -27.826 | -28.056 | -0.230 |
| Fe(2) | 3.047e-004 | | | | |
| Fe+2 | 1.859e-004 | 1.094e-004 | -3.731 | -3.961 | -0.230 |
| FeHCO3+ | 1.159e-004 | 1.015e-004 | -3.936 | -3.994 | -0.057 |
| FeSO4 | 1.855e-006 | 1.863e-006 | -5.732 | -5.730 | 0.002 |
| FeCO3 | 1.021e-006 | 1.026e-006 | -5.991 | -5.989 | 0.002 |
| FeCl+ | 6.369e-008 | 5.580e-008 | -7.196 | -7.253 | -0.057 |
| FeOH+ | 1.589e-008 | 1.392e-008 | -7.799 | -7.856 | -0.057 |

| | | | | | |
|---|---|---|---|---|---|
| FeHSO4+ | 1.066e-011 | 9.342e-012 | -10.972 | -11.030 | -0.057 |
| Fe(OH)2 | 3.918e-014 | 3.936e-014 | -13.407 | -13.405 | 0.002 |
| Fe(OH)3- | 1.844e-018 | 1.615e-018 | -17.734 | -17.792 | -0.057 |
| Fe(3) | 2.781e-011 | | | | |
| Fe(OH)2+ | 2.575e-011 | 2.256e-011 | -10.589 | -10.647 | -0.057 |
| Fe(OH)3 | 1.890e-012 | 1.898e-012 | -11.724 | -11.722 | 0.002 |
| FeOH+2 | 1.622e-013 | 9.553e-014 | -12.790 | -13.020 | -0.230 |
| Fe(OH)4- | 1.360e-015 | 1.192e-015 | -14.866 | -14.924 | -0.057 |
| Fe+3 | 9.463e-017 | 2.875e-017 | -16.024 | -16.541 | -0.517 |
| FeSO4+ | 3.244e-017 | 2.841e-017 | -16.489 | -16.546 | -0.057 |
| FeCl+2 | 3.323e-019 | 1.957e-019 | -18.478 | -18.708 | -0.230 |
| Fe(SO4)2- | 8.496e-020 | 7.443e-020 | -19.071 | -19.128 | -0.057 |
| FeCl2+ | 6.038e-022 | 5.289e-022 | -21.219 | -21.277 | -0.057 |
| FeHSO4+2 | 1.047e-022 | 6.163e-023 | -21.980 | -22.210 | -0.230 |
| Fe2(OH)2+4 | 3.887e-024 | 4.675e-025 | -23.410 | -24.330 | -0.920 |
| FeCl3 | 1.945e-026 | 1.953e-026 | -25.711 | -25.709 | 0.002 |
| Fe3(OH)4+5 | 2.538e-031 | 9.272e-033 | -30.596 | -32.033 | -1.437 |
| H(0) | 2.379e-017 | | | | |
| H2 | 1.190e-017 | 1.195e-017 | -16.925 | -16.923 | 0.002 |
| K | 8.703e-005 | | | | |
| K+ | 8.697e-005 | 7.592e-005 | -4.061 | -4.120 | -0.059 |
| KSO4- | 5.904e-008 | 5.172e-008 | -7.229 | -7.286 | -0.057 |
| Mg | 1.853e-003 | | | | |
| Mg+2 | 1.708e-003 | 1.038e-003 | -2.767 | -2.984 | -0.216 |
| MgHCO3+ | 1.233e-004 | 1.080e-004 | -3.909 | -3.966 | -0.057 |
| MgSO4 | 2.064e-005 | 2.073e-005 | -4.685 | -4.683 | 0.002 |
| MgCO3 | 3.070e-007 | 3.083e-007 | -6.513 | -6.511 | 0.002 |
| MgOH+ | 1.357e-009 | 1.189e-009 | -8.867 | -8.925 | -0.057 |
| Mn(2) | 4.919e-004 | | | | |
| Mn+2 | 3.104e-004 | 1.828e-004 | -3.508 | -3.738 | -0.230 |
| MnHCO3+ | 1.725e-004 | 1.511e-004 | -3.763 | -3.821 | -0.057 |
| MnCO3 | 5.648e-006 | 5.673e-006 | -5.248 | -5.246 | 0.002 |
| MnSO4 | 3.060e-006 | 3.073e-006 | -5.514 | -5.512 | 0.002 |
| MnCl+ | 3.139e-007 | 2.750e-007 | -6.503 | -6.561 | -0.057 |
| MnOH+ | 1.940e-009 | 1.700e-009 | -8.712 | -8.770 | -0.057 |
| MnCl2 | 4.414e-011 | 4.433e-011 | -10.355 | -10.353 | 0.002 |
| MnCl3- | 5.148e-015 | 4.510e-015 | -14.288 | -14.346 | -0.057 |
| Mn(OH)3- | 7.056e-021 | 6.181e-021 | -20.151 | -20.209 | -0.057 |
| Mn(3) | 1.235e-029 | | | | |
| Mn+3 | 1.235e-029 | 3.752e-030 | -28.908 | -29.426 | -0.517 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -75.573 | -75.803 | -0.230 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -85.338 | -85.395 | -0.057 |
| Na | 8.707e-004 | | | | |
| Na+ | 8.663e-004 | 7.601e-004 | -3.062 | -3.119 | -0.057 |
| NaHCO3 | 3.947e-006 | 3.964e-006 | -5.404 | -5.402 | 0.002 |
| NaSO4- | 5.013e-007 | 4.392e-007 | -6.300 | -6.357 | -0.057 |
| NaCO3- | 2.878e-009 | 2.521e-009 | -8.541 | -8.598 | -0.057 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -63.563 | -63.561 | 0.002 |
| Pb | 2.270e-008 | | | | |
| PbHCO3+ | 1.124e-008 | 9.844e-009 | -7.949 | -8.007 | -0.057 |
| PbCO3 | 9.034e-009 | 9.074e-009 | -8.044 | -8.042 | 0.002 |
| Pb+2 | 2.269e-009 | 1.336e-009 | -8.644 | -8.874 | -0.230 |
| PbSO4 | 9.520e-011 | 9.562e-011 | -10.021 | -10.019 | 0.002 |
| PbOH+ | 3.829e-011 | 3.355e-011 | -10.417 | -10.474 | -0.057 |
| PbCl+ | 1.524e-011 | 1.335e-011 | -10.817 | -10.874 | -0.057 |
| Pb(CO3)2-2 | 1.512e-011 | 8.905e-012 | -10.820 | -11.050 | -0.230 |
| Pb(SO4)2-2 | 1.084e-013 | 6.385e-014 | -12.965 | -13.195 | -0.230 |
| Pb(OH)2 | 1.673e-014 | 1.680e-014 | -13.777 | -13.775 | 0.002 |
| PbCl2 | 1.041e-014 | 1.046e-014 | -13.983 | -13.981 | 0.002 |
| Pb2OH+3 | 3.304e-018 | 1.004e-018 | -17.481 | -17.998 | -0.517 |
| PbCl3- | 3.181e-018 | 2.786e-018 | -17.497 | -17.555 | -0.057 |
| Pb(OH)3- | 2.835e-019 | 2.483e-019 | -18.547 | -18.605 | -0.057 |
| PbCl4-2 | 7.418e-022 | 4.368e-022 | -21.130 | -21.360 | -0.230 |
| Pb(OH)4-2 | 1.244e-024 | 7.324e-025 | -23.905 | -24.135 | -0.230 |
| Pb3(OH)4+2 | 1.419e-027 | 8.357e-028 | -26.848 | -27.078 | -0.230 |
| S(6) | 2.917e-004 | | | | |
| SO4-2 | 2.136e-004 | 1.272e-004 | -3.670 | -3.895 | -0.225 |
| CaSO4 | 5.198e-005 | 5.221e-005 | -4.284 | -4.282 | 0.002 |
| MgSO4 | 2.064e-005 | 2.073e-005 | -4.685 | -4.683 | 0.002 |
| MnSO4 | 3.060e-006 | 3.073e-006 | -5.514 | -5.512 | 0.002 |
| FeSO4 | 1.855e-006 | 1.863e-006 | -5.732 | -5.730 | 0.002 |
| NaSO4- | 5.013e-007 | 4.392e-007 | -6.300 | -6.357 | -0.057 |
| KSO4- | 5.904e-008 | 5.172e-008 | -7.229 | -7.286 | -0.057 |
| BaSO4 | 4.056e-008 | 4.073e-008 | -7.392 | -7.390 | 0.002 |
| HSO4- | 8.104e-009 | 7.099e-009 | -8.091 | -8.149 | -0.057 |
| ZnSO4 | 6.429e-010 | 6.457e-010 | -9.192 | -9.190 | 0.002 |
| CaHSO4+ | 2.317e-010 | 2.030e-010 | -9.635 | -9.693 | -0.057 |
| PbSO4 | 9.520e-011 | 9.562e-011 | -10.021 | -10.019 | 0.002 |
| AgSO4- | 2.807e-011 | 2.459e-011 | -10.552 | -10.609 | -0.057 |
| CuSO4 | 2.046e-011 | 2.055e-011 | -10.689 | -10.687 | 0.002 |
| CdSO4 | 1.686e-011 | 1.694e-011 | -10.773 | -10.771 | 0.002 |
| FeHSO4+ | 1.066e-011 | 9.342e-012 | -10.972 | -11.030 | -0.057 |
| Zn(SO4)2-2 | 1.278e-012 | 7.528e-013 | -11.893 | -12.123 | -0.230 |
| Pb(SO4)2-2 | 1.084e-013 | 6.385e-014 | -12.965 | -13.195 | -0.230 |
| Cd(SO4)2-2 | 4.414e-014 | 2.599e-014 | -13.355 | -13.585 | -0.230 |
| FeSO4+ | 3.244e-017 | 2.841e-017 | -16.489 | -16.546 | -0.057 |
| Fe(SO4)2- | 8.496e-020 | 7.443e-020 | -19.071 | -19.128 | -0.057 |
| FeHSO4+2 | 1.047e-022 | 6.163e-023 | -21.980 | -22.210 | -0.230 |
| Se(-2) | 7.926e-016 | | | | |
| HSe- | 7.872e-016 | 6.896e-016 | -15.104 | -15.161 | -0.057 |

| | | | | | |
|---|---|---|---|---|---|
| H2Se | 5.366e-018 | 5.389e-018 | -17.270 | -17.268 | 0.002 |
| Se(4) | 2.535e-008 | | | | |
| HSeO3- | 2.519e-008 | 2.207e-008 | -7.599 | -7.656 | -0.057 |
| SeO3-2 | 1.526e-010 | 8.989e-011 | -9.816 | -10.046 | -0.230 |
| H2SeO3 | 9.590e-012 | 9.632e-012 | -11.018 | -11.016 | 0.002 |
| Se(6) | 5.853e-027 | | | | |
| SeO4-2 | 5.853e-027 | 3.447e-027 | -26.233 | -26.463 | -0.230 |
| HSeO4- | 9.056e-032 | 7.933e-032 | -31.043 | -31.101 | -0.057 |
| Zn | 7.656e-008 | | | | |
| Zn+2 | 4.144e-008 | 2.440e-008 | -7.383 | -7.613 | -0.230 |
| ZnHCO3+ | 3.252e-008 | 2.849e-008 | -7.488 | -7.545 | -0.057 |
| ZnCO3 | 1.894e-009 | 1.902e-009 | -8.723 | -8.721 | 0.002 |
| ZnSO4 | 6.429e-010 | 6.457e-010 | -9.192 | -9.190 | 0.002 |
| Zn(CO3)2-2 | 2.699e-011 | 1.589e-011 | -10.569 | -10.799 | -0.230 |
| ZnCl+ | 1.393e-011 | 1.221e-011 | -10.856 | -10.913 | -0.057 |
| ZnOH+ | 1.207e-011 | 1.057e-011 | -10.918 | -10.976 | -0.057 |
| Zn(SO4)2-2 | 1.278e-012 | 7.528e-013 | -11.893 | -12.123 | -0.230 |
| Zn(OH)2 | 5.070e-013 | 5.092e-013 | -12.295 | -12.293 | 0.002 |
| ZnOHCl | 3.825e-013 | 3.842e-013 | -12.417 | -12.415 | 0.002 |
| ZnCl2 | 4.415e-015 | 4.434e-015 | -14.355 | -14.353 | 0.002 |
| Zn(OH)3- | 2.366e-018 | 2.073e-018 | -17.626 | -17.683 | -0.057 |
| ZnCl3- | 1.910e-018 | 1.673e-018 | -17.719 | -17.776 | -0.057 |
| ZnCl4-2 | 4.649e-022 | 2.738e-022 | -21.333 | -21.563 | -0.230 |
| Zn(OH)4-2 | 7.182e-025 | 4.229e-025 | -24.144 | -24.374 | -0.230 |

----------Saturation indices----------

| Phase | SI | log IAP | log KT | |
|---|---|---|---|---|
| Ag2CO3 | -10.87 | -22.30 | -11.43 | Ag2CO3 |
| Ag2O | -16.65 | -3.67 | 12.98 | Ag2O |
| Ag2SO4 | -14.71 | -19.79 | -5.08 | Ag2SO4 |
| AgMetal | 5.72 | -8.76 | -14.48 | Ag |
| Anglesite | -4.90 | -12.77 | -7.87 | PbSO4 |
| Anhydrite | -2.18 | -6.52 | -4.34 | CaSO4 |
| Antlerite | -14.91 | -6.62 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.78 | -9.03 | -8.26 | CaCO3 |
| Arsenolite | -13.86 | -15.52 | -1.65 | As2O3 |
| Artinite | -10.86 | -0.16 | 10.70 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -37.34 | -28.82 | 8.52 | As2O5 |
| As_native | -14.93 | -28.52 | -13.59 | As |
| Atacamite | -11.27 | -3.21 | 8.06 | Cu2(OH)3Cl |
| Azurite | -11.72 | -6.79 | 4.93 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -2.76 | -53.23 | -50.47 | Ba3(AsO4)2 |
| Barite | 0.15 | -10.09 | -10.24 | BaSO4 |
| BaSeO3 | -9.85 | -16.24 | -6.39 | BaSeO3 |
| Bianchite | -9.75 | -11.51 | -1.76 | ZnSO4:6H2O |
| Birnessite | -21.28 | 22.32 | 43.60 | MnO2 |
| Bixbyite | -22.17 | -22.19 | -0.03 | Mn2O3 |
| Brochantite | -18.80 | -3.46 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -8.64 | 9.24 | 17.88 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -23.61 | -42.52 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.62 | -9.03 | -8.41 | CaCO3 |
| CaSeO3 | -7.07 | -12.67 | -5.60 | CaSeO3 |
| Cd(gamma) | -25.20 | -10.91 | 14.28 | Cd |
| Cd(OH)2 | -10.72 | 2.93 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -11.60 | 2.93 | 14.53 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -30.16 | -23.45 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -29.90 | -7.34 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -32.81 | -4.41 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -15.65 | -16.16 | -0.51 | CdCl2 |
| CdCl2:2.5H2O | -14.15 | -16.16 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -14.52 | -16.16 | -1.64 | CdCl2:H2O |
| CdMetal | -25.09 | -10.91 | 14.18 | Cd |
| CdOHCl | -10.42 | -6.62 | 3.80 | CdOHCl |
| CdSO4 | -13.65 | -13.19 | 0.46 | CdSO4 |
| CdSO4:2.7H2O | -11.48 | -13.19 | -1.71 | CdSO4:2.67H2O |
| CdSO4:H2O | -11.82 | -13.19 | -1.37 | CdSO4:H2O |
| Cerargyrite | -1.03 | -11.38 | -10.35 | AgCl |
| Cerrusite | -1.97 | -15.28 | -13.32 | PbCO3 |
| Chalcanthite | -10.26 | -12.95 | -2.70 | CuSO4:5H2O |
| Claudetite | -13.92 | -15.52 | -1.60 | As2O3 |
| CO2(g) | -0.41 | -1.68 | -1.27 | CO2 |
| Cotunnite | -10.75 | -15.74 | -4.98 | PbCl2 |
| Cu(OH)2 | -6.06 | 3.16 | 9.22 | Cu(OH)2 |
| Cu2SO4 | -16.54 | -18.31 | -1.78 | Cu2SO4 |
| Cu3(AsO4)2:6w | -26.69 | -61.81 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -5.83 | -15.46 | -9.63 | CuCO3 |
| CuMetal | 1.40 | -8.02 | -9.42 | Cu |
| CuOCuSO4 | -22.68 | -9.79 | 12.89 | CuO:CuSO4 |
| CupricFerrite | -0.62 | 6.74 | 7.36 | CuFe2O4 |
| Cuprite | -0.41 | -2.20 | -1.79 | Cu2O |
| CuprousFerrite | 9.46 | 0.69 | -8.77 | CuFeO2 |
| CuSO4 | -16.66 | -12.95 | 3.70 | CuSO4 |
| Dolomite | -1.70 | -18.42 | -16.73 | CaMg(CO3)2 |
| Dolomite(d) | -2.31 | -18.42 | -16.12 | CaMg(CO3)2 |
| Epsomite | -4.63 | -6.88 | -2.25 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 1.97 | -1.07 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -3.10 | 1.79 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -27.79 | -63.22 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -8.39 | 11.83 | 20.22 | Fe3(OH)8 |
| FeSe2 | -1.86 | -20.44 | -18.58 | FeSe2 |
| Goethite | 2.23 | 1.79 | -0.45 | FeOOH |

| | | | |
|---|---|---|---|
| Goslarite | -9.42 | -11.51 | -2.09 ZnSO4:7H2O |
| Gypsum | -1.93 | -6.52 | -4.59 CaSO4:2H2O |
| H2(g) | -13.84 | -16.92 | -3.08 H2 |
| H2O(g) | -1.91 | -0.00 | 1.91 H2O |
| Halite | -8.10 | -6.55 | 1.55 NaCl |
| Hausmannite | -25.60 | 39.28 | 64.88 Mn3O4 |
| Hematite | 6.40 | 3.58 | -2.83 Fe2O3 |
| Huntite | -8.23 | -37.21 | -28.98 CaMg3(CO3)4 |
| Hydrocerrusite | -9.76 | -27.22 | -17.46 Pb(OH)2:2PbCO3 |
| Hydromagnesite | -21.57 | -28.33 | -6.76 Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -23.56 | 6.75 | 30.31 Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -25.28 | 6.75 | 32.03 Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -15.41 | -25.24 | -9.83 (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -16.86 | -24.88 | -8.01 KFe3(SO4)2(OH)6 |
| Jarosite-Na | -19.98 | -23.88 | -3.89 NaFe3(SO4)2(OH)6 |
| JarositeH | -23.59 | -26.87 | -3.28 (H3O)Fe3(SO4)2(OH)6 |
| Langite | -21.76 | -3.46 | 18.31 Cu4(OH)6SO4:H2O |
| Larnakite | -9.39 | -9.42 | -0.03 PbO:PbSO4 |
| Laurionite | -6.82 | -6.20 | 0.62 PbOHCl |
| Litharge | -10.00 | 3.35 | 13.35 PbO |
| Maghemite | -2.81 | 3.58 | 6.39 Fe2O3 |
| Magnesite | -1.60 | -9.39 | -7.79 MgCO3 |
| Magnetite | 6.17 | 11.84 | 5.67 Fe3O4 |
| Malachite | -7.72 | -1.81 | 5.91 Cu2(OH)2CO3 |
| Manganite | -9.94 | 15.40 | 25.34 MnOOH |
| Massicot | -10.21 | 3.35 | 13.55 PbO |
| Melanothallite | -20.12 | -15.92 | 4.20 CuCl2 |
| Melanterite | -5.45 | -7.86 | -2.41 FeSO4:7H2O |
| Minium | -53.75 | 23.88 | 77.62 Pb3O4 |
| Mirabilite | -8.30 | -10.14 | -1.84 Na2SO4:10H2O |
| Mn2(SO4)3 | -66.32 | -70.54 | -4.22 Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -17.16 | -45.86 | -28.71 Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.65 | -10.60 | 2.04 MnCl2:4H2O |
| MnSO4 | -10.90 | -7.63 | 3.26 MnSO4 |
| Monteponite | -11.79 | 2.93 | 14.72 CdO |
| Nahcolite | -4.46 | -5.15 | -0.69 NaHCO3 |
| Nantokite | -3.50 | -10.64 | -7.14 CuCl |
| Natron | -10.74 | -12.65 | -1.91 Na2CO3:10H2O |
| Nesquehonite | -3.99 | -9.39 | -5.40 MgCO3:3H2O |
| Nsutite | -20.24 | 22.32 | 42.56 MnO2 |
| O2(g) | -60.79 | -63.56 | -2.77 O2 |
| Otavite | -3.70 | -15.70 | -12.00 CdCO3 |
| Pb(OH)2 | -5.34 | 3.35 | 8.69 Pb(OH)2 |
| Pb2(OH)3Cl | -11.64 | -2.85 | 8.79 Pb2(OH)3Cl |
| Pb2O(OH)2 | -19.51 | 6.69 | 26.20 PbO:Pb(OH)2 |
| Pb2O3 | -40.51 | 20.53 | 61.04 Pb2O3 |
| Pb2OCO3 | -11.88 | -11.94 | -0.06 PbO:PbCO3 |
| Pb3(AsO4)2 | -25.87 | -61.27 | -35.40 Pb3(AsO4)2 |
| Pb3O2CO3 | -20.62 | -8.59 | 12.03 PbCO3:2PbO |
| Pb3O2SO4 | -17.27 | -6.08 | 11.19 PbSO4:2PbO |
| Pb4(OH)6SO4 | -23.83 | -2.73 | 21.10 Pb4(OH)6SO4 |
| Pb4O3SO4 | -26.18 | -2.73 | 23.44 PbSO4:3PbO |
| PbMetal | -14.75 | -10.49 | 4.25 Pb |
| PbO:0.3H2O | -9.63 | 3.35 | 12.98 PbO:0.33H2O |
| Phosgenite | -11.21 | -31.02 | -19.81 PbCl2:PbCO3 |
| Plattnerite | -34.82 | 17.19 | 52.01 PbO2 |
| Portlandite | -14.39 | 9.60 | 23.99 Ca(OH)2 |
| Pyrochroite | -6.72 | 8.48 | 15.20 Mn(OH)2 |
| Pyrolusite | -21.55 | 22.32 | 43.87 MnO2 |
| Rhodochrosite | 0.93 | -10.15 | -11.08 MnCO3 |
| Rhodochrosite(d) | 0.24 | -10.15 | -10.39 MnCO3 |
| Scorodite | -13.62 | -33.87 | -20.25 FeAsO4:2H2O |
| Se(s) | 9.89 | -7.43 | -17.32 Se |
| SeO2 | -13.89 | -22.27 | -8.38 SeO2 |
| Siderite | 0.43 | -10.37 | -10.80 FeCO3 |
| Siderite(d)(3) | 0.08 | -10.37 | -10.45 FeCO3 |
| Smithsonite | -4.19 | -14.02 | -9.83 ZnCO3 |
| Smithsonite_PG | -3.22 | -14.02 | -10.80 ZnCO3 |
| Tenorite | -5.04 | 3.16 | 8.20 CuO |
| Thenardite | -9.98 | -10.13 | -0.16 Na2SO4 |
| Thermonatrite | -12.88 | -12.65 | 0.23 Na2CO3:H2O |
| Trona | -17.69 | -17.80 | -0.11 NaHCO3:Na2CO3:2H2O |
| Witherite | -3.97 | -12.60 | -8.63 BaCO3 |
| Zincite(c) | -7.37 | 4.61 | 11.98 ZnO |
| Zincosite | -15.25 | -11.51 | 3.75 ZnSO4 |
| Zn(OH)2-a | -7.84 | 4.61 | 12.45 Zn(OH)2 |
| Zn(OH)2-b | -7.14 | 4.61 | 11.75 Zn(OH)2 |
| Zn(OH)2-c | -7.59 | 4.61 | 12.20 Zn(OH)2 |
| Zn(OH)2-e | -6.89 | 4.61 | 11.50 Zn(OH)2 |
| Zn(OH)2-g | -7.10 | 4.61 | 11.71 Zn(OH)2 |
| Zn2(OH)2SO4 | -14.40 | -6.90 | 7.50 Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -15.53 | -0.33 | 15.20 Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -29.94 | -57.49 | -27.55 Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -39.80 | -18.41 | 21.39 ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -26.09 | 2.31 | 28.40 Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -34.55 | 3.95 | 38.50 Zn5(OH)8Cl2 |
| ZnCl2 | -22.18 | -14.48 | 7.70 ZnCl2 |
| ZnCO3:1H2O | -3.76 | -14.02 | -10.26 ZnCO3:1H2O |
| ZnCO3:H2O | -3.76 | -14.02 | -10.26 ZnCO3:H2O |
| ZnMetal | -36.40 | -9.23 | 27.17 Zn |
| ZnO(a) | -6.70 | 4.61 | 11.31 ZnO |
| ZnSO4:H2O | -11.35 | -11.51 | -0.16 ZnSO4:H2O |

---
End of simulation.
---

---
Reading input data for simulation 2.
---

Solution 2 - MW-1013A, Sample Date June 2013

| | | |
|---|---|---|
| Units | | mg/L |
| pH | | 6.64 #Field value |
| pe | | 0.83 |
| Temperature | 11.9 | |
| Alkalinity | 320 | |
| As | | 0.001 #Detection Limit |
| Ba | | 0.094 |
| Cd | | 0.00012 #Detection Limit |
| Ca | | 130 |
| Cl | | 8.2 |
| Cu | | 0.0025 |
| Fe | | 0.097 |
| Pb | | 0.0014 #Detection Limit |
| Mg | | 47 |
| Mn | | 3 |
| K | | 8.1 |
| Se | | 0.002 #Detection Limit |
| Ag | | 0.00064 #Detection Limit |
| Na | | 31 |
| S(6) | | 220 |
| Zn | | 0.005 #Detection Limit |
| END | | |

---
Beginning of initial solution calculations.
---

Initial solution 2. - MW-1013A, Sample Date June 2013

---Solution composition---

| Elements | Molality | Moles |
|---|---|---|
| Ag | 5.938e-009 | 5.938e-009 |
| Alkalinity | 6.399e-003 | 6.399e-003 |
| As | 1.336e-008 | 1.336e-008 |
| Ba | 6.850e-007 | 6.850e-007 |
| Ca | 3.246e-003 | 3.246e-003 |
| Cd | 1.068e-009 | 1.068e-009 |
| Cl | 2.315e-004 | 2.315e-004 |
| Cu | 3.937e-008 | 3.937e-008 |
| Fe | 1.738e-006 | 1.738e-006 |
| K | 2.073e-004 | 2.073e-004 |
| Mg | 1.935e-003 | 1.935e-003 |
| Mn | 5.465e-005 | 5.465e-005 |
| Na | 1.349e-003 | 1.349e-003 |
| Pb | 6.762e-009 | 6.762e-009 |
| S(6) | 2.292e-003 | 2.292e-003 |
| Se | 2.535e-008 | 2.535e-008 |
| Zn | 7.655e-008 | 7.655e-008 |

---Description of solution---

| | |
|---|---|
| pH | = 6.640 |
| pe | = 0.830 |
| Activity of water | = 1.000 |
| Ionic strength | = 1.667e-002 |
| Mass of water (kg) | = 1.000e+000 |
| Total carbon (mol/kg) | = 9.887e-003 |
| Total CO2 (mol/kg) | = 9.887e-003 |
| Temperature (deg C) | = 11.900 |
| Electrical balance (eq) | = 8.186e-004 |
| Percent error, 100*(Cat-\|An\|)/(Cat+\|An\|) | = 3.94 |
| Iterations | = 10 |
| Total H | = 1.110188e+002 |
| Total O | = 5.554155e+001 |

---Distribution of species---

| Species | Molality | Log Activity | Log Molality | Log Activity | Gamma |
|---|---|---|---|---|---|
| H+ | 2.551e-007 | 2.291e-007 | -6.593 | -6.640 | -0.047 |
| OH- | 1.711e-008 | 1.509e-008 | -7.767 | -7.821 | -0.055 |
| H2O | 5.551e+001 | 9.997e-001 | 1.744 | -0.000 | 0.000 |
| Ag | 5.938e-009 | | | | |
| Ag+ | 4.126e-009 | 3.639e-009 | -8.384 | -8.439 | -0.055 |
| AgCl | 1.691e-009 | 1.698e-009 | -8.772 | -8.770 | 0.002 |
| AgSO4- | 7.749e-011 | 6.834e-011 | -10.111 | -10.165 | -0.055 |
| AgCl2- | 4.316e-011 | 3.806e-011 | -10.365 | -10.420 | -0.055 |
| AgOH | 1.582e-014 | 1.588e-014 | -13.801 | -13.799 | 0.002 |
| AgCl3-2 | 9.883e-015 | 5.979e-015 | -14.005 | -14.223 | -0.218 |
| AgCl4-3 | 6.255e-018 | 2.019e-018 | -17.204 | -17.695 | -0.491 |
| Ag(OH)2- | 7.857e-020 | 6.930e-020 | -19.105 | -19.159 | -0.055 |
| As(3) | 1.157e-008 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| H3AsO3 | 1.155e-008 | 1.159e-008 | -7.937 | -7.936 | 0.002 |
| H2AsO3- | 2.438e-011 | 2.150e-011 | -10.613 | -10.667 | -0.055 |
| H4AsO3+ | 1.492e-015 | 1.316e-015 | -14.826 | -14.881 | -0.055 |
| HAsO3-2 | 1.715e-019 | 1.037e-019 | -18.766 | -18.984 | -0.218 |
| AsO3-3 | 1.750e-028 | 5.651e-029 | -27.757 | -28.248 | -0.491 |
| As(5) | 1.783e-009 | | | | |
| H2AsO4- | 1.260e-009 | 1.112e-009 | -8.900 | -8.954 | -0.055 |
| HAsO4-2 | 5.227e-010 | 3.162e-010 | -9.282 | -9.500 | -0.218 |
| H3AsO4 | 4.440e-014 | 4.457e-014 | -13.353 | -13.351 | 0.002 |
| AsO4-3 | 6.831e-015 | 2.205e-015 | -14.166 | -14.657 | -0.491 |
| Ba | 6.850e-007 | | | | |
| Ba+2 | 5.071e-007 | 3.068e-007 | -6.295 | -6.513 | -0.218 |
| BaSO4 | 1.656e-007 | 1.663e-007 | -6.781 | -6.779 | 0.002 |
| BaHCO3+ | 1.212e-008 | 1.069e-008 | -7.917 | -7.971 | -0.055 |
| BaCO3 | 9.978e-011 | 1.002e-010 | -10.001 | -9.999 | 0.002 |
| BaOH+ | 5.144e-014 | 4.537e-014 | -13.289 | -13.343 | -0.055 |
| C(4) | 9.887e-003 | | | | |
| HCO3- | 6.193e-003 | 5.488e-003 | -2.208 | -2.261 | -0.052 |
| CO2 | 3.494e-003 | 3.508e-003 | -2.457 | -2.455 | 0.002 |
| CaHCO3+ | 1.054e-004 | 9.300e-005 | -3.977 | -4.032 | -0.055 |
| MgHCO3+ | 7.301e-005 | 6.439e-005 | -4.137 | -4.191 | -0.055 |
| MnHCO3+ | 1.252e-005 | 1.104e-005 | -4.902 | -4.957 | -0.055 |
| NaHCO3 | 3.637e-006 | 3.651e-006 | -5.439 | -5.438 | 0.002 |
| CaCO3 | 1.962e-006 | 1.969e-006 | -5.707 | -5.706 | 0.002 |
| MnCO3 | 1.468e-006 | 1.474e-006 | -5.833 | -5.831 | 0.002 |
| CO3-2 | 1.333e-006 | 8.221e-007 | -5.875 | -6.085 | -0.210 |
| MgCO3 | 6.667e-007 | 6.693e-007 | -6.176 | -6.174 | 0.002 |
| FeHCO3+ | 4.424e-007 | 3.902e-007 | -6.354 | -6.409 | -0.055 |
| ZnHCO3+ | 2.113e-008 | 1.864e-008 | -7.675 | -7.730 | -0.055 |
| FeCO3 | 1.397e-008 | 1.402e-008 | -7.855 | -7.853 | 0.002 |
| BaHCO3+ | 1.212e-008 | 1.069e-008 | -7.917 | -7.971 | -0.055 |
| NaCO3- | 1.029e-008 | 9.073e-009 | -7.988 | -8.042 | -0.055 |
| PbCO3 | 4.457e-009 | 4.475e-009 | -8.351 | -8.349 | 0.002 |
| ZnCO3 | 4.408e-009 | 4.425e-009 | -8.356 | -8.354 | 0.002 |
| CuCO3 | 1.961e-009 | 1.968e-009 | -8.708 | -8.706 | 0.002 |
| PbHCO3+ | 1.548e-009 | 1.365e-009 | -8.810 | -8.865 | -0.055 |
| CuHCO3+ | 1.390e-009 | 1.226e-009 | -8.857 | -8.911 | -0.055 |
| Zn(CO3)2-2 | 1.285e-010 | 7.777e-011 | -9.891 | -10.109 | -0.218 |
| BaCO3 | 9.978e-011 | 1.002e-010 | -10.001 | -9.999 | 0.002 |
| CdHCO3+ | 9.718e-011 | 8.571e-011 | -10.012 | -10.067 | -0.055 |
| Pb(CO3)2-2 | 1.527e-011 | 9.240e-012 | -10.816 | -11.034 | -0.218 |
| Cu(CO3)2-2 | 3.367e-012 | 2.037e-012 | -11.473 | -11.691 | -0.218 |
| CdCO3 | 3.213e-013 | 3.225e-013 | -12.493 | -12.491 | 0.002 |
| Cd(CO3)2-2 | 1.386e-015 | 8.385e-016 | -14.858 | -15.077 | -0.218 |
| Ca | 3.246e-003 | | | | |
| Ca+2 | 2.811e-003 | 1.733e-003 | -2.551 | -2.761 | -0.210 |
| CaSO4 | 3.277e-004 | 3.289e-004 | -3.485 | -3.483 | 0.002 |
| CaHCO3+ | 1.054e-004 | 9.300e-005 | -3.977 | -4.032 | -0.055 |
| CaCO3 | 1.962e-006 | 1.969e-006 | -5.707 | -5.706 | 0.002 |
| CaOH+ | 1.423e-009 | 1.255e-009 | -8.847 | -8.901 | -0.055 |
| CaHSO4+ | 4.344e-010 | 3.831e-010 | -9.362 | -9.417 | -0.055 |
| Cd | 1.068e-009 | | | | |
| Cd+2 | 8.163e-010 | 4.939e-010 | -9.088 | -9.306 | -0.218 |
| CdSO4 | 1.411e-010 | 1.416e-010 | -9.851 | -9.849 | 0.002 |
| CdHCO3+ | 9.718e-011 | 8.571e-011 | -10.012 | -10.067 | -0.055 |
| CdCl+ | 1.040e-011 | 9.169e-012 | -10.983 | -11.038 | -0.055 |
| Cd(SO4)2-2 | 3.018e-012 | 1.826e-012 | -11.520 | -11.739 | -0.218 |
| CdCO3 | 3.213e-013 | 3.225e-013 | -12.493 | -12.491 | 0.002 |
| CdOH+ | 7.358e-014 | 6.490e-014 | -13.133 | -13.188 | -0.055 |
| CdOHCl | 1.229e-014 | 1.234e-014 | -13.910 | -13.909 | 0.002 |
| CdCl2 | 7.367e-015 | 7.396e-015 | -14.133 | -14.131 | 0.002 |
| Cd(CO3)2-2 | 1.386e-015 | 8.385e-016 | -14.858 | -15.077 | -0.218 |
| Cd(OH)2 | 4.185e-017 | 4.201e-017 | -16.378 | -16.377 | 0.002 |
| CdCl3- | 8.760e-019 | 7.726e-019 | -18.058 | -18.112 | -0.055 |
| Cd2OH+3 | 5.767e-022 | 1.862e-022 | -21.239 | -21.730 | -0.491 |
| Cd(OH)3- | 2.332e-023 | 2.057e-023 | -22.632 | -22.687 | -0.055 |
| Cd(OH)4-2 | 1.322e-030 | 8.000e-031 | -29.879 | -30.097 | -0.218 |
| Cl | 2.315e-004 | | | | |
| Cl- | 2.314e-004 | 2.035e-004 | -3.636 | -3.691 | -0.056 |
| MnCl+ | 2.122e-008 | 1.871e-008 | -7.673 | -7.728 | -0.055 |
| AgCl | 1.691e-009 | 1.698e-009 | -8.772 | -8.770 | 0.002 |
| CuCl2- | 4.671e-010 | 4.119e-010 | -9.331 | -9.385 | -0.055 |
| FeCl+ | 2.265e-010 | 1.997e-010 | -9.645 | -9.700 | -0.055 |
| AgCl2- | 4.316e-011 | 3.806e-011 | -10.365 | -10.420 | -0.055 |
| CdCl+ | 1.040e-011 | 9.169e-012 | -10.983 | -11.038 | -0.055 |
| ZnCl+ | 9.155e-012 | 8.074e-012 | -11.038 | -11.093 | -0.055 |
| PbCl+ | 2.048e-012 | 1.807e-012 | -11.689 | -11.743 | -0.055 |
| MnCl2 | 1.656e-012 | 1.662e-012 | -11.781 | -11.779 | 0.002 |
| ZnOHCl | 7.901e-013 | 7.932e-013 | -12.102 | -12.101 | 0.002 |
| CuCl3-2 | 2.083e-013 | 1.260e-013 | -12.681 | -12.900 | -0.218 |
| CuCl+ | 1.415e-013 | 1.248e-013 | -12.849 | -12.904 | -0.055 |
| CdOHCl | 1.229e-014 | 1.234e-014 | -13.910 | -13.909 | 0.002 |
| AgCl3-2 | 9.883e-015 | 5.979e-015 | -14.005 | -14.223 | -0.218 |
| CdCl2 | 7.367e-015 | 7.396e-015 | -14.133 | -14.131 | 0.002 |
| ZnCl2 | 1.622e-015 | 1.628e-015 | -14.790 | -14.788 | 0.002 |
| PbCl2 | 7.497e-016 | 7.526e-016 | -15.125 | -15.123 | 0.002 |
| MnCl3- | 1.056e-016 | 9.317e-017 | -15.976 | -16.031 | -0.055 |
| CuCl2 | 1.172e-017 | 1.176e-017 | -16.931 | -16.929 | 0.002 |
| AgCl4-3 | 6.255e-018 | 2.019e-018 | -17.204 | -17.695 | -0.491 |
| CdCl3- | 8.760e-019 | 7.726e-019 | -18.058 | -18.112 | -0.055 |
| ZnCl3- | 3.883e-019 | 3.424e-019 | -18.411 | -18.465 | -0.055 |
| PbCl3- | 1.268e-019 | 1.118e-019 | -18.897 | -18.952 | -0.055 |
| FeCl+2 | 1.425e-021 | 8.624e-022 | -20.846 | -21.064 | -0.218 |

| | | | | | |
|---|---|---|---|---|---|
| ZnCl4-2 | 5.179e-023 | 3.133e-023 | -22.286 | -22.504 | -0.218 |
| PbCl4-2 | 1.620e-023 | 9.798e-024 | -22.791 | -23.009 | -0.218 |
| CuCl3- | 7.555e-024 | 6.663e-024 | -23.122 | -23.176 | -0.055 |
| FeCl2+ | 1.372e-024 | 1.210e-024 | -23.863 | -23.917 | -0.055 |
| FeCl3 | 2.454e-029 | 2.463e-029 | -28.610 | -28.609 | 0.002 |
| CuCl4-2 | 8.179e-030 | 4.948e-030 | -29.087 | -29.306 | -0.218 |
| Cu(1) | 3.499e-008 | | | | |
| Cu+ | 3.453e-008 | 3.045e-008 | -7.462 | -7.516 | -0.055 |
| CuCl2- | 4.671e-010 | 4.119e-010 | -9.331 | -9.385 | -0.055 |
| CuCl3-2 | 2.083e-013 | 1.260e-013 | -12.681 | -12.900 | -0.218 |
| Cu(2) | 4.379e-009 | | | | |
| CuCO3 | 1.961e-009 | 1.968e-009 | -8.708 | -8.706 | 0.002 |
| CuHCO3+ | 1.390e-009 | 1.226e-009 | -8.857 | -8.911 | -0.055 |
| Cu+2 | 7.369e-010 | 4.458e-010 | -9.133 | -9.351 | -0.218 |
| Cu(OH)2 | 1.767e-010 | 1.774e-010 | -9.753 | -9.751 | 0.002 |
| CuSO4 | 8.919e-011 | 8.953e-011 | -10.050 | -10.048 | 0.002 |
| CuOH+ | 2.206e-011 | 1.945e-011 | -10.656 | -10.711 | -0.055 |
| Cu(CO3)2-2 | 3.367e-012 | 2.037e-012 | -11.473 | -11.691 | -0.218 |
| CuCl+ | 1.415e-013 | 1.248e-013 | -12.849 | -12.904 | -0.055 |
| Cu2(OH)2+2 | 7.023e-017 | 4.249e-017 | -16.153 | -16.372 | -0.218 |
| Cu(OH)3- | 5.288e-017 | 4.664e-017 | -16.277 | -16.331 | -0.055 |
| CuCl2 | 1.172e-017 | 1.176e-017 | -16.931 | -16.929 | 0.002 |
| Cu(OH)4-2 | 6.712e-023 | 4.061e-023 | -22.173 | -22.391 | -0.218 |
| CuCl3- | 7.555e-024 | 6.663e-024 | -23.122 | -23.176 | -0.055 |
| CuCl4-2 | 8.179e-030 | 4.948e-030 | -29.087 | -29.306 | -0.218 |
| Fe(2) | 1.738e-006 | | | | |
| Fe+2 | 1.175e-006 | 7.110e-007 | -5.930 | -6.148 | -0.218 |
| FeHCO3+ | 4.424e-007 | 3.902e-007 | -6.354 | -6.409 | -0.055 |
| FeSO4 | 1.060e-007 | 1.064e-007 | -6.975 | -6.973 | 0.002 |
| FeCO3 | 1.397e-008 | 1.402e-008 | -7.855 | -7.853 | 0.002 |
| FeOH+ | 3.996e-010 | 3.524e-010 | -9.398 | -9.453 | -0.055 |
| FeCl+ | 2.265e-010 | 1.997e-010 | -9.645 | -9.700 | -0.055 |
| FeHSO4+ | 1.782e-013 | 1.572e-013 | -12.749 | -12.804 | -0.055 |
| Fe(OH)2 | 3.960e-015 | 3.975e-015 | -14.402 | -14.401 | 0.002 |
| Fe(OH)3- | 6.388e-019 | 5.634e-019 | -18.195 | -18.249 | -0.055 |
| Fe(3) | 3.383e-012 | | | | |
| Fe(OH)2+ | 2.655e-012 | 2.342e-012 | -11.576 | -11.630 | -0.055 |
| Fe(OH)3 | 7.216e-013 | 7.244e-013 | -12.142 | -12.140 | 0.002 |
| FeOH+2 | 4.504e-015 | 2.725e-015 | -14.346 | -14.565 | -0.218 |
| Fe(OH)4- | 1.885e-015 | 1.662e-015 | -14.725 | -14.779 | -0.055 |
| FeSO4+ | 2.151e-018 | 1.897e-018 | -17.667 | -17.722 | -0.055 |
| Fe+3 | 6.712e-019 | 2.167e-019 | -18.173 | -18.664 | -0.491 |
| Fe(SO4)2- | 4.822e-020 | 4.253e-020 | -19.317 | -19.371 | -0.055 |
| FeCl+2 | 1.425e-021 | 8.624e-022 | -20.846 | -21.064 | -0.218 |
| FeHSO4+2 | 1.989e-024 | 1.203e-024 | -23.701 | -23.920 | -0.218 |
| FeCl2+ | 1.372e-024 | 1.210e-024 | -23.863 | -23.917 | -0.055 |
| Fe2(OH)2+4 | 2.627e-027 | 3.520e-028 | -26.580 | -27.453 | -0.873 |
| FeCl3 | 2.454e-029 | 2.463e-029 | -28.610 | -28.609 | 0.002 |
| Fe3(OH)4+5 | 1.410e-035 | 6.098e-037 | -34.851 | -36.215 | -1.364 |
| H(0) | 1.856e-018 | | | | |
| H2 | 9.281e-019 | 9.317e-019 | -18.032 | -18.031 | 0.002 |
| K | 2.073e-004 | | | | |
| K+ | 2.061e-004 | 1.812e-004 | -3.686 | -3.742 | -0.056 |
| KSO4- | 1.229e-006 | 1.084e-006 | -5.910 | -5.965 | -0.055 |
| Mg | 1.935e-003 | | | | |
| Mg+2 | 1.676e-003 | 1.043e-003 | -2.776 | -2.982 | -0.206 |
| MgSO4 | 1.851e-004 | 1.858e-004 | -3.733 | -3.731 | 0.002 |
| MgHCO3+ | 7.301e-005 | 6.439e-005 | -4.137 | -4.191 | -0.055 |
| MgCO3 | 6.667e-007 | 6.693e-007 | -6.176 | -6.174 | 0.002 |
| MgOH+ | 5.438e-009 | 4.796e-009 | -8.265 | -8.319 | -0.055 |
| Mn(2) | 5.465e-005 | | | | |
| Mn+2 | 3.731e-005 | 2.257e-005 | -4.428 | -4.646 | -0.218 |
| MnHCO3+ | 1.252e-005 | 1.104e-005 | -4.902 | -4.957 | -0.055 |
| MnSO4 | 3.329e-006 | 3.342e-006 | -5.478 | -5.476 | 0.002 |
| MnCO3 | 1.468e-006 | 1.474e-006 | -5.833 | -5.831 | 0.002 |
| MnCl+ | 2.122e-008 | 1.871e-008 | -7.673 | -7.728 | -0.055 |
| MnOH+ | 9.396e-010 | 8.287e-010 | -9.027 | -9.082 | -0.055 |
| MnCl2 | 1.656e-012 | 1.662e-012 | -11.781 | -11.779 | 0.002 |
| MnCl3- | 1.056e-016 | 9.317e-017 | -15.976 | -16.031 | -0.055 |
| Mn(OH)3- | 3.371e-020 | 2.973e-020 | -19.472 | -19.527 | -0.055 |
| Mn(3) | 1.975e-030 | | | | |
| Mn+3 | 1.975e-030 | 6.375e-031 | -29.704 | -30.195 | -0.491 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -71.482 | -71.700 | -0.218 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -81.096 | -81.151 | -0.055 |
| Na | 1.349e-003 | | | | |
| Na+ | 1.339e-003 | 1.183e-003 | -2.873 | -2.927 | -0.054 |
| NaSO4- | 6.663e-006 | 5.877e-006 | -5.176 | -5.231 | -0.055 |
| NaHCO3 | 3.637e-006 | 3.651e-006 | -5.439 | -5.438 | 0.002 |
| NaCO3- | 1.029e-008 | 9.073e-009 | -7.988 | -8.042 | -0.055 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -60.742 | -60.741 | 0.002 |
| Pb | 6.762e-009 | | | | |
| PbCO3 | 4.457e-009 | 4.475e-009 | -8.351 | -8.349 | 0.002 |
| PbHCO3+ | 1.548e-009 | 1.365e-009 | -8.810 | -8.865 | -0.055 |
| Pb+2 | 5.177e-010 | 3.132e-010 | -9.286 | -9.504 | -0.218 |
| PbSO4 | 1.897e-010 | 1.904e-010 | -9.722 | -9.720 | 0.002 |
| PbOH+ | 3.022e-011 | 2.665e-011 | -10.520 | -10.574 | -0.055 |
| Pb(CO3)2-2 | 1.527e-011 | 9.240e-012 | -10.816 | -11.034 | -0.218 |
| PbCl+ | 2.048e-012 | 1.807e-012 | -11.689 | -11.743 | -0.055 |
| Pb(SO4)2-2 | 1.786e-012 | 1.081e-012 | -11.748 | -11.966 | -0.218 |
| Pb(OH)2 | 4.507e-014 | 4.524e-014 | -13.346 | -13.344 | 0.002 |

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   PbCl2            7.497e-016  7.526e-016  -15.125  -15.123    0.002
   Pb(OH)3-           2.570e-018  2.267e-018  -17.590  -17.645   -0.055
   Pb2OH+3            5.788e-019  1.869e-019  -18.237  -18.728   -0.491
   PbCl3-           1.268e-019  1.118e-019  -18.897  -18.952   -0.055
   Pb(OH)4-2          3.746e-023  2.266e-023  -22.426  -22.645   -0.218
   PbCl4-2          1.620e-023  9.798e-024  -22.791  -23.009   -0.218
   Pb3(OH)4+2           3.108e-027  1.880e-027  -26.507  -26.726   -0.218
S(6)          2.292e-003
   SO4-2            1.768e-003  1.081e-003   -2.753   -2.966   -0.214
   CaSO4              3.277e-004  3.289e-004   -3.485   -3.483    0.002
   MgSO4              1.851e-004  1.858e-004   -3.733   -3.731    0.002
   NaSO4-             6.663e-006  5.877e-006   -5.176   -5.231   -0.055
   MnSO4              3.329e-006  3.342e-006   -5.478   -5.476    0.002
   KSO4-            1.229e-006  1.084e-006   -5.910   -5.965   -0.055
   BaSO4              1.656e-007  1.663e-007   -6.781   -6.779    0.002
   FeSO4              1.060e-007  1.064e-007   -6.975   -6.973    0.002
   HSO4-              2.085e-008  1.839e-008   -7.681   -7.735   -0.055
   ZnSO4              6.129e-009  6.152e-009   -8.213   -8.211    0.002
   CaHSO4+            4.344e-010  3.831e-010   -9.362   -9.417   -0.055
   PbSO4              1.897e-010  1.904e-010   -9.722   -9.720    0.002
   CdSO4              1.411e-010  1.416e-010   -9.851   -9.849    0.002
   Zn(SO4)2-2         9.931e-011  6.008e-011  -10.003  -10.221   -0.218
   CuSO4              8.919e-011  8.953e-011  -10.050  -10.048    0.002
   AgSO4-             7.749e-011  6.834e-011  -10.111  -10.165   -0.055
   Cd(SO4)2-2         3.018e-012  1.826e-012  -11.520  -11.739   -0.218
   Pb(SO4)2-2         1.786e-012  1.081e-012  -11.748  -11.966   -0.218
   FeHSO4+            1.782e-013  1.572e-013  -12.749  -12.804   -0.055
   FeSO4+             2.151e-018  1.897e-018  -17.667  -17.722   -0.055
   Fe(SO4)2-          4.822e-020  4.253e-020  -19.317  -19.371   -0.055
   FeHSO4+2           1.989e-024  1.203e-024  -23.701  -23.920   -0.218
Se(-2)        3.895e-019
   HSe-             3.887e-019  3.429e-019  -18.410  -18.465   -0.055
   H2Se               7.447e-022  7.476e-022  -21.128  -21.126    0.002
Se(4)         2.535e-008
   HSeO3-             2.485e-008  2.191e-008   -7.605   -7.659   -0.055
   SeO3-2             5.000e-010  3.025e-010   -9.301   -9.519   -0.218
   H2SeO3             2.812e-012  2.823e-012  -11.551  -11.549    0.002
Se(6)         2.414e-025
   SeO4-2             2.414e-025  1.461e-025  -24.617  -24.835   -0.218
   HSeO4-             1.185e-030  1.045e-030  -29.926  -29.981   -0.055
Zn            7.655e-008
   Zn+2             4.458e-008  2.697e-008   -7.351   -7.569   -0.218
   ZnHCO3+            2.113e-008  1.864e-008   -7.675   -7.730   -0.055
   ZnSO4              6.129e-009  6.152e-009   -8.213   -8.211    0.002
   ZnCO3              4.408e-009  4.425e-009   -8.356   -8.354    0.002
   Zn(CO3)2-2         1.285e-010  7.777e-011   -9.891  -10.109   -0.218
   Zn(SO4)2-2         9.931e-011  6.008e-011  -10.003  -10.221   -0.218
   ZnOH+              5.176e-011  4.565e-011  -10.286  -10.341   -0.055
   ZnCl+            9.155e-012  8.074e-012  -11.038  -11.093   -0.055
   Zn(OH)2            6.442e-012  6.467e-012  -11.191  -11.189    0.002
   ZnOHCl             7.901e-013  7.932e-013  -12.102  -12.101    0.002
   ZnCl2            1.622e-015  1.628e-015  -14.790  -14.788    0.002
   Zn(OH)3-           1.012e-016  8.924e-017  -15.995  -16.049   -0.055
   ZnCl3-           3.883e-019  3.424e-019  -18.411  -18.465   -0.055
   Zn(OH)4-2          1.020e-022  6.172e-023  -21.991  -22.210   -0.218
   ZnCl4-2          5.179e-023  3.133e-023  -22.286  -22.504   -0.218

-----------Saturation indices-----------

                Phase           SI log IAP  log KT

                Ag2CO3        -11.57  -22.96  -11.39  Ag2CO3
                Ag2O          -16.53   -3.60   12.93  Ag2O
                Ag2SO4        -14.78  -19.84   -5.06  Ag2SO4
                AgMetal         5.09   -9.27  -14.36  Ag
                Anglesite      -4.61  -12.47   -7.86  PbSO4
                Anhydrite      -1.39   -5.73   -4.33  CaSO4
                Antlerite     -12.75   -4.46    8.29  Cu3(OH)4SO4
                Aragonite      -0.58   -8.85   -8.26  CaCO3
                Arsenolite     -14.25  -15.87   -1.62  As2O3
                Artinite       -9.34    1.23   10.57  MgCO3:Mg(OH)2:3H2O
                As2O5(cr)      -35.18  -26.70    8.48  As2O5
                As_native      -16.89  -30.35  -13.46  As
                Atacamite      -10.44   -2.47    7.97  Cu2(OH)3Cl
                Azurite        -10.80   -6.01    4.79  Cu3(OH)2(CO3)2
                Ba3(AsO4)2       1.58  -48.85  -50.43  Ba3(AsO4)2
                Barite           0.73   -9.48  -10.21  BaSO4
                BaSeO3          -9.64  -16.03   -6.39  BaSeO3
                Bianchite       -8.78  -10.54   -1.76  ZnSO4:6H2O
                Birnessite     -20.03   23.57   43.60  MnO2
                Bixbyite       -20.45  -20.55   -0.10  Mn2O3
                Brochantite    -15.87   -0.53   15.34  Cu4(OH)6SO4
                Brucite         -7.45   10.30   17.75  Mg(OH)2
                Ca3(AsO4)2:4w  -18.69  -37.60  -18.91  Ca3(AsO4)2:4H2O
                Calcite         -0.43   -8.85   -8.42  CaCO3
                CaSeO3          -6.68  -12.28   -5.60  CaSeO3
                Cd(gamma)      -25.17  -10.97   14.20  Cd
                Cd(OH)2         -9.68    3.97   13.65  Cd(OH)2
                Cd(OH)2(a)     -10.46    3.97   14.43  Cd(OH)2
                Cd3(OH)2(SO4)2  -27.28  -20.57    6.71  Cd3(OH)2(SO4)2
                Cd3(OH)4SO4     -26.89   -4.33   22.56  Cd3(OH)4SO4
                Cd4(OH)6SO4     -28.75   -0.35   28.40  Cd4(OH)6SO4
                CdCl2           -16.16  -16.69   -0.53  CdCl2
```

| | | | |
|---|---|---|---|
| CdCl2:2.5H2O | -14.69 | -16.69 | -2.00 CdCl2:2.5H2O |
| CdCl2:H2O | -15.04 | -16.69 | -1.65 CdCl2:H2O |
| CdMetal | -25.06 | -10.97 | 14.10 Cd |
| CdOHCl | -10.13 | -6.36 | 3.77 CdOHCl |
| CdSO4 | -12.67 | -12.27 | 0.40 CdSO4 |
| CdSO4:2.7H2O | -10.54 | -12.27 | -1.73 CdSO4:2.67H2O |
| CdSO4:H2O | -10.87 | -12.27 | -1.40 CdSO4:H2O |
| Cerargyrite | -1.85 | -12.13 | -10.28 AgCl |
| Cerrusite | -2.30 | -15.59 | -13.29 PbCO3 |
| Chalcanthite | -9.63 | -12.32 | -2.69 CuSO4:5H2O |
| Claudetite | -14.30 | -15.87 | -1.57 As2O3 |
| CO2(g) | -1.16 | -2.45 | -1.30 CO2 |
| Cotunnite | -11.93 | -16.89 | -4.96 PbCl2 |
| Cu(OH)2 | -5.22 | 3.93 | 9.15 Cu(OH)2 |
| Cu2SO4 | -16.20 | -18.00 | -1.80 Cu2SO4 |
| Cu3(AsO4)2:6w | -22.24 | -57.37 | -35.12 Cu3(AsO4)2:6H2O |
| CuCO3 | -5.81 | -15.44 | -9.63 CuCO3 |
| CuMetal | 0.99 | -8.35 | -9.34 Cu |
| CuOCuSO4 | -21.12 | -8.39 | 12.73 CuO:CuSO4 |
| CupricFerrite | -0.74 | 6.44 | 7.18 CuFe2O4 |
| Cuprite | 0.01 | -1.75 | -1.76 Cu2O |
| CuprousFerrite | 9.17 | 0.38 | -8.79 CuFeO2 |
| CuSO4 | -15.94 | -12.32 | 3.62 CuSO4 |
| Dolomite | -1.14 | -17.91 | -16.77 CaMg(CO3)2 |
| Dolomite(d) | -1.75 | -17.91 | -16.17 CaMg(CO3)2 |
| Epsomite | -3.71 | -5.95 | -2.23 MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 1.20 | -1.84 | -3.04 Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -3.64 | 1.26 | 4.89 Fe(OH)3 |
| Fe2(SeO3)3 | -30.46 | -65.89 | -35.43 Fe2(SeO3)3 |
| Fe3(OH)8 | -10.58 | 9.64 | 20.22 Fe3(OH)8 |
| FeSe2 | -9.56 | -28.14 | -18.58 FeSe2 |
| Goethite | 1.77 | 1.26 | -0.51 FeOOH |
| Goslarite | -8.46 | -10.54 | -2.07 ZnSO4:7H2O |
| Gypsum | -1.14 | -5.73 | -4.59 CaSO4:2H2O |
| H2(g) | -14.94 | -18.03 | -3.09 H2 |
| H2O(g) | -1.86 | -0.00 | 1.86 H2O |
| Halite | -8.17 | -6.62 | 1.55 NaCl |
| Hausmannite | -23.58 | 40.84 | 64.42 Mn3O4 |
| Hematite | 5.48 | 2.51 | -2.97 Fe2O3 |
| Huntite | -6.95 | -36.05 | -29.10 CaMg3(CO3)4 |
| Hydrocerrusite | -9.94 | -27.40 | -17.46 Pb(OH)2:2PbCO3 |
| Hydromagnesite | -18.97 | -25.97 | -7.00 Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -19.55 | 10.75 | 30.31 Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -20.97 | 10.75 | 31.72 Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -16.55 | -26.38 | -9.83 (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -17.67 | -25.83 | -8.16 KFe3(SO4)2(OH)6 |
| Jarosite-Na | -20.95 | -25.01 | -4.06 NaFe3(SO4)2(OH)6 |
| JarositeH | -25.19 | -28.73 | -3.53 (H3O)Fe3(SO4)2(OH)6 |
| Langite | -18.65 | -0.53 | 18.12 Cu4(OH)6SO4:H2O |
| Larnakite | -8.63 | -8.69 | -0.06 PbO:PbSO4 |
| Laurionite | -7.18 | -6.56 | 0.62 PbOHCl |
| Litharge | -9.50 | 3.78 | 13.27 PbO |
| Maghemite | -3.87 | 2.51 | 6.39 Fe2O3 |
| Magnesite | -1.25 | -9.07 | -7.82 MgCO3 |
| Magnetite | 4.21 | 9.64 | 5.44 Fe3O4 |
| Malachite | -6.86 | -1.04 | 5.82 Cu2(OH)2CO3 |
| Manganite | -9.24 | 16.10 | 25.34 MnOOH |
| Massicot | -9.70 | 3.78 | 13.48 PbO |
| Melanothallite | -20.88 | -16.73 | 4.15 CuCl2 |
| Melanterite | -6.73 | -9.12 | -2.38 FeSO4:7H2O |
| Minium | -50.88 | 26.27 | 77.15 Pb3O4 |
| Mirabilite | -7.07 | -8.82 | -1.75 Na2SO4:10H2O |
| Mn2(SO4)3 | -64.89 | -69.29 | -4.40 Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -14.55 | -43.25 | -28.71 Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -14.15 | -12.03 | 2.12 MnCl2:4H2O |
| MnSO4 | -10.80 | -7.61 | 3.19 MnSO4 |
| Monteponite | -10.63 | 3.97 | 14.60 CdO |
| Nahcolite | -4.51 | -5.19 | -0.67 NaHCO3 |
| Nantokite | -4.11 | -11.21 | -7.10 CuCl |
| Natron | -10.10 | -11.94 | -1.84 Na2CO3:10H2O |
| Nesquehonite | -3.64 | -9.07 | -5.43 MgCO3:3H2O |
| Nsutite | -18.99 | 23.57 | 42.56 MnO2 |
| O2(g) | -57.96 | -60.74 | -2.78 O2 |
| Otavite | -3.39 | -15.39 | -12.00 CdCO3 |
| Pb(OH)2 | -4.85 | 3.78 | 8.62 Pb(OH)2 |
| Pb2(OH)3Cl | -11.57 | -2.78 | 8.79 Pb2(OH)3Cl |
| Pb2O(OH)2 | -18.65 | 7.55 | 26.20 PbO:Pb(OH)2 |
| Pb2O3 | -38.55 | 22.49 | 61.04 Pb2O3 |
| Pb2OCO3 | -11.70 | -11.81 | -0.11 PbO:PbCO3 |
| Pb3(AsO4)2 | -22.42 | -57.83 | -35.40 Pb3(AsO4)2 |
| Pb3O2CO3 | -19.95 | -8.04 | 11.91 PbCO3:2PbO |
| Pb3O2SO4 | -16.02 | -4.92 | 11.10 PbSO4:2PbO |
| Pb4(OH)6SO4 | -22.24 | -1.14 | 21.10 Pb4(OH)6SO4 |
| Pb4O3SO4 | -24.42 | -1.14 | 23.28 PbSO4:3PbO |
| PbMetal | -15.42 | -11.16 | 4.26 Pb |
| PbO:0.3H2O | -9.20 | 3.78 | 12.98 PbO:0.33H2O |
| Phosgenite | -12.67 | -32.48 | -19.81 PbCl2:PbCO3 |
| Plattnerite | -32.97 | 18.72 | 51.68 PbO2 |
| Portlandite | -13.33 | 10.52 | 23.84 Ca(OH)2 |
| Pyrochroite | -6.57 | 8.63 | 15.20 Mn(OH)2 |
| Pyrolusite | -20.00 | 23.57 | 43.57 MnO2 |
| Rhodochrosite | 0.35 | -10.73 | -11.08 MnCO3 |
| Rhodochrosite(d) | -0.34 | -10.73 | -10.39 MnCO3 |

```
Scorodite      -13.07  -33.32  -20.25  FeAsO4:2H2O
Se(s)            7.16  -10.16  -17.32  Se
SeO2           -14.42  -22.80   -8.38  SeO2
Siderite        -1.43  -12.23  -10.81  FeCO3
Siderite(d)(3)  -1.78  -12.23  -10.45  FeCO3
Smithsonite     -3.80  -13.65   -9.85  ZnCO3
Smithsonite_PG  -2.84  -13.65  -10.81  ZnCO3
Tenorite        -4.20    3.93    8.13  CuO
Thenardite      -8.66   -8.82   -0.16  Na2SO4
Thermonatrite  -12.16  -11.94    0.22  Na2CO3:H2O
Trona          -16.94  -17.13   -0.19  NaHCO3:Na2CO3:2H2O
Witherite       -3.98  -12.60   -8.62  BaCO3
Zincite(c)      -6.17    5.71   11.88  ZnO
Zincosite      -14.19  -10.54    3.66  ZnSO4
Zn(OH)2-a        -6.74    5.71   12.45  Zn(OH)2
Zn(OH)2-b        -6.04    5.71   11.75  Zn(OH)2
Zn(OH)2-c        -6.49    5.71   12.20  Zn(OH)2
Zn(OH)2-e        -5.79    5.71   11.50  Zn(OH)2
Zn(OH)2-g        -6.00    5.71   11.71  Zn(OH)2
Zn2(OH)2SO4     -12.32   -4.82    7.50  Zn2(OH)2SO4
Zn2(OH)3Cl      -14.11    1.09   15.20  Zn2(OH)3Cl
Zn3(AsO4)2:2.5w -24.47  -52.02  -27.55  Zn3(AsO4)2:2.5H2O
Zn3O(SO4)2      -36.47  -15.36   21.11  ZnO:2ZnSO4
Zn4(OH)6SO4     -21.80    6.60   28.40  Zn4(OH)6SO4
Zn5(OH)8Cl2     -30.61    7.89   38.50  Zn5(OH)8Cl2
ZnCl2           -22.57  -14.95    7.62  ZnCl2
ZnCO3:1H2O       -3.39  -13.65  -10.26  ZnCO3:1H2O
ZnCO3:H2O        -3.39  -13.65  -10.26  ZnCO3:H2O
ZnMetal         -36.23   -9.23   27.00  Zn
ZnO(a)           -5.60    5.71   11.31  ZnO
ZnSO4:H2O        -10.32  -10.54   -0.21  ZnSO4:H2O

-----------
End of simulation.
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-------------------
Reading input data for simulation 3.
-------------------

        Solution 3 - MW-1013B, Sample Date June 2013
        Units                   mg/L
        pH                      6.18      #Field value
        pe                      1.69
        Temperature 11.5
        Alkalinity      510
        As                      0.001     #Detection Limit
        Ba                      0.016     #Detection Limit
        Cd                      0.0006    #Detection Limit
        Ca                      640
        Cl                      60        #Detection Limit
        Cu                      0.31
        Fe                      0.07      #Detection Limit
        Pb                      0.028     #Detection Limit
        Mg                      150
        Mn                      18
        K                       6.6
        Se                      0.002     #Detection Limit
        Ag                      0.002     #Detection Limit
        Na                      29
        S(6)                    1600
        Zn                      0.15
        END
--------------------
Beginning of initial solution calculations.
--------------------

Initial solution 3.             - MW-1013B, Sample Date June 2013

-----------Solution composition-----------

        Elements        Molality        Moles

        Ag              1.860e-008  1.860e-008
        Alkalinity      1.022e-002  1.022e-002
        As              1.339e-008  1.339e-008
        Ba              1.169e-007  1.169e-007
        Ca              1.602e-002  1.602e-002
        Cd              5.354e-009  5.354e-009
        Cl              1.697e-003  1.697e-003
        Cu              4.893e-006  4.893e-006
        Fe              1.257e-006  1.257e-006
        K               1.693e-004  1.693e-004
        Mg              6.188e-003  6.188e-003
        Mn              3.286e-004  3.286e-004
        Na              1.265e-003  1.265e-003
        Pb              1.356e-007  1.356e-007
        S(6)            1.671e-002  1.671e-002
        Se              2.541e-008  2.541e-008
        Zn              2.302e-006  2.302e-006

-----------Description of solution----------
```

pH = 6.180
pe = 1.690
Activity of water = 0.999
Ionic strength = 5.989e-002
Mass of water (kg) = 1.000e+000
Total carbon (mol/kg) = 2.443e-002
Total CO2 (mol/kg) = 2.443e-002
Temperature (deg C) = 11.500
Electrical balance (eq) = 1.185e-003
Percent error, 100*(Cat-|An|)/(Cat+|An|) = 1.78
Iterations = 11
Total H = 1.110226e+002
Total O = 5.563213e+001

----------Distribution of species----------

| Species | Molality | Log Activity | Log Molality | Log Activity | Gamma |
|---|---|---|---|---|---|
| H+ | 7.780e-007 | 6.607e-007 | -6.109 | -6.180 | -0.071 |
| OH- | 6.197e-009 | 5.048e-009 | -8.208 | -8.297 | -0.089 |
| H2O | 5.551e+001 | 9.990e-001 | 1.744 | -0.000 | 0.000 |
| Ag | 1.860e-008 | | | | |
| AgCl | 1.151e-008 | 1.167e-008 | -7.939 | -7.933 | 0.006 |
| Ag+ | 4.552e-009 | 3.708e-009 | -8.342 | -8.431 | -0.089 |
| AgCl2- | 2.158e-009 | 1.758e-009 | -8.666 | -8.755 | -0.089 |
| AgSO4- | 3.777e-010 | 3.076e-010 | -9.423 | -9.512 | -0.089 |
| AgCl3-2 | 4.160e-012 | 1.832e-012 | -11.381 | -11.737 | -0.356 |
| AgCl4-3 | 2.625e-014 | 4.144e-015 | -13.581 | -14.383 | -0.802 |
| AgOH | 5.530e-015 | 5.607e-015 | -14.257 | -14.251 | 0.006 |
| Ag(OH)2- | 1.041e-020 | 8.478e-021 | -19.983 | -20.072 | -0.089 |
| As(3) | 1.040e-008 | | | | |
| H3AsO3 | 1.039e-008 | 1.054e-008 | -7.983 | -7.977 | 0.006 |
| H2AsO3- | 8.183e-012 | 6.665e-012 | -11.087 | -11.176 | -0.089 |
| H4AsO3+ | 4.234e-015 | 3.449e-015 | -14.373 | -14.462 | -0.089 |
| HAsO3-2 | 2.485e-020 | 1.094e-020 | -19.605 | -19.961 | -0.356 |
| AsO3-3 | 1.289e-029 | 2.035e-030 | -28.890 | -29.691 | -0.802 |
| As(5) | 2.988e-009 | | | | |
| H2AsO4- | 2.528e-009 | 2.059e-009 | -8.597 | -8.686 | -0.089 |
| HAsO4-2 | 4.605e-010 | 2.027e-010 | -9.337 | -9.693 | -0.356 |
| H3AsO4 | 2.339e-013 | 2.371e-013 | -12.631 | -12.625 | 0.006 |
| AsO4-3 | 3.071e-015 | 4.850e-016 | -14.513 | -15.314 | -0.802 |
| Ba | 1.169e-007 | | | | |
| BaSO4 | 5.890e-008 | 5.972e-008 | -7.230 | -7.224 | 0.006 |
| Ba+2 | 5.646e-008 | 2.486e-008 | -7.248 | -7.605 | -0.356 |
| BaHCO3+ | 1.482e-009 | 1.207e-009 | -8.829 | -8.918 | -0.089 |
| BaCO3 | 3.845e-012 | 3.899e-012 | -11.415 | -11.409 | 0.006 |
| BaOH+ | 1.563e-015 | 1.274e-015 | -14.806 | -14.895 | -0.089 |
| C(4) | 2.443e-002 | | | | |
| CO2 | 1.422e-002 | 1.442e-002 | -1.847 | -1.841 | 0.006 |
| HCO3- | 9.431e-003 | 7.750e-003 | -2.025 | -2.111 | -0.085 |
| CaHCO3+ | 4.754e-004 | 3.873e-004 | -3.323 | -3.412 | -0.089 |
| MgHCO3+ | 2.205e-004 | 1.796e-004 | -3.657 | -3.746 | -0.089 |
| MnHCO3+ | 7.335e-005 | 5.975e-005 | -4.135 | -4.224 | -0.089 |
| NaHCO3 | 4.331e-006 | 4.391e-006 | -5.363 | -5.357 | 0.006 |
| CaCO3 | 2.793e-006 | 2.832e-006 | -5.554 | -5.548 | 0.006 |
| MnCO3 | 2.698e-006 | 2.735e-006 | -5.569 | -5.563 | 0.006 |
| CO3-2 | 8.730e-007 | 3.981e-007 | -6.059 | -6.400 | -0.341 |
| CuHCO3+ | 8.143e-007 | 6.633e-007 | -6.089 | -6.178 | -0.089 |
| MgCO3 | 6.279e-007 | 6.366e-007 | -6.202 | -6.196 | 0.006 |
| ZnHCO3+ | 5.934e-007 | 4.834e-007 | -6.227 | -6.316 | -0.089 |
| CuCO3 | 3.601e-007 | 3.651e-007 | -6.444 | -6.438 | 0.006 |
| FeHCO3+ | 3.080e-007 | 2.509e-007 | -6.511 | -6.601 | -0.089 |
| PbHCO3+ | 5.236e-008 | 4.265e-008 | -7.281 | -7.370 | -0.089 |
| PbCO3 | 4.728e-008 | 4.793e-008 | -7.325 | -7.319 | 0.006 |
| ZnCO3 | 3.881e-008 | 3.935e-008 | -7.411 | -7.405 | 0.006 |
| NaCO3- | 4.493e-009 | 3.660e-009 | -8.347 | -8.437 | -0.089 |
| FeCO3 | 3.049e-009 | 3.091e-009 | -8.516 | -8.510 | 0.006 |
| BaHCO3+ | 1.482e-009 | 1.207e-009 | -8.829 | -8.918 | -0.089 |
| Zn(CO3)2-2 | 7.607e-010 | 3.349e-010 | -9.119 | -9.475 | -0.356 |
| Cu(CO3)2-2 | 4.156e-010 | 1.830e-010 | -9.381 | -9.738 | -0.356 |
| CdHCO3+ | 3.890e-010 | 3.169e-010 | -9.410 | -9.499 | -0.089 |
| Pb(CO3)2-2 | 1.089e-010 | 4.793e-011 | -9.963 | -10.319 | -0.356 |
| BaCO3 | 3.845e-012 | 3.899e-012 | -11.415 | -11.409 | 0.006 |
| CdCO3 | 4.032e-013 | 4.088e-013 | -12.394 | -12.388 | 0.006 |
| Cd(CO3)2-2 | 1.169e-015 | 5.147e-016 | -14.932 | -15.288 | -0.356 |
| Ca | 1.602e-002 | | | | |
| Ca+2 | 1.127e-002 | 5.164e-003 | -1.948 | -2.287 | -0.339 |
| CaSO4 | 4.269e-003 | 4.328e-003 | -2.370 | -2.364 | 0.006 |
| CaHCO3+ | 4.754e-004 | 3.873e-004 | -3.323 | -3.412 | -0.089 |
| CaCO3 | 2.793e-006 | 2.832e-006 | -5.554 | -5.548 | 0.006 |
| CaHSO4+ | 1.778e-008 | 1.449e-008 | -7.750 | -7.839 | -0.089 |
| CaOH+ | 1.591e-009 | 1.296e-009 | -8.798 | -8.887 | -0.089 |
| Cd | 5.354e-009 | | | | |
| Cd+2 | 2.936e-009 | 1.293e-009 | -8.532 | -8.888 | -0.356 |
| CdSO4 | 1.617e-009 | 1.639e-009 | -8.791 | -8.785 | 0.006 |
| CdHCO3+ | 3.890e-010 | 3.169e-010 | -9.410 | -9.499 | -0.089 |
| Cd(SO4)2-2 | 2.134e-010 | 9.395e-011 | -9.671 | -10.027 | -0.356 |
| CdCl+ | 1.971e-010 | 1.605e-010 | -9.705 | -9.794 | -0.089 |
| CdCl2 | 8.543e-013 | 8.661e-013 | -12.068 | -12.062 | 0.006 |
| CdCO3 | 4.032e-013 | 4.088e-013 | -12.394 | -12.388 | 0.006 |
| CdOHCl | 7.316e-014 | 7.418e-014 | -13.136 | -13.130 | 0.006 |
| CdOH+ | 6.995e-014 | 5.698e-014 | -13.155 | -13.244 | -0.089 |

| | | | | | |
|---|---|---|---|---|---|
| Cd(CO3)2-2 | 1.169e-015 | 5.147e-016 | -14.932 | -15.288 | -0.356 |
| CdCl3- | 7.392e-016 | 6.021e-016 | -15.131 | -15.220 | -0.089 |
| Cd(OH)2 | 1.302e-017 | 1.320e-017 | -16.885 | -16.879 | 0.006 |
| Cd2OH+3 | 2.725e-021 | 4.303e-022 | -20.565 | -21.366 | -0.802 |
| Cd(OH)3- | 2.750e-024 | 2.240e-024 | -23.561 | -23.650 | -0.089 |
| Cd(OH)4-2 | 6.856e-032 | 3.018e-032 | -31.164 | -31.520 | -0.356 |
| Cl | 1.697e-003 | | | | |
| Cl- | 1.694e-003 | 1.363e-003 | -2.771 | -2.865 | -0.094 |
| CuCl2- | 1.196e-006 | 9.745e-007 | -5.922 | -6.011 | -0.089 |
| MnCl+ | 5.897e-007 | 4.804e-007 | -6.229 | -6.318 | -0.089 |
| AgCl | 1.151e-008 | 1.167e-008 | -7.939 | -7.933 | 0.006 |
| CuCl3-2 | 4.529e-009 | 1.994e-009 | -8.344 | -8.700 | -0.356 |
| AgCl2- | 2.158e-009 | 1.758e-009 | -8.666 | -8.755 | -0.089 |
| ZnCl+ | 1.196e-009 | 9.744e-010 | -8.922 | -9.011 | -0.089 |
| FeCl+ | 7.478e-010 | 6.091e-010 | -9.126 | -9.215 | -0.089 |
| CuCl+ | 3.849e-010 | 3.135e-010 | -9.415 | -9.504 | -0.089 |
| PbCl+ | 3.251e-010 | 2.648e-010 | -9.488 | -9.577 | -0.089 |
| MnCl2 | 2.819e-010 | 2.859e-010 | -9.550 | -9.544 | 0.006 |
| CdCl+ | 1.971e-010 | 1.605e-010 | -9.705 | -9.794 | -0.089 |
| ZnOHCl | 3.335e-011 | 3.381e-011 | -10.477 | -10.471 | 0.006 |
| AgCl3-2 | 4.160e-012 | 1.832e-012 | -11.381 | -11.737 | -0.356 |
| ZnCl2 | 1.296e-012 | 1.314e-012 | -11.887 | -11.881 | 0.006 |
| CdCl2 | 8.543e-013 | 8.661e-013 | -12.068 | -12.062 | 0.006 |
| PbCl2 | 7.349e-013 | 7.451e-013 | -12.134 | -12.128 | 0.006 |
| CuCl2 | 1.943e-013 | 1.970e-013 | -12.712 | -12.706 | 0.006 |
| MnCl3- | 1.318e-013 | 1.073e-013 | -12.880 | -12.969 | -0.089 |
| CdOHCl | 7.316e-014 | 7.418e-014 | -13.136 | -13.130 | 0.006 |
| AgCl4-3 | 2.625e-014 | 4.144e-015 | -13.581 | -14.383 | -0.802 |
| ZnCl3- | 2.267e-015 | 1.846e-015 | -14.645 | -14.734 | -0.089 |
| PbCl3- | 9.078e-016 | 7.395e-016 | -15.042 | -15.131 | -0.089 |
| CdCl3- | 7.392e-016 | 6.021e-016 | -15.131 | -15.220 | -0.089 |
| ZnCl4-2 | 2.562e-018 | 1.128e-018 | -17.591 | -17.948 | -0.356 |
| PbCl4-2 | 9.828e-019 | 4.327e-019 | -18.008 | -18.364 | -0.356 |
| CuCl3- | 9.105e-019 | 7.417e-019 | -18.041 | -18.130 | -0.089 |
| FeCl+2 | 4.167e-020 | 1.835e-020 | -19.380 | -19.736 | -0.356 |
| FeCl2+ | 2.147e-022 | 1.749e-022 | -21.668 | -21.757 | -0.089 |
| CuCl4-2 | 8.296e-024 | 3.653e-024 | -23.081 | -23.437 | -0.356 |
| FeCl3 | 2.352e-026 | 2.384e-026 | -25.629 | -25.623 | 0.006 |
| Cu(1) | 3.169e-006 | | | | |
| Cu+ | 1.968e-006 | 1.603e-006 | -5.706 | -5.795 | -0.089 |
| CuCl2- | 1.196e-006 | 9.745e-007 | -5.922 | -6.011 | -0.089 |
| CuCl3-2 | 4.529e-009 | 1.994e-009 | -8.344 | -8.700 | -0.356 |
| Cu(2) | 1.724e-006 | | | | |
| CuHCO3+ | 8.143e-007 | 6.633e-007 | -6.089 | -6.178 | -0.089 |
| Cu+2 | 3.879e-007 | 1.708e-007 | -6.411 | -6.768 | -0.356 |
| CuCO3 | 3.601e-007 | 3.651e-007 | -6.444 | -6.438 | 0.006 |
| CuSO4 | 1.495e-007 | 1.516e-007 | -6.825 | -6.819 | 0.006 |
| Cu(OH)2 | 8.045e-009 | 8.157e-009 | -8.094 | -8.088 | 0.006 |
| CuOH+ | 3.170e-009 | 2.582e-009 | -8.499 | -8.588 | -0.089 |
| Cu(CO3)2-2 | 4.156e-010 | 1.830e-010 | -9.381 | -9.738 | -0.356 |
| CuCl+ | 3.849e-010 | 3.135e-010 | -9.415 | -9.504 | -0.089 |
| Cu2(OH)2+2 | 1.628e-012 | 7.166e-013 | -11.788 | -12.145 | -0.356 |
| CuCl2 | 1.943e-013 | 1.970e-013 | -12.712 | -12.706 | 0.006 |
| Cu(OH)3- | 9.123e-016 | 7.431e-016 | -15.040 | -15.129 | -0.089 |
| CuCl3- | 9.105e-019 | 7.417e-019 | -18.041 | -18.130 | -0.089 |
| Cu(OH)4-2 | 5.092e-022 | 2.242e-022 | -21.293 | -21.649 | -0.356 |
| CuCl4-2 | 8.296e-024 | 3.653e-024 | -23.081 | -23.437 | -0.356 |
| Fe(2) | 1.257e-006 | | | | |
| Fe+2 | 7.352e-007 | 3.237e-007 | -6.134 | -6.490 | -0.356 |
| FeHCO3+ | 3.080e-007 | 2.509e-007 | -6.511 | -6.601 | -0.089 |
| FeSO4 | 2.102e-007 | 2.131e-007 | -6.677 | -6.671 | 0.006 |
| FeCO3 | 3.049e-009 | 3.091e-009 | -8.516 | -8.510 | 0.006 |
| FeCl+ | 7.478e-010 | 6.091e-010 | -9.126 | -9.215 | -0.089 |
| FeOH+ | 6.605e-011 | 5.381e-011 | -10.180 | -10.269 | -0.089 |
| FeHSO4+ | 1.115e-012 | 9.081e-013 | -11.953 | -12.042 | -0.089 |
| Fe(OH)2 | 1.996e-016 | 2.024e-016 | -15.700 | -15.694 | 0.006 |
| Fe(OH)3- | 1.215e-020 | 9.897e-021 | -19.915 | -20.005 | -0.089 |
| Fe(3) | 1.162e-012 | | | | |
| Fe(OH)2+ | 1.065e-012 | 8.676e-013 | -11.973 | -12.062 | -0.089 |
| Fe(OH)3 | 8.999e-014 | 9.124e-014 | -13.046 | -13.040 | 0.006 |
| FeOH+2 | 6.729e-015 | 2.962e-015 | -14.172 | -14.528 | -0.356 |
| Fe(OH)4- | 8.750e-017 | 7.127e-017 | -16.058 | -16.147 | -0.089 |
| FeSO4+ | 3.292e-017 | 2.681e-017 | -16.483 | -16.572 | -0.089 |
| Fe+3 | 4.418e-018 | 6.976e-019 | -17.355 | -18.156 | -0.802 |
| Fe(SO4)2- | 3.267e-018 | 2.661e-018 | -17.486 | -17.575 | -0.089 |
| FeCl+2 | 4.167e-020 | 1.835e-020 | -19.380 | -19.736 | -0.356 |
| FeCl2+ | 2.147e-022 | 1.749e-022 | -21.668 | -21.757 | -0.089 |
| FeHSO4+2 | 1.117e-022 | 4.916e-023 | -21.952 | -22.308 | -0.356 |
| FeCl3 | 2.352e-026 | 2.384e-026 | -25.629 | -25.623 | 0.006 |
| Fe2(OH)2+4 | 1.128e-026 | 4.237e-028 | -25.948 | -27.373 | -1.425 |
| Fe3(OH)4+5 | 4.772e-035 | 2.831e-037 | -34.321 | -36.548 | -2.227 |
| H(0) | 2.925e-019 | | | | |
| H2 | 1.463e-019 | 1.483e-019 | -18.835 | -18.829 | 0.006 |
| K | 1.693e-004 | | | | |
| K+ | 1.650e-004 | 1.328e-004 | -3.782 | -3.877 | -0.094 |
| KSO4- | 4.289e-006 | 3.494e-006 | -5.368 | -5.457 | -0.089 |
| Mg | 6.188e-003 | | | | |
| Mg+2 | 4.380e-003 | 2.062e-003 | -2.359 | -2.686 | -0.327 |
| MgSO4 | 1.588e-003 | 1.610e-003 | -2.799 | -2.793 | 0.006 |
| MgHCO3+ | 2.205e-004 | 1.796e-004 | -3.657 | -3.746 | -0.089 |
| MgCO3 | 6.279e-007 | 6.366e-007 | -6.202 | -6.196 | 0.006 |
| MgOH+ | 3.876e-009 | 3.157e-009 | -8.412 | -8.501 | -0.089 |
| Mn(2) | 3.286e-004 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Mn+2 | 1.965e-004 | 8.650e-005 | -3.707 | -4.063 | -0.356 |
| MnHCO3+ | 7.335e-005 | 5.975e-005 | -4.135 | -4.224 | -0.089 |
| MnSO4 | 5.553e-005 | 5.630e-005 | -4.255 | -4.249 | 0.006 |
| MnCO3 | 2.698e-006 | 2.735e-006 | -5.569 | -5.563 | 0.006 |
| MnCl+ | 5.897e-007 | 4.804e-007 | -6.229 | -6.318 | -0.089 |
| MnOH+ | 1.303e-009 | 1.062e-009 | -8.885 | -8.974 | -0.089 |
| MnCl2 | 2.819e-010 | 2.859e-010 | -9.550 | -9.544 | 0.006 |
| MnCl3- | 1.318e-013 | 1.073e-013 | -12.880 | -12.969 | -0.089 |
| Mn(OH)3- | 5.818e-021 | 4.739e-021 | -20.235 | -20.324 | -0.089 |
| Mn(3) | 1.051e-028 | | | | |
| Mn+3 | 1.051e-028 | 1.660e-029 | -27.978 | -28.780 | -0.802 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -71.164 | -71.520 | -0.356 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -80.050 | -80.139 | -0.089 |
| Na | 1.265e-003 | | | | |
| Na+ | 1.234e-003 | 1.007e-003 | -2.909 | -2.997 | -0.088 |
| NaSO4- | 2.717e-005 | 2.213e-005 | -4.566 | -4.655 | -0.089 |
| NaHCO3 | 4.331e-006 | 4.391e-006 | -5.363 | -5.357 | 0.006 |
| NaCO3- | 4.493e-009 | 3.660e-009 | -8.347 | -8.437 | -0.089 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -59.293 | -59.287 | 0.006 |
| Pb | 1.356e-007 | | | | |
| PbHCO3+ | 5.236e-008 | 4.265e-008 | -7.281 | -7.370 | -0.089 |
| PbCO3 | 4.728e-008 | 4.793e-008 | -7.325 | -7.319 | 0.006 |
| PbSO4 | 1.842e-008 | 1.868e-008 | -7.735 | -7.729 | 0.006 |
| Pb+2 | 1.574e-008 | 6.928e-009 | -7.803 | -8.159 | -0.356 |
| Pb(SO4)2-2 | 1.067e-009 | 4.699e-010 | -8.972 | -9.328 | -0.356 |
| PbCl+ | 3.251e-010 | 2.648e-010 | -9.488 | -9.577 | -0.089 |
| PbOH+ | 2.508e-010 | 2.043e-010 | -9.601 | -9.690 | -0.089 |
| Pb(CO3)2-2 | 1.089e-010 | 4.793e-011 | -9.963 | -10.319 | -0.356 |
| PbCl2 | 7.349e-013 | 7.451e-013 | -12.134 | -12.128 | 0.006 |
| Pb(OH)2 | 1.185e-013 | 1.202e-013 | -12.926 | -12.920 | 0.006 |
| PbCl3- | 9.078e-016 | 7.395e-016 | -15.042 | -15.131 | -0.089 |
| Pb2OH+3 | 2.007e-016 | 3.168e-017 | -15.698 | -16.499 | -0.802 |
| Pb(OH)3- | 2.561e-018 | 2.086e-018 | -17.592 | -17.681 | -0.089 |
| PbCl4-2 | 9.828e-019 | 4.327e-019 | -18.008 | -18.364 | -0.356 |
| Pb(OH)4-2 | 1.641e-023 | 7.225e-024 | -22.785 | -23.141 | -0.356 |
| Pb3(OH)4+2 | 6.240e-025 | 2.747e-025 | -24.205 | -24.561 | -0.356 |
| S(6) | 1.671e-002 | | | | |
| SO4-2 | 1.076e-002 | 4.794e-003 | -1.968 | -2.319 | -0.351 |
| CaSO4 | 4.269e-003 | 4.328e-003 | -2.370 | -2.364 | 0.006 |
| MgSO4 | 1.588e-003 | 1.610e-003 | -2.799 | -2.793 | 0.006 |
| MnSO4 | 5.553e-005 | 5.630e-005 | -4.255 | -4.249 | 0.006 |
| NaSO4- | 2.717e-005 | 2.213e-005 | -4.566 | -4.655 | -0.089 |
| KSO4- | 4.289e-006 | 3.494e-006 | -5.368 | -5.457 | -0.089 |
| ZnSO4 | 4.925e-007 | 4.993e-007 | -6.308 | -6.302 | 0.006 |
| HSO4- | 2.865e-007 | 2.333e-007 | -6.543 | -6.632 | -0.089 |
| FeSO4 | 2.102e-007 | 2.131e-007 | -6.677 | -6.671 | 0.006 |
| CuSO4 | 1.495e-007 | 1.516e-007 | -6.825 | -6.819 | 0.006 |
| BaSO4 | 5.890e-008 | 5.972e-008 | -7.230 | -7.224 | 0.006 |
| Zn(SO4)2-2 | 4.927e-008 | 2.169e-008 | -7.307 | -7.664 | -0.356 |
| PbSO4 | 1.842e-008 | 1.868e-008 | -7.735 | -7.729 | 0.006 |
| CaHSO4+ | 1.778e-008 | 1.449e-008 | -7.750 | -7.839 | -0.089 |
| CdSO4 | 1.617e-009 | 1.639e-009 | -8.791 | -8.785 | 0.006 |
| Pb(SO4)2-2 | 1.067e-009 | 4.699e-010 | -8.972 | -9.328 | -0.356 |
| AgSO4- | 3.777e-010 | 3.076e-010 | -9.423 | -9.512 | -0.089 |
| Cd(SO4)2-2 | 2.134e-010 | 9.395e-011 | -9.671 | -10.027 | -0.356 |
| FeHSO4+ | 1.115e-012 | 9.081e-013 | -11.953 | -12.042 | -0.089 |
| FeSO4+ | 3.292e-017 | 2.681e-017 | -16.483 | -16.572 | -0.089 |
| Fe(SO4)2- | 3.267e-018 | 2.661e-018 | -17.486 | -17.575 | -0.089 |
| FeHSO4+2 | 1.117e-022 | 4.916e-023 | -21.952 | -22.308 | -0.356 |
| Se(-2) | 1.580e-021 | | | | |
| HSe- | 1.571e-021 | 1.280e-021 | -20.804 | -20.893 | -0.089 |
| H2Se | 8.044e-024 | 8.156e-024 | -23.095 | -23.089 | 0.006 |
| Se(4) | 2.541e-008 | | | | |
| HSeO3- | 2.518e-008 | 2.051e-008 | -7.599 | -7.688 | -0.089 |
| SeO3-2 | 2.229e-010 | 9.815e-011 | -9.652 | -10.008 | -0.356 |
| H2SeO3 | 7.515e-012 | 7.619e-012 | -11.124 | -11.118 | 0.006 |
| Se(6) | 6.788e-025 | | | | |
| SeO4-2 | 6.788e-025 | 2.989e-025 | -24.168 | -24.525 | -0.356 |
| HSeO4- | 7.479e-030 | 6.092e-030 | -29.126 | -29.215 | -0.089 |
| Zn | 2.302e-006 | | | | |
| Zn+2 | 1.125e-006 | 4.954e-007 | -5.949 | -6.305 | -0.356 |
| ZnHCO3+ | 5.934e-007 | 4.834e-007 | -6.227 | -6.316 | -0.089 |
| ZnSO4 | 4.925e-007 | 4.993e-007 | -6.308 | -6.302 | 0.006 |
| Zn(SO4)2-2 | 4.927e-008 | 2.169e-008 | -7.307 | -7.664 | -0.356 |
| ZnCO3 | 3.881e-008 | 3.935e-008 | -7.411 | -7.405 | 0.006 |
| ZnCl+ | 1.196e-009 | 9.744e-010 | -8.922 | -9.011 | -0.089 |
| Zn(CO3)2-2 | 7.607e-010 | 3.349e-010 | -9.119 | -9.475 | -0.356 |
| ZnOH+ | 3.450e-010 | 2.810e-010 | -9.462 | -9.551 | -0.089 |
| ZnOHCl | 3.335e-011 | 3.381e-011 | -10.477 | -10.471 | 0.006 |
| Zn(OH)2 | 1.406e-011 | 1.426e-011 | -10.852 | -10.846 | 0.006 |
| ZnCl2 | 1.296e-012 | 1.314e-012 | -11.887 | -11.881 | 0.006 |
| ZnCl3- | 2.267e-015 | 1.846e-015 | -14.645 | -14.734 | -0.089 |
| Zn(OH)3- | 8.370e-017 | 6.818e-017 | -16.077 | -16.166 | -0.089 |
| ZnCl4-2 | 2.562e-018 | 1.128e-018 | -17.591 | -17.948 | -0.356 |
| Zn(OH)4-2 | 3.711e-023 | 1.634e-023 | -22.431 | -22.787 | -0.356 |

----------Saturation indices----------

| Phase | SI | log IAP | log KT |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Ag2CO3 | -11.86 | -23.26 | -11.40 Ag2CO3 |
| Ag2O | -17.44 | -4.50 | 12.94 Ag2O |
| Ag2SO4 | -14.11 | -19.18 | -5.07 Ag2SO4 |
| AgMetal | 4.27 | -10.12 | -14.39 Ag |
| Anglesite | -2.61 | -10.48 | -7.86 PbSO4 |
| Anhydrite | -0.27 | -4.61 | -4.33 CaSO4 |
| Antlerite | -6.19 | 2.10 | 8.29 Cu3(OH)4SO4 |
| Aragonite | -0.42 | -8.69 | -8.26 CaCO3 |
| Arsenolite | -14.32 | -15.95 | -1.63 As2O3 |
| Artinite | -10.01 | 0.59 | 10.60 MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -33.74 | -25.25 | 8.49 As2O5 |
| As_native | -18.10 | -31.59 | -13.49 As |
| Atacamite | -5.85 | 2.14 | 7.99 Cu2(OH)3Cl |
| Azurite | -4.63 | 0.19 | 4.82 Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -3.00 | -53.44 | -50.44 Ba3(AsO4)2 |
| Barite | 0.29 | -9.92 | -10.21 BaSO4 |
| BaSeO3 | -11.22 | -17.61 | -6.39 BaSeO3 |
| Bianchite | -6.87 | -8.63 | -1.76 ZnSO4:6H2O |
| Birnessite | -19.56 | 24.04 | 43.60 MnO2 |
| Bixbyite | -20.40 | -20.48 | -0.08 Mn2O3 |
| Brochantite | -7.65 | 7.69 | 15.34 Cu4(OH)6SO4 |
| Brucite | -8.11 | 9.67 | 17.78 Mg(OH)2 |
| Ca3(AsO4)2:4w | -18.59 | -37.49 | -18.91 Ca3(AsO4)2:4H2O |
| Calcite | -0.27 | -8.69 | -8.42 CaCO3 |
| CaSeO3 | -6.70 | -12.30 | -5.60 CaSeO3 |
| Cd(gamma) | -26.49 | -12.27 | 14.22 Cd |
| Cd(OH)2 | -10.18 | 3.47 | 13.65 Cd(OH)2 |
| Cd(OH)2(a) | -10.98 | 3.47 | 14.45 Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -25.65 | -18.94 | 6.71 Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -26.83 | -4.27 | 22.56 Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -29.20 | -0.80 | 28.40 Cd4(OH)6SO4 |
| CdCl2 | -14.09 | -14.62 | -0.52 CdCl2 |
| CdCl2:2.5H2O | -12.62 | -14.62 | -2.00 CdCl2:2.5H2O |
| CdCl2:H2O | -12.97 | -14.62 | -1.65 CdCl2:H2O |
| CdMetal | -26.38 | -12.27 | 14.12 Cd |
| CdOHCl | -9.35 | -5.57 | 3.78 CdOHCl |
| CdSO4 | -11.62 | -11.21 | 0.41 CdSO4 |
| CdSO4:2.7H2O | -9.49 | -11.21 | -1.72 CdSO4:2.67H2O |
| CdSO4:H2O | -9.81 | -11.21 | -1.40 CdSO4:H2O |
| Cerargyrite | -1.00 | -11.30 | -10.29 AgCl |
| Cerrusite | -1.26 | -14.56 | -13.30 PbCO3 |
| Chalcanthite | -6.40 | -9.09 | -2.69 CuSO4:5H2O |
| Claudetite | -14.38 | -15.95 | -1.58 As2O3 |
| CO2(g) | -0.55 | -1.84 | -1.29 CO2 |
| Cotunnite | -8.93 | -13.89 | -4.96 PbCl2 |
| Cu(OH)2 | -3.58 | 5.59 | 9.17 Cu(OH)2 |
| Cu2SO4 | -12.12 | -13.91 | -1.79 Cu2SO4 |
| Cu3(AsO4)2:6w | -15.81 | -50.93 | -35.12 Cu3(AsO4)2:6H2O |
| CuCO3 | -3.54 | -13.17 | -9.63 CuCO3 |
| CuMetal | 1.87 | -7.48 | -9.36 Cu |
| CuOCuSO4 | -16.26 | -3.49 | 12.77 CuO:CuSO4 |
| CupricFerrite | -0.87 | 6.36 | 7.22 CuFe2O4 |
| Cuprite | 2.54 | 0.77 | -1.77 Cu2O |
| CuprousFerrite | 9.56 | 0.77 | -8.79 CuFeO2 |
| CuSO4 | -12.73 | -9.09 | 3.64 CuSO4 |
| Dolomite | -1.01 | -17.77 | -16.76 CaMg(CO3)2 |
| Dolomite(d) | -1.62 | -17.77 | -16.15 CaMg(CO3)2 |
| Epsomite | -2.77 | -5.01 | -2.24 MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 0.71 | -2.33 | -3.04 Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -4.51 | 0.38 | 4.89 Fe(OH)3 |
| Fe2(SeO3)3 | -30.91 | -66.34 | -35.43 Fe2(SeO3)3 |
| Fe3(OH)8 | -13.59 | 6.63 | 20.22 Fe3(OH)8 |
| FeSe2 | -13.96 | -32.54 | -18.58 FeSe2 |
| Goethite | 0.88 | 0.38 | -0.50 FeOOH |
| Goslarite | -6.55 | -8.63 | -2.07 ZnSO4:7H2O |
| Gypsum | -0.02 | -4.61 | -4.59 CaSO4:2H2O |
| H2(g) | -15.74 | -18.83 | -3.09 H2 |
| H2O(g) | -1.88 | -0.00 | 1.88 H2O |
| Halite | -7.41 | -5.86 | 1.55 NaCl |
| Hausmannite | -23.90 | 40.63 | 64.53 Mn3O4 |
| Hematite | 3.70 | 0.77 | -2.94 Fe2O3 |
| Huntite | -6.87 | -35.94 | -29.07 CaMg3(CO3)4 |
| Hydrocerrusite | -7.46 | -24.92 | -17.46 Pb(OH)2:2PbCO3 |
| Hydromagnesite | -19.73 | -26.67 | -6.95 Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -16.62 | 13.69 | 30.31 Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -18.10 | 13.69 | 31.79 Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -16.51 | -26.34 | -9.83 (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -17.78 | -25.91 | -8.12 KFe3(SO4)2(OH)6 |
| Jarosite-Na | -21.00 | -25.03 | -4.02 NaFe3(SO4)2(OH)6 |
| JarositeH | -24.74 | -28.21 | -3.47 (H3O)Fe3(SO4)2(OH)6 |
| Langite | -10.48 | 7.69 | 18.17 Cu4(OH)6SO4:H2O |
| Larnakite | -6.22 | -6.28 | -0.06 PbO:PbSO4 |
| Laurionite | -5.47 | -4.85 | 0.62 PbOHCl |
| Litharge | -9.09 | 4.20 | 13.29 PbO |
| Maghemite | -5.62 | 0.77 | 6.39 Fe2O3 |
| Magnesite | -1.27 | -9.09 | -7.81 MgCO3 |
| Magnetite | 1.14 | 6.64 | 5.49 Fe3O4 |
| Malachite | -2.94 | 2.89 | 5.84 Cu2(OH)2CO3 |
| Manganite | -9.17 | 16.17 | 25.34 MnOOH |
| Massicot | -9.29 | 4.20 | 13.49 PbO |
| Melanothallite | -16.66 | -12.50 | 4.16 CuCl2 |
| Melanterite | -6.42 | -8.81 | -2.39 FeSO4:7H2O |
| Minium | -48.92 | 28.34 | 77.26 Pb3O4 |

```
Mirabilite      -6.54   -8.32   -1.77  Na2SO4:10H2O
Mn2(SO4)3       -60.16  -64.52  -4.35  Mn2(SO4)3
Mn3(AsO4)2:8H2O -14.11  -42.82  -28.71  Mn3(AsO4)2:8H2O
MnCl2:4H2O      -11.90  -9.80   2.11  MnCl2:4H2O
MnSO4           -9.59   -6.38   3.21  MnSO4
Monteponite     -11.16   3.47   14.63  CdO
Nahcolite       -4.43   -5.11   -0.68  NaHCO3
Nantokite       -1.55   -8.66   -7.11  CuCl
Natron          -10.54  -12.40  -1.86  Na2CO3:10H2O
Nesquehonite    -3.67   -9.09   -5.42  MgCO3:3H2O
Nsutite         -18.53   24.04   42.56  MnO2
O2(g)           -56.51  -59.29  -2.78  O2
Otavite         -3.29   -15.29  -12.00  CdCO3
Pb(OH)2         -4.44    4.20    8.64  Pb(OH)2
Pb2(OH)3Cl      -9.44   -0.65    8.79  Pb2(OH)3Cl
Pb2O(OH)2       -17.80   8.40   26.20  PbO:Pb(OH)2
Pb2O3           -36.90   24.14   61.04  Pb2O3
Pb2OCO3         -10.26  -10.36  -0.10  PbO:PbCO3
Pb3(AsO4)2      -19.70  -55.11  -35.40  Pb3(AsO4)2
Pb3O2CO3        -18.10  -6.16   11.94  PbCO3:2PbO
Pb3O2SO4        -13.20  -2.08   11.12  PbSO4:2PbO
Pb4(OH)6SO4     -18.98   2.12   21.10  Pb4(OH)6SO4
Pb4O3SO4        -21.20   2.12   23.32  PbSO4:3PbO
PbMetal         -15.80  -11.54   4.26  Pb
PbO:0.3H2O      -8.78    4.20   12.98  PbO:0.33H2O
Phosgenite      -8.64   -28.45  -19.81  PbCl2:PbCO3
Plattnerite     -31.82   19.94   51.76  PbO2
Portlandite     -13.81   10.07   23.88  Ca(OH)2
Pyrochroite     -6.90    8.30   15.20  Mn(OH)2
Pyrolusite      -19.61   24.04   43.64  MnO2
Rhodochrosite    0.62   -10.46  -11.08  MnCO3
Rhodochrosite(d) -0.07  -10.46  -10.39  MnCO3
Scorodite       -13.22  -33.47  -20.25  FeAsO4:2H2O
Se(s)           5.99    -11.33  -17.32  Se
SeO2            -13.99  -22.37  -8.38  SeO2
Siderite        -2.09   -12.89  -10.80  FeCO3
Siderite(d)(3)  -2.44   -12.89  -10.45  FeCO3
Smithsonite     -2.86   -12.71  -9.85  ZnCO3
Smithsonite_PG  -1.89   -12.71  -10.81  ZnCO3
Tenorite        -2.56    5.59    8.15  CuO
Thenardite      -8.15   -8.31   -0.16  Na2SO4
Thermonatrite   -12.62  -12.39   0.22  Na2CO3:H2O
Trona           -17.33  -17.50  -0.17  NaHCO3:Na2CO3:2H2O
Witherite       -5.38   -14.00  -8.62  BaCO3
Zincite(c)      -5.85    6.05   11.90  ZnO
Zincosite       -12.30  -8.62   3.68  ZnSO4
Zn(OH)2-a       -6.40    6.05   12.45  Zn(OH)2
Zn(OH)2-b       -5.70    6.05   11.75  Zn(OH)2
Zn(OH)2-c       -6.15    6.05   12.20  Zn(OH)2
Zn(OH)2-e       -5.45    6.05   11.50  Zn(OH)2
Zn(OH)2-g       -5.66    6.05   11.71  Zn(OH)2
Zn2(OH)2SO4     -10.07  -2.57    7.50  Zn2(OH)2SO4
Zn2(OH)3Cl      -12.14   3.06   15.20  Zn2(OH)3Cl
Zn3(AsO4)2:2.5w -22.00  -49.54  -27.55  Zn3(AsO4)2:2.5H2O
Zn3O(SO4)2      -32.37  -11.19   21.18  ZnO:2ZnSO4
Zn4(OH)6SO4     -18.86   9.54   28.40  Zn4(OH)6SO4
Zn5(OH)8Cl2     -26.32   12.18   38.50  Zn5(OH)8Cl2
ZnCl2           -19.67  -12.04    7.64  ZnCl2
ZnCO3:1H2O      -2.45   -12.71  -10.26  ZnCO3:1H2O
ZnCO3:H2O       -2.45   -12.71  -10.26  ZnCO3:H2O
ZnMetal         -36.72   -9.69   27.04  Zn
ZnO(a)          -5.26    6.05   11.31  ZnO
ZnSO4:H2O       -8.42   -8.62   -0.20  ZnSO4:H2O

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End of simulation.
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Reading input data for simulation 4.
----------------------

Solution 4  - MW-1013C, Sample Date June 2013
Units                   mg/L
pH                      6.39            #Field value
pe                      1.6
Temperature 14.1
Alkalinity      530
As                      0.019
Ba                      0.021
Cd                      0.0006    #Detection Limit
Ca                      600
Cl                      71
Cu                      0.0093
Fe                      15
Pb                      0.012     #Detection Limit
Mg                      170
Mn                      10
K                       27
Se                      0.002     #Detection Limit
Ag                      0.0017    #Detection Limit
Na                      35
S(6)                    1600
```

```
            Zn                          0.39
            END
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Beginning of initial solution calculations.
-------------------------------

Initial solution 4.          - MW-1013C, Sample Date June 2013

-----------------Solution composition-----------------

            Elements        Molality      Moles

            Ag            1.581e-008  1.581e-008
            Alkalinity     1.062e-002  1.062e-002
            As            2.544e-007  2.544e-007
            Ba            1.534e-007  1.534e-007
            Ca            1.502e-002  1.502e-002
            Cd            5.354e-009  5.354e-009
            Cl            2.009e-003  2.009e-003
            Cu            1.468e-007  1.468e-007
            Fe            2.694e-004  2.694e-004
            K             6.926e-004  6.926e-004
            Mg            7.014e-003  7.014e-003
            Mn            1.826e-004  1.826e-004
            Na            1.527e-003  1.527e-003
            Pb            5.810e-008  5.810e-008
            S(6)          1.671e-002  1.671e-002
            Se            2.541e-008  2.541e-008
            Zn            5.984e-006  5.984e-006

-----------------Description of solution-----------------

                    pH  =   6.390
                    pe  =   1.600
          Activity of water  =   0.999
            Ionic strength  =  6.007e-002
          Mass of water (kg)  =  1.000e+000
        Total carbon (mol/kg)  =  1.919e-002
          Total CO2 (mol/kg)  =  1.919e-002
         Temperature (deg C)  =  14.100
       Electrical balance (eq)  =  1.151e-003
 Percent error, 100*(Cat-|An|)/(Cat+|An|)  =   1.71
                 Iterations  =  10
                   Total H  = 1.110230e+002
                   Total O  = 5.562205e+001

-----------------Distribution of species-----------------

                                  Log      Log       Log
  Species            Molality   Activity  Molality  Activity    Gamma

  H+               4.801e-007  4.074e-007   -6.319    -6.390    -0.071
  OH-              1.259e-008  1.024e-008   -7.900    -7.990    -0.090
  H2O              5.551e+001  9.991e-001    1.744    -0.000     0.000
Ag          1.581e-008
  AgCl             9.899e-009  1.004e-008   -8.004    -7.998     0.006
  Ag+              3.457e-009  2.813e-009   -8.461    -8.551    -0.090
  AgCl2-           2.156e-009  1.755e-009   -8.666    -8.756    -0.090
  AgSO4-           2.904e-010  2.363e-010   -9.537    -9.627    -0.090
  AgCl3-2          5.258e-012  2.306e-012  -11.279   -11.637    -0.358
  AgCl4-3          3.946e-014  6.176e-015  -13.404   -14.209    -0.806
  AgOH             6.804e-015  6.899e-015  -14.167   -14.161     0.006
  Ag(OH)2-         2.079e-020  1.692e-020  -19.682   -19.772    -0.090
As(3)       1.061e-007
  H3AsO3           1.059e-007  1.074e-007   -6.975    -6.969     0.006
  H2AsO3-          1.505e-010  1.224e-010   -9.823    -9.912    -0.090
  H4AsO3+          2.664e-014  2.168e-014  -13.574   -13.664    -0.090
  HAsO3-2          8.396e-019  3.682e-019  -18.076   -18.434    -0.358
  AsO3-3           7.821e-028  1.224e-028  -27.107   -27.912    -0.806
As(5)       1.483e-007
  H2AsO4-          1.141e-007  9.283e-008   -6.943    -7.032    -0.090
  HAsO4-2          3.422e-008  1.501e-008   -7.466    -7.824    -0.358
  H3AsO4           6.679e-012  6.772e-012  -11.175   -11.169     0.006
  AsO4-3           3.988e-013  6.241e-014  -12.399   -13.205    -0.806
Ba          1.534e-007
  BaSO4            7.661e-008  7.767e-008   -7.116    -7.110     0.006
  Ba+2             7.457e-008  3.270e-008   -7.127    -7.485    -0.358
  BaHCO3+          2.186e-009  1.779e-009   -8.660    -8.750    -0.090
  BaCO3            9.574e-012  9.707e-012  -11.019   -11.013     0.006
  BaOH+            3.339e-015  2.717e-015  -14.476   -14.566    -0.090
C(4)        1.919e-002
  HCO3-            9.743e-003  7.999e-003   -2.011    -2.097    -0.086
  CO2              8.584e-003  8.703e-003   -2.066    -2.060     0.006
  CaHCO3+          4.870e-004  3.963e-004   -3.312    -3.402    -0.090
  MgHCO3+          2.543e-004  2.069e-004   -3.595    -3.684    -0.090
  FeHCO3+          6.689e-005  5.443e-005   -4.175    -4.264    -0.090
  MnHCO3+          4.112e-005  3.346e-005   -4.386    -4.475    -0.090
  NaHCO3           5.388e-006  5.463e-006   -5.269    -5.263     0.006
  CaCO3            4.775e-006  4.841e-006   -5.321    -5.315     0.006
  MnCO3            2.630e-006  2.666e-006   -5.580    -5.574     0.006
  CO3-2            1.574e-006  7.152e-007   -5.803    -6.146    -0.343
  ZnHCO3+          1.552e-006  1.263e-006   -5.809    -5.898    -0.090
  MgCO3            1.304e-006  1.322e-006   -5.885    -5.879     0.006
```

| | | | | | |
|---|---|---|---|---|---|
| FeCO3 | 1.151e-006 | 1.167e-006 | -5.939 | -5.933 | 0.006 |
| ZnCO3 | 1.766e-007 | 1.790e-007 | -6.753 | -6.747 | 0.006 |
| PbCO3 | 2.815e-008 | 2.854e-008 | -7.550 | -7.544 | 0.006 |
| CuHCO3+ | 1.854e-008 | 1.509e-008 | -7.732 | -7.821 | -0.090 |
| PbHCO3+ | 1.793e-008 | 1.459e-008 | -7.746 | -7.836 | -0.090 |
| CuCO3 | 1.426e-008 | 1.445e-008 | -7.846 | -7.840 | 0.006 |
| NaCO3- | 1.123e-008 | 9.141e-009 | -7.950 | -8.039 | -0.090 |
| Zn(CO3)2-2 | 6.242e-009 | 2.737e-009 | -8.205 | -8.563 | -0.358 |
| BaHCO3+ | 2.186e-009 | 1.779e-009 | -8.660 | -8.750 | -0.090 |
| CdHCO3+ | 3.967e-010 | 3.229e-010 | -9.401 | -9.491 | -0.090 |
| Pb(CO3)2-2 | 1.169e-010 | 5.128e-011 | -9.932 | -10.290 | -0.358 |
| Cu(CO3)2-2 | 2.968e-011 | 1.301e-011 | -10.528 | -10.886 | -0.358 |
| BaCO3 | 9.574e-012 | 9.707e-012 | -11.019 | -11.013 | 0.006 |
| CdCO3 | 7.151e-013 | 7.251e-013 | -12.146 | -12.140 | 0.006 |
| Cd(CO3)2-2 | 3.739e-015 | 1.640e-015 | -14.427 | -14.785 | -0.358 |
| Ca 1.502e-002 | | | | | |
| Ca+2 | 1.050e-002 | 4.795e-003 | -1.979 | -2.319 | -0.340 |
| CaSO4 | 4.023e-003 | 4.079e-003 | -2.395 | -2.389 | 0.006 |
| CaHCO3+ | 4.870e-004 | 3.963e-004 | -3.312 | -3.402 | -0.090 |
| CaCO3 | 4.775e-006 | 4.841e-006 | -5.321 | -5.315 | 0.006 |
| CaHSO4+ | 1.060e-008 | 8.625e-009 | -7.975 | -8.064 | -0.090 |
| CaOH+ | 2.398e-009 | 1.951e-009 | -8.620 | -8.710 | -0.090 |
| Cd 5.354e-009 | | | | | |
| Cd+2 | 2.911e-009 | 1.276e-009 | -8.536 | -8.894 | -0.358 |
| CdSO4 | 1.605e-009 | 1.628e-009 | -8.794 | -8.788 | 0.006 |
| CdHCO3+ | 3.967e-010 | 3.229e-010 | -9.401 | -9.491 | -0.090 |
| CdCl+ | 2.328e-010 | 1.894e-010 | -9.633 | -9.723 | -0.090 |
| Cd(SO4)2-2 | 2.067e-010 | 9.065e-011 | -9.685 | -10.043 | -0.358 |
| CdCl2 | 1.206e-012 | 1.222e-012 | -11.919 | -11.913 | 0.006 |
| CdCO3 | 7.151e-013 | 7.251e-013 | -12.146 | -12.140 | 0.006 |
| CdOHCl | 1.487e-013 | 1.508e-013 | -12.828 | -12.822 | 0.006 |
| CdOH+ | 1.383e-013 | 1.125e-013 | -12.859 | -12.949 | -0.090 |
| Cd(CO3)2-2 | 3.739e-015 | 1.640e-015 | -14.427 | -14.785 | -0.358 |
| CdCl3- | 1.290e-015 | 1.050e-015 | -14.889 | -14.979 | -0.090 |
| Cd(OH)2 | 3.382e-017 | 3.429e-017 | -16.471 | -16.465 | 0.006 |
| Cd2OH+3 | 5.174e-021 | 8.098e-022 | -20.286 | -21.092 | -0.806 |
| Cd(OH)3- | 1.159e-023 | 9.435e-024 | -22.936 | -23.025 | -0.090 |
| Cd(OH)4-2 | 4.702e-031 | 2.062e-031 | -30.328 | -30.686 | -0.358 |
| Cl 2.009e-003 | | | | | |
| Cl- | 2.008e-003 | 1.614e-003 | -2.697 | -2.792 | -0.095 |
| MnCl+ | 3.792e-007 | 3.086e-007 | -6.421 | -6.511 | -0.090 |
| FeCl+ | 1.863e-007 | 1.516e-007 | -6.730 | -6.819 | -0.090 |
| CuCl2- | 4.641e-008 | 3.777e-008 | -7.333 | -7.423 | -0.090 |
| AgCl | 9.899e-009 | 1.004e-008 | -8.004 | -7.998 | 0.006 |
| ZnCl+ | 4.066e-009 | 3.309e-009 | -8.391 | -8.480 | -0.090 |
| AgCl2- | 2.156e-009 | 1.755e-009 | -8.666 | -8.756 | -0.090 |
| CdCl+ | 2.328e-010 | 1.894e-010 | -9.633 | -9.723 | -0.090 |
| MnCl2 | 2.144e-010 | 2.174e-010 | -9.669 | -9.663 | 0.006 |
| CuCl3-2 | 2.109e-010 | 9.249e-011 | -9.676 | -10.034 | -0.358 |
| ZnOHCl | 1.622e-010 | 1.644e-010 | -9.790 | -9.784 | 0.006 |
| PbCl+ | 1.370e-010 | 1.115e-010 | -9.863 | -9.953 | -0.090 |
| CuCl+ | 1.154e-011 | 9.395e-012 | -10.938 | -11.027 | -0.090 |
| ZnCl2 | 5.270e-012 | 5.343e-012 | -11.278 | -11.272 | 0.006 |
| AgCl3-2 | 5.258e-012 | 2.306e-012 | -11.279 | -11.637 | -0.358 |
| CdCl2 | 1.206e-012 | 1.222e-012 | -11.919 | -11.913 | 0.006 |
| PbCl2 | 3.474e-013 | 3.522e-013 | -12.459 | -12.453 | 0.006 |
| CdOHCl | 1.487e-013 | 1.508e-013 | -12.828 | -12.822 | 0.006 |
| MnCl3- | 1.187e-013 | 9.662e-014 | -12.925 | -13.015 | -0.090 |
| AgCl4-3 | 3.946e-014 | 6.176e-015 | -13.404 | -14.209 | -0.806 |
| ZnCl3- | 1.111e-014 | 9.040e-015 | -13.954 | -14.044 | -0.090 |
| CuCl2 | 7.106e-015 | 7.205e-015 | -14.148 | -14.142 | 0.006 |
| CdCl3- | 1.290e-015 | 1.050e-015 | -14.889 | -14.979 | -0.090 |
| PbCl3- | 5.174e-016 | 4.211e-016 | -15.286 | -15.376 | -0.090 |
| ZnCl4-2 | 1.524e-017 | 6.685e-018 | -16.817 | -17.175 | -0.358 |
| FeCl+2 | 1.081e-017 | 4.739e-018 | -16.966 | -17.324 | -0.358 |
| PbCl4-2 | 6.798e-019 | 2.981e-019 | -18.168 | -18.526 | -0.358 |
| FeCl2+ | 6.009e-020 | 4.890e-020 | -19.221 | -19.311 | -0.090 |
| CuCl3- | 4.149e-020 | 3.376e-020 | -19.382 | -19.472 | -0.090 |
| FeCl3 | 7.784e-024 | 7.892e-024 | -23.109 | -23.103 | 0.006 |
| CuCl4-2 | 4.792e-025 | 2.102e-025 | -24.319 | -24.677 | -0.358 |
| Cu(1) 1.015e-007 | | | | | |
| Cu+ | 5.485e-008 | 4.464e-008 | -7.261 | -7.350 | -0.090 |
| CuCl2- | 4.641e-008 | 3.777e-008 | -7.333 | -7.423 | -0.090 |
| CuCl3-2 | 2.109e-010 | 9.249e-011 | -9.676 | -10.034 | -0.358 |
| Cu(2) 4.532e-008 | | | | | |
| CuHCO3+ | 1.854e-008 | 1.509e-008 | -7.732 | -7.821 | -0.090 |
| CuCO3 | 1.426e-008 | 1.445e-008 | -7.846 | -7.840 | 0.006 |
| Cu+2 | 8.582e-009 | 3.764e-009 | -8.066 | -8.424 | -0.358 |
| CuSO4 | 3.322e-009 | 3.368e-009 | -8.479 | -8.473 | 0.006 |
| Cu(OH)2 | 4.664e-010 | 4.729e-010 | -9.331 | -9.325 | 0.006 |
| CuOH+ | 1.134e-010 | 9.230e-011 | -9.945 | -10.035 | -0.090 |
| Cu(CO3)2-2 | 2.968e-011 | 1.301e-011 | -10.528 | -10.886 | -0.358 |
| CuCl+ | 1.154e-011 | 9.395e-012 | -10.938 | -11.027 | -0.090 |
| CuCl2 | 7.106e-015 | 7.205e-015 | -14.148 | -14.142 | 0.006 |
| Cu2(OH)2+2 | 2.764e-015 | 1.212e-015 | -14.558 | -14.916 | -0.358 |
| Cu(OH)3- | 8.587e-017 | 6.988e-017 | -16.066 | -16.156 | -0.090 |
| CuCl3- | 4.149e-020 | 3.376e-020 | -19.382 | -19.472 | -0.090 |
| Cu(OH)4-2 | 7.798e-023 | 3.419e-023 | -22.108 | -22.466 | -0.358 |
| CuCl4-2 | 4.792e-025 | 2.102e-025 | -24.319 | -24.677 | -0.358 |
| Fe(2) 2.694e-004 | | | | | |
| Fe+2 | 1.552e-004 | 6.805e-005 | -3.809 | -4.167 | -0.358 |
| FeHCO3+ | 6.689e-005 | 5.443e-005 | -4.175 | -4.264 | -0.090 |
| FeSO4 | 4.599e-005 | 4.663e-005 | -4.337 | -4.331 | 0.006 |

| | | | | | |
|---|---|---|---|---|---|
| FeCO3 | 1.151e-006 | 1.167e-006 | -5.939 | -5.933 | 0.006 |
| FeCl+ | 1.863e-007 | 1.516e-007 | -6.730 | -6.819 | -0.090 |
| FeOH+ | 2.785e-008 | 2.266e-008 | -7.555 | -7.645 | -0.090 |
| FeHSO4+ | 1.504e-010 | 1.224e-010 | -9.823 | -9.912 | -0.090 |
| Fe(OH)2 | 1.744e-013 | 1.768e-013 | -12.759 | -12.753 | 0.006 |
| Fe(OH)3- | 1.771e-017 | 1.441e-017 | -16.752 | -16.841 | -0.090 |
| Fe(3) | 8.523e-010 | | | | |
| Fe(OH)2+ | 7.356e-010 | 5.986e-010 | -9.133 | -9.223 | -0.090 |
| Fe(OH)3 | 1.139e-010 | 1.155e-010 | -9.943 | -9.937 | 0.006 |
| FeOH+2 | 2.582e-012 | 1.132e-012 | -11.588 | -11.946 | -0.358 |
| Fe(OH)4- | 2.014e-013 | 1.639e-013 | -12.696 | -12.785 | -0.090 |
| FeSO4+ | 6.918e-015 | 5.630e-015 | -14.160 | -14.249 | -0.090 |
| Fe+3 | 8.894e-016 | 1.392e-016 | -15.051 | -15.856 | -0.806 |
| Fe(SO4)2- | 6.863e-016 | 5.585e-016 | -15.163 | -15.253 | -0.090 |
| FeCl+2 | 1.081e-017 | 4.739e-018 | -16.966 | -17.324 | -0.358 |
| FeCl2+ | 6.009e-020 | 4.890e-020 | -19.221 | -19.311 | -0.090 |
| FeHSO4+2 | 1.434e-020 | 6.289e-021 | -19.843 | -20.201 | -0.358 |
| Fe2(OH)2+4 | 1.489e-021 | 5.506e-023 | -20.827 | -22.259 | -1.432 |
| FeCl3 | 7.784e-024 | 7.892e-024 | -23.109 | -23.103 | 0.006 |
| Fe3(OH)4+5 | 3.379e-027 | 1.956e-029 | -26.471 | -28.709 | -2.238 |
| H(0) | 1.637e-019 | | | | |
| H2 | 8.183e-020 | 8.297e-020 | -19.087 | -19.081 | 0.006 |
| K | 6.926e-004 | | | | |
| K+ | 6.744e-004 | 5.420e-004 | -3.171 | -3.266 | -0.095 |
| KSO4- | 1.821e-005 | 1.482e-005 | -4.740 | -4.829 | -0.090 |
| Mg | 7.014e-003 | | | | |
| Mg+2 | 4.883e-003 | 2.291e-003 | -2.311 | -2.640 | -0.329 |
| MgSO4 | 1.876e-003 | 1.902e-003 | -2.727 | -2.721 | 0.006 |
| MgHCO3+ | 2.543e-004 | 2.069e-004 | -3.595 | -3.684 | -0.090 |
| MgCO3 | 1.304e-006 | 1.322e-006 | -5.885 | -5.879 | 0.006 |
| MgOH+ | 9.024e-009 | 7.344e-009 | -8.045 | -8.134 | -0.090 |
| Mn(2) | 1.826e-004 | | | | |
| Mn+2 | 1.070e-004 | 4.693e-005 | -3.971 | -4.329 | -0.358 |
| MnHCO3+ | 4.112e-005 | 3.346e-005 | -4.386 | -4.475 | -0.090 |
| MnSO4 | 3.143e-005 | 3.187e-005 | -4.503 | -4.497 | 0.006 |
| MnCO3 | 2.630e-006 | 2.666e-006 | -5.580 | -5.574 | 0.006 |
| MnCl+ | 3.792e-007 | 3.086e-007 | -6.421 | -6.511 | -0.090 |
| MnOH+ | 1.446e-009 | 1.176e-009 | -8.840 | -8.929 | -0.090 |
| MnCl2 | 2.144e-010 | 2.174e-010 | -9.669 | -9.663 | 0.006 |
| MnCl3- | 1.187e-013 | 9.662e-014 | -12.925 | -13.015 | -0.090 |
| Mn(OH)3- | 1.348e-020 | 1.097e-020 | -19.870 | -19.960 | -0.090 |
| Mn(3) | 7.069e-029 | | | | |
| Mn+3 | 7.069e-029 | 1.106e-029 | -28.151 | -28.956 | -0.806 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -69.065 | -69.423 | -0.358 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -77.857 | -77.947 | -0.090 |
| Na | 1.527e-003 | | | | |
| Na+ | 1.489e-003 | 1.214e-003 | -2.827 | -2.916 | -0.088 |
| NaSO4- | 3.299e-005 | 2.685e-005 | -4.482 | -4.571 | -0.090 |
| NaHCO3 | 5.388e-006 | 5.463e-006 | -5.269 | -5.263 | 0.006 |
| NaCO3- | 1.123e-008 | 9.141e-009 | -7.950 | -8.039 | -0.090 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -57.876 | -57.870 | 0.006 |
| Pb | 5.810e-008 | | | | |
| PbCO3 | 2.815e-008 | 2.854e-008 | -7.550 | -7.544 | 0.006 |
| PbHCO3+ | 1.793e-008 | 1.459e-008 | -7.746 | -7.836 | -0.090 |
| PbSO4 | 6.036e-009 | 6.121e-009 | -8.219 | -8.213 | 0.006 |
| Pb+2 | 5.237e-009 | 2.297e-009 | -8.281 | -8.639 | -0.358 |
| Pb(SO4)2-2 | 3.471e-010 | 1.522e-010 | -9.460 | -9.818 | -0.358 |
| PbCl+ | 1.370e-010 | 1.115e-010 | -9.863 | -9.953 | -0.090 |
| PbOH+ | 1.350e-010 | 1.098e-010 | -9.870 | -9.959 | -0.090 |
| Pb(CO3)2-2 | 1.169e-010 | 5.128e-011 | -9.932 | -10.290 | -0.358 |
| PbCl2 | 3.474e-013 | 3.522e-013 | -12.459 | -12.453 | 0.006 |
| Pb(OH)2 | 1.033e-013 | 1.048e-013 | -12.986 | -12.980 | 0.006 |
| PbCl3- | 5.174e-016 | 4.211e-016 | -15.286 | -15.376 | -0.090 |
| Pb2OH+3 | 3.608e-017 | 5.647e-018 | -16.443 | -17.248 | -0.806 |
| Pb(OH)3- | 3.626e-018 | 2.950e-018 | -17.441 | -17.530 | -0.090 |
| PbCl4-2 | 6.798e-019 | 2.981e-019 | -18.168 | -18.526 | -0.358 |
| Pb(OH)4-2 | 3.780e-023 | 1.658e-023 | -22.423 | -22.781 | -0.358 |
| Pb3(OH)4+2 | 2.413e-025 | 1.058e-025 | -24.617 | -24.975 | -0.358 |
| S(6) | 1.671e-002 | | | | |
| SO4-2 | 1.068e-002 | 4.739e-003 | -1.972 | -2.324 | -0.353 |
| CaSO4 | 4.023e-003 | 4.079e-003 | -2.395 | -2.389 | 0.006 |
| MgSO4 | 1.876e-003 | 1.902e-003 | -2.727 | -2.721 | 0.006 |
| FeSO4 | 4.599e-005 | 4.663e-005 | -4.337 | -4.331 | 0.006 |
| NaSO4- | 3.299e-005 | 2.685e-005 | -4.482 | -4.571 | -0.090 |
| MnSO4 | 3.143e-005 | 3.187e-005 | -4.503 | -4.497 | 0.006 |
| KSO4- | 1.821e-005 | 1.482e-005 | -4.740 | -4.829 | -0.090 |
| ZnSO4 | 1.260e-006 | 1.277e-006 | -5.900 | -5.894 | 0.006 |
| HSO4- | 1.839e-007 | 1.496e-007 | -6.736 | -6.825 | -0.090 |
| Zn(SO4)2-2 | 1.224e-007 | 5.368e-008 | -6.912 | -7.270 | -0.358 |
| BaSO4 | 7.661e-008 | 7.767e-008 | -7.116 | -7.110 | 0.006 |
| CaHSO4+ | 1.060e-008 | 8.625e-009 | -7.975 | -8.064 | -0.090 |
| PbSO4 | 6.036e-009 | 6.121e-009 | -8.219 | -8.213 | 0.006 |
| CuSO4 | 3.322e-009 | 3.368e-009 | -8.479 | -8.473 | 0.006 |
| CdSO4 | 1.605e-009 | 1.628e-009 | -8.794 | -8.788 | 0.006 |
| Pb(SO4)2-2 | 3.471e-010 | 1.522e-010 | -9.460 | -9.818 | -0.358 |
| AgSO4- | 2.904e-010 | 2.363e-010 | -9.537 | -9.627 | -0.090 |
| Cd(SO4)2-2 | 2.067e-010 | 9.065e-011 | -9.685 | -10.043 | -0.358 |
| FeHSO4+ | 1.504e-010 | 1.224e-010 | -9.823 | -9.912 | -0.090 |
| FeSO4+ | 6.918e-015 | 5.630e-015 | -14.160 | -14.249 | -0.090 |
| Fe(SO4)2- | 6.863e-016 | 5.585e-016 | -15.163 | -15.253 | -0.090 |

| | | | | | |
|---|---|---|---|---|---|
| FeHSO4+2 | 1.434e-020 | 6.289e-021 | -19.843 | -20.201 | -0.358 |
| Se(-2) | 2.986e-022 | | | | |
| HSe- | 2.978e-022 | 2.423e-022 | -21.526 | -21.616 | -0.090 |
| H2Se | 8.626e-025 | 8.746e-025 | -24.064 | -24.058 | 0.006 |
| Se(4) | 2.541e-008 | | | | |
| HSeO3- | 2.504e-008 | 2.038e-008 | -7.601 | -7.691 | -0.090 |
| SeO3-2 | 3.607e-010 | 1.582e-010 | -9.443 | -9.801 | -0.358 |
| H2SeO3 | 4.604e-012 | 4.668e-012 | -11.337 | -11.331 | 0.006 |
| Se(6) | 1.909e-024 | | | | |
| SeO4-2 | 1.909e-024 | 8.370e-025 | -23.719 | -24.077 | -0.358 |
| HSeO4- | 1.399e-029 | 1.138e-029 | -28.854 | -28.944 | -0.090 |
| Zn | 5.984e-006 | | | | |
| Zn+2 | 2.861e-006 | 1.255e-006 | -5.544 | -5.902 | -0.358 |
| ZnHCO3+ | 1.552e-006 | 1.263e-006 | -5.809 | -5.898 | -0.090 |
| ZnSO4 | 1.260e-006 | 1.277e-006 | -5.900 | -5.894 | 0.006 |
| ZnCO3 | 1.766e-007 | 1.790e-007 | -6.753 | -6.747 | 0.006 |
| Zn(SO4)2-2 | 1.224e-007 | 5.368e-008 | -6.912 | -7.270 | -0.358 |
| Zn(CO3)2-2 | 6.242e-009 | 2.737e-009 | -8.205 | -8.563 | -0.358 |
| ZnCl+ | 4.066e-009 | 3.309e-009 | -8.391 | -8.480 | -0.090 |
| ZnOH+ | 1.757e-009 | 1.430e-009 | -8.755 | -8.845 | -0.090 |
| ZnOHCl | 1.622e-010 | 1.644e-010 | -9.790 | -9.784 | 0.006 |
| Zn(OH)2 | 9.368e-011 | 9.498e-011 | -10.028 | -10.022 | 0.006 |
| ZnCl2 | 5.270e-012 | 5.343e-012 | -11.278 | -11.272 | 0.006 |
| ZnCl3- | 1.111e-014 | 9.040e-015 | -13.954 | -14.044 | -0.090 |
| Zn(OH)3- | 9.052e-016 | 7.366e-016 | -15.043 | -15.133 | -0.090 |
| ZnCl4-2 | 1.524e-017 | 6.685e-018 | -16.817 | -17.175 | -0.358 |
| Zn(OH)4-2 | 6.529e-022 | 2.863e-022 | -21.185 | -21.543 | -0.358 |

----------Saturation indices----------

| Phase | SI | log IAP | log KT | |
|---|---|---|---|---|
| Ag2CO3 | -11.91 | -23.25 | -11.34 | Ag2CO3 |
| Ag2O | -17.19 | -4.32 | 12.87 | Ag2O |
| Ag2SO4 | -14.39 | -19.43 | -5.04 | Ag2SO4 |
| AgMetal | 4.06 | -10.15 | -14.21 | Ag |
| Anglesite | -3.11 | -10.96 | -7.85 | PbSO4 |
| Anhydrite | -0.31 | -4.64 | -4.33 | CaSO4 |
| Antlerite | -10.33 | -2.04 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.19 | -8.46 | -8.27 | CaCO3 |
| Arsenolite | -12.36 | -13.94 | -1.58 | As2O3 |
| Artinite | -9.05 | 1.35 | 10.40 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -30.78 | -22.34 | 8.44 | As2O5 |
| As_native | -17.64 | -30.94 | -13.30 | As |
| Atacamite | -8.33 | -0.47 | 7.86 | Cu2(OH)3Cl |
| Azurite | -8.52 | -3.91 | 4.61 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | 1.51 | -48.87 | -50.37 | Ba3(AsO4)2 |
| Barite | 0.35 | -9.81 | -10.16 | BaSO4 |
| BaSeO3 | -10.90 | -17.29 | -6.39 | BaSeO3 |
| Bianchite | -6.47 | -8.23 | -1.76 | ZnSO4:6H2O |
| Birnessite | -19.17 | 24.43 | 43.60 | MnO2 |
| Bixbyite | -19.39 | -19.57 | -0.19 | Mn2O3 |
| Brochantite | -13.02 | 2.32 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -7.45 | 10.14 | 17.59 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -14.46 | -33.37 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.04 | -8.46 | -8.43 | CaCO3 |
| CaSeO3 | -6.52 | -12.12 | -5.60 | CaSeO3 |
| Cd(gamma) | -26.19 | -12.09 | 14.09 | Cd |
| Cd(OH)2 | -9.76 | 3.89 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -10.42 | 3.89 | 14.31 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -25.26 | -18.55 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -26.01 | -3.45 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -27.96 | 0.44 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -13.92 | -14.48 | -0.56 | CdCl2 |
| CdCl2:2.5H2O | -12.49 | -14.48 | -1.99 | CdCl2:2.5H2O |
| CdCl2:H2O | -12.82 | -14.48 | -1.66 | CdCl2:H2O |
| CdMetal | -26.08 | -12.09 | 13.99 | Cd |
| CdOHCl | -9.02 | -5.30 | 3.73 | CdOHCl |
| CdSO4 | -11.53 | -11.22 | 0.31 | CdSO4 |
| CdSO4:2.7H2O | -9.47 | -11.22 | -1.75 | CdSO4:2.67H2O |
| CdSO4:H2O | -9.77 | -11.22 | -1.45 | CdSO4:H2O |
| Cerargyrite | -1.16 | -11.34 | -10.19 | AgCl |
| Cerrusite | -1.52 | -14.78 | -13.27 | PbCO3 |
| Chalcanthite | -8.07 | -10.75 | -2.68 | CuSO4:5H2O |
| Claudetite | -12.41 | -13.94 | -1.53 | As2O3 |
| CO2(g) | -0.73 | -2.06 | -1.33 | CO2 |
| Cotunnite | -9.30 | -14.22 | -4.93 | PbCl2 |
| Cu(OH)2 | -4.71 | 4.35 | 9.06 | Cu(OH)2 |
| Cu2SO4 | -15.20 | -17.02 | -1.82 | Cu2SO4 |
| Cu3(AsO4)2:6w | -16.56 | -51.69 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -4.94 | -14.57 | -9.63 | CuCO3 |
| CuMetal | 0.29 | -8.95 | -9.24 | Cu |
| CuOCuSO4 | -18.91 | -6.39 | 12.52 | CuO:CuSO4 |
| CupricFerrite | 4.02 | 10.98 | 6.96 | CuFe2O4 |
| Cuprite | -0.20 | -1.92 | -1.72 | Cu2O |
| CuprousFerrite | 11.17 | 2.35 | -8.81 | CuFeO2 |
| CuSO4 | -14.26 | -10.75 | 3.51 | CuSO4 |
| Dolomite | -0.42 | -17.25 | -16.83 | CaMg(CO3)2 |
| Dolomite(d) | -1.02 | -17.25 | -16.23 | CaMg(CO3)2 |
| Epsomite | -2.75 | -4.97 | -2.22 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 3.60 | 0.56 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -1.58 | 3.31 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -25.69 | -61.12 | -35.43 | Fe2(SeO3)3 |

| | | | | |
|---|---|---|---|---|
| Fe3(OH)8 | -4.99 | 15.24 | 20.22 | Fe3(OH)8 |
| FeSe2 | -12.84 | -31.42 | -18.58 | FeSe2 |
| Goethite | 3.91 | 3.31 | -0.60 | FeOOH |
| Goslarite | -6.18 | -8.23 | -2.05 | ZnSO4:7H2O |
| Gypsum | -0.06 | -4.64 | -4.59 | CaSO4:2H2O |
| H2(g) | -15.98 | -19.08 | -3.10 | H2 |
| H2O(g) | -1.80 | -0.00 | 1.80 | H2O |
| Halite | -7.26 | -5.71 | 1.56 | NaCl |
| Hausmannite | -22.50 | 41.33 | 63.83 | Mn3O4 |
| Hematite | 9.78 | 6.63 | -3.15 | Fe2O3 |
| Huntite | -5.57 | -34.82 | -29.25 | CaMg3(CO3)4 |
| Hydrocerrusite | -7.97 | -25.43 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -17.70 | -25.00 | -7.31 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -12.89 | 17.42 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -13.91 | 17.42 | 31.32 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -7.93 | -17.76 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -8.81 | -17.15 | -8.34 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -12.52 | -16.80 | -4.27 | NaFe3(SO4)2(OH)6 |
| JarositeH | -16.41 | -20.27 | -3.86 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -15.58 | 2.32 | 17.89 | Cu4(OH)6SO4:H2O |
| Larnakite | -6.72 | -6.82 | -0.10 | PbO:PbSO4 |
| Laurionite | -5.66 | -5.04 | 0.62 | PbOHCl |
| Litharge | -9.03 | 4.14 | 13.18 | PbO |
| Maghemite | 0.24 | 6.63 | 6.39 | Fe2O3 |
| Magnesite | -0.93 | -8.79 | -7.86 | MgCO3 |
| Magnetite | 10.10 | 15.24 | 5.14 | Fe3O4 |
| Malachite | -5.48 | 0.22 | 5.70 | Cu2(OH)2CO3 |
| Manganite | -8.90 | 16.44 | 25.34 | MnOOH |
| Massicot | -9.24 | 4.14 | 13.38 | PbO |
| Melanothallite | -18.08 | -14.01 | 4.07 | CuCl2 |
| Melanterite | -4.14 | -6.49 | -2.35 | FeSO4:7H2O |
| Minium | -48.15 | 28.40 | 76.55 | Pb3O4 |
| Mirabilite | -6.52 | -8.16 | -1.64 | Na2SO4:10H2O |
| Mn2(SO4)3 | -60.26 | -64.89 | -4.62 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -10.69 | -39.40 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.14 | -9.91 | 2.23 | MnCl2:4H2O |
| MnSO4 | -9.75 | -6.65 | 3.10 | MnSO4 |
| Monteponite | -10.57 | 3.89 | 14.46 | CdO |
| Nahcolite | -4.36 | -5.01 | -0.65 | NaHCO3 |
| Nantokite | -3.10 | -10.14 | -7.04 | CuCl |
| Natron | -10.23 | -11.98 | -1.75 | Na2CO3:10H2O |
| Nesquehonite | -3.33 | -8.79 | -5.46 | MgCO3:3H2O |
| Nsutite | -18.13 | 24.43 | 42.56 | MnO2 |
| O2(g) | -55.07 | -57.87 | -2.80 | O2 |
| Otavite | -3.04 | -15.04 | -12.00 | CdCO3 |
| Pb(OH)2 | -4.40 | 4.14 | 8.54 | Pb(OH)2 |
| Pb2(OH)3Cl | -9.69 | -0.90 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -17.92 | 8.28 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -36.78 | 24.26 | 61.04 | Pb2O3 |
| Pb2OCO3 | -10.46 | -10.64 | -0.18 | PbO:PbCO3 |
| Pb3(AsO4)2 | -16.92 | -52.33 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -18.26 | -6.50 | 11.76 | PbCO3:2PbO |
| Pb3O2SO4 | -13.66 | -2.68 | 10.98 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -19.64 | 1.46 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -21.62 | 1.46 | 23.08 | PbSO4:3PbO |
| PbMetal | -16.10 | -11.84 | 4.26 | Pb |
| PbO:0.3H2O | -8.84 | 4.14 | 12.98 | PbO:0.33H2O |
| Phosgenite | -9.20 | -29.01 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -31.15 | 20.12 | 51.27 | PbO2 |
| Portlandite | -13.20 | 10.46 | 23.66 | Ca(OH)2 |
| Pyrochroite | -6.75 | 8.45 | 15.20 | Mn(OH)2 |
| Pyrolusite | -18.76 | 24.43 | 43.19 | MnO2 |
| Rhodochrosite | 0.62 | -10.47 | -11.09 | MnCO3 |
| Rhodochrosite(d) | -0.08 | -10.47 | -10.39 | MnCO3 |
| Scorodite | -8.81 | -29.06 | -20.25 | FeAsO4:2H2O |
| Se(s) | 5.30 | -12.03 | -17.32 | Se |
| SeO2 | -14.20 | -22.58 | -8.38 | SeO2 |
| Siderite | 0.51 | -10.31 | -10.82 | FeCO3 |
| Siderite(d)(3) | 0.14 | -10.31 | -10.45 | FeCO3 |
| Smithsonite | -2.17 | -12.05 | -9.88 | ZnCO3 |
| Smithsonite_PG | -1.22 | -12.05 | -10.83 | ZnCO3 |
| Tenorite | -3.69 | 4.36 | 8.04 | CuO |
| Thenardite | -7.99 | -8.16 | -0.16 | Na2SO4 |
| Thermonatrite | -12.18 | -11.98 | 0.20 | Na2CO3:H2O |
| Trona | -16.70 | -16.99 | -0.29 | NaHCO3:Na2CO3:2H2O |
| Witherite | -5.03 | -13.63 | -8.60 | BaCO3 |
| Zincite(c) | -4.87 | 6.88 | 11.75 | ZnO |
| Zincosite | -11.77 | -8.23 | 3.54 | ZnSO4 |
| Zn(OH)2-a | -5.57 | 6.88 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -4.87 | 6.88 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -5.32 | 6.88 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -4.62 | 6.88 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -4.83 | 6.88 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -8.85 | -1.35 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -10.63 | 4.57 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -16.57 | -44.12 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -30.32 | -9.57 | 20.74 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -15.99 | 12.41 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -22.48 | 16.02 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -19.00 | -11.49 | 7.52 | ZnCl2 |
| ZnCO3:1H2O | -1.79 | -12.05 | -10.26 | ZnCO3:1H2O |
| ZnCO3:H2O | -1.79 | -12.05 | -10.26 | ZnCO3:H2O |
| ZnMetal | -35.88 | -9.10 | 26.78 | Zn |

```
ZnO(a)        -4.43   6.88   11.31  ZnO
ZnSO4:H2O     -7.95  -8.23  -0.27  ZnSO4:H2O

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End of simulation.
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Reading input data for simulation 5.
-------------------

Solution 5  - MW-1014, Sample Date June 2013
Units                    mg/L
pH                       6.49      #Field value
pe                       1.0
Temperature 10.1
Alkalinity     150
As                       0.001     #Detection Limit
Ba                       0.044
Cd                       0.00012   #Detection Limit
Ca                       82
Cl                       38
Cu                       0.0064
Fe                       0.014     #Detection Limit
Pb                       0.0014    #Detection Limit
Mg                       27
Mn                       2.1
K                        3.6
Se                       0.002     #Detection Limit
Ag                       0.00095
Na                       17
S(6)                     110
Zn                       0.0078    #Detection Limit
END
-----------------------
Beginning of initial solution calculations.
-----------------------

Initial solution 5.          - MW-1014, Sample Date June 2013

---------------Solution composition---------------

Elements        Molality      Moles

Ag            8.811e-009  8.811e-009
Alkalinity     2.998e-003  2.998e-003
As            1.335e-008  1.335e-008
Ba            3.205e-007  3.205e-007
Ca            2.047e-003  2.047e-003
Cd            1.068e-009  1.068e-009
Cl            1.072e-003  1.072e-003
Cu            1.008e-007  1.008e-007
Fe            2.508e-007  2.508e-007
K             9.211e-005  9.211e-005
Mg            1.111e-003  1.111e-003
Mn            3.824e-005  3.824e-005
Na            7.398e-004  7.398e-004
Pb            6.760e-009  6.760e-009
S(6)          1.146e-003  1.146e-003
Se            2.534e-008  2.534e-008
Zn            1.194e-007  1.194e-007

---------------Description of solution---------------

pH  =  6.490
pe  =  1.000
Activity of water  =  1.000
Ionic strength  =  1.018e-002
Mass of water (kg)  =  1.000e+000
Total carbon (mol/kg)  =  5.486e-003
Total CO2 (mol/kg)  =  5.486e-003
Temperature (deg C)  =  10.100
Electrical balance (eq)  =  8.637e-004
Percent error, 100*(Cat-|An|)/(Cat+|An|)  =  6.84
Iterations  =  10
Total H  = 1.110154e+002
Total O  = 5.552477e+001

---------------Distribution of species---------------

                                  Log      Log       Log
Species            Molality   Activity  Molality  Activity    Gamma

H+               3.538e-007  3.236e-007   -6.451    -6.490   -0.039
OH-              1.009e-008  9.119e-009   -7.996    -8.040   -0.044
H2O              5.551e+001  9.998e-001    1.744    -0.000    0.000
Ag          8.811e-009
AgCl             5.470e-009  5.482e-009   -8.262    -8.261    0.001
Ag+              2.657e-009  2.400e-009   -8.576    -8.620   -0.044
AgCl2-            6.556e-010  5.923e-010   -9.183    -9.227   -0.044
AgSO4-            2.855e-011  2.579e-011  -10.544   -10.589   -0.044
AgCl3-2           6.349e-013  4.231e-013  -12.197   -12.374   -0.176
AgOH              7.398e-015  7.416e-015  -14.131   -14.130    0.001
```

| | | | | | |
|---|---|---|---|---|---|
| AgCl4-3 | 1.692e-015 | 6.789e-016 | -14.771 | -15.168 | -0.397 |
| Ag(OH)2- | 2.536e-020 | 2.291e-020 | -19.596 | -19.640 | -0.044 |
| As(3) | 1.241e-008 | | | | |
| H3AsO3 | 1.239e-008 | 1.242e-008 | -7.907 | -7.906 | 0.001 |
| H2AsO3- | 1.676e-011 | 1.514e-011 | -10.776 | -10.820 | -0.044 |
| H4AsO3+ | 2.203e-015 | 1.991e-015 | -14.657 | -14.701 | -0.044 |
| HAsO3-2 | 7.126e-020 | 4.748e-020 | -19.147 | -19.323 | -0.176 |
| AsO3-3 | 4.265e-029 | 1.711e-029 | -28.370 | -28.767 | -0.397 |
| As(5) | 9.479e-010 | | | | |
| H2AsO4- | 7.459e-010 | 6.739e-010 | -9.127 | -9.171 | -0.044 |
| HAsO4-2 | 2.019e-010 | 1.346e-010 | -9.695 | -9.871 | -0.176 |
| H3AsO4 | 3.737e-014 | 3.745e-014 | -13.428 | -13.427 | 0.001 |
| AsO4-3 | 1.577e-015 | 6.327e-016 | -14.802 | -15.199 | -0.397 |
| Ba | 3.205e-007 | | | | |
| Ba+2 | 2.624e-007 | 1.749e-007 | -6.581 | -6.757 | -0.176 |
| BaSO4 | 5.500e-008 | 5.513e-008 | -7.260 | -7.259 | 0.001 |
| BaHCO3+ | 3.085e-009 | 2.787e-009 | -8.511 | -8.555 | -0.044 |
| BaCO3 | 1.790e-011 | 1.794e-011 | -10.747 | -10.746 | 0.001 |
| BaOH+ | 2.026e-014 | 1.831e-014 | -13.693 | -13.737 | -0.044 |
| C(4) | 5.486e-003 | | | | |
| HCO3- | 2.932e-003 | 2.658e-003 | -2.533 | -2.575 | -0.043 |
| CO2 | 2.489e-003 | 2.494e-003 | -2.604 | -2.603 | 0.001 |
| CaHCO3+ | 3.467e-005 | 3.132e-005 | -4.460 | -4.504 | -0.044 |
| MgHCO3+ | 2.287e-005 | 2.066e-005 | -4.641 | -4.685 | -0.044 |
| MnHCO3+ | 5.358e-006 | 4.841e-006 | -5.271 | -5.315 | -0.044 |
| NaHCO3 | 9.935e-007 | 9.959e-007 | -6.003 | -6.002 | 0.001 |
| CaCO3 | 4.612e-007 | 4.622e-007 | -6.336 | -6.335 | 0.001 |
| MnCO3 | 4.338e-007 | 4.348e-007 | -6.363 | -6.362 | 0.001 |
| CO3-2 | 3.966e-007 | 2.679e-007 | -6.402 | -6.572 | -0.170 |
| MgCO3 | 1.405e-007 | 1.409e-007 | -6.852 | -6.851 | 0.001 |
| FeHCO3+ | 3.910e-008 | 3.532e-008 | -7.408 | -7.452 | -0.044 |
| ZnHCO3+ | 2.147e-008 | 1.940e-008 | -7.668 | -7.712 | -0.044 |
| PbCO3 | 3.513e-009 | 3.521e-009 | -8.454 | -8.453 | 0.001 |
| ZnCO3 | 3.091e-009 | 3.098e-009 | -8.510 | -8.509 | 0.001 |
| BaHCO3+ | 3.085e-009 | 2.787e-009 | -8.511 | -8.555 | -0.044 |
| CuHCO3+ | 2.111e-009 | 1.908e-009 | -8.675 | -8.720 | -0.044 |
| CuCO3 | 2.055e-009 | 2.060e-009 | -8.687 | -8.686 | 0.001 |
| PbHCO3+ | 1.768e-009 | 1.597e-009 | -8.753 | -8.797 | -0.044 |
| NaCO3- | 1.668e-009 | 1.507e-009 | -8.778 | -8.822 | -0.044 |
| FeCO3 | 8.520e-010 | 8.540e-010 | -9.070 | -9.069 | 0.001 |
| CdHCO3+ | 5.348e-011 | 4.832e-011 | -10.272 | -10.316 | -0.044 |
| Zn(CO3)2-2 | 2.663e-011 | 1.774e-011 | -10.575 | -10.751 | -0.176 |
| BaCO3 | 1.790e-011 | 1.794e-011 | -10.747 | -10.746 | 0.001 |
| Pb(CO3)2-2 | 3.555e-012 | 2.369e-012 | -11.449 | -11.625 | -0.176 |
| Cu(CO3)2-2 | 1.042e-012 | 6.946e-013 | -11.982 | -12.158 | -0.176 |
| CdCO3 | 1.220e-013 | 1.223e-013 | -12.914 | -12.912 | 0.001 |
| Cd(CO3)2-2 | 1.555e-016 | 1.036e-016 | -15.808 | -15.985 | -0.176 |
| Ca | 2.047e-003 | | | | |
| Ca+2 | 1.875e-003 | 1.265e-003 | -2.727 | -2.898 | -0.171 |
| CaSO4 | 1.369e-004 | 1.372e-004 | -3.864 | -3.863 | 0.001 |
| CaHCO3+ | 3.467e-005 | 3.132e-005 | -4.460 | -4.504 | -0.044 |
| CaCO3 | 4.612e-007 | 4.622e-007 | -6.336 | -6.335 | 0.001 |
| CaOH+ | 7.181e-010 | 6.488e-010 | -9.144 | -9.188 | -0.044 |
| CaHSO4+ | 2.459e-010 | 2.222e-010 | -9.609 | -9.653 | -0.044 |
| Cd | 1.068e-009 | | | | |
| Cd+2 | 8.628e-010 | 5.749e-010 | -9.064 | -9.240 | -0.176 |
| CdSO4 | 9.454e-011 | 9.476e-011 | -10.024 | -10.023 | 0.001 |
| CdCl+ | 5.576e-011 | 5.038e-011 | -10.254 | -10.298 | -0.044 |
| CdHCO3+ | 5.348e-011 | 4.832e-011 | -10.272 | -10.316 | -0.044 |
| Cd(SO4)2-2 | 1.080e-012 | 7.194e-013 | -11.967 | -12.143 | -0.176 |
| CdCl2 | 1.912e-013 | 1.917e-013 | -12.718 | -12.717 | 0.001 |
| CdCO3 | 1.220e-013 | 1.223e-013 | -12.914 | -12.912 | 0.001 |
| CdOH+ | 5.111e-014 | 4.618e-014 | -13.292 | -13.336 | -0.044 |
| CdOHCl | 4.592e-014 | 4.603e-014 | -13.338 | -13.337 | 0.001 |
| Cd(CO3)2-2 | 1.555e-016 | 1.036e-016 | -15.808 | -15.985 | -0.176 |
| CdCl3- | 1.022e-016 | 9.235e-017 | -15.990 | -16.035 | -0.044 |
| Cd(OH)2 | 2.446e-017 | 2.452e-017 | -16.612 | -16.611 | 0.001 |
| Cd2OH+3 | 3.940e-022 | 1.581e-022 | -21.404 | -21.801 | -0.397 |
| Cd(OH)3- | 9.407e-024 | 8.499e-024 | -23.027 | -23.071 | -0.044 |
| Cd(OH)4-2 | 3.512e-031 | 2.340e-031 | -30.454 | -30.631 | -0.176 |
| Cl | 1.072e-003 | | | | |
| Cl- | 1.072e-003 | 9.669e-004 | -2.970 | -3.015 | -0.045 |
| MnCl+ | 8.910e-008 | 8.050e-008 | -7.050 | -7.094 | -0.044 |
| CuCl2- | 2.205e-008 | 1.992e-008 | -7.657 | -7.701 | -0.044 |
| AgCl | 5.470e-009 | 5.482e-009 | -8.262 | -8.261 | 0.001 |
| AgCl2- | 6.556e-010 | 5.923e-010 | -9.183 | -9.227 | -0.044 |
| FeCl+ | 1.964e-010 | 1.774e-010 | -9.707 | -9.751 | -0.044 |
| ZnCl+ | 8.362e-011 | 7.555e-011 | -10.078 | -10.122 | -0.044 |
| CdCl+ | 5.576e-011 | 5.038e-011 | -10.254 | -10.298 | -0.044 |
| CuCl3-2 | 4.313e-011 | 2.874e-011 | -10.365 | -10.541 | -0.176 |
| MnCl2 | 3.390e-011 | 3.398e-011 | -10.470 | -10.469 | 0.001 |
| PbCl+ | 2.185e-011 | 1.974e-011 | -10.661 | -10.705 | -0.044 |
| ZnOHCl | 5.722e-012 | 5.735e-012 | -11.242 | -11.241 | 0.001 |
| CuCl+ | 1.914e-012 | 1.729e-012 | -11.718 | -11.762 | -0.044 |
| AgCl3-2 | 6.349e-013 | 4.231e-013 | -12.197 | -12.374 | -0.176 |
| CdCl2 | 1.912e-013 | 1.917e-013 | -12.718 | -12.717 | 0.001 |
| ZnCl2 | 7.166e-014 | 7.182e-014 | -13.145 | -13.144 | 0.001 |
| CdOHCl | 4.592e-014 | 4.603e-014 | -13.338 | -13.337 | 0.001 |
| PbCl2 | 4.045e-014 | 4.055e-014 | -13.393 | -13.392 | 0.001 |
| MnCl3- | 1.002e-014 | 9.049e-015 | -13.999 | -14.043 | -0.044 |
| AgCl4-3 | 1.692e-015 | 6.789e-016 | -14.771 | -15.168 | -0.397 |
| CuCl2 | 7.561e-016 | 7.579e-016 | -15.121 | -15.120 | 0.001 |
| CdCl3- | 1.022e-016 | 9.235e-017 | -15.990 | -16.035 | -0.044 |

| | | | | | |
|---|---|---|---|---|---|
| ZnCl3- | 7.850e-017 | 7.093e-017 | -16.105 | -16.149 | -0.044 |
| PbCl3- | 3.129e-017 | 2.827e-017 | -16.505 | -16.549 | -0.044 |
| ZnCl4-2 | 4.555e-020 | 3.035e-020 | -19.341 | -19.518 | -0.176 |
| PbCl4-2 | 1.740e-020 | 1.160e-020 | -19.759 | -19.936 | -0.176 |
| CuCl3- | 2.180e-021 | 1.969e-021 | -20.662 | -20.706 | -0.044 |
| FeCl+2 | 1.433e-021 | 9.546e-022 | -20.844 | -21.020 | -0.176 |
| FeCl2+ | 7.502e-024 | 6.778e-024 | -23.125 | -23.169 | -0.044 |
| CuCl4-2 | 9.961e-027 | 6.637e-027 | -26.002 | -26.178 | -0.176 |
| FeCl3 | 6.539e-028 | 6.554e-028 | -27.184 | -27.183 | 0.001 |
| Cu(1) | 9.394e-008 | | | | |
| Cu+ | 7.185e-008 | 6.491e-008 | -7.144 | -7.188 | -0.044 |
| CuCl2- | 2.205e-008 | 1.992e-008 | -7.657 | -7.701 | -0.044 |
| CuCl3-2 | 4.313e-011 | 2.874e-011 | -10.365 | -10.541 | -0.176 |
| Cu(2) | 6.817e-009 | | | | |
| Cu+2 | 2.149e-009 | 1.432e-009 | -8.668 | -8.844 | -0.176 |
| CuHCO3+ | 2.111e-009 | 1.908e-009 | -8.675 | -8.720 | -0.044 |
| CuCO3 | 2.055e-009 | 2.060e-009 | -8.687 | -8.686 | 0.001 |
| Cu(OH)2 | 2.850e-010 | 2.856e-010 | -9.545 | -9.544 | 0.001 |
| CuSO4 | 1.647e-010 | 1.650e-010 | -9.783 | -9.782 | 0.001 |
| CuOH+ | 4.897e-011 | 4.425e-011 | -10.310 | -10.354 | -0.044 |
| CuCl+ | 1.914e-012 | 1.729e-012 | -11.718 | -11.762 | -0.044 |
| Cu(CO3)2-2 | 1.042e-012 | 6.946e-013 | -11.982 | -12.158 | -0.176 |
| CuCl2 | 7.561e-016 | 7.579e-016 | -15.121 | -15.120 | 0.001 |
| Cu2(OH)2+2 | 2.709e-016 | 1.805e-016 | -15.567 | -15.743 | -0.176 |
| Cu(OH)3- | 5.885e-017 | 5.317e-017 | -16.230 | -16.274 | -0.044 |
| CuCl3- | 2.180e-021 | 1.969e-021 | -20.662 | -20.706 | -0.044 |
| Cu(OH)4-2 | 4.920e-023 | 3.278e-023 | -22.308 | -22.484 | -0.176 |
| CuCl4-2 | 9.961e-027 | 6.637e-027 | -26.002 | -26.178 | -0.176 |
| Fe(2) | 2.508e-007 | | | | |
| Fe+2 | 1.995e-007 | 1.329e-007 | -6.700 | -6.876 | -0.176 |
| FeHCO3+ | 3.910e-008 | 3.532e-008 | -7.408 | -7.452 | -0.044 |
| FeSO4 | 1.113e-008 | 1.116e-008 | -7.953 | -7.952 | 0.001 |
| FeCO3 | 8.520e-010 | 8.540e-010 | -9.070 | -9.069 | 0.001 |
| FeCl+ | 1.964e-010 | 1.774e-010 | -9.707 | -9.751 | -0.044 |
| FeOH+ | 4.452e-011 | 4.023e-011 | -10.351 | -10.395 | -0.044 |
| FeHSO4+ | 2.583e-014 | 2.333e-014 | -13.588 | -13.632 | -0.044 |
| Fe(OH)2 | 2.698e-016 | 2.704e-016 | -15.569 | -15.568 | 0.001 |
| Fe(OH)3- | 2.945e-020 | 2.661e-020 | -19.531 | -19.575 | -0.044 |
| Fe(3) | 3.149e-013 | | | | |
| Fe(OH)2+ | 2.660e-013 | 2.403e-013 | -12.575 | -12.619 | -0.044 |
| Fe(OH)3 | 4.818e-014 | 4.829e-014 | -13.317 | -13.316 | 0.001 |
| FeOH+2 | 6.391e-016 | 4.258e-016 | -15.194 | -15.371 | -0.176 |
| Fe(OH)4- | 8.018e-017 | 7.244e-017 | -16.096 | -16.140 | -0.044 |
| FeSO4+ | 2.899e-019 | 2.620e-019 | -18.538 | -18.582 | -0.044 |
| Fe+3 | 1.340e-019 | 5.374e-020 | -18.873 | -19.270 | -0.397 |
| Fe(SO4)2- | 3.753e-021 | 3.391e-021 | -20.426 | -20.470 | -0.044 |
| FeCl+2 | 1.433e-021 | 9.546e-022 | -20.844 | -21.020 | -0.176 |
| FeCl2+ | 7.502e-024 | 6.778e-024 | -23.125 | -23.169 | -0.044 |
| FeHSO4+2 | 3.557e-025 | 2.370e-025 | -24.449 | -24.625 | -0.176 |
| FeCl3 | 6.539e-028 | 6.554e-028 | -27.184 | -27.183 | 0.001 |
| Fe2(OH)2+4 | 4.733e-029 | 9.332e-030 | -28.325 | -29.030 | -0.705 |
| Fe3(OH)4+5 | 2.519e-038 | 1.992e-039 | -37.599 | -38.701 | -1.102 |
| H(0) | 1.729e-018 | | | | |
| H2 | 8.646e-019 | 8.666e-019 | -18.063 | -18.062 | 0.001 |
| K | 9.211e-005 | | | | |
| K+ | 9.180e-005 | 8.279e-005 | -4.037 | -4.082 | -0.045 |
| KSO4- | 3.080e-007 | 2.783e-007 | -6.511 | -6.555 | -0.044 |
| Mg | 1.111e-003 | | | | |
| Mg+2 | 1.020e-003 | 6.928e-004 | -2.991 | -3.159 | -0.168 |
| MgSO4 | 6.805e-005 | 6.821e-005 | -4.167 | -4.166 | 0.001 |
| MgHCO3+ | 2.287e-005 | 2.066e-005 | -4.641 | -4.685 | -0.044 |
| MgCO3 | 1.405e-007 | 1.409e-007 | -6.852 | -6.851 | 0.001 |
| MgOH+ | 2.087e-009 | 1.886e-009 | -8.680 | -8.725 | -0.044 |
| Mn(2) | 3.824e-005 | | | | |
| Mn+2 | 3.067e-005 | 2.044e-005 | -4.513 | -4.690 | -0.176 |
| MnHCO3+ | 5.358e-006 | 4.841e-006 | -5.271 | -5.315 | -0.044 |
| MnSO4 | 1.691e-006 | 1.695e-006 | -5.772 | -5.771 | 0.001 |
| MnCO3 | 4.338e-007 | 4.348e-007 | -6.363 | -6.362 | 0.001 |
| MnCl+ | 8.910e-008 | 8.050e-008 | -7.050 | -7.094 | -0.044 |
| MnOH+ | 5.002e-010 | 4.519e-010 | -9.301 | -9.345 | -0.044 |
| MnCl2 | 3.390e-011 | 3.398e-011 | -10.470 | -10.469 | 0.001 |
| MnCl3- | 1.002e-014 | 9.049e-015 | -13.999 | -14.043 | -0.044 |
| Mn(OH)3- | 1.057e-020 | 9.553e-021 | -19.976 | -20.020 | -0.044 |
| Mn(3) | 1.593e-030 | | | | |
| Mn+3 | 1.593e-030 | 6.392e-031 | -29.798 | -30.194 | -0.397 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -72.818 | -72.994 | -0.176 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -82.360 | -82.404 | -0.044 |
| Na | 7.398e-004 | | | | |
| Na+ | 7.367e-004 | 6.663e-004 | -3.133 | -3.176 | -0.044 |
| NaSO4- | 2.105e-006 | 1.902e-006 | -5.677 | -5.721 | -0.044 |
| NaHCO3 | 9.935e-007 | 9.959e-007 | -6.003 | -6.002 | 0.001 |
| NaCO3- | 1.668e-009 | 1.507e-009 | -8.778 | -8.822 | -0.044 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -61.318 | -61.317 | 0.001 |
| Pb | 6.760e-009 | | | | |
| PbCO3 | 3.513e-009 | 3.521e-009 | -8.454 | -8.453 | 0.001 |
| PbHCO3+ | 1.768e-009 | 1.597e-009 | -8.753 | -8.797 | -0.044 |
| Pb+2 | 1.135e-009 | 7.565e-010 | -8.945 | -9.121 | -0.176 |
| PbSO4 | 2.670e-010 | 2.676e-010 | -9.574 | -9.573 | 0.001 |
| PbOH+ | 5.044e-011 | 4.557e-011 | -10.297 | -10.341 | -0.044 |
| PbCl+ | 2.185e-011 | 1.974e-011 | -10.661 | -10.705 | -0.044 |

| | | | | | |
|---|---|---|---|---|---|
| Pb(CO3)2-2 | 3.555e-012 | 2.369e-012 | -11.449 | -11.625 | -0.176 |
| Pb(SO4)2-2 | 1.326e-012 | 8.834e-013 | -11.878 | -12.054 | -0.176 |
| Pb(OH)2 | 5.465e-014 | 5.478e-014 | -13.262 | -13.261 | 0.001 |
| PbCl2 | 4.045e-014 | 4.055e-014 | -13.393 | -13.392 | 0.001 |
| PbCl3- | 3.129e-017 | 2.827e-017 | -16.505 | -16.549 | -0.044 |
| Pb(OH)3- | 2.151e-018 | 1.943e-018 | -17.667 | -17.711 | -0.044 |
| Pb2OH+3 | 1.924e-018 | 7.718e-019 | -17.716 | -18.113 | -0.397 |
| PbCl4-2 | 1.740e-020 | 1.160e-020 | -19.759 | -19.936 | -0.176 |
| Pb(OH)4-2 | 2.064e-023 | 1.375e-023 | -22.685 | -22.862 | -0.176 |
| Pb3(OH)4+2 | 7.423e-027 | 4.946e-027 | -26.129 | -26.306 | -0.176 |
| S(6) | 1.146e-003 | | | | |
| SO4-2 | 9.365e-004 | 6.290e-004 | -3.028 | -3.201 | -0.173 |
| CaSO4 | 1.369e-004 | 1.372e-004 | -3.864 | -3.863 | 0.001 |
| MgSO4 | 6.805e-005 | 6.821e-005 | -4.167 | -4.166 | 0.001 |
| NaSO4- | 2.105e-006 | 1.902e-006 | -5.677 | -5.721 | -0.044 |
| MnSO4 | 1.691e-006 | 1.695e-006 | -5.772 | -5.771 | 0.001 |
| KSO4- | 3.080e-007 | 2.783e-007 | -6.511 | -6.555 | -0.044 |
| BaSO4 | 5.500e-008 | 5.513e-008 | -7.260 | -7.259 | 0.001 |
| HSO4- | 1.616e-008 | 1.460e-008 | -7.791 | -7.836 | -0.044 |
| FeSO4 | 1.113e-008 | 1.116e-008 | -7.953 | -7.952 | 0.001 |
| ZnSO4 | 7.558e-009 | 7.576e-009 | -8.122 | -8.121 | 0.001 |
| PbSO4 | 2.670e-010 | 2.676e-010 | -9.574 | -9.573 | 0.001 |
| CaHSO4+ | 2.459e-010 | 2.222e-010 | -9.609 | -9.653 | -0.044 |
| CuSO4 | 1.647e-010 | 1.650e-010 | -9.783 | -9.782 | 0.001 |
| CdSO4 | 9.454e-011 | 9.476e-011 | -10.024 | -10.023 | 0.001 |
| Zn(SO4)2-2 | 6.559e-011 | 4.371e-011 | -10.183 | -10.359 | -0.176 |
| AgSO4- | 2.855e-011 | 2.579e-011 | -10.544 | -10.589 | -0.044 |
| Pb(SO4)2-2 | 1.326e-012 | 8.834e-013 | -11.878 | -12.054 | -0.176 |
| Cd(SO4)2-2 | 1.080e-012 | 7.194e-013 | -11.967 | -12.143 | -0.176 |
| FeHSO4+ | 2.583e-014 | 2.333e-014 | -13.588 | -13.632 | -0.044 |
| FeSO4+ | 2.899e-019 | 2.620e-019 | -18.538 | -18.582 | -0.044 |
| Fe(SO4)2- | 3.753e-021 | 3.391e-021 | -20.426 | -20.470 | -0.044 |
| FeHSO4+2 | 3.557e-025 | 2.370e-025 | -24.449 | -24.625 | -0.176 |
| Se(-2) | 2.975e-019 | | | | |
| HSe- | 2.967e-019 | 2.680e-019 | -18.528 | -18.572 | -0.044 |
| H2Se | 8.741e-022 | 8.761e-022 | -21.058 | -21.057 | 0.001 |
| Se(4) | 2.534e-008 | | | | |
| HSeO3- | 2.500e-008 | 2.259e-008 | -7.602 | -7.646 | -0.044 |
| SeO3-2 | 3.313e-010 | 2.208e-010 | -9.480 | -9.656 | -0.176 |
| H2SeO3 | 4.101e-012 | 4.111e-012 | -11.387 | -11.386 | 0.001 |
| Se(6) | 1.755e-025 | | | | |
| SeO4-2 | 1.755e-025 | 1.169e-025 | -24.756 | -24.932 | -0.176 |
| HSeO4- | 1.238e-030 | 1.118e-030 | -29.907 | -29.951 | -0.044 |
| Zn | 1.194e-007 | | | | |
| Zn+2 | 8.700e-008 | 5.797e-008 | -7.060 | -7.237 | -0.176 |
| ZnHCO3+ | 2.147e-008 | 1.940e-008 | -7.668 | -7.712 | -0.044 |
| ZnSO4 | 7.558e-009 | 7.576e-009 | -8.122 | -8.121 | 0.001 |
| ZnCO3 | 3.091e-009 | 3.098e-009 | -8.510 | -8.509 | 0.001 |
| ZnCl+ | 8.362e-011 | 7.555e-011 | -10.078 | -10.122 | -0.044 |
| ZnOH+ | 6.615e-011 | 5.977e-011 | -10.179 | -10.224 | -0.044 |
| Zn(SO4)2-2 | 6.559e-011 | 4.371e-011 | -10.183 | -10.359 | -0.176 |
| Zn(CO3)2-2 | 2.663e-011 | 1.774e-011 | -10.575 | -10.751 | -0.176 |
| Zn(OH)2 | 6.951e-012 | 6.967e-012 | -11.158 | -11.157 | 0.001 |
| ZnOHCl | 5.722e-012 | 5.735e-012 | -11.242 | -11.241 | 0.001 |
| ZnCl2 | 7.166e-014 | 7.182e-014 | -13.145 | -13.144 | 0.001 |
| ZnCl3- | 7.850e-017 | 7.093e-017 | -16.105 | -16.149 | -0.044 |
| Zn(OH)3- | 7.534e-017 | 6.807e-017 | -16.123 | -16.167 | -0.044 |
| ZnCl4-2 | 4.555e-020 | 3.035e-020 | -19.341 | -19.518 | -0.176 |
| Zn(OH)4-2 | 5.002e-023 | 3.333e-023 | -22.301 | -22.477 | -0.176 |

----------Saturation indices----------

| Phase | SI | log IAP | log KT | |
|---|---|---|---|---|
| Ag2CO3 | -12.37 | -23.81 | -11.44 | Ag2CO3 |
| Ag2O | -17.24 | -4.26 | 12.98 | Ag2O |
| Ag2SO4 | -15.36 | -20.44 | -5.08 | Ag2SO4 |
| AgMetal | 4.86 | -9.62 | -14.48 | Ag |
| Anglesite | -4.45 | -12.32 | -7.87 | PbSO4 |
| Anhydrite | -1.76 | -6.10 | -4.34 | CaSO4 |
| Antlerite | -12.06 | -3.77 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -1.21 | -9.47 | -8.26 | CaCO3 |
| Arsenolite | -14.15 | -15.81 | -1.66 | As2O3 |
| Artinite | -10.62 | 0.09 | 10.71 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -35.37 | -26.85 | 8.52 | As2O5 |
| As_native | -16.78 | -30.38 | -13.59 | As |
| Atacamite | -9.29 | -1.23 | 8.06 | Cu2(OH)3Cl |
| Azurite | -10.66 | -5.72 | 4.94 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -0.19 | -50.67 | -50.48 | Ba3(AsO4)2 |
| Barite | 0.28 | -9.96 | -10.24 | BaSO4 |
| BaSeO3 | -10.02 | -16.41 | -6.39 | BaSeO3 |
| Bianchite | -8.68 | -10.44 | -1.76 | ZnSO4:6H2O |
| Birnessite | -20.33 | 23.27 | 43.60 | MnO2 |
| Bixbyite | -21.43 | -21.45 | -0.02 | Mn2O3 |
| Brochantite | -14.98 | 0.36 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -8.06 | 9.82 | 17.88 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -20.19 | -39.09 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -1.06 | -9.47 | -8.41 | CaCO3 |
| CaSeO3 | -6.95 | -12.55 | -5.60 | CaSeO3 |
| Cd(gamma) | -25.53 | -11.24 | 14.29 | Cd |
| Cd(OH)2 | -9.91 | 3.74 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -10.79 | 3.74 | 14.53 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -27.85 | -21.14 | 6.71 | Cd3(OH)2(SO4)2 |

| | | | | |
|---|---|---|---|---|
| Cd3(OH)4SO4 | -27.52 | -4.96 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -29.62 | -1.22 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -14.76 | -15.27 | -0.51 | CdCl2 |
| CdCl2:2.5H2O | -13.26 | -15.27 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -13.63 | -15.27 | -1.64 | CdCl2:H2O |
| CdMetal | -25.42 | -11.24 | 14.18 | Cd |
| CdOHCl | -9.57 | -5.77 | 3.81 | CdOHCl |
| CdSO4 | -12.91 | -12.44 | 0.47 | CdSO4 |
| CdSO4:2.7H2O | -10.73 | -12.44 | -1.71 | CdSO4:2.67H2O |
| CdSO4:H2O | -11.07 | -12.44 | -1.37 | CdSO4:H2O |
| Cerargyrite | -1.28 | -11.63 | -10.35 | AgCl |
| Cerrusite | -2.38 | -15.69 | -13.32 | PbCO3 |
| Chalcanthite | -9.35 | -12.05 | -2.70 | CuSO4:5H2O |
| Claudetite | -14.21 | -15.81 | -1.60 | As2O3 |
| CO2(g) | -1.33 | -2.60 | -1.27 | CO2 |
| Cotunnite | -10.16 | -15.15 | -4.99 | PbCl2 |
| Cu(OH)2 | -5.09 | 4.14 | 9.23 | Cu(OH)2 |
| Cu2SO4 | -15.80 | -17.58 | -1.77 | Cu2SO4 |
| Cu3(AsO4)2:6w | -21.81 | -56.93 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -5.79 | -15.42 | -9.63 | CuCO3 |
| CuMetal | 1.23 | -8.19 | -9.42 | Cu |
| CuOCuSO4 | -20.81 | -7.91 | 12.90 | CuO:CuSO4 |
| CupricFerrite | -2.84 | 4.54 | 7.37 | CuFe2O4 |
| Cuprite | 0.40 | -1.40 | -1.79 | Cu2O |
| CuprousFerrite | 8.28 | -0.50 | -8.77 | CuFeO2 |
| CuSO4 | -15.75 | -12.05 | 3.71 | CuSO4 |
| Dolomite | -2.48 | -19.20 | -16.73 | CaMg(CO3)2 |
| Dolomite(d) | -3.09 | -19.20 | -16.11 | CaMg(CO3)2 |
| Epsomite | -4.11 | -6.36 | -2.25 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 0.39 | -2.65 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -4.69 | 0.20 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -32.08 | -67.51 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -13.72 | 6.50 | 20.22 | Fe3(OH)8 |
| FeSe2 | -10.46 | -29.04 | -18.58 | FeSe2 |
| Goethite | 0.64 | 0.20 | -0.44 | FeOOH |
| Goslarite | -8.35 | -10.44 | -2.09 | ZnSO4:7H2O |
| Gypsum | -1.51 | -6.10 | -4.59 | CaSO4:2H2O |
| H2(g) | -14.98 | -18.06 | -3.08 | H2 |
| H2O(g) | -1.92 | -0.00 | 1.92 | H2O |
| Halite | -7.74 | -6.19 | 1.55 | NaCl |
| Hausmannite | -25.06 | 39.85 | 64.91 | Mn3O4 |
| Hematite | 3.22 | 0.40 | -2.82 | Fe2O3 |
| Huntite | -9.69 | -38.66 | -28.97 | CaMg3(CO3)4 |
| Hydrocerrusite | -10.07 | -27.53 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -22.36 | -29.11 | -6.75 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -19.72 | 10.58 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -21.46 | 10.58 | 32.05 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -19.98 | -29.81 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -21.35 | -29.35 | -8.00 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -24.56 | -28.45 | -3.88 | NaFe3(SO4)2(OH)6 |
| JarositeH | -28.50 | -31.76 | -3.26 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -17.96 | 0.36 | 18.32 | Cu4(OH)6SO4:H2O |
| Larnakite | -8.43 | -8.46 | -0.03 | PbO:PbSO4 |
| Laurionite | -6.27 | -5.65 | 0.62 | PbOHCl |
| Litharge | -9.49 | 3.86 | 13.35 | PbO |
| Maghemite | -5.99 | 0.40 | 6.39 | Fe2O3 |
| Magnesite | -1.94 | -9.73 | -7.79 | MgCO3 |
| Magnetite | 0.82 | 6.50 | 5.68 | Fe3O4 |
| Malachite | -6.71 | -0.79 | 5.91 | Cu2(OH)2CO3 |
| Manganite | -9.56 | 15.78 | 25.34 | MnOOH |
| Massicot | -9.70 | 3.86 | 13.56 | PbO |
| Melanothallite | -19.08 | -14.87 | 4.21 | CuCl2 |
| Melanterite | -7.67 | -10.08 | -2.41 | FeSO4:7H2O |
| Minium | -51.10 | 26.56 | 77.65 | Pb3O4 |
| Mirabilite | -7.71 | -9.55 | -1.85 | Na2SO4:10H2O |
| Mn2(SO4)3 | -65.79 | -69.99 | -4.20 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -15.76 | -44.47 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.76 | -10.72 | 2.04 | MnCl2:4H2O |
| MnSO4 | -11.16 | -7.89 | 3.27 | MnSO4 |
| Monteponite | -10.99 | 3.74 | 14.72 | CdO |
| Nahcolite | -5.06 | -5.75 | -0.69 | NaHCO3 |
| Nantokite | -3.06 | -10.20 | -7.14 | CuCl |
| Natron | -11.01 | -12.93 | -1.92 | Na2CO3:10H2O |
| Nesquehonite | -4.33 | -9.73 | -5.40 | MgCO3:3H2O |
| Nsutite | -19.29 | 23.27 | 42.56 | MnO2 |
| O2(g) | -58.55 | -61.32 | -2.77 | O2 |
| Otavite | -3.81 | -15.81 | -12.00 | CdCO3 |
| Pb(OH)2 | -4.83 | 3.86 | 8.69 | Pb(OH)2 |
| Pb2(OH)3Cl | -10.58 | -1.79 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -18.48 | 7.72 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -38.34 | 22.70 | 61.04 | Pb2O3 |
| Pb2OCO3 | -11.78 | -11.83 | -0.06 | PbO:PbCO3 |
| Pb3(AsO4)2 | -22.36 | -57.76 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -20.01 | -7.98 | 12.04 | PbCO3:2PbO |
| Pb3O2SO4 | -15.81 | -4.61 | 11.20 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -21.85 | -0.75 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -24.20 | -0.75 | 23.45 | PbSO4:3PbO |
| PbMetal | -15.38 | -11.12 | 4.25 | Pb |
| PbO:0.3H2O | -9.12 | 3.86 | 12.98 | PbO:0.33H2O |
| Phosgenite | -11.03 | -30.84 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -33.19 | 18.84 | 52.03 | PbO2 |
| Portlandite | -13.91 | 10.08 | 24.00 | Ca(OH)2 |
| Pyrochroite | -6.91 | 8.29 | 15.20 | Mn(OH)2 |

```
Pyrolusite      -20.62   23.27   43.89  MnO2
Rhodochrosite    -0.19  -11.26  -11.07  MnCO3
Rhodochrosite(d) -0.87  -11.26  -10.39  MnCO3
Scorodite       -14.22  -34.47  -20.25  FeAsO4:2H2O
Se(s)             7.24  -10.08  -17.32  Se
SeO2            -14.26  -22.64   -8.38  SeO2
Siderite         -2.65  -13.45  -10.79  FeCO3
Siderite(d)(3)   -3.00  -13.45  -10.45  FeCO3
Smithsonite      -3.98  -13.81   -9.83  ZnCO3
Smithsonite_PG   -3.01  -13.81  -10.80  ZnCO3
Tenorite         -4.07    4.14    8.21  CuO
Thenardite       -9.40   -9.55   -0.16  Na2SO4
Thermonatrite   -13.16  -12.92    0.23  Na2CO3:H2O
Trona           -18.58  -18.68   -0.10  NaHCO3:Na2CO3:2H2O
Witherite        -4.70  -13.33   -8.63  BaCO3
Zincite(c)       -6.24    5.74   11.98  ZnO
Zincosite       -14.19  -10.44    3.75  ZnSO4
Zn(OH)2-a        -6.71    5.74   12.45  Zn(OH)2
Zn(OH)2-b        -6.01    5.74   11.75  Zn(OH)2
Zn(OH)2-c        -6.46    5.74   12.20  Zn(OH)2
Zn(OH)2-e        -5.76    5.74   11.50  Zn(OH)2
Zn(OH)2-g        -5.97    5.74   11.71  Zn(OH)2
Zn2(OH)2SO4     -12.20   -4.70    7.50  Zn2(OH)2SO4
Zn2(OH)3Cl      -13.22    1.98   15.20  Zn2(OH)3Cl
Zn3(AsO4)2:2.5w -24.56  -52.11  -27.55  Zn3(AsO4)2:2.5H2O
Zn3O(SO4)2      -36.54  -15.13   21.41  ZnO:2ZnSO4
Zn4(OH)6SO4     -21.61    6.79   28.40  Zn4(OH)6SO4
Zn5(OH)8Cl2     -28.79    9.71   38.50  Zn5(OH)8Cl2
ZnCl2           -20.97  -13.27    7.70  ZnCl2
ZnCO3:1H2O       -3.55  -13.81  -10.26  ZnCO3:1H2O
ZnCO3:H2O        -3.55  -13.81  -10.26  ZnCO3:H2O
ZnMetal         -36.41   -9.24   27.18  Zn
ZnO(a)           -5.57    5.74   11.31  ZnO
ZnSO4:H2O        -10.28  -10.44   -0.16  ZnSO4:H2O

-----------
End of simulation.
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-------------------
Reading input data for simulation 6.
-------------------

Solution 6 - MW-1014A, Sample Date June 2013
Units                   mg/L
pH                      6.58      #Field value
pe                      1.41
Temperature 10.5
Alkalinity      430
As                      0.001     #Detection Limit
Ba                      0.017
Cd                      0.00012   #Detection Limit
Ca                      330
Cl                      25        #Detection Limit
Cu                      0.0059
Fe                      0.014     #Detection Limit
Pb                      0.0019    #Detection Limit
Mg                      130
Mn                      0.016
K                       11
Se                      0.002     #Detection Limit
Ag                      0.00035   #Detection Limit
Na                      60
S(6)                    1000
Zn                      0.0076    #Detection Limit
END
-----------------------
Beginning of initial solution calculations.
-----------------------

Initial solution 6.             - MW-1014A, Sample Date June 2013

-----------Solution composition-----------

Elements        Molality        Moles

Ag              3.251e-009  3.251e-009
Alkalinity      8.609e-003  8.609e-003
As              1.337e-008  1.337e-008
Ba              1.240e-007  1.240e-007
Ca              8.250e-003  8.250e-003
Cd              1.070e-009  1.070e-009
Cl              7.066e-004  7.066e-004
Cu              9.303e-008  9.303e-008
Fe              2.512e-007  2.512e-007
K               2.819e-004  2.819e-004
Mg              5.358e-003  5.358e-003
Mn              2.918e-007  2.918e-007
Na              2.615e-003  2.615e-003
Pb              9.189e-009  9.189e-009
S(6)            1.043e-002  1.043e-002
Se              2.538e-008  2.538e-008
Zn              1.165e-007  1.165e-007
```

----------Description of solution----------

pH = 6.580
pe = 1.410
Activity of water = 0.999
Ionic strength = 4.087e-002
Mass of water (kg) = 1.000e+000
Total carbon (mol/kg) = 1.376e-002
Total CO2 (mol/kg) = 1.376e-002
Temperature (deg C) = 10.500
Electrical balance (eq) = -6.247e-005
Percent error, 100*(Cat-|An|)/(Cat+|An|) = -0.13
Iterations = 10
Total H = 1.110210e+002
Total O = 5.558405e+001

----------Distribution of species----------

| Species | Molality | Log Activity | Log Molality | Log Activity | Gamma |
|---|---|---|---|---|---|
| H+ | 3.042e-007 | 2.630e-007 | -6.517 | -6.580 | -0.063 |
| OH- | 1.389e-008 | 1.162e-008 | -7.857 | -7.935 | -0.078 |
| H2O | 5.551e+001 | 9.994e-001 | 1.744 | -0.000 | 0.000 |
| Ag | 3.251e-009 | | | | |
| AgCl | 1.617e-009 | 1.632e-009 | -8.791 | -8.787 | 0.004 |
| Ag+ | 1.419e-009 | 1.187e-009 | -8.848 | -8.926 | -0.078 |
| AgCl2- | 1.274e-010 | 1.065e-010 | -9.895 | -9.972 | -0.078 |
| AgSO4- | 8.809e-011 | 7.367e-011 | -10.055 | -10.133 | -0.078 |
| AgCl3-2 | 9.522e-014 | 4.658e-014 | -13.021 | -13.332 | -0.311 |
| AgOH | 4.466e-015 | 4.509e-015 | -14.350 | -14.346 | 0.004 |
| AgCl4-3 | 2.264e-016 | 4.531e-017 | -15.645 | -16.344 | -0.699 |
| Ag(OH)2- | 2.048e-020 | 1.713e-020 | -19.689 | -19.766 | -0.078 |
| As(3) | 6.008e-009 | | | | |
| H3AsO3 | 5.997e-009 | 6.054e-009 | -8.222 | -8.218 | 0.004 |
| H2AsO3- | 1.104e-011 | 9.234e-012 | -10.957 | -11.035 | -0.078 |
| H4AsO3+ | 9.433e-016 | 7.889e-016 | -15.025 | -15.103 | -0.078 |
| HAsO3-2 | 7.422e-020 | 3.631e-020 | -19.130 | -19.440 | -0.311 |
| AsO3-3 | 8.163e-029 | 1.634e-029 | -28.088 | -28.787 | -0.699 |
| As(5) | 7.366e-009 | | | | |
| H2AsO4- | 5.184e-009 | 4.336e-009 | -8.285 | -8.363 | -0.078 |
| HAsO4-2 | 2.181e-009 | 1.067e-009 | -8.661 | -8.972 | -0.311 |
| H3AsO4 | 1.948e-013 | 1.967e-013 | -12.710 | -12.706 | 0.004 |
| AsO4-3 | 3.118e-014 | 6.240e-015 | -13.506 | -14.205 | -0.699 |
| Ba | 1.240e-007 | | | | |
| Ba+2 | 6.514e-008 | 3.187e-008 | -7.186 | -7.497 | -0.311 |
| BaSO4 | 5.729e-008 | 5.783e-008 | -7.242 | -7.238 | 0.004 |
| BaHCO3+ | 1.591e-009 | 1.331e-009 | -8.798 | -8.876 | -0.078 |
| BaCO3 | 1.051e-011 | 1.061e-011 | -10.978 | -10.974 | 0.004 |
| BaOH+ | 4.905e-015 | 4.103e-015 | -14.309 | -14.387 | -0.078 |
| C(4) | 1.376e-002 | | | | |
| HCO3- | 8.158e-003 | 6.876e-003 | -2.088 | -2.163 | -0.074 |
| CO2 | 5.153e-003 | 5.202e-003 | -2.288 | -2.284 | 0.004 |
| CaHCO3+ | 2.387e-004 | 1.996e-004 | -3.622 | -3.700 | -0.078 |
| MgHCO3+ | 1.903e-004 | 1.592e-004 | -3.721 | -3.798 | -0.078 |
| NaHCO3 | 8.235e-006 | 8.313e-006 | -5.084 | -5.080 | 0.004 |
| CaCO3 | 3.601e-006 | 3.635e-006 | -5.444 | -5.439 | 0.004 |
| CO3-2 | 1.709e-006 | 8.625e-007 | -5.767 | -6.064 | -0.297 |
| MgCO3 | 1.345e-006 | 1.358e-006 | -5.871 | -5.867 | 0.004 |
| MnHCO3+ | 6.432e-008 | 5.379e-008 | -7.192 | -7.269 | -0.078 |
| FeHCO3+ | 6.127e-008 | 5.124e-008 | -7.213 | -7.290 | -0.078 |
| ZnHCO3+ | 2.972e-008 | 2.485e-008 | -7.527 | -7.605 | -0.078 |
| NaCO3- | 1.914e-008 | 1.601e-008 | -7.718 | -7.796 | -0.078 |
| CuCO3 | 1.208e-008 | 1.220e-008 | -7.918 | -7.914 | 0.004 |
| CuHCO3+ | 1.085e-008 | 9.075e-009 | -7.965 | -8.042 | -0.078 |
| MnCO3 | 5.957e-009 | 6.013e-009 | -8.225 | -8.221 | 0.004 |
| PbCO3 | 5.310e-009 | 5.360e-009 | -8.275 | -8.271 | 0.004 |
| ZnCO3 | 4.894e-009 | 4.940e-009 | -8.310 | -8.306 | 0.004 |
| PbHCO3+ | 2.336e-009 | 1.953e-009 | -8.632 | -8.709 | -0.078 |
| BaHCO3+ | 1.591e-009 | 1.331e-009 | -8.798 | -8.876 | -0.078 |
| FeCO3 | 1.527e-009 | 1.542e-009 | -8.816 | -8.812 | 0.004 |
| Zn(CO3)2-2 | 1.862e-010 | 9.109e-011 | -9.730 | -10.041 | -0.311 |
| CdHCO3+ | 8.190e-011 | 6.850e-011 | -10.087 | -10.164 | -0.078 |
| Cu(CO3)2-2 | 2.707e-011 | 1.324e-011 | -10.568 | -10.878 | -0.311 |
| Pb(CO3)2-2 | 2.374e-011 | 1.161e-011 | -10.625 | -10.935 | -0.311 |
| BaCO3 | 1.051e-011 | 1.061e-011 | -10.978 | -10.974 | 0.004 |
| CdCO3 | 2.138e-013 | 2.158e-013 | -12.670 | -12.666 | 0.004 |
| Cd(CO3)2-2 | 1.203e-015 | 5.886e-016 | -14.920 | -15.230 | -0.311 |
| Ca | 8.250e-003 | | | | |
| Ca+2 | 6.094e-003 | 3.082e-003 | -2.215 | -2.511 | -0.296 |
| CaSO4 | 1.913e-003 | 1.931e-003 | -2.718 | -2.714 | 0.004 |
| CaHCO3+ | 2.387e-004 | 1.996e-004 | -3.622 | -3.700 | -0.078 |
| CaCO3 | 3.601e-006 | 3.635e-006 | -5.444 | -5.439 | 0.004 |
| CaHSO4+ | 3.050e-009 | 2.551e-009 | -8.516 | -8.593 | -0.078 |
| CaOH+ | 2.324e-009 | 1.944e-009 | -8.634 | -8.711 | -0.078 |
| Cd | 1.070e-009 | | | | |
| Cd+2 | 6.439e-010 | 3.150e-010 | -9.191 | -9.502 | -0.311 |
| CdSO4 | 2.969e-010 | 2.997e-010 | -9.527 | -9.523 | 0.004 |
| CdHCO3+ | 8.190e-011 | 6.850e-011 | -10.087 | -10.164 | -0.078 |
| Cd(SO4)2-2 | 2.670e-011 | 1.306e-011 | -10.574 | -10.884 | -0.311 |
| CdCl+ | 2.004e-011 | 1.676e-011 | -10.698 | -10.776 | -0.078 |
| CdCO3 | 2.138e-013 | 2.158e-013 | -12.670 | -12.666 | 0.004 |

| | | | | | |
|---|---|---|---|---|---|
| CdOH+ | 3.844e-014 | 3.215e-014 | -13.415 | -13.493 | -0.078 |
| CdCl2 | 3.835e-014 | 3.871e-014 | -13.416 | -13.412 | 0.004 |
| CdOHCl | 1.883e-014 | 1.900e-014 | -13.725 | -13.721 | 0.004 |
| Cd(CO3)2-2 | 1.203e-015 | 5.886e-016 | -14.920 | -15.230 | -0.311 |
| Cd(OH)2 | 2.012e-017 | 2.031e-017 | -16.696 | -16.692 | 0.004 |
| CdCl3- | 1.361e-017 | 1.138e-017 | -16.866 | -16.944 | -0.078 |
| Cd2OH+3 | 2.996e-022 | 5.997e-023 | -21.523 | -22.222 | -0.699 |
| Cd(OH)3- | 1.035e-023 | 8.659e-024 | -22.985 | -23.063 | -0.078 |
| Cd(OH)4-2 | 5.994e-031 | 2.932e-031 | -30.222 | -30.533 | -0.311 |
| Cl | 7.066e-004 | | | | |
| Cl- | 7.065e-004 | 5.861e-004 | -3.151 | -3.232 | -0.081 |
| CuCl2- | 6.280e-009 | 5.252e-009 | -8.202 | -8.280 | -0.078 |
| AgCl | 1.617e-009 | 1.632e-009 | -8.791 | -8.787 | 0.004 |
| MnCl+ | 2.506e-010 | 2.096e-010 | -9.601 | -9.679 | -0.078 |
| AgCl2- | 1.274e-010 | 1.065e-010 | -9.895 | -9.972 | -0.078 |
| FeCl+ | 7.208e-011 | 6.028e-011 | -10.142 | -10.220 | -0.078 |
| ZnCl+ | 2.765e-011 | 2.313e-011 | -10.558 | -10.636 | -0.078 |
| CdCl+ | 2.004e-011 | 1.676e-011 | -10.698 | -10.776 | -0.078 |
| CuCl3-2 | 9.404e-012 | 4.601e-012 | -11.027 | -11.337 | -0.311 |
| PbCl+ | 6.838e-012 | 5.719e-012 | -11.165 | -11.243 | -0.078 |
| CuCl+ | 2.355e-012 | 1.969e-012 | -11.628 | -11.706 | -0.078 |
| ZnOHCl | 2.097e-012 | 2.117e-012 | -11.678 | -11.674 | 0.004 |
| AgCl3-2 | 9.522e-014 | 4.658e-014 | -13.021 | -13.332 | -0.311 |
| MnCl2 | 5.312e-014 | 5.362e-014 | -13.275 | -13.271 | 0.004 |
| CdCl2 | 3.835e-014 | 3.871e-014 | -13.416 | -13.412 | 0.004 |
| CdOHCl | 1.883e-014 | 1.900e-014 | -13.725 | -13.721 | 0.004 |
| ZnCl2 | 1.322e-014 | 1.335e-014 | -13.879 | -13.875 | 0.004 |
| PbCl2 | 6.996e-015 | 7.062e-015 | -14.155 | -14.151 | 0.004 |
| CuCl2 | 5.208e-016 | 5.257e-016 | -15.283 | -15.279 | 0.004 |
| AgCl4-3 | 2.264e-016 | 4.531e-017 | -15.645 | -16.344 | -0.699 |
| CdCl3- | 1.361e-017 | 1.138e-017 | -16.866 | -16.944 | -0.078 |
| MnCl3- | 1.035e-017 | 8.655e-018 | -16.985 | -17.063 | -0.078 |
| ZnCl3- | 9.579e-018 | 8.011e-018 | -17.019 | -17.096 | -0.078 |
| PbCl3- | 3.578e-018 | 2.993e-018 | -17.446 | -17.524 | -0.078 |
| ZnCl4-2 | 4.263e-021 | 2.086e-021 | -20.370 | -20.681 | -0.311 |
| FeCl+2 | 1.771e-021 | 8.663e-022 | -20.752 | -21.062 | -0.311 |
| PbCl4-2 | 1.526e-021 | 7.465e-022 | -20.816 | -21.127 | -0.311 |
| CuCl3- | 9.978e-022 | 8.345e-022 | -21.001 | -21.079 | -0.078 |
| FeCl2+ | 4.396e-024 | 3.677e-024 | -23.357 | -23.435 | -0.078 |
| CuCl4-2 | 3.521e-027 | 1.722e-027 | -26.453 | -26.764 | -0.311 |
| FeCl3 | 2.135e-028 | 2.155e-028 | -27.671 | -27.667 | 0.004 |
| Cu(1) | 6.204e-008 | | | | |
| Cu+ | 5.575e-008 | 4.663e-008 | -7.254 | -7.331 | -0.078 |
| CuCl2- | 6.280e-009 | 5.252e-009 | -8.202 | -8.280 | -0.078 |
| CuCl3-2 | 9.404e-012 | 4.601e-012 | -11.027 | -11.337 | -0.311 |
| Cu(2) | 3.099e-008 | | | | |
| CuCO3 | 1.208e-008 | 1.220e-008 | -7.918 | -7.914 | 0.004 |
| CuHCO3+ | 1.085e-008 | 9.075e-009 | -7.965 | -8.042 | -0.078 |
| Cu+2 | 5.382e-009 | 2.633e-009 | -8.269 | -8.580 | -0.311 |
| CuSO4 | 1.736e-009 | 1.752e-009 | -8.761 | -8.756 | 0.004 |
| Cu(OH)2 | 7.867e-010 | 7.942e-010 | -9.104 | -9.100 | 0.004 |
| CuOH+ | 1.196e-010 | 1.000e-010 | -9.922 | -10.000 | -0.078 |
| Cu(CO3)2-2 | 2.707e-011 | 1.324e-011 | -10.568 | -10.878 | -0.311 |
| CuCl+ | 2.355e-012 | 1.969e-012 | -11.628 | -11.706 | -0.078 |
| Cu2(OH)2+2 | 1.971e-015 | 9.644e-016 | -14.705 | -15.016 | -0.311 |
| CuCl2 | 5.208e-016 | 5.257e-016 | -15.283 | -15.279 | 0.004 |
| Cu(OH)3- | 2.174e-016 | 1.818e-016 | -15.663 | -15.740 | -0.078 |
| CuCl3- | 9.978e-022 | 8.345e-022 | -21.001 | -21.079 | -0.078 |
| Cu(OH)4-2 | 2.818e-022 | 1.378e-022 | -21.550 | -21.861 | -0.311 |
| CuCl4-2 | 3.521e-027 | 1.722e-027 | -26.453 | -26.764 | -0.311 |
| Fe(2) | 2.512e-007 | | | | |
| Fe+2 | 1.523e-007 | 7.451e-008 | -6.817 | -7.128 | -0.311 |
| FeHCO3+ | 6.127e-008 | 5.124e-008 | -7.213 | -7.290 | -0.078 |
| FeSO4 | 3.597e-008 | 3.631e-008 | -7.444 | -7.440 | 0.004 |
| FeCO3 | 1.527e-009 | 1.542e-009 | -8.816 | -8.812 | 0.004 |
| FeCl+ | 7.208e-011 | 6.028e-011 | -10.142 | -10.220 | -0.078 |
| FeOH+ | 3.428e-011 | 2.867e-011 | -10.465 | -10.543 | -0.078 |
| FeHSO4+ | 7.374e-014 | 6.167e-014 | -13.132 | -13.210 | -0.078 |
| Fe(OH)2 | 2.439e-016 | 2.462e-016 | -15.613 | -15.609 | 0.004 |
| Fe(OH)3- | 3.578e-020 | 2.993e-020 | -19.446 | -19.524 | -0.078 |
| Fe(3) | 8.114e-013 | | | | |
| Fe(OH)2+ | 6.697e-013 | 5.601e-013 | -12.174 | -12.252 | -0.078 |
| Fe(OH)3 | 1.398e-013 | 1.411e-013 | -12.855 | -12.851 | 0.004 |
| FeOH+2 | 1.622e-015 | 7.935e-016 | -14.790 | -15.100 | -0.311 |
| Fe(OH)4- | 3.168e-016 | 2.649e-016 | -15.499 | -15.577 | -0.078 |
| FeSO4+ | 2.688e-018 | 2.248e-018 | -17.571 | -17.648 | -0.078 |
| Fe+3 | 3.964e-019 | 7.935e-020 | -18.402 | -19.100 | -0.699 |
| Fe(SO4)2- | 2.006e-019 | 1.678e-019 | -18.698 | -18.775 | -0.078 |
| FeCl+2 | 1.771e-021 | 8.663e-022 | -20.752 | -21.062 | -0.311 |
| FeCl2+ | 4.396e-024 | 3.677e-024 | -23.357 | -23.435 | -0.078 |
| FeHSO4+2 | 3.372e-024 | 1.650e-024 | -23.472 | -23.783 | -0.311 |
| Fe2(OH)2+4 | 5.555e-028 | 3.182e-029 | -27.255 | -28.497 | -1.242 |
| FeCl3 | 2.135e-028 | 2.155e-028 | -27.671 | -27.667 | 0.004 |
| Fe3(OH)4+5 | 1.325e-036 | 1.519e-038 | -35.878 | -37.818 | -1.941 |
| H(0) | 1.709e-019 | | | | |
| H2 | 8.547e-020 | 8.628e-020 | -19.068 | -19.064 | 0.004 |
| K | 2.819e-004 | | | | |
| K+ | 2.765e-004 | 2.294e-004 | -3.558 | -3.639 | -0.081 |
| KSO4- | 5.349e-006 | 4.473e-006 | -5.272 | -5.349 | -0.078 |
| Mg | 5.358e-003 | | | | |
| Mg+2 | 3.995e-003 | 2.062e-003 | -2.398 | -2.686 | -0.287 |
| MgSO4 | 1.171e-003 | 1.182e-003 | -2.932 | -2.927 | 0.004 |
| MgHCO3+ | 1.903e-004 | 1.592e-004 | -3.721 | -3.798 | -0.078 |

| | | | | | |
|---|---|---|---|---|---|
| MgCO3 | 1.345e-006 | 1.358e-006 | -5.871 | -5.867 | 0.004 |
| MgOH+ | 8.588e-009 | 7.182e-009 | -8.066 | -8.144 | -0.078 |
| Mn(2) | 2.918e-007 | | | | |
| Mn+2 | 1.794e-007 | 8.778e-008 | -6.746 | -7.057 | -0.311 |
| MnHCO3+ | 6.432e-008 | 5.379e-008 | -7.192 | -7.269 | -0.078 |
| MnSO4 | 4.186e-008 | 4.226e-008 | -7.378 | -7.374 | 0.004 |
| MnCO3 | 5.957e-009 | 6.013e-009 | -8.225 | -8.221 | 0.004 |
| MnCl+ | 2.506e-010 | 2.096e-010 | -9.601 | -9.679 | -0.078 |
| MnOH+ | 2.959e-012 | 2.475e-012 | -11.529 | -11.606 | -0.078 |
| MnCl2 | 5.312e-014 | 5.362e-014 | -13.275 | -13.271 | 0.004 |
| MnCl3- | 1.035e-017 | 8.655e-018 | -16.985 | -17.063 | -0.078 |
| Mn(OH)3- | 9.124e-023 | 7.630e-023 | -22.040 | -22.117 | -0.078 |
| Mn(3) | 3.761e-032 | | | | |
| Mn+3 | 3.761e-032 | 7.528e-033 | -31.425 | -32.123 | -0.699 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -72.528 | -72.839 | -0.311 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -81.732 | -81.810 | -0.078 |
| Na | 2.615e-003 | | | | |
| Na+ | 2.564e-003 | 2.150e-003 | -2.591 | -2.668 | -0.077 |
| NaSO4- | 4.235e-005 | 3.542e-005 | -4.373 | -4.451 | -0.078 |
| NaHCO3 | 8.235e-006 | 8.313e-006 | -5.084 | -5.080 | 0.004 |
| NaCO3- | 1.914e-008 | 1.601e-008 | -7.718 | -7.796 | -0.078 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -59.175 | -59.171 | 0.004 |
| Pb | 9.189e-009 | | | | |
| PbCO3 | 5.310e-009 | 5.360e-009 | -8.275 | -8.271 | 0.004 |
| PbHCO3+ | 2.336e-009 | 1.953e-009 | -8.632 | -8.709 | -0.078 |
| Pb+2 | 7.310e-010 | 3.576e-010 | -9.136 | -9.447 | -0.311 |
| PbSO4 | 7.214e-010 | 7.282e-010 | -9.142 | -9.138 | 0.004 |
| PbOH+ | 3.168e-011 | 2.649e-011 | -10.499 | -10.577 | -0.078 |
| Pb(SO4)2-2 | 2.828e-011 | 1.384e-011 | -10.548 | -10.859 | -0.311 |
| Pb(CO3)2-2 | 2.374e-011 | 1.161e-011 | -10.625 | -10.935 | -0.311 |
| PbCl+ | 6.838e-012 | 5.719e-012 | -11.165 | -11.243 | -0.078 |
| Pb(OH)2 | 3.880e-014 | 3.916e-014 | -13.411 | -13.407 | 0.004 |
| PbCl2 | 6.996e-015 | 7.062e-015 | -14.155 | -14.151 | 0.004 |
| PbCl3- | 3.578e-018 | 2.993e-018 | -17.446 | -17.524 | -0.078 |
| Pb(OH)3- | 2.043e-018 | 1.708e-018 | -17.690 | -17.767 | -0.078 |
| Pb2OH+3 | 1.060e-018 | 2.121e-019 | -17.975 | -18.673 | -0.699 |
| PbCl4-2 | 1.526e-021 | 7.465e-022 | -20.816 | -21.127 | -0.311 |
| Pb(OH)4-2 | 3.040e-023 | 1.487e-023 | -22.517 | -22.828 | -0.311 |
| Pb3(OH)4+2 | 2.611e-027 | 1.277e-027 | -26.583 | -26.894 | -0.311 |
| S(6) | 1.043e-002 | | | | |
| SO4-2 | 7.299e-003 | 3.621e-003 | -2.137 | -2.441 | -0.304 |
| CaSO4 | 1.913e-003 | 1.931e-003 | -2.718 | -2.714 | 0.004 |
| MgSO4 | 1.171e-003 | 1.182e-003 | -2.932 | -2.927 | 0.004 |
| NaSO4- | 4.235e-005 | 3.542e-005 | -4.373 | -4.451 | -0.078 |
| KSO4- | 5.349e-006 | 4.473e-006 | -5.272 | -5.349 | -0.078 |
| HSO4- | 8.232e-008 | 6.884e-008 | -7.085 | -7.162 | -0.078 |
| BaSO4 | 5.729e-008 | 5.783e-008 | -7.242 | -7.238 | 0.004 |
| MnSO4 | 4.186e-008 | 4.226e-008 | -7.378 | -7.374 | 0.004 |
| FeSO4 | 3.597e-008 | 3.631e-008 | -7.444 | -7.440 | 0.004 |
| ZnSO4 | 2.147e-008 | 2.167e-008 | -7.668 | -7.664 | 0.004 |
| CaHSO4+ | 3.050e-009 | 2.551e-009 | -8.516 | -8.593 | -0.078 |
| CuSO4 | 1.736e-009 | 1.752e-009 | -8.761 | -8.756 | 0.004 |
| Zn(SO4)2-2 | 1.466e-009 | 7.172e-010 | -8.834 | -9.144 | -0.311 |
| PbSO4 | 7.214e-010 | 7.282e-010 | -9.142 | -9.138 | 0.004 |
| CdSO4 | 2.969e-010 | 2.997e-010 | -9.527 | -9.523 | 0.004 |
| AgSO4- | 8.809e-011 | 7.367e-011 | -10.055 | -10.133 | -0.078 |
| Pb(SO4)2-2 | 2.828e-011 | 1.384e-011 | -10.548 | -10.859 | -0.311 |
| Cd(SO4)2-2 | 2.670e-011 | 1.306e-011 | -10.574 | -10.884 | -0.311 |
| FeHSO4+ | 7.374e-014 | 6.167e-014 | -13.132 | -13.210 | -0.078 |
| FeSO4+ | 2.688e-018 | 2.248e-018 | -17.571 | -17.648 | -0.078 |
| Fe(SO4)2- | 2.006e-019 | 1.678e-019 | -18.698 | -18.775 | -0.078 |
| FeHSO4+2 | 3.372e-024 | 1.650e-024 | -23.472 | -23.783 | -0.311 |
| Se(-2) | 2.961e-022 | | | | |
| HSe- | 2.954e-022 | 2.471e-022 | -21.530 | -21.607 | -0.078 |
| H2Se | 6.417e-025 | 6.477e-025 | -24.193 | -24.189 | 0.004 |
| Se(4) | 2.538e-008 | | | | |
| HSeO3- | 2.487e-008 | 2.080e-008 | -7.604 | -7.682 | -0.078 |
| SeO3-2 | 5.111e-010 | 2.500e-010 | -9.292 | -9.602 | -0.311 |
| H2SeO3 | 3.047e-012 | 3.076e-012 | -11.516 | -11.512 | 0.004 |
| Se(6) | 2.705e-024 | | | | |
| SeO4-2 | 2.705e-024 | 1.323e-024 | -23.568 | -23.878 | -0.311 |
| HSeO4- | 1.245e-029 | 1.042e-029 | -28.905 | -28.982 | -0.078 |
| Zn | 1.165e-007 | | | | |
| Zn+2 | 5.868e-008 | 2.871e-008 | -7.231 | -7.542 | -0.311 |
| ZnHCO3+ | 2.972e-008 | 2.485e-008 | -7.527 | -7.605 | -0.078 |
| ZnSO4 | 2.147e-008 | 2.167e-008 | -7.668 | -7.664 | 0.004 |
| ZnCO3 | 4.894e-009 | 4.940e-009 | -8.310 | -8.306 | 0.004 |
| Zn(SO4)2-2 | 1.466e-009 | 7.172e-010 | -8.834 | -9.144 | -0.311 |
| Zn(CO3)2-2 | 1.862e-010 | 9.109e-011 | -9.730 | -10.041 | -0.311 |
| ZnOH+ | 4.501e-011 | 3.764e-011 | -10.347 | -10.424 | -0.078 |
| ZnCl+ | 2.765e-011 | 2.313e-011 | -10.558 | -10.636 | -0.078 |
| Zn(OH)2 | 5.169e-012 | 5.217e-012 | -11.287 | -11.283 | 0.004 |
| ZnOHCl | 2.097e-012 | 2.117e-012 | -11.678 | -11.674 | 0.004 |
| ZnCl2 | 1.322e-014 | 1.335e-014 | -13.879 | -13.875 | 0.004 |
| Zn(OH)3- | 7.495e-017 | 6.269e-017 | -16.125 | -16.203 | -0.078 |
| ZnCl3- | 9.579e-018 | 8.011e-018 | -17.019 | -17.096 | -0.078 |
| ZnCl4-2 | 4.263e-021 | 2.086e-021 | -20.370 | -20.681 | -0.311 |
| Zn(OH)4-2 | 7.716e-023 | 3.775e-023 | -22.113 | -22.423 | -0.311 |

----------Saturation indices----------

| Phase | SI | log IAP | log KT | |
|---|---|---|---|---|
| Ag2CO3 | -12.49 | -23.92 | -11.43 | Ag2CO3 |
| Ag2O | -17.66 | -4.69 | 12.97 | Ag2O |
| Ag2SO4 | -15.21 | -20.29 | -5.08 | Ag2SO4 |
| AgMetal | 4.12 | -10.34 | -14.46 | Ag |
| Anglesite | -4.02 | -11.89 | -7.87 | PbSO4 |
| Anhydrite | -0.62 | -4.95 | -4.34 | CaSO4 |
| Antlerite | -10.15 | -1.86 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.32 | -8.58 | -8.26 | CaCO3 |
| Arsenolite | -14.79 | -16.44 | -1.65 | As2O3 |
| Artinite | -8.95 | 1.72 | 10.68 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -33.92 | -25.41 | 8.51 | As2O5 |
| As_native | -18.62 | -32.19 | -13.56 | As |
| Atacamite | -8.69 | -0.65 | 8.04 | Cu2(OH)3Cl |
| Azurite | -8.65 | -3.74 | 4.91 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -0.43 | -50.90 | -50.47 | Ba3(AsO4)2 |
| Barite | 0.30 | -9.94 | -10.24 | BaSO4 |
| BaSeO3 | -10.71 | -17.10 | -6.39 | BaSeO3 |
| Bianchite | -8.23 | -9.98 | -1.76 | ZnSO4:6H2O |
| Birnessite | -21.52 | 22.08 | 43.60 | MnO2 |
| Bixbyite | -24.73 | -24.77 | -0.04 | Mn2O3 |
| Brochantite | -12.62 | 2.72 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -7.38 | 10.47 | 17.86 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -17.04 | -35.94 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.16 | -8.58 | -8.41 | CaCO3 |
| CaSeO3 | -6.51 | -12.11 | -5.60 | CaSeO3 |
| Cd(gamma) | -26.59 | -12.32 | 14.27 | Cd |
| Cd(OH)2 | -9.99 | 3.66 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -10.85 | 3.66 | 14.51 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -26.94 | -20.23 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -27.19 | -4.63 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -29.37 | -0.97 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -15.45 | -15.97 | -0.51 | CdCl2 |
| CdCl2:2.5H2O | -13.96 | -15.97 | -2.00 | CdCl2:2.5H2O |
| CdCl2:H2O | -14.32 | -15.97 | -1.64 | CdCl2:H2O |
| CdMetal | -26.49 | -12.32 | 14.16 | Cd |
| CdOHCl | -9.95 | -6.15 | 3.80 | CdOHCl |
| CdSO4 | -12.40 | -11.94 | 0.45 | CdSO4 |
| CdSO4:2.7H2O | -10.23 | -11.94 | -1.71 | CdSO4:2.67H2O |
| CdSO4:H2O | -10.57 | -11.94 | -1.38 | CdSO4:H2O |
| Cerargyrite | -1.82 | -12.16 | -10.34 | AgCl |
| Cerrusite | -2.20 | -15.51 | -13.31 | PbCO3 |
| Chalcanthite | -8.33 | -11.02 | -2.69 | CuSO4:5H2O |
| Claudetite | -14.84 | -16.44 | -1.59 | As2O3 |
| CO2(g) | -1.01 | -2.28 | -1.28 | CO2 |
| Cotunnite | -10.93 | -15.91 | -4.98 | PbCl2 |
| Cu(OH)2 | -4.63 | 4.58 | 9.21 | Cu(OH)2 |
| Cu2SO4 | -15.32 | -17.10 | -1.78 | Cu2SO4 |
| Cu3(AsO4)2:6w | -19.03 | -54.15 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -5.01 | -14.64 | -9.63 | CuCO3 |
| CuMetal | 0.66 | -8.74 | -9.40 | Cu |
| CuOCuSO4 | -19.30 | -6.44 | 12.86 | CuO:CuSO4 |
| CupricFerrite | -1.47 | 5.86 | 7.33 | CuFe2O4 |
| Cuprite | 0.28 | -1.50 | -1.78 | Cu2O |
| CuprousFerrite | 8.67 | -0.11 | -8.78 | CuFeO2 |
| CuSO4 | -14.71 | -11.02 | 3.69 | CuSO4 |
| Dolomite | -0.59 | -17.33 | -16.74 | CaMg(CO3)2 |
| Dolomite(d) | -1.20 | -17.33 | -16.12 | CaMg(CO3)2 |
| Epsomite | -2.88 | -5.13 | -2.25 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 0.74 | -2.30 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -4.25 | 0.64 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -31.58 | -67.01 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -12.91 | 7.31 | 20.22 | Fe3(OH)8 |
| FeSe2 | -15.78 | -34.36 | -18.58 | FeSe2 |
| Goethite | 1.10 | 0.64 | -0.46 | FeOOH |
| Goslarite | -7.90 | -9.99 | -2.08 | ZnSO4:7H2O |
| Gypsum | -0.36 | -4.95 | -4.59 | CaSO4:2H2O |
| H2(g) | -15.98 | -19.06 | -3.08 | H2 |
| H2O(g) | -1.90 | -0.00 | 1.90 | H2O |
| Halite | -7.45 | -5.90 | 1.55 | NaCl |
| Hausmannite | -30.51 | 34.29 | 64.80 | Mn3O4 |
| Hematite | 4.13 | 1.28 | -2.85 | Fe2O3 |
| Huntite | -5.82 | -34.83 | -29.00 | CaMg3(CO3)4 |
| Hydrocerrusite | -9.85 | -27.31 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -17.72 | -24.53 | -6.80 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -19.70 | 10.60 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -21.37 | 10.60 | 31.98 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -17.07 | -26.90 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -18.31 | -26.34 | -8.04 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -21.45 | -25.37 | -3.92 | NaFe3(SO4)2(OH)6 |
| JarositeH | -25.96 | -29.29 | -3.32 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -15.56 | 2.72 | 18.27 | Cu4(OH)6SO4:H2O |
| Larnakite | -8.14 | -8.17 | -0.04 | PbO:PbSO4 |
| Laurionite | -6.72 | -6.10 | 0.62 | PbOHCl |
| Litharge | -9.62 | 3.71 | 13.33 | PbO |
| Maghemite | -5.11 | 1.28 | 6.39 | Fe2O3 |
| Magnesite | -0.95 | -8.75 | -7.80 | MgCO3 |
| Magnetite | 1.68 | 7.31 | 5.63 | Fe3O4 |
| Malachite | -5.47 | 0.42 | 5.89 | Cu2(OH)2CO3 |
| Manganite | -11.25 | 14.09 | 25.34 | MnOOH |
| Massicot | -9.83 | 3.71 | 13.54 | PbO |

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Melanothallite  -19.24  -15.04    4.19  CuCl2
Melanterite      -7.17   -9.57   -2.40  FeSO4:7H2O
Minium          -50.42   27.12   77.54  Pb3O4
Mirabilite       -5.95   -7.78   -1.83  Na2SO4:10H2O
Mn2(SO4)3       -67.32  -71.57   -4.25  Mn2(SO4)3
Mn3(AsO4)2:8H2O -20.87  -49.58  -28.71  Mn3(AsO4)2:8H2O
MnCl2:4H2O      -15.58  -13.52    2.06  MnCl2:4H2O
MnSO4           -12.75   -9.50    3.25  MnSO4
Monteponite     -11.04    3.66   14.70  CdO
Nahcolite        -4.14   -4.83   -0.69  NaHCO3
Nantokite        -3.43  -10.56   -7.13  CuCl
Natron           -9.50  -11.40   -1.90  Na2CO3:10H2O
Nesquehonite     -3.35   -8.75   -5.40  MgCO3:3H2O
Nsutite         -20.48   22.08   42.56  MnO2
O2(g)           -56.40  -59.17   -2.77  O2
Otavite          -3.56  -15.57  -12.00  CdCO3
Pb(OH)2          -4.96    3.71    8.67  Pb(OH)2
Pb2(OH)3Cl      -11.18   -2.39    8.79  Pb2(OH)3Cl
Pb2O(OH)2       -18.77    7.43   26.20  PbO:Pb(OH)2
Pb2O3           -37.63   23.41   61.04  Pb2O3
Pb2OCO3         -11.73  -11.80   -0.07  PbO:PbCO3
Pb3(AsO4)2      -21.35  -56.75  -35.40  Pb3(AsO4)2
Pb3O2CO3        -20.09   -8.08   12.01  PbCO3:2PbO
Pb3O2SO4        -15.64   -4.46   11.18  PbSO4:2PbO
Pb4(OH)6SO4     -21.85   -0.75   21.10  Pb4(OH)6SO4
Pb4O3SO4        -24.16   -0.75   23.41  PbSO4:3PbO
PbMetal         -16.52  -12.27    4.26  Pb
PbO:0.3H2O       -9.27    3.71   12.98  PbO:0.33H2O
Phosgenite      -11.61  -31.42  -19.81  PbCl2:PbCO3
Plattnerite     -32.26   19.69   51.95  PbO2
Portlandite     -13.31   10.65   23.96  Ca(OH)2
Pyrochroite      -9.10    6.10   15.20  Mn(OH)2
Pyrolusite      -21.74   22.08   43.82  MnO2
Rhodochrosite    -2.04  -13.12  -11.08  MnCO3
Rhodochrosite(d) -2.73  -13.12  -10.39  MnCO3
Scorodite       -13.06  -33.31  -20.25  FeAsO4:2H2O
Se(s)             5.11  -12.21  -17.32  Se
SeO2            -14.38  -22.76   -8.38  SeO2
Siderite         -2.39  -13.19  -10.80  FeCO3
Siderite(d)(3)   -2.74  -13.19  -10.45  FeCO3
Smithsonite      -3.77  -13.61   -9.84  ZnCO3
Smithsonite_PG   -2.80  -13.61  -10.81  ZnCO3
Tenorite         -3.61    4.58    8.19  CuO
Thenardite       -7.62   -7.78   -0.16  Na2SO4
Thermonatrite   -11.63  -11.40    0.23  Na2CO3:H2O
Trona           -16.11  -16.23   -0.12  NaHCO3:Na2CO3:2H2O
Witherite        -4.93  -13.56   -8.63  BaCO3
Zincite(c)       -6.34    5.62   11.96  ZnO
Zincosite       -13.71   -9.98    3.73  ZnSO4
Zn(OH)2-a        -6.83    5.62   12.45  Zn(OH)2
Zn(OH)2-b        -6.13    5.62   11.75  Zn(OH)2
Zn(OH)2-c        -6.58    5.62   12.20  Zn(OH)2
Zn(OH)2-e        -5.88    5.62   11.50  Zn(OH)2
Zn(OH)2-g        -6.09    5.62   11.71  Zn(OH)2
Zn2(OH)2SO4     -11.87   -4.37    7.50  Zn2(OH)2SO4
Zn2(OH)3Cl      -13.78    1.42   15.20  Zn2(OH)3Cl
Zn3(AsO4)2:2.5w -23.49  -51.04  -27.55  Zn3(AsO4)2:2.5H2O
Zn3O(SO4)2      -35.69  -14.35   21.34  ZnO:2ZnSO4
Zn4(OH)6SO4     -21.53    6.87   28.40  Zn4(OH)6SO4
Zn5(OH)8Cl2     -30.04    8.46   38.50  Zn5(OH)8Cl2
ZnCl2           -21.69  -14.01    7.68  ZnCl2
ZnCO3:1H2O       -3.35  -13.61  -10.26  ZnCO3:1H2O
ZnCO3:H2O        -3.35  -13.61  -10.26  ZnCO3:H2O
ZnMetal         -37.50  -10.36   27.14  Zn
ZnO(a)           -5.69    5.62   11.31  ZnO
ZnSO4:H2O        -9.81   -9.98   -0.17  ZnSO4:H2O

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End of simulation.
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Reading input data for simulation 7.
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Solution 7  - MW-1014B, Sample Date June 2013
Units                   mg/L
pH                      6.3      #Field value
pe                      1.62
Temperature 10.7
Alkalinity      460
As                      0.001    #Detection Limit
Ba                      0.023    #Detection Limit
Cd                      0.0022   #Detection Limit
Ca                      540
Cl                      44
Cu                      0.61
Fe                      0.07     #Detection Limit
Pb                      0.029
Mg                      170
Mn                      13
K                       24
Se                      0.002    #Detection Limit
```

| | | |
|---|---|---|
| Ag | 0.0014 | #Detection Limit |
| Na | 36 | |
| S(6) | 1400 | |
| Zn | 1.2 | |
| END | | |

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Beginning of initial solution calculations.

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Initial solution 7. - MW-1014B, Sample Date June 2013

----------Solution composition----------

| Elements | Molality | Moles |
|---|---|---|
| Ag | 1.301e-008 | 1.301e-008 |
| Alkalinity | 9.216e-003 | 9.216e-003 |
| As | 1.338e-008 | 1.338e-008 |
| Ba | 1.679e-007 | 1.679e-007 |
| Ca | 1.351e-002 | 1.351e-002 |
| Cd | 1.963e-008 | 1.963e-008 |
| Cl | 1.244e-003 | 1.244e-003 |
| Cu | 9.625e-006 | 9.625e-006 |
| Fe | 1.257e-006 | 1.257e-006 |
| K | 6.154e-004 | 6.154e-004 |
| Mg | 7.011e-003 | 7.011e-003 |
| Mn | 2.373e-004 | 2.373e-004 |
| Na | 1.570e-003 | 1.570e-003 |
| Pb | 1.403e-007 | 1.403e-007 |
| S(6) | 1.461e-002 | 1.461e-002 |
| Se | 2.540e-008 | 2.540e-008 |
| Zn | 1.841e-005 | 1.841e-005 |

----------Description of solution----------

| | |
|---|---|
| pH | = 6.300 |
| pe | = 1.620 |
| Activity of water | = 0.999 |
| Ionic strength | = 5.530e-002 |
| Mass of water (kg) | = 1.000e+000 |
| Total carbon (mol/kg) | = 1.920e-002 |
| Total CO2 (mol/kg) | = 1.920e-002 |
| Temperature (deg C) | = 10.700 |
| Electrical balance (eq) | = 4.068e-003 |
| Percent error, 100*(Cat-\|An\|)/(Cat+\|An\|) | = 6.60 |
| Iterations | = 10 |
| Total H | = 1.110216e+002 |
| Total O | = 5.561227e+001 |

----------Distribution of species----------

| Species | Molality | Log Activity | Log Molality | Log Activity | Gamma |
|---|---|---|---|---|---|
| H+ | 5.879e-007 | 5.012e-007 | -6.231 | -6.300 | -0.069 |
| OH- | 7.573e-009 | 6.204e-009 | -8.121 | -8.207 | -0.087 |
| H2O | 5.551e+001 | 9.991e-001 | 1.744 | -0.000 | 0.000 |
| Ag | 1.301e-008 | | | | |
| AgCl | 7.640e-009 | 7.738e-009 | -8.117 | -8.111 | 0.006 |
| Ag+ | 4.018e-009 | 3.292e-009 | -8.396 | -8.483 | -0.087 |
| AgCl2- | 1.056e-009 | 8.651e-010 | -8.976 | -9.063 | -0.087 |
| AgSO4- | 2.984e-010 | 2.445e-010 | -9.525 | -9.612 | -0.087 |
| AgCl3-2 | 1.447e-012 | 6.519e-013 | -11.840 | -12.186 | -0.346 |
| AgCl4-3 | 6.539e-015 | 1.088e-015 | -14.185 | -14.964 | -0.779 |
| AgOH | 6.479e-015 | 6.562e-015 | -14.188 | -14.183 | 0.006 |
| Ag(OH)2- | 1.597e-020 | 1.308e-020 | -19.797 | -19.883 | -0.087 |
| As(3) | 9.358e-009 | | | | |
| H3AsO3 | 9.349e-009 | 9.469e-009 | -8.029 | -8.024 | 0.006 |
| H2AsO3- | 9.328e-012 | 7.643e-012 | -11.030 | -11.117 | -0.087 |
| H4AsO3+ | 2.870e-015 | 2.351e-015 | -14.542 | -14.629 | -0.087 |
| HAsO3-2 | 3.533e-020 | 1.592e-020 | -19.452 | -19.798 | -0.346 |
| AsO3-3 | 2.278e-029 | 3.789e-030 | -28.642 | -29.422 | -0.779 |
| As(5) | 4.025e-009 | | | | |
| H2AsO4- | 3.259e-009 | 2.670e-009 | -8.487 | -8.574 | -0.087 |
| HAsO4-2 | 7.661e-010 | 3.452e-010 | -9.116 | -9.462 | -0.346 |
| H3AsO4 | 2.283e-013 | 2.313e-013 | -12.641 | -12.636 | 0.006 |
| AsO4-3 | 6.404e-015 | 1.065e-015 | -14.194 | -14.973 | -0.779 |
| Ba | 1.679e-007 | | | | |
| Ba+2 | 8.447e-008 | 3.806e-008 | -7.073 | -7.420 | -0.346 |
| BaSO4 | 8.144e-008 | 8.248e-008 | -7.089 | -7.084 | 0.006 |
| BaHCO3+ | 2.001e-009 | 1.639e-009 | -8.699 | -8.785 | -0.087 |
| BaCO3 | 6.797e-012 | 6.884e-012 | -11.168 | -11.162 | 0.006 |
| BaOH+ | 3.138e-015 | 2.571e-015 | -14.503 | -14.590 | -0.087 |
| C(4) | 1.920e-002 | | | | |
| CO2 | 9.989e-003 | 1.012e-002 | -2.000 | -1.995 | 0.006 |
| HCO3- | 8.528e-003 | 7.048e-003 | -2.069 | -2.152 | -0.083 |
| CaHCO3+ | 3.721e-004 | 3.048e-004 | -3.429 | -3.516 | -0.087 |
| MgHCO3+ | 2.369e-004 | 1.941e-004 | -3.625 | -3.712 | -0.087 |
| MnHCO3+ | 5.056e-005 | 4.143e-005 | -4.296 | -4.383 | -0.087 |
| NaHCO3 | 4.933e-006 | 4.996e-006 | -5.307 | -5.301 | 0.006 |
| ZnHCO3+ | 4.562e-006 | 3.738e-006 | -5.341 | -5.427 | -0.087 |
| CaCO3 | 2.881e-006 | 2.918e-006 | -5.540 | -5.535 | 0.006 |
| MnCO3 | 2.413e-006 | 2.444e-006 | -5.617 | -5.612 | 0.006 |

| | | | | | |
|---|---|---|---|---|---|
| CuHCO3+ | 1.499e-006 | 1.228e-006 | -5.824 | -5.911 | -0.087 |
| CO3-2 | 1.000e-006 | 4.666e-007 | -6.000 | -6.331 | -0.331 |
| MgCO3 | 8.656e-007 | 8.767e-007 | -6.063 | -6.057 | 0.006 |
| CuCO3 | 8.599e-007 | 8.709e-007 | -6.066 | -6.060 | 0.006 |
| ZnCO3 | 3.872e-007 | 3.921e-007 | -6.412 | -6.407 | 0.006 |
| FeHCO3+ | 2.946e-007 | 2.414e-007 | -6.531 | -6.617 | -0.087 |
| PbCO3 | 5.708e-008 | 5.781e-008 | -7.244 | -7.238 | 0.006 |
| PbHCO3+ | 4.872e-008 | 3.992e-008 | -7.312 | -7.399 | -0.087 |
| Zn(CO3)2-2 | 8.681e-009 | 3.912e-009 | -8.061 | -8.408 | -0.346 |
| NaCO3- | 6.267e-009 | 5.134e-009 | -8.203 | -8.290 | -0.087 |
| FeCO3 | 3.785e-009 | 3.833e-009 | -8.422 | -8.416 | 0.006 |
| BaHCO3+ | 2.001e-009 | 1.639e-009 | -8.699 | -8.785 | -0.087 |
| CdHCO3+ | 1.384e-009 | 1.134e-009 | -8.859 | -8.946 | -0.087 |
| Cu(CO3)2-2 | 1.135e-009 | 5.116e-010 | -8.945 | -9.291 | -0.346 |
| Pb(CO3)2-2 | 1.504e-010 | 6.775e-011 | -9.823 | -10.169 | -0.346 |
| BaCO3 | 6.797e-012 | 6.884e-012 | -11.168 | -11.162 | 0.006 |
| CdCO3 | 1.861e-012 | 1.885e-012 | -11.730 | -11.725 | 0.006 |
| Cd(CO3)2-2 | 6.173e-015 | 2.781e-015 | -14.209 | -14.556 | -0.346 |
| Ca | 1.351e-002 | | | | |
| Ca+2 | 9.753e-003 | 4.567e-003 | -2.011 | -2.340 | -0.329 |
| CaSO4 | 3.381e-003 | 3.425e-003 | -2.471 | -2.465 | 0.006 |
| CaHCO3+ | 3.721e-004 | 3.048e-004 | -3.429 | -3.516 | -0.087 |
| CaCO3 | 2.881e-006 | 2.918e-006 | -5.540 | -5.535 | 0.006 |
| CaHSO4+ | 1.054e-008 | 8.634e-009 | -7.977 | -8.064 | -0.087 |
| CaOH+ | 1.844e-009 | 1.511e-009 | -8.734 | -8.821 | -0.087 |
| Cd | 1.963e-008 | | | | |
| Cd+2 | 1.129e-008 | 5.087e-009 | -7.947 | -8.294 | -0.346 |
| CdSO4 | 5.714e-009 | 5.787e-009 | -8.243 | -8.238 | 0.006 |
| CdHCO3+ | 1.384e-009 | 1.134e-009 | -8.859 | -8.946 | -0.087 |
| Cd(SO4)2-2 | 6.675e-010 | 3.007e-010 | -9.176 | -9.522 | -0.346 |
| CdCl+ | 5.669e-010 | 4.644e-010 | -9.247 | -9.333 | -0.087 |
| CdCO3 | 1.861e-012 | 1.885e-012 | -11.730 | -11.725 | 0.006 |
| CdCl2 | 1.818e-012 | 1.842e-012 | -11.740 | -11.735 | 0.006 |
| CdOH+ | 3.380e-013 | 2.769e-013 | -12.471 | -12.558 | -0.087 |
| CdOHCl | 2.741e-013 | 2.777e-013 | -12.562 | -12.556 | 0.006 |
| Cd(CO3)2-2 | 6.173e-015 | 2.781e-015 | -14.209 | -14.556 | -0.346 |
| CdCl3- | 1.137e-015 | 9.316e-016 | -14.944 | -15.031 | -0.087 |
| Cd(OH)2 | 8.916e-017 | 9.030e-017 | -16.050 | -16.044 | 0.006 |
| Cd2OH+3 | 5.001e-020 | 8.318e-021 | -19.301 | -20.080 | -0.779 |
| Cd(OH)3- | 2.465e-023 | 2.020e-023 | -22.608 | -22.695 | -0.087 |
| Cd(OH)4-2 | 7.964e-031 | 3.588e-031 | -30.099 | -30.445 | -0.346 |
| Cl | 1.244e-003 | | | | |
| Cl- | 1.241e-003 | 1.005e-003 | -2.906 | -2.998 | -0.092 |
| CuCl2- | 1.537e-006 | 1.259e-006 | -5.813 | -5.900 | -0.087 |
| MnCl+ | 3.296e-007 | 2.701e-007 | -6.482 | -6.569 | -0.087 |
| AgCl | 7.640e-009 | 7.738e-009 | -8.117 | -8.111 | 0.006 |
| ZnCl+ | 7.173e-009 | 5.877e-009 | -8.144 | -8.231 | -0.087 |
| CuCl3-2 | 4.203e-009 | 1.894e-009 | -8.376 | -8.723 | -0.346 |
| AgCl2- | 1.056e-009 | 8.651e-010 | -8.976 | -9.063 | -0.087 |
| FeCl+ | 5.801e-010 | 4.753e-010 | -9.237 | -9.323 | -0.087 |
| CdCl+ | 5.669e-010 | 4.644e-010 | -9.247 | -9.333 | -0.087 |
| CuCl+ | 5.502e-010 | 4.507e-010 | -9.260 | -9.346 | -0.087 |
| ZnOHCl | 2.760e-010 | 2.795e-010 | -9.559 | -9.554 | 0.006 |
| PbCl+ | 2.400e-010 | 1.966e-010 | -9.620 | -9.706 | -0.087 |
| MnCl2 | 1.170e-010 | 1.185e-010 | -9.932 | -9.926 | 0.006 |
| ZnCl2 | 5.750e-012 | 5.824e-012 | -11.240 | -11.235 | 0.006 |
| CdCl2 | 1.818e-012 | 1.842e-012 | -11.740 | -11.735 | 0.006 |
| AgCl3-2 | 1.447e-012 | 6.519e-013 | -11.840 | -12.186 | -0.346 |
| PbCl2 | 4.095e-013 | 4.147e-013 | -12.388 | -12.382 | 0.006 |
| CdOHCl | 2.741e-013 | 2.777e-013 | -12.562 | -12.556 | 0.006 |
| CuCl2 | 2.042e-013 | 2.069e-013 | -12.690 | -12.684 | 0.006 |
| MnCl3- | 4.005e-014 | 3.281e-014 | -13.397 | -13.484 | -0.087 |
| ZnCl3- | 7.326e-015 | 6.002e-015 | -14.135 | -14.222 | -0.087 |
| AgCl4-3 | 6.539e-015 | 1.088e-015 | -14.185 | -14.964 | -0.779 |
| CdCl3- | 1.137e-015 | 9.316e-016 | -14.944 | -15.031 | -0.087 |
| PbCl3- | 3.684e-016 | 3.018e-016 | -15.434 | -15.520 | -0.087 |
| ZnCl4-2 | 5.958e-018 | 2.685e-018 | -17.225 | -17.571 | -0.346 |
| CuCl3- | 6.901e-019 | 5.654e-019 | -18.161 | -18.248 | -0.087 |
| PbCl4-2 | 2.871e-019 | 1.294e-019 | -18.542 | -18.888 | -0.346 |
| FeCl+2 | 2.506e-020 | 1.129e-020 | -19.601 | -19.947 | -0.346 |
| FeCl2+ | 9.961e-023 | 8.161e-023 | -22.002 | -22.088 | -0.087 |
| CuCl4-2 | 4.465e-024 | 2.012e-024 | -23.350 | -23.696 | -0.346 |
| FeCl3 | 8.100e-027 | 8.204e-027 | -26.092 | -26.086 | 0.006 |
| Cu(1) | 6.183e-006 | | | | |
| Cu+ | 4.642e-006 | 3.803e-006 | -5.333 | -5.420 | -0.087 |
| CuCl2- | 1.537e-006 | 1.259e-006 | -5.813 | -5.900 | -0.087 |
| CuCl3-2 | 4.203e-009 | 1.894e-009 | -8.376 | -8.723 | -0.346 |
| Cu(2) | 3.442e-006 | | | | |
| CuHCO3+ | 1.499e-006 | 1.228e-006 | -5.824 | -5.911 | -0.087 |
| CuCO3 | 8.599e-007 | 8.709e-007 | -6.066 | -6.060 | 0.006 |
| Cu+2 | 7.715e-007 | 3.476e-007 | -6.113 | -6.459 | -0.346 |
| CuSO4 | 2.731e-007 | 2.766e-007 | -6.564 | -6.558 | 0.006 |
| Cu(OH)2 | 2.850e-008 | 2.886e-008 | -7.545 | -7.540 | 0.006 |
| CuOH+ | 8.458e-009 | 6.929e-009 | -8.073 | -8.159 | -0.087 |
| Cu(CO3)2-2 | 1.135e-009 | 5.116e-010 | -8.945 | -9.291 | -0.346 |
| CuCl+ | 5.502e-010 | 4.507e-010 | -9.260 | -9.346 | -0.087 |
| Cu2(OH)2+2 | 1.050e-011 | 4.729e-012 | -10.979 | -11.325 | -0.346 |
| CuCl2 | 2.042e-013 | 2.069e-013 | -12.690 | -12.684 | 0.006 |
| Cu(OH)3- | 4.231e-015 | 3.467e-015 | -14.374 | -14.460 | -0.087 |
| CuCl3- | 6.901e-019 | 5.654e-019 | -18.161 | -18.248 | -0.087 |
| Cu(OH)4-2 | 3.060e-021 | 1.379e-021 | -20.514 | -20.860 | -0.346 |
| CuCl4-2 | 4.465e-024 | 2.012e-024 | -23.350 | -23.696 | -0.346 |
| Fe(2) | 1.257e-006 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Fe+2 | 7.601e-007 | 3.425e-007 | -6.119 | -6.465 | -0.346 |
| FeHCO3+ | 2.946e-007 | 2.414e-007 | -6.531 | -6.617 | -0.087 |
| FeSO4 | 1.976e-007 | 2.001e-007 | -6.704 | -6.699 | 0.006 |
| FeCO3 | 3.785e-009 | 3.833e-009 | -8.422 | -8.416 | 0.006 |
| FeCl+ | 5.801e-010 | 4.753e-010 | -9.237 | -9.323 | -0.087 |
| FeOH+ | 8.578e-011 | 7.028e-011 | -10.067 | -10.153 | -0.087 |
| FeHSO4+ | 7.903e-013 | 6.475e-013 | -12.102 | -12.189 | -0.087 |
| Fe(OH)2 | 3.188e-016 | 3.229e-016 | -15.496 | -15.491 | 0.006 |
| Fe(OH)3- | 2.519e-020 | 2.064e-020 | -19.599 | -19.685 | -0.087 |
| Fe(3) | 1.614e-012 | | | | |
| Fe(OH)2+ | 1.451e-012 | 1.188e-012 | -11.838 | -11.925 | -0.087 |
| Fe(OH)3 | 1.566e-013 | 1.586e-013 | -12.805 | -12.800 | 0.006 |
| FeOH+2 | 7.064e-015 | 3.183e-015 | -14.151 | -14.497 | -0.346 |
| Fe(OH)4- | 1.924e-016 | 1.577e-016 | -15.716 | -15.802 | -0.087 |
| FeSO4+ | 2.485e-017 | 2.036e-017 | -16.605 | -16.691 | -0.087 |
| Fe+3 | 3.599e-018 | 5.987e-019 | -17.444 | -18.223 | -0.779 |
| Fe(SO4)2- | 2.216e-018 | 1.816e-018 | -17.654 | -17.741 | -0.087 |
| FeCl+2 | 2.506e-020 | 1.129e-020 | -19.601 | -19.947 | -0.346 |
| FeCl2+ | 9.961e-023 | 8.161e-023 | -22.002 | -22.088 | -0.087 |
| FeHSO4+2 | 6.310e-023 | 2.843e-023 | -22.200 | -22.546 | -0.346 |
| Fe2(OH)2+4 | 1.230e-026 | 5.072e-028 | -25.910 | -27.295 | -1.385 |
| FeCl3 | 8.100e-027 | 8.204e-027 | -26.092 | -26.086 | 0.006 |
| Fe3(OH)4+5 | 7.345e-035 | 5.036e-037 | -34.134 | -36.298 | -2.164 |
| H(0) | 2.347e-019 | | | | |
| H2 | 1.173e-019 | 1.188e-019 | -18.931 | -18.925 | 0.006 |
| K | 6.154e-004 | | | | |
| K+ | 6.015e-004 | 4.873e-004 | -3.221 | -3.312 | -0.092 |
| KSO4- | 1.390e-005 | 1.139e-005 | -4.857 | -4.943 | -0.087 |
| Mg | 7.011e-003 | | | | |
| Mg+2 | 5.106e-003 | 2.453e-003 | -2.292 | -2.610 | -0.318 |
| MgSO4 | 1.667e-003 | 1.689e-003 | -2.778 | -2.772 | 0.006 |
| MgHCO3+ | 2.369e-004 | 1.941e-004 | -3.625 | -3.712 | -0.087 |
| MgCO3 | 8.656e-007 | 8.767e-007 | -6.063 | -6.057 | 0.006 |
| MgOH+ | 5.582e-009 | 4.573e-009 | -8.253 | -8.340 | -0.087 |
| Mn(2) | 2.373e-004 | | | | |
| Mn+2 | 1.464e-004 | 6.595e-005 | -3.835 | -4.181 | -0.346 |
| MnHCO3+ | 5.056e-005 | 4.143e-005 | -4.296 | -4.383 | -0.087 |
| MnSO4 | 3.759e-005 | 3.808e-005 | -4.425 | -4.419 | 0.006 |
| MnCO3 | 2.413e-006 | 2.444e-006 | -5.617 | -5.612 | 0.006 |
| MnCl+ | 3.296e-007 | 2.701e-007 | -6.482 | -6.569 | -0.087 |
| MnOH+ | 1.212e-009 | 9.933e-010 | -8.916 | -9.003 | -0.087 |
| MnCl2 | 1.170e-010 | 1.185e-010 | -9.932 | -9.926 | 0.006 |
| MnCl3- | 4.005e-014 | 3.281e-014 | -13.397 | -13.484 | -0.087 |
| Mn(OH)3- | 1.011e-020 | 8.281e-021 | -19.995 | -20.082 | -0.087 |
| Mn(3) | 5.695e-029 | | | | |
| Mn+3 | 5.695e-029 | 9.473e-030 | -28.244 | -29.023 | -0.779 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -70.936 | -71.282 | -0.346 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -79.942 | -80.028 | -0.087 |
| Na | 1.570e-003 | | | | |
| Na+ | 1.535e-003 | 1.261e-003 | -2.814 | -2.899 | -0.085 |
| NaSO4- | 3.032e-005 | 2.484e-005 | -4.518 | -4.605 | -0.087 |
| NaHCO3 | 4.933e-006 | 4.996e-006 | -5.307 | -5.301 | 0.006 |
| NaCO3- | 6.267e-009 | 5.134e-009 | -8.203 | -8.290 | -0.087 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -59.384 | -59.378 | 0.006 |
| Pb | 1.403e-007 | | | | |
| PbCO3 | 5.708e-008 | 5.781e-008 | -7.244 | -7.238 | 0.006 |
| PbHCO3+ | 4.872e-008 | 3.992e-008 | -7.312 | -7.399 | -0.087 |
| PbSO4 | 1.712e-008 | 1.734e-008 | -7.767 | -7.761 | 0.006 |
| Pb+2 | 1.582e-008 | 7.130e-009 | -7.801 | -8.147 | -0.346 |
| Pb(SO4)2-2 | 8.731e-010 | 3.934e-010 | -9.059 | -9.405 | -0.346 |
| PbOH+ | 3.383e-010 | 2.772e-010 | -9.471 | -9.557 | -0.087 |
| PbCl+ | 2.400e-010 | 1.966e-010 | -9.620 | -9.706 | -0.087 |
| Pb(CO3)2-2 | 1.504e-010 | 6.775e-011 | -9.823 | -10.169 | -0.346 |
| PbCl2 | 4.095e-013 | 4.147e-013 | -12.388 | -12.382 | 0.006 |
| Pb(OH)2 | 2.122e-013 | 2.149e-013 | -12.673 | -12.668 | 0.006 |
| PbCl3- | 3.684e-016 | 3.018e-016 | -15.434 | -15.520 | -0.087 |
| Pb2OH+3 | 2.660e-016 | 4.424e-017 | -15.575 | -16.354 | -0.779 |
| Pb(OH)3- | 6.005e-018 | 4.920e-018 | -17.221 | -17.308 | -0.087 |
| PbCl4-2 | 2.871e-019 | 1.294e-019 | -18.542 | -18.888 | -0.346 |
| Pb(OH)4-2 | 4.986e-023 | 2.247e-023 | -22.302 | -22.648 | -0.346 |
| Pb3(OH)4+2 | 1.760e-024 | 7.929e-025 | -23.755 | -24.101 | -0.346 |
| S(6) | 1.461e-002 | | | | |
| SO4-2 | 9.478e-003 | 4.324e-003 | -2.023 | -2.364 | -0.341 |
| CaSO4 | 3.381e-003 | 3.425e-003 | -2.471 | -2.465 | 0.006 |
| MgSO4 | 1.667e-003 | 1.689e-003 | -2.778 | -2.772 | 0.006 |
| MnSO4 | 3.759e-005 | 3.808e-005 | -4.425 | -4.419 | 0.006 |
| NaSO4- | 3.032e-005 | 2.484e-005 | -4.518 | -4.605 | -0.087 |
| KSO4- | 1.390e-005 | 1.139e-005 | -4.857 | -4.943 | -0.087 |
| ZnSO4 | 3.755e-006 | 3.804e-006 | -5.425 | -5.420 | 0.006 |
| Zn(SO4)2-2 | 3.331e-007 | 1.501e-007 | -6.477 | -6.824 | -0.346 |
| CuSO4 | 2.731e-007 | 2.766e-007 | -6.564 | -6.558 | 0.006 |
| FeSO4 | 1.976e-007 | 2.001e-007 | -6.704 | -6.699 | 0.006 |
| HSO4- | 1.919e-007 | 1.572e-007 | -6.717 | -6.803 | -0.087 |
| BaSO4 | 8.144e-008 | 8.248e-008 | -7.089 | -7.084 | 0.006 |
| PbSO4 | 1.712e-008 | 1.734e-008 | -7.767 | -7.761 | 0.006 |
| CaHSO4+ | 1.054e-008 | 8.634e-009 | -7.977 | -8.064 | -0.087 |
| CdSO4 | 5.714e-009 | 5.787e-009 | -8.243 | -8.238 | 0.006 |
| Pb(SO4)2-2 | 8.731e-010 | 3.934e-010 | -9.059 | -9.405 | -0.346 |
| Cd(SO4)2-2 | 6.675e-010 | 3.007e-010 | -9.176 | -9.522 | -0.346 |
| AgSO4- | 2.984e-010 | 2.445e-010 | -9.525 | -9.612 | -0.087 |

| | | | | |
|---|---|---|---|---|
| FeHSO4+ | 7.903e-013 | 6.475e-013 | -12.102 | -12.189 | -0.087 |
| FeSO4+ | 2.485e-017 | 2.036e-017 | -16.605 | -16.691 | -0.087 |
| Fe(SO4)2- | 2.216e-018 | 1.816e-018 | -17.654 | -17.741 | -0.087 |
| FeHSO4+2 | 6.310e-023 | 2.843e-023 | -22.200 | -22.546 | -0.346 |
| Se(-2) | 7.882e-022 | | | | |
| HSe- | 7.850e-022 | 6.432e-022 | -21.105 | -21.192 | -0.087 |
| H2Se | 3.152e-024 | 3.192e-024 | -23.501 | -23.496 | 0.006 |
| Se(4) | 2.540e-008 | | | | |
| HSeO3- | 2.510e-008 | 2.057e-008 | -7.600 | -7.687 | -0.087 |
| SeO3-2 | 2.880e-010 | 1.298e-010 | -9.541 | -9.887 | -0.346 |
| H2SeO3 | 5.723e-012 | 5.797e-012 | -11.242 | -11.237 | 0.006 |
| Se(6) | 1.104e-024 | | | | |
| SeO4-2 | 1.104e-024 | 4.975e-025 | -23.957 | -24.303 | -0.346 |
| HSeO4- | 9.163e-030 | 7.507e-030 | -29.038 | -29.125 | -0.087 |
| Zn | 1.841e-005 | | | | |
| Zn+2 | 9.349e-006 | 4.212e-006 | -5.029 | -5.375 | -0.346 |
| ZnHCO3+ | 4.562e-006 | 3.738e-006 | -5.341 | -5.427 | -0.087 |
| ZnSO4 | 3.755e-006 | 3.804e-006 | -5.425 | -5.420 | 0.006 |
| ZnCO3 | 3.872e-007 | 3.921e-007 | -6.412 | -6.407 | 0.006 |
| Zn(SO4)2-2 | 3.331e-007 | 1.501e-007 | -6.477 | -6.824 | -0.346 |
| Zn(CO3)2-2 | 8.681e-009 | 3.912e-009 | -8.061 | -8.408 | -0.346 |
| ZnCl+ | 7.173e-009 | 5.877e-009 | -8.144 | -8.231 | -0.087 |
| ZnOH+ | 3.597e-009 | 2.947e-009 | -8.444 | -8.531 | -0.087 |
| ZnOHCl | 2.760e-010 | 2.795e-010 | -9.559 | -9.554 | 0.006 |
| Zn(OH)2 | 2.081e-010 | 2.107e-010 | -9.682 | -9.676 | 0.006 |
| ZnCl2 | 5.750e-012 | 5.824e-012 | -11.240 | -11.235 | 0.006 |
| ZnCl3- | 7.326e-015 | 6.002e-015 | -14.135 | -14.222 | -0.087 |
| Zn(OH)3- | 1.622e-015 | 1.329e-015 | -14.790 | -14.877 | -0.087 |
| ZnCl4-2 | 5.958e-018 | 2.685e-018 | -17.225 | -17.571 | -0.346 |
| Zn(OH)4-2 | 9.316e-022 | 4.198e-022 | -21.031 | -21.377 | -0.346 |

----------Saturation indices----------

| Phase | SI | log IAP | log KT | |
|---|---|---|---|---|
| Ag2CO3 | -11.87 | -23.30 | -11.42 | Ag2CO3 |
| Ag2O | -17.33 | -4.37 | 12.97 | Ag2O |
| Ag2SO4 | -14.25 | -19.33 | -5.08 | Ag2SO4 |
| AgMetal | 4.34 | -10.10 | -14.44 | Ag |
| Anglesite | -2.64 | -10.51 | -7.87 | PbSO4 |
| Anhydrite | -0.37 | -4.70 | -4.34 | CaSO4 |
| Antlerite | -4.83 | 3.46 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.41 | -8.67 | -8.26 | CaCO3 |
| Arsenolite | -14.40 | -16.05 | -1.65 | As2O3 |
| Artinite | -9.62 | 1.05 | 10.66 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -33.78 | -25.27 | 8.51 | As2O5 |
| As_native | -18.23 | -31.78 | -13.55 | As |
| Atacamite | -5.05 | 2.98 | 8.03 | Cu2(OH)3Cl |
| Azurite | -3.37 | 1.52 | 4.89 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | -1.74 | -52.20 | -50.46 | Ba3(AsO4)2 |
| Barite | 0.45 | -9.78 | -10.23 | BaSO4 |
| BaSeO3 | -10.92 | -17.31 | -6.39 | BaSeO3 |
| Bianchite | -5.98 | -7.74 | -1.76 | ZnSO4:6H2O |
| Birnessite | -19.34 | 24.26 | 43.60 | MnO2 |
| Bixbyite | -20.20 | -20.25 | -0.05 | Mn2O3 |
| Brochantite | -5.74 | 9.60 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -7.85 | 9.99 | 17.84 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -18.06 | -36.97 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.26 | -8.67 | -8.41 | CaCO3 |
| CaSeO3 | -6.63 | -12.23 | -5.60 | CaSeO3 |
| Cd(gamma) | -25.79 | -11.53 | 14.26 | Cd |
| Cd(OH)2 | -9.34 | 4.31 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -10.19 | 4.31 | 14.50 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -23.72 | -17.01 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -24.61 | -2.05 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -26.14 | 2.26 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -13.77 | -14.29 | -0.51 | CdCl2 |
| CdCl2:2.5H2O | -12.29 | -14.29 | -2.00 | CdCl2:2.5H2O |
| CdCl2:H2O | -12.65 | -14.29 | -1.64 | CdCl2:H2O |
| CdMetal | -25.69 | -11.53 | 14.15 | Cd |
| CdOHCl | -8.79 | -4.99 | 3.79 | CdOHCl |
| CdSO4 | -11.10 | -10.66 | 0.44 | CdSO4 |
| CdSO4:2.7H2O | -8.94 | -10.66 | -1.71 | CdSO4:2.67H2O |
| CdSO4:H2O | -9.28 | -10.66 | -1.38 | CdSO4:H2O |
| Cerargyrite | -1.15 | -11.48 | -10.33 | AgCl |
| Cerrusite | -1.17 | -14.48 | -13.31 | PbCO3 |
| Chalcanthite | -6.13 | -8.82 | -2.69 | CuSO4:5H2O |
| Claudetite | -14.46 | -16.05 | -1.59 | As2O3 |
| CO2(g) | -0.72 | -1.99 | -1.28 | CO2 |
| Cotunnite | -9.17 | -14.14 | -4.98 | PbCl2 |
| Cu(OH)2 | -3.06 | 6.14 | 9.20 | Cu(OH)2 |
| Cu2SO4 | -11.42 | -13.20 | -1.78 | Cu2SO4 |
| Cu3(AsO4)2:6w | -14.20 | -49.32 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -3.16 | -12.79 | -9.63 | CuCO3 |
| CuMetal | 2.35 | -7.04 | -9.39 | Cu |
| CuOCuSO4 | -15.53 | -2.68 | 12.84 | CuO:CuSO4 |
| CupricFerrite | 0.19 | 7.49 | 7.31 | CuFe2O4 |
| Cuprite | 3.54 | 1.76 | -1.78 | Cu2O |
| CuprousFerrite | 10.34 | 1.56 | -8.78 | CuFeO2 |
| CuSO4 | -12.50 | -8.82 | 3.68 | CuSO4 |
| Dolomite | -0.87 | -17.61 | -16.74 | CaMg(CO3)2 |
| Dolomite(d) | -1.48 | -17.61 | -16.13 | CaMg(CO3)2 |
| Epsomite | -2.73 | -4.98 | -2.24 | MgSO4:7H2O |

| | | | | |
|---|---|---|---|---|
| Fe(OH)2.7Cl.3 | 0.93 | -2.11 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -4.21 | 0.68 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -30.68 | -66.11 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -12.74 | 7.49 | 20.22 | Fe3(OH)8 |
| FeSe2 | -14.43 | -33.01 | -18.58 | FeSe2 |
| Goethite | 1.14 | 0.68 | -0.47 | FeOOH |
| Goslarite | -5.66 | -7.74 | -2.08 | ZnSO4:7H2O |
| Gypsum | -0.11 | -4.71 | -4.59 | CaSO4:2H2O |
| H2(g) | -15.84 | -18.93 | -3.09 | H2 |
| H2O(g) | -1.90 | -0.00 | 1.90 | H2O |
| Halite | -7.45 | -5.90 | 1.55 | NaCl |
| Hausmannite | -23.65 | 41.10 | 64.75 | Mn3O4 |
| Hematite | 4.22 | 1.35 | -2.87 | Fe2O3 |
| Huntite | -6.48 | -35.50 | -29.02 | CaMg3(CO3)4 |
| Hydrocerrusite | -7.04 | -24.50 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -18.95 | -25.78 | -6.83 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -11.09 | 19.22 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -12.72 | 19.22 | 31.94 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -15.67 | -25.50 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -16.86 | -24.91 | -8.05 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -20.55 | -24.50 | -3.94 | NaFe3(SO4)2(OH)6 |
| JarositeH | -24.55 | -27.90 | -3.35 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -8.66 | 9.60 | 18.25 | Cu4(OH)6SO4:H2O |
| Larnakite | -6.02 | -6.06 | -0.04 | PbO:PbSO4 |
| Laurionite | -5.47 | -4.85 | 0.62 | PbOHCl |
| Litharge | -8.87 | 4.45 | 13.32 | PbO |
| Maghemite | -5.03 | 1.35 | 6.39 | Fe2O3 |
| Magnesite | -1.14 | -8.94 | -7.80 | MgCO3 |
| Magnetite | 1.89 | 7.49 | 5.60 | Fe3O4 |
| Malachite | -2.05 | 3.83 | 5.88 | Cu2(OH)2CO3 |
| Manganite | -9.00 | 16.34 | 25.34 | MnOOH |
| Massicot | -9.08 | 4.45 | 13.53 | PbO |
| Melanothallite | -16.64 | -12.45 | 4.18 | CuCl2 |
| Melanterite | -6.43 | -8.83 | -2.40 | FeSO4:7H2O |
| Minium | -48.29 | 29.20 | 77.48 | Pb3O4 |
| Mirabilite | -6.35 | -8.17 | -1.82 | Na2SO4:10H2O |
| Mn2(SO4)3 | -60.87 | -65.14 | -4.27 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -13.78 | -42.49 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.25 | -10.18 | 2.07 | MnCl2:4H2O |
| MnSO4 | -9.79 | -6.54 | 3.24 | MnSO4 |
| Monteponite | -10.38 | 4.31 | 14.68 | CdO |
| Nahcolite | -4.37 | -5.05 | -0.69 | NaHCO3 |
| Nantokite | -1.29 | -8.42 | -7.13 | CuCl |
| Natron | -10.24 | -12.13 | -1.89 | Na2CO3:10H2O |
| Nesquehonite | -3.54 | -8.94 | -5.41 | MgCO3:3H2O |
| Nsutite | -18.31 | 24.26 | 42.56 | MnO2 |
| O2(g) | -56.61 | -59.38 | -2.77 | O2 |
| Otavite | -2.62 | -14.62 | -12.00 | CdCO3 |
| Pb(OH)2 | -4.21 | 4.45 | 8.67 | Pb(OH)2 |
| Pb2(OH)3Cl | -9.19 | -0.39 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -17.29 | 8.91 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -36.29 | 24.75 | 61.04 | Pb2O3 |
| Pb2OCO3 | -9.95 | -10.03 | -0.08 | PbO:PbCO3 |
| Pb3(AsO4)2 | -18.98 | -54.39 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -17.57 | -5.57 | 12.00 | PbCO3:2PbO |
| Pb3O2SO4 | -12.77 | -1.61 | 11.17 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -18.25 | 2.85 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -20.55 | 2.85 | 23.40 | PbSO4:3PbO |
| PbMetal | -15.64 | -11.39 | 4.26 | Pb |
| PbO:0.3H2O | -8.53 | 4.45 | 12.98 | PbO:0.33H2O |
| Phosgenite | -8.81 | -28.62 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -31.62 | 20.29 | 51.91 | PbO2 |
| Portlandite | -13.69 | 10.26 | 23.94 | Ca(OH)2 |
| Pyrochroite | -6.78 | 8.42 | 15.20 | Mn(OH)2 |
| Pyrolusite | -19.53 | 24.26 | 43.78 | MnO2 |
| Rhodochrosite | 0.57 | -10.51 | -11.08 | MnCO3 |
| Rhodochrosite(d) | -0.12 | -10.51 | -10.39 | MnCO3 |
| Scorodite | -12.95 | -33.20 | -20.25 | FeAsO4:2H2O |
| Se(s) | 5.67 | -11.65 | -17.32 | Se |
| SeO2 | -14.11 | -22.49 | -8.38 | SeO2 |
| Siderite | -2.00 | -12.80 | -10.80 | FeCO3 |
| Siderite(d)(3) | -2.35 | -12.80 | -10.45 | FeCO3 |
| Smithsonite | -1.87 | -11.71 | -9.84 | ZnCO3 |
| Smithsonite_PG | -0.90 | -11.71 | -10.81 | ZnCO3 |
| Tenorite | -2.04 | 6.14 | 8.18 | CuO |
| Thenardite | -8.01 | -8.16 | -0.16 | Na2SO4 |
| Thermonatrite | -12.36 | -12.13 | 0.23 | Na2CO3:H2O |
| Trona | -17.05 | -17.18 | -0.13 | NaHCO3:Na2CO3:2H2O |
| Witherite | -5.12 | -13.75 | -8.63 | BaCO3 |
| Zincite(c) | -4.72 | 7.22 | 11.95 | ZnO |
| Zincosite | -11.46 | -7.74 | 3.72 | ZnSO4 |
| Zn(OH)2-a | -5.23 | 7.22 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -4.53 | 7.22 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -4.98 | 7.22 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -4.28 | 7.22 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -4.49 | 7.22 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -8.02 | -0.52 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -10.05 | 5.15 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -18.53 | -46.07 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -29.56 | -8.26 | 21.31 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -14.47 | 13.93 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -20.98 | 17.52 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -19.05 | -11.37 | 7.68 | ZnCl2 |

```
ZnCO3:1H2O      -1.45  -11.71  -10.26  ZnCO3:1H2O
ZnCO3:H2O       -1.45  -11.71  -10.26  ZnCO3:H2O
ZnMetal        -35.73   -8.62   27.12  Zn
ZnO(a)          -4.09    7.22   11.31  ZnO
ZnSO4:H2O       -7.56   -7.74   -0.18  ZnSO4:H2O

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End of simulation.
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Reading input data for simulation 8.
-------------------

Solution 8  - MW-1014C, Sample Date June 2013
Units                    mg/L
pH                       6.62     #Field value
pe                       1.06
Temperature 11.9
Alkalinity      270
As                       0.021
Ba                       0.034
Cd                       0.00012   #Detection Limit
Ca                       160
Cl                       49
Cu                       0.0016    #Detection Limit
Fe                       5.1
Pb                       0.0014
Mg                       39
Mn                       1.7
K                        5.4
Se                       0.002     #Detection Limit
Ag                       0.065     #Detection Limit
Na                       11
S(6)                     210
Zn                       0.29
END
-----------------------
Beginning of initial solution calculations.
-----------------------

Initial solution 8.          - MW-1014C, Sample Date June 2013

---------------Solution composition---------------

Elements        Molality      Moles

Ag            6.030e-007  6.030e-007
Alkalinity      5.399e-003  5.399e-003
As            2.805e-007  2.805e-007
Ba            2.477e-007  2.477e-007
Ca            3.995e-003  3.995e-003
Cd            1.068e-009  1.068e-009
Cl            1.383e-003  1.383e-003
Cu            2.520e-008  2.520e-008
Fe            9.139e-005  9.139e-005
K             1.382e-004  1.382e-004
Mg            1.605e-003  1.605e-003
Mn            3.097e-005  3.097e-005
Na            4.788e-004  4.788e-004
Pb            6.762e-009  6.762e-009
S(6)          2.188e-003  2.188e-003
Se            2.535e-008  2.535e-008
Zn            4.440e-006  4.440e-006

---------------Description of solution---------------

                pH  =   6.620
                pe  =   1.060
        Activity of water  =   1.000
           Ionic strength  =  1.701e-002
        Mass of water (kg)  =  1.000e+000
      Total carbon (mol/kg)  =  8.462e-003
        Total CO2 (mol/kg)  =  8.462e-003
        Temperature (deg C)  =  11.900
     Electrical balance (eq)  =  9.151e-004
 Percent error, 100*(Cat-|An|)/(Cat+|An|)  =   4.42
              Iterations  =   9
                Total H  = 1.110178e+002
                Total O  = 5.553729e+001

---------------Distribution of species---------------

                                  Log      Log       Log
  Species            Molality   Activity  Molality  Activity    Gamma

  H+               2.673e-007  2.399e-007   -6.573    -6.620    -0.047
  OH-              1.635e-008  1.441e-008   -7.786    -7.841    -0.055
  H2O              5.551e+001  9.997e-001    1.744    -0.000     0.000
Ag            6.030e-007
  AgCl             3.843e-007  3.858e-007   -6.415    -6.414     0.002
  Ag+              1.573e-007  1.386e-007   -6.803    -6.858    -0.055
  AgCl2-            5.858e-008  5.161e-008   -7.232    -7.287    -0.055
```

| | | | | | |
|---|---|---|---|---|---|
| AgSO4- | 2.753e-009 | 2.425e-009 | -8.560 | -8.615 | -0.055 |
| AgCl3-2 | 8.030e-011 | 4.838e-011 | -10.095 | -10.315 | -0.220 |
| AgOH | 5.754e-013 | 5.777e-013 | -12.240 | -12.238 | 0.002 |
| AgCl4-3 | 3.048e-013 | 9.749e-014 | -12.516 | -13.011 | -0.495 |
| Ag(OH)2- | 2.732e-018 | 2.407e-018 | -17.563 | -17.618 | -0.055 |
| As(3) | 2.029e-007 | | | | |
| H3AsO3 | 2.025e-007 | 2.033e-007 | -6.694 | -6.692 | 0.002 |
| H2AsO3- | 4.086e-010 | 3.600e-010 | -9.389 | -9.444 | -0.055 |
| H4AsO3+ | 2.742e-014 | 2.416e-014 | -13.562 | -13.617 | -0.055 |
| HAsO3-2 | 2.753e-018 | 1.659e-018 | -17.560 | -17.780 | -0.220 |
| AsO3-3 | 2.698e-027 | 8.628e-028 | -26.569 | -27.064 | -0.495 |
| As(5) | 7.763e-008 | | | | |
| H2AsO4- | 5.556e-008 | 4.895e-008 | -7.255 | -7.310 | -0.055 |
| HAsO4-2 | 2.207e-008 | 1.330e-008 | -7.656 | -7.876 | -0.220 |
| H3AsO4 | 2.047e-012 | 2.055e-012 | -11.689 | -11.687 | 0.002 |
| AsO4-3 | 2.769e-013 | 8.856e-014 | -12.558 | -13.053 | -0.495 |
| Ba | 2.477e-007 | | | | |
| Ba+2 | 1.872e-007 | 1.128e-007 | -6.728 | -6.948 | -0.220 |
| BaSO4 | 5.673e-008 | 5.695e-008 | -7.246 | -7.244 | 0.002 |
| BaHCO3+ | 3.740e-009 | 3.295e-009 | -8.427 | -8.482 | -0.055 |
| BaCO3 | 2.938e-011 | 2.950e-011 | -10.532 | -10.530 | 0.002 |
| BaOH+ | 1.808e-014 | 1.593e-014 | -13.743 | -13.798 | -0.055 |
| C(4) | 8.462e-003 | | | | |
| HCO3- | 5.199e-003 | 4.603e-003 | -2.284 | -2.337 | -0.053 |
| CO2 | 3.068e-003 | 3.080e-003 | -2.513 | -2.511 | 0.002 |
| CaHCO3+ | 1.099e-004 | 9.685e-005 | -3.959 | -4.014 | -0.055 |
| MgHCO3+ | 5.135e-005 | 4.524e-005 | -4.289 | -4.344 | -0.055 |
| FeHCO3+ | 2.041e-005 | 1.798e-005 | -4.690 | -4.745 | -0.055 |
| MnHCO3+ | 6.213e-006 | 5.474e-006 | -5.207 | -5.262 | -0.055 |
| CaCO3 | 1.951e-006 | 1.958e-006 | -5.710 | -5.708 | 0.002 |
| ZnHCO3+ | 1.093e-006 | 9.633e-007 | -5.961 | -6.016 | -0.055 |
| NaHCO3 | 1.082e-006 | 1.086e-006 | -5.966 | -5.964 | 0.002 |
| CO3-2 | 1.072e-006 | 6.584e-007 | -5.970 | -6.181 | -0.212 |
| MnCO3 | 6.952e-007 | 6.980e-007 | -6.158 | -6.156 | 0.002 |
| FeCO3 | 6.147e-007 | 6.171e-007 | -6.211 | -6.210 | 0.002 |
| MgCO3 | 4.473e-007 | 4.490e-007 | -6.349 | -6.348 | 0.002 |
| ZnCO3 | 2.176e-007 | 2.184e-007 | -6.662 | -6.661 | 0.002 |
| Zn(CO3)2-2 | 5.103e-009 | 3.075e-009 | -8.292 | -8.512 | -0.220 |
| PbCO3 | 4.296e-009 | 4.313e-009 | -8.367 | -8.365 | 0.002 |
| BaHCO3+ | 3.740e-009 | 3.295e-009 | -8.427 | -8.482 | -0.055 |
| NaCO3- | 2.926e-009 | 2.578e-009 | -8.534 | -8.589 | -0.055 |
| PbHCO3+ | 1.564e-009 | 1.378e-009 | -8.806 | -8.861 | -0.055 |
| CuCO3 | 1.166e-009 | 1.171e-009 | -8.933 | -8.931 | 0.002 |
| CuHCO3+ | 8.670e-010 | 7.638e-010 | -9.062 | -9.117 | -0.055 |
| CdHCO3+ | 7.938e-011 | 6.994e-011 | -10.100 | -10.155 | -0.055 |
| BaCO3 | 2.938e-011 | 2.950e-011 | -10.532 | -10.530 | 0.002 |
| Pb(CO3)2-2 | 1.184e-011 | 7.134e-012 | -10.927 | -11.147 | -0.220 |
| Cu(CO3)2-2 | 1.611e-012 | 9.706e-013 | -11.793 | -12.013 | -0.220 |
| CdCO3 | 2.503e-013 | 2.513e-013 | -12.601 | -12.600 | 0.002 |
| Cd(CO3)2-2 | 8.685e-016 | 5.233e-016 | -15.061 | -15.281 | -0.220 |
| Ca | 3.995e-003 | | | | |
| Ca+2 | 3.504e-003 | 2.152e-003 | -2.455 | -2.667 | -0.212 |
| CaSO4 | 3.790e-004 | 3.805e-004 | -3.421 | -3.420 | 0.002 |
| CaHCO3+ | 1.099e-004 | 9.685e-005 | -3.959 | -4.014 | -0.055 |
| CaCO3 | 1.951e-006 | 1.958e-006 | -5.710 | -5.708 | 0.002 |
| CaOH+ | 1.689e-009 | 1.488e-009 | -8.772 | -8.827 | -0.055 |
| CaHSO4+ | 5.268e-010 | 4.641e-010 | -9.278 | -9.333 | -0.055 |
| Cd | 1.068e-009 | | | | |
| Cd+2 | 7.975e-010 | 4.805e-010 | -9.098 | -9.318 | -0.220 |
| CdSO4 | 1.279e-010 | 1.284e-010 | -9.893 | -9.892 | 0.002 |
| CdHCO3+ | 7.938e-011 | 6.994e-011 | -10.100 | -10.155 | -0.055 |
| CdCl+ | 6.041e-011 | 5.323e-011 | -10.219 | -10.274 | -0.055 |
| Cd(SO4)2-2 | 2.559e-012 | 1.542e-012 | -11.592 | -11.812 | -0.220 |
| CdCl2 | 2.552e-013 | 2.562e-013 | -12.593 | -12.591 | 0.002 |
| CdCO3 | 2.503e-013 | 2.513e-013 | -12.601 | -12.600 | 0.002 |
| CdOH+ | 6.844e-014 | 6.030e-014 | -13.165 | -13.220 | -0.055 |
| CdOHCl | 6.815e-014 | 6.842e-014 | -13.167 | -13.165 | 0.002 |
| Cd(CO3)2-2 | 8.685e-016 | 5.233e-016 | -15.061 | -15.281 | -0.220 |
| CdCl3- | 1.812e-016 | 1.597e-016 | -15.742 | -15.797 | -0.055 |
| Cd(OH)2 | 3.713e-017 | 3.728e-017 | -16.430 | -16.429 | 0.002 |
| Cd2OH+3 | 5.263e-022 | 1.683e-022 | -21.279 | -21.774 | -0.495 |
| Cd(OH)3- | 1.978e-023 | 1.743e-023 | -22.704 | -22.759 | -0.055 |
| Cd(OH)4-2 | 1.075e-030 | 6.474e-031 | -29.969 | -30.189 | -0.220 |
| Cl | 1.383e-003 | | | | |
| Cl- | 1.382e-003 | 1.214e-003 | -2.859 | -2.916 | -0.056 |
| AgCl | 3.843e-007 | 3.858e-007 | -6.415 | -6.414 | 0.002 |
| MnCl+ | 7.492e-008 | 6.601e-008 | -7.125 | -7.180 | -0.055 |
| FeCl+ | 7.432e-008 | 6.548e-008 | -7.129 | -7.184 | -0.055 |
| AgCl2- | 5.858e-008 | 5.161e-008 | -7.232 | -7.287 | -0.055 |
| CuCl2- | 7.280e-009 | 6.414e-009 | -8.138 | -8.193 | -0.055 |
| ZnCl+ | 3.370e-009 | 2.969e-009 | -8.472 | -8.527 | -0.055 |
| ZnOHCl | 2.775e-010 | 2.786e-010 | -9.557 | -9.555 | 0.002 |
| AgCl3-2 | 8.030e-011 | 4.838e-011 | -10.095 | -10.315 | -0.220 |
| CdCl+ | 6.041e-011 | 5.323e-011 | -10.219 | -10.274 | -0.055 |
| MnCl2 | 3.485e-011 | 3.499e-011 | -10.458 | -10.456 | 0.002 |
| CuCl3-2 | 1.943e-011 | 1.171e-011 | -10.711 | -10.931 | -0.220 |
| PbCl+ | 1.472e-011 | 1.297e-011 | -10.832 | -10.887 | -0.055 |
| ZnCl2 | 3.559e-012 | 3.573e-012 | -11.449 | -11.447 | 0.002 |
| CuCl+ | 6.279e-013 | 5.532e-013 | -12.202 | -12.257 | -0.055 |
| AgCl4-3 | 3.048e-013 | 9.749e-014 | -12.516 | -13.011 | -0.495 |
| CdCl2 | 2.552e-013 | 2.562e-013 | -12.593 | -12.591 | 0.002 |
| CdOHCl | 6.815e-014 | 6.842e-014 | -13.167 | -13.165 | 0.002 |
| PbCl2 | 3.212e-014 | 3.225e-014 | -13.493 | -13.492 | 0.002 |

| | | | | | |
|---|---|---|---|---|---|
| MnCl3- | 1.328e-014 | 1.170e-014 | -13.877 | -13.932 | -0.055 |
| ZnCl3- | 5.088e-015 | 4.483e-015 | -14.293 | -14.348 | -0.055 |
| CuCl2 | 3.098e-016 | 3.111e-016 | -15.509 | -15.507 | 0.002 |
| CdCl3- | 1.812e-016 | 1.597e-016 | -15.742 | -15.797 | -0.055 |
| PbCl3- | 3.244e-017 | 2.858e-017 | -16.489 | -16.544 | -0.055 |
| ZnCl4-2 | 4.062e-018 | 2.447e-018 | -17.391 | -17.611 | -0.220 |
| FeCl+2 | 7.970e-019 | 4.802e-019 | -18.099 | -18.319 | -0.220 |
| PbCl4-2 | 2.481e-020 | 1.495e-020 | -19.605 | -19.825 | -0.220 |
| FeCl2+ | 4.564e-021 | 4.021e-021 | -20.341 | -20.396 | -0.055 |
| CuCl3- | 1.193e-021 | 1.051e-021 | -20.923 | -20.978 | -0.055 |
| FeCl3 | 4.863e-025 | 4.882e-025 | -24.313 | -24.311 | 0.002 |
| CuCl4-2 | 7.731e-027 | 4.658e-027 | -26.112 | -26.332 | -0.220 |
| Cu(1) | 2.242e-008 | | | | |
| Cu+ | 1.512e-008 | 1.332e-008 | -7.821 | -7.876 | -0.055 |
| CuCl2- | 7.280e-009 | 6.414e-009 | -8.138 | -8.193 | -0.055 |
| CuCl3-2 | 1.943e-011 | 1.171e-011 | -10.711 | -10.931 | -0.220 |
| Cu(2) | 2.782e-009 | | | | |
| CuCO3 | 1.166e-009 | 1.171e-009 | -8.933 | -8.931 | 0.002 |
| CuHCO3+ | 8.670e-010 | 7.638e-010 | -9.062 | -9.117 | -0.055 |
| Cu+2 | 5.496e-010 | 3.311e-010 | -9.260 | -9.480 | -0.220 |
| Cu(OH)2 | 1.197e-010 | 1.202e-010 | -9.922 | -9.920 | 0.002 |
| CuSO4 | 6.171e-011 | 6.195e-011 | -10.210 | -10.208 | 0.002 |
| CuOH+ | 1.566e-011 | 1.380e-011 | -10.805 | -10.860 | -0.055 |
| Cu(CO3)2-2 | 1.611e-012 | 9.706e-013 | -11.793 | -12.013 | -0.220 |
| CuCl+ | 6.279e-013 | 5.532e-013 | -12.202 | -12.257 | -0.055 |
| CuCl2 | 3.098e-016 | 3.111e-016 | -15.509 | -15.507 | 0.002 |
| Cu2(OH)2+2 | 3.548e-017 | 2.138e-017 | -16.450 | -16.670 | -0.220 |
| Cu(OH)3- | 3.425e-017 | 3.017e-017 | -16.465 | -16.520 | -0.055 |
| CuCl3- | 1.193e-021 | 1.051e-021 | -20.923 | -20.978 | -0.055 |
| Cu(OH)4-2 | 4.164e-023 | 2.509e-023 | -22.380 | -22.601 | -0.220 |
| CuCl4-2 | 7.731e-027 | 4.658e-027 | -26.112 | -26.332 | -0.220 |
| Fe(2) | 9.139e-005 | | | | |
| Fe+2 | 6.484e-005 | 3.907e-005 | -4.188 | -4.408 | -0.220 |
| FeHCO3+ | 2.041e-005 | 1.798e-005 | -4.690 | -4.745 | -0.055 |
| FeSO4 | 5.426e-006 | 5.447e-006 | -5.266 | -5.264 | 0.002 |
| FeCO3 | 6.147e-007 | 6.171e-007 | -6.211 | -6.210 | 0.002 |
| FeCl+ | 7.432e-008 | 6.548e-008 | -7.129 | -7.184 | -0.055 |
| FeOH+ | 2.099e-008 | 1.849e-008 | -7.678 | -7.733 | -0.055 |
| FeHSO4+ | 9.565e-012 | 8.427e-012 | -11.019 | -11.074 | -0.055 |
| Fe(OH)2 | 1.984e-013 | 1.992e-013 | -12.702 | -12.701 | 0.002 |
| Fe(OH)3- | 3.060e-017 | 2.696e-017 | -16.514 | -16.569 | -0.055 |
| Fe(3) | 2.854e-010 | | | | |
| Fe(OH)2+ | 2.262e-010 | 1.993e-010 | -9.646 | -9.701 | -0.055 |
| Fe(OH)3 | 5.865e-011 | 5.888e-011 | -10.232 | -10.230 | 0.002 |
| FeOH+2 | 4.030e-013 | 2.428e-013 | -12.395 | -12.615 | -0.220 |
| Fe(OH)4- | 1.464e-013 | 1.290e-013 | -12.834 | -12.889 | -0.055 |
| FeSO4+ | 1.872e-016 | 1.649e-016 | -15.728 | -15.783 | -0.055 |
| Fe+3 | 6.322e-017 | 2.022e-017 | -16.199 | -16.694 | -0.495 |
| Fe(SO4)2- | 3.910e-018 | 3.444e-018 | -17.408 | -17.463 | -0.055 |
| FeCl+2 | 7.970e-019 | 4.802e-019 | -18.099 | -18.319 | -0.220 |
| FeCl2+ | 4.564e-021 | 4.021e-021 | -20.341 | -20.396 | -0.055 |
| FeHSO4+2 | 1.818e-022 | 1.095e-022 | -21.740 | -21.960 | -0.220 |
| Fe2(OH)2+4 | 2.122e-023 | 2.796e-024 | -22.673 | -23.554 | -0.880 |
| FeCl3 | 4.863e-025 | 4.882e-025 | -24.313 | -24.311 | 0.002 |
| Fe3(OH)4+5 | 9.779e-030 | 4.121e-031 | -29.010 | -30.385 | -1.375 |
| H(0) | 7.056e-019 | | | | |
| H2 | 3.528e-019 | 3.542e-019 | -18.452 | -18.451 | 0.002 |
| K | 1.382e-004 | | | | |
| K+ | 1.374e-004 | 1.207e-004 | -3.862 | -3.918 | -0.056 |
| KSO4- | 7.635e-007 | 6.727e-007 | -6.117 | -6.172 | -0.055 |
| Mg | 1.605e-003 | | | | |
| Mg+2 | 1.409e-003 | 8.739e-004 | -2.851 | -3.059 | -0.207 |
| MgSO4 | 1.444e-004 | 1.450e-004 | -3.840 | -3.839 | 0.002 |
| MgHCO3+ | 5.135e-005 | 4.524e-005 | -4.289 | -4.344 | -0.055 |
| MgCO3 | 4.473e-007 | 4.490e-007 | -6.349 | -6.348 | 0.002 |
| MgOH+ | 4.355e-009 | 3.837e-009 | -8.361 | -8.416 | -0.055 |
| Mn(2) | 3.097e-005 | | | | |
| Mn+2 | 2.215e-005 | 1.335e-005 | -4.655 | -4.875 | -0.220 |
| MnHCO3+ | 6.213e-006 | 5.474e-006 | -5.207 | -5.262 | -0.055 |
| MnSO4 | 1.833e-006 | 1.841e-006 | -5.737 | -5.735 | 0.002 |
| MnCO3 | 6.952e-007 | 6.980e-007 | -6.158 | -6.156 | 0.002 |
| MnCl+ | 7.492e-008 | 6.601e-008 | -7.125 | -7.180 | -0.055 |
| MnOH+ | 5.310e-010 | 4.679e-010 | -9.275 | -9.330 | -0.055 |
| MnCl2 | 3.485e-011 | 3.499e-011 | -10.458 | -10.456 | 0.002 |
| MnCl3- | 1.328e-014 | 1.170e-014 | -13.877 | -13.932 | -0.055 |
| Mn(OH)3- | 1.738e-020 | 1.531e-020 | -19.760 | -19.815 | -0.055 |
| Mn(3) | 2.001e-030 | | | | |
| Mn+3 | 2.001e-030 | 6.401e-031 | -29.699 | -30.194 | -0.495 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -70.949 | -71.169 | -0.220 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -80.334 | -80.389 | -0.055 |
| Na | 4.788e-004 | | | | |
| Na+ | 4.755e-004 | 4.196e-004 | -3.323 | -3.377 | -0.054 |
| NaSO4- | 2.205e-006 | 1.942e-006 | -5.657 | -5.712 | -0.055 |
| NaHCO3 | 1.082e-006 | 1.086e-006 | -5.966 | -5.964 | 0.002 |
| NaCO3- | 2.926e-009 | 2.578e-009 | -8.534 | -8.589 | -0.055 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -59.902 | -59.901 | 0.002 |
| Pb | 6.762e-009 | | | | |
| PbCO3 | 4.296e-009 | 4.313e-009 | -8.367 | -8.365 | 0.002 |
| PbHCO3+ | 1.564e-009 | 1.378e-009 | -8.806 | -8.861 | -0.055 |
| Pb+2 | 6.257e-010 | 3.769e-010 | -9.204 | -9.424 | -0.220 |

| | | | | | |
|---|---|---|---|---|---|
| PbSO4 | 2.127e-010 | 2.135e-010 | -9.672 | -9.671 | 0.002 |
| PbOH+ | 3.477e-011 | 3.063e-011 | -10.459 | -10.514 | -0.055 |
| PbCl+ | 1.472e-011 | 1.297e-011 | -10.832 | -10.887 | -0.055 |
| Pb(CO3)2-2 | 1.184e-011 | 7.134e-012 | -10.927 | -11.147 | -0.220 |
| Pb(SO4)2-2 | 1.873e-012 | 1.129e-012 | -11.727 | -11.947 | -0.220 |
| Pb(OH)2 | 4.947e-014 | 4.966e-014 | -13.306 | -13.304 | 0.002 |
| PbCl2 | 3.212e-014 | 3.225e-014 | -13.493 | -13.492 | 0.002 |
| PbCl3- | 3.244e-017 | 2.858e-017 | -16.489 | -16.544 | -0.055 |
| Pb(OH)3- | 2.697e-018 | 2.376e-018 | -17.569 | -17.624 | -0.055 |
| Pb2OH+3 | 8.082e-019 | 2.585e-019 | -18.092 | -18.588 | -0.495 |
| PbCl4-2 | 2.481e-020 | 1.495e-020 | -19.605 | -19.825 | -0.220 |
| Pb(OH)4-2 | 3.765e-023 | 2.269e-023 | -22.424 | -22.644 | -0.220 |
| Pb3(OH)4+2 | 4.526e-027 | 2.727e-027 | -26.344 | -26.564 | -0.220 |
| S(6) | 2.188e-003 | | | | |
| SO4-2 | 1.654e-003 | 1.007e-003 | -2.782 | -2.997 | -0.215 |
| CaSO4 | 3.790e-004 | 3.805e-004 | -3.421 | -3.420 | 0.002 |
| MgSO4 | 1.444e-004 | 1.450e-004 | -3.840 | -3.839 | 0.002 |
| FeSO4 | 5.426e-006 | 5.447e-006 | -5.266 | -5.264 | 0.002 |
| NaSO4- | 2.205e-006 | 1.942e-006 | -5.657 | -5.712 | -0.055 |
| MnSO4 | 1.833e-006 | 1.841e-006 | -5.737 | -5.735 | 0.002 |
| KSO4- | 7.635e-007 | 6.727e-007 | -6.117 | -6.172 | -0.055 |
| ZnSO4 | 3.519e-007 | 3.533e-007 | -6.454 | -6.452 | 0.002 |
| BaSO4 | 5.673e-008 | 5.695e-008 | -7.246 | -7.244 | 0.002 |
| HSO4- | 2.036e-008 | 1.794e-008 | -7.691 | -7.746 | -0.055 |
| Zn(SO4)2-2 | 5.335e-009 | 3.214e-009 | -8.273 | -8.493 | -0.220 |
| AgSO4- | 2.753e-009 | 2.425e-009 | -8.560 | -8.615 | -0.055 |
| CaHSO4+ | 5.268e-010 | 4.641e-010 | -9.278 | -9.333 | -0.055 |
| PbSO4 | 2.127e-010 | 2.135e-010 | -9.672 | -9.671 | 0.002 |
| CdSO4 | 1.279e-010 | 1.284e-010 | -9.893 | -9.892 | 0.002 |
| CuSO4 | 6.171e-011 | 6.195e-011 | -10.210 | -10.208 | 0.002 |
| FeHSO4+ | 9.565e-012 | 8.427e-012 | -11.019 | -11.074 | -0.055 |
| Cd(SO4)2-2 | 2.559e-012 | 1.542e-012 | -11.592 | -11.812 | -0.220 |
| Pb(SO4)2-2 | 1.873e-012 | 1.129e-012 | -11.727 | -11.947 | -0.220 |
| FeSO4+ | 1.872e-016 | 1.649e-016 | -15.728 | -15.783 | -0.055 |
| Fe(SO4)2- | 3.910e-018 | 3.444e-018 | -17.408 | -17.463 | -0.055 |
| FeHSO4+2 | 1.818e-022 | 1.095e-022 | -21.740 | -21.960 | -0.220 |
| Se(-2) | 2.142e-020 | | | | |
| HSe- | 2.138e-020 | 1.884e-020 | -19.670 | -19.725 | -0.055 |
| H2Se | 4.284e-023 | 4.301e-023 | -22.368 | -22.366 | 0.002 |
| Se(4) | 2.535e-008 | | | | |
| HSeO3- | 2.487e-008 | 2.191e-008 | -7.604 | -7.659 | -0.055 |
| SeO3-2 | 4.793e-010 | 2.888e-010 | -9.319 | -9.539 | -0.220 |
| H2SeO3 | 2.944e-012 | 2.955e-012 | -11.531 | -11.529 | 0.002 |
| Se(6) | 6.089e-025 | | | | |
| SeO4-2 | 6.089e-025 | 3.668e-025 | -24.215 | -24.436 | -0.220 |
| HSeO4- | 3.119e-030 | 2.748e-030 | -29.506 | -29.561 | -0.055 |
| Zn | 4.440e-006 | | | | |
| Zn+2 | 2.759e-006 | 1.662e-006 | -5.559 | -5.779 | -0.220 |
| ZnHCO3+ | 1.093e-006 | 9.633e-007 | -5.961 | -6.016 | -0.055 |
| ZnSO4 | 3.519e-007 | 3.533e-007 | -6.454 | -6.452 | 0.002 |
| ZnCO3 | 2.176e-007 | 2.184e-007 | -6.662 | -6.661 | 0.002 |
| Zn(SO4)2-2 | 5.335e-009 | 3.214e-009 | -8.273 | -8.493 | -0.220 |
| Zn(CO3)2-2 | 5.103e-009 | 3.075e-009 | -8.292 | -8.512 | -0.220 |
| ZnCl+ | 3.370e-009 | 2.969e-009 | -8.472 | -8.527 | -0.055 |
| ZnOH+ | 3.050e-009 | 2.687e-009 | -8.516 | -8.571 | -0.055 |
| Zn(OH)2 | 3.621e-010 | 3.635e-010 | -9.441 | -9.440 | 0.002 |
| ZnOHCl | 2.775e-010 | 2.786e-010 | -9.557 | -9.555 | 0.002 |
| ZnCl2 | 3.559e-012 | 3.573e-012 | -11.449 | -11.447 | 0.002 |
| Zn(OH)3- | 5.437e-015 | 4.790e-015 | -14.265 | -14.320 | -0.055 |
| ZnCl3- | 5.088e-015 | 4.483e-015 | -14.293 | -14.348 | -0.055 |
| ZnCl4-2 | 4.062e-018 | 2.447e-018 | -17.391 | -17.611 | -0.220 |
| Zn(OH)4-2 | 5.251e-021 | 3.164e-021 | -20.280 | -20.500 | -0.220 |

----------Saturation indices----------

| Phase | SI | log IAP | log KT | |
|---|---|---|---|---|
| Ag2CO3 | -8.51 | -19.90 | -11.39 | Ag2CO3 |
| Ag2O | -13.41 | -0.48 | 12.93 | Ag2O |
| Ag2SO4 | -11.65 | -16.71 | -5.06 | Ag2SO4 |
| AgMetal | 6.44 | -7.92 | -14.36 | Ag |
| Anglesite | -4.56 | -12.42 | -7.86 | PbSO4 |
| Anhydrite | -1.33 | -5.66 | -4.33 | CaSO4 |
| Antlerite | -13.25 | -4.96 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.58 | -8.85 | -8.26 | CaCO3 |
| Arsenolite | -11.76 | -13.38 | -1.62 | As2O3 |
| Artinite | -9.63 | 0.94 | 10.57 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -31.86 | -23.37 | 8.48 | As2O5 |
| As_native | -16.27 | -29.73 | -13.46 | As |
| Atacamite | -9.99 | -2.02 | 7.97 | Cu2(OH)3Cl |
| Azurite | -11.42 | -6.63 | 4.79 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | 3.48 | -46.95 | -50.43 | Ba3(AsO4)2 |
| Barite | 0.26 | -9.94 | -10.21 | BaSO4 |
| BaSeO3 | -10.10 | -16.49 | -6.39 | BaSeO3 |
| Bianchite | -7.02 | -8.78 | -1.76 | ZnSO4:6H2O |
| Birnessite | -19.88 | 23.73 | 43.60 | MnO2 |
| Bixbyite | -20.57 | -20.67 | -0.10 | Mn2O3 |
| Brochantite | -16.54 | -1.20 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -7.57 | 10.18 | 17.75 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -15.20 | -34.11 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.43 | -8.85 | -8.42 | CaCO3 |
| CaSeO3 | -6.61 | -12.21 | -5.60 | CaSeO3 |
| Cd(gamma) | -25.64 | -11.44 | 14.20 | Cd |

| | | | | |
|---|---|---|---|---|
| Cd(OH)2 | -9.73 | 3.92 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -10.51 | 3.92 | 14.43 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -27.42 | -20.71 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -27.03 | -4.47 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -28.95 | -0.55 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -14.62 | -15.15 | -0.53 | CdCl2 |
| CdCl2:2.5H2O | -13.15 | -15.15 | -2.00 | CdCl2:2.5H2O |
| CdCl2:H2O | -13.50 | -15.15 | -1.65 | CdCl2:H2O |
| CdMetal | -25.53 | -11.44 | 14.10 | Cd |
| CdOHCl | -9.38 | -5.61 | 3.77 | CdOHCl |
| CdSO4 | -12.71 | -12.32 | 0.40 | CdSO4 |
| CdSO4:2.7H2O | -10.59 | -12.32 | -1.73 | CdSO4:2.67H2O |
| CdSO4:H2O | -10.91 | -12.32 | -1.40 | CdSO4:H2O |
| Cerargyrite | 0.50 | -9.77 | -10.28 | AgCl |
| Cerrusite | -2.31 | -15.61 | -13.29 | PbCO3 |
| Chalcanthite | -9.79 | -12.48 | -2.69 | CuSO4:5H2O |
| Claudetite | -11.81 | -13.38 | -1.57 | As2O3 |
| CO2(g) | -1.21 | -2.51 | -1.30 | CO2 |
| Cotunnite | -10.30 | -15.26 | -4.96 | PbCl2 |
| Cu(OH)2 | -5.39 | 3.76 | 9.15 | Cu(OH)2 |
| Cu2SO4 | -16.95 | -18.75 | -1.80 | Cu2SO4 |
| Cu3(AsO4)2:6w | -19.42 | -54.55 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -6.03 | -15.66 | -9.63 | CuCO3 |
| CuMetal | 0.40 | -8.94 | -9.34 | Cu |
| CuOCuSO4 | -21.45 | -8.72 | 12.73 | CuO:CuSO4 |
| CupricFerrite | 2.91 | 10.09 | 7.18 | CuFe2O4 |
| Cuprite | -0.75 | -2.51 | -1.76 | Cu2O |
| CuprousFerrite | 10.70 | 1.91 | -8.79 | CuFeO2 |
| CuSO4 | -16.10 | -12.48 | 3.62 | CuSO4 |
| Dolomite | -1.32 | -18.09 | -16.77 | CaMg(CO3)2 |
| Dolomite(d) | -1.92 | -18.09 | -16.17 | CaMg(CO3)2 |
| Epsomite | -3.82 | -6.06 | -2.23 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 3.34 | 0.30 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -1.73 | 3.17 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -26.58 | -62.01 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -5.06 | 15.16 | 20.22 | Fe3(OH)8 |
| FeSe2 | -9.92 | -28.50 | -18.58 | FeSe2 |
| Goethite | 3.68 | 3.17 | -0.51 | FeOOH |
| Goslarite | -6.71 | -8.78 | -2.07 | ZnSO4:7H2O |
| Gypsum | -1.08 | -5.66 | -4.59 | CaSO4:2H2O |
| H2(g) | -15.36 | -18.45 | -3.09 | H2 |
| H2O(g) | -1.86 | -0.00 | 1.86 | H2O |
| Halite | -7.84 | -6.29 | 1.55 | NaCl |
| Hausmannite | -23.96 | 40.46 | 64.42 | Mn3O4 |
| Hematite | 9.30 | 6.33 | -2.97 | Fe2O3 |
| Huntite | -7.47 | -36.57 | -29.10 | CaMg3(CO3)4 |
| Hydrocerrusite | -9.93 | -27.39 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -19.78 | -26.78 | -7.00 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -10.92 | 19.39 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -12.33 | 19.39 | 31.72 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -10.97 | -20.80 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -12.12 | -20.28 | -8.16 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -15.67 | -19.73 | -4.06 | NaFe3(SO4)2(OH)6 |
| JarositeH | -19.45 | -22.98 | -3.53 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -19.32 | -1.20 | 18.12 | Cu4(OH)6SO4:H2O |
| Larnakite | -8.54 | -8.60 | -0.06 | PbO:PbSO4 |
| Laurionite | -6.34 | -5.72 | 0.62 | PbOHCl |
| Litharge | -9.46 | 3.82 | 13.27 | PbO |
| Maghemite | -0.05 | 6.33 | 6.39 | Fe2O3 |
| Magnesite | -1.42 | -9.24 | -7.82 | MgCO3 |
| Magnetite | 9.73 | 15.16 | 5.44 | Fe3O4 |
| Malachite | -7.25 | -1.44 | 5.82 | Cu2(OH)2CO3 |
| Manganite | -9.29 | 16.05 | 25.34 | MnOOH |
| Massicot | -9.66 | 3.82 | 13.48 | PbO |
| Melanothallite | -19.46 | -15.31 | 4.15 | CuCl2 |
| Melanterite | -5.02 | -7.41 | -2.38 | FeSO4:7H2O |
| Minium | -50.34 | 26.81 | 77.15 | Pb3O4 |
| Mirabilite | -8.00 | -9.75 | -1.75 | Na2SO4:10H2O |
| Mn2(SO4)3 | -64.98 | -69.38 | -4.40 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -12.02 | -40.73 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -12.83 | -10.71 | 2.12 | MnCl2:4H2O |
| MnSO4 | -11.06 | -7.87 | 3.19 | MnSO4 |
| Monteponite | -10.68 | 3.92 | 14.60 | CdO |
| Nahcolite | -5.04 | -5.71 | -0.67 | NaHCO3 |
| Nantokite | -3.70 | -10.79 | -7.10 | CuCl |
| Natron | -11.10 | -12.94 | -1.84 | Na2CO3:10H2O |
| Nesquehonite | -3.81 | -9.24 | -5.43 | MgCO3:3H2O |
| Nsutite | -18.84 | 23.73 | 42.56 | MnO2 |
| O2(g) | -57.12 | -59.90 | -2.78 | O2 |
| Otavite | -3.50 | -15.50 | -12.00 | CdCO3 |
| Pb(OH)2 | -4.81 | 3.82 | 8.62 | Pb(OH)2 |
| Pb2(OH)3Cl | -10.70 | -1.90 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -18.57 | 7.63 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -38.05 | 22.99 | 61.04 | Pb2O3 |
| Pb2OCO3 | -11.68 | -11.79 | -0.11 | PbO:PbCO3 |
| Pb3(AsO4)2 | -18.97 | -54.38 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -19.88 | -7.97 | 11.91 | PbCO3:2PbO |
| Pb3O2SO4 | -15.89 | -4.79 | 11.10 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -22.07 | -0.97 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -24.25 | -0.97 | 23.28 | PbSO4:3PbO |
| PbMetal | -15.80 | -11.54 | 4.26 | Pb |
| PbO:0.3H2O | -9.16 | 3.82 | 12.98 | PbO:0.33H2O |
| Phosgenite | -11.05 | -30.86 | -19.81 | PbCl2:PbCO3 |

```
Plattnerite    -32.51   19.18   51.68  PbO2
Portlandite    -13.27   10.57   23.84  Ca(OH)2
Pyrochroite     -6.83    8.37   15.20  Mn(OH)2
Pyrolusite     -19.85   23.73   43.57  MnO2
Rhodochrosite    0.03  -11.06  -11.08  MnCO3
Rhodochrosite(d) -0.67  -11.06  -10.39  MnCO3
Scorodite       -9.50  -29.75  -20.25  FeAsO4:2H2O
Se(s)           6.34  -10.99  -17.32  Se
SeO2           -14.40  -22.78   -8.38  SeO2
Siderite         0.22  -10.59  -10.81  FeCO3
Siderite(d)(3)  -0.14  -10.59  -10.45  FeCO3
Smithsonite     -2.11  -11.96   -9.85  ZnCO3
Smithsonite_PG  -1.15  -11.96  -10.81  ZnCO3
Tenorite        -4.37    3.76    8.13  CuO
Thenardite      -9.59   -9.75   -0.16  Na2SO4
Thermonatrite  -13.16  -12.94    0.22  Na2CO3:H2O
Trona          -18.46  -18.65   -0.19  NaHCO3:Na2CO3:2H2O
Witherite       -4.51  -13.13   -8.62  BaCO3
Zincite(c)      -4.42    7.46   11.88  ZnO
Zincosite      -12.43   -8.78    3.66  ZnSO4
Zn(OH)2-a       -4.99    7.46   12.45  Zn(OH)2
Zn(OH)2-b       -4.29    7.46   11.75  Zn(OH)2
Zn(OH)2-c       -4.74    7.46   12.20  Zn(OH)2
Zn(OH)2-e       -4.04    7.46   11.50  Zn(OH)2
Zn(OH)2-g       -4.25    7.46   11.71  Zn(OH)2
Zn2(OH)2SO4     -8.82   -1.32    7.50  Zn2(OH)2SO4
Zn2(OH)3Cl      -9.81    5.39   15.20  Zn2(OH)3Cl
Zn3(AsO4)2:2.5w -15.90  -43.44  -27.55  Zn3(AsO4)2:2.5H2O
Zn3O(SO4)2      -31.20  -10.09   21.11  ZnO:2ZnSO4
Zn4(OH)6SO4     -14.79   13.61   28.40  Zn4(OH)6SO4
Zn5(OH)8Cl2     -20.27   18.23   38.50  Zn5(OH)8Cl2
ZnCl2           -19.23  -11.61    7.62  ZnCl2
ZnCO3:1H2O       -1.70  -11.96  -10.26  ZnCO3:1H2O
ZnCO3:H2O        -1.70  -11.96  -10.26  ZnCO3:H2O
ZnMetal         -34.90   -7.90   27.00  Zn
ZnO(a)           -3.85    7.46   11.31  ZnO
ZnSO4:H2O        -8.56   -8.78   -0.21  ZnSO4:H2O

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End of simulation.
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Reading input data for simulation 9.
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Solution 9 - MW-1005P, Sample Date June 2013
Units                   mg/L
pH                      7.1      #Field value
pe                      1.65
Temperature 10.3
Alkalinity      220
As                      0.0005    #Detection Limit
Ba                      0.072
Cd                      0.00013   #Detection Limit
Ca                      56
Cl                      19
Cu                      0.0013    #Detection Limit
Fe                      0.16
Pb                      0.0028    #Detection Limit
Mg                      21
Mn                      0.11
K                       8.9
Se                      0.002     #Detection Limit
Ag                      0.00026   #Detection Limit
Na                      22
S(6)                    3         #Detection Limit
Zn                      0.005     #Detection Limit
END
-----------------------
Beginning of initial solution calculations.
-----------------------

Initial solution 9.             - MW-1005P, Sample Date June 2013

-----------------Solution composition----------------

Elements        Molality        Moles

Ag              2.411e-009  2.411e-009
Alkalinity      4.397e-003  4.397e-003
As              6.676e-009  6.676e-009
Ba              5.244e-007  5.244e-007
Ca              1.398e-003  1.398e-003
Cd              1.157e-009  1.157e-009
Cl              5.361e-004  5.361e-004
Cu              2.046e-008  2.046e-008
Fe              2.866e-006  2.866e-006
K               2.277e-004  2.277e-004
Mg              8.641e-004  8.641e-004
Mn              2.003e-006  2.003e-006
Na              9.573e-004  9.573e-004
Pb              1.352e-008  1.352e-008
```

| | | |
|---|---|---|
| S(6) | 3.124e-005 | 3.124e-005 |
| Se | 2.534e-008 | 2.534e-008 |
| Zn | 7.651e-008 | 7.651e-008 |

----------Description of solution----------

| | |
|---|---|
| pH | = 7.100 |
| pe | = 1.650 |
| Activity of water | = 1.000 |
| Ionic strength | = 7.490e-003 |
| Mass of water (kg) | = 1.000e+000 |
| Total carbon (mol/kg) | = 5.298e-003 |
| Total CO2 (mol/kg) | = 5.298e-003 |
| Temperature (deg C) | = 10.300 |
| Electrical balance (eq) | = 7.237e-004 |
| Percent error, 100*(Cat-\|An\|)/(Cat+\|An\|) | = 6.86 |
| Iterations | = 9 |
| Total H | = 1.110168e+002 |
| Total O | = 5.552133e+001 |

----------Distribution of species----------

| Species | Molality | Log Activity | Log Molality | Log Activity | Gamma |
|---|---|---|---|---|---|
| H+ | 8.597e-008 | 7.943e-008 | -7.066 | -7.100 | -0.034 |
| OH- | 4.132e-008 | 3.782e-008 | -7.384 | -7.422 | -0.039 |
| H2O | 5.551e+001 | 9.998e-001 | 1.744 | -0.000 | 0.000 |
| Ag | 2.411e-009 | | | | |
| AgCl | 1.200e-009 | 1.202e-009 | -8.921 | -8.920 | 0.001 |
| Ag+ | 1.139e-009 | 1.042e-009 | -8.944 | -8.982 | -0.039 |
| AgCl2- | 7.181e-011 | 6.571e-011 | -10.144 | -10.182 | -0.039 |
| AgSO4- | 3.622e-013 | 3.314e-013 | -12.441 | -12.480 | -0.039 |
| AgCl3-2 | 3.408e-014 | 2.390e-014 | -13.467 | -13.622 | -0.154 |
| AgOH | 1.310e-014 | 1.312e-014 | -13.883 | -13.882 | 0.001 |
| AgCl4-3 | 4.318e-017 | 1.943e-017 | -16.365 | -16.711 | -0.347 |
| Ag(OH)2- | 1.804e-019 | 1.651e-019 | -18.744 | -18.782 | -0.039 |
| As(3) | 3.897e-011 | | | | |
| H3AsO3 | 3.876e-011 | 3.883e-011 | -10.412 | -10.411 | 0.001 |
| H2AsO3- | 2.125e-013 | 1.945e-013 | -12.673 | -12.711 | -0.039 |
| H4AsO3+ | 1.670e-018 | 1.528e-018 | -17.777 | -17.816 | -0.039 |
| HAsO3-2 | 3.577e-021 | 2.508e-021 | -20.447 | -20.601 | -0.154 |
| AsO3-3 | 8.243e-030 | 3.710e-030 | -29.084 | -29.431 | -0.347 |
| As(5) | 6.637e-009 | | | | |
| HAsO4-2 | 3.419e-009 | 2.398e-009 | -8.466 | -8.620 | -0.154 |
| H2AsO4- | 3.218e-009 | 2.945e-009 | -8.492 | -8.531 | -0.039 |
| AsO4-3 | 1.026e-013 | 4.618e-014 | -12.989 | -13.336 | -0.347 |
| H3AsO4 | 4.019e-014 | 4.026e-014 | -13.396 | -13.395 | 0.001 |
| Ba | 5.244e-007 | | | | |
| Ba+2 | 5.115e-007 | 3.587e-007 | -6.291 | -6.445 | -0.154 |
| BaHCO3+ | 9.367e-009 | 8.572e-009 | -8.028 | -8.067 | -0.039 |
| BaSO4 | 3.335e-009 | 3.340e-009 | -8.477 | -8.476 | 0.001 |
| BaCO3 | 2.252e-010 | 2.256e-010 | -9.647 | -9.647 | 0.001 |
| BaOH+ | 1.672e-013 | 1.530e-013 | -12.777 | -12.815 | -0.039 |
| C(4) | 5.298e-003 | | | | |
| HCO3- | 4.316e-003 | 3.960e-003 | -2.365 | -2.402 | -0.037 |
| CO2 | 9.066e-004 | 9.082e-004 | -3.043 | -3.042 | 0.001 |
| CaHCO3+ | 3.886e-005 | 3.556e-005 | -4.410 | -4.449 | -0.039 |
| MgHCO3+ | 2.879e-005 | 2.635e-005 | -4.541 | -4.579 | -0.039 |
| CO3-2 | 2.307e-006 | 1.635e-006 | -5.637 | -5.786 | -0.150 |
| CaCO3 | 2.137e-006 | 2.141e-006 | -5.670 | -5.669 | 0.001 |
| NaHCO3 | 1.945e-006 | 1.948e-006 | -5.711 | -5.710 | 0.001 |
| MgCO3 | 7.367e-007 | 7.380e-007 | -6.133 | -6.132 | 0.001 |
| FeHCO3+ | 6.518e-007 | 5.964e-007 | -6.186 | -6.224 | -0.039 |
| MnHCO3+ | 3.969e-007 | 3.632e-007 | -6.401 | -6.440 | -0.039 |
| MnCO3 | 1.335e-007 | 1.337e-007 | -6.875 | -6.874 | 0.001 |
| FeCO3 | 5.898e-008 | 5.908e-008 | -7.229 | -7.229 | 0.001 |
| ZnHCO3+ | 1.793e-008 | 1.641e-008 | -7.746 | -7.785 | -0.039 |
| NaCO3- | 1.335e-008 | 1.221e-008 | -7.875 | -7.913 | -0.039 |
| PbCO3 | 1.138e-008 | 1.140e-008 | -7.944 | -7.943 | 0.001 |
| ZnCO3 | 1.072e-008 | 1.074e-008 | -7.970 | -7.969 | 0.001 |
| BaHCO3+ | 9.367e-009 | 8.572e-009 | -8.028 | -8.067 | -0.039 |
| CuCO3 | 6.448e-009 | 6.459e-009 | -8.191 | -8.190 | 0.001 |
| CuHCO3+ | 1.595e-009 | 1.460e-009 | -8.797 | -8.836 | -0.039 |
| PbHCO3+ | 1.379e-009 | 1.262e-009 | -8.860 | -8.899 | -0.039 |
| Zn(CO3)2-2 | 5.354e-010 | 3.755e-010 | -9.271 | -9.425 | -0.154 |
| BaCO3 | 2.252e-010 | 2.256e-010 | -9.647 | -9.647 | 0.001 |
| CdHCO3+ | 9.784e-011 | 8.953e-011 | -10.009 | -10.048 | -0.039 |
| Pb(CO3)2-2 | 6.678e-011 | 4.683e-011 | -10.175 | -10.329 | -0.154 |
| Cu(CO3)2-2 | 1.896e-011 | 1.330e-011 | -10.722 | -10.876 | -0.154 |
| CdCO3 | 9.271e-013 | 9.287e-013 | -12.033 | -12.032 | 0.001 |
| Cd(CO3)2-2 | 6.847e-015 | 4.802e-015 | -14.164 | -14.319 | -0.154 |
| Ca | 1.398e-003 | | | | |
| Ca+2 | 1.354e-003 | 9.588e-004 | -2.869 | -3.018 | -0.150 |
| CaHCO3+ | 3.886e-005 | 3.556e-005 | -4.410 | -4.449 | -0.039 |
| CaSO4 | 3.071e-006 | 3.077e-006 | -5.513 | -5.512 | 0.001 |
| CaCO3 | 2.137e-006 | 2.141e-006 | -5.670 | -5.669 | 0.001 |
| CaOH+ | 2.189e-009 | 2.003e-009 | -8.660 | -8.698 | -0.039 |
| CaHSO4+ | 1.339e-012 | 1.225e-012 | -11.873 | -11.912 | -0.039 |
| Cd | 1.157e-009 | | | | |
| Cd+2 | 1.020e-009 | 7.150e-010 | -8.992 | -9.146 | -0.154 |
| CdHCO3+ | 9.784e-011 | 8.953e-011 | -10.009 | -10.048 | -0.039 |
| CdCl+ | 3.472e-011 | 3.177e-011 | -10.459 | -10.498 | -0.039 |

| | | | | | |
|---|---|---|---|---|---|
| CdSO4 | 3.480e-012 | 3.486e-012 | -11.458 | -11.458 | 0.001 |
| CdCO3 | 9.271e-013 | 9.287e-013 | -12.033 | -12.032 | 0.001 |
| CdOH+ | 2.599e-013 | 2.378e-013 | -12.585 | -12.624 | -0.039 |
| CdOHCl | 1.186e-013 | 1.188e-013 | -12.926 | -12.925 | 0.001 |
| CdCl2 | 6.120e-014 | 6.130e-014 | -13.213 | -13.213 | 0.001 |
| Cd(CO3)2-2 | 6.847e-015 | 4.802e-015 | -14.164 | -14.319 | -0.154 |
| Cd(SO4)2-2 | 1.113e-015 | 7.806e-016 | -14.953 | -15.108 | -0.154 |
| Cd(OH)2 | 5.052e-016 | 5.060e-016 | -15.297 | -15.296 | 0.001 |
| CdCl3- | 1.641e-017 | 1.501e-017 | -16.785 | -16.823 | -0.039 |
| Cd2OH+3 | 2.244e-021 | 1.010e-021 | -20.649 | -20.996 | -0.347 |
| Cd(OH)3- | 7.810e-022 | 7.147e-022 | -21.107 | -21.146 | -0.039 |
| Cd(OH)4-2 | 1.143e-028 | 8.017e-029 | -27.942 | -28.096 | -0.154 |
| Cl | 5.361e-004 | | | | |
| Cl- | 5.361e-004 | 4.900e-004 | -3.271 | -3.310 | -0.039 |
| MnCl+ | 2.245e-009 | 2.054e-009 | -8.649 | -8.687 | -0.039 |
| AgCl | 1.200e-009 | 1.202e-009 | -8.921 | -8.920 | 0.001 |
| FeCl+ | 1.113e-009 | 1.019e-009 | -8.953 | -8.992 | -0.039 |
| CuCl2- | 6.437e-010 | 5.891e-010 | -9.191 | -9.230 | -0.039 |
| AgCl2- | 7.181e-011 | 6.571e-011 | -10.144 | -10.182 | -0.039 |
| CdCl+ | 3.472e-011 | 3.177e-011 | -10.459 | -10.498 | -0.039 |
| ZnCl+ | 2.399e-011 | 2.195e-011 | -10.620 | -10.658 | -0.039 |
| ZnOHCl | 6.711e-012 | 6.723e-012 | -11.173 | -11.172 | 0.001 |
| PbCl+ | 5.829e-012 | 5.334e-012 | -11.234 | -11.273 | -0.039 |
| CuCl3-2 | 6.146e-013 | 4.310e-013 | -12.211 | -12.366 | -0.154 |
| CuCl+ | 4.972e-013 | 4.550e-013 | -12.303 | -12.342 | -0.039 |
| MnCl2 | 4.386e-013 | 4.394e-013 | -12.358 | -12.357 | 0.001 |
| CdOHCl | 1.186e-013 | 1.188e-013 | -12.926 | -12.925 | 0.001 |
| CdCl2 | 6.120e-014 | 6.130e-014 | -13.213 | -13.213 | 0.001 |
| AgCl3-2 | 3.408e-014 | 2.390e-014 | -13.467 | -13.622 | -0.154 |
| ZnCl2 | 1.057e-014 | 1.058e-014 | -13.976 | -13.975 | 0.001 |
| PbCl2 | 5.520e-015 | 5.530e-015 | -14.258 | -14.257 | 0.001 |
| CuCl2 | 1.011e-016 | 1.013e-016 | -15.995 | -15.994 | 0.001 |
| MnCl3- | 6.479e-017 | 5.929e-017 | -16.188 | -16.227 | -0.039 |
| AgCl4-3 | 4.318e-017 | 1.943e-017 | -16.365 | -16.711 | -0.347 |
| CdCl3- | 1.641e-017 | 1.501e-017 | -16.785 | -16.823 | -0.039 |
| ZnCl3- | 5.795e-018 | 5.303e-018 | -17.237 | -17.275 | -0.039 |
| PbCl3- | 2.138e-018 | 1.956e-018 | -17.670 | -17.709 | -0.039 |
| FeCl+2 | 3.559e-020 | 2.496e-020 | -19.449 | -19.603 | -0.154 |
| ZnCl4-2 | 1.643e-021 | 1.152e-021 | -20.784 | -20.939 | -0.154 |
| PbCl4-2 | 5.807e-022 | 4.073e-022 | -21.236 | -21.390 | -0.154 |
| CuCl3- | 1.463e-022 | 1.339e-022 | -21.835 | -21.873 | -0.039 |
| FeCl2+ | 9.745e-023 | 8.917e-023 | -22.011 | -22.050 | -0.039 |
| FeCl3 | 4.362e-027 | 4.369e-027 | -26.360 | -26.360 | 0.001 |
| CuCl4-2 | 3.277e-028 | 2.298e-028 | -27.485 | -27.639 | -0.154 |
| Cu(1) | 8.818e-009 | | | | |
| Cu+ | 8.174e-009 | 7.480e-009 | -8.088 | -8.126 | -0.039 |
| CuCl2- | 6.437e-010 | 5.891e-010 | -9.191 | -9.230 | -0.039 |
| CuCl3-2 | 6.146e-013 | 4.310e-013 | -12.211 | -12.366 | -0.154 |
| Cu(2) | 1.165e-008 | | | | |
| CuCO3 | 6.448e-009 | 6.459e-009 | -8.191 | -8.190 | 0.001 |
| Cu(OH)2 | 2.431e-009 | 2.435e-009 | -8.614 | -8.614 | 0.001 |
| CuHCO3+ | 1.595e-009 | 1.460e-009 | -8.797 | -8.836 | -0.039 |
| Cu+2 | 1.049e-009 | 7.356e-010 | -8.979 | -9.133 | -0.154 |
| CuOH+ | 1.012e-010 | 9.259e-011 | -9.995 | -10.033 | -0.039 |
| Cu(CO3)2-2 | 1.896e-011 | 1.330e-011 | -10.722 | -10.876 | -0.154 |
| CuSO4 | 2.504e-012 | 2.508e-012 | -11.601 | -11.601 | 0.001 |
| CuCl+ | 4.972e-013 | 4.550e-013 | -12.303 | -12.342 | -0.039 |
| Cu(OH)3- | 2.018e-015 | 1.847e-015 | -14.695 | -14.734 | -0.039 |
| Cu2(OH)2+2 | 1.152e-015 | 8.081e-016 | -14.938 | -15.093 | -0.154 |
| CuCl2 | 1.011e-016 | 1.013e-016 | -15.995 | -15.994 | 0.001 |
| Cu(OH)4-2 | 6.614e-021 | 4.638e-021 | -20.180 | -20.334 | -0.154 |
| CuCl3- | 1.463e-022 | 1.339e-022 | -21.835 | -21.873 | -0.039 |
| CuCl4-2 | 3.277e-028 | 2.298e-028 | -27.485 | -27.639 | -0.154 |
| Fe(2) | 2.866e-006 | | | | |
| Fe+2 | 2.148e-006 | 1.506e-006 | -5.668 | -5.822 | -0.154 |
| FeHCO3+ | 6.518e-007 | 5.964e-007 | -6.186 | -6.224 | -0.039 |
| FeCO3 | 5.898e-008 | 5.908e-008 | -7.229 | -7.229 | 0.001 |
| FeSO4 | 3.745e-009 | 3.751e-009 | -8.427 | -8.426 | 0.001 |
| FeOH+ | 2.063e-009 | 1.888e-009 | -8.685 | -8.724 | -0.039 |
| FeCl+ | 1.113e-009 | 1.019e-009 | -8.953 | -8.992 | -0.039 |
| Fe(OH)2 | 5.262e-014 | 5.271e-014 | -13.279 | -13.278 | 0.001 |
| FeHSO4+ | 2.103e-015 | 1.925e-015 | -14.677 | -14.716 | -0.039 |
| Fe(OH)3- | 2.314e-017 | 2.118e-017 | -16.636 | -16.674 | -0.039 |
| Fe(3) | 4.018e-010 | | | | |
| Fe(OH)2+ | 2.282e-010 | 2.088e-010 | -9.642 | -9.680 | -0.039 |
| Fe(OH)3 | 1.723e-010 | 1.726e-010 | -9.764 | -9.763 | 0.001 |
| Fe(OH)4- | 1.163e-012 | 1.064e-012 | -11.934 | -11.973 | -0.039 |
| FeOH+2 | 1.284e-013 | 9.006e-014 | -12.891 | -13.045 | -0.154 |
| Fe+3 | 6.119e-018 | 2.754e-018 | -17.213 | -17.560 | -0.347 |
| FeSO4+ | 4.354e-019 | 3.984e-019 | -18.361 | -18.400 | -0.039 |
| FeCl+2 | 3.559e-020 | 2.496e-020 | -19.449 | -19.603 | -0.154 |
| Fe(SO4)2- | 1.666e-022 | 1.525e-022 | -21.778 | -21.817 | -0.039 |
| FeCl2+ | 9.745e-023 | 8.917e-023 | -22.011 | -22.050 | -0.039 |
| Fe2(OH)2+4 | 1.710e-024 | 4.136e-025 | -23.767 | -24.383 | -0.616 |
| FeHSO4+2 | 1.260e-025 | 8.839e-026 | -24.899 | -25.054 | -0.154 |
| FeCl3 | 4.362e-027 | 4.369e-027 | -26.360 | -26.360 | 0.001 |
| Fe3(OH)4+5 | 6.905e-031 | 7.515e-032 | -30.161 | -31.124 | -0.963 |
| H(0) | 5.214e-021 | | | | |
| H2 | 2.607e-021 | 2.611e-021 | -20.584 | -20.583 | 0.001 |
| K | 2.277e-004 | | | | |
| K+ | 2.277e-004 | 2.081e-004 | -3.643 | -3.682 | -0.039 |
| KSO4- | 2.267e-008 | 2.074e-008 | -7.645 | -7.683 | -0.039 |
| Mg | 8.641e-004 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Mg+2 | 8.328e-004 | 5.928e-004 | -3.079 | -3.227 | -0.148 |
| MgHCO3+ | 2.879e-005 | 2.635e-005 | -4.541 | -4.579 | -0.039 |
| MgSO4 | 1.731e-006 | 1.734e-006 | -5.762 | -5.761 | 0.001 |
| MgCO3 | 7.367e-007 | 7.380e-007 | -6.133 | -6.132 | 0.001 |
| MgOH+ | 7.327e-009 | 6.705e-009 | -8.135 | -8.174 | -0.039 |
| Mn(2) | 2.003e-006 | | | | |
| Mn+2 | 1.468e-006 | 1.029e-006 | -5.833 | -5.987 | -0.154 |
| MnHCO3+ | 3.969e-007 | 3.632e-007 | -6.401 | -6.440 | -0.039 |
| MnCO3 | 1.335e-007 | 1.337e-007 | -6.875 | -6.874 | 0.001 |
| MnSO4 | 2.528e-009 | 2.532e-009 | -8.597 | -8.597 | 0.001 |
| MnCl+ | 2.245e-009 | 2.054e-009 | -8.649 | -8.687 | -0.039 |
| MnOH+ | 1.032e-010 | 9.442e-011 | -9.986 | -10.025 | -0.039 |
| MnCl2 | 4.386e-013 | 4.394e-013 | -12.358 | -12.357 | 0.001 |
| MnCl3- | 6.479e-017 | 5.929e-017 | -16.188 | -16.227 | -0.039 |
| Mn(OH)3- | 3.555e-020 | 3.253e-020 | -19.449 | -19.488 | -0.039 |
| Mn(3) | 3.300e-031 | | | | |
| Mn+3 | 3.300e-031 | 1.485e-031 | -30.481 | -30.828 | -0.347 |
| Mn(6) | 0.000e+000 | | | | |
| MnO4-2 | 0.000e+000 | 0.000e+000 | -66.576 | -66.731 | -0.154 |
| Mn(7) | 0.000e+000 | | | | |
| MnO4- | 0.000e+000 | 0.000e+000 | -75.437 | -75.476 | -0.039 |
| Na | 9.573e-004 | | | | |
| Na+ | 9.552e-004 | 8.749e-004 | -3.020 | -3.058 | -0.038 |
| NaHCO3 | 1.945e-006 | 1.948e-006 | -5.711 | -5.710 | 0.001 |
| NaSO4- | 8.072e-008 | 7.387e-008 | -7.093 | -7.132 | -0.039 |
| NaCO3- | 1.335e-008 | 1.221e-008 | -7.875 | -7.913 | -0.039 |
| O(0) | 0.000e+000 | | | | |
| O2 | 0.000e+000 | 0.000e+000 | -56.205 | -56.204 | 0.001 |
| Pb | 1.352e-008 | | | | |
| PbCO3 | 1.138e-008 | 1.140e-008 | -7.944 | -7.943 | 0.001 |
| PbHCO3+ | 1.379e-009 | 1.262e-009 | -8.860 | -8.899 | -0.039 |
| Pb+2 | 5.722e-010 | 4.013e-010 | -9.242 | -9.397 | -0.154 |
| PbOH+ | 1.076e-010 | 9.848e-011 | -9.968 | -10.007 | -0.039 |
| Pb(CO3)2-2 | 6.678e-011 | 4.683e-011 | -10.175 | -10.329 | -0.154 |
| PbCl+ | 5.829e-012 | 5.334e-012 | -11.234 | -11.273 | -0.039 |
| PbSO4 | 4.186e-012 | 4.193e-012 | -11.378 | -11.377 | 0.001 |
| Pb(OH)2 | 4.815e-013 | 4.823e-013 | -12.317 | -12.317 | 0.001 |
| PbCl2 | 5.520e-015 | 5.530e-015 | -14.258 | -14.257 | 0.001 |
| Pb(SO4)2-2 | 5.830e-016 | 4.089e-016 | -15.234 | -15.388 | -0.154 |
| Pb(OH)3- | 7.617e-017 | 6.970e-017 | -16.118 | -16.157 | -0.039 |
| PbCl3- | 2.138e-018 | 1.956e-018 | -17.670 | -17.709 | -0.039 |
| Pb2OH+3 | 1.966e-018 | 8.847e-019 | -17.706 | -18.053 | -0.347 |
| Pb(OH)4-2 | 2.866e-021 | 2.010e-021 | -20.543 | -20.697 | -0.154 |
| PbCl4-2 | 5.807e-022 | 4.073e-022 | -21.236 | -21.390 | -0.154 |
| Pb3(OH)4+2 | 2.998e-025 | 2.102e-025 | -24.523 | -24.677 | -0.154 |
| S(6) | 3.124e-005 | | | | |
| SO4-2 | 2.633e-005 | 1.858e-005 | -4.580 | -4.731 | -0.151 |
| CaSO4 | 3.071e-006 | 3.077e-006 | -5.513 | -5.512 | 0.001 |
| MgSO4 | 1.731e-006 | 1.734e-006 | -5.762 | -5.761 | 0.001 |
| NaSO4- | 8.072e-008 | 7.387e-008 | -7.093 | -7.132 | -0.039 |
| KSO4- | 2.267e-008 | 2.074e-008 | -7.645 | -7.683 | -0.039 |
| FeSO4 | 3.745e-009 | 3.751e-009 | -8.427 | -8.426 | 0.001 |
| BaSO4 | 3.335e-009 | 3.340e-009 | -8.477 | -8.476 | 0.001 |
| MnSO4 | 2.528e-009 | 2.532e-009 | -8.597 | -8.597 | 0.001 |
| ZnSO4 | 1.271e-010 | 1.273e-010 | -9.896 | -9.895 | 0.001 |
| HSO4- | 1.161e-010 | 1.063e-010 | -9.935 | -9.974 | -0.039 |
| PbSO4 | 4.186e-012 | 4.193e-012 | -11.378 | -11.377 | 0.001 |
| CdSO4 | 3.480e-012 | 3.486e-012 | -11.458 | -11.458 | 0.001 |
| CuSO4 | 2.504e-012 | 2.508e-012 | -11.601 | -11.601 | 0.001 |
| CaHSO4+ | 1.339e-012 | 1.225e-012 | -11.873 | -11.912 | -0.039 |
| AgSO4- | 3.622e-013 | 3.314e-013 | -12.441 | -12.480 | -0.039 |
| Zn(SO4)2-2 | 3.088e-014 | 2.166e-014 | -13.510 | -13.664 | -0.154 |
| FeHSO4+ | 2.103e-015 | 1.925e-015 | -14.677 | -14.716 | -0.039 |
| Cd(SO4)2-2 | 1.113e-015 | 7.806e-016 | -14.953 | -15.108 | -0.154 |
| Pb(SO4)2-2 | 5.830e-016 | 4.089e-016 | -15.234 | -15.388 | -0.154 |
| FeSO4+ | 4.354e-019 | 3.984e-019 | -18.361 | -18.400 | -0.039 |
| Fe(SO4)2- | 1.666e-022 | 1.525e-022 | -21.778 | -21.817 | -0.039 |
| FeHSO4+2 | 1.260e-025 | 8.839e-026 | -24.899 | -25.054 | -0.154 |
| Se(-2) | 7.876e-027 | | | | |
| HSe- | 7.870e-027 | 7.202e-027 | -26.104 | -26.143 | -0.039 |
| H2Se | 5.730e-030 | 5.740e-030 | -29.242 | -29.241 | 0.001 |
| Se(4) | 2.534e-008 | | | | |
| HSeO3- | 2.409e-008 | 2.204e-008 | -7.618 | -7.657 | -0.039 |
| SeO3-2 | 1.251e-009 | 8.775e-010 | -8.903 | -9.057 | -0.154 |
| H2SeO3 | 9.828e-013 | 9.845e-013 | -12.008 | -12.007 | 0.001 |
| Se(6) | 2.194e-022 | | | | |
| SeO4-2 | 2.194e-022 | 1.539e-022 | -21.659 | -21.813 | -0.154 |
| HSeO4- | 3.972e-028 | 3.635e-028 | -27.401 | -27.439 | -0.039 |
| Zn | 7.651e-008 | | | | |
| Zn+2 | 4.695e-008 | 3.292e-008 | -7.328 | -7.483 | -0.154 |
| ZnHCO3+ | 1.793e-008 | 1.641e-008 | -7.746 | -7.785 | -0.039 |
| ZnCO3 | 1.072e-008 | 1.074e-008 | -7.970 | -7.969 | 0.001 |
| Zn(CO3)2-2 | 5.354e-010 | 3.755e-010 | -9.271 | -9.425 | -0.154 |
| ZnOH+ | 1.537e-010 | 1.406e-010 | -9.813 | -9.852 | -0.039 |
| ZnSO4 | 1.271e-010 | 1.273e-010 | -9.896 | -9.895 | 0.001 |
| Zn(OH)2 | 6.555e-011 | 6.567e-011 | -10.183 | -10.183 | 0.001 |
| ZnCl+ | 2.399e-011 | 2.195e-011 | -10.620 | -10.658 | -0.039 |
| ZnOHCl | 6.711e-012 | 6.723e-012 | -11.173 | -11.172 | 0.001 |
| Zn(SO4)2-2 | 3.088e-014 | 2.166e-014 | -13.510 | -13.664 | -0.154 |
| ZnCl2 | 1.057e-014 | 1.058e-014 | -13.976 | -13.975 | 0.001 |
| Zn(OH)3- | 2.856e-015 | 2.614e-015 | -14.544 | -14.583 | -0.039 |
| ZnCl3- | 5.795e-018 | 5.303e-018 | -17.237 | -17.275 | -0.039 |
| Zn(OH)4-2 | 7.436e-021 | 5.214e-021 | -20.129 | -20.283 | -0.154 |

ZnCl4-2 1.643e-021 1.152e-021 -20.784 -20.939 -0.154

----------Saturation indices----------

| Phase | SI | log IAP | log KT | |
|---|---|---|---|---|
| Ag2CO3 | -12.32 | -23.75 | -11.43 | Ag2CO3 |
| Ag2O | -16.74 | -3.76 | 12.98 | Ag2O |
| Ag2SO4 | -17.61 | -22.70 | -5.08 | Ag2SO4 |
| AgMetal | 3.84 | -10.63 | -14.47 | Ag |
| Anglesite | -6.26 | -14.13 | -7.87 | PbSO4 |
| Anhydrite | -3.41 | -7.75 | -4.34 | CaSO4 |
| Antlerite | -12.02 | -3.73 | 8.29 | Cu3(OH)4SO4 |
| Aragonite | -0.55 | -8.80 | -8.26 | CaCO3 |
| Arsenolite | -19.17 | -20.82 | -1.65 | As2O3 |
| Artinite | -8.73 | 1.96 | 10.69 | MgCO3:Mg(OH)2:3H2O |
| As2O5(cr) | -35.31 | -26.79 | 8.52 | As2O5 |
| As_native | -23.08 | -36.66 | -13.58 | As |
| Atacamite | -8.33 | -0.28 | 8.05 | Cu2(OH)3Cl |
| Azurite | -8.73 | -3.80 | 4.92 | Cu3(OH)2(CO3)2 |
| Ba3(AsO4)2 | 4.46 | -46.01 | -50.47 | Ba3(AsO4)2 |
| Barite | -0.94 | -11.18 | -10.24 | BaSO4 |
| BaSeO3 | -9.11 | -15.50 | -6.39 | BaSeO3 |
| Bianchite | -10.45 | -12.21 | -1.76 | ZnSO4:6H2O |
| Birnessite | -17.89 | 25.71 | 43.60 | MnO2 |
| Bixbyite | -19.03 | -19.06 | -0.03 | Mn2O3 |
| Brochantite | -14.00 | 1.34 | 15.34 | Cu4(OH)6SO4 |
| Brucite | -6.90 | 10.97 | 17.87 | Mg(OH)2 |
| Ca3(AsO4)2:4w | -16.82 | -35.73 | -18.91 | Ca3(AsO4)2:4H2O |
| Calcite | -0.39 | -8.80 | -8.41 | CaCO3 |
| CaSeO3 | -6.48 | -12.08 | -5.60 | CaSeO3 |
| Cd(gamma) | -26.73 | -12.45 | 14.28 | Cd |
| Cd(OH)2 | -8.60 | 5.05 | 13.65 | Cd(OH)2 |
| Cd(OH)2(a) | -9.47 | 5.05 | 14.52 | Cd(OH)2 |
| Cd3(OH)2(SO4)2 | -29.41 | -22.70 | 6.71 | Cd3(OH)2(SO4)2 |
| Cd3(OH)4SO4 | -26.33 | -3.77 | 22.56 | Cd3(OH)4SO4 |
| Cd4(OH)6SO4 | -27.11 | 1.29 | 28.40 | Cd4(OH)6SO4 |
| CdCl2 | -15.26 | -15.77 | -0.51 | CdCl2 |
| CdCl2:2.5H2O | -13.76 | -15.77 | -2.01 | CdCl2:2.5H2O |
| CdCl2:H2O | -14.12 | -15.77 | -1.64 | CdCl2:H2O |
| CdMetal | -26.62 | -12.45 | 14.17 | Cd |
| CdOHCl | -9.16 | -5.36 | 3.80 | CdOHCl |
| CdSO4 | -14.34 | -13.88 | 0.46 | CdSO4 |
| CdSO4:2.7H2O | -12.17 | -13.88 | -1.71 | CdSO4:2.67H2O |
| CdSO4:H2O | -12.51 | -13.88 | -1.37 | CdSO4:H2O |
| Cerargyrite | -1.95 | -12.29 | -10.34 | AgCl |
| Cerrusite | -1.87 | -15.18 | -13.31 | PbCO3 |
| Chalcanthite | -11.17 | -13.86 | -2.69 | CuSO4:5H2O |
| Claudetite | -19.22 | -20.82 | -1.60 | As2O3 |
| CO2(g) | -1.77 | -3.04 | -1.27 | CO2 |
| Cotunnite | -11.03 | -16.02 | -4.98 | PbCl2 |
| Cu(OH)2 | -4.15 | 5.07 | 9.22 | Cu(OH)2 |
| Cu2SO4 | -19.21 | -20.98 | -1.78 | Cu2SO4 |
| Cu3(AsO4)2:6w | -18.95 | -54.07 | -35.12 | Cu3(AsO4)2:6H2O |
| CuCO3 | -5.29 | -14.92 | -9.63 | CuCO3 |
| CuMetal | -0.36 | -9.78 | -9.41 | Cu |
| CuOCuSO4 | -21.68 | -8.80 | 12.88 | CuO:CuSO4 |
| CupricFerrite | 5.20 | 12.55 | 7.35 | CuFe2O4 |
| Cuprite | -0.26 | -2.05 | -1.79 | Cu2O |
| CuprousFerrite | 11.49 | 2.71 | -8.78 | CuFeO2 |
| CuSO4 | -17.56 | -13.86 | 3.70 | CuSO4 |
| Dolomite | -1.09 | -17.82 | -16.73 | CaMg(CO3)2 |
| Dolomite(d) | -1.70 | -17.82 | -16.12 | CaMg(CO3)2 |
| Epsomite | -5.71 | -7.96 | -2.25 | MgSO4:7H2O |
| Fe(OH)2.7Cl.3 | 3.66 | 0.62 | -3.04 | Fe(OH)2.7Cl0.3 |
| Fe(OH)3(a) | -1.15 | 3.74 | 4.89 | Fe(OH)3 |
| Fe2(SeO3)3 | -26.86 | -62.29 | -35.43 | Fe2(SeO3)3 |
| Fe3(OH)8 | -4.36 | 15.86 | 20.22 | Fe3(OH)8 |
| FeSe2 | -22.03 | -40.61 | -18.58 | FeSe2 |
| Goethite | 4.19 | 3.74 | -0.45 | FeOOH |
| Goslarite | -10.13 | -12.21 | -2.09 | ZnSO4:7H2O |
| Gypsum | -3.16 | -7.75 | -4.59 | CaSO4:2H2O |
| H2(g) | -17.50 | -20.58 | -3.08 | H2 |
| H2O(g) | -1.91 | -0.00 | 1.91 | H2O |
| Halite | -7.91 | -6.37 | 1.55 | NaCl |
| Hausmannite | -22.72 | 42.14 | 64.86 | Mn3O4 |
| Hematite | 10.32 | 7.48 | -2.84 | Fe2O3 |
| Huntite | -6.86 | -35.85 | -28.99 | CaMg3(CO3)4 |
| Hydrocerrusite | -8.10 | -25.56 | -17.46 | Pb(OH)2:2PbCO3 |
| Hydromagnesite | -18.31 | -25.08 | -6.78 | Mg5(CO3)4(OH)2:4H2O |
| Hydrozincite | -15.73 | 14.58 | 30.31 | Zn5(OH)6(CO3)2 |
| Hydrozincite_PG | -17.43 | 14.58 | 32.01 | Zn5(OH)6(CO3)2 |
| Jarosite(ss) | -14.06 | -23.89 | -9.83 | (K0.77Na0.03H0.2)Fe3(SO4)2(OH)6 |
| Jarosite-K | -15.20 | -23.22 | -8.02 | KFe3(SO4)2(OH)6 |
| Jarosite-Na | -18.70 | -22.60 | -3.90 | NaFe3(SO4)2(OH)6 |
| JarositeH | -23.35 | -26.64 | -3.29 | (H3O)Fe3(SO4)2(OH)6 |
| Langite | -16.96 | 1.34 | 18.30 | Cu4(OH)6SO4:H2O |
| Larnakite | -9.29 | -9.32 | -0.04 | PbO:PbSO4 |
| Laurionite | -6.23 | -5.61 | 0.62 | PbOHCl |
| Litharge | -8.54 | 4.80 | 13.34 | PbO |
| Maghemite | 1.09 | 7.48 | 6.39 | Fe2O3 |
| Magnesite | -1.22 | -9.01 | -7.79 | MgCO3 |
| Magnetite | 10.20 | 15.86 | 5.66 | Fe3O4 |

| | | | | |
|---|---|---|---|---|
| Malachite | -5.27 | 0.63 | 5.90 | Cu2(OH)2CO3 |
| Manganite | -8.38 | 16.96 | 25.34 | MnOOH |
| Massicot | -8.74 | 4.80 | 13.55 | PbO |
| Melanothallite | -19.95 | -15.75 | 4.20 | CuCl2 |
| Melanterite | -8.15 | -10.55 | -2.41 | FeSO4:7H2O |
| Minium | -45.69 | 31.91 | 77.60 | Pb3O4 |
| Mirabilite | -9.01 | -10.85 | -1.84 | Na2SO4:10H2O |
| Mn2(SO4)3 | -71.62 | -75.85 | -4.23 | Mn2(SO4)3 |
| Mn3(AsO4)2:8H2O | -15.93 | -44.63 | -28.71 | Mn3(AsO4)2:8H2O |
| MnCl2:4H2O | -14.66 | -12.61 | 2.05 | MnCl2:4H2O |
| MnSO4 | -13.98 | -10.72 | 3.26 | MnSO4 |
| Monteponite | -9.66 | 5.05 | 14.71 | CdO |
| Nahcolite | -4.77 | -5.46 | -0.69 | NaHCO3 |
| Nantokite | -4.30 | -11.44 | -7.14 | CuCl |
| Natron | -9.99 | -11.90 | -1.91 | Na2CO3:10H2O |
| Nesquehonite | -3.61 | -9.01 | -5.40 | MgCO3:3H2O |
| Nsutite | -16.85 | 25.71 | 42.56 | MnO2 |
| O2(g) | -53.44 | -56.20 | -2.77 | O2 |
| Otavite | -2.93 | -14.93 | -12.00 | CdCO3 |
| Pb(OH)2 | -3.88 | 4.80 | 8.68 | Pb(OH)2 |
| Pb2(OH)3Cl | -9.60 | -0.80 | 8.79 | Pb2(OH)3Cl |
| Pb2O(OH)2 | -16.59 | 9.61 | 26.20 | PbO:Pb(OH)2 |
| Pb2O3 | -33.93 | 27.11 | 61.04 | Pb2O3 |
| Pb2OCO3 | -10.32 | -10.38 | -0.06 | PbO:PbCO3 |
| Pb3(AsO4)2 | -19.46 | -54.86 | -35.40 | Pb3(AsO4)2 |
| Pb3O2CO3 | -17.60 | -5.58 | 12.02 | PbCO3:2PbO |
| Pb3O2SO4 | -15.71 | -4.52 | 11.19 | PbSO4:2PbO |
| Pb4(OH)6SO4 | -20.82 | 0.28 | 21.10 | Pb4(OH)6SO4 |
| Pb4O3SO4 | -23.15 | 0.28 | 23.43 | PbSO4:3PbO |
| PbMetal | -16.95 | -12.70 | 4.25 | Pb |
| PbO:0.3H2O | -8.18 | 4.80 | 12.98 | PbO:0.33H2O |
| Phosgenite | -11.39 | -31.20 | -19.81 | PbCl2:PbCO3 |
| Plattnerite | -29.69 | 22.30 | 51.99 | PbO2 |
| Portlandite | -12.80 | 11.18 | 23.98 | Ca(OH)2 |
| Pyrochroite | -6.99 | 8.21 | 15.20 | Mn(OH)2 |
| Pyrolusite | -18.14 | 25.71 | 43.86 | MnO2 |
| Rhodochrosite | -0.70 | -11.77 | -11.08 | MnCO3 |
| Rhodochrosite(d) | -1.38 | -11.77 | -10.39 | MnCO3 |
| Scorodite | -10.65 | -30.90 | -20.25 | FeAsO4:2H2O |
| Se(s) | 1.58 | -15.74 | -17.32 | Se |
| SeO2 | -14.88 | -23.26 | -8.38 | SeO2 |
| Siderite | -0.81 | -11.61 | -10.80 | FeCO3 |
| Siderite(d)(3) | -1.16 | -11.61 | -10.45 | FeCO3 |
| Smithsonite | -3.43 | -13.27 | -9.83 | ZnCO3 |
| Smithsonite_PG | -2.47 | -13.27 | -10.80 | ZnCO3 |
| Tenorite | -3.13 | 5.07 | 8.20 | CuO |
| Thenardite | -10.69 | -10.85 | -0.16 | Na2SO4 |
| Thermonatrite | -12.13 | -11.90 | 0.23 | Na2CO3:H2O |
| Trona | -17.25 | -17.36 | -0.11 | NaHCO3:Na2CO3:2H2O |
| Witherite | -3.60 | -12.23 | -8.63 | BaCO3 |
| Zincite(c) | -5.25 | 6.72 | 11.97 | ZnO |
| Zincosite | -15.95 | -12.21 | 3.74 | ZnSO4 |
| Zn(OH)2-a | -5.73 | 6.72 | 12.45 | Zn(OH)2 |
| Zn(OH)2-b | -5.03 | 6.72 | 11.75 | Zn(OH)2 |
| Zn(OH)2-c | -5.48 | 6.72 | 12.20 | Zn(OH)2 |
| Zn(OH)2-e | -4.78 | 6.72 | 11.50 | Zn(OH)2 |
| Zn(OH)2-g | -4.99 | 6.72 | 11.71 | Zn(OH)2 |
| Zn2(OH)2SO4 | -13.00 | -5.50 | 7.50 | Zn2(OH)2SO4 |
| Zn2(OH)3Cl | -12.18 | 3.02 | 15.20 | Zn2(OH)3Cl |
| Zn3(AsO4)2:2.5w | -21.57 | -49.12 | -27.55 | Zn3(AsO4)2:2.5H2O |
| Zn3O(SO4)2 | -39.09 | -17.71 | 21.38 | ZnO:2ZnSO4 |
| Zn4(OH)6SO4 | -20.46 | 7.94 | 28.40 | Zn4(OH)6SO4 |
| Zn5(OH)8Cl2 | -25.73 | 12.77 | 38.50 | Zn5(OH)8Cl2 |
| ZnCl2 | -21.80 | -14.10 | 7.69 | ZnCl2 |
| ZnCO3:1H2O | -3.01 | -13.27 | -10.26 | ZnCO3:1H2O |
| ZnCO3:H2O | -3.01 | -13.27 | -10.26 | ZnCO3:H2O |
| ZnMetal | -37.94 | -10.78 | 27.16 | Zn |
| ZnO(a) | -4.59 | 6.72 | 11.31 | ZnO |
| ZnSO4:H2O | -12.05 | -12.21 | -0.17 | ZnSO4:H2O |

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End of simulation.
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Reading input data for simulation 10.
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End of run.
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# Appendix B

# Groundwater Quality & Elevation/Surface Water Quality Trends

# Memorandum

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January 28, 2014

TO: Dave Cline, Flambeau Mining Company

CC: Steve Donohue, Foth Infrastructure & Environment, LLC

FR: Stephen Lehrke, Ph.D., Foth Infrastructure & Environment, LLC
Sharon Kozicki, P.G., Foth Infrastructure & Environment, LLC

RE: 2013 Annual Report Groundwater and Surface Water Trends
Flambeau Mining Company

## Background

Groundwater and surface water sample results collected for the 2013 monitoring programs were added to the analytical monitoring historical database. These results were statistically tested and graphically displayed to determine whether any significant increasing or decreasing trends are occurring in the groundwater or surface water chemistry. This is done to satisfy the requirements of Part 4, Condition 9 of the Mine Permit to summarize the monitoring activities and any observed trends. The 2013 surface water samples in the Flambeau River were not required but taken voluntarily by Flambeau Mining Company (Flambeau).

Groundwater quality results, trend graphs and statistical test results are included as Attachment 1 for the quarterly monitoring parameters and Attachment 2 for the annual monitoring parameters. Surface water quality results, trend graphs and statistical test results are included as Attachment 3. Hydrographs are included as Attachment 4.

Intervention boundary wells included in the trend analyses are MW-1000PR, MW-1002, MW-1002G, MW-1004P, MW-1004S, MW-1005, MW-1005P, MW-1005S, and MW-1010P. The in-pit wells included in the trend analyses are MW-1013, MW-1013A, MW-1013B, MW-1013C, MW-1014, MW-1014A, MW-1014B and MW-1014C. Wells MW-1015A and MW-1015B (also included in the analyses) were constructed in January 2001 approximately 1,000 feet northwest of the backfilled pit and adjacent to the compliance boundary.

Note that during the fourth quarter of 2010, wells MW-1000R and MW-1004 had sufficient water recovery for sampling for the first time during the post-mining period. MW-1000R has 13 and MW-1004 has 12 post-mining monitoring results for the quarterly monitoring parameters. Both wells have three post-mining result for the annual monitoring parameters. The quarterly parameters for these wells are included in the trend analysis results, but insufficient data still exist to include the annual parameters.

## Statistical Methods

Groundwater and surface water data are tested statistically for trends utilizing two distinct start dates. Long-term trends encompass the results from October 1997 through December 2013. October 1997 was selected as the start date for long-term trend tests since it is the beginning of the post-mining period. Short-term trends encompass the results of January 2009 through December 2013, i.e., the previous five years.

Note that the long-term trend analyses begin with February 1999 for the in-pit wells MW-1013B, MW-1013C, MW-1014A, MW-1014B and MW-1014C, and with April 2001 for wells MW-1015A and MW-1015B, which is when monitoring for these wells began. Trend analyses are also included for wells MW-1013, MW-1013A and MW-1014 beginning with October 2005, and for MW-1000R and MW-1004 beginning with the October 2010, at which time sufficient groundwater recovery occurred to collect samples.

For the annual monitoring parameters of barium, cadmium, calcium, chloride, chromium, lead, magnesium, mercury, potassium, selenium, silver, sodium and zinc, the long-term trend analyses begin with July 1999 since this was the recent start date of monitoring for these parameters.

The non-parametric Mann-Kendall test for trend was used to statistically determine existing trends in both the long-term and recent (5-year) data sets. This test indicates whether any general increasing or decreasing trends have occurred during these time frames. The results of the trend tests are best used in conjunction with the trend graphs of Attachments 1, 2, and 3 to properly evaluate trend conditions in the context of the broader site hydrology. It should be noted that a statistically increasing or decreasing trend as determined through the Mann-Kendall test does not necessarily indicate a substantial increase or decrease in actual parameter concentrations. There are situations where variation in the data is small, allowing slight consecutive concentration changes to be detected as a statistically significant trend. Although these minor trends may occur, they should not be construed as an indication of a broader impact on water quality.

The procedure for the Mann-Kendall test is given in Gilbert (1987)[1] and USEPA (2009)[2]. The Type I error for each test was set to 0.01 (two-tailed), with the exception of the 5-year trend tests for the annual parameters. In those cases, the type I error (two-tailed) was set to 0.05 to increase the statistical power (power of detecting existing trends) to counteract the decrease in power due to small sample sizes. All non-detected values were replaced with a common value below the lowest detected value.

In the trend test results of Attachments 1, 2, and 3, a "+" indicates a statistically increasing trend and a "-" indicates a statistically decreasing trend. If neither a "+" or "-" is given, no statistically significant trend is present.

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[1]Gilbert, R.O., 1987. *Statistical Methods for Environmental Pollution Monitoring*, Van Nostrand Reinhold, New York.

[2]USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530-R-09-007. Office of Resource Conservation and Recovery, Program Implementation and Information Division, Washington, D.C.

# Trend Results

**Quarterly Parameters (Attachment 1)**

The majority of observable trends, increasing and/or decreasing, were exhibited in the groundwater results for the quarterly parameters of alkalinity, copper, hardness, iron, manganese, sulfate, TDS, conductivity and redox. A larger number of the observed trends are similar to those noted in the previous annual reports.

Based on the historical concentration trend graphs of Attachment 1, a majority of the short-term trends noted as statistically significant by the Mann-Kendall test results appear to be well within historical concentration ranges. Many long-term trends reported as statistically significant either appear to be generally stabilizing due to the completion of well recoveries during the post-mining period, or are noted as statistical trends due only to relatively small consecutive concentration increases or decreases.

The concentration increases of hardness, iron, manganese, sulfate, TDS and conductivity observed in the intervention boundary well MW-1000PR around 1999 to 2000 associated with well recovery subsequently followed long decreasing trends of these parameters, and for the most part have stabilized. This is also the case for iron and manganese in MW-1010P. The concentration increases of iron and manganese observed in MW-1004P observed around 2006 to 2007 have also decreased and fairly stabilized.

An increase in the total dissolved solids and conductivity of MW-1005 occurred in 2011. The concentration levels of these parameters remained consistent during 2012 and 2013.

In the boundary well MW-1015B, stronger decreasing trends for iron and manganese continue following sharper increases from 2002 to 2003, with redox in MW-1015B currently following a stronger increasing trend.

Iron in the in-pit well MW-1013C continues to have a stronger increasing trend which began in 1999. Copper in MW-1013B had a similar increasing trend through 2010, but in the last three years has stabilized and somewhat decreased. The in-pit wells MW-1014A (manganese), MW-1014B (manganese) and MW-1014C (alkalinity, hardness, iron, manganese, sulfate, TDS and conductivity) had stronger decreasing trends which began in 1999 and fairly stabilized around 2010.

The following narrative provides a more detailed discussion of the statistical trend results for each well, also utilizing the historical trend graphs of Attachment 1 to interpret the results. The term “statistical trend” is used to indicate statistically significant results with the Mann-Kendall trend tests. “Long-term” is used to indicate statistically significant results in the October 1997 through December 2013 data. “Short-term” is used to indicate statistically significant results in the January 2008 through December 2013 data. The results presented in the below discussion are organized by well nest or well location groupings.

**Intervention Boundary Wells**

- **MW-1000R/MW-1000PR/MW-1010P (Figures B-1a to B-1d):** These three wells are located near the immediate southwest boundary and hydraulically downgradient of the former mine pit.

  No statistical trends exist for MW-1000R, with the post-mining period chemical data set being relatively small with collected results beginning in October 2010. Larger sample to sample variation is, however, observed in the results for this well.

  In MW-1000PR, as observed in the historical trend graphs, several parameters exhibited an immediate increase in concentrations at the beginning of the post-mining period followed by a period of long-term statistically decreasing trends. These are hardness, iron, manganese, sulfate, TDS and conductivity. Short-term statistically decreasing trends continue for sulfate, TDS and conductivity.

  Alkalinity in MW-1000PR also increased at the beginning of the post-mining period and subsequently stabilized around 2002. A long-term statistically increasing trend is noted in the Mann-Kendall results due to the pre-2002 increase, but no short-term statistical trend is noted. Similarly, long-term statistically increasing trends are also given for arsenic and pH due to concentration increases through 2007. No short-term statistical trend is noted for arsenic and pH since concentrations have stabilized.

  In MW-1010P, fewer trends are discernible from the historical trend graphs. A long-term statistically increasing trend is noted for arsenic due to increases over the lower concentrations observed from 2005 through 2008. Also, a long-term statistically increasing trend is denoted for redox due to increases over the lower concentrations occurring in 2002 and 2003. Current concentrations for both these parameters are still somewhat similar to those observed prior to the low concentration periods, and no short-term trends are indicated.

  A long-term statistically decreasing trend is indicated for copper in MW-1010P, reflecting a period of increased concentrations during 1995 through 1999 followed by non-detectable concentrations for the most part following 2001.

  Short-term statistically decreasing trends are indicated for iron and manganese in MW-1010P. Iron and manganese in this well increased during late 2000 subsequent to well recovery in the post-mining period. Concentrations of these parameters again reduced to lower levels and remained consistent between 2005 through 2011. The short-term decreasing trend reflects continued decreases subsequent to 2011. The iron and manganese trend graphs of Figure B-1b are displayed on a logarithmic scale so that the somewhat similar trend patterns of MW-1010P and MW-1000PR are visible (albeit at different concentration scales).

  Statistically increasing trends in MW-1010P are also denoted for hardness, sulfate and conductivity, however, these trends reflect smaller changes in actual concentration

levels with current concentrations similar to, or below, pre-mining (pre-1993) conditions.

- **MW-1002/MW-1002G (Figures B-2a to B-2d):** This well nest is located approximately 1800 feet to the northwest and hydraulically sidegradient of the former mine pit.

  In MW-1002, long-term statistically decreasing trends are indicated for iron, manganese and TDS. The trends for iron and manganese reflect a long period of non-detected values following low-level detects at the onset of the post-mining period. The concentrations of TDS generally decreased in 2004, and have exhibited random fluctuations since then.

  A short-term statistically increasing trend of hardness is indicated for MW-1002 due to increased concentrations observed in 2013. Current concentration levels, however, are within the range observed during the pre-mining period.

  In MW-1002G, short-term and long-term statistically increasing trends are indicated for hardness and conductivity. However, again concentrations for both constituents are well within concentration ranges observed during the pre-mining period.

  A long-term statistically decreasing trend is also indicated for sulfate in MW-1002G, but is the result of very minimal variation observed in the data and a long period of small consecutive changes at already low concentrations.

- **MW-1004/MW-1004S/MW-1004P (Figures B-3a to B-3d):** This well nest is located near the immediate northwest boundary and hydraulically downgradient of the former mine pit.

  In MW-1004, the post-mining period chemical data set is small with collected results beginning in October 2010. No statistically significant trends exist.

  In MW-1004S, alkalinity, hardness, sulfate and conductivity have statistically increasing long-term trends, but as can be seen in the trend graphs of Attachment 1 these are small increases since 2002 where concentrations remain generally low with alkalinity, hardness and conductivity below pre-mining (pre-1993) concentrations.

  A short-term statistically increasing trend of redox also exists for MW-1004S, reflecting increased concentrations observed in 2012 and 2013.

  In MW-1004P, a long-term statistically increasing trend is indicated for iron and manganese. Iron and manganese concentrations in this well initially decreased in 1993 following the onset of the mining period. Concentrations remained lower than pre-1993 levels until a general increase began around 2002. Between January 2005 and June 2009, concentrations fluctuated randomly still at concentrations near or below pre-1993 levels. Sampling during October 2009 showed increased concentrations of these two parameters, but subsequent sampling in 2010 through 2013 again resulted in decreased

concentrations to levels observed prior to 2009 and near or below pre-1993 concentrations.

A long-term statistical increase of hardness is indicated in MW-1004P, however, this reflects only small concentration changes between 1998 and 2013. Hardness concentrations are currently below pre-mining concentrations.

A long-term statistically decreasing trend is indicated in MW-1004P for copper, reflecting decreases over an isolated period of marginally increased concentrations during 1997 and 1998. A long-term statistically decreasing trend is also given for TDS, which reflects a generally steady decrease dating back to the pre-mining period.

- **MW-1005/MW-1005S/MW-1005P (Figures B-4a to B-4d):** This well nest is located approximately 1000 feet to the southeast and hydraulically upgradient of the former mine pit.

  In MW-1005, statistically long-term decreasing trends have occurred for alkalinity and iron. These reflect moderate concentration decreases since the onset of the post-mining period. A statistically long-term decreasing trend is also noted for arsenic, reflecting decreased concentrations beginning in 2009.

  Although the long-term statistical trend of alkalinity and iron is decreasing in MW-1005, short-term statistical trends are increasing for these two analytes, along with hardness, manganese, TDS and conductivity. These short-term trends are due to concentration increases observed from 2011 through 2013. Current concentrations are still at or near the range observed historically.

  In MW-1005S, alkalinity, hardness, manganese and conductivity have long-term statistically increasing trends, but reflect only small changes in actual concentration levels which are near or below pre-1993 results. A long-term statistically decreasing trend of sulfate was indicated, but also reflects very minimal variation observed in the data being a long period of non-detected values following very low-level detects.

  In MW-1005P, iron and conductivity have long-term statistically increasing trends, but similar to several of the noted trends for MW-1005S, reflect relatively small actual concentration changes with current levels which are near or below pre-1993 results. A short-term statistically decreasing trend of pH was also noted.

  Note the iron trend graphs of Figure B-4b are displayed on a logarithmic scale so the trend patterns of MW-1005, MW-1005S and MW-1005P are visible at different concentration scales.

- **MW-1015A/MW-1015B (Figures B-5a to B-5d):** This well nest is located approximately 1000 feet to the west and hydraulically downgradient of the former mine pit.

In MW-1015A, various long-term statistical trends were noted for sulfate (increasing), conductivity (increasing) and manganese (decreasing) but reflect very minimal variation observed in the data and very small consecutive concentration changes. Concentrations remain generally stable and at lower levels. While the long-term trend noted for sulfate is increasing, the short-term statistical trend is decreasing, again reflecting only very small consecutive concentration changes. A long-term statistically decreasing trend of TDS is also noted reflecting moderate concentration changes.

In MW-1015B, a statistically increasing long-term trend of hardness is indicated, but similar to the trends noted for MW-1015A reflects only small changes in actual concentration. A long-term statistically increasing trend is also noted for conductivity which reflects more moderate concentration changes.

A stronger long-term and short-term statistically increasing trend of redox is also observed in MW-1015B, increasing since 2005.

Short-term statistically decreasing trends in MW-1015B are indicated for iron and manganese. Concentrations of iron and manganese increased during 2002 to 2003, and have generally followed a strong decreasing trend since then.

**In-Pit Wells**

- **MW-1013/MW-1013A/MW-1013B/MW-1013C (Figures B-6a to B-6d):** This well nest is located within the former mine pit on the southwest side.

  In MW-1013 or MW-1013A, several statistical trends are noted for iron, sulfate and conductivity, but reflect only small changes in actual concentration.

  In MW-1013B, a long-term statistically increasing trend is noted for copper, reflecting stronger concentration increases from 1999 through 2010. However, in the last three years copper has stabilized and somewhat decreased. Long-term and short-term statistically increasing trends are also noted for redox, but due to only more modest concentration increases.

  Iron in MW-1013B was following a significantly increasing trend until 2004, when concentrations suddenly fell to non-detectable levels. Iron is now noted as a long-term statistically decreasing trend for this well.

  TDS in MW-1013B has had a long-term statistically decreasing trend due to a general concentration decrease subsequent to 2003.

  In MW-1013C, long-term statistically increasing trends were observed for alkalinity, iron and manganese, where stronger concentration increases began in 1999. No statistical trends are observed in the short-term results for alkalinity and manganese, where concentrations appear to have stabilized subsequent to 2006. The increasing trend of iron continues in MW-1013C.

A long-term statistically increasing trend is also observed for arsenic in MW-1013C, but reflects relatively small changes in actual concentration levels.

A long-term statistically decreasing trend is noted for TDS and conductivity in MW-1013C due to a general concentration decrease subsequent to 2003, similar to what was observed in MW-1013B.

- **MW-1014/MW-1014A/MW-1014B/MW-1014C (Figures B-7a to B-7d):** This well nest is located within the former mine pit on the northeast side.

  In MW-1014, sulfate and TDS have statistically decreasing long-term and short-term trends (trend data beginning in October 2005). The decreasing trends reflect very minimal variation observed in the data with small consecutive concentration changes.

  In MW-1014A, long-term statistically decreasing trends were noted for iron and manganese. Prior to 2002, iron was observed at concentrations over 1 mg/L, but has generally been at non-detectable levels or slightly over since 2004. From 2000 to 2009 manganese concentrations reduced by over a factor of 30, and have remained consistently at lower levels since then.

  Long-term statistically decreasing trends are also noted in MW-1014A for conductivity and hardness, long-term statistically increasing trends were noted for alkalinity and copper, and long-term and short-term statistically increasing trends were noted for redox, but all reflect smaller concentration changes.

  In MW-1014B, statistically long-term decreasing trends were observed for hardness, manganese, sulfate, TDS, conductivity and redox, with the decreasing trend also noted in the short-term results for manganese. The trend with manganese particularly reflects a stronger decreasing trend from 1999 through 2010, and somewhat stabilizing thereafter. Hardness, sulfate TDS and conductivity reflect moderate decreasing trends through this time period.

  In MW-1014C, statistically long-term decreasing trends are observed for alkalinity, hardness, iron, manganese, sulfate, TDS and conductivity, with a short-term decreasing trend also observed for alkalinity. Similar to manganese in MW-1014B, the decreasing trend of iron in MW-1014C also reflects a stronger decreasing trend from 1999 through 2010 and somewhat stabilizing thereafter. The trends of the other parameters noted for MW-1014C reflect moderate steady concentration decreases over that time period.

  Statistical long-term increasing trends are noted for arsenic, copper, pH and redox, but reflect relatively smaller concentration changes.

## Annual Parameters (Attachment 2)

Flambeau voluntarily continued surface water sampling of the Flambeau River in 2013. Similar to past trend results, the annual groundwater parameters of barium, cadmium, calcium,

chloride, chromium, lead, magnesium, mercury, potassium, selenium, silver, sodium and zinc illustrated few statistically significant trends, and of those that are noted, most generally reflect relatively small consecutive concentration changes. Historical trend charts for the annual parameters are illustrated in Figure B8a through Figure B14e of Attachment 2. The discussion below is limited to statistical trends reflecting more moderate concentration changes. These trends are:

- MW-1000PR has had long-term statistically decreasing trends of calcium, magnesium and zinc (Figures B-8a, B-8c and B-8e). A long-term statistically increasing trend is observed for chloride, however, chloride concentrations are very low remaining well below 50 mg/L.

- MW-1002G has long-term statistically increasing trend of chloride, but with concentrations being very low, remaining well below 50 mg/L (Figure B-9b).

- MW-1013B has a long-term statistically decreasing trend noted for chromium (Figure B-13b). Lead in MW-1013B has seen mostly non-detectable levels since 1999, however, detects were observed in the annual samples of the most recent three years, resulting in a short-term statistically increasing trend.

- MW-10013C has a long-term statistically increasing trend of chloride, but with concentrations being low, remaining below 100 mg/L (Figure B-13b). Similar to MW-1013B, lead has been mostly non-detectable since 1999, however, detects during the most recent three years resulted in a short-term statistically increasing trend. Zinc in MW-1013C has a long-term statistically decreasing trend, with the largest concentration drops occurring between 1999 and 2003.

- MW-1014B and MW-1014C have statistically decreasing trends denoted in the long-term results of calcium, magnesium and zinc, with MW-1014B also having a statistically decreasing trend in the long-term results of cadmium (Figures B-14a, B-14c and B-14e). The decreasing trend for zinc also appears in the short-term results for MW-1014C.

  A long-term statistically increasing trend of chloride is noted for MW-1014B and MW-1014C, and a long-term statistically increasing trend of barium is noted for MW-1014C, but these are due to relatively small consecutive concentration changes with low level concentration values.

**Surface Water (Attachment 3)**

Parameters currently included in the surface water monitoring are copper, hardness, zinc, pH and conductivity. Iron, manganese and sulfate were not monitored in 2013 and therefore not included in the trend analysis. No statistical trends were noted in the surface water results.

**Hydrographs (Attachment 4)**

As observed in the hydrographs (Figures B-16a through B-16p), water levels in all wells illustrating significant drawdown during the production period of 1993 to 1997 substantially stabilized. These wells include MW-1000PR, MW-1001, MW-1001G, MW-1001P, MW-1003, MW-1003P, MW-1004,
MW-1004P, MW-1004S, MW-1010P, OW-7, OW-39, OW-42, PZ-1006G, PZ-1006S, PZ-1007S, PZ-1008, PZ-1008G, PZ-1012, PZ-R1, PZ-S1, PZ-S3, ST-9-23 and ST-9-26.

Groundwater elevations increased steadily from 1999 through 2002 for the in-pit wells of MW-1013A, MW-1013B, MW-1013C, MW-1014, MW-1014A, MW-1014B and MW-1014C, but stabilized subsequent to 2003. Elevations for MW-1013 rose through 2004, but appear to have stabilized during 2005 and remained consistent since then.

Generally higher groundwater elevations are noted for all wells during 2010 and 2011, reflecting the increased precipitation observed in those years. Elevations generally dropped in 2012, but rebounded again during the summer of 2013.

## Conclusions

A detailed analysis of statistical trends occurring in the groundwater and surface water data was performed. Statistical tests evaluated long-term trends occurring during the post-mining period (October 1997 to the present) and short-term trends for the most recent five years. Historical trend graphs of the data are also presented. Many short-term statistical trends appear to be well within historical concentration ranges. Many long-term statistical trends either appear to be generally stabilizing due to the completion of well recoveries during the post-mining period, or are noted as statistical trends due only to relatively small consecutive concentration increases or decreases.

The majority of the statistically significant trends with notable concentration changes occur with the quarterly groundwater monitoring parameters. For the intervention boundary wells, several trends which appeared prominent in previous annual reports have stabilized or decreased. The intervention boundary well MW-1000PR, where concentration increases of hardness, iron, manganese, sulfate, TDS and conductivity were observed around 1999 to 2000 and associated with well recovery, have subsequently followed long-term statistically decreasing trends. Iron and manganese in MW-1010P also increased during late 2000 subsequent to post-mining groundwater level recovery, however, concentrations now continue a steady decrease first beginning with 2004. Additionally, with the intervention boundary well MW-1004P, the concentration increases of iron and manganese observed around 2006 to 2007 have also decreased and fairly stabilized.

In one intervention boundary well, MW-1005, a short-term statistically increasing trend in total dissolved solids and conductivity began in 2011. The concentration levels of these parameters remained consistent during 2012 and 2013.

MW1015B, located adjacent to the compliance boundary approximately 1,000 feet northwest of the backfilled pit, exhibits stronger decreasing trends for iron and manganese (following

initial increases observed from 2002 to 2003), with redox in MW-1015B following a stronger increasing trend.

Several stronger trends have previously been reported for the in-pit wells. Iron in MW-1013C continues to have an increasing trend which began in 1999. Copper in MW-1013B had a similar increasing trend through 2010, but in the last three years has stabilized and somewhat decreased. The in-pit wells MW-1014A (manganese), MW-1014B (manganese) and MW-1014C (alkalinity, hardness, iron, manganese, sulfate, TDS and conductivity) had stronger decreasing trends from 1999 through 2010, but now have fairly stabilized.

Few significant trends were noted for the annual groundwater parameters of barium, cadmium, calcium, chloride, chromium, lead, magnesium, mercury, potassium, selenium, silver, sodium and zinc. The somewhat more notable trends include long-term decreasing trends of calcium, magnesium and zinc in MW-1000PR, long-term decreasing trends of calcium and zinc in MW-1014B and MW-1014C, and a long-term decreasing trend of cadmium in MW-1014B.

No statistically significant trends were observed in the surface water monitoring results.

# Attachment 1

## Statistical Results

## Trend Graphs

## Historical Data

## (Groundwater - Quarterly Parameters)

## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2013

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Field Cond (umho) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1000PR** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | -46 | 37 | -48 | -43 | 37 | -49 | -96 | -113 | 23 | -88 | -15 | 20 |
| p-Level | 0.146 | 0.247 | 0.128 | 0.175 | 0.247 | 0.120 | 0.002 | 0.000 | 0.480 | 0.004 | 0.628 | 0.542 |
| Trend | | | | | | | - | - | | - | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 65 | 46 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 50 | 65 |
| Mann-Kendall S | 1351 | 278 | -351 | -1242 | -543 | -1181 | -1448 | -1225 | 573 | -1444 | -246 | 200 |
| p-Level | 0.000 | 0.008 | 0.045 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.040 | 0.260 |
| Trend | + | + | | - | - | - | - | - | + | - | | |
| **MW-1000R** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 20 |
| Mann-Kendall S | -27 | 3 | -22 | -26 | -5 | -32 | -27 | -33 | -3 | -12 | 28 | 28 |
| p-Level | 0.114 | 0.905 | 0.204 | 0.128 | 0.812 | 0.058 | 0.114 | 0.05 | 0.905 | 0.51 | 0.1 | 0.386 |
| Trend | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 64 |
| Mann-Kendall S | -27 | 3 | -22 | -26 | -5 | -32 | -27 | -33 | -3 | -12 | 28 | 223 |
| p-Level | 0.114 | 0.905 | 0.204 | 0.128 | 0.812 | 0.058 | 0.114 | 0.05 | 0.905 | 0.51 | 0.1 | 0.198 |
| Trend | | | | | | | | | | | | |
| **MW-1002** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 1 | 20 |
| Mann-Kendall S | 60 | 9 | -8 | 99 | 21 | -13 | -32 | -26 | 28 | 58 | 0 | 34 |
| p-Level | 0.054 | 0.798 | 0.822 | 0.001 | 0.521 | 0.701 | 0.318 | 0.422 | 0.386 | 0.064 | | 0.288 |
| Trend | | | | + | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 65 | 43 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 1 | 65 |
| Mann-Kendall S | 332 | 19 | -231 | 383 | -378 | -351 | -428 | -603 | 99 | 130 | 0 | -127 |
| p-Level | 0.060 | 0.668 | 0.054 | 0.030 | 0.010 | 0.002 | 0.016 | 0.001 | 0.578 | 0.465 | | 0.476 |
| Trend | | | | | - | - | | - | | | | |
| **MW-1002G** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 1 | 20 |
| Mann-Kendall S | -5 | 0 | 5 | 102 | 1 | -9 | 19 | 15 | 15 | 110 | 0 | 34 |
| p-Level | 0.898 | 1.000 | 0.898 | 0.000 | 0.987 | 0.798 | 0.564 | 0.654 | 0.654 | 0.000 | | 0.288 |
| Trend | | | | + | | | | | | + | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 65 | 43 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 1 | 65 |
| Mann-Kendall S | -151 | -53 | 4 | 815 | -186 | -57 | -998 | -207 | -92 | 628 | 0 | -147 |
| p-Level | 0.392 | 0.134 | 0.967 | 0.000 | 0.174 | 0.577 | 0.000 | 0.238 | 0.606 | 0.000 | | 0.408 |
| Trend | | | | + | | | - | | | + | | |
| **MW-1004** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 19 |
| Mann-Kendall S | 9 | 3 | 33 | 16 | 6 | -4 | 24 | 14 | -4 | 20 | 21 | 58 |
| p-Level | 0.592 | 0.893 | 0.026 | 0.31 | 0.738 | 0.84 | 0.116 | 0.38 | 0.84 | 0.196 | 0.174 | 0.046 |
| Trend | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 52 |
| Mann-Kendall S | 9 | 3 | 33 | 16 | 6 | -4 | 24 | 14 | -4 | 20 | 21 | -50 |
| p-Level | 0.592 | 0.893 | 0.026 | 0.31 | 0.738 | 0.84 | 0.116 | 0.38 | 0.84 | 0.196 | 0.174 | 0.699 |
| Trend | | | | | | | | | | | | |

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## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2013

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Field Cond (umho) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1004P** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 15 | 21 |
| Mann-Kendall S | -32 | -3 | 11 | 55 | -8 | -13 | 49 | -36 | -79 | 41 | -34 | 49 |
| p-Level | 0.354 | 0.952 | 0.765 | 0.104 | 0.834 | 0.720 | 0.149 | 0.294 | 0.017 | 0.230 | 0.103 | 0.149 |
| Trend | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 66 | 46 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 47 | 66 |
| Mann-Kendall S | -8 | -4 | -552 | 469 | 1020 | 1083 | -320 | -538 | -53 | 419 | -212 | 368 |
| p-Level | 0.960 | 0.958 | 0.000 | 0.004 | 0.000 | 0.000 | 0.027 | 0.003 | 0.773 | 0.021 | 0.053 | 0.042 |
| Trend | | | - | + | + | + | | - | | | | |
| **MW-1004S** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | -57 | 0 | 49 | -8 | -17 | -40 | -15 | -29 | 51 | -38 | 86 | 43 |
| p-Level | 0.069 | 1.000 | 0.120 | 0.822 | 0.608 | 0.208 | 0.654 | 0.369 | 0.105 | 0.234 | 0.004 | 0.175 |
| Trend | | | | | | | | | | | + | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 65 | 45 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 51 | 65 |
| Mann-Kendall S | 710 | -13 | -54 | 1005 | -312 | -352 | 1131 | -280 | 329 | 699 | 286 | 333 |
| p-Level | 0.000 | 0.741 | 0.725 | 0.000 | 0.025 | 0.012 | 0.000 | 0.112 | 0.063 | 0.000 | 0.021 | 0.060 |
| Trend | + | | | + | | | + | | | + | | |
| **MW-1005** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 1 | 19 |
| Mann-Kendall S | 92 | 8 | 31 | 99 | 80 | 97 | 42 | 81 | -91 | 98 | 0 | 37 |
| p-Level | 0.002 | 0.822 | 0.335 | 0.001 | 0.010 | 0.002 | 0.186 | 0.009 | 0.003 | 0.002 | | 0.210 |
| Trend | + | | | + | + | + | | + | - | + | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 65 | 43 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 1 | 64 |
| Mann-Kendall S | -1064 | -244 | 324 | 179 | -491 | -313 | 281 | 180 | -219 | 259 | 0 | 15 |
| p-Level | 0.000 | 0.009 | 0.011 | 0.312 | 0.005 | 0.077 | 0.099 | 0.310 | 0.216 | 0.144 | | 0.935 |
| Trend | - | - | | | - | | | | | | | |
| **MW-1005P** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | -14 | -15 | -7 | 75 | 50 | 20 | 16 | -16 | -80 | 5 | -7 | 26 |
| p-Level | 0.678 | 0.654 | 0.847 | 0.015 | 0.112 | 0.542 | 0.630 | 0.630 | 0.010 | 0.898 | 0.847 | 0.422 |
| Trend | | | | | | | | | - | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 65 | 43 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 53 | 65 |
| Mann-Kendall S | -44 | -72 | -226 | 125 | 1009 | 224 | -276 | -447 | -293 | 464 | -330 | -108 |
| p-Level | 0.794 | 0.138 | 0.011 | 0.465 | 0.000 | 0.207 | 0.017 | 0.011 | 0.098 | 0.009 | 0.012 | 0.545 |
| Trend | | | | | + | | | | | + | | |
| **MW-1005S** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 1 | 20 |
| Mann-Kendall S | 8 | -51 | -7 | 79 | 71 | 66 | 0 | -49 | -79 | 56 | 0 | 36 |
| p-Level | 0.822 | 0.105 | 0.847 | 0.011 | 0.022 | 0.034 | 1.000 | 0.120 | 0.011 | 0.074 | | 0.260 |
| Trend | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 65 | 43 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 1 | 65 |
| Mann-Kendall S | 795 | -28 | -21 | 785 | 398 | 730 | -621 | -334 | -114 | 557 | 0 | 78 |
| p-Level | 0.000 | 0.777 | 0.704 | 0.000 | 0.023 | 0.000 | 0.000 | 0.058 | 0.521 | 0.002 | | 0.663 |
| Trend | + | | | + | | + | - | | | + | | |

## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2013

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Field Cond (umho) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1010P** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | -37 | 17 | 5 | 103 | -98 | -109 | 116 | 0 | -53 | 128 | 61 | 11 |
| p-Level | 0.247 | 0.608 | 0.898 | 0.000 | 0.002 | 0.000 | 0.000 | 1.000 | 0.092 | 0.000 | 0.050 | 0.749 |
| Trend | | | | + | - | - | + | | | + | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 65 | 46 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 51 | 65 |
| Mann-Kendall S | 321 | 384 | -799 | 1329 | -228 | 17 | 1403 | -93 | 276 | 1158 | 634 | 133 |
| p-Level | 0.048 | 0.000 | 0.000 | 0.000 | 0.197 | 0.928 | 0.000 | 0.599 | 0.119 | 0.000 | 0.000 | 0.455 |
| Trend | | + | - | + | | | + | | | + | + | |
| **MW-1013** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | 7 | 23 | 2 | 16 | 46 | 40 | -126 | 39 | -34 | 24 | 18 | 16 |
| p-Level | 0.847 | 0.480 | 0.974 | 0.630 | 0.146 | 0.208 | 0.000 | 0.221 | 0.288 | 0.460 | 0.586 | 0.630 |
| Trend | | | | | | | - | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 34 | 60 |
| Mann-Kendall S | 121 | -56 | 93 | 50 | -7 | 87 | -352 | 157 | -86 | -25 | 35 | 1093 |
| p-Level | 0.062 | 0.398 | 0.155 | 0.450 | 0.926 | 0.185 | 0.000 | 0.015 | 0.190 | 0.712 | 0.616 | 0.000 |
| Trend | | | | | | | - | | | | | + |
| **MW-1013A** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 19 | 20 |
| Mann-Kendall S | -42 | 5 | 57 | 33 | 72 | 70 | 14 | -1 | 8 | 16 | 54 | 44 |
| p-Level | 0.186 | 0.898 | 0.069 | 0.303 | 0.020 | 0.024 | 0.678 | 0.987 | 0.822 | 0.630 | 0.063 | 0.164 |
| Trend | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 60 |
| Mann-Kendall S | -63 | -57 | 105 | -66 | 319 | 117 | -151 | -76 | 4 | -175 | 11 | 438 |
| p-Level | 0.340 | 0.389 | 0.107 | 0.316 | 0.000 | 0.072 | 0.019 | 0.248 | 0.964 | 0.006 | 0.878 | 0.005 |
| Trend | | | | | + | | | | | - | | + |
| **MW-1013B** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | -34 | -7 | 50 | 60 | 44 | 47 | 10 | 29 | -8 | 49 | 95 | 53 |
| p-Level | 0.288 | 0.847 | 0.112 | 0.054 | 0.164 | 0.137 | 0.774 | 0.369 | 0.822 | 0.120 | 0.002 | 0.092 |
| Trend | | | | | | | | | | | + | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 60 | 48 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 53 | 60 |
| Mann-Kendall S | -141 | -169 | 1279 | -322 | -464 | -159 | 228 | -556 | -143 | -330 | 640 | 462 |
| p-Level | 0.370 | 0.094 | 0.000 | 0.027 | 0.001 | 0.312 | 0.120 | 0.000 | 0.363 | 0.036 | 0.000 | 0.003 |
| Trend | | | + | | - | | | - | | | + | + |
| **MW-1013C** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | 1 | 8 | 74 | 33 | 121 | -22 | -23 | 9 | -14 | -42 | 14 | 42 |
| p-Level | 0.987 | 0.822 | 0.016 | 0.303 | 0.000 | 0.500 | 0.480 | 0.798 | 0.678 | 0.186 | 0.678 | 0.186 |
| Trend | | | | | + | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 60 | 48 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 59 | 53 | 60 |
| Mann-Kendall S | 488 | 313 | 22 | -313 | 1539 | 630 | -27 | -408 | -52 | -424 | 188 | 440 |
| p-Level | 0.002 | 0.005 | 0.856 | 0.038 | 0.000 | 0.000 | 0.859 | 0.007 | 0.744 | 0.006 | 0.151 | 0.005 |
| Trend | + | + | | | + | + | | - | | - | | + |

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## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2013

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Field Cond (umho) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1014** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | 8 | 0 | 14 | 18 | -3 | 69 | -105 | -90 | 41 | -62 | 51 | 37 |
| p-Level | 0.822 | 1.000 | 0.678 | 0.586 | 0.949 | 0.026 | 0.000 | 0.004 | 0.197 | 0.046 | 0.105 | 0.247 |
| Trend | | | | | | | - | - | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 34 | 57 |
| Mann-Kendall S | 33 | -33 | -27 | -161 | 62 | 6 | -375 | -174 | -18 | -145 | 42 | 526 |
| p-Level | 0.623 | 0.623 | 0.689 | 0.012 | 0.348 | 0.938 | 0.000 | 0.006 | 0.794 | 0.025 | 0.546 | 0.000 |
| Trend | | | | | | | - | - | | | | + |
| **MW-1014A** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | -56 | -22 | 13 | 33 | -13 | -78 | -27 | -7 | -14 | 20 | 88 | 34 |
| p-Level | 0.074 | 0.500 | 0.701 | 0.303 | 0.701 | 0.012 | 0.404 | 0.847 | 0.678 | 0.542 | 0.004 | 0.288 |
| Trend | | | | | | | | | | | + | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 55 | 45 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 53 | 60 |
| Mann-Kendall S | 361 | -70 | 436 | -377 | -610 | -1288 | 65 | -202 | -120 | -579 | 393 | 671 |
| p-Level | 0.009 | 0.429 | 0.000 | 0.002 | 0.000 | 0.000 | 0.638 | 0.122 | 0.385 | 0.000 | 0.003 | 0.000 |
| Trend | + | | + | - | - | - | | | | - | + | + |
| **MW-1014B** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 21 | 21 | 20 | 21 |
| Mann-Kendall S | -59 | -22 | -38 | 30 | -8 | -80 | -20 | -35 | -45 | -21 | -3 | 58 |
| p-Level | 0.059 | 0.500 | 0.234 | 0.352 | 0.822 | 0.010 | 0.542 | 0.274 | 0.186 | 0.550 | 0.949 | 0.086 |
| Trend | | | | | | - | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 60 | 48 | 60 | 60 | 60 | 60 | 60 | 60 | 61 | 61 | 53 | 61 |
| Mann-Kendall S | -207 | 16 | -276 | -832 | -112 | -1443 | -519 | -842 | 229 | -808 | -371 | 525 |
| p-Level | 0.187 | 0.889 | 0.079 | 0.000 | 0.203 | 0.000 | 0.001 | 0.000 | 0.153 | 0.000 | 0.005 | 0.001 |
| Trend | | | | - | | - | - | - | | - | - | + |
| **MW-1014C** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | -93 | 16 | 60 | 17 | -20 | -23 | -54 | -23 | 6 | -32 | -44 | 40 |
| p-Level | 0.002 | 0.630 | 0.054 | 0.608 | 0.542 | 0.480 | 0.086 | 0.480 | 0.872 | 0.318 | 0.164 | 0.208 |
| Trend | - | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 60 | 48 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 53 | 60 |
| Mann-Kendall S | -1048 | 524 | 314 | -1447 | -1540 | -1513 | -1376 | -1228 | 544 | -1498 | 368 | 429 |
| p-Level | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.005 | 0.006 |
| Trend | - | + | + | - | - | - | - | - | + | - | + | + |
| **MW-1015A** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | -25 | 0 | -6 | 62 | -7 | -49 | -87 | -66 | 32 | -21 | 68 | 20 |
| p-Level | 0.441 | 1.000 | 0.872 | 0.046 | 0.847 | 0.120 | 0.004 | 0.034 | 0.318 | 0.521 | 0.028 | 0.542 |
| Trend | | | | | | | - | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 59 | 52 | 59 | 59 | 60 | 60 | 59 | 59 | 60 | 60 | 37 | 60 |
| Mann-Kendall S | 280 | -71 | 114 | 298 | -83 | -843 | 702 | -425 | 317 | 961 | 150 | -337 |
| p-Level | 0.063 | 0.170 | 0.157 | 0.051 | 0.346 | 0.000 | 0.000 | 0.005 | 0.044 | 0.000 | 0.050 | 0.032 |
| Trend | | | | | | - | + | - | | + | | |

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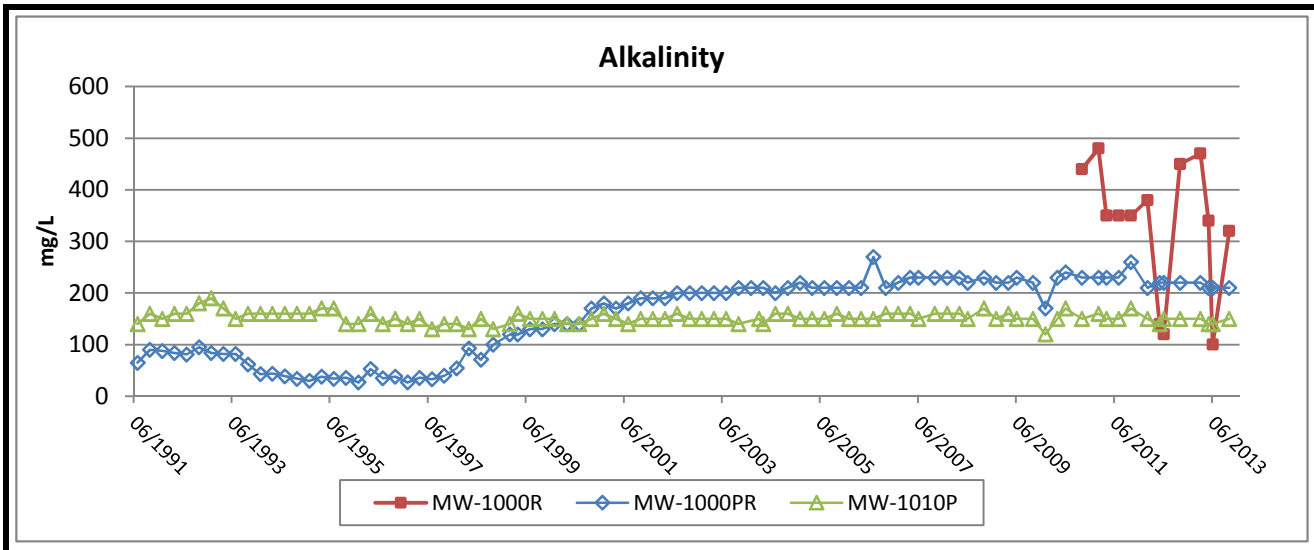
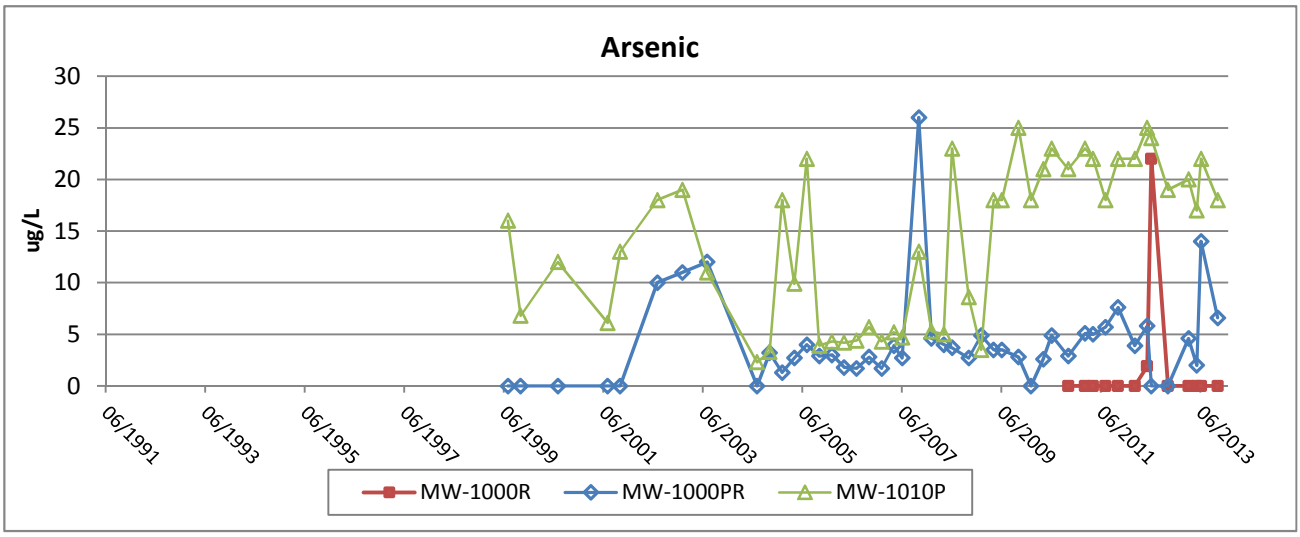
## Trend Analysis Results - Groundwater (Quarterly Parameters)
## Year Ending 2013

| | Alkalinity | Arsenic | Copper | Hardness | Iron | Manganese | Sulfate | TDS | Field pH (su) | Field Cond (umho) | Redox (mV) | Grd Water El (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1015B** | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | |
| Sample Size | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mann-Kendall S | -29 | 0 | 9 | 51 | -88 | -125 | 0 | -72 | -9 | 24 | 94 | 23 |
| p-Level | 0.369 | 1.000 | 0.798 | 0.105 | 0.004 | 0.000 | 1.000 | 0.020 | 0.798 | 0.460 | 0.002 | 0.480 |
| Trend | | | | | - | - | | | | | + | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | |
| Sample Size | 59 | 52 | 59 | 59 | 60 | 60 | 59 | 59 | 60 | 60 | 38 | 60 |
| Mann-Kendall S | -199 | -36 | 87 | 614 | 54 | -363 | -105 | -146 | 95 | 989 | 525 | -284 |
| p-Level | 0.072 | 0.493 | 0.072 | 0.000 | 0.735 | 0.021 | 0.073 | 0.341 | 0.548 | 0.000 | 0.000 | 0.071 |
| Trend | | | | + | | | | | | + | + | |

Notes: Overall increasing trend denoted by "+".
Overall decreasing trend denoted by "-"
All trend tests performed at a Type I (two-tailed) error rate of 0.01.



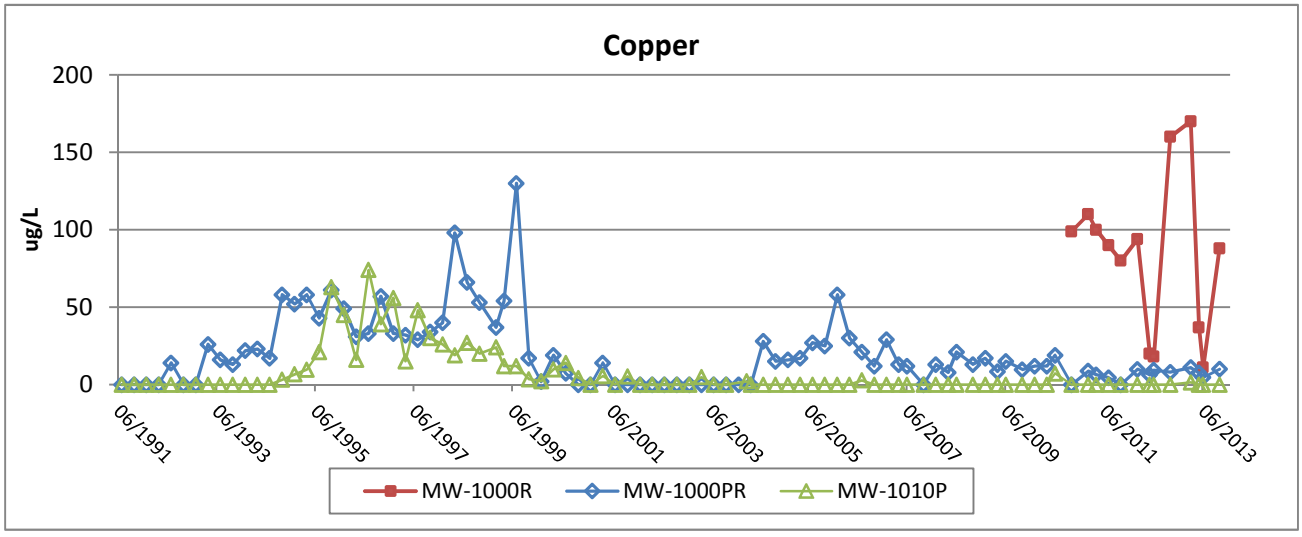




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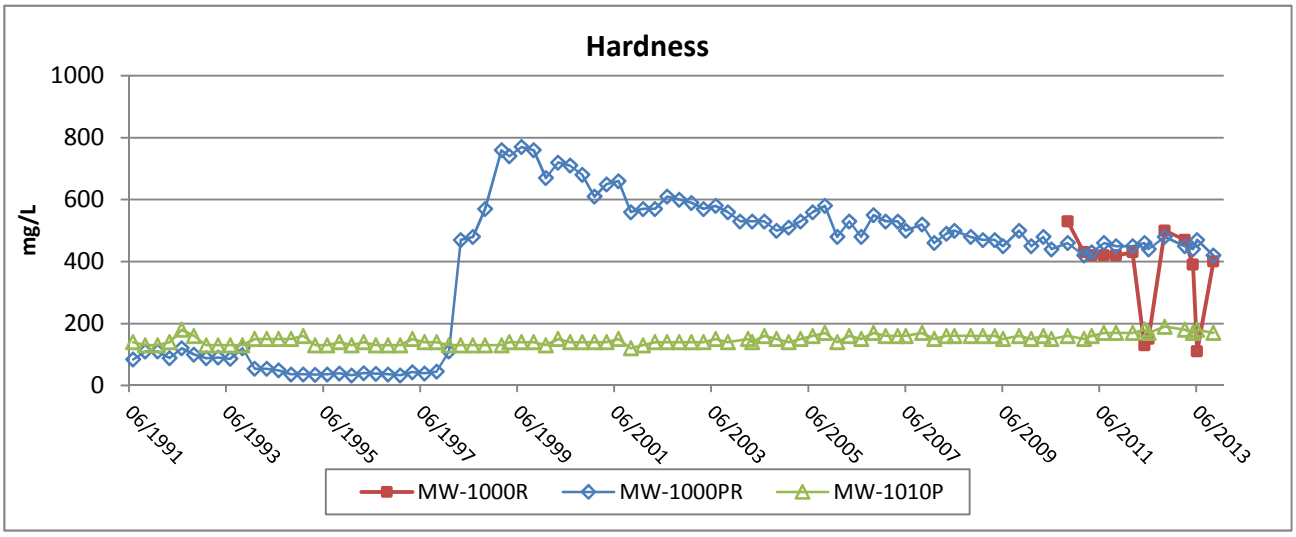
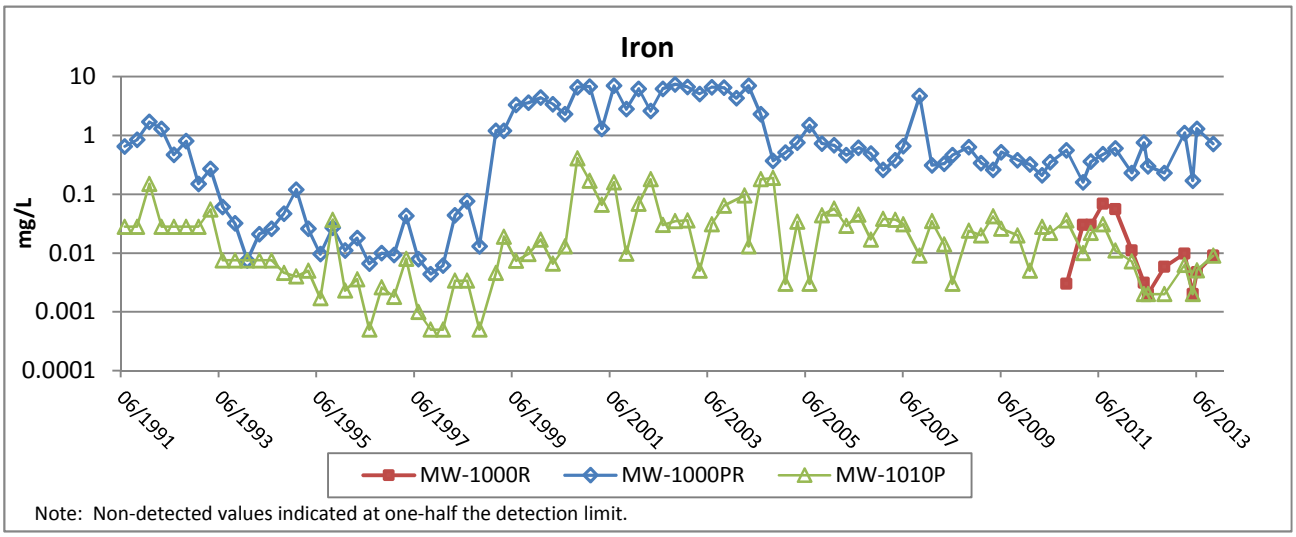
Figure B-1a

Groundwater Trend Graphs - Quarterly Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |




Note: Non-detected values indicated at one-half the detection limit.

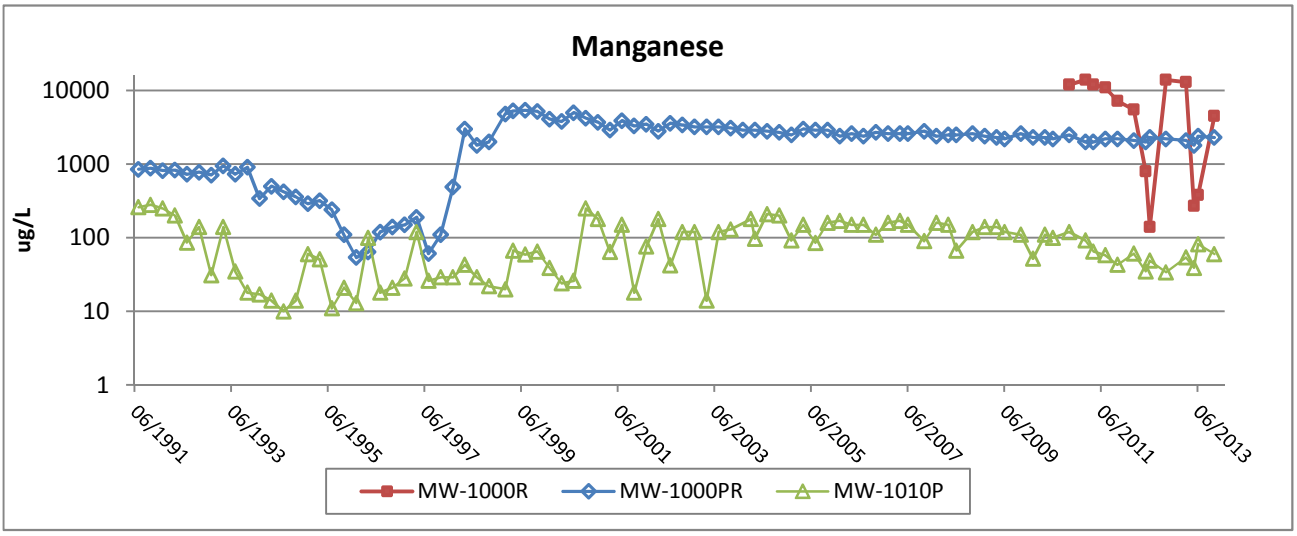



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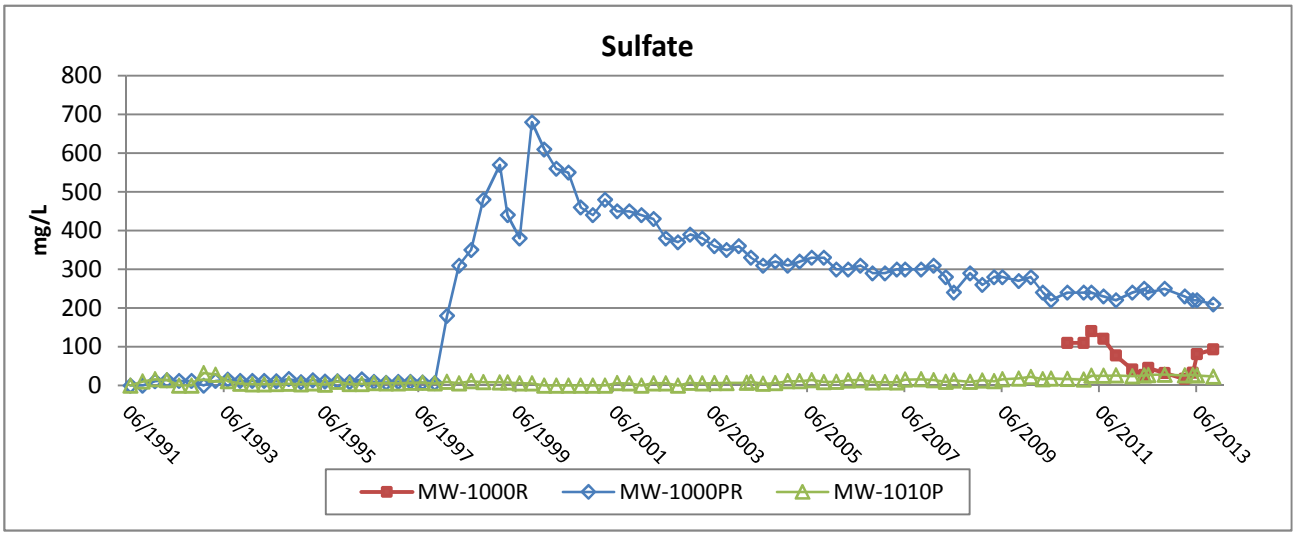
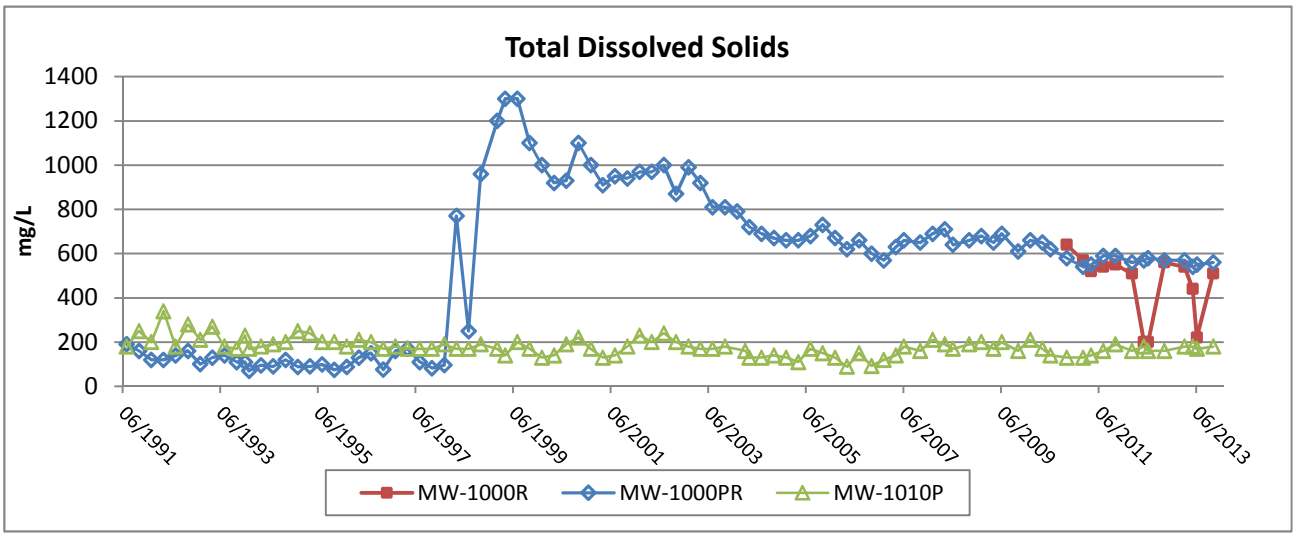
Figure B-1b

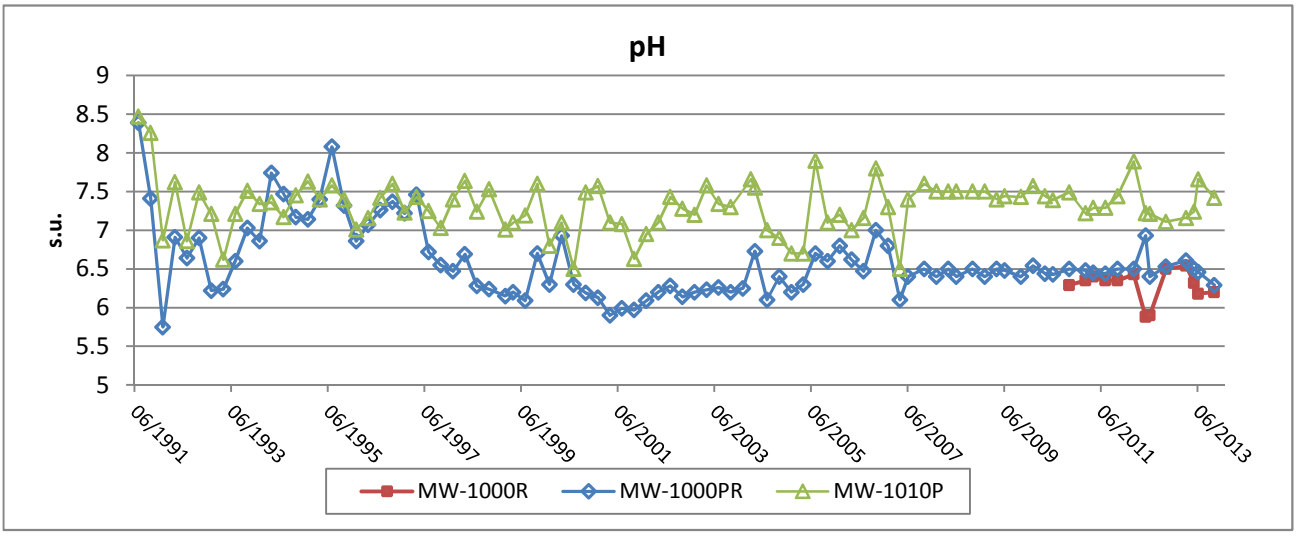
Groundwater Trend Graphs - Quarterly Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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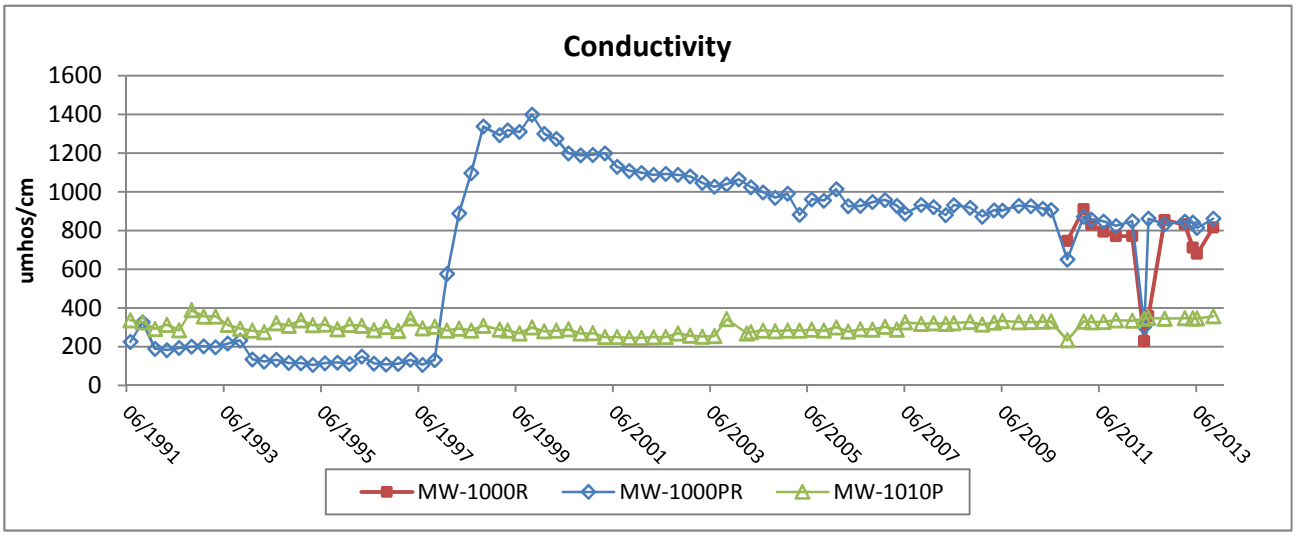
FLAMBEAU MINING COMPANY

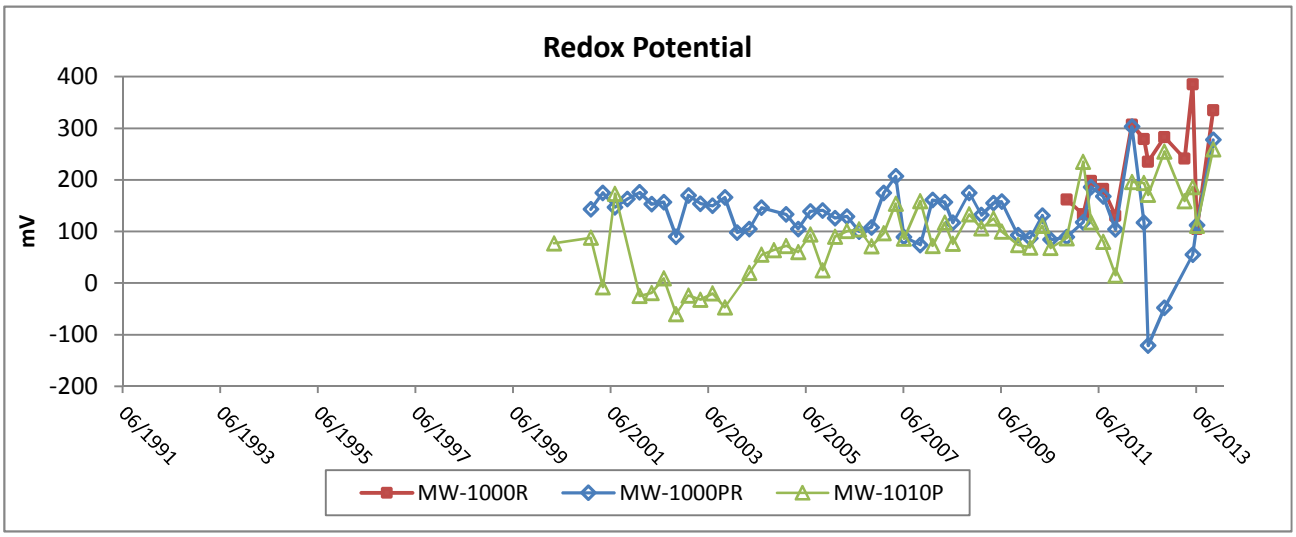
Figure B-1c

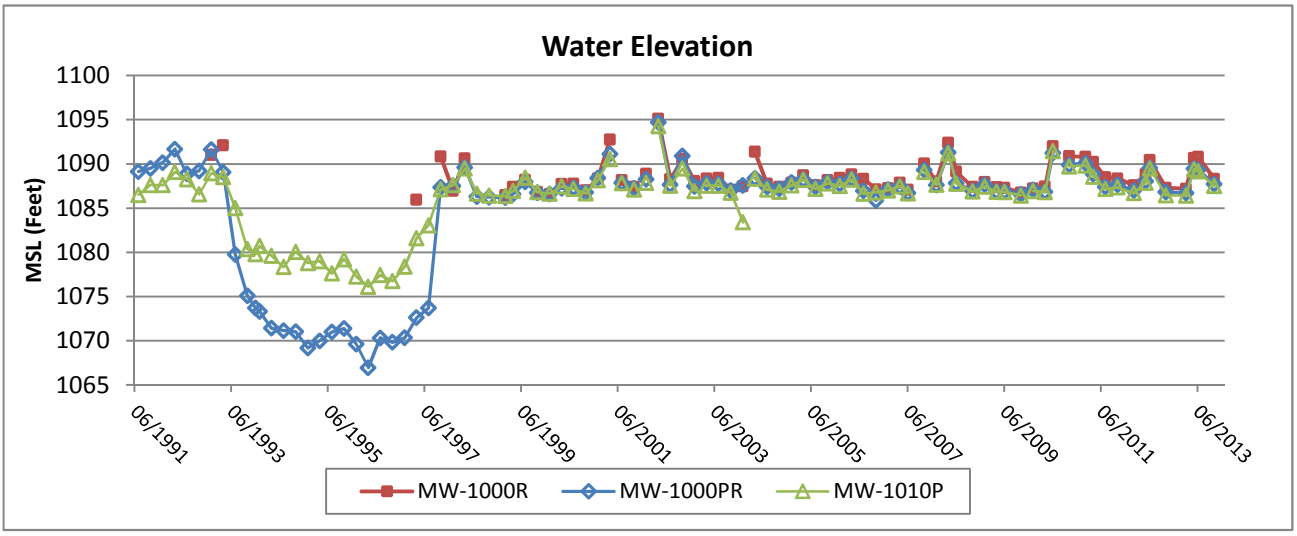
Groundwater Trend Graphs - Quarterly Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



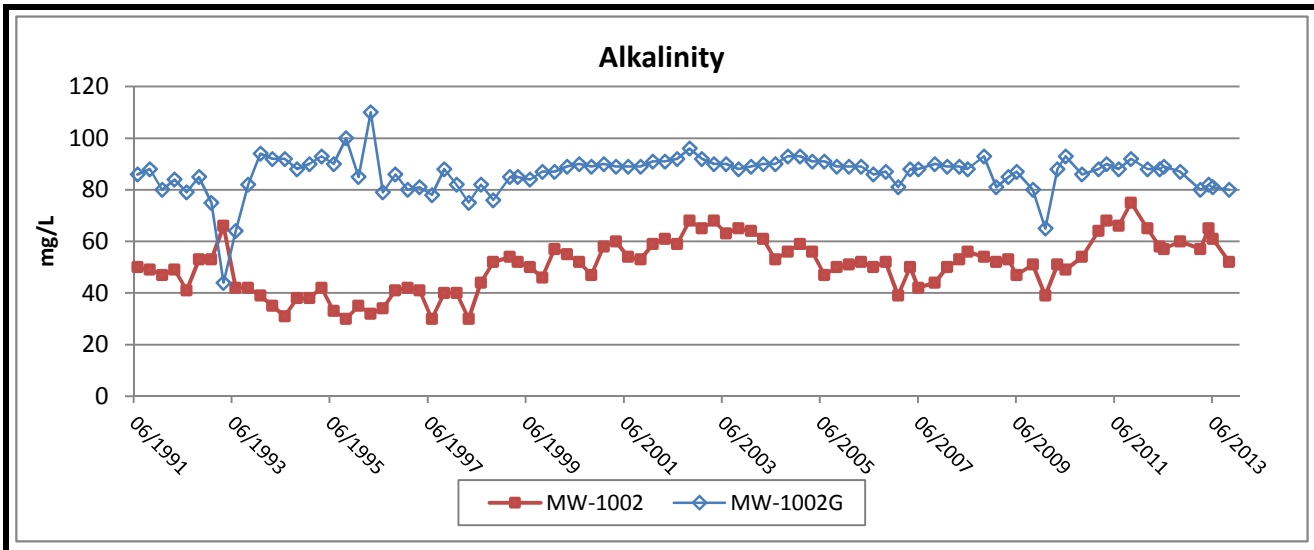

FLAMBEAU MINING COMPANY

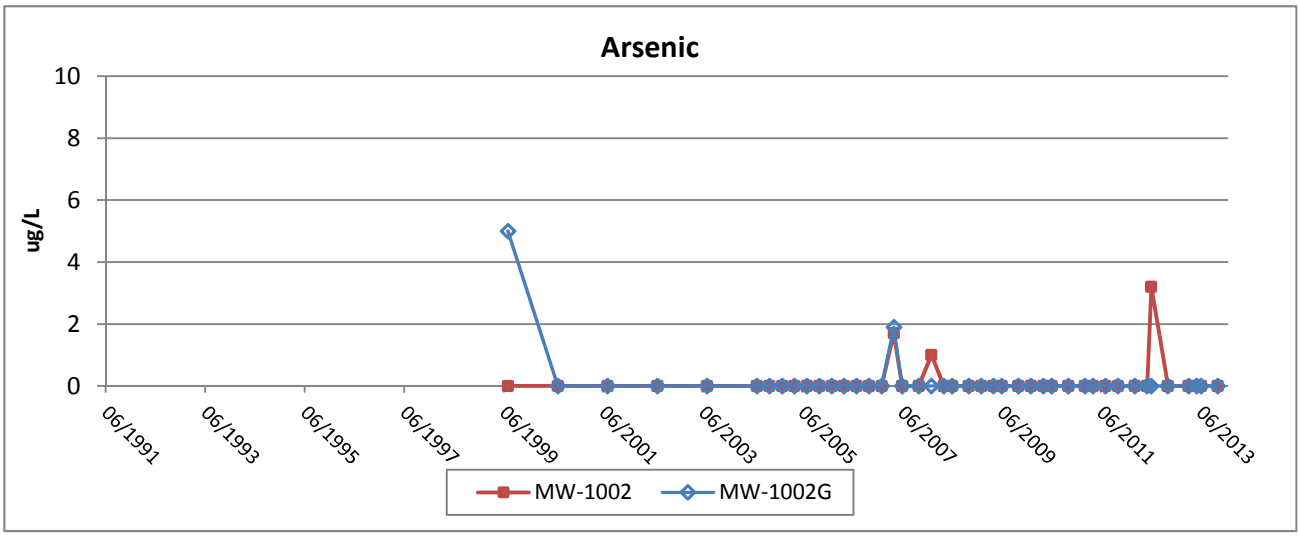
Figure B-1d

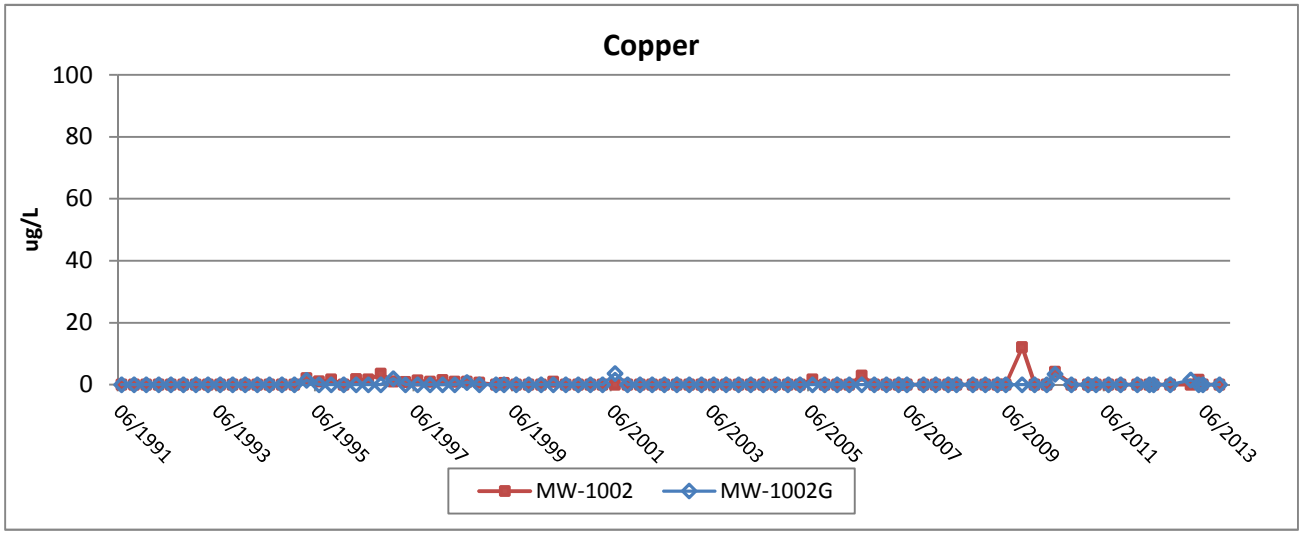
Groundwater Trend Graphs - Quarterly Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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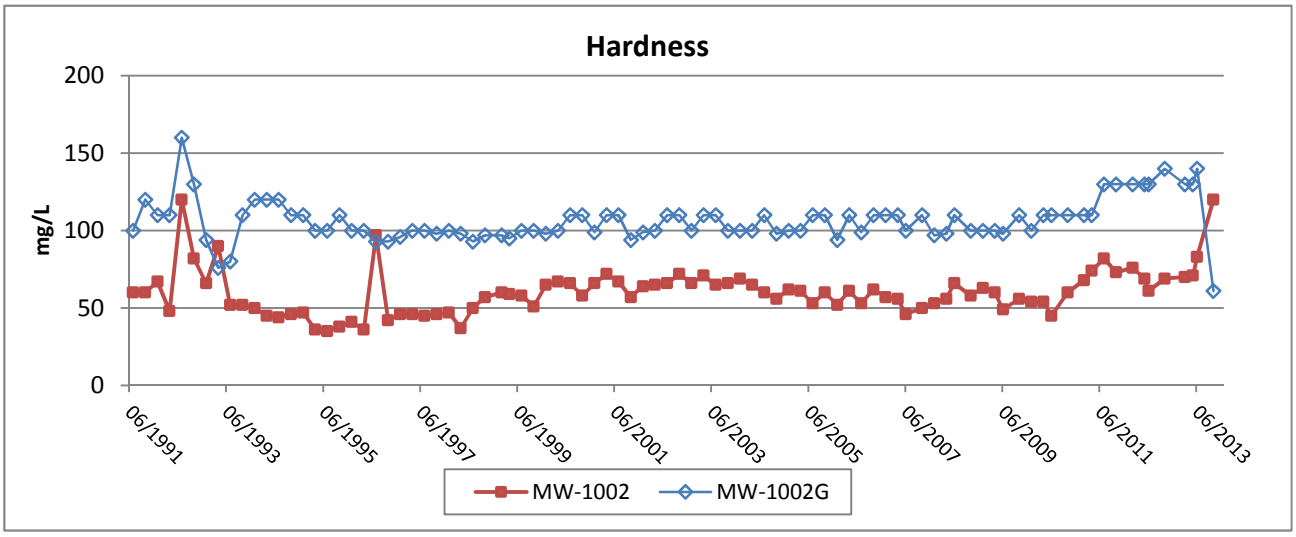
FLAMBEAU MINING COMPANY

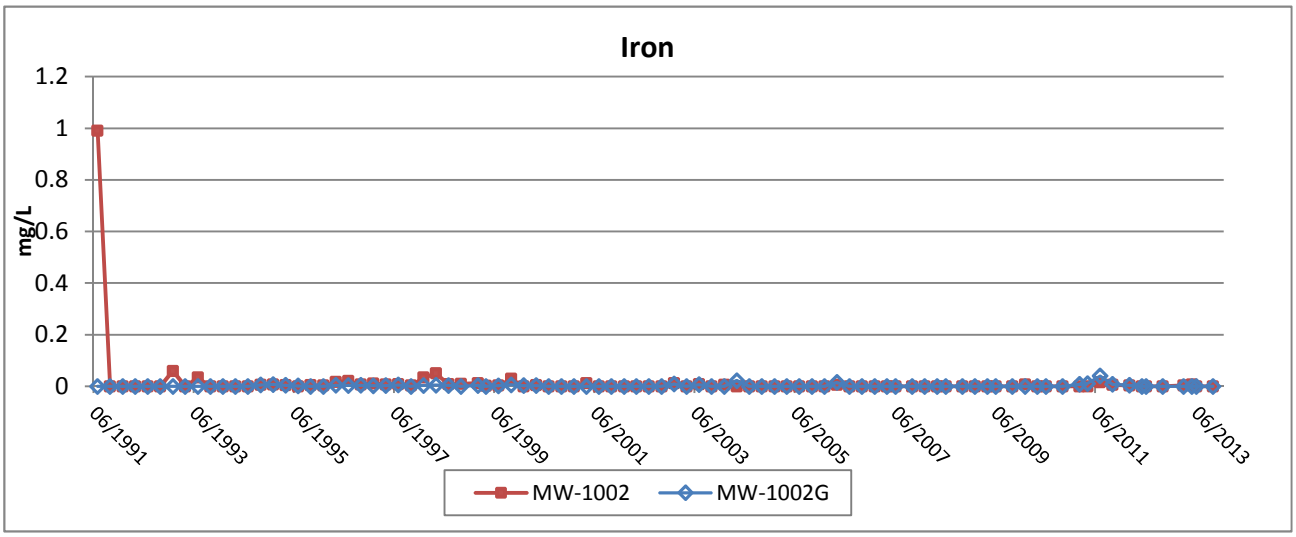
Figure B-2a

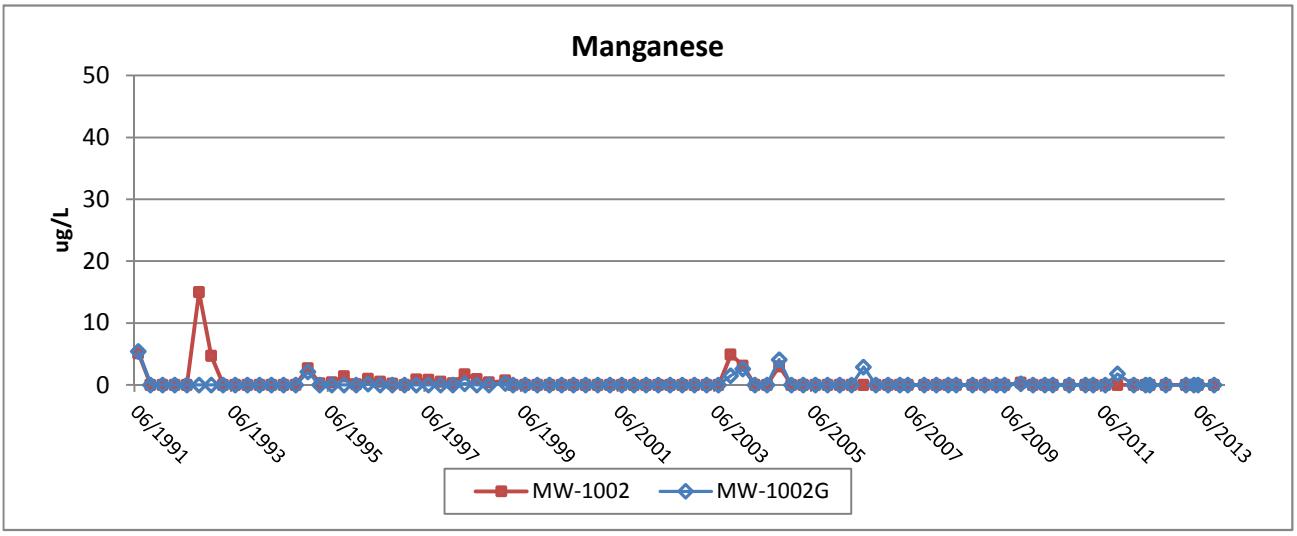
Groundwater Trend Graphs - Quarterly Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



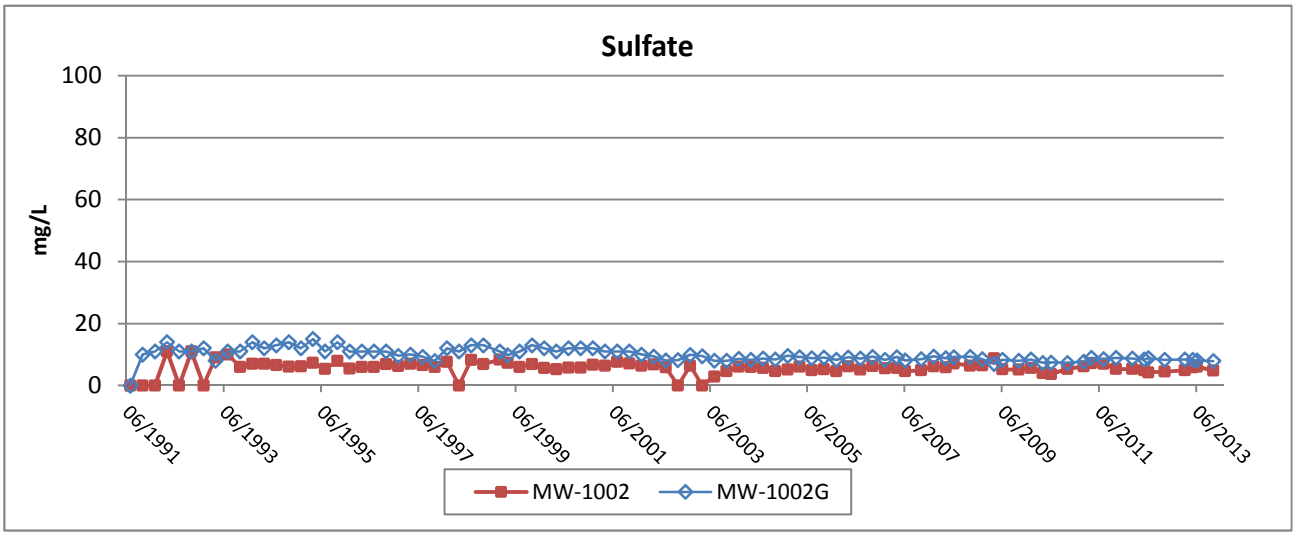

FLAMBEAU MINING COMPANY

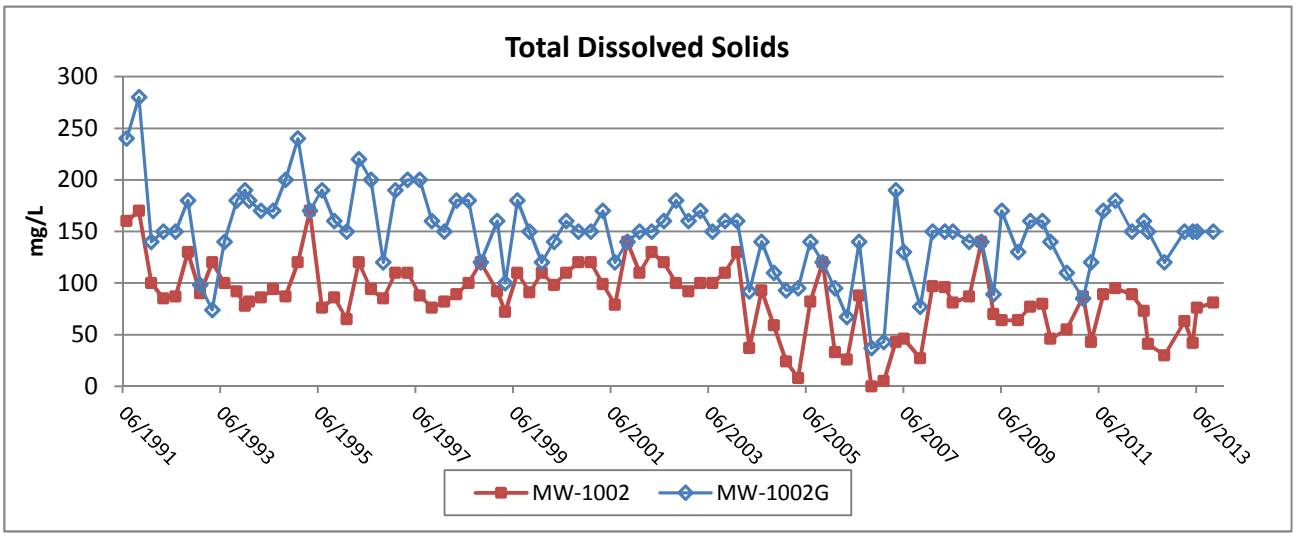
Figure B-2b

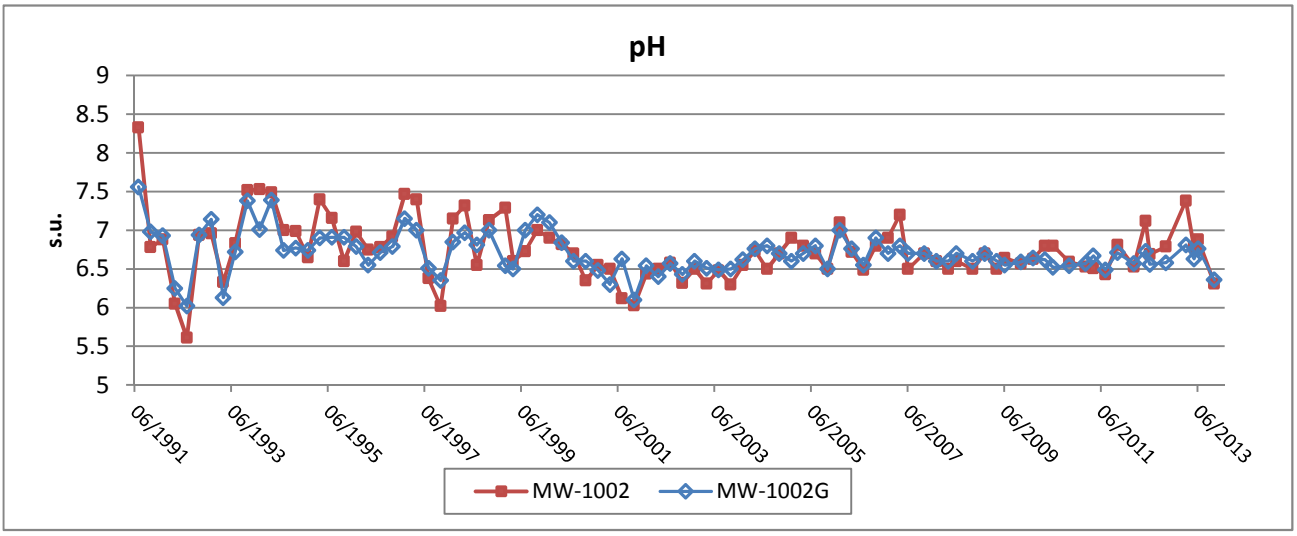
Groundwater Trend Graphs - Quarterly Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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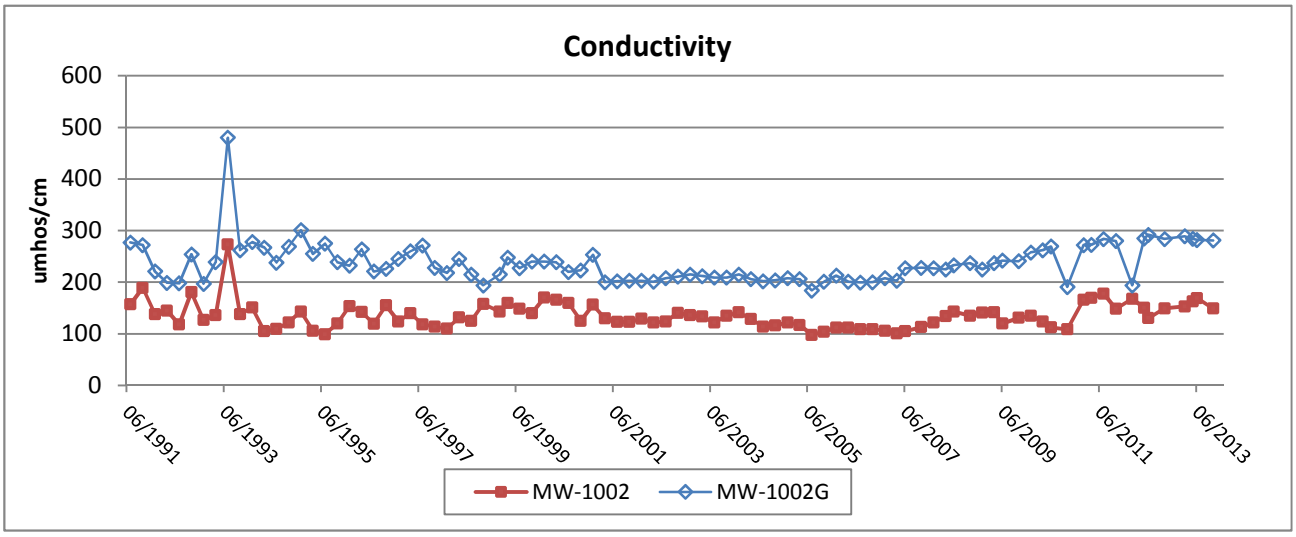
FLAMBEAU MINING COMPANY

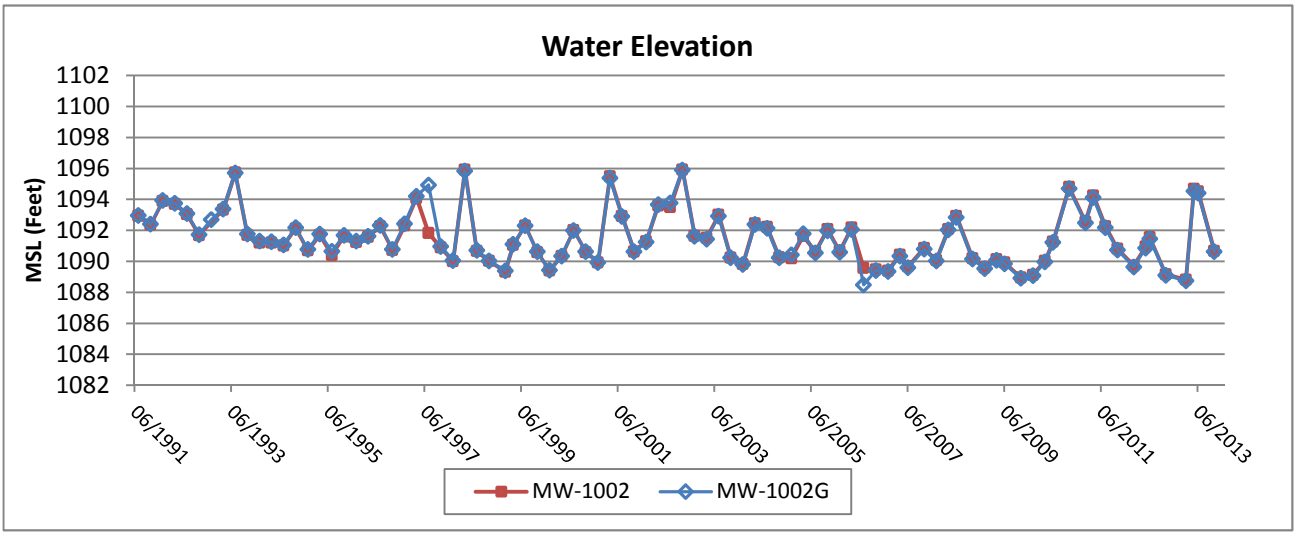
Figure B-2c

Groundwater Trend Graphs - Quarterly Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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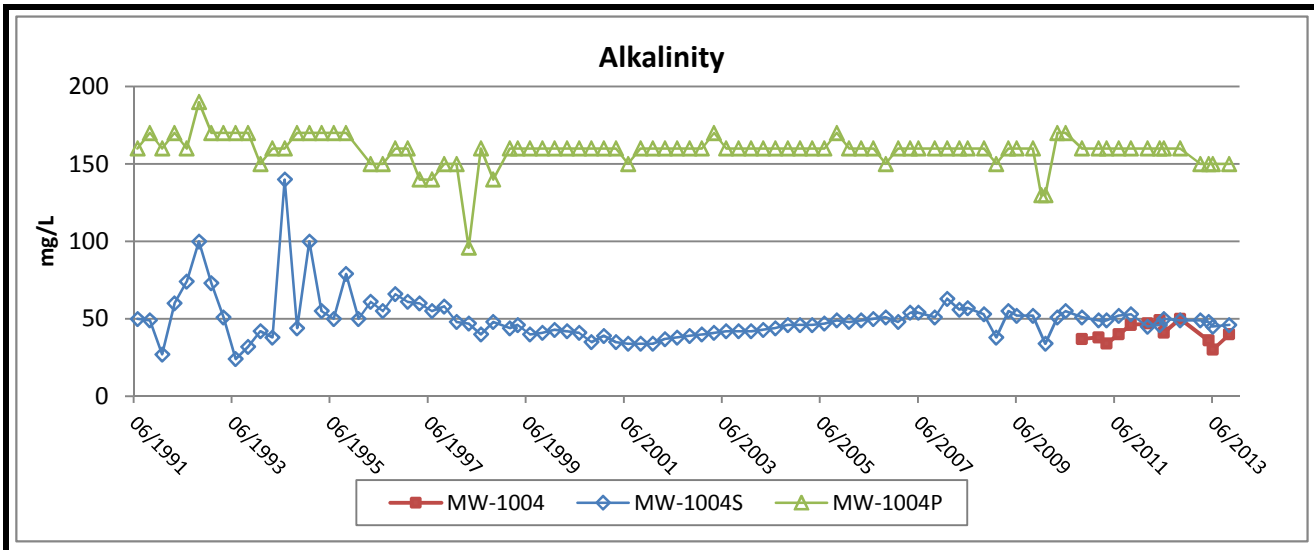
FLAMBEAU MINING COMPANY

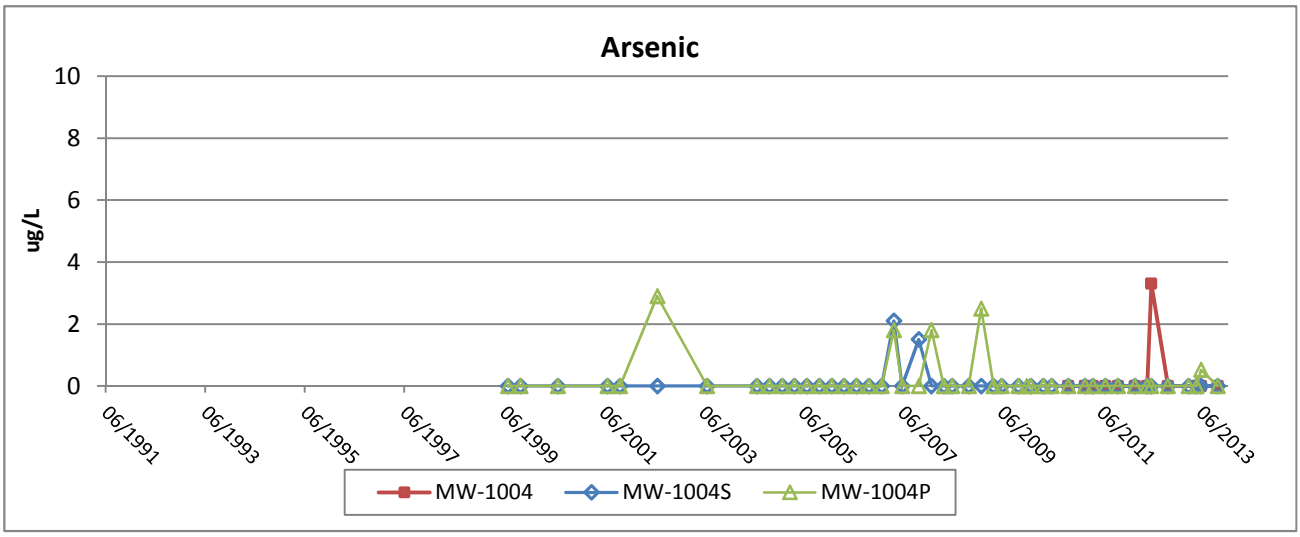
Figure B-2d

Groundwater Trend Graphs - Quarterly Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



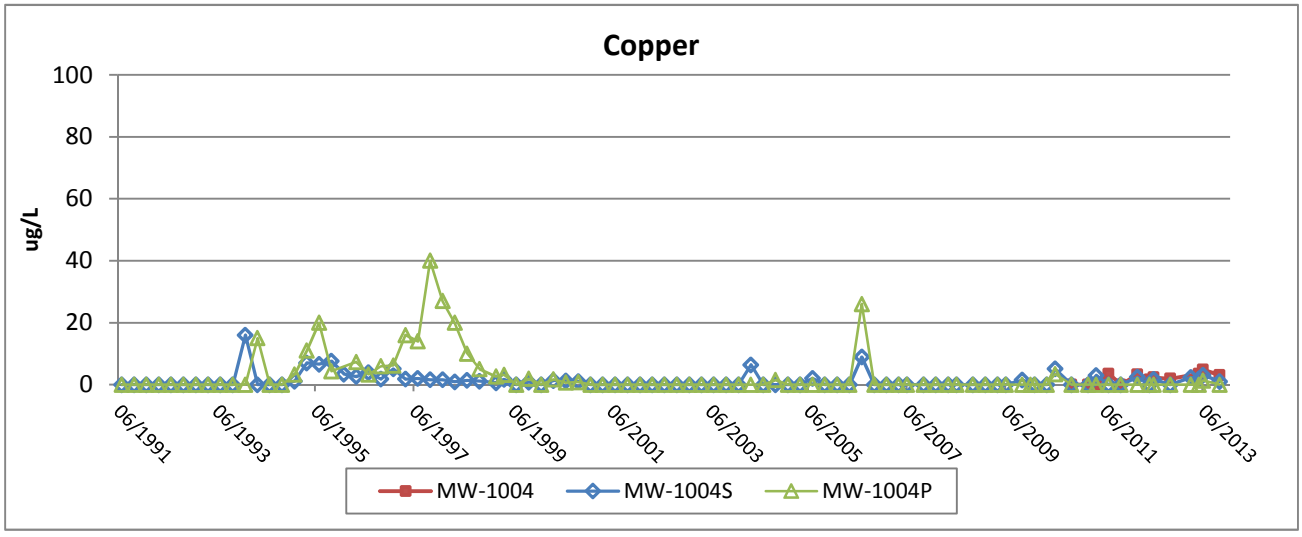




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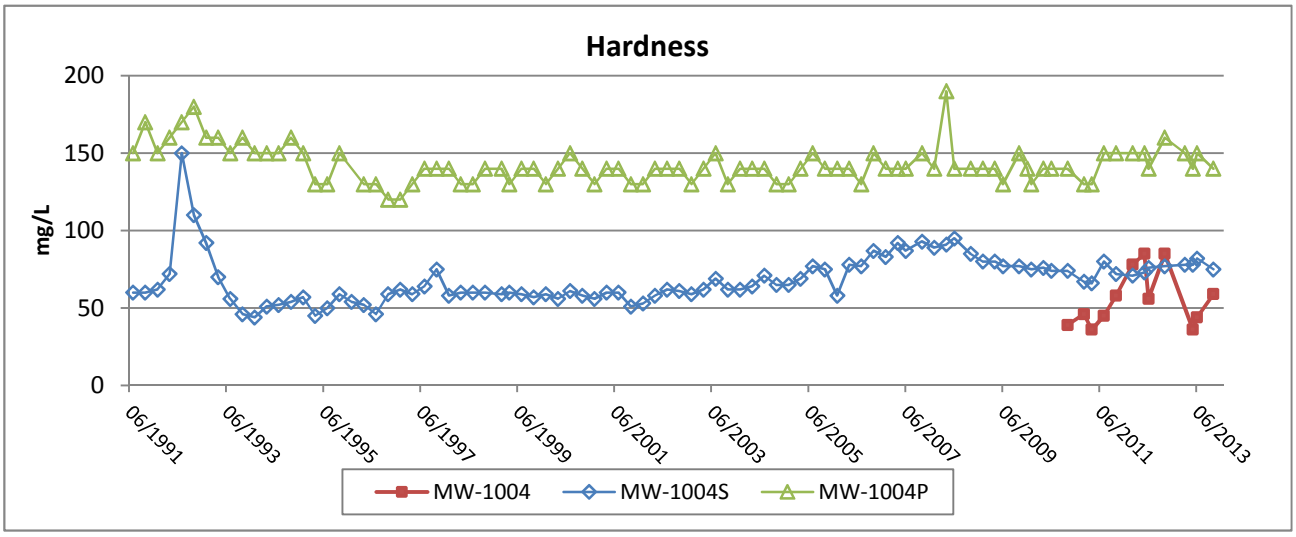
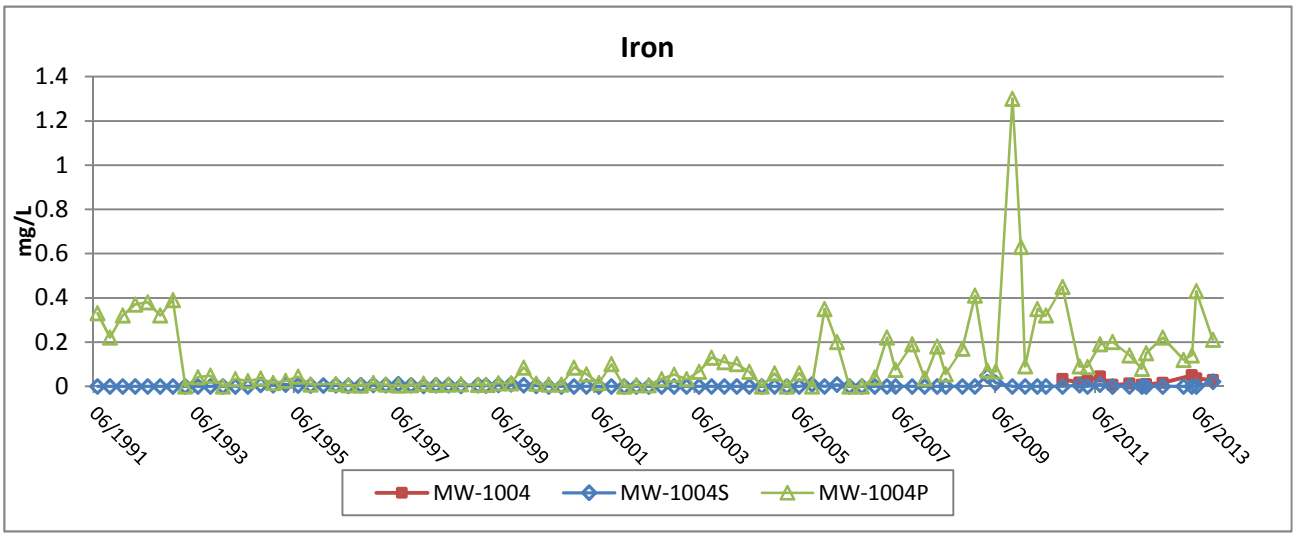
Figure B-3a

Groundwater Trend Graphs - Quarterly Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



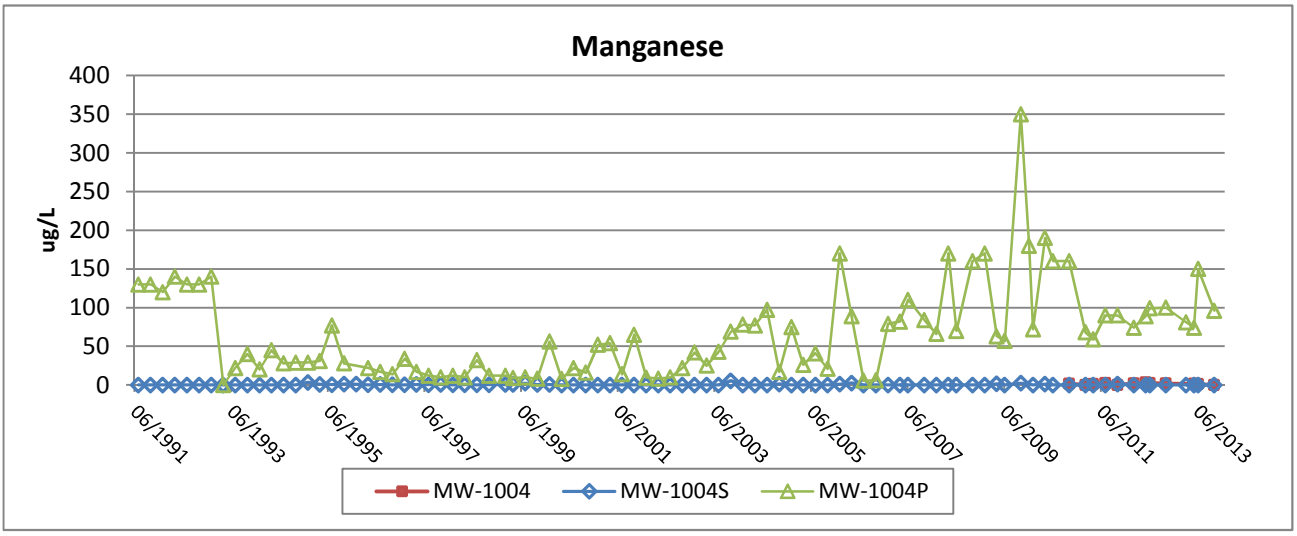




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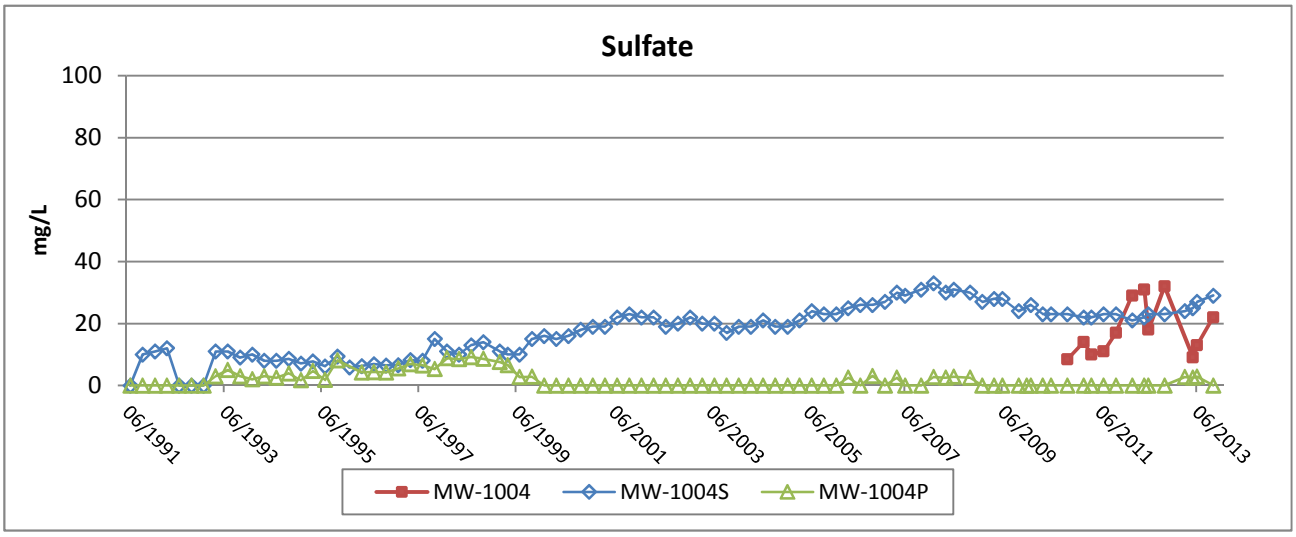
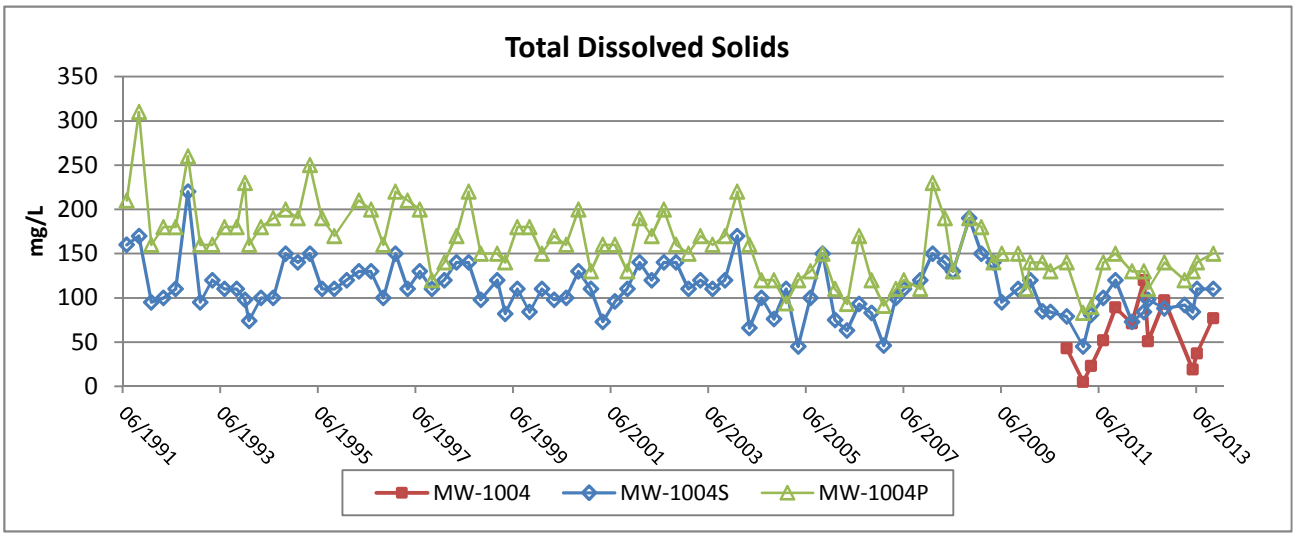
Figure B-3b

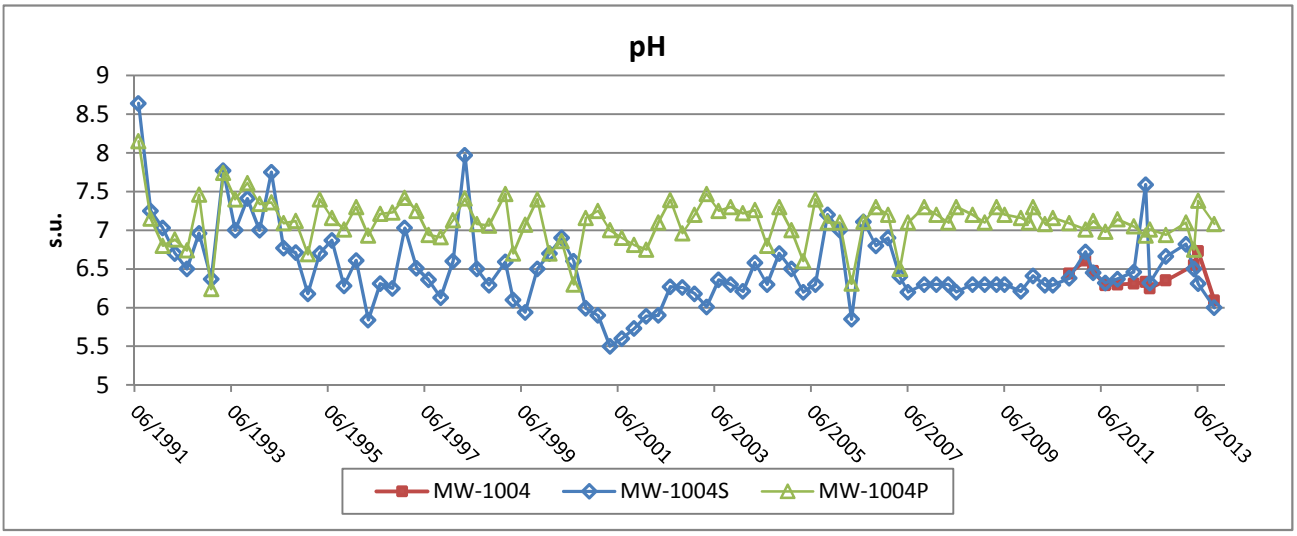
Groundwater Trend Graphs - Quarterly Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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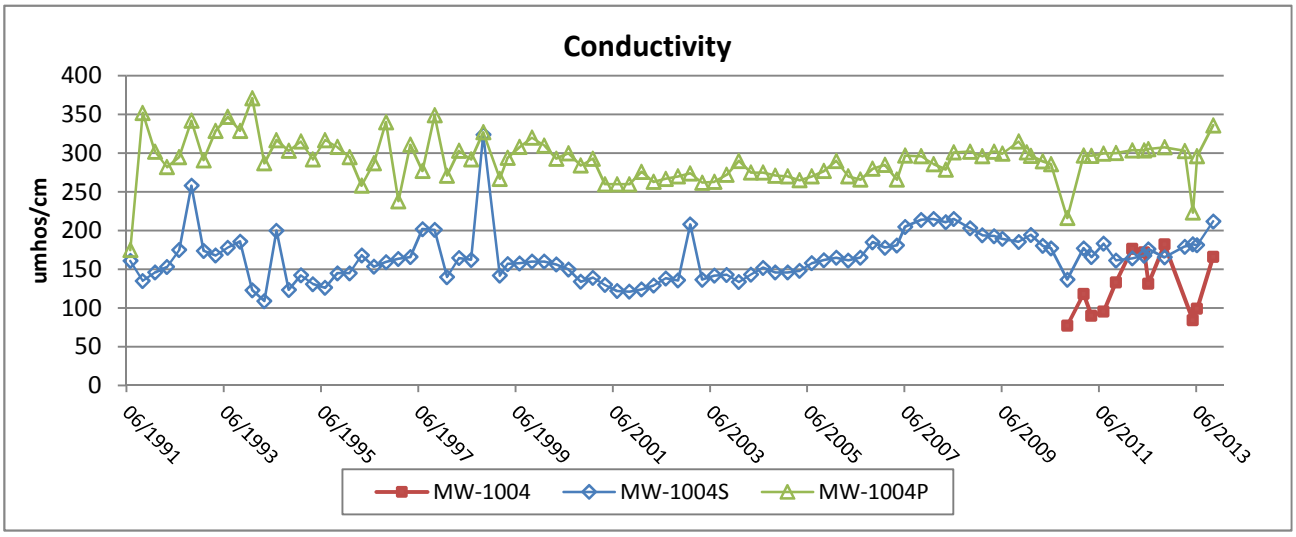
FLAMBEAU MINING COMPANY

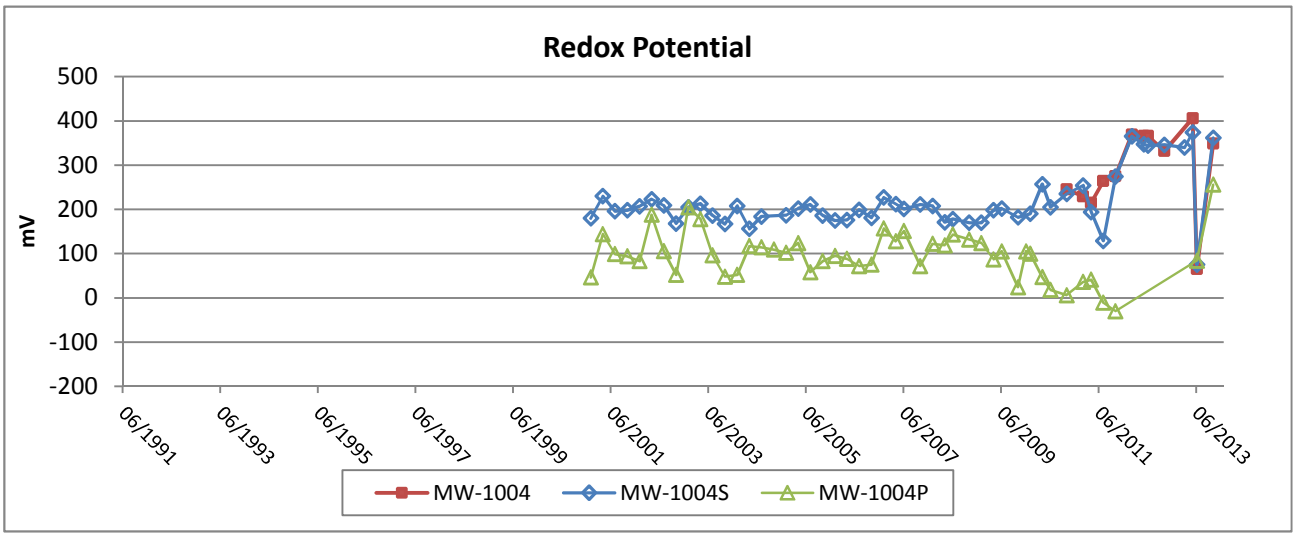
Figure B-3c

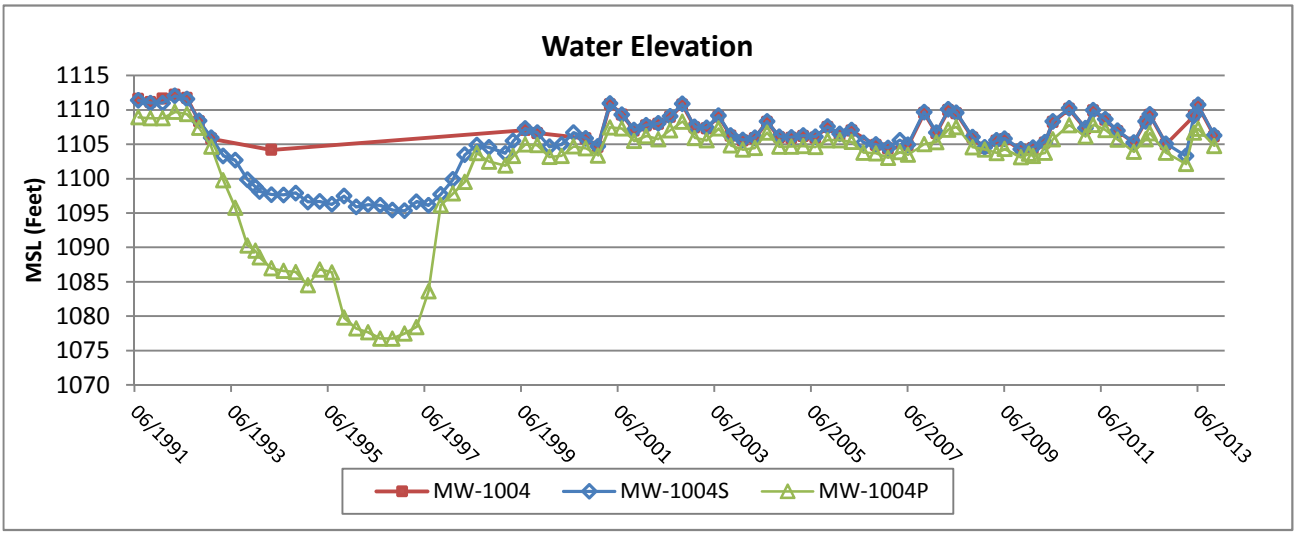
Groundwater Trend Graphs - Quarterly Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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FLAMBEAU MINING COMPANY

Figure B-3d

Groundwater Trend Graphs - Quarterly Results

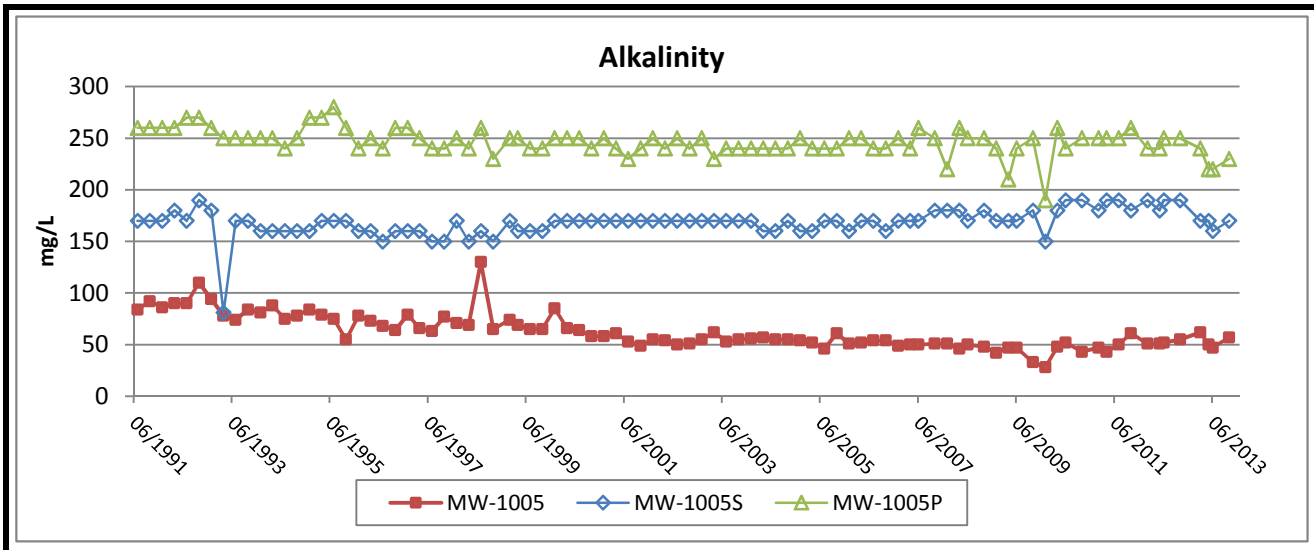
MW-1004/MW-1004S/MW-1004P

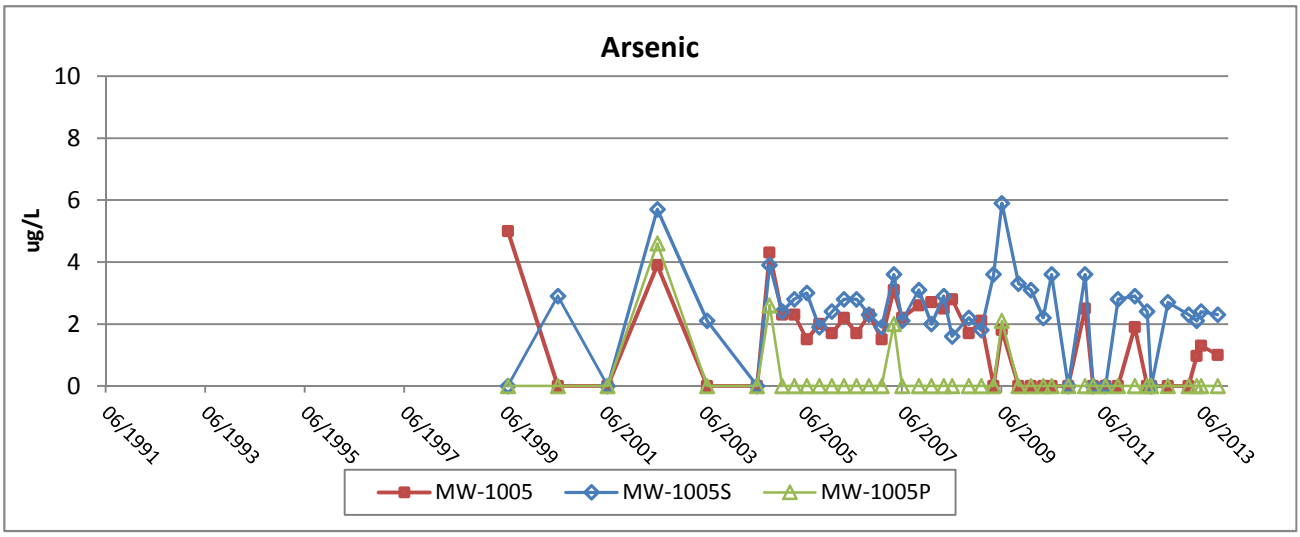
| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

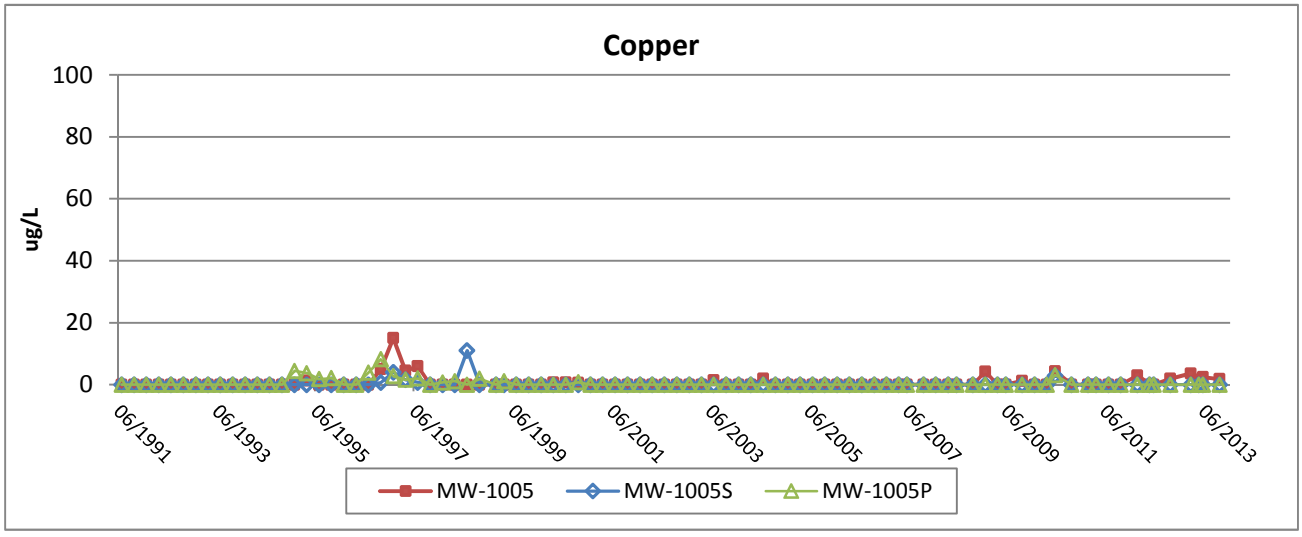
Flambeau Mining Co.
2013 Annual Report



X:\GB\IE\2008\08F777\10500 Support Data\Stats\2013 Annual Report\Support Files\GWGraphs_Qtrly.xlsm

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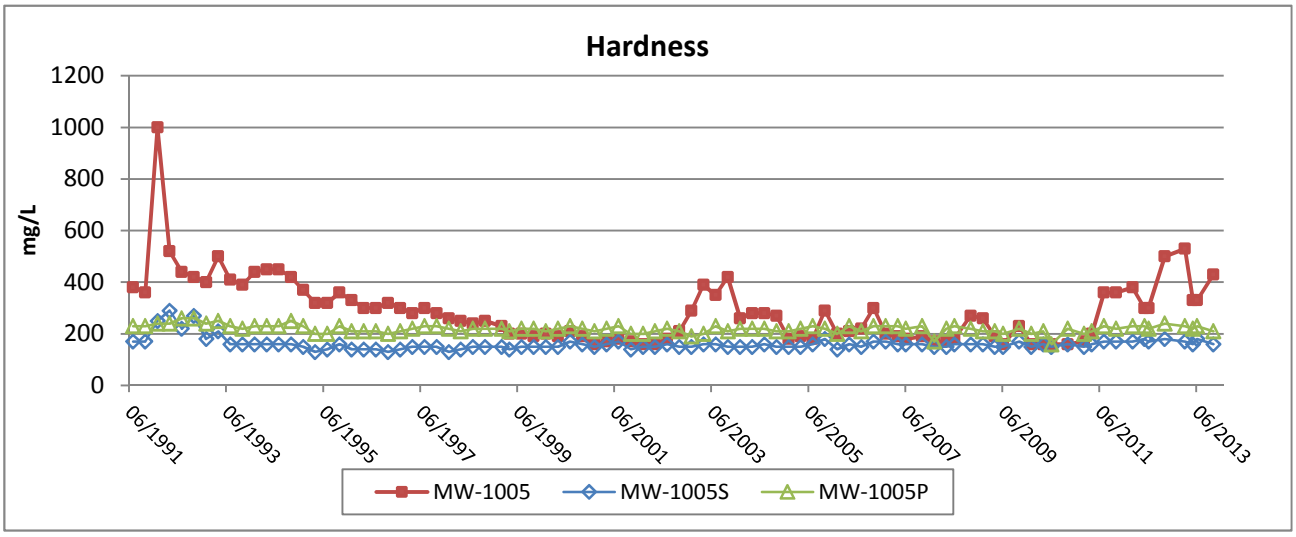
FLAMBEAU MINING COMPANY

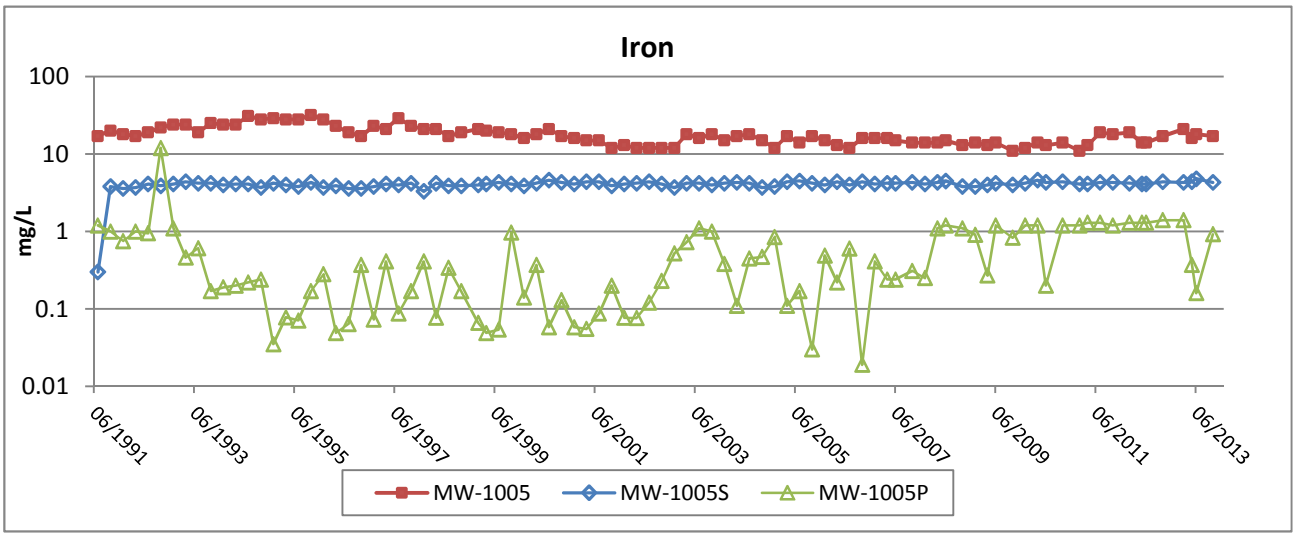
Figure B-4a

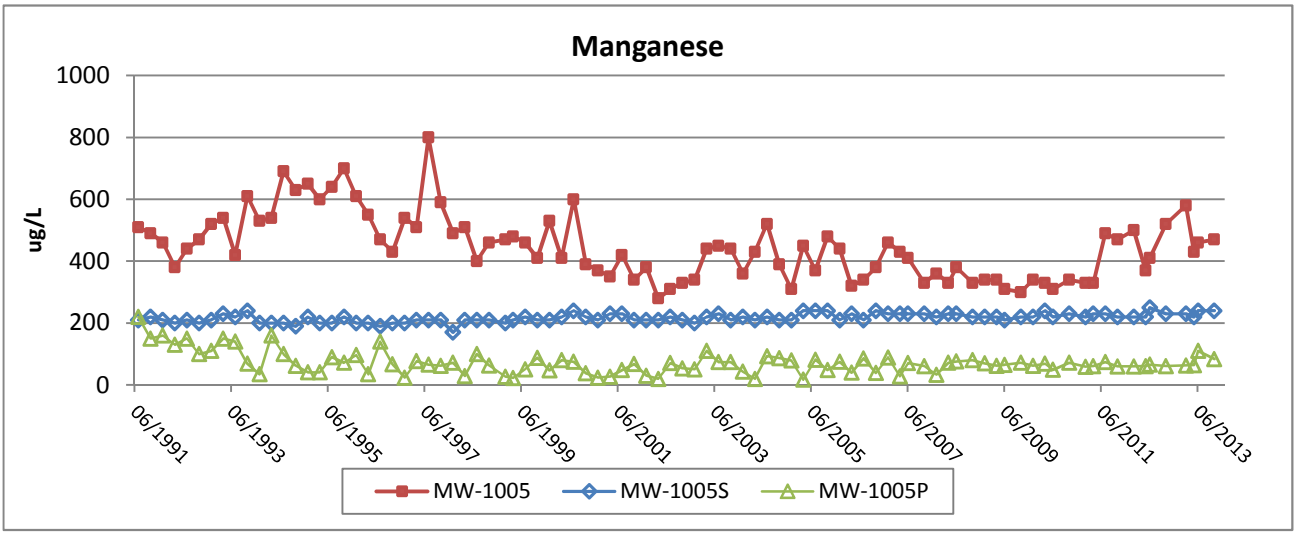
Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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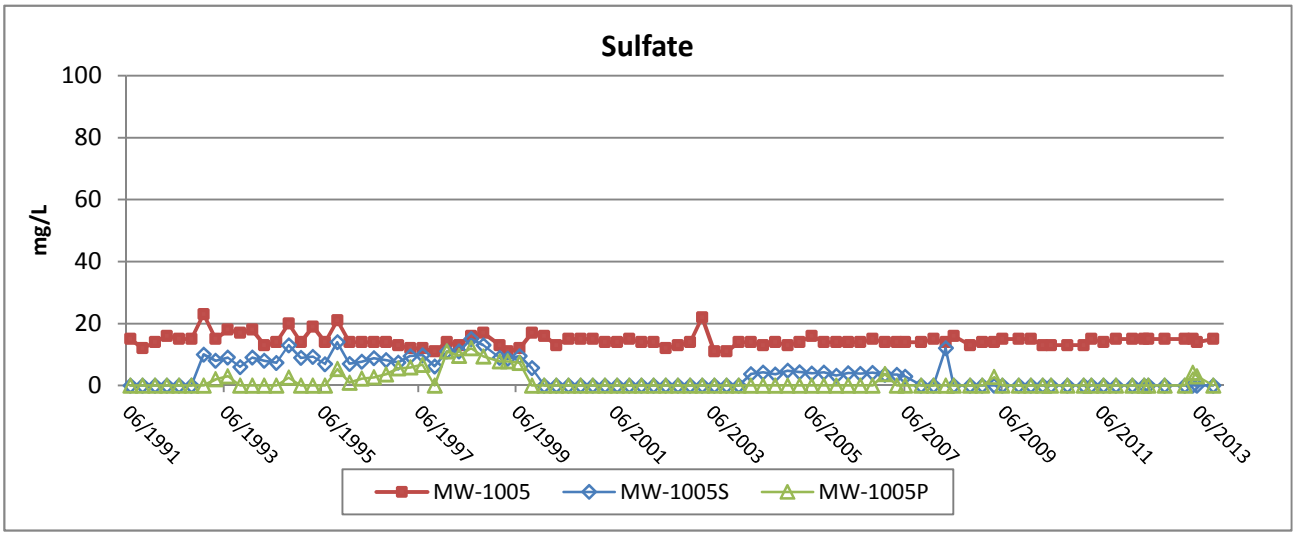
FLAMBEAU MINING COMPANY

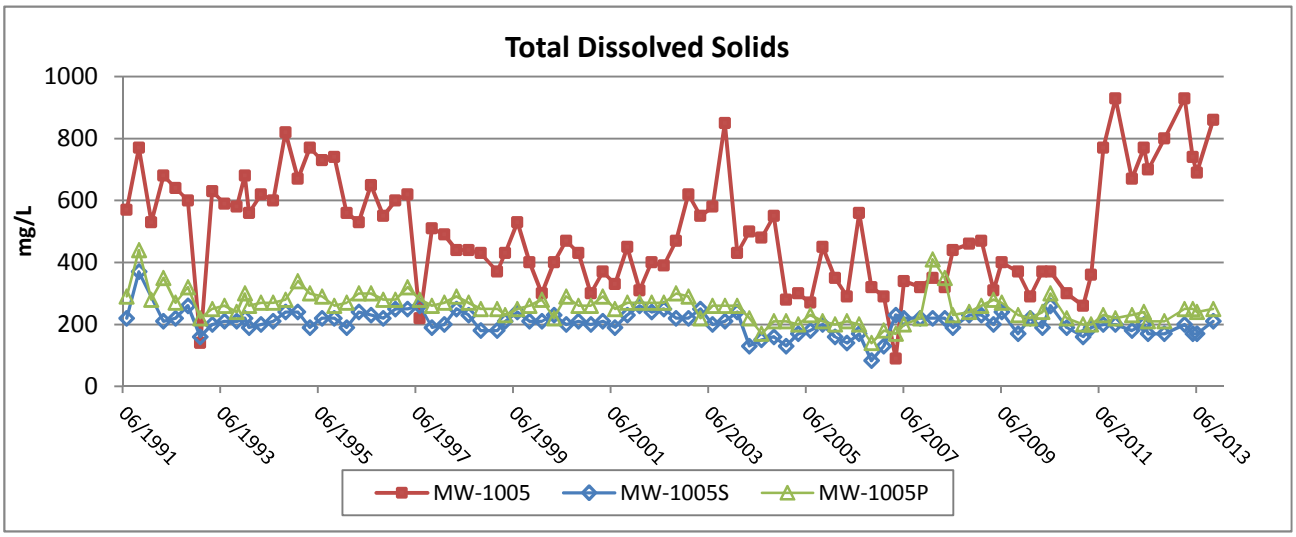
Figure B-4b

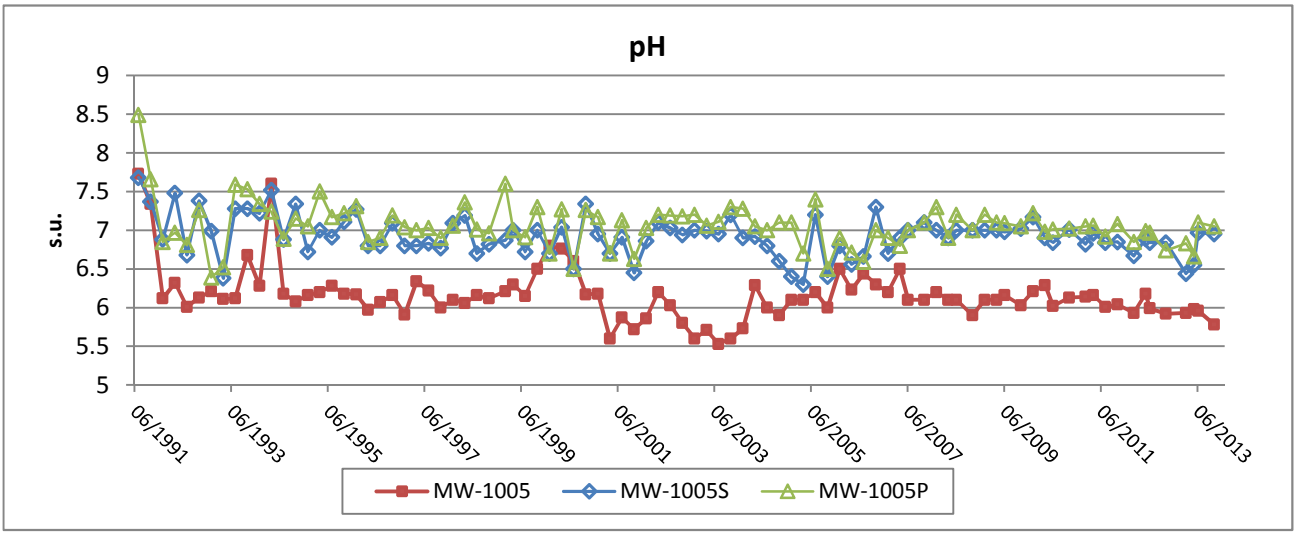
Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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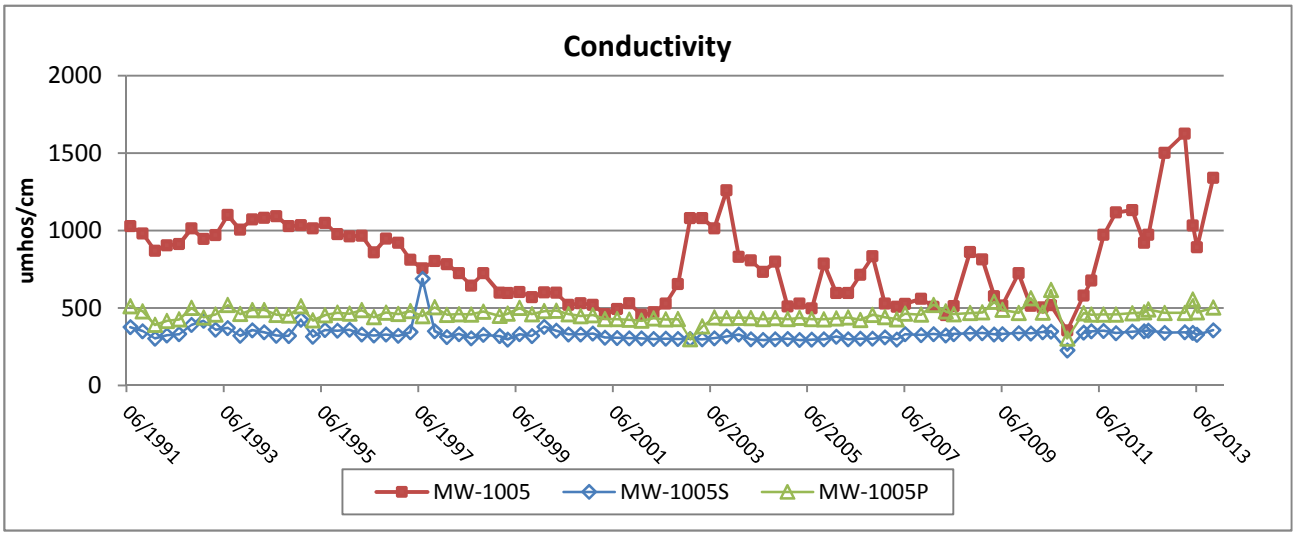
FLAMBEAU MINING COMPANY

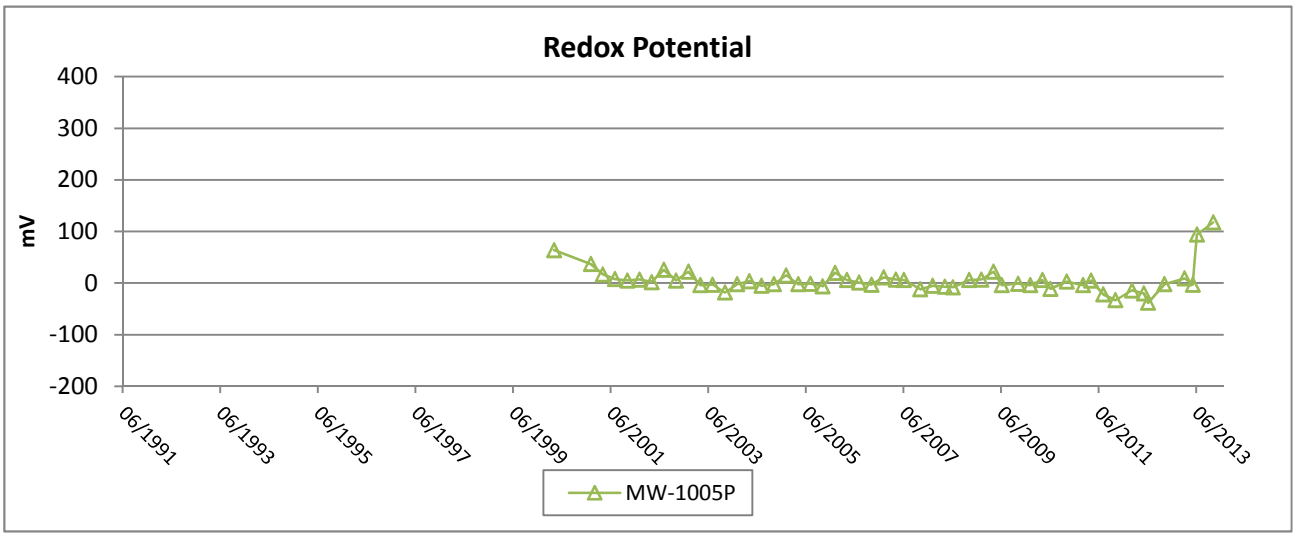
Figure B-4c

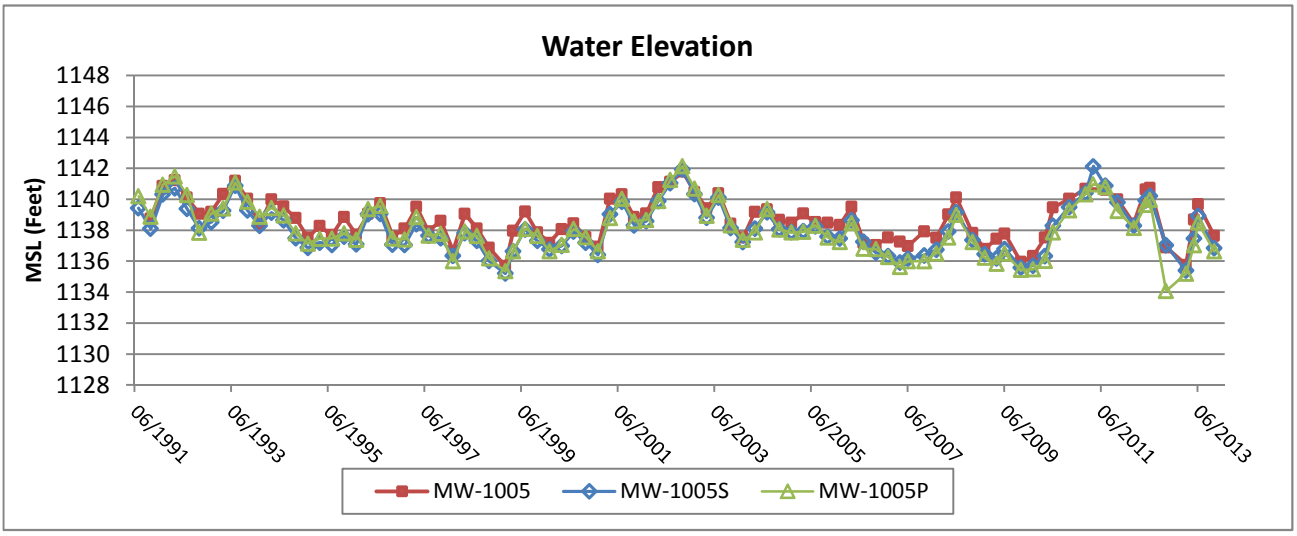
Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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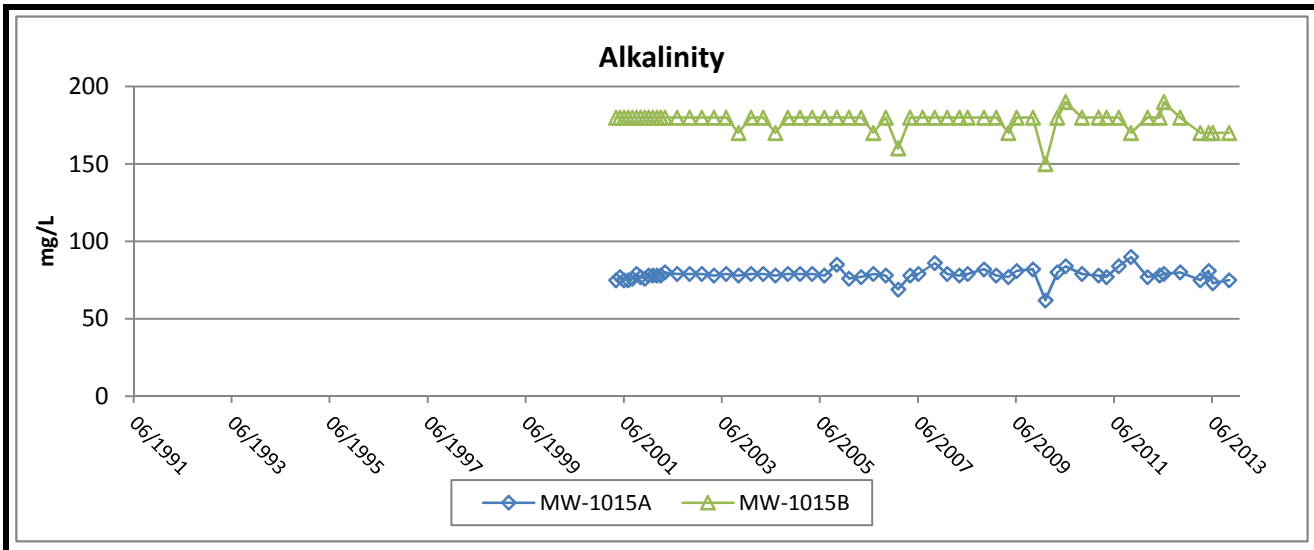
FLAMBEAU MINING COMPANY

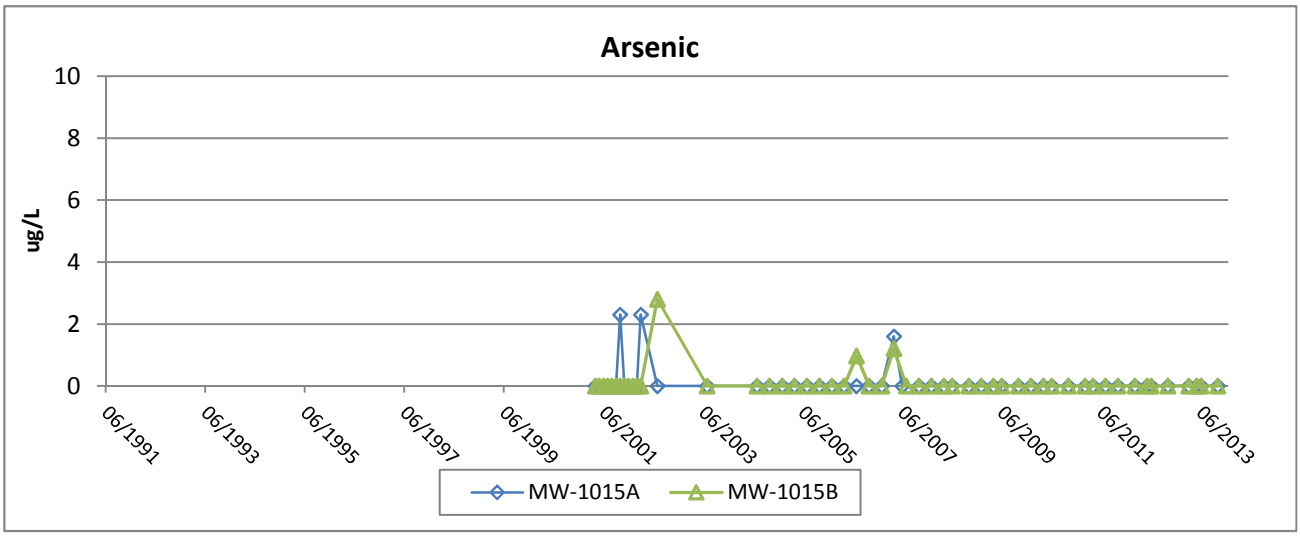
Figure B-4d

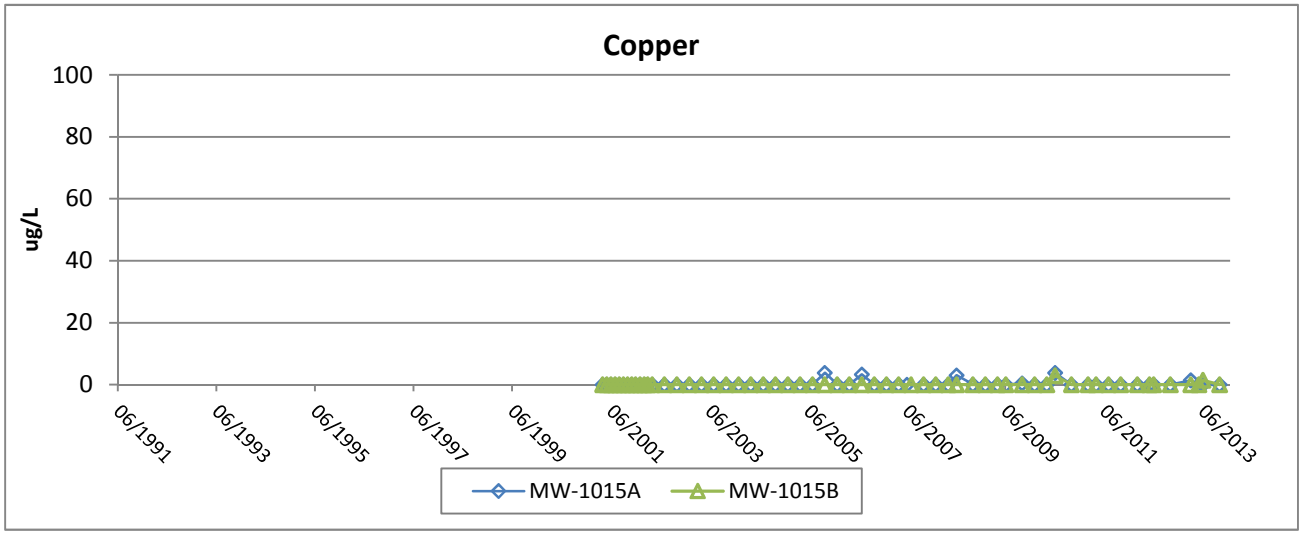
Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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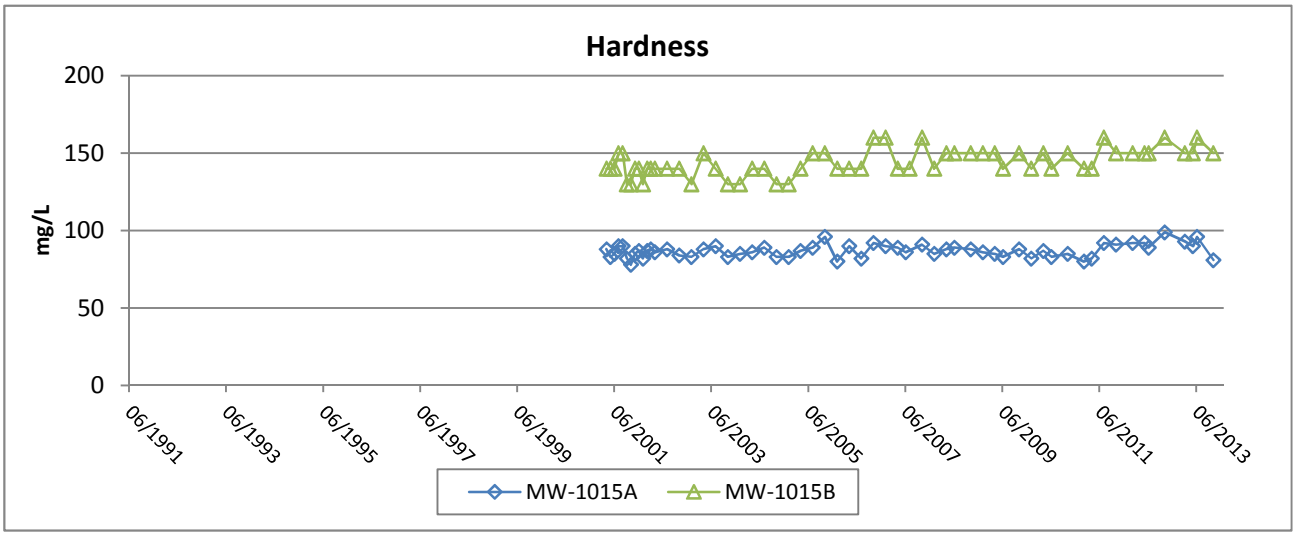
FLAMBEAU MINING COMPANY

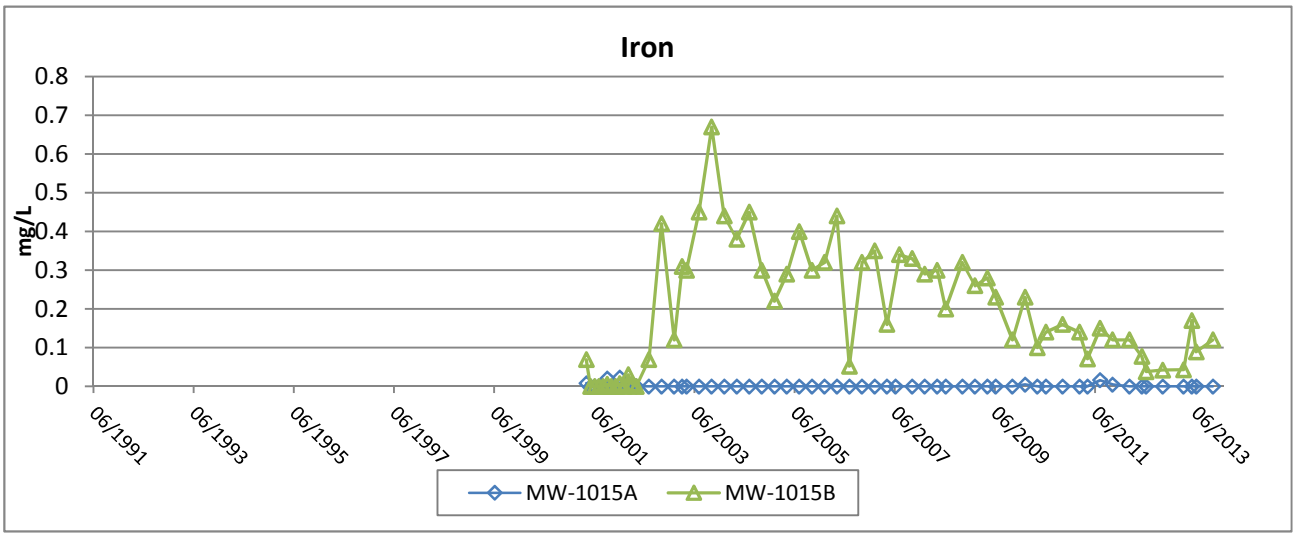
Figure B-5a

Groundwater Trend Graphs - Quarterly Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



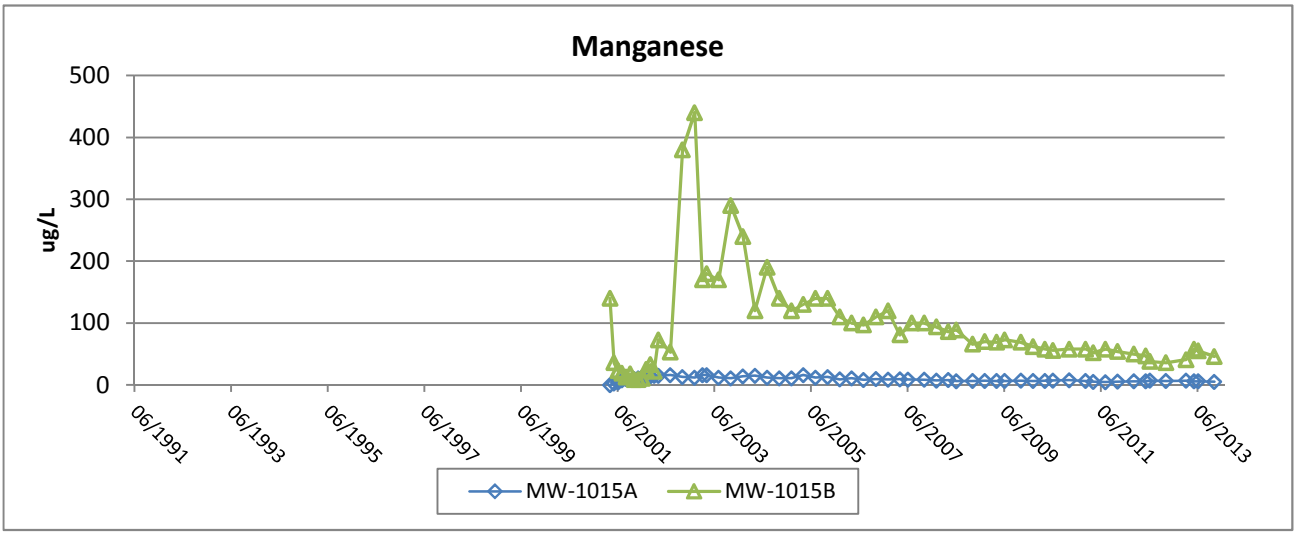




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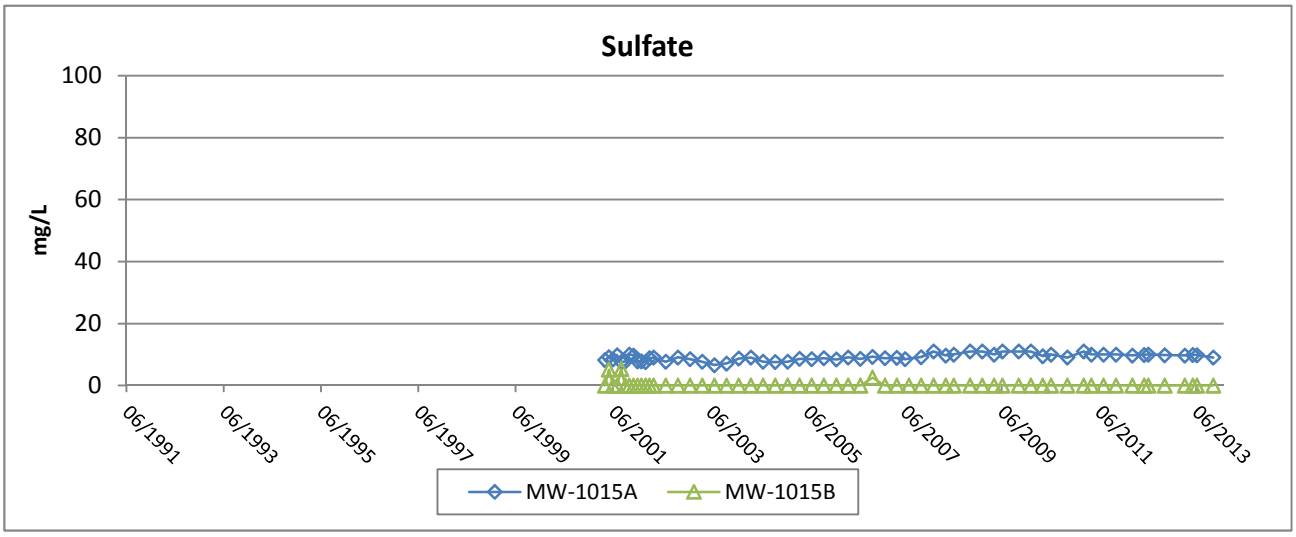
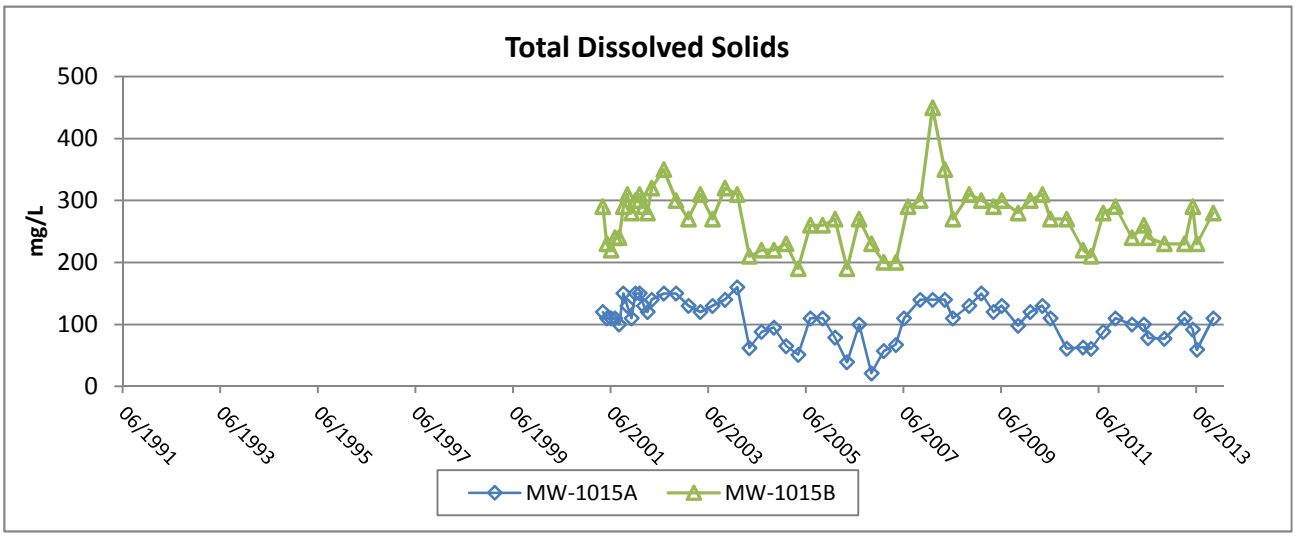
Figure B-5b

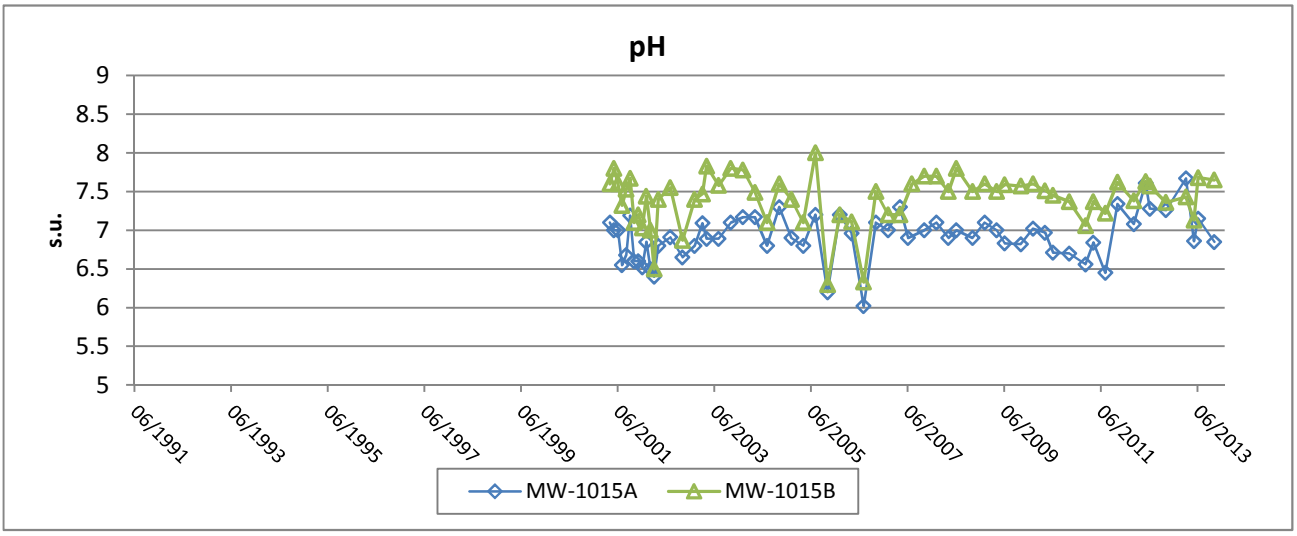
Groundwater Trend Graphs - Quarterly Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |




Foth

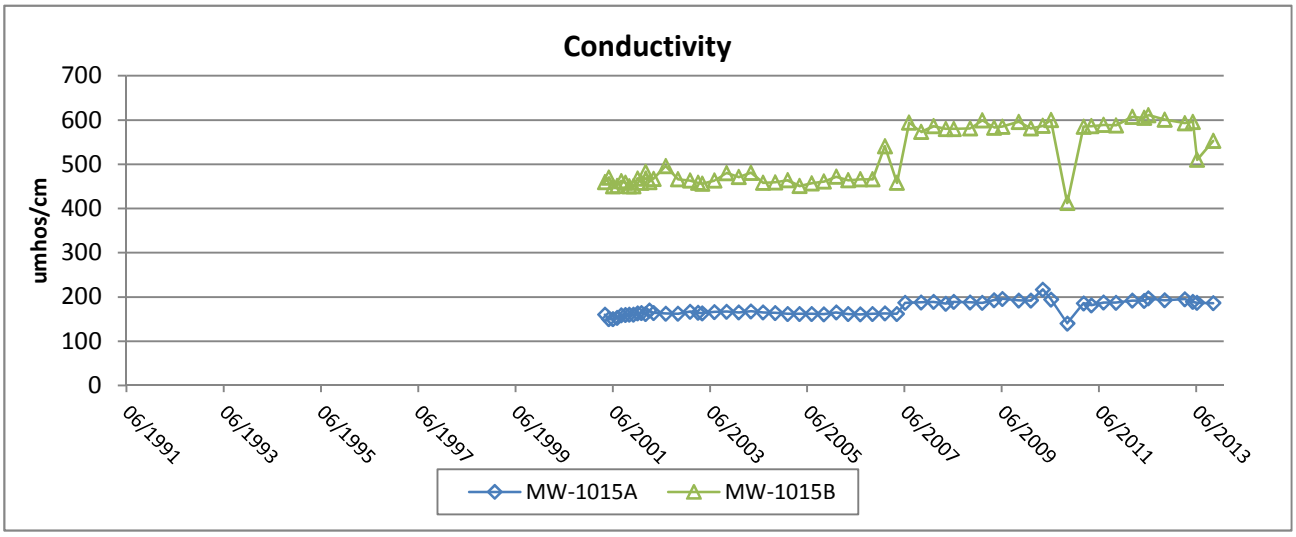
FLAMBEAU MINING COMPANY

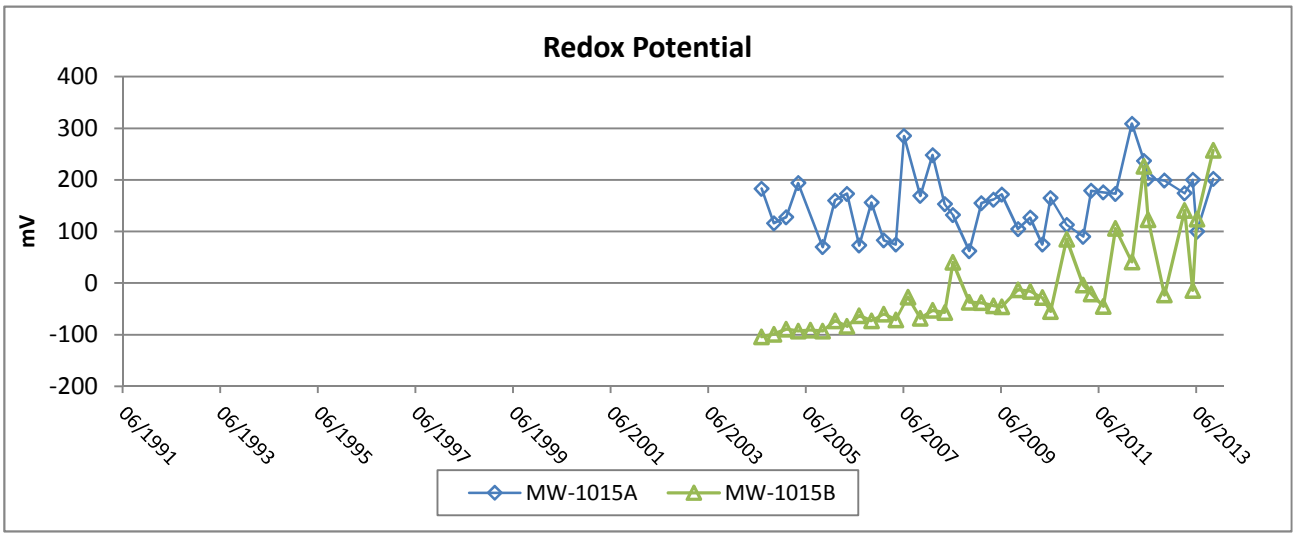
Figure B-5c

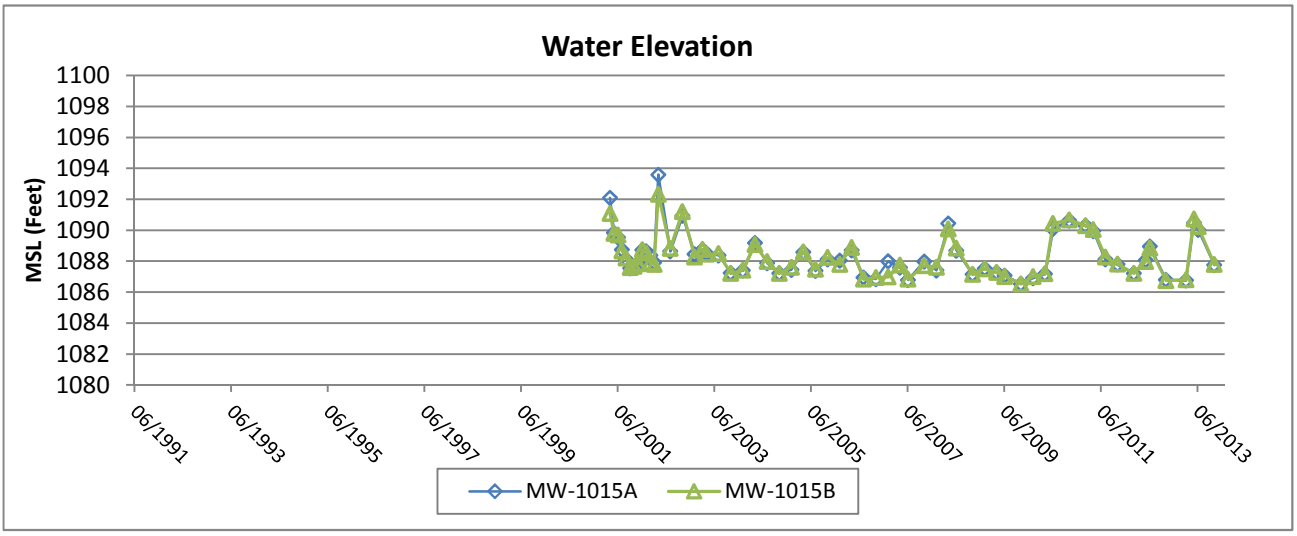
Groundwater Trend Graphs - Quarterly Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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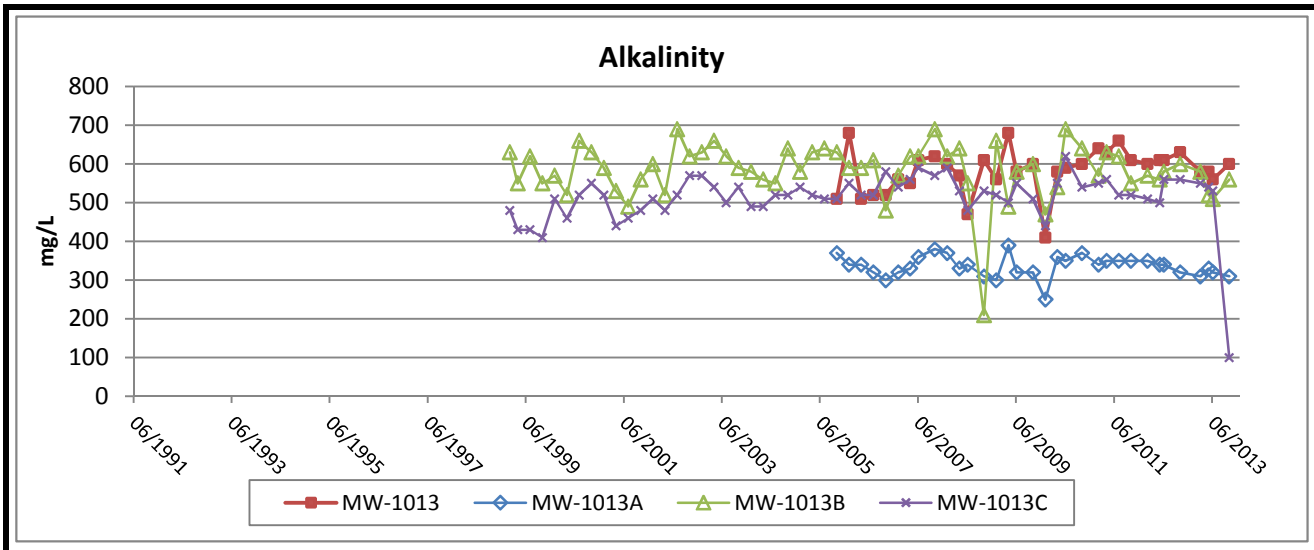
FLAMBEAU MINING COMPANY

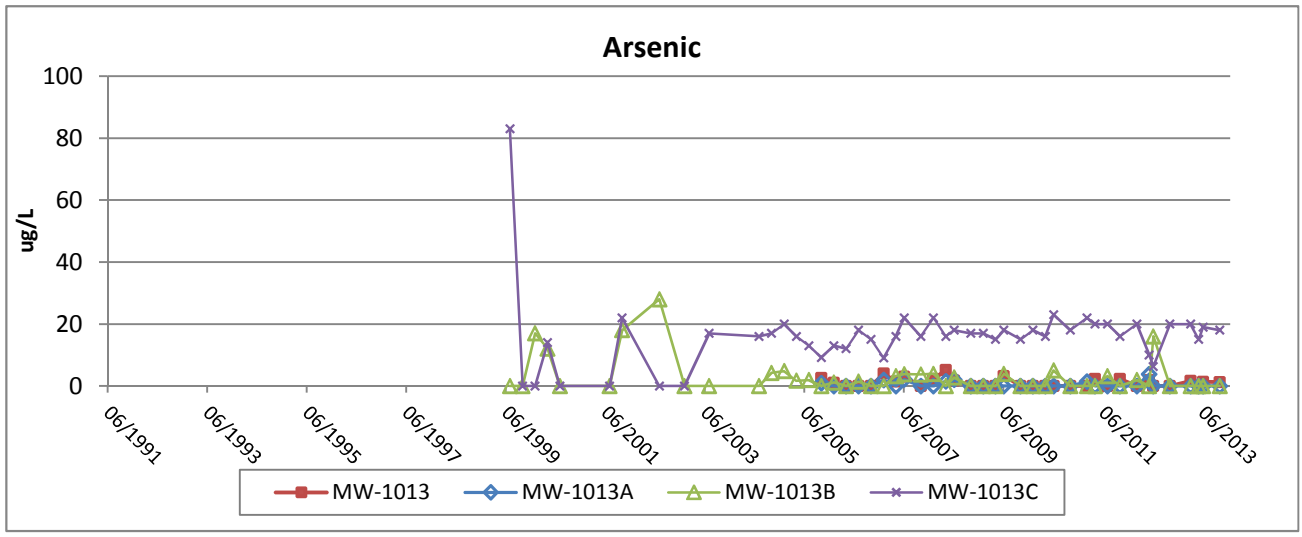
Figure B-5d

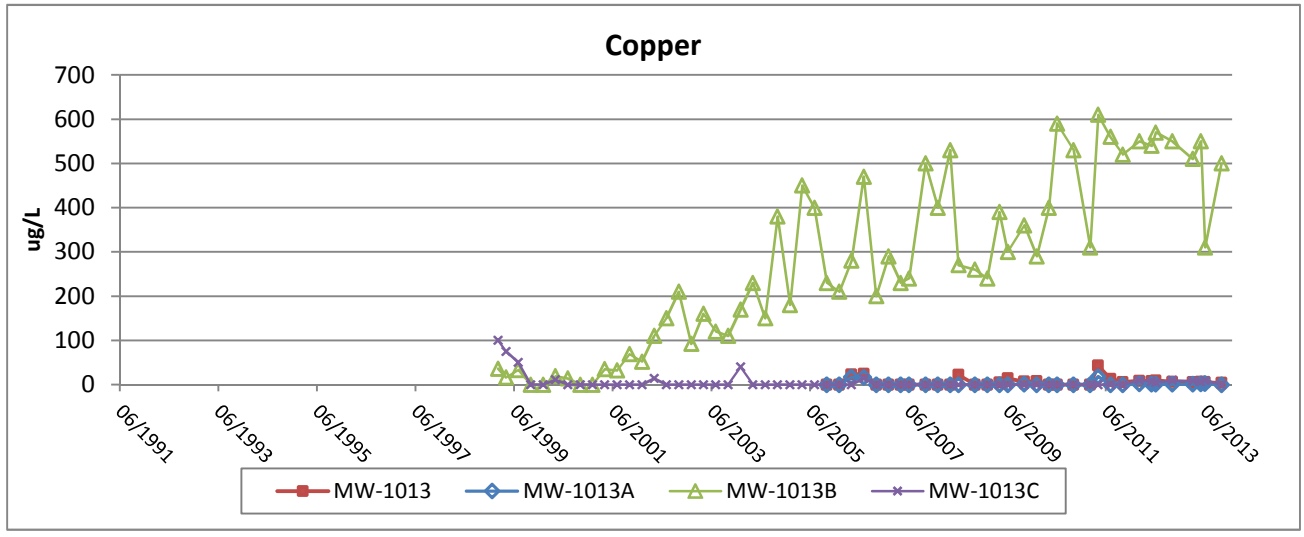
Groundwater Trend Graphs - Quarterly Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |




Foth

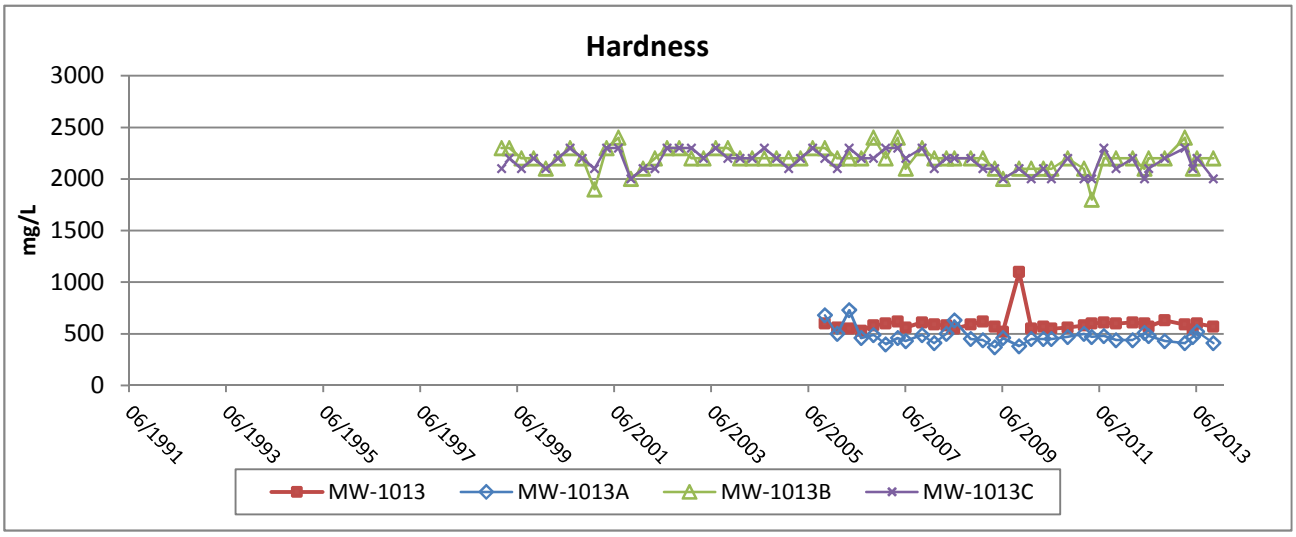
FLAMBEAU MINING COMPANY

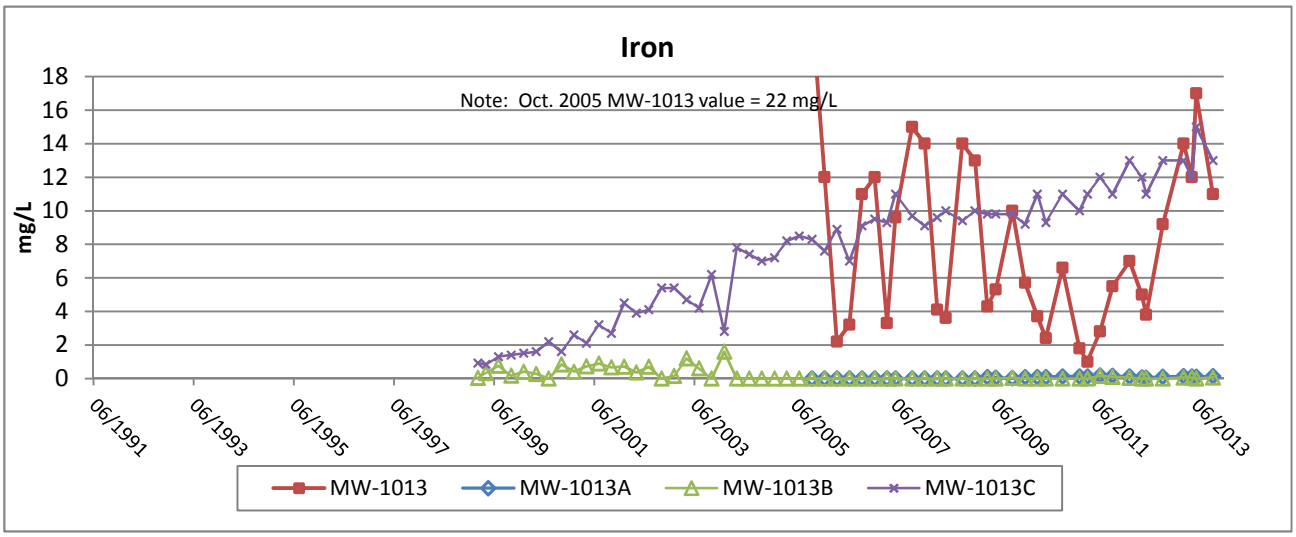
Figure B-6a

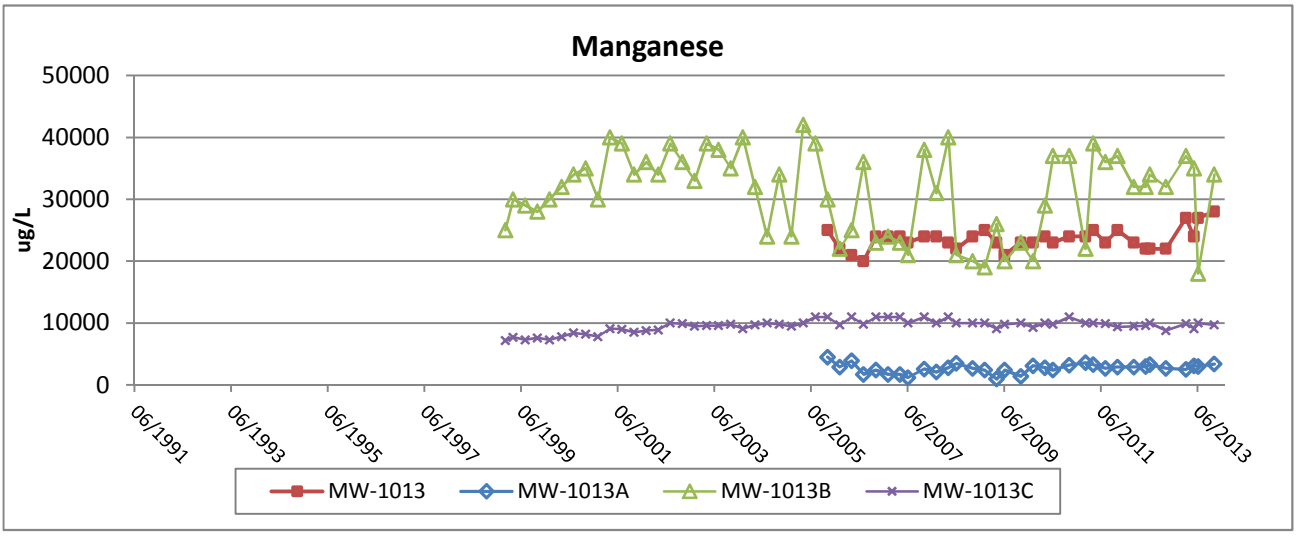
Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |




Foth

FLAMBEAU MINING COMPANY

Figure B-6b

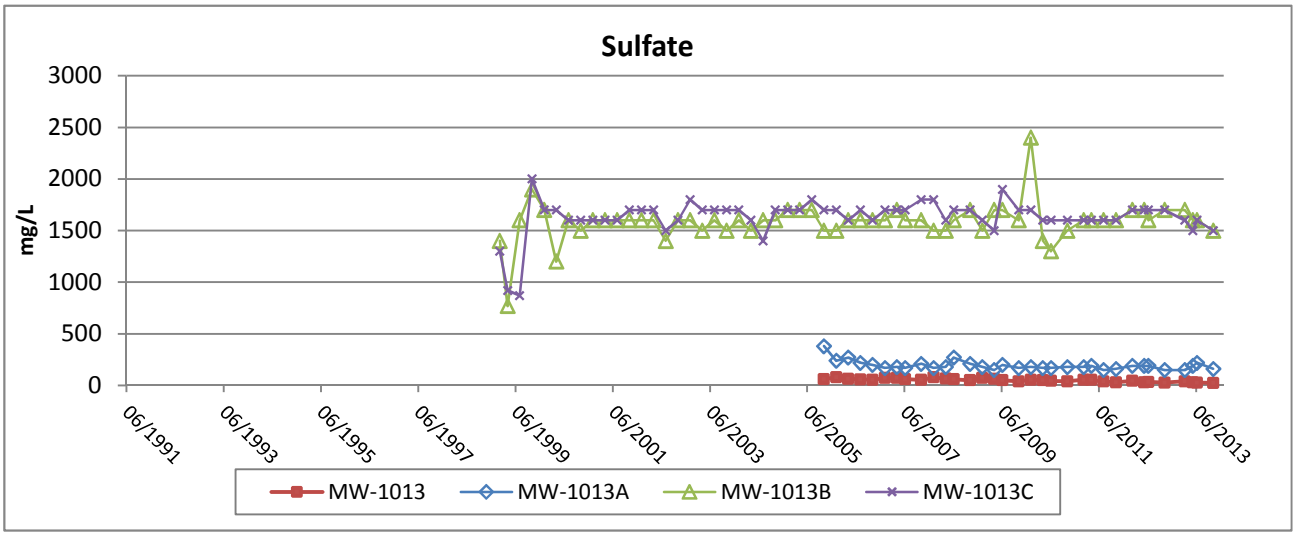
Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

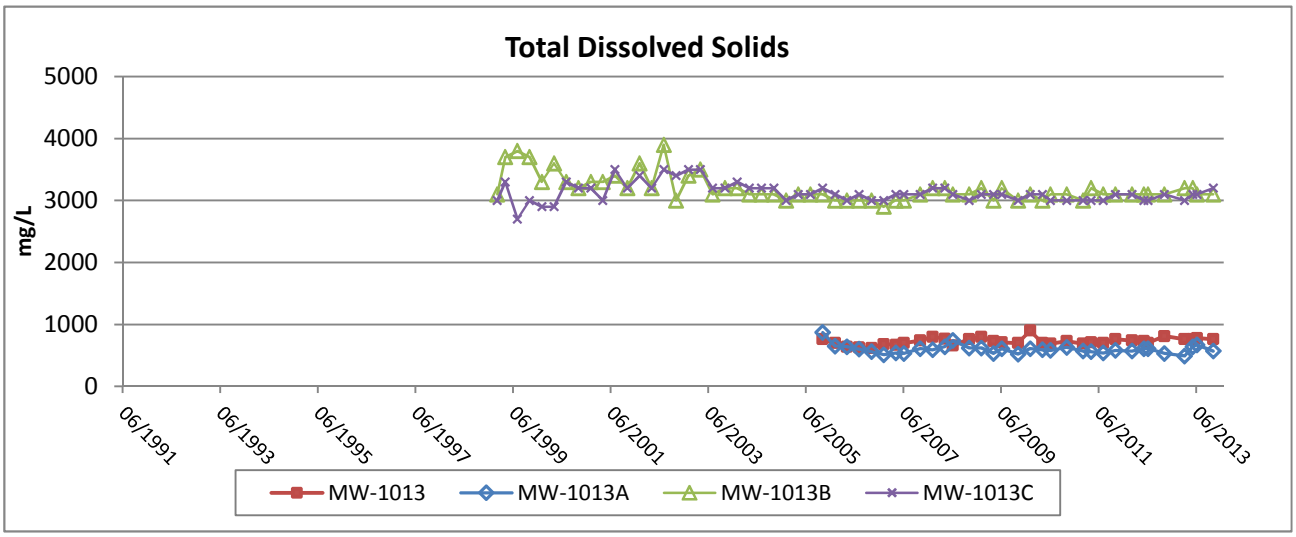
MW-1013/MW-1013A/MW-1013B/MW-1013C

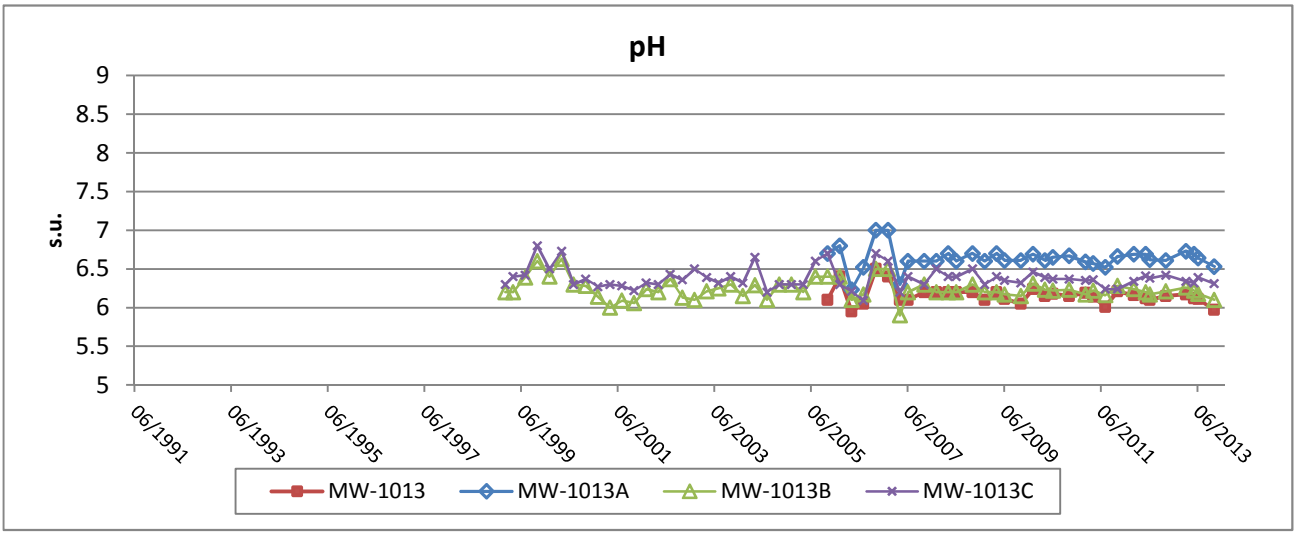
| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



X:\GB\IE\2008\08F777\10500 Support Data\Stats\2013 Annual Report\Support Files\GWGraphs_Qtrly.xlsm




Foth

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Figure B-6c

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



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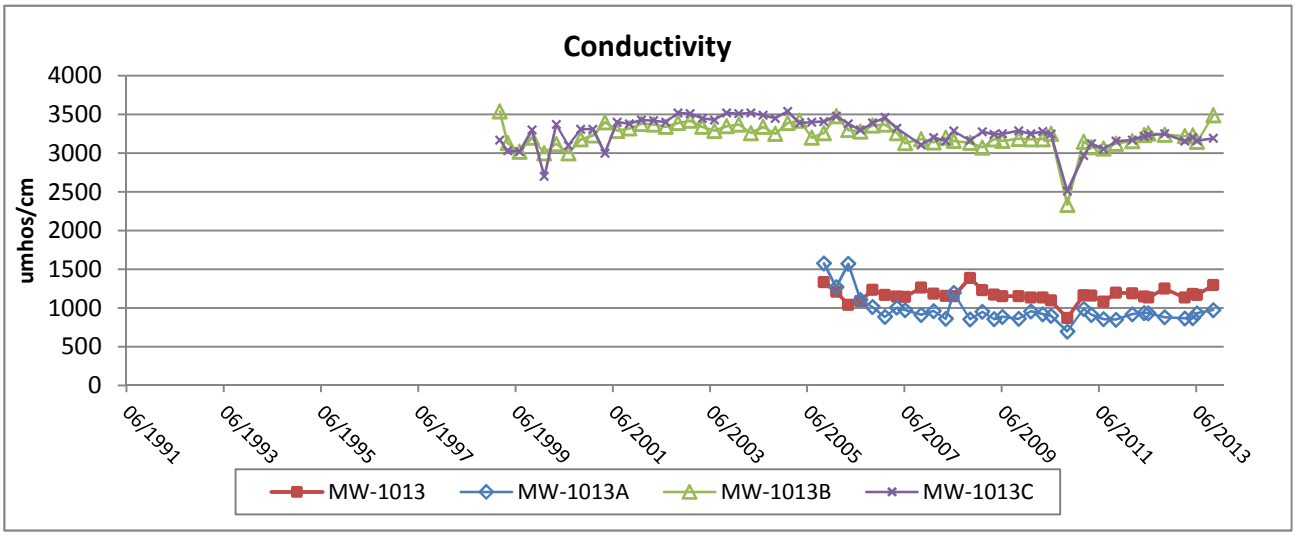


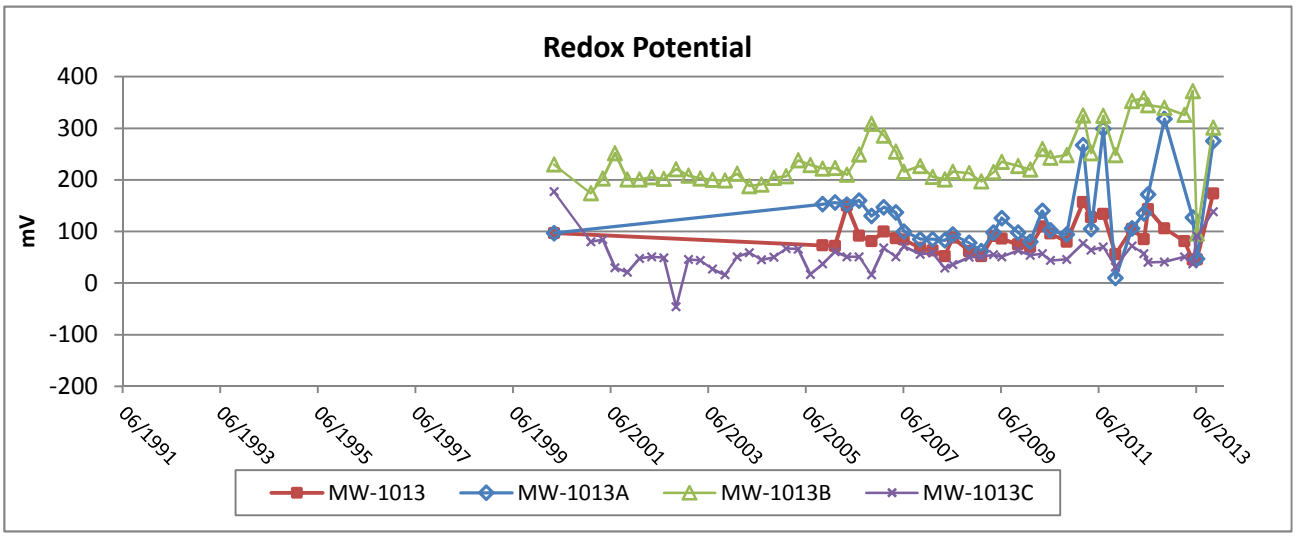


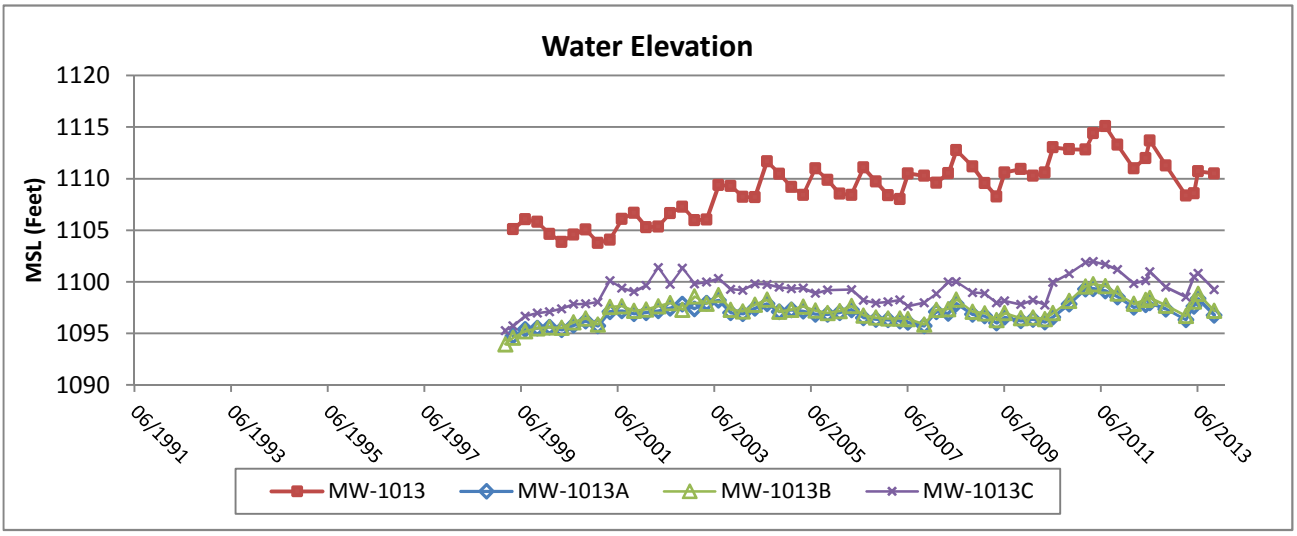


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FLAMBEAU MINING COMPANY

Figure B-6d

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



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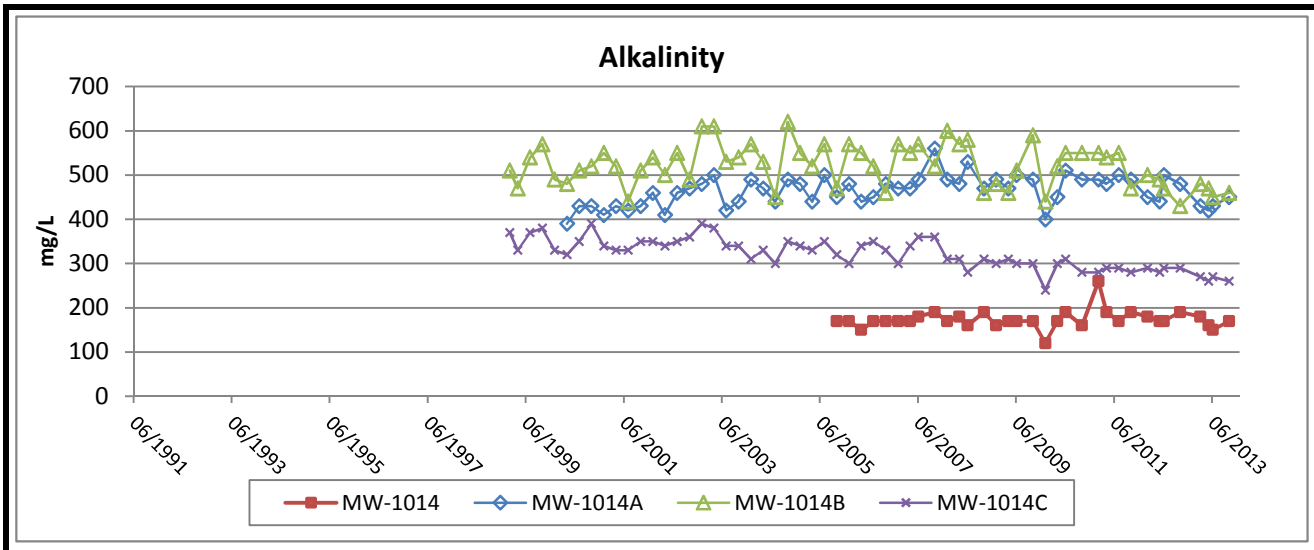


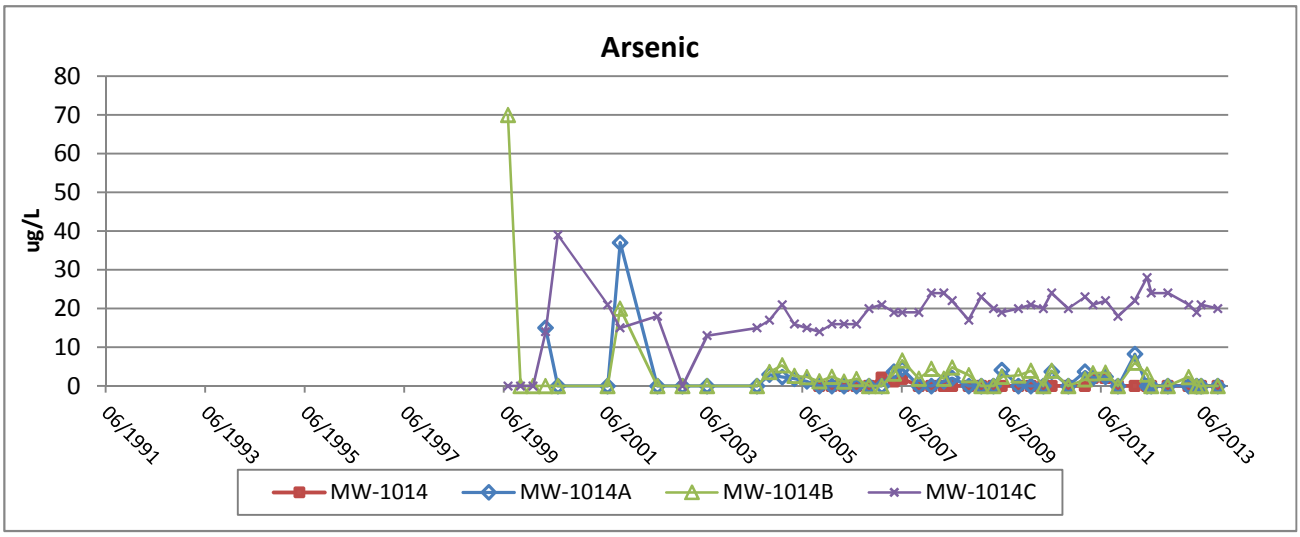


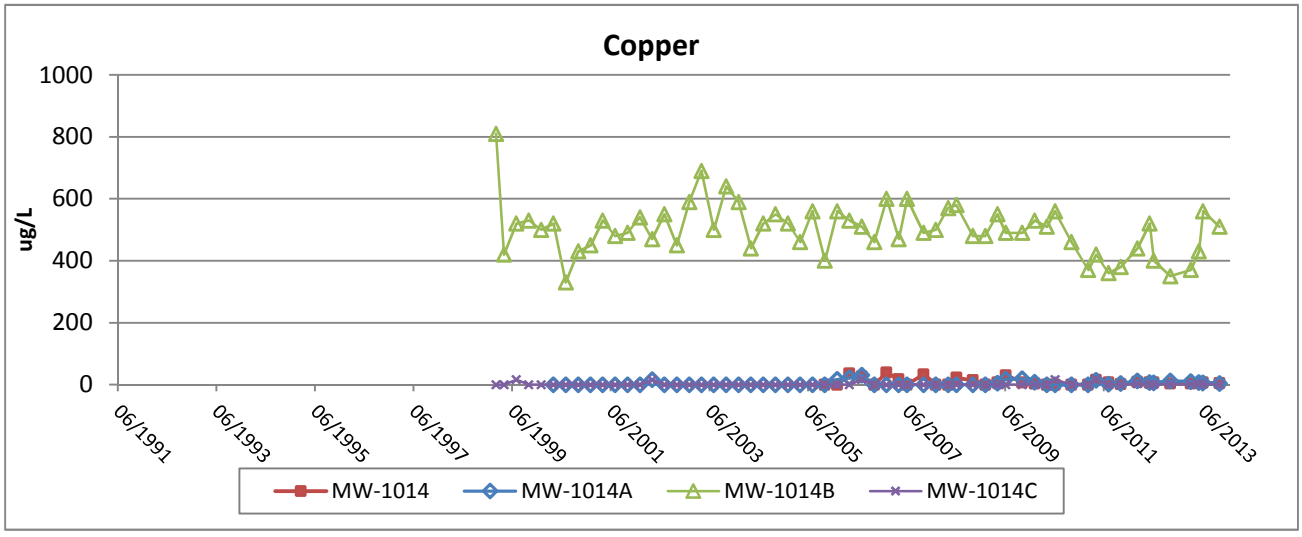


Foth

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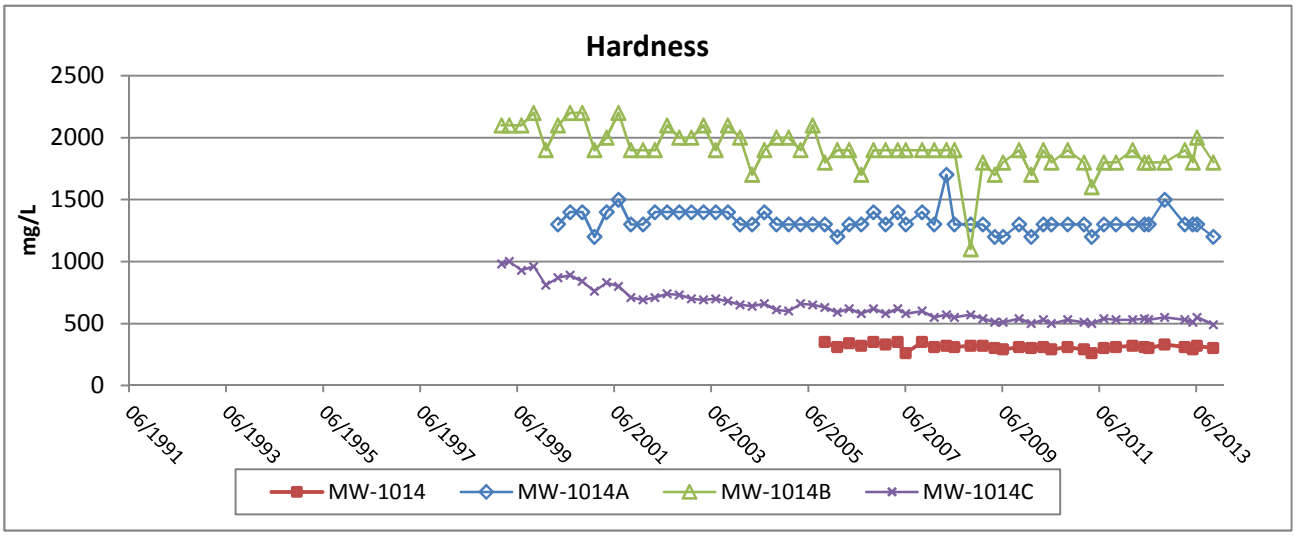
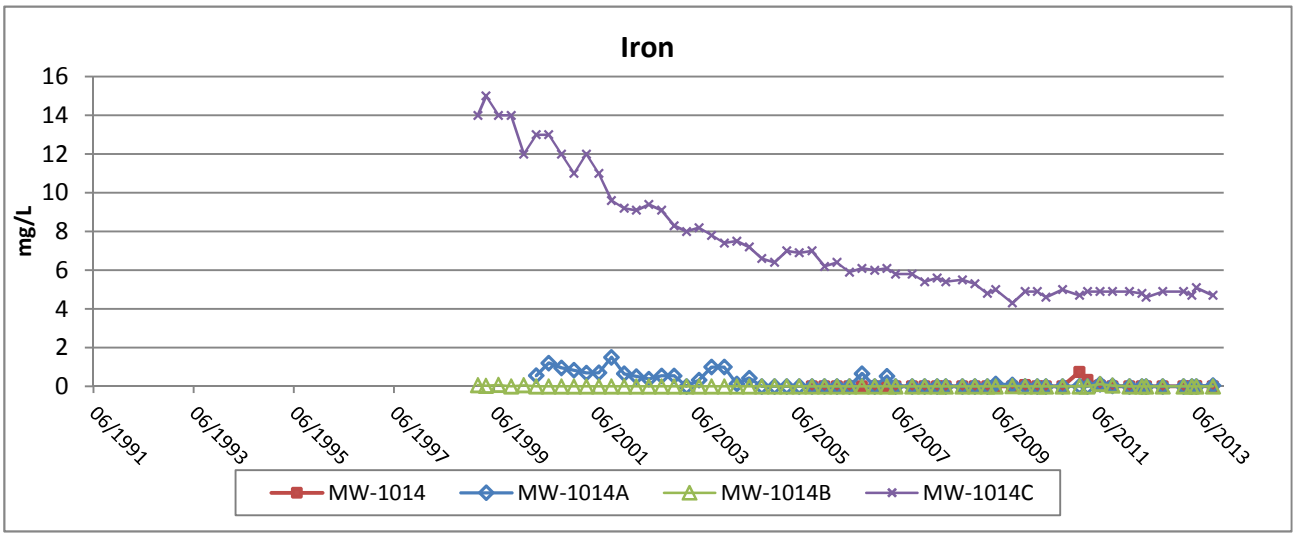
Figure B-7a

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



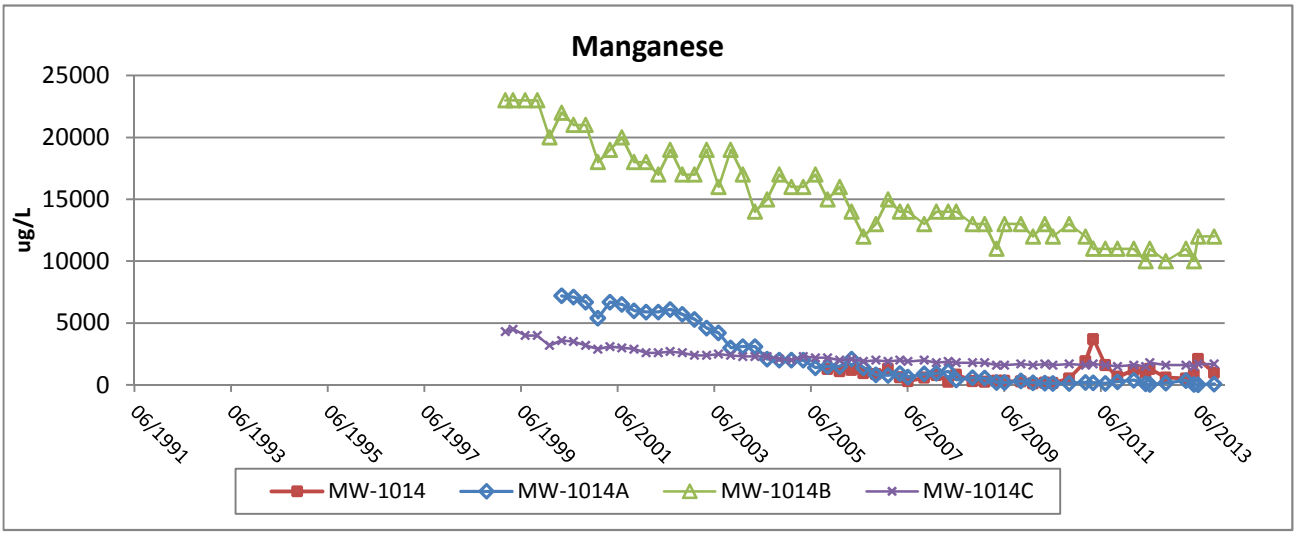




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Figure B-7b

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



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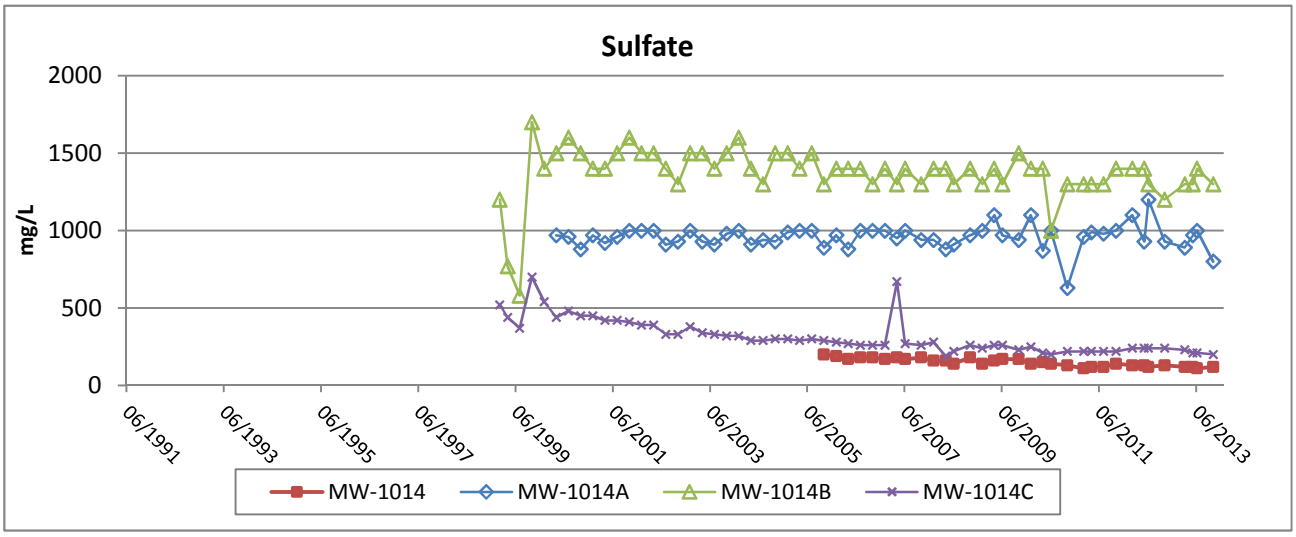


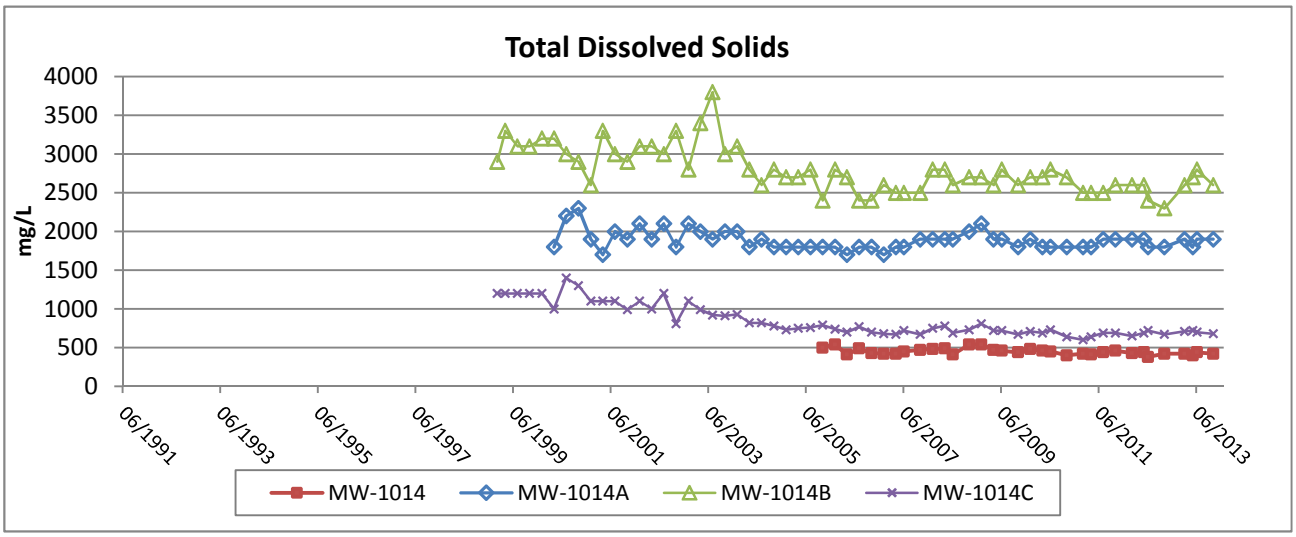


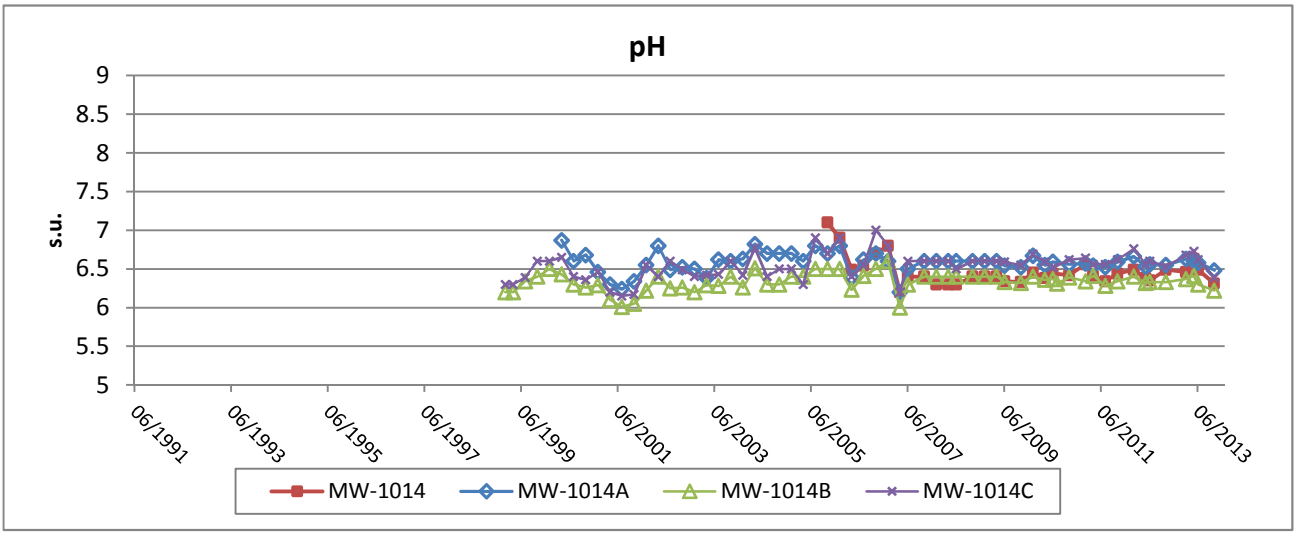


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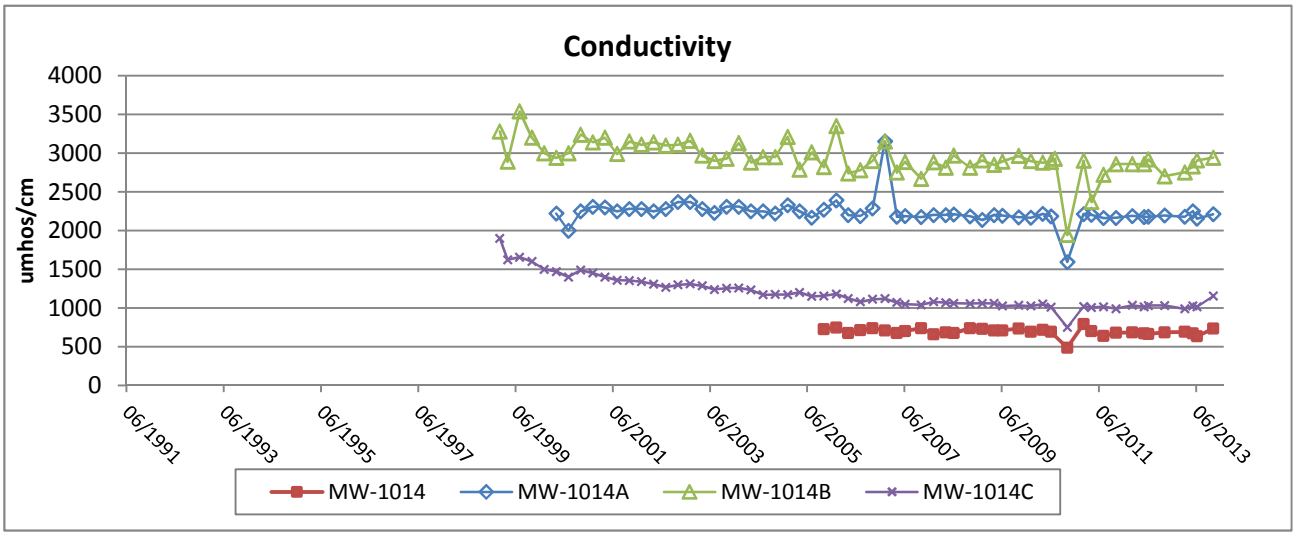
FLAMBEAU MINING COMPANY

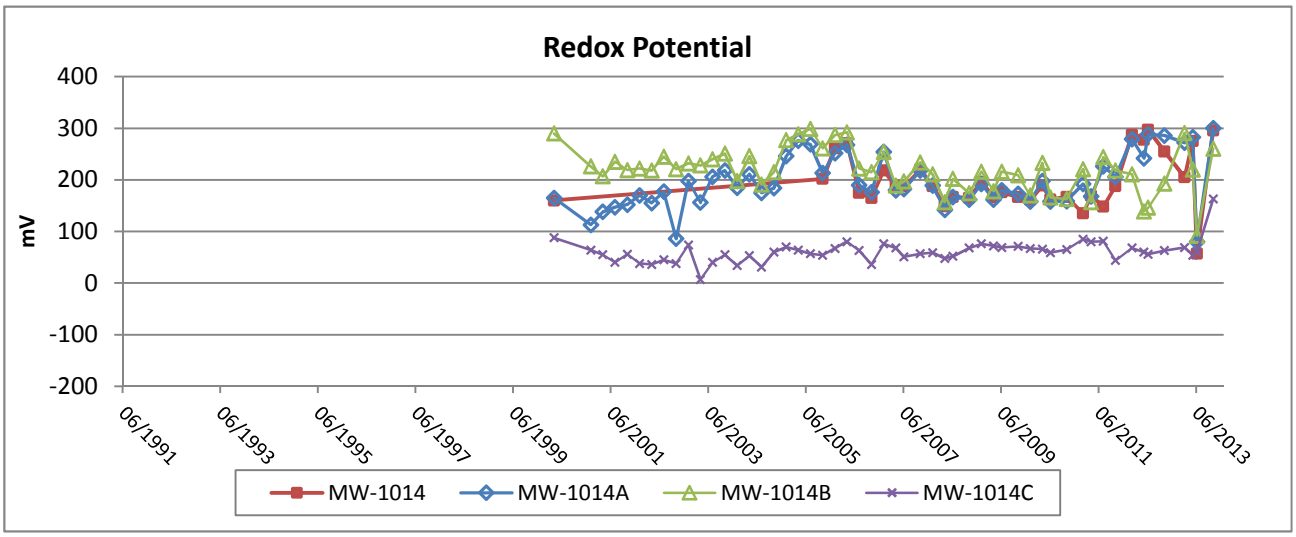
Figure B-7c

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



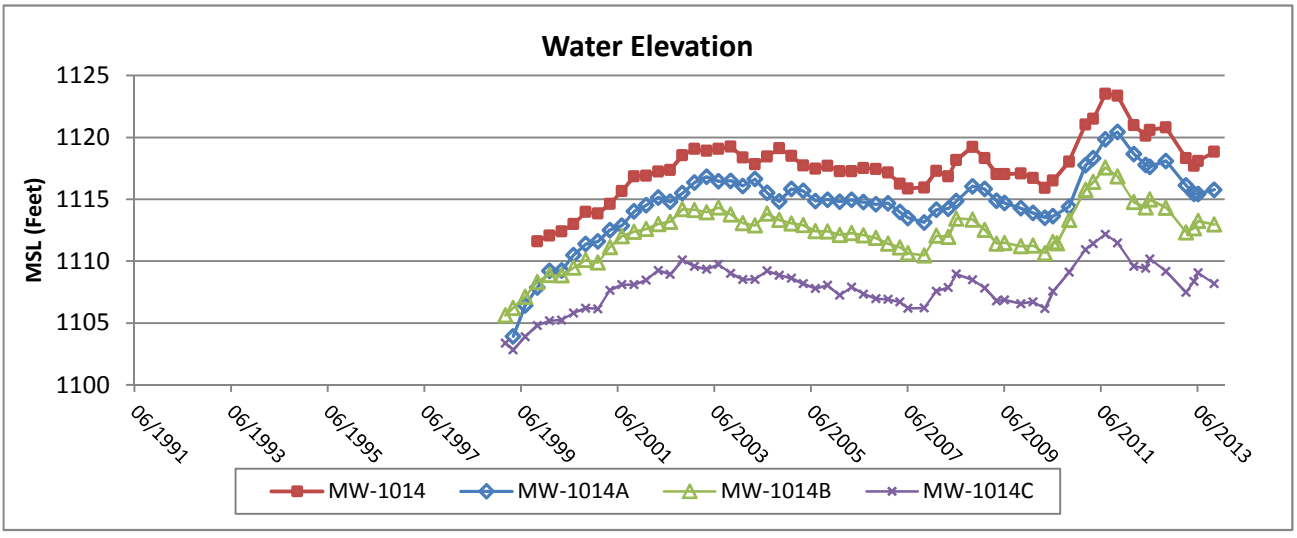




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Figure B-7d

Groundwater Trend Graphs - Quarterly Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

# Attachment 2

## Statistical Results

## Trend Graphs

## Historical Data

## (Groundwater - Annual Parameters)

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1987-10 | MW-1005 | | | | 64 | | < 5 | 370 | 7.2 | 1400 | 16 | 640 | 5.5 | 844 | |
| 1987-11 | MW-1005 | | | | 74 | | < 5 | 380 | 6.1 | 1100 | 16 | 610 | 5.6 | 816 | |
| 1987-12 | MW-1005 | | | | 64 | | < 5 | 380 | 13 | 750 | 17 | 650 | 5.79 | 822 | |
| 1988-01 | MW-1005 | | | | 70 | | < 6 | 380 | 12 | 650 | 8 | 640 | 5.6 | 787 | |
| 1988-02 | MW-1005 | | | | 80 | | 5 | 390 | 12 | 750 | 22 | 550 | 5.51 | 867 | |
| 1988-03 | MW-1005 | | | | 60 | | 16 | 390 | 7.9 | 710 | 20 | 630 | 5.25 | 880 | |
| 1988-04 | MW-1005 | | | | 60 | | 18 | 360 | 3.5 | 630 | 17 | 580 | 5.91 | 868 | |
| 1988-05 | MW-1005 | | | | 72 | | < 10 | 400 | 15 | 560 | 18 | 730 | 5.96 | 954 | |
| 1988-06 | MW-1005 | | | | 81 | | < 10 | 350 | 21 | 620 | 9 | 770 | 6.05 | 924 | |
| 1988-07 | MW-1005 | | | | 81 | | 25 | 340 | 19 | 640 | 17 | 650 | 7.01 | 468 | |
| 1988-08 | MW-1005 | | | | 60 | | 15 | 330 | 1.1 | 450 | 20 | 1000 | 6.1 | 825 | |
| 1988-09 | MW-1005 | | | | 93 | | < 10 | 380 | 12 | 560 | < 25 | 690 | 5.58 | 842 | |
| 1989-01 | MW-1000PR | | | 1088.83 | | | | | | | | | | | |
| 1989-04 | MW-1000PR | | | 1088.75 | | | | | | | | | | | |
| 1989-07 | MW-1000PR | | | 1090.13 | | | | | | | | | | | |
| 1989-11 | MW-1000PR | | | 1088.04 | | | | | | | | | | | |
| 1990-01 | MW-1000PR | | | 1087.46 | | | | | | | | | | | |
| 1990-04 | MW-1000PR | | | 1088.19 | | | | | | | | | | | |
| 1990-08 | MW-1000PR | | | 1087.94 | | | | | | | | | | | |
| 1990-10 | MW-1000PR | | | 1090.73 | | | | | | | | | | | |
| 1991-01 | MW-1000PR | | | 1089.12 | | | | | | | | | | | |
| 1991-01 | MW-1005 | | | | | | | | | | | | 7.82 | 733 | |
| 1991-04 | MW-1000PR | | | 1091.83 | | | | | | | | | | | |
| 1991-04 | MW-1005 | | | | | | | | | | | | 6.58 | 842 | |
| 1991-07 | MW-1000PR | | | 1089.14 | 65 | | < 14 | 84 | 0.65 | 850 | < 10 | 190 | 8.39 | 225 | |
| 1991-07 | MW-1002 | | | 1092.94 | 50 | | < 14 | 60 | 0.99 | 5.1 | < 10 | 160 | 8.33 | 157 | |
| 1991-07 | MW-1002G | | | 1092.97 | 86 | | < 14 | 100 | < 0.055 | 5.4 | < 10 | 240 | 7.56 | 277 | |
| 1991-07 | MW-1004 | | | 1111.57 | | | | | | | | | | | |
| 1991-07 | MW-1004P | | | 1108.93 | 160 | | < 14 | 150 | 0.33 | 130 | < 10 | 210 | 8.15 | 175 | |
| 1991-07 | MW-1004S | | | 1111.39 | 50 | | < 14 | 60 | < 0.055 | < 4 | < 10 | 160 | 8.64 | 161 | |
| 1991-07 | MW-1005 | | | | 84 | | < 14 | 380 | 17 | 510 | 15 | 570 | 7.73 | 1028 | |
| 1991-07 | MW-1005P | | | 1140.19 | 260 | | < 14 | 230 | 1.2 | 220 | < 10 | 290 | 8.49 | 512 | |
| 1991-07 | MW-1005S | | | 1139.43 | 170 | | < 14 | 170 | 0.3 | 210 | < 10 | 220 | 7.68 | 377 | |
| 1991-07 | MW-1010P | | | 1086.5 | 140 | | < 14 | 140 | < 0.055 | 260 | < 10 | 180 | 8.47 | 337 | |
| 1991-10 | MW-1000PR | | | 1089.51 | 90 | | < 14 | 110 | 0.84 | 880 | < 10 | 160 | 7.41 | 327 | |
| 1991-10 | MW-1002 | | | 1092.36 | 49 | | < 14 | 60 | < 0.055 | < 4 | < 10 | 170 | 6.78 | 189 | |
| 1991-10 | MW-1002G | | | 1092.4 | 88 | | < 14 | 120 | < 0.055 | < 4 | 10 | 280 | 6.98 | 272 | |
| 1991-10 | MW-1004 | | | 1111.14 | | | | | | | | | | | |
| 1991-10 | MW-1004P | | | 1108.79 | 170 | | < 14 | 170 | 0.22 | 130 | < 10 | 310 | 7.15 | 352 | |
| 1991-10 | MW-1004S | | | 1111 | 49 | | < 14 | 60 | < 0.055 | < 4 | 10 | 170 | 7.25 | 135 | |
| 1991-10 | MW-1005 | | | 1138.75 | 92 | | < 14 | 360 | 20 | 490 | 12 | 770 | 7.34 | 981 | |
| 1991-10 | MW-1005P | | | 1138.88 | 260 | | < 14 | 230 | 1 | 150 | < 10 | 440 | 7.66 | 479 | |
| 1991-10 | MW-1005S | | | 1138.1 | 170 | | < 14 | 170 | 3.8 | 220 | < 10 | 370 | 7.37 | 351 | |
| 1991-10 | MW-1010P | | | 1087.62 | 160 | | < 14 | 130 | < 0.055 | 280 | 10 | 250 | 8.26 | 326 | |
| 1992-01 | MW-1000PR | | | 1090.15 | 88 | | < 14 | 110 | 1.7 | 820 | 11 | 120 | 5.75 | 190 | |
| 1992-01 | MW-1002 | | | 1093.9 | 47 | | < 14 | 67 | < 0.055 | < 4 | < 10 | 100 | 6.88 | 138 | |
| 1992-01 | MW-1002G | | | 1093.93 | 80 | | < 14 | 110 | < 0.055 | < 4 | 11 | 140 | 6.93 | 221 | |
| 1992-01 | MW-1004 | | | 1111.65 | | | | | | | | | | | |
| 1992-01 | MW-1004P | | | 1108.79 | 160 | | < 14 | 150 | 0.32 | 120 | < 10 | 160 | 6.8 | 302 | |
| 1992-01 | MW-1004S | | | 1111 | 27 | | < 14 | 62 | < 0.055 | < 4 | 11 | 95 | 7.03 | 146 | |
| 1992-01 | MW-1005 | | | 1140.86 | 86 | | < 14 | 1000 | 18 | 460 | 14 | 530 | 6.12 | 870 | |
| 1992-01 | MW-1005P | | | 1140.95 | 260 | | < 14 | 240 | 0.75 | 160 | < 10 | 280 | 6.85 | 391 | |
| 1992-01 | MW-1005S | | | 1140.32 | 170 | | < 14 | 250 | 3.6 | 210 | < 10 | | 6.88 | 303 | |
| 1992-01 | MW-1010P | | | 1087.6 | 150 | | < 14 | 130 | 0.15 | 250 | 16 | 200 | 6.87 | 292 | |
| 1992-04 | MW-1000PR | | | 1091.67 | 84 | | < 14 | 88 | 1.3 | 830 | 14 | 120 | 6.91 | 183.2 | |
| 1992-04 | MW-1002 | | | 1093.7 | 49 | | < 14 | 48 | < 0.055 | < 4 | 11 | 85 | 6.05 | 145 | |
| 1992-04 | MW-1002G | | | 1093.75 | 84 | | < 14 | 110 | < 0.055 | < 4 | 14 | 150 | 6.25 | 199 | |
| 1992-04 | MW-1004 | | | 1112.19 | | | | | | | | | | | |
| 1992-04 | MW-1004P | | | 1109.72 | 170 | | < 14 | 160 | 0.37 | 140 | < 10 | 180 | 6.88 | 282 | |
| 1992-04 | MW-1004S | | | 1112.05 | 60 | | < 14 | 72 | < 0.055 | < 4 | 12 | 100 | 6.7 | 153 | |
| 1992-04 | MW-1005 | | | 1141.23 | 90 | | < 14 | 520 | 17 | 380 | 16 | 680 | 6.32 | 905 | |
| 1992-04 | MW-1005P | | | 1141.48 | 260 | | < 14 | 240 | 1 | 130 | < 10 | 350 | 6.97 | 417 | |
| 1992-04 | MW-1005S | | | 1140.71 | 180 | | < 14 | 290 | 3.7 | 200 | < 10 | 210 | 7.48 | 324 | |
| 1992-04 | MW-1010P | | | 1089.08 | 160 | | < 14 | 140 | < 0.055 | 200 | 14 | 340 | 7.62 | 314 | |
| 1992-07 | MW-1000PR | | | 1088.87 | 81 | | 14 | 120 | 0.47 | 730 | 12 | 140 | 6.64 | 194 | |
| 1992-07 | MW-1002 | | | 1093.04 | 41 | | < 14 | 120 | < 0.055 | < 4 | < 10 | 87 | 5.61 | 118 | |
| 1992-07 | MW-1002G | | | 1093.09 | 79 | | < 14 | 160 | < 0.055 | < 4 | 11 | 150 | 6.02 | 198 | |
| 1992-07 | MW-1004 | | | 1111.73 | | | | | | | | | | | |
| 1992-07 | MW-1004P | | | 1109.39 | 160 | | < 14 | 170 | 0.38 | 130 | < 10 | 180 | 6.74 | 295 | |
| 1992-07 | MW-1004S | | | 1111.58 | 74 | | < 14 | 150 | < 0.055 | < 4 | < 10 | 110 | 6.5 | 175 | |
| 1992-07 | MW-1005 | | | 1140.11 | 90 | | < 14 | 440 | 19 | 440 | 15 | 640 | 6.01 | 912 | |
| 1992-07 | MW-1005P | | | 1140.29 | 270 | | < 14 | 260 | 0.95 | 150 | < 10 | 270 | 6.81 | 426 | |
| 1992-07 | MW-1005S | | | 1139.4 | 170 | | < 14 | 220 | 4.1 | 210 | < 10 | 220 | 6.68 | 331 | |
| 1992-07 | MW-1010P | | | 1088.28 | 160 | | < 14 | 180 | < 0.055 | 86 | < 10 | 180 | 6.86 | 285 | |
| 1992-10 | MW-1000PR | | | 1089.22 | 95 | | < 14 | 100 | 0.8 | 780 | 12 | 160 | 6.9 | 201 | |
| 1992-10 | MW-1002 | | | 1091.69 | 53 | | < 14 | 82 | < 0.055 | 15 | 11 | 130 | 6.94 | 181 | |
| 1992-10 | MW-1002G | | | 1091.73 | 85 | | < 14 | 130 | < 0.055 | < 4 | 11 | 180 | 6.94 | 254 | |
| 1992-10 | MW-1004 | | | 1108.33 | | | | | | | | | | | |
| 1992-10 | MW-1004P | | | 1107.39 | 190 | | < 14 | 180 | 0.32 | 130 | < 10 | 260 | 7.46 | 342 | |
| 1992-10 | MW-1004S | | | 1108.44 | 100 | | < 14 | 110 | < 0.055 | < 4 | < 10 | 220 | 6.96 | 258 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992-10 | MW-1005 | | 1139.07 | 110 | | < 14 | 420 | 22 | 470 | 15 | 600 | 6.13 | 1013 | |
| 1992-10 | MW-1005P | | 1137.84 | 270 | | < 14 | 260 | 12 | 100 | < 10 | 320 | 7.26 | 501 | |
| 1992-10 | MW-1005S | | 1138.13 | 190 | | < 14 | 270 | 3.9 | 200 | < 10 | 260 | 7.38 | 391 | |
| 1992-10 | MW-1010P | | 1086.55 | 180 | | < 14 | 160 | < 0.055 | 140 | < 10 | 280 | 7.49 | 389 | |
| 1993-01 | MW-1000PR | | 1091.62 | 84 | | < 14 | 88 | 0.15 | 710 | < 10 | 100 | 6.22 | 203 | |
| 1993-01 | MW-1000R | | 1091.01 | | | | | | | | | | | |
| 1993-01 | MW-1002 | | | 53 | | < 14 | 66 | 0.059 | 4.7 | < 10 | 90 | 6.96 | 127 | |
| 1993-01 | MW-1002G | | 1092.69 | 75 | | < 14 | 94 | < 0.055 | < 4 | 12 | 98 | 7.14 | 197 | |
| 1993-01 | MW-1004 | | 1105.8 | | | | | | | | | | | |
| 1993-01 | MW-1004P | | 1104.64 | 170 | | < 14 | 160 | 0.39 | 140 | < 10 | 160 | 6.24 | 291 | |
| 1993-01 | MW-1004S | | 1105.97 | 73 | | < 14 | 92 | < 0.055 | < 4 | < 10 | 95 | 6.37 | 174 | |
| 1993-01 | MW-1005 | | 1139.18 | 94 | | < 14 | 400 | 24 | 520 | 23 | 140 | 6.21 | 945 | |
| 1993-01 | MW-1005P | | 1139.08 | 260 | | < 14 | 240 | 1.1 | 110 | < 10 | 220 | 6.39 | 440 | |
| 1993-01 | MW-1005S | | 1138.52 | 180 | | < 14 | 180 | 4.1 | 210 | 10 | 160 | 6.99 | 418 | |
| 1993-01 | MW-1010P | | 1088.95 | 190 | | < 14 | 130 | < 0.055 | 31 | 32 | 210 | 7.21 | 357 | |
| 1993-04 | MW-1000PR | | 1089.06 | 82 | | 26 | 90 | 0.27 | 950 | 12 | 130 | 6.24 | 198 | |
| 1993-04 | MW-1000R | | 1092.11 | | | | | | | | | | | |
| 1993-04 | MW-1002 | | 1093.34 | 66 | | < 12 | 90 | < 0.015 | < 4 | 9 | 120 | 6.33 | 136 | |
| 1993-04 | MW-1002G | | 1093.38 | 44 | | < 12 | 76 | < 0.015 | < 4 | 8 | 74 | 6.13 | 239 | |
| 1993-04 | MW-1004P | | 1099.76 | 170 | | < 12 | 160 | < 0.015 | < 4 | 3 | 160 | 7.74 | 329 | |
| 1993-04 | MW-1004S | | 1103.31 | 51 | | < 12 | 70 | < 0.015 | < 4 | 11 | 120 | 7.77 | 168 | |
| 1993-04 | MW-1005 | | 1140.35 | 78 | | < 12 | 500 | 24 | 540 | 15 | 630 | 6.11 | 971 | |
| 1993-04 | MW-1005P | | 1139.42 | 250 | | < 12 | 250 | 0.46 | 150 | 2 | 250 | 6.52 | 458 | |
| 1993-04 | MW-1005S | | 1139.26 | 81 | | < 12 | 210 | 4.4 | 230 | 8 | 200 | 6.38 | 360 | |
| 1993-04 | MW-1010P | | 1088.51 | 170 | | < 14 | 130 | 0.055 | 140 | 28 | 270 | 6.62 | 357 | |
| 1993-07 | MW-1000PR | | 1079.77 | 82 | | 16 | 86 | 0.061 | 730 | 15 | 140 | 6.6 | 217 | |
| 1993-07 | MW-1002 | | 1095.73 | 42 | | < 12 | 52 | 0.034 | < 4 | 10 | 100 | 6.83 | 273 | |
| 1993-07 | MW-1002G | | 1095.72 | 64 | | < 12 | 80 | < 0.015 | < 4 | 11 | 140 | 6.72 | 480 | |
| 1993-07 | MW-1004P | | 1095.77 | 170 | | < 12 | 150 | 0.042 | 22 | 5 | 180 | 7.4 | 347 | |
| 1993-07 | MW-1004S | | 1102.69 | 24 | | < 12 | 56 | < 0.015 | < 4 | 11 | 110 | 7 | 178 | |
| 1993-07 | MW-1005 | | 1141.19 | 74 | | < 12 | 410 | 19 | 420 | 18 | 590 | 6.12 | 1100 | |
| 1993-07 | MW-1005P | | 1141.08 | 250 | | < 12 | 230 | 0.61 | 140 | 3 | 260 | 7.59 | 519 | |
| 1993-07 | MW-1005S | | 1140.88 | 170 | | < 12 | 160 | 4.2 | 220 | 9 | 210 | 7.28 | 372 | |
| 1993-07 | MW-1010P | | 1085.01 | 150 | | < 12 | 130 | < 0.015 | 35 | 11 | 180 | 7.21 | 313 | |
| 1993-08 | MW-1000PR | | 1077.59<br>1079.23<br>1078.63<br>1077.13 | | | | | | | | | | | |
| 1993-08 | MW-1000R | | 1084.61 | | | | | | | | | | | |
| 1993-08 | MW-1004 | | | | | | | | | | | | | |
| 1993-08 | MW-1004P | | 1094.63<br>1094.34<br>1094.03<br>1093.16 | | | | | | | | | | | |
| 1993-08 | MW-1004S | | 1101.99<br>1101.73<br>1101.57<br>1101.29 | | | | | | | | | | | |
| 1993-08 | MW-1010P | | 1083.01<br>1081.55<br>1081.58<br>1080.71 | | | | | | | | | | | |
| 1993-09 | MW-1000PR | | 1076.89<br>1076.75<br>1077.04<br>1076.2<br>1075.12 | | | | | | | | | | | |
| 1993-09 | MW-1000R | | | | | | | | | | | | | |
| 1993-09 | MW-1004 | | | | | | | | | | | | | |
| 1993-09 | MW-1004P | | 1092.64<br>1092.45<br>1092.34<br>1092.2<br>1091.84 | | | | | | | | | | | |
| 1993-09 | MW-1004S | | 1101.04<br>1100.85<br>1100.65<br>1100.49<br>1100.33 | | | | | | | | | | | |
| 1993-09 | MW-1010P | | 1081.61<br>1081.22<br>1081.84<br>1081.13<br>1080.95 | | | | | | | | | | | |
| 1993-10 | MW-1000PR | | 1074.73<br>1075.31<br>1074.86<br>1075.56<br>1074.99 | 62 | | 13 | 120 | 0.032 | 910 | 12 | 110 | 7.03 | 233 | |
| 1993-10 | MW-1000R | | | | | | | | | | | | | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1993-10 | MW-1002 | | 1091.71 | 42 | | < 12 | 52 | < 0.015 | < 4 | 6 | 92 | 7.52 | 138 | |
| 1993-10 | MW-1002G | | 1091.77 | 82 | | < 12 | 110 | < 0.015 | < 4 | 11 | 180 | 7.38 | 262 | |
| 1993-10 | MW-1004 | | | | | | | | | | | | | |
| 1993-10 | MW-1004P | | 1091.04<br>1090.18<br>1090.27<br>1090.09<br>1089.84 | 170 | | < 12 | 160 | 0.048 | 40 | 3 | 180 | 7.61 | 329 | |
| 1993-10 | MW-1004S | | 1100.18<br>1099.98<br>1099.82<br>1099.78<br>1099.61 | 32 | | < 12 | 46 | < 0.015 | < 4 | 9 | 110 | 7.41 | 186 | |
| 1993-10 | MW-1005 | | 1140.03 | 84 | | < 12 | 390 | 25 | 610 | 17 | 580 | 6.68 | 1005 | |
| 1993-10 | MW-1005P | | 1139.85 | 250 | | < 12 | 220 | 0.17 | 69 | < 2 | 240 | 7.53 | 462 | |
| 1993-10 | MW-1005S | | 1139.29 | 170 | | < 12 | 160 | 4.2 | 240 | 6 | 210 | 7.28 | 321 | |
| 1993-10 | MW-1010P | | 1080.02<br>1081.25<br>1080.16<br><br>1080.01 | 160 | | < 12 | 130 | < 0.015 | 18 | 5 | 170 | 7.51 | 294 | |
| 1993-11 | MW-1000PR | | 1075.95<br>1075.09<br>1074.87<br>1074.21 | | | | | | | | | | | |
| 1993-11 | MW-1000R | | | | | | | | | | | | | |
| 1993-11 | MW-1004 | | | | | | | | | | | | | |
| 1993-11 | MW-1004P | | 1090.03<br>1089.94<br>1088.84<br>1089.75 | | | | | | | | | | | |
| 1993-11 | MW-1004S | | 1099.45<br>1099.27<br>1099.18<br>1099.06 | | | | | | | | | | | |
| 1993-11 | MW-1010P | | 1079.89<br>1079.71<br>1080.55<br>1079.91 | | | | | | | | | | | |
| 1993-12 | MW-1000PR | | 1074.1<br>1073.61<br>1073.49 | | | | | | | | 110 | | | |
| 1993-12 | MW-1000R | | | | | | | | | | | | | |
| 1993-12 | MW-1002 | | | | | | | | | | 78 | | | |
| 1993-12 | MW-1002G | | | | | | | | | | 190 | | | |
| 1993-12 | MW-1004 | | | | | | | | | | | | | |
| 1993-12 | MW-1004P | | 1089.76<br>1089.54<br>1089.27 | | | | | | | | 230 | | | |
| 1993-12 | MW-1004S | | 1098.95<br>1098.78<br>1098.67 | | | | | | | | 98 | | | |
| 1993-12 | MW-1005 | | | | | | | | | | 680 | | | |
| 1993-12 | MW-1005P | | | | | | | | | | 300 | | | |
| 1993-12 | MW-1005S | | | | | | | | | | 220 | | | |
| 1993-12 | MW-1010P | | 1079.57<br>1079.91<br>1079.9 | | | | | | | | 230 | | | |
| 1994-01 | MW-1000PR | | 1073.55<br>1072.7<br>1073.75 | 43 | | 22 | 54 | < 0.015 | 340 | 12 | 70 | 6.86 | 135 | |
| 1994-01 | MW-1000R | | | | | | | | | | | | | |
| 1994-01 | MW-1002 | | 1091.21 | 39 | | < 12 | 50 | < 0.015 | < 4 | 7 | 82 | 7.53 | 151 | |
| 1994-01 | MW-1002G | | 1091.31 | 94 | | < 12 | 120 | < 0.015 | < 4 | 14 | 180 | 7.01 | 278 | |
| 1994-01 | MW-1004 | | | | | | | | | | | | | |
| 1994-01 | MW-1004P | | 1088.81<br>1088.52<br>1088.4 | 150 | | < 12 | 150 | < 0.015 | 20 | 2 | 160 | 7.34 | 371 | |
| 1994-01 | MW-1004S | | 1098.3<br>1098.18<br>1097.96 | 42 | | 16 | 44 | < 0.015 | < 4 | 10 | 74 | 7 | 123 | |
| 1994-01 | MW-1005 | | 1138.39 | 81 | | < 12 | 440 | 24 | 530 | 18 | 560 | 6.28 | 1072 | |
| 1994-01 | MW-1005P | | 1138.88 | 250 | | < 12 | 230 | 0.19 | 35 | < 2 | 260 | 7.34 | 487 | |
| 1994-01 | MW-1005S | | 1138.29 | 160 | | < 12 | 160 | 4 | 200 | 9 | 190 | 7.22 | 357 | |
| 1994-01 | MW-1010P | | 1080.83<br>1080.25<br>1081.09 | 160 | | < 12 | 150 | < 0.015 | 17 | 3 | 170 | 7.34 | 283 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994-02 | MW-1000PR | | 1073.23<br>1071.99<br>1071.66<br>1071.64 | | | | | | | | | | | |
| 1994-02 | MW-1000R | | | | | | | | | | | | | |
| 1994-02 | MW-1004 | | | | | | | | | | | | | |
| 1994-02 | MW-1004P | | 1088.45<br>1088.32<br>1088.13<br>1088.24 | | | | | | | | | | | |
| 1994-02 | MW-1004S | | 1097.82<br>1097.74<br>1097.67<br>1097.97 | | | | | | | | | | | |
| 1994-02 | MW-1010P | | 1080.99<br>1080.89<br>1080.51<br>1080.58 | | | | | | | | | | | |
| 1994-03 | MW-1000PR | | 1071.26<br>1070.68<br>1070.41<br>1070.71 | | | | | | | | | | | |
| 1994-03 | MW-1000R | | | | | | | | | | | | | |
| 1994-03 | MW-1004 | | | | | | | | | | | | | |
| 1994-03 | MW-1004P | | 1088.11<br>1087.64<br>1087.56<br>1087.15 | | | | | | | | | | | |
| 1994-03 | MW-1004S | | 1097.71<br>1097.77<br>1097.74<br>1097.76 | | | | | | | | | | | |
| 1994-03 | MW-1010P | | 1080.62<br>1079.5<br>1078.94<br>1079.52 | | | | | | | | | | | |
| 1994-04 | MW-1000PR | | 1070.66<br>1071.16<br>1071.91<br>1071.98 | 44 | | 23 | 54 | 0.021 | 500 | 12 | 95 | 7.74 | 124 | |
| 1994-04 | MW-1000R | | | | | | | | | | | | | |
| 1994-04 | MW-1002 | | 1091.21 | 35 | | < 12 | 45 | < 0.015 | < 4 | 7 | 86 | 7.49 | 105 | |
| 1994-04 | MW-1002G | | 1091.27 | 92 | | < 12 | 120 | < 0.015 | < 4 | 12 | 170 | 7.39 | 267 | |
| 1994-04 | MW-1004 | | 1104.19<br>1104.19 | | | | | | | | | | | |
| 1994-04 | MW-1004P | | 1086.88<br>1087<br>1086.91<br>1087.03 | 160 | | 15 | 150 | 0.033 | 45 | 3 | 180 | 7.36 | 287 | |
| 1994-04 | MW-1004S | | 1097.73<br>1097.66<br>1097.6<br>1097.72 | 38 | | < 12 | 51 | < 0.015 | < 4 | 8 | 100 | 7.75 | 109 | |
| 1994-04 | MW-1005 | | 1140 | 88 | | < 12 | 450 | 24 | 540 | 13 | 620 | 7.6 | 1082 | |
| 1994-04 | MW-1005P | | 1139.44 | 250 | | < 12 | 230 | 0.2 | 160 | < 2 | 270 | 7.24 | 487 | |
| 1994-04 | MW-1005S | | 1139.14 | 160 | | < 12 | 160 | 4.1 | 200 | 8 | 200 | 7.52 | 344 | |
| 1994-04 | MW-1010P | | 1079.25<br>1079.25<br>1080.02<br>1080 | 160 | | < 12 | 150 | < 0.015 | 14 | 3 | 180 | 7.36 | 276 | |
| 1994-05 | MW-1000PR | | 1071.59<br>1071.21<br>1070.96<br>1071.22 | | | | | | | | | | | |
| 1994-05 | MW-1000R | | | | | | | | | | | | | |
| 1994-05 | MW-1004 | | | | | | | | | | | | | |
| 1994-05 | MW-1004P | | 1087.18<br>1086.87<br>1086.65<br>1086.66 | | | | | | | | | | | |
| 1994-05 | MW-1004S | | 1098.23<br>1098.42<br>1098.41<br>1098.31 | | | | | | | | | | | |
| 1994-05 | MW-1010P | | 1079.94<br>1079<br>1078.84<br>1078.33 | | | | | | | | | | | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994-06 | MW-1000PR | | 1071.93<br>1071.71<br>1071.45<br>1071.41<br>1071.18 | | | | | | | | | | | |
| 1994-06 | MW-1000R | | | | | | | | | | | | | |
| 1994-06 | MW-1004 | | | | | | | | | | | | | |
| 1994-06 | MW-1004P | | 1086.57<br>1086.58<br>1086.57<br>1086.47<br>1086.48 | | | | | | | | | | | |
| 1994-06 | MW-1004S | | 1098.12<br>1098<br>1097.88<br>1097.77<br>1097.67 | | | | | | | | | | | |
| 1994-06 | MW-1010P | | 1079.45<br>1078.94<br>1078.43<br>1078.37<br>1078.25 | | | | | | | | | | | |
| 1994-07 | MW-1000PR | | 1071.28<br>1071.01<br>1071.19<br>1071.1 | 39 | | 17 | 49 | 0.026 | 420 | 11 | 90 | 7.47 | 132.6 | |
| 1994-07 | MW-1000R | | | | | | | | | | | | | |
| 1994-07 | MW-1002 | | 1091.02 | 31 | | < 12 | 44 | < 0.015 | < 4 | 6.6 | 94 | 7 | 109.4 | |
| 1994-07 | MW-1002G | | 1091.07 | 92 | | < 12 | 120 | < 0.015 | < 4 | 13 | 170 | 6.74 | 238 | |
| 1994-07 | MW-1004 | | | | | | | | | | | | | |
| 1994-07 | MW-1004P | | 1086.56<br>1086.74<br>1086.64<br>1086.39 | 160 | | < 12 | 150 | 0.024 | 28 | 2.5 | 190 | 7.09 | 317 | |
| 1994-07 | MW-1004S | | 1097.7<br>1097.66<br>1097.59<br>1097.56 | 140 | | < 12 | 52 | < 0.015 | < 4 | 8 | 100 | 6.77 | 200 | |
| 1994-07 | MW-1005 | | 1139.53 | 75 | | < 12 | 450 | 31 | 690 | 14 | 600 | 6.18 | 1093 | |
| 1994-07 | MW-1005P | | 1138.96 | 240 | | < 12 | 230 | 0.22 | 100 | < 2 | 270 | 6.89 | 456 | |
| 1994-07 | MW-1005S | | 1138.65 | 160 | | < 12 | 160 | 4.1 | 200 | 7.3 | 210 | 6.88 | 322 | |
| 1994-07 | MW-1010P | | 1078.46<br>1078.27<br>1078.24<br>1078.37 | 160 | | < 12 | 150 | < 0.015 | 10 | 3.4 | 190 | 7.17 | 322 | |
| 1994-08 | MW-1000PR | | 1071.07<br>1070.87<br>1070.55<br>1070.75 | | | | | | | | | | | |
| 1994-08 | MW-1000R | | | | | | | | | | | | | |
| 1994-08 | MW-1004 | | | | | | | | | | | | | |
| 1994-08 | MW-1004P | | 1086.12<br>1086.01<br>1085.86<br>1085.8 | | | | | | | | | | | |
| 1994-08 | MW-1004S | | 1097.49<br>1097.43<br>1097.33<br>1097.27 | | | | | | | | | | | |
| 1994-08 | MW-1010P | | 1078.31<br>1078.05<br>1077.91<br>1078.76 | | | | | | | | | | | |
| 1994-09 | MW-1000PR | | 1070.91<br>1070.71 | | | | | | | | | | | |
| 1994-09 | MW-1000R | | | | | | | | | | | | | |
| 1994-09 | MW-1004 | | | | | | | | | | | | | |
| 1994-09 | MW-1004P | | 1085.86<br>1085.92<br>1086.6 | | | | | | | | | | | |
| 1994-09 | MW-1004S | | 1097.16<br>1097.08<br>1097.87 | | | | | | | | | | | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994-09 | MW-1010P | | 1078.59<br>1078.55<br>1086.68<br>1085.52<br>1084.29<br>1083.36<br>1082.6<br>1081.25<br>1080.72<br>1080.87 | | | | | | | | | | | |
| 1994-10 | MW-1000PR | | 1071.03 | 34 | | 58 | 36 | 0.047 | 360 | 17 | 120 | 7.17 | 115.9 | |
| 1994-10 | MW-1000R | | | | | | | | | | | | | |
| 1994-10 | MW-1002 | | 1092.12 | 38 | | < 1.6 | 46 | 0.0056 | < 0.47 | 6.1 | 87 | 6.99 | 122 | |
| 1994-10 | MW-1002G | | 1092.18 | 88 | | < 1.6 | 110 | 0.0054 | < 0.47 | 14 | 200 | 6.77 | 269 | |
| 1994-10 | MW-1004 | | | | | | | | | | | | | |
| 1994-10 | MW-1004P | | 1086.47<br>1086.45<br>1086.4<br>1086.36<br>1086.46 | 170 | | < 1.6 | 160 | 0.035 | 29 | 3.9 | 200 | 7.12 | 303 | |
| 1994-10 | MW-1004S | | 1098.1<br>1097.99<br>1097.84<br>1097.75<br>1097.97 | 44 | | < 1.6 | 54 | 0.0064 | < 0.47 | 8.6 | 150 | 6.71 | 123.5 | |
| 1994-10 | MW-1005 | | 1138.79 | 78 | | < 1.6 | 420 | 28 | 630 | 20 | 820 | 6.08 | 1028 | |
| 1994-10 | MW-1005P | | 1137.79 | 250 | | < 1.6 | 250 | 0.24 | 62 | 2.5 | 280 | 7.15 | 452 | |
| 1994-10 | MW-1005S | | 1137.49 | 160 | | < 1.6 | 160 | 3.7 | 190 | 13 | 240 | 7.34 | 320 | |
| 1994-10 | MW-1010P | | 1079.81<br>1079.8<br>1080.6<br>1080.17<br>1079.92 | 160 | | 3.2 | 150 | 0.0046 | 14 | 4.5 | 200 | 7.45 | 309 | |
| 1994-11 | MW-1000PR | | 1070.27<br>1070.28<br>1070.23 | | | | | | | | | | | |
| 1994-11 | MW-1000R | | | | | | | | | | | | | |
| 1994-11 | MW-1004 | | | | | | | | | | | | | |
| 1994-11 | MW-1004P | | 1086.24<br>1086.14<br>1086.1 | | | | | | | | | | | |
| 1994-11 | MW-1004S | | 1097.63<br>1097.53<br>1097.35 | | | | | | | | | | | |
| 1994-11 | MW-1010P | | 1079.07<br>1078.85<br>1079.29 | | | | | | | | | | | |
| 1994-12 | MW-1000PR | | 1069.65<br>1069.28<br>1069.24<br>1068.91 | | | | | | | | | | | |
| 1994-12 | MW-1000R | | | | | | | | | | | | | |
| 1994-12 | MW-1004 | | | | | | | | | | | | | |
| 1994-12 | MW-1004P | | 1086.29<br>1086.07<br>1085.93<br>1085.84 | | | | | | | | | | | |
| 1994-12 | MW-1004S | | 1097.24<br>1097.14<br>1097.03<br>1096.95 | | | | | | | | | | | |
| 1994-12 | MW-1010P | | 1078.61<br>1078.12<br>1078.66<br>1078.33 | | | | | | | | | | | |
| 1995-01 | MW-1000PR | | 1069.57<br>1069.2<br>1068.79<br>1069.18 | 30 | | 52 | 36 | 0.12 | 290 | 9 | 88 | 7.14 | 115.6 | |
| 1995-01 | MW-1000R | | | | | | | | | | | | | |
| 1995-01 | MW-1002 | | 1090.71 | 38 | | < 0.47 | 47 | 0.0073 | 2.7 | 6.2 | 120 | 6.65 | 143.2 | |
| 1995-01 | MW-1002G | | 1090.77 | 90 | | < 0.47 | 110 | 0.0072 | 2.1 | 12 | 240 | 6.74 | 301 | |
| 1995-01 | MW-1004 | | | | | | | | | | | | | |
| 1995-01 | MW-1004P | | 1080.64<br>1085.72<br>1085.81<br>1085.79 | 170 | | 3.3 | 150 | 0.015 | 29 | 1.7 | 190 | 6.69 | 315 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995-01 | MW-1004S | | 1096.75<br>1096.65<br>1096.59<br>1096.47 | 100 | | 1.1 | 57 | 0.0049 | 3.4 | 7.1 | 140 | 6.18 | 142.4 | |
| 1995-01 | MW-1005 | | 1137.52 | 84 | | < 0.47 | 370 | 29 | 650 | 14 | 670 | 6.16 | 1035 | |
| 1995-01 | MW-1005P | | 1137.14 | 270 | | 4.4 | 230 | 0.035 | 41 | < 0.56 | 340 | 7.05 | 511 | |
| 1995-01 | MW-1005S | | 1136.86 | 160 | | < 0.47 | 150 | 4.2 | 220 | 8.9 | 240 | 6.72 | 425 | |
| 1995-01 | MW-1010P | | 1079.52<br>1078.76<br>1078.26<br>1078.61 | 160 | | 6.7 | 160 | 0.004 | 60 | 3.3 | 250 | 7.63 | 337 | |
| 1995-02 | MW-1000PR | | 1069.14<br>1069.19<br>1069.09<br>1069.68 | | | | | | | | | | | |
| 1995-02 | MW-1000R | | | | | | | | | | | | | |
| 1995-02 | MW-1004 | | | | | | | | | | | | | |
| 1995-02 | MW-1004P | | 1085.73<br>1085.63<br>1085.56<br>1085.6 | | | | | | | | | | | |
| 1995-02 | MW-1004S | | 1096.39<br>1096.31<br>1096.24<br>1096.16 | | | | | | | | | | | |
| 1995-02 | MW-1010P | | 1078.21<br>1078.37<br>1078.32<br>1078.49 | | | | | | | | | | | |
| 1995-04 | MW-1000PR | | 1070 | 38 | | 58 | 35 | 0.026 | 320 | 14 | 90 | 7.4 | 106 | |
| 1995-04 | MW-1000R | | | | | | | | | | | | | |
| 1995-04 | MW-1002 | | 1091.7 | 42 | | 2 | 36 | 0.0039 | 0.27 | 7.3 | 170 | 7.4 | 106 | |
| 1995-04 | MW-1002G | | 1091.77 | 93 | | 1.4 | 100 | 0.0044 | < 0.086 | 15 | 170 | 6.9 | 255 | |
| 1995-04 | MW-1002G | Dup. | | 93 | | < 0.68 | 100 | 0.0061 | < 0.086 | 15 | 160 | | | |
| 1995-04 | MW-1004 | | | | | | | | | | | | | |
| 1995-04 | MW-1004P | | 1086.8 | 170 | | 11 | 130 | 0.025 | 31 | 4.7 | 250 | 7.4 | 292 | |
| 1995-04 | MW-1004S | | 1096.68 | 55 | | 7 | 45 | 0.0087 | 0.87 | 7.8 | 150 | 6.7 | 131 | |
| 1995-04 | MW-1005 | | 1138.27 | 79 | | 1.3 | 320 | 28 | 600 | 19 | 770 | 6.2 | 1014 | |
| 1995-04 | MW-1005P | | 1137.45 | 270 | | 3.7 | 200 | 0.078 | 41 | < 0.56 | 300 | 7.5 | 420 | |
| 1995-04 | MW-1005S | | 1137.2 | 170 | | < 0.68 | 130 | 4 | 200 | 9.3 | 190 | 7 | 315 | |
| 1995-04 | MW-1010P | | 1079.01 | 170 | | 9.7 | 130 | 0.005 | 51 | 5.1 | 240 | 7.4 | 311 | |
| 1995-05 | MW-1000PR | | | | | | | | | | | | | |
| 1995-05 | MW-1005 | | 1138.55 | | | | | | | | | | | |
| 1995-05 | MW-1005P | | 1137.9 | | | | | | | | | | | |
| 1995-05 | MW-1005S | | 1137.55 | | | | | | | | | | | |
| 1995-07 | MW-1000PR | | 1070.99 | 34 | | 43 | 36 | 0.0096 | 240 | 10 | 99 | 8.08 | 115.7 | |
| 1995-07 | MW-1000R | | | | | | | | | | | | | |
| 1995-07 | MW-1002 | | 1090.41 | 33 | | 0.97 | 35 | < 0.0017 | 0.42 | 5.3 | 76 | 7.16 | 99 | |
| 1995-07 | MW-1002G | | 1090.65 | 90 | | < 0.68 | 100 | 0.0019 | < 0.086 | 11 | 190 | 6.91 | 275 | |
| 1995-07 | MW-1002G | Dup. | | 97 | | < 0.68 | 100 | 0.005 | 0.28 | 11 | 190 | | | |
| 1995-07 | MW-1004 | | | | | | | | | | | | | |
| 1995-07 | MW-1004P | | 1086.38 | 170 | | 20 | 130 | 0.044 | 77 | 1.8 | 190 | 7.16 | 317 | |
| 1995-07 | MW-1004S | | 1096.28 | 50 | | 6.6 | 50 | 0.0031 | 0.5 | 6.2 | 110 | 6.87 | 126.3 | |
| 1995-07 | MW-1005 | | 1137.69 | 75 | | < 0.68 | 320 | 28 | 640 | 14 | 730 | 6.28 | 1049 | |
| 1995-07 | MW-1005P | | 1137.47 | 280 | | 1.8 | 200 | 0.071 | 90 | < 0.56 | 290 | 7.17 | 454 | |
| 1995-07 | MW-1005S | | 1137.06 | 170 | | < 0.68 | 140 | 3.8 | 200 | 6.9 | 220 | 6.91 | 358 | |
| 1995-07 | MW-1010P | | 1077.61 | 170 | | 21 | 130 | 0.0017 | 11 | 2.4 | 200 | 7.58 | 315 | |
| 1995-10 | MW-1000PR | | 1071.39 | 36 | | 61 | 39 | 0.027 | 110 | 11 | 75 | 7.32 | 118.8 | |
| 1995-10 | MW-1000PR | Dup. | | 34 | | 60 | 39 | 0.036 | 140 | 9.2 | 71 | | | |
| 1995-10 | MW-1000R | | | | | | | | | | | | | |
| 1995-10 | MW-1002 | | 1091.61 | 30 | | 1.6 | 38 | 0.004 | 1.4 | 7.9 | 86 | 6.6 | 120 | |
| 1995-10 | MW-1002G | | 1091.68 | 100 | | < 0.68 | 110 | < 0.0017 | < 0.086 | 14 | 160 | 6.91 | 239 | |
| 1995-10 | MW-1004 | | | | | | | | | | | | | |
| 1995-10 | MW-1004P | | 1079.81 | 170 | | 4.3 | 150 | 0.0086 | 28 | 8.1 | 170 | 7.01 | 308 | |
| 1995-10 | MW-1004S | | 1097.49 | 79 | | 7.6 | 59 | 0.004 | 1.3 | 9.4 | 110 | 6.28 | 144.9 | |
| 1995-10 | MW-1005 | | 1138.86 | 55 | | < 0.68 | 360 | 32 | 700 | 21 | 740 | 6.18 | 976 | |
| 1995-10 | MW-1005P | | 1137.79 | 260 | | 2.1 | 230 | 0.17 | 72 | 5.3 | 260 | 7.22 | 470 | |
| 1995-10 | MW-1005S | | 1137.6 | 170 | | < 0.68 | 160 | 4.3 | 220 | 14 | 220 | 7.11 | 354 | |
| 1995-10 | MW-1010P | | 1079.23 | 140 | | 63 | 140 | 0.037 | 21 | 9.6 | 200 | 7.4 | 291 | |
| 1996-01 | MW-1000PR | | 1069.64 | 27 | | 49 | 33 | 0.011 | 54 | 8.5 | 87 | 6.86 | 112.4 | |
| 1996-01 | MW-1000R | | | | | | | | | | | | | |
| 1996-01 | MW-1002 | | 1091.25 | 35 | | < 0.68 | 41 | 0.0031 | 0.12 | 5.4 | 65 | 6.98 | 153.7 | |
| 1996-01 | MW-1002G | | 1091.31 | 85 | | < 0.68 | 100 | < 0.0017 | < 0.086 | 11 | 150 | 6.79 | 232 | |
| 1996-01 | MW-1002G | Dup. | | 82 | | < 0.68 | 100 | 0.0049 | < 0.086 | 11 | 160 | | | |
| 1996-01 | MW-1004 | | | | | | | | | | | | | |
| 1996-01 | MW-1004P | | 1078.22 | | | | | | | | | 7.3 | 295 | |
| 1996-01 | MW-1004S | | 1095.89 | 50 | | 3.4 | 54 | 0.0038 | 1.1 | 5.8 | 120 | 6.61 | 144.9 | |
| 1996-01 | MW-1005 | | 1137.72 | 78 | | < 0.68 | 330 | 28 | 610 | 14 | 560 | 6.17 | 963 | |
| 1996-01 | MW-1005P | | 1137.39 | 240 | | < 0.68 | 210 | 0.28 | 97 | 0.93 | 270 | 7.31 | 464 | |
| 1996-01 | MW-1005S | | 1137.09 | 160 | | < 0.68 | 140 | 3.7 | 200 | 7 | 190 | 7.27 | 360 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1996-01 | MW-1010P | | 1077.28 | 140 | | 45 | 130 | 0.0023 | 13 | 3.4 | 180 | 7.01 | 313 | |
| 1996-04 | MW-1000PR | | 1066.96 | 53 | | 31 | 40 | 0.018 | 64 | 16 | 130 | 7.07 | 149.4 | |
| 1996-04 | MW-1000R | | | | | | | | | | | | | |
| 1996-04 | MW-1002 | | 1091.57 | 32 | | 1.7 | 36 | 0.017 | 0.98 | 5.9 | 120 | 6.75 | 142.2 | |
| 1996-04 | MW-1002 | Dup. | | 32 | | 2.2 | 35 | 0.015 | 0.71 | 5.9 | 85 | | | |
| 1996-04 | MW-1002G | | 1091.63 | 110 | | < 0.68 | 100 | 0.0039 | 0.14 | 11 | 220 | 6.55 | 264 | |
| 1996-04 | MW-1004 | | | | | | | | | | | | | |
| 1996-04 | MW-1004P | | 1077.65 | 150 | | 7.3 | 130 | 0.011 | 22 | 4.2 | 210 | 6.93 | 258 | |
| 1996-04 | MW-1004S | | 1096.23 | 61 | | 2.6 | 52 | 0.0048 | 0.32 | 6.3 | 130 | 5.84 | 168.2 | |
| 1996-04 | MW-1005 | | 1139.05 | 73 | | < 0.68 | 300 | 23 | 550 | 14 | 530 | 5.97 | 967 | |
| 1996-04 | MW-1005P | | 1139.37 | 250 | | < 0.68 | 210 | 0.049 | 35 | 2.2 | 300 | 6.85 | 486 | |
| 1996-04 | MW-1005S | | 1139.04 | 160 | | < 0.68 | 140 | 3.9 | 200 | 7.7 | 240 | 6.8 | 329 | |
| 1996-04 | MW-1010P | | 1076.11 | 160 | | 16 | 140 | 0.0036 | 100 | 3.8 | 210 | 7.16 | 309 | |
| 1996-07 | MW-1000PR | | 1070.33 | 35 | | 33 | 38 | 0.0066 | 120 | 9.3 | 150 | 7.26 | 113.5 | |
| 1996-07 | MW-1000R | | | | | | | | | | | | | |
| 1996-07 | MW-1002 | | 1092.26 | 34 | | 1.6 | 97 | 0.021 | 0.5 | 5.9 | 94 | 6.78 | 119.6 | |
| 1996-07 | MW-1002G | | 1092.33 | 79 | | < 0.54 | 93 | 0.0038 | < 0.18 | 11 | 200 | 6.71 | 221 | |
| 1996-07 | MW-1004 | | | | | | | | | | | | | |
| 1996-07 | MW-1004P | | 1076.74 | 150 | | 3.3 | 130 | 0.0047 | 17 | 4.3 | 200 | 7.21 | 287 | |
| 1996-07 | MW-1004S | | 1096.12 | 55 | | 3.9 | 46 | 0.0023 | 0.72 | 6.9 | 130 | 6.31 | 153.5 | |
| 1996-07 | MW-1004S | Dup. | | 54 | | 3.7 | 46 | 0.0033 | 0.54 | 7 | 140 | | | |
| 1996-07 | MW-1005 | | 1139.74 | 68 | | < 0.54 | 300 | 19 | 470 | 14 | 650 | 6.07 | 858 | |
| 1996-07 | MW-1005P | | 1139.57 | 240 | | 3.9 | 210 | 0.064 | 140 | 2.6 | 300 | 6.9 | 441 | |
| 1996-07 | MW-1005S | | 1139.05 | 150 | | < 0.54 | 140 | 3.6 | 190 | 8.8 | 230 | 6.8 | 323 | |
| 1996-07 | MW-1010P | | 1077.43 | 140 | | 74 | 130 | < 0.001 | 18 | 5.9 | 200 | 7.42 | 285 | |
| 1996-10 | MW-1000PR | | 1069.84 | 38 | | 57 | 36 | 0.010 | 140 | 7.1 | 76 | 7.37 | 108.5 | |
| 1996-10 | MW-1000R | | | | | | | | | | | | | |
| 1996-10 | MW-1002 | | 1090.73 | 41 | | 3.5 | 42 | 0.0063 | 0.2 | 6.9 | 85 | 6.92 | 155.1 | |
| 1996-10 | MW-1002G | | 1090.78 | 86 | | < 0.54 | 93 | 0.0039 | < 0.18 | 11 | 120 | 6.79 | 226 | |
| 1996-10 | MW-1004 | | | | | | | | | | | | | |
| 1996-10 | MW-1004P | | 1076.74 | 160 | | 5.9 | 120 | 0.0042 | 14 | 4.2 | 160 | 7.23 | 340 | |
| 1996-10 | MW-1004S | | 1095.43 | 66 | | 1.8 | 59 | 0.0049 | 0.29 | 6.5 | 100 | 6.25 | 159.5 | |
| 1996-10 | MW-1004S | Dup. | | 61 | | 2.1 | 60 | 0.0069 | 0.5 | 7.1 | 100 | | | |
| 1996-10 | MW-1005 | | 1137.6 | 64 | | 5 | 320 | 17 | 430 | 14 | 550 | 6.16 | 948 | |
| 1996-10 | MW-1005P | | 1137.46 | 260 | | 8.2 | 200 | 0.37 | 67 | 3.6 | 280 | 7.19 | 471 | |
| 1996-10 | MW-1005S | | 1137.07 | 160 | | 0.63 | 130 | 3.6 | 200 | 8.2 | 220 | 7.09 | 329 | |
| 1996-10 | MW-1010P | | 1076.75 | 150 | | 39 | 130 | 0.0026 | 21 | 5.8 | 170 | 7.6 | 302 | |
| 1997-01 | MW-1000PR | | 1070.35 | 27 | | 33 | 33 | 0.0093 | 150 | 9.9 | 160 | 7.22 | 112.4 | |
| 1997-01 | MW-1000R | | | | | | | | | | | | | |
| 1997-01 | MW-1002 | | 1092.32 | 42 | | 0.99 | 46 | 0.011 | < 0.18 | 6.3 | 110 | 7.47 | 123.8 | |
| 1997-01 | MW-1002G | | 1092.43 | 80 | | 1.9 | 96 | 0.0024 | < 0.18 | 9.6 | 190 | 7.15 | 245 | |
| 1997-01 | MW-1004 | | | | | | | | | | | | | |
| 1997-01 | MW-1004P | | 1077.5 | 160 | | 6.2 | 120 | 0.015 | 34 | 5.5 | 220 | 7.42 | 238 | |
| 1997-01 | MW-1004S | | 1095.33 | 61 | | 5.1 | 62 | 0.0061 | 0.25 | 6.6 | 150 | 7.03 | 163.7 | |
| 1997-01 | MW-1005 | | 1138.1 | 79 | | 15 | 300 | 23 | 540 | 13 | 600 | 5.91 | 921 | |
| 1997-01 | MW-1005P | | 1137.41 | 260 | | 2.7 | 210 | 0.073 | 24 | 5.5 | 280 | 7.04 | 462 | |
| 1997-01 | MW-1005S | | 1137.05 | 160 | | 4 | 140 | 3.8 | 200 | 7.4 | 250 | 6.8 | 321 | |
| 1997-01 | MW-1005S | Dup. | | 160 | | 1.6 | 140 | 3.8 | 200 | 6.9 | 210 | | | |
| 1997-01 | MW-1010P | | 1078.4 | 140 | | 56 | 130 | 0.0018 | 28 | 5.8 | 180 | 7.23 | 282 | |
| 1997-04 | MW-1000PR | | 1072.62 | 36 | | 32 | 43 | 0.043 | 190 | 9.9 | 170 | 7.46 | 132.9 | |
| 1997-04 | MW-1000R | | 1085.95 | | | | | | | | | | | |
| 1997-04 | MW-1002 | | 1094.09 | 41 | | 0.79 | 46 | 0.007 | 0.87 | 7 | 110 | 7.4 | 140 | |
| 1997-04 | MW-1002 | Dup. | | 42 | | 1.1 | 46 | 0.0058 | 0.37 | 7.3 | 130 | | | |
| 1997-04 | MW-1002G | | 1094.21 | 81 | | < 0.54 | 100 | 0.0029 | < 0.18 | 10 | 200 | 7 | 260 | |
| 1997-04 | MW-1004 | | | | | | | | | | | | | |
| 1997-04 | MW-1004P | | 1078.42 | 140 | | 16 | 130 | 0.008 | 17 | 6.9 | 210 | 7.25 | 311 | |
| 1997-04 | MW-1004S | | 1096.67 | 60 | | 1.8 | 59 | 0.0049 | 0.72 | 8.2 | 110 | 6.51 | 165.8 | |
| 1997-04 | MW-1005 | | 1139.51 | 66 | | 4.5 | 280 | 21 | 510 | 12 | 620 | 6.34 | 812 | |
| 1997-04 | MW-1005P | | 1138.85 | 250 | | 1.6 | 220 | 0.41 | 77 | 5.8 | 320 | 7 | 480 | |
| 1997-04 | MW-1005S | | 1138.4 | 160 | | 1.6 | 150 | 4.1 | 210 | 9.5 | 250 | 6.8 | 344 | |
| 1997-04 | MW-1010P | | 1081.61 | 150 | | 15 | 150 | 0.008 | 120 | 6.7 | 170 | 7.43 | 346 | |
| 1997-07 | MW-1000PR | | 1073.7 | 33 | | 29 | 39 | 0.0079 | 61 | 7.8 | 110 | 6.72 | 107.1 | |
| 1997-07 | MW-1000R | | | | | | | | | | | | | |
| 1997-07 | MW-1002 | | 1091.83 | 30 | | 1.3 | 45 | 0.0087 | 0.8 | 6.6 | 88 | 6.38 | 118.4 | |
| 1997-07 | MW-1002G | | 1094.93 | 78 | | < 0.54 | 100 | 0.0051 | < 0.18 | 9.3 | 200 | 6.51 | 271 | |
| 1997-07 | MW-1004 | | | | | | | | | | | | | |
| 1997-07 | MW-1004P | | 1083.61 | 140 | | 14 | 140 | 0.0035 | 12 | 6.5 | 200 | 6.94 | 277 | |
| 1997-07 | MW-1004P | Dup. | | 140 | | 13 | 140 | 0.0042 | 12 | 6.4 | 130 | | | |
| 1997-07 | MW-1004S | | 1096.13 | 55 | | 2 | 64 | 0.0091 | 0.38 | 8 | 130 | 6.36 | 202 | |
| 1997-07 | MW-1005 | | 1137.92 | 63 | | 5.9 | 300 | 29 | 800 | 12 | 220 | 6.22 | 755 | |
| 1997-07 | MW-1005P | | 1137.66 | 240 | | 2 | 230 | 0.087 | 66 | 6.7 | 280 | 7.03 | 448 | |
| 1997-07 | MW-1005S | | 1137.65 | 150 | | 0.71 | 150 | 4 | 210 | 9.8 | 260 | 6.83 | 689 | |
| 1997-07 | MW-1010P | | 1083.07 | 130 | | 48 | 140 | 0.001 | 26 | 7.1 | 170 | 7.25 | 295 | |
| 1997-10 | MW-1000PR | | 1087.37 | 40 | | 34 | 45 | 0.0044 | 110 | 5.9 | 82 | 6.55 | 132 | |
| 1997-10 | MW-1000R | | 1090.84 | | | | | | | | | | | |
| 1997-10 | MW-1002 | | 1090.89 | 40 | | 0.86 | 46 | 0.003 | 0.52 | 6 | 76 | 6.02 | 114 | |
| 1997-10 | MW-1002G | | 1090.97 | 88 | | < 0.54 | 98 | < 0.001 | < 0.18 | 7.9 | 160 | 6.35 | 228 | |
| 1997-10 | MW-1004 | | | | | | | | | | | | | |
| 1997-10 | MW-1004P | | 1096.14 | 150 | | 40 | 140 | 0.0047 | 10 | 5.3 | 120 | 6.91 | 349 | |
| 1997-10 | MW-1004S | | 1097.72 | 58 | | 1.6 | 75 | 0.0057 | 0.93 | 15 | 110 | 6.13 | 201 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997-10 | MW-1005 | | 1138.61 | 77 | | < 0.54 | 280 | 23 | 590 | 11 | 510 | 6 | 804 | |
| 1997-10 | MW-1005P | | 1137.77 | 240 | | < 0.54 | 230 | 0.17 | 62 | < 5 | 260 | 6.9 | 505 | |
| 1997-10 | MW-1005S | | 1137.49 | 150 | | < 0.54 | 150 | 4.2 | 210 | 6.2 | 190 | 6.77 | 351 | |
| 1997-10 | MW-1010P | | 1087.13 | 140 | | 30 | 140 | < 0.001 | 29 | 5.1 | 170 | 7.03 | 303 | |
| 1997-10 | MW-1010P | Dup. | | 130 | | 31 | 140 | 0.0039 | 28 | 6.2 | 140 | | | |
| 1998-01 | MW-1000PR | | 1087.51 | 54 | | 40 | 110 | 0.0061 | 490 | 180 | 96 | 6.47 | 576 | |
| 1998-01 | MW-1000PR | Dup. | | 61 | | 42 | 120 | 0.0071 | 520 | 260 | 200 | | | |
| 1998-01 | MW-1000R | | 1086.97 | | | | | | | | | | | |
| 1998-01 | MW-1002 | | 1090 | 40 | | 1.4 | 47 | 0.034 | 0.26 | 7.6 | 82 | 7.15 | 109.8 | |
| 1998-01 | MW-1002G | | 1090.06 | 82 | | < 0.54 | 100 | 0.0034 | < 0.18 | 12 | 150 | 6.85 | 218 | |
| 1998-01 | MW-1004 | | | | | | | | | | | | | |
| 1998-01 | MW-1004P | | 1097.86 | 150 | | 27 | 140 | 0.012 | 12 | 8.8 | 140 | 7.13 | 271 | |
| 1998-01 | MW-1004S | | 1099.89 | 48 | | 1.6 | 58 | 0.0027 | 0.3 | 11 | 120 | 6.6 | 140.1 | |
| 1998-01 | MW-1005 | | 1136.65 | 71 | | < 0.54 | 260 | 21 | 490 | 14 | 490 | 6.1 | 782 | |
| 1998-01 | MW-1005P | | 1136 | 250 | | 0.73 | 220 | 0.41 | 72 | 11 | 270 | 7.06 | 456 | |
| 1998-01 | MW-1005S | | 1136.35 | 170 | | < 0.54 | 130 | 3.3 | 170 | 11 | 200 | 7.09 | 313 | |
| 1998-01 | MW-1010P | | 1087.61 | 140 | | 26 | 130 | < 0.001 | 29 | 9.2 | 190 | 7.4 | 284 | |
| 1998-04 | MW-1000PR | | 1089.61 | 93 | | 98 | 470 | 0.044 | 3000 | 310 | 770 | 6.69 | 888 | |
| 1998-04 | MW-1000PR | Dup. | | 94 | | 95 | 470 | 0.0054 | 3000 | 320 | 790 | | | |
| 1998-04 | MW-1000R | | 1090.61 | | | | | | | | | | | |
| 1998-04 | MW-1002 | | 1095.91 | 30 | | 0.86 | 37 | 0.05 | 1.7 | < 5 | 89 | 7.32 | 131.7 | |
| 1998-04 | MW-1002G | | 1095.83 | 75 | | < 0.54 | 98 | 0.0047 | 0.21 | 11 | 180 | 6.97 | 245 | |
| 1998-04 | MW-1004 | | | | | | | | | | | | | |
| 1998-04 | MW-1004P | | 1099.54 | 96 | | 20 | 130 | 0.0064 | 9.9 | 8.5 | 170 | 7.41 | 303 | |
| 1998-04 | MW-1004S | | 1103.49 | 47 | | 0.92 | 60 | 0.0049 | 0.52 | 10 | 140 | 7.97 | 164.6 | |
| 1998-04 | MW-1005 | | 1139.07 | 69 | | < 0.54 | 250 | 21 | 510 | 13 | 440 | 6.06 | 725 | |
| 1998-04 | MW-1005P | | 1137.92 | 240 | | 1.1 | 210 | 0.077 | 29 | 9.6 | 290 | 7.36 | 461 | |
| 1998-04 | MW-1005S | | 1137.81 | 150 | | < 0.54 | 140 | 4.2 | 210 | 11 | 250 | 7.19 | 332 | |
| 1998-04 | MW-1010P | | 1089.49 | 130 | | 19 | 130 | 0.0034 | 43 | 5.6 | 170 | 7.64 | 294 | |
| 1998-07 | MW-1000PR | | 1086.3 | 71 | | 66 | 480 | 0.076 | 1800 | 350 | 250 | 6.28 | 1097 | |
| 1998-07 | MW-1000PR | Dup. | | 99 | | 160 | 640 | 0.58 | 3600 | 440 | 330 | | | |
| 1998-07 | MW-1000R | | | | | | | | | | | | | |
| 1998-07 | MW-1002 | | 1090.67 | 44 | | 0.9 | 50 | 0.0077 | 0.92 | 8.2 | 100 | 6.55 | 124.8 | |
| 1998-07 | MW-1002G | | 1090.72 | 82 | | 0.69 | 93 | 0.0038 | < 0.18 | 13 | 180 | 6.81 | 215 | |
| 1998-07 | MW-1004 | | | | | | | | | | | | | |
| 1998-07 | MW-1004P | | 1103.72 | 160 | | 10 | 130 | 0.0077 | 32 | 9.2 | 220 | 7.08 | 292 | |
| 1998-07 | MW-1004S | | 1104.88 | 40 | | 1.4 | 60 | 0.0054 | 0.29 | 13 | 140 | 6.5 | 162.3 | |
| 1998-07 | MW-1005 | | 1138.11 | 130 | | < 0.54 | 240 | 17 | 400 | 16 | 440 | 6.16 | 644 | |
| 1998-07 | MW-1005P | | 1137.63 | 260 | | < 0.54 | 220 | 0.34 | 100 | 12 | 270 | 7.01 | 458 | |
| 1998-07 | MW-1005S | | 1137.32 | 160 | | 11 | 150 | 3.9 | 210 | 15 | 230 | 6.7 | 305 | |
| 1998-07 | MW-1010P | | 1086.64 | 150 | | 27 | 130 | 0.0034 | 29 | 11 | 170 | 7.24 | 284 | |
| 1998-10 | MW-1000PR | | 1086.24 | 100 | | 53 | 570 | 0.013 | 2000 | 480 | 960 | 6.24 | 1338 | |
| 1998-10 | MW-1000PR | Dup. | | 100 | | 40 | 650 | 0.017 | 3300 | 460 | 1100 | | | |
| 1998-10 | MW-1000R | | | | | | | | | | | | | |
| 1998-10 | MW-1002 | | 1090.03 | 52 | | 0.56 | 57 | 0.0096 | 0.4 | 6.9 | 120 | 7.13 | 158 | |
| 1998-10 | MW-1002G | | 1090.04 | 76 | | < 0.54 | 97 | < 0.001 | < 0.18 | 13 | 120 | 7 | 194 | |
| 1998-10 | MW-1004 | | | | | | | | | | | | | |
| 1998-10 | MW-1004P | | 1102.48 | 140 | | 5 | 140 | 0.0094 | 12 | 8.6 | 150 | 7.06 | 327 | |
| 1998-10 | MW-1004S | | 1104.56 | 48 | | 1.1 | 60 | 0.0029 | 0.45 | 14 | 98 | 6.29 | 324 | |
| 1998-10 | MW-1005 | | 1136.87 | 65 | | < 0.54 | 250 | 19 | 460 | 17 | 430 | 6.12 | 724 | |
| 1998-10 | MW-1005P | | 1136.19 | 230 | | 1.9 | 220 | 0.17 | 63 | 9.4 | 250 | 6.96 | 477 | |
| 1998-10 | MW-1005S | | 1136.02 | 150 | | < 0.54 | 150 | 3.9 | 210 | 13 | 180 | 6.82 | 327 | |
| 1998-10 | MW-1010P | | 1086.42 | 130 | | 20 | 130 | < 0.001 | 22 | 8.6 | 190 | 7.53 | 309 | |
| 1999-02 | MW-1000PR | | 1086.21 | 120 | | 37 | 760 | 1.2 | 4800 | 570 | 1200 | 6.15 | 1293 | |
| 1999-02 | MW-1000R | | 1086.44 | | | | | | | | | | | |
| 1999-02 | MW-1002 | | 1089.33 | 54 | | < 0.54 | 60 | 0.012 | 0.71 | 8.3 | 92 | 7.29 | 142.9 | |
| 1999-02 | MW-1002G | | 1089.39 | 85 | | < 0.54 | 97 | 0.0035 | 0.24 | 11 | 160 | 6.54 | 215 | |
| 1999-02 | MW-1004 | | | | | | | | | | | | | |
| 1999-02 | MW-1004P | | 1101.9 | 160 | | 2.6 | 140 | 0.007 | 12 | 7.6 | 150 | 7.47 | 267 | |
| 1999-02 | MW-1004P | Dup. | | 160 | | 2.8 | 140 | 0.0069 | 12 | 7.6 | 170 | | | |
| 1999-02 | MW-1004S | | 1103.7 | 44 | | 0.6 | 59 | 0.005 | 0.63 | 11 | 120 | 6.59 | 141.8 | |
| 1999-02 | MW-1005 | | 1135.69 | 74 | | < 0.54 | 230 | 21 | 470 | 13 | 370 | 6.21 | 598 | |
| 1999-02 | MW-1005P | | 1135.35 | 250 | | < 0.54 | 220 | 0.066 | 27 | 7.8 | 250 | 7.6 | 449 | |
| 1999-02 | MW-1005S | | 1135.21 | 170 | | < 0.54 | 150 | 4 | 200 | 8.9 | 180 | 6.87 | 319 | |
| 1999-02 | MW-1010P | | 1086.37 | 140 | | 24 | 130 | 0.0046 | 20 | 8.3 | 170 | 7.01 | 288 | |
| 1999-02 | MW-1013 | | | | | | | | | | | | | |
| 1999-02 | MW-1013A | | | | | | | | | | | | | |
| 1999-02 | MW-1013B | | 1093.95 | 630 | | 36 | 2300 | 0.045 | 25000 | 1400 | 3100 | 6.2 | 3540 | |
| 1999-02 | MW-1013C | | 1095.27 | 480 | | 100 | 2100 | 0.92 | 7200 | 1300 | 3000 | 6.3 | 3170 | |
| 1999-02 | MW-1014 | | | | | | | | | | | | | |
| 1999-02 | MW-1014A | | | | | | | | | | | | | |
| 1999-02 | MW-1014B | | 1105.62 | 510 | | 810 | 2100 | 0.062 | 23000 | 1200 | 2900 | 6.2 | 3280 | |
| 1999-02 | MW-1014C | | 1103.39 | 370 | | < 4.7 | 980 | 14 | 4300 | 520 | 1200 | 6.3 | 1900 | |
| 1999-04 | MW-1000PR | | 1086.61 | 120 | | 54 | 740 | 1.2 | 5300 | 440 | 1300 | 6.2 | 1319 | |
| 1999-04 | MW-1000PR | Dup. | | 120 | | 55 | 770 | 1.3 | 5300 | 340 | 1200 | | | |
| 1999-04 | MW-1000R | | 1087.39 | | | | | | | | | | | |
| 1999-04 | MW-1002 | | 1091.06 | 52 | | 0.51 | 59 | 0.0018 | < 0.41 | 7.3 | 72 | 6.6 | 160 | |
| 1999-04 | MW-1002G | | 1091.1 | 85 | | < 0.47 | 95 | < 0.001 | < 0.41 | 9.8 | 100 | 6.5 | 248 | |
| 1999-04 | MW-1004 | | | | | | | | | | | | | |
| 1999-04 | MW-1004P | | 1103.29 | 160 | | 3.2 | 130 | 0.0066 | 9 | 6.6 | 140 | 6.7 | 294 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999-04 | MW-1004S | | 1105.49 | 46 | | 1.7 | 60 | 0.0037 | 0.87 | 10 | 82 | 6.1 | 157 | |
| 1999-04 | MW-1005 | | 1137.97 | 69 | | < 0.47 | 200 | 20 | 480 | 11 | 430 | 6.3 | 596 | |
| 1999-04 | MW-1005P | | 1136.65 | 250 | | 1.1 | 210 | 0.049 | 23 | 7.8 | 230 | 7 | 464 | |
| 1999-04 | MW-1005S | | 1136.65 | 160 | | < 0.47 | 140 | 4.1 | 210 | 8.6 | 210 | 7 | 297 | |
| 1999-04 | MW-1010P | | 1086.95 | 160 | | 12 | 140 | 0.019 | 67 | 7.6 | 140 | 7.1 | 284 | |
| 1999-04 | MW-1013 | | 1105.11 | | | | | | | | | | | |
| 1999-04 | MW-1013A | | 1094.73 | | | | | | | | | | | |
| 1999-04 | MW-1013B | | 1094.58 | 550 | | 16 | 2300 | 0.33 | 30000 | 770 | 3700 | 6.2 | 3130 | |
| 1999-04 | MW-1013C | | 1095.73 | 430 | | 75 | 2200 | 0.84 | 7700 | 920 | 3300 | 6.4 | 3030 | |
| 1999-04 | MW-1014 | | | | | | | | | | | | | |
| 1999-04 | MW-1014A | | 1103.93 | | | | | | | | | | | |
| 1999-04 | MW-1014B | | 1106.23 | 470 | | 420 | 2100 | 0.033 | 23000 | 770 | 3300 | 6.2 | 2890 | |
| 1999-04 | MW-1014C | | 1102.83 | 330 | | < 4.7 | 1000 | 15 | 4500 | 440 | 1200 | 6.3 | 1623 | |
| 1999-06 | MW-1000R | | 1087.69 | | | | | | | | | | | |
| 1999-06 | MW-1013 | | 1105.34 | | | | | | | | | | | |
| 1999-06 | MW-1013A | | 1094.82 | | | | | | | | | | | |
| 1999-06 | MW-1014 | | | | | | | | | | | | | |
| 1999-06 | MW-1014A | | 1105.19 | | | | | | | | | | | |
| 1999-07 | MW-1000PR | | 1087.96 | 130 | < 42 | 130 | 770 | 3.3 | 5400 | 380 | 1300 | 6.09 | 1310 | |
| 1999-07 | MW-1000PR | Dup. | | 130 | < 42 | 97 | 770 | 3.2 | 5600 | 350 | 1300 | | | |
| 1999-07 | MW-1000R | | 1088.18 | | | | | | | | | | | |
| 1999-07 | MW-1002 | | 1092.31 | 50 | < 4.2 | < 4.7 | 58 | 0.0027 | < 0.41 | 5.9 | 110 | 6.73 | 148.6 | |
| 1999-07 | MW-1002G | | 1092.3 | 84 | 5 | < 4.7 | 100 | 0.0022 | < 0.41 | 11 | 180 | 7 | 227 | |
| 1999-07 | MW-1004 | | 1107.06 | | | | | | | | | | | |
| 1999-07 | MW-1004P | | 1104.96 | 160 | < 4.2 | < 6.9 | 140 | 0.014 | 10 | 2.7 | 180 | 7.07 | 308 | |
| 1999-07 | MW-1004S | | 1107.29 | 40 | < 4.2 | < 6.9 | 59 | 0.0068 | 2.3 | 10 | 110 | 5.94 | 157.9 | |
| 1999-07 | MW-1005 | | 1139.21 | 65 | 5 | < 4.7 | 200 | 19 | 460 | 12 | 530 | 6.15 | 603 | |
| 1999-07 | MW-1005P | | 1138.09 | 240 | < 4.2 | < 4.7 | 220 | 0.054 | 51 | 7.3 | 250 | 6.91 | 501 | |
| 1999-07 | MW-1005S | | 1138.05 | 160 | < 4.2 | < 4.7 | 150 | 4.3 | 220 | 9.5 | 240 | 6.72 | 331 | |
| 1999-07 | MW-1010P | | 1088.46 | 150 | 16 | 12 | 140 | 0.0074 | 59 | 5.5 | 200 | 7.19 | 269 | |
| 1999-07 | MW-1013 | | 1106.07 | | | | | | | | | | | |
| 1999-07 | MW-1013A | | 1095.38 | | | | | | | | | | | |
| 1999-07 | MW-1013B | | 1095.2 | 620 | < 42 | 33 | 2200 | 0.76 | 29000 | 1600 | 3800 | 6.39 | 3020 | |
| 1999-07 | MW-1013C | | 1096.67 | 430 | 83 | 50 | 2100 | 1.3 | 7300 | 870 | 2700 | 6.42 | 3020 | |
| 1999-07 | MW-1014 | | | | | | | | | | | | | |
| 1999-07 | MW-1014A | | 1106.42 | | | | | | | | | | | |
| 1999-07 | MW-1014B | | 1107.13 | 540 | 70 | 520 | 2100 | 0.072 | 23000 | 580 | 3100 | 6.34 | 3540 | |
| 1999-07 | MW-1014C | | 1103.9 | 370 | < 42 | 16 | 930 | 14 | 4000 | 370 | 1200 | 6.39 | 1657 | |
| 1999-10 | MW-1000PR | | 1086.75 | 130 | < 8.4 | 17 | 760 | 3.6 | 5200 | 680 | 1100 | 6.7 | 1400 | |
| 1999-10 | MW-1000R | | 1086.8 | | | | | | | | | | | |
| 1999-10 | MW-1002 | | 1090.59 | 46 | | < 0.47 | 51 | 0.029 | < 0.41 | 6.9 | 91 | 7 | 140 | |
| 1999-10 | MW-1002G | | 1090.62 | 87 | | < 0.47 | 100 | 0.0061 | < 0.41 | 13 | 150 | 7.2 | 240 | |
| 1999-10 | MW-1004 | | 1106.62 | | | | | | | | | | | |
| 1999-10 | MW-1004P | | 1104.88 | 160 | < 4.2 | 1.9 | 140 | 0.014 | 8.1 | 2.8 | 180 | 7.4 | 320 | |
| 1999-10 | MW-1004S | | 1106.68 | 41 | < 4.2 | 0.83 | 57 | 0.0089 | 0.63 | 15 | 84 | 6.5 | 160 | |
| 1999-10 | MW-1005 | | 1137.86 | 65 | | < 0.47 | 190 | 18 | 410 | 17 | 400 | 6.5 | 570 | |
| 1999-10 | MW-1005P | | 1137.64 | 240 | | < 0.47 | 220 | 0.97 | 88 | < 1.5 | 260 | 7.3 | 460 | |
| 1999-10 | MW-1005S | | 1137.32 | 160 | | < 0.47 | 150 | 4.1 | 210 | 5.6 | 210 | 7 | 320 | |
| 1999-10 | MW-1010P | | 1086.81 | 150 | 6.8 | 3.5 | 140 | 0.0096 | 65 | 5.3 | 170 | 7.6 | 300 | |
| 1999-10 | MW-1010P | Dup. | | 140 | 13 | 0.84 | 140 | 0.011 | 130 | 5.2 | 170 | | | |
| 1999-10 | MW-1013 | | 1105.8 | | | | | | | | | | | |
| 1999-10 | MW-1013A | | 1095.51 | | | | | | | | | | | |
| 1999-10 | MW-1013B | | 1095.49 | 550 | < 42 | < 9.4 | 2200 | 0.17 | 28000 | 1900 | 3700 | 6.6 | 3200 | |
| 1999-10 | MW-1013C | | 1096.97 | 410 | < 42 | < 9.4 | 2200 | 1.4 | 7600 | 2000 | 3000 | 6.8 | 3300 | |
| 1999-10 | MW-1014 | | 1111.6 | | | | | | | | | | | |
| 1999-10 | MW-1014A | | 1107.87 | | | | | | | | | | | |
| 1999-10 | MW-1014B | | 1108.33 | 570 | < 42 | 530 | 2200 | < 0.010 | 23000 | 1700 | 3100 | 6.4 | 3200 | |
| 1999-10 | MW-1014C | | 1104.81 | 380 | < 42 | < 9.4 | 960 | 14 | 4000 | 700 | 1200 | 6.6 | 1600 | |
| 2000-01 | MW-1000PR | | 1086.61 | 140 | | 1.9 | 670 | 4.4 | 4100 | 610 | 1000 | 6.3 | 1300 | |
| 2000-01 | MW-1000R | | 1086.58 | | | | | | | | | | | |
| 2000-01 | MW-1002 | | 1089.42 | 57 | | < 0.47 | 65 | < 0.001 | < 0.41 | 5.6 | 110 | 6.9 | 170 | |
| 2000-01 | MW-1002G | | 1089.43 | 87 | | < 0.47 | 98 | 0.0031 | < 0.41 | 12 | 120 | 7.1 | 240 | |
| 2000-01 | MW-1004 | | | | | | | | | | | | | |
| 2000-01 | MW-1004P | | 1103.16 | 160 | | < 0.47 | 130 | 0.085 | 56 | < 5 | 150 | 6.7 | 310 | |
| 2000-01 | MW-1004S | | 1104.64 | 43 | | < 0.47 | 59 | 0.0051 | 0.65 | 16 | 110 | 6.7 | 160 | |
| 2000-01 | MW-1005 | | 1137.18 | 85 | | < 0.47 | 200 | 16 | 530 | 16 | 300 | 6.8 | 600 | |
| 2000-01 | MW-1005P | | 1136.65 | 250 | | < 0.47 | 210 | 0.14 | 47 | < 5 | 280 | 6.7 | 480 | |
| 2000-01 | MW-1005S | | 1136.76 | 170 | | < 0.47 | 150 | 3.9 | 210 | < 5 | 210 | 6.7 | 380 | |
| 2000-01 | MW-1010P | | 1086.65 | 150 | | 2.2 | 130 | 0.017 | 39 | < 5 | 130 | 6.8 | 280 | |
| 2000-01 | MW-1013 | | 1104.64 | | | | | | | | | | | |
| 2000-01 | MW-1013A | | 1095.62 | | | | | | | | | | | |
| 2000-01 | MW-1013B | | 1095.59 | 570 | 17 | < 4.7 | 2100 | 0.41 | 30000 | 1700 | 3300 | 6.4 | 3000 | |
| 2000-01 | MW-1013C | | 1097.1 | 510 | < 15 | < 4.7 | 2100 | 1.5 | 7300 | 1700 | 2900 | 6.5 | 2700 | |
| 2000-01 | MW-1014 | | 1112.07 | | | | | | | | | | | |
| 2000-01 | MW-1014A | | 1109.22 | | | | | | | | | | | |
| 2000-01 | MW-1014B | | 1108.88 | 490 | < 15 | 500 | 1900 | 0.055 | 20000 | 1400 | 3200 | 6.5 | 3000 | |
| 2000-01 | MW-1014C | | 1105.18 | 330 | < 15 | < 0.47 | 810 | 12 | 3200 | 540 | 1200 | 6.6 | 1500 | |
| 2000-01 | MW-1014C | Dup. | | 310 | < 15 | < 0.47 | 820 | 11 | 3100 | 560 | 1300 | | | |
| 2000-04 | MW-1000PR | | 1087.26 | 140 | | 19 | 720 | 3.4 | 3800 | 560 | 920 | 6.93 | 1274 | |
| 2000-04 | MW-1000PR | Dup. | | 150 | | 18 | 700 | 4.3 | 4000 | 550 | 1000 | | | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000-04 | MW-1000R | | 1087.73 | | | | | | | | | | | |
| 2000-04 | MW-1002 | | 1090.33 | 55 | | 0.91 | 67 | 0.0039 | < 0.41 | 5.2 | 98 | 6.82 | 166 | |
| 2000-04 | MW-1002G | | 1090.34 | 89 | | < 0.6 | 100 | 0.0027 | < 0.41 | 11 | 140 | 6.84 | 239 | |
| 2000-04 | MW-1004 | | | | | | | | | | | | | |
| 2000-04 | MW-1004P | | 1103.32 | 160 | | 1.7 | 140 | 0.012 | 7.9 | < 5 | 170 | 6.86 | 293 | |
| 2000-04 | MW-1004S | | 1104.96 | 42 | | 1.3 | 56 | 0.0027 | < 0.41 | 15 | 98 | 6.9 | 156.3 | |
| 2000-04 | MW-1005 | | 1138.07 | 66 | | 0.67 | 190 | 18 | 410 | 13 | 400 | 6.76 | 598 | |
| 2000-04 | MW-1005P | | 1137.05 | 250 | | < 0.6 | 220 | 0.37 | 80 | < 5 | 220 | 7.27 | 483 | 64 |
| 2000-04 | MW-1005S | | 1136.99 | 170 | | < 0.6 | 150 | 4.2 | 220 | < 5 | 230 | 7.04 | 354 | |
| 2000-04 | MW-1010P | | 1087.46 | 140 | | 9.9 | 150 | 0.0066 | 24 | < 5 | 140 | 7.1 | 283 | 77 |
| 2000-04 | MW-1013 | | 1103.87 | | | | | | | | | | | 97 |
| 2000-04 | MW-1013A | | 1095.36 | | | | | | | | | | | 97 |
| 2000-04 | MW-1013B | | 1095.54 | 520 | 12 | 19 | 2200 | 0.27 | 32000 | 1200 | 3600 | 6.63 | 3120 | 230 |
| 2000-04 | MW-1013C | | 1097.39 | 460 | 14 | 11 | 2200 | 1.6 | 7800 | 1700 | 2900 | 6.73 | 3370 | 177 |
| 2000-04 | MW-1014 | | 1112.41 | | | | | | | | | | | 160 |
| 2000-04 | MW-1014A | | 1109.24 | 390 | 15 | < 6 | 1300 | 0.55 | 7200 | 970 | 1800 | 6.87 | 2220 | 165 |
| 2000-04 | MW-1014B | | 1108.85 | 480 | < 7.5 | 520 | 2100 | < 0.15 | 22000 | 1500 | 3200 | 6.43 | 2940 | 290 |
| 2000-04 | MW-1014C | | 1105.25 | 320 | 14 | < 6 | 870 | 13 | 3600 | 440 | 1000 | 6.65 | 1470 | 88 |
| 2000-07 | MW-1000PR | | 1087.3 | 140 | < 8.7 | 7.3 | 710 | 2.3 | 5000 | 550 | 930 | 6.3 | 1200 | |
| 2000-07 | MW-1000R | | 1087.74 | | | | | | | | | | | |
| 2000-07 | MW-1002 | | 1092.01 | 52 | < 1.7 | < 0.53 | 66 | < 0.005 | < 2 | 5.7 | 110 | 6.7 | 160 | |
| 2000-07 | MW-1002G | | 1092 | 90 | < 1.7 | < 0.53 | 110 | < 0.005 | < 2 | 12 | 160 | 6.6 | 220 | |
| 2000-07 | MW-1004 | | | | | | | | | | | | | |
| 2000-07 | MW-1004P | | 1104.68 | 160 | < 1.7 | 0.65 | 150 | 0.0086 | 22 | < 5 | 160 | 6.3 | 300 | |
| 2000-07 | MW-1004S | | 1106.7 | 41 | < 1.7 | 1.2 | 61 | < 0.005 | < 2 | 16 | 100 | 6.6 | 150 | |
| 2000-07 | MW-1005 | | 1138.43 | 64 | < 1.7 | 0.7 | 210 | 21 | 600 | 15 | 470 | 6.6 | 520 | |
| 2000-07 | MW-1005P | | 1138.08 | 250 | < 1.7 | < 0.53 | 230 | 0.058 | 75 | < 5 | 290 | 6.5 | 460 | |
| 2000-07 | MW-1005S | | 1137.92 | 170 | 2.9 | < 0.53 | 170 | 4.6 | 240 | < 5 | 200 | 6.5 | 330 | |
| 2000-07 | MW-1010P | | 1087.16 | 140 | 12 | 14 | 140 | < 0.025 | 26 | < 5 | 190 | 6.5 | 290 | |
| 2000-07 | MW-1010P | Dup. | | 150 | 11 | 9.9 | 140 | 0.013 | 40 | < 5 | 170 | | | |
| 2000-07 | MW-1013 | | 1104.58 | | | | | | | | | | | |
| 2000-07 | MW-1013A | | 1095.79 | | | | | | | | | | | |
| 2000-07 | MW-1013B | | 1096.09 | 660 | < 21 | 14 | 2300 | < 0.36 | 34000 | 1600 | 3300 | 6.3 | 3000 | |
| 2000-07 | MW-1013C | | 1097.84 | 520 | < 21 | < 12 | 2300 | 2.2 | 8400 | 1600 | 3300 | 6.3 | 3100 | |
| 2000-07 | MW-1014 | | 1113 | | | | | | | | | | | |
| 2000-07 | MW-1014A | | 1110.5 | 430 | < 21 | < 12 | 1400 | 1.2 | 7100 | 960 | 2200 | 6.6 | 2000 | |
| 2000-07 | MW-1014B | | 1109.47 | 510 | < 21 | 330 | 2200 | < 0.36 | 21000 | 1600 | 3000 | 6.3 | 3000 | |
| 2000-07 | MW-1014C | | 1105.82 | 350 | 39 | < 12 | 890 | 13 | 3500 | 480 | 1400 | 6.4 | 1400 | |
| 2000-10 | MW-1000PR | | 1086.79 | 170 | | < 2.7 | 680 | 6.6 | 4200 | 460 | 1100 | 6.19 | 1189 | |
| 2000-10 | MW-1000R | | 1087.01 | | | | | | | | | | | |
| 2000-10 | MW-1002 | | 1090.59 | 47 | | < 0.53 | 58 | < 0.005 | < 2 | 5.7 | 120 | 6.35 | 125 | |
| 2000-10 | MW-1002G | | 1090.62 | 89 | | < 0.53 | 110 | < 0.005 | < 2 | 12 | 150 | 6.6 | 223 | |
| 2000-10 | MW-1004 | | 1105.86 | | | | | | | | | | | |
| 2000-10 | MW-1004P | | 1104.4 | 160 | | 0.8 | 140 | 0.008 | 16 | < 5 | 200 | 7.16 | 284 | |
| 2000-10 | MW-1004P | Dup. | | 160 | | < 0.53 | 140 | 0.17 | 79 | < 5 | 200 | | | |
| 2000-10 | MW-1004S | | 1105.86 | 35 | | 1 | 58 | < 0.005 | < 2 | 18 | 130 | 5.99 | 134.1 | |
| 2000-10 | MW-1005 | | 1137.55 | 58 | | 0.58 | 190 | 17 | 390 | 15 | 430 | 6.17 | 530 | |
| 2000-10 | MW-1005P | | 1137.56 | 240 | | 0.74 | 220 | 0.13 | 38 | < 5 | 260 | 7.26 | 448 | |
| 2000-10 | MW-1005S | | 1137.2 | 170 | | < 0.53 | 160 | 4.3 | 220 | < 5 | 210 | 7.34 | 330 | |
| 2000-10 | MW-1010P | | 1086.67 | 150 | | 4.3 | 140 | 0.41 | 250 | < 5 | 220 | 7.49 | 268 | |
| 2000-10 | MW-1013 | | 1105.06 | | | | | | | | | | | |
| 2000-10 | MW-1013A | | 1096.2 | | | | | | | | | | | |
| 2000-10 | MW-1013B | | 1096.45 | 630 | | < 12 | 2200 | 0.84 | 35000 | 1500 | 3200 | 6.28 | 3180 | |
| 2000-10 | MW-1013C | | 1097.86 | 550 | | < 12 | 2200 | 1.6 | 8200 | 1600 | 3200 | 6.37 | 3310 | |
| 2000-10 | MW-1014 | | 1113.98 | | | | | | | | | | | |
| 2000-10 | MW-1014A | | 1111.39 | 430 | | < 12 | 1400 | 0.96 | 6700 | 880 | 2300 | 6.68 | 2250 | |
| 2000-10 | MW-1014B | | 1110.09 | 520 | | 430 | 2200 | < 0.36 | 21000 | 1500 | 2900 | 6.26 | 3240 | |
| 2000-10 | MW-1014C | | 1106.21 | 390 | | < 12 | 840 | 12 | 3200 | 450 | 1300 | 6.36 | 1490 | |
| 2001-01 | MW-1000PR | | 1088.39 | 180 | | < 2.7 | 610 | 6.8 | 3700 | 440 | 1000 | 6.13 | 1192 | 143 |
| 2001-01 | MW-1000R | | 1088.35 | | | | | | | | | | | |
| 2001-01 | MW-1002 | | 1089.93 | 58 | | < 0.53 | 66 | < 0.005 | < 2 | 6.7 | 120 | 6.55 | 156.3 | |
| 2001-01 | MW-1002G | | 1089.93 | 90 | | < 0.53 | 99 | < 0.005 | < 2 | 12 | 150 | 6.48 | 253 | |
| 2001-01 | MW-1004 | | 1104.61 | | | | | | | | | | | |
| 2001-01 | MW-1004P | | 1103.36 | 160 | | < 0.53 | 130 | 0.085 | 52 | < 5 | 130 | 7.25 | 293 | 46 |
| 2001-01 | MW-1004S | | 1104.72 | 39 | | < 0.53 | 56 | < 0.005 | < 2 | 19 | 110 | 5.9 | 139.3 | 180 |
| 2001-01 | MW-1005 | | 1136.92 | 58 | | < 0.53 | 160 | 16 | 370 | 15 | 300 | 6.18 | 520 | |
| 2001-01 | MW-1005P | | 1136.65 | 250 | | < 0.53 | 210 | 0.058 | 24 | < 5 | 260 | 7.17 | 454 | 37 |
| 2001-01 | MW-1005S | | 1136.42 | 170 | | < 0.53 | 150 | 4.1 | 210 | < 5 | 200 | 6.95 | 335 | |
| 2001-01 | MW-1010P | | 1088.16 | 160 | | < 0.53 | 140 | 0.17 | 180 | < 5 | 170 | 7.57 | 270 | 88 |
| 2001-01 | MW-1013 | | 1103.78 | | | | | | | | | | | |
| 2001-01 | MW-1013A | | 1095.72 | | | | | | | | | | | |
| 2001-01 | MW-1013B | | 1095.86 | 590 | | < 12 | 1900 | 0.41 | 30000 | 1600 | 3300 | 6.14 | 3230 | 174 |
| 2001-01 | MW-1013C | | 1098.03 | 520 | | < 12 | 2100 | 2.6 | 7800 | 1600 | 3200 | 6.27 | 3310 | 80 |
| 2001-01 | MW-1013C | Dup. | | 470 | | < 12 | 2000 | 2.5 | 7700 | 1600 | 3000 | | | |
| 2001-01 | MW-1014 | | 1113.86 | | | | | | | | | | | |
| 2001-01 | MW-1014A | | 1111.59 | 410 | | < 12 | 1200 | 0.83 | 5400 | 970 | 1900 | 6.46 | 2310 | 113 |
| 2001-01 | MW-1014B | | 1109.89 | 550 | | 450 | 1900 | < 0.36 | 18000 | 1400 | 2600 | 6.29 | 3140 | 226 |
| 2001-01 | MW-1014C | | 1106.15 | 340 | | < 12 | 760 | 11 | 2900 | 450 | 1100 | 6.46 | 1452 | 64 |
| 2001-04 | MW-1000PR | | 1091.12 | 170 | | 14 | 650 | 1.3 | 2900 | 480 | 910 | 5.9 | 1200 | 175 |
| 2001-04 | MW-1000R | | 1092.76 | | | | | | | | | | | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001-04 | MW-1002 | | 1095.48 | 60 | | < 2.7 | 72 | 0.012 | < 2 | 6.4 | 99 | 6.5 | 130 | |
| 2001-04 | MW-1002G | | 1095.38 | 89 | | < 2.7 | 110 | < 0.005 | < 2 | 11 | 170 | 6.3 | 200 | |
| 2001-04 | MW-1002G | Dup. | | 89 | | < 2.7 | 110 | < 0.005 | < 2 | 11 | 200 | | | |
| 2001-04 | MW-1004 | | 1110.8 | | | | | | | | | | | |
| 2001-04 | MW-1004P | | 1107.46 | 160 | | < 2.7 | 140 | 0.055 | 54 | < 5 | 160 | 7 | 260 | 144 |
| 2001-04 | MW-1004S | | 1110.92 | 35 | | < 2.7 | 60 | < 0.005 | < 2 | 19 | 73 | 5.5 | 130 | 230 |
| 2001-04 | MW-1005 | | 1140.04 | 61 | | < 2.7 | 170 | 15 | 350 | 14 | 370 | 5.6 | 460 | |
| 2001-04 | MW-1005P | | 1138.8 | 240 | | < 2.7 | 220 | 0.055 | 27 | < 5 | 290 | 6.7 | 430 | 17 |
| 2001-04 | MW-1005S | | 1139.04 | 170 | | < 2.7 | 160 | 4.4 | 230 | < 5 | 210 | 6.7 | 310 | |
| 2001-04 | MW-1010P | | 1090.56 | 150 | | 5.5 | 140 | 0.066 | 64 | < 5 | 130 | 7.1 | 250 | -8 |
| 2001-04 | MW-1013 | | 1104.08 | | | | | | | | | | | |
| 2001-04 | MW-1013A | | 1097.1 | | | | | | | | | | | |
| 2001-04 | MW-1013B | | 1097.57 | 530 | | 35 | 2300 | 0.72 | 40000 | 1600 | 3300 | 6 | 3400 | 203 |
| 2001-04 | MW-1013C | | 1100.12 | 440 | | < 13 | 2300 | 2.1 | 9100 | 1600 | 3000 | 6.3 | 3000 | 84 |
| 2001-04 | MW-1014 | | 1114.62 | | | | | | | | | | | |
| 2001-04 | MW-1014A | | 1112.51 | 430 | | < 13 | 1400 | 0.69 | 6700 | 920 | 1700 | 6.3 | 2300 | 138 |
| 2001-04 | MW-1014B | | 1111.14 | 520 | | 530 | 2000 | < 0.15 | 19000 | 1400 | 3300 | 6.1 | 3200 | 207 |
| 2001-04 | MW-1014C | | 1107.65 | 330 | | < 13 | 830 | 12 | 3100 | 420 | 1100 | 6.2 | 1400 | 55 |
| 2001-04 | MW-1015A | | 1092.09 | 75 | < 2.3 | < 2.7 | 88 | 0.0082 | < 2 | 8.2 | 120 | 7.1 | 160 | |
| 2001-04 | MW-1015B | | 1091.09 | 180 | < 2.3 | < 2.7 | 140 | 0.069 | 140 | < 5 | 290 | 7.6 | 460 | |
| 2001-05 | MW-1015A | | 1089.83 | 77 | < 2.3 | < 2.7 | 83 | < 0.005 | 2.5 | 9.2 | 110 | 7 | 150 | |
| 2001-05 | MW-1015B | | 1089.79 | 180 | < 2.3 | < 2.7 | 140 | < 0.005 | 36 | 5.1 | 230 | 7.8 | 470 | |
| 2001-06 | MW-1015A | | 1089.53 | 75 | < 2.3 | < 2.7 | 85 | < 0.005 | 4.2 | 8.4 | 110 | 7 | 150 | |
| 2001-06 | MW-1015B | | 1089.69 | 180 | < 2.3 | < 2.7 | 140 | < 0.005 | 23 | < 5 | 220 | 7.6 | 450 | |
| 2001-07 | MW-1000PR | | 1087.88 | 180 | < 11 | < 13 | 660 | 7 | 3900 | 450 | 950 | 5.99 | 1130 | 147 |
| 2001-07 | MW-1000R | | 1088.16 | | | | | | | | | | | |
| 2001-07 | MW-1002 | | 1092.93 | 54 | < 2.3 | < 2.7 | 67 | < 0.005 | < 2 | 7.6 | 79 | 6.12 | 123 | |
| 2001-07 | MW-1002G | | 1092.9 | 89 | < 2.3 | 3.6 | 110 | < 0.005 | < 2 | 11 | 120 | 6.63 | 202 | |
| 2001-07 | MW-1004 | | 1109.31 | | | | | | | | | | | |
| 2001-07 | MW-1004P | | 1107.3 | 150 | < 2.3 | < 2.7 | 140 | 0.015 | 14 | < 5 | 160 | 6.9 | 260 | 99 |
| 2001-07 | MW-1004S | | 1109.32 | 34 | < 2.3 | < 2.7 | 60 | < 0.005 | < 2 | 22 | 96 | 5.6 | 122 | 196 |
| 2001-07 | MW-1005 | | 1140.32 | 53 | < 2.3 | < 2.7 | 180 | 15 | 420 | 14 | 330 | 5.87 | 493 | |
| 2001-07 | MW-1005P | | 1140.03 | 230 | < 2.3 | < 2.7 | 230 | 0.087 | 48 | < 5 | 250 | 7.13 | 428 | 8 |
| 2001-07 | MW-1005P | Dup. | | 240 | < 2.3 | < 2.7 | 230 | 0.77 | 80 | < 5 | 210 | | | |
| 2001-07 | MW-1005S | | 1139.84 | 170 | < 2.3 | < 2.7 | 170 | 4.4 | 230 | < 5 | 190 | 6.91 | 308 | |
| 2001-07 | MW-1010P | | 1087.82 | 140 | 6.1 | < 2.7 | 150 | 0.16 | 150 | 6 | 140 | 7.08 | 250 | 173 |
| 2001-07 | MW-1013 | | 1106.08 | | | | | | | | | | | |
| 2001-07 | MW-1013A | | 1097.19 | | | | | | | | | | | |
| 2001-07 | MW-1013B | | 1097.63 | 490 | < 15 | 32 | 2400 | 0.89 | 39000 | 1600 | 3400 | 6.09 | 3290 | 252 |
| 2001-07 | MW-1013C | | 1099.39 | 460 | < 15 | < 13 | 2300 | 3.2 | 9000 | 1600 | 3500 | 6.28 | 3400 | 30 |
| 2001-07 | MW-1014 | | 1115.67 | | | | | | | | | | | |
| 2001-07 | MW-1014A | | 1112.88 | 420 | < 15 | < 13 | 1500 | 0.7 | 6500 | 960 | 2000 | 6.24 | 2250 | 147 |
| 2001-07 | MW-1014B | | 1112.02 | 440 | < 15 | 480 | 2200 | < 0.15 | 20000 | 1500 | 3000 | 6.01 | 2990 | 235 |
| 2001-07 | MW-1014C | | 1108.11 | 330 | 21 | < 13 | 800 | 11 | 3000 | 420 | 1100 | 6.15 | 1360 | 40 |
| 2001-07 | MW-1015A | | 1088.74 | 75 | < 2.3 | < 2.7 | 90 | < 0.005 | 7.5 | 9.8 | 110 | 6.55 | 153 | |
| 2001-07 | MW-1015B | | 1088.67 | 180 | < 2.3 | < 2.7 | 150 | < 0.005 | 19 | < 5 | 240 | 7.32 | 451 | |
| 2001-08 | MW-1015A | | 1088.12 | 76 | < 2.3 | < 2.7 | 90 | < 0.005 | 9.7 | 7.6 | 100 | 6.68 | 158.7 | |
| 2001-08 | MW-1015B | | 1088.21 | 180 | < 2.3 | < 2.7 | 150 | < 0.005 | 13 | 5.3 | 240 | 7.53 | 462 | |
| 2001-09 | MW-1015A | | 1087.55 | 79 | < 2.3 | < 2.7 | 82 | 0.02 | 15 | 7.8 | 150 | 7.19 | 159.9 | |
| 2001-09 | MW-1015B | | 1087.59 | 180 | < 2.3 | < 2.7 | 130 | 0.0052 | 18 | < 5 | 290 | 7.67 | 458 | |
| 2001-10 | MW-1000PR | | 1087.26 | 190 | < 11 | < 13 | 560 | 2.8 | 3300 | 450 | 940 | 5.97 | 1109 | 163 |
| 2001-10 | MW-1000R | | 1087.39 | | | | | | | | | | | |
| 2001-10 | MW-1002 | | 1090.63 | 53 | | < 2.7 | 57 | < 0.005 | < 2 | 7.1 | 140 | 6.03 | 123.3 | |
| 2001-10 | MW-1002G | | 1090.63 | 89 | | < 2.7 | 94 | < 0.005 | < 2 | 11 | 140 | 6.1 | 203 | |
| 2001-10 | MW-1004 | | 1106.99 | | | | | | | | | | | |
| 2001-10 | MW-1004P | | 1105.49 | 160 | < 2.3 | < 2.7 | 130 | 0.1 | 65 | < 5 | 130 | 6.81 | 260 | 94 |
| 2001-10 | MW-1004S | | 1107.06 | 34 | < 2.3 | < 2.7 | 51 | < 0.005 | < 2 | 23 | 110 | 5.73 | 121.3 | 198 |
| 2001-10 | MW-1004S | Dup. | | 33 | < 2.3 | < 2.7 | 50 | < 0.005 | < 2 | 23 | 110 | | | |
| 2001-10 | MW-1005 | | 1138.85 | 49 | | < 2.7 | 170 | 12 | 340 | 15 | 450 | 5.72 | 530 | |
| 2001-10 | MW-1005P | | 1138.59 | 240 | | < 2.7 | 200 | 0.2 | 68 | < 5 | 270 | 6.63 | 424 | 5 |
| 2001-10 | MW-1005S | | 1138.31 | 170 | | < 2.7 | 140 | 3.9 | 210 | < 5 | 230 | 6.45 | 306 | |
| 2001-10 | MW-1010P | | 1087.1 | 150 | 13 | 5.3 | 120 | 0.0097 | 18 | 5.4 | 180 | 6.63 | 246 | |
| 2001-10 | MW-1013 | | 1106.69 | | | | | | | | | | | |
| 2001-10 | MW-1013A | | 1096.9 | | | | | | | | | | | |
| 2001-10 | MW-1013B | | 1097.19 | 560 | 18 | 69 | 2000 | 0.66 | 34000 | 1600 | 3200 | 6.06 | 3320 | 201 |
| 2001-10 | MW-1013C | | 1099.04 | 480 | 22 | < 13 | 2000 | 2.7 | 8500 | 1700 | 3200 | 6.22 | 3380 | 21 |
| 2001-10 | MW-1014 | | 1116.86 | | | | | | | | | | | |
| 2001-10 | MW-1014A | | 1114.03 | 430 | 37 | < 13 | 1300 | 1.5 | 6000 | 1000 | 1900 | 6.34 | 2280 | 152 |
| 2001-10 | MW-1014B | | 1112.38 | 510 | 20 | 490 | 1900 | < 0.15 | 18000 | 1600 | 2900 | 6.05 | 3150 | 219 |
| 2001-10 | MW-1014C | | 1108.1 | 350 | 15 | < 13 | 710 | 9.6 | 2900 | 410 | 990 | 6.17 | 1354 | 56 |
| 2001-10 | MW-1015A | | 1087.58 | 77 | 2.3 | < 2.7 | 78 | < 0.005 | 10 | 10 | 130 | 6.6 | 160 | |
| 2001-10 | MW-1015B | | 1087.67 | 180 | < 2.3 | < 2.7 | 130 | < 0.005 | 8.6 | < 5 | 310 | 7.1 | 450 | |
| 2001-11 | MW-1015A | | 1087.86 | 76 | < 2.3 | < 2.7 | 85 | < 0.005 | 11 | 9.7 | 110 | 6.6 | 160 | |
| 2001-11 | MW-1015B | | 1087.84 | 180 | < 2.3 | < 2.7 | 140 | < 0.005 | 8.9 | < 5 | 280 | 7.2 | 450 | |
| 2001-12 | MW-1015A | | 1088.72 | 78 | < 2.3 | < 2.7 | 87 | 0.023 | 13 | 7.8 | 150 | 6.52 | 163.5 | |
| 2001-12 | MW-1015B | | 1088.74 | 180 | < 2.3 | < 2.7 | 140 | 0.0069 | 11 | < 5 | 300 | 7.03 | 468 | |
| 2002-01 | MW-1000PR | | 1088.25 | 190 | | < 13 | 570 | 6.2 | 3500 | 440 | 970 | 6.09 | 1099 | 176 |
| 2002-01 | MW-1000R | | 1088.89 | | | | | | | | | | | |
| 2002-01 | MW-1002 | | 1091.3 | 59 | | < 2.7 | 64 | < 0.005 | < 2 | 6.4 | 110 | 6.44 | 129.3 | |
| 2002-01 | MW-1002G | | 1091.25 | 91 | | < 2.7 | 99 | < 0.005 | < 2 | 10 | 150 | 6.54 | 203 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002-01 | MW-1004 | | 1107.71 | | | | | | | | | | | |
| 2002-01 | MW-1004P | | 1106.2 | 160 | | < 2.7 | 130 | < 0.005 | 9.6 | < 5 | 190 | 6.75 | 276 | 83 |
| 2002-01 | MW-1004P | Dup. | | 160 | | < 2.7 | 130 | 0.0061 | 11 | < 5 | 200 | | | |
| 2002-01 | MW-1004S | | 1107.79 | 34 | | < 2.7 | 53 | < 0.005 | < 2 | 22 | 140 | 5.89 | 124.1 | 207 |
| 2002-01 | MW-1005 | | 1139.08 | 55 | | < 2.7 | 160 | 13 | 380 | 14 | 310 | 5.86 | 455 | |
| 2002-01 | MW-1005P | | 1138.67 | 250 | | < 2.7 | 200 | 0.077 | 30 | < 5 | 270 | 7.03 | 418 | 7 |
| 2002-01 | MW-1005S | | 1138.59 | 170 | | < 2.7 | 150 | 4.1 | 210 | < 5 | 260 | 6.86 | 304 | |
| 2002-01 | MW-1010P | | 1087.87 | 150 | | < 2.7 | 130 | 0.069 | 76 | < 5 | 230 | 6.95 | 246 | -25 |
| 2002-01 | MW-1013 | | 1105.28 | | | | | | | | | | | |
| 2002-01 | MW-1013A | | 1097.02 | | | | | | | | | | | |
| 2002-01 | MW-1013B | | 1097.33 | 600 | | 52 | 2100 | 0.71 | 36000 | 1600 | 3600 | 6.24 | 3380 | 201 |
| 2002-01 | MW-1013C | | 1099.65 | 510 | | < 13 | 2100 | 4.5 | 8800 | 1700 | 3400 | 6.32 | 3430 | 48 |
| 2002-01 | MW-1014 | | 1116.91 | | | | | | | | | | | |
| 2002-01 | MW-1014A | | 1114.51 | 460 | | < 13 | 1300 | 0.65 | 5900 | 1000 | 2100 | 6.55 | 2280 | 170 |
| 2002-01 | MW-1014B | | 1112.61 | 540 | | 540 | 1900 | < 0.15 | 18000 | 1500 | 3100 | 6.22 | 3110 | 222 |
| 2002-01 | MW-1014C | | 1108.48 | 350 | | < 13 | 690 | 9.2 | 2600 | 390 | 1100 | 6.55 | 1341 | 38 |
| 2002-01 | MW-1015A | | 1088.65 | 78 | < 2.3 | < 2.7 | 82 | < 0.005 | 12 | 7.8 | 150 | 6.85 | 164.2 | |
| 2002-01 | MW-1015B | | 1088.54 | 180 | < 2.3 | < 2.7 | 130 | < 0.005 | 25 | < 5 | 310 | 7.44 | 458 | |
| 2002-02 | MW-1015A | | 1088.38 | 78 | < 2.3 | < 2.7 | 87 | < 0.005 | 14 | 7.6 | 130 | 6.5 | 162 | |
| 2002-02 | MW-1015B | | 1087.9 | 180 | < 2.3 | < 2.7 | 140 | 0.03 | 33 | < 5 | 290 | 7 | 483 | |
| 2002-03 | MW-1015A | | 1087.91 | 78 | 2.3 | < 2.7 | 88 | 0.0074 | 15 | 8.8 | 120 | 6.4 | 170 | |
| 2002-03 | MW-1015B | | 1087.79 | 180 | < 2.3 | < 2.7 | 140 | 0.0066 | 22 | < 5 | 280 | 6.5 | 460 | |
| 2002-04 | MW-1000PR | | 1094.71 | 190 | | < 13 | 570 | 2.6 | 2800 | 430 | 970 | 6.2 | 1088 | 153 |
| 2002-04 | MW-1000R | | 1095.09 | | | | | | | | | | | |
| 2002-04 | MW-1002 | | 1093.61 | 61 | | < 2.7 | 65 | < 0.005 | < 2 | 6.8 | 130 | 6.5 | 122 | |
| 2002-04 | MW-1002 | Dup. | | 60 | | < 2.7 | 65 | < 0.005 | < 2 | 7 | 130 | | | |
| 2002-04 | MW-1002G | | 1093.66 | 91 | | < 2.7 | 100 | < 0.005 | < 2 | 9.4 | 150 | 6.4 | 201 | |
| 2002-04 | MW-1004 | | 1107.96 | | | | | | | | | | | |
| 2002-04 | MW-1004P | | 1105.73 | 160 | | < 2.7 | 140 | 0.0053 | 8.3 | < 5 | 170 | 7.1 | 263 | 188 |
| 2002-04 | MW-1004S | | 1108.04 | 37 | | < 2.7 | 58 | < 0.005 | < 2 | 22 | 120 | 5.9 | 129 | 223 |
| 2002-04 | MW-1005 | | 1140.78 | 54 | | < 2.7 | 160 | 12 | 280 | 14 | 400 | 6.2 | 472 | |
| 2002-04 | MW-1005P | | 1139.89 | 240 | | < 2.7 | 210 | 0.076 | 20 | < 5 | 270 | 7.2 | 434 | 2 |
| 2002-04 | MW-1005S | | 1139.89 | 170 | | < 2.7 | 150 | 4.2 | 210 | < 5 | 240 | 7.1 | 300 | |
| 2002-04 | MW-1010P | | 1094.26 | 150 | | < 2.7 | 140 | 0.18 | 180 | 5.5 | 200 | 7.1 | 249 | -19 |
| 2002-04 | MW-1013 | | 1105.35 | | | | | | | | | | | |
| 2002-04 | MW-1013A | | 1097.18 | | | | | | | | | | | |
| 2002-04 | MW-1013B | | 1097.63 | 520 | | 110 | 2200 | 0.36 | 34000 | 1600 | 3200 | 6.2 | 3370 | 205 |
| 2002-04 | MW-1013C | | 1101.39 | 480 | | 14 | 2100 | 3.9 | 8900 | 1700 | 3200 | 6.3 | 3420 | 51 |
| 2002-04 | MW-1014 | | 1117.24 | | | | | | | | | | | |
| 2002-04 | MW-1014A | | 1115.15 | 410 | | 16 | 1400 | 0.51 | 5900 | 1000 | 1900 | 6.8 | 2250 | 155 |
| 2002-04 | MW-1014B | | 1113 | 500 | | 470 | 1900 | < 0.15 | 17000 | 1500 | 3100 | 6.4 | 3140 | 218 |
| 2002-04 | MW-1014C | | 1109.25 | 340 | | 15 | 710 | 9.1 | 2600 | 390 | 1000 | 6.4 | 1310 | 36 |
| 2002-04 | MW-1015A | | 1093.59 | 80 | | < 2.7 | 86 | < 0.005 | 15 | 9 | 140 | 6.8 | 164 | |
| 2002-04 | MW-1015B | | 1092.33 | 180 | | < 2.7 | 140 | < 0.005 | 73 | < 5 | 320 | 7.4 | 467 | |
| 2002-07 | MW-1000PR | | 1087.66 | 200 | 10 | < 13 | 610 | 6.2 | 3600 | 380 | 1000 | 6.28 | 1093 | 157 |
| 2002-07 | MW-1000R | | 1088.28 | | | | | | | | | | | |
| 2002-07 | MW-1002 | | 1093.51 | 59 | < 2.6 | < 2.7 | 66 | < 0.005 | < 2 | 5.8 | 120 | 6.58 | 123.7 | |
| 2002-07 | MW-1002G | | 1093.78 | 92 | < 2.6 | < 2.7 | 110 | < 0.005 | < 2 | 8.1 | 160 | 6.57 | 208 | |
| 2002-07 | MW-1004 | | 1108.97 | | | | | | | | | | | |
| 2002-07 | MW-1004P | | 1107.04 | 160 | 2.9 | < 2.7 | 140 | 0.0056 | 9.7 | < 5 | 200 | 7.39 | 267 | 106 |
| 2002-07 | MW-1004S | | 1109.06 | 38 | < 2.7 | < 2.7 | 62 | < 0.005 | < 2 | 19 | 140 | 6.27 | 138.4 | 209 |
| 2002-07 | MW-1005 | | 1141.12 | 50 | 3.9 | < 2.7 | 180 | 12 | 310 | 12 | 390 | 6.03 | 528 | |
| 2002-07 | MW-1005P | | 1141.25 | 250 | 4.6 | < 2.7 | 220 | 0.12 | 71 | < 5 | 270 | 7.19 | 426 | 26 |
| 2002-07 | MW-1005S | | 1141.05 | 170 | 5.7 | < 2.7 | 160 | 4.4 | 220 | < 5 | 250 | 7.03 | 302 | |
| 2002-07 | MW-1010P | | 1087.55 | 160 | 18 | < 2.7 | 140 | 0.03 | 42 | 5.8 | 240 | 7.43 | 250 | 9 |
| 2002-07 | MW-1013 | | 1106.66 | | | | | | | | | | | |
| 2002-07 | MW-1013A | | 1097.44 | | | | | | | | | | | |
| 2002-07 | MW-1013B | | 1097.95 | 690 | 28 | 150 | 2300 | 0.7 | 39000 | 1400 | 3900 | 6.37 | 3340 | 202 |
| 2002-07 | MW-1013C | | 1099.76 | 520 | < 27 | < 13 | 2300 | 4.1 | 10000 | 1500 | 3500 | 6.43 | 3400 | 49 |
| 2002-07 | MW-1014 | | 1117.37 | | | | | | | | | | | |
| 2002-07 | MW-1014A | | 1114.8 | 460 | < 27 | < 13 | 1400 | 0.38 | 6100 | 910 | 2100 | 6.49 | 2280 | 177 |
| 2002-07 | MW-1014A | Dup. | | 480 | < 27 | < 13 | 1500 | 0.42 | 6400 | 910 | 2200 | | | |
| 2002-07 | MW-1014B | | 1113.19 | 550 | < 27 | 550 | 2100 | < 0.15 | 19000 | 1400 | 3000 | 6.25 | 3100 | 245 |
| 2002-07 | MW-1014C | | 1108.93 | 350 | 18 | < 13 | 740 | 9.4 | 2700 | 330 | 1200 | 6.6 | 1269 | 45 |
| 2002-07 | MW-1015A | | 1088.64 | 79 | < 2.7 | < 2.7 | 88 | < 0.005 | 16 | 7.7 | 150 | 6.91 | 162.8 | |
| 2002-07 | MW-1015B | | 1088.82 | 180 | 2.8 | < 2.7 | 140 | 0.069 | 53 | < 5 | 350 | 7.55 | 496 | |
| 2002-10 | MW-1000PR | | 1090.89 | 200 | | < 13 | 600 | 7.4 | 3400 | 370 | 870 | 6.14 | 1088 | 90 |
| 2002-10 | MW-1000R | | 1090.59 | | | | | | | | | | | |
| 2002-10 | MW-1002 | | 1095.93 | 68 | | < 2.7 | 72 | < 0.005 | < 2 | < 5 | 100 | 6.32 | 140.5 | |
| 2002-10 | MW-1002G | | 1095.89 | 96 | | < 2.7 | 110 | < 0.005 | < 2 | 8.2 | 180 | 6.43 | 211 | |
| 2002-10 | MW-1004 | | 1110.75 | | | | | | | | | | | |
| 2002-10 | MW-1004P | | 1108.3 | 160 | | < 2.7 | 140 | 0.033 | 22 | < 5 | 160 | 6.96 | 270 | 52 |
| 2002-10 | MW-1004S | | 1110.88 | 39 | | < 2.7 | 61 | < 0.005 | < 2 | 20 | 140 | 6.26 | 135.7 | 168 |
| 2002-10 | MW-1005 | | 1141.78 | 51 | | < 2.7 | 210 | 12 | 330 | 13 | 470 | 5.8 | 655 | |
| 2002-10 | MW-1005 | Dup. | | 50 | | < 2.7 | 210 | 12 | 320 | 12 | 510 | | | |
| 2002-10 | MW-1005P | | 1142.14 | 240 | | < 2.7 | 210 | 0.23 | 54 | < 5 | 300 | 7.18 | 428 | 5 |
| 2002-10 | MW-1005S | | 1141.94 | 170 | | < 2.7 | 150 | 4.1 | 210 | < 5 | 220 | 6.94 | 300 | |
| 2002-10 | MW-1010P | | 1089.49 | 150 | | < 2.7 | 140 | 0.035 | 120 | < 5 | 200 | 7.28 | 269 | -60 |
| 2002-10 | MW-1013 | | 1107.28 | | | | | | | | | | | |
| 2002-10 | MW-1013A | | 1097.85 | | | | | | | | | | | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002-10 | MW-1013B | | 1097.3 | 620 | | 210 | 2300 | < 0.15 | 36000 | 1600 | 3000 | 6.13 | 3390 | 221 |
| 2002-10 | MW-1013C | | 1101.33 | 570 | | < 13 | 2300 | 5.4 | 9900 | 1600 | 3400 | 6.36 | 3520 | -46 |
| 2002-10 | MW-1014 | | 1118.56 | | | | | | | | | | | |
| 2002-10 | MW-1014A | | 1115.5 | 470 | | < 13 | 1400 | 0.54 | 5700 | 930 | 1800 | 6.52 | 2370 | 86 |
| 2002-10 | MW-1014B | | 1114.21 | 490 | | 450 | 2000 | < 0.15 | 17000 | 1300 | 3300 | 6.26 | 3110 | 221 |
| 2002-10 | MW-1014C | | 1110.1 | 360 | | < 13 | 730 | 9.1 | 2600 | 330 | 810 | 6.49 | 1299 | 38 |
| 2002-10 | MW-1015A | | 1090.94 | 79 | | < 2.7 | 84 | < 0.005 | 13 | 9.1 | 150 | 6.65 | 162.4 | |
| 2002-10 | MW-1015B | | 1091.21 | 180 | | < 2.7 | 140 | 0.42 | 380 | < 5 | 300 | 6.87 | 466 | |
| 2003-01 | MW-1000PR | | 1087.45 | 200 | 11 | < 13 | 590 | 6.7 | 3200 | 390 | 990 | 6.2 | 1080 | 170 |
| 2003-01 | MW-1000R | | 1088.05 | | | | | | | | | | | |
| 2003-01 | MW-1002 | | 1091.65 | 65 | | < 2.7 | 66 | 0.012 | < 2 | 6.4 | 92 | 6.5 | 136 | |
| 2003-01 | MW-1002G | | 1091.63 | 92 | | < 2.7 | 100 | 0.0089 | < 2 | 9.9 | 160 | 6.6 | 215 | |
| 2003-01 | MW-1004 | | 1107.43 | | | | | | | | | | | |
| 2003-01 | MW-1004P | | 1105.93 | 160 | | < 2.7 | 130 | 0.053 | 42 | < 5 | 150 | 7.2 | 274 | 205 |
| 2003-01 | MW-1004S | | 1107.52 | 40 | | < 2.7 | 59 | < 0.005 | < 2 | 22 | 110 | 6.18 | 208 | 205 |
| 2003-01 | MW-1005 | | 1140.47 | 55 | | < 2.7 | 290 | 12 | 340 | 14 | 620 | 5.6 | 1079 | |
| 2003-01 | MW-1005P | | 1140.7 | 250 | | < 2.7 | 190 | 0.52 | 51 | < 5 | 290 | 7.2 | 298 | 22 |
| 2003-01 | MW-1005S | | 1140.35 | 170 | | < 2.7 | 150 | 3.7 | 200 | < 5 | 220 | 7 | 301 | |
| 2003-01 | MW-1010P | | 1086.94 | 150 | 19 | < 2.7 | 140 | 0.036 | 120 | 7 | 180 | 7.2 | 257 | -24 |
| 2003-01 | MW-1013 | | 1105.97 | | | | | | | | | | | |
| 2003-01 | MW-1013A | | 1097.39 | | | | | | | | | | | |
| 2003-01 | MW-1013B | | 1098.58 | 630 | < 27 | 92 | 2200 | 0.15 | 33000 | 1600 | 3400 | 6.1 | 3420 | 208 |
| 2003-01 | MW-1013C | | 1099.8 | 570 | < 27 | < 13 | 2300 | 5.4 | 9500 | 1800 | 3500 | 6.5 | 3510 | 46 |
| 2003-01 | MW-1014 | | 1119.07 | | | | | | | | | | | |
| 2003-01 | MW-1014A | | 1116.36 | 480 | < 27 | < 13 | 1400 | 0.54 | 5300 | 1000 | 2100 | 6.5 | 2370 | 198 |
| 2003-01 | MW-1014B | | 1114.14 | 610 | < 27 | 590 | 2000 | < 0.15 | 17000 | 1500 | 2800 | 6.2 | 3160 | 232 |
| 2003-01 | MW-1014C | | 1109.58 | 390 | < 27 | < 13 | 700 | 8.3 | 2400 | 380 | 1100 | 6.4 | 1311 | 74 |
| 2003-01 | MW-1014C | Dup. | | 370 | < 27 | < 13 | 690 | 8.3 | 2400 | 370 | 1000 | | | |
| 2003-01 | MW-1015A | | 1088.46 | 79 | | < 2.7 | 83 | < 0.005 | 12 | 8.5 | 130 | 6.8 | 167 | |
| 2003-01 | MW-1015B | | 1088.27 | 180 | | < 2.7 | 130 | 0.12 | 440 | < 5 | 270 | 7.4 | 463 | |
| 2003-03 | MW-1015A | | 1088.75 | | | | | < 0.010 | 16 | | | 7.09 | 164.4 | |
| 2003-03 | MW-1015B | | 1088.76 | | | | | 0.31 | 170 | | | 7.47 | 458 | |
| 2003-04 | MW-1000PR | | 1087.83 | 200 | | < 6.7 | 570 | 5.1 | 3200 | 380 | 920 | 6.23 | 1047 | 154 |
| 2003-04 | MW-1000R | | 1088.35 | | | | | | | | | | | |
| 2003-04 | MW-1002 | | 1091.51 | 68 | | < 1.3 | 71 | < 0.010 | < 2 | < 5 | 100 | 6.31 | 133.6 | |
| 2003-04 | MW-1002G | | 1091.43 | 90 | | < 1.3 | 110 | < 0.010 | < 2 | 9.5 | 170 | 6.51 | 212 | |
| 2003-04 | MW-1004 | | 1107.32 | | | | | | | | | | | |
| 2003-04 | MW-1004P | | 1105.58 | 170 | | < 1.3 | 140 | 0.032 | 25 | < 5 | 170 | 7.47 | 262 | 178 |
| 2003-04 | MW-1004S | | 1107.39 | 41 | | < 1.3 | 62 | < 0.010 | < 2 | 20 | 120 | 6.01 | 136.7 | 213 |
| 2003-04 | MW-1005 | | 1139.42 | 62 | | < 1.3 | 390 | 18 | 440 | 22 | 550 | 5.71 | 1080 | |
| 2003-04 | MW-1005P | | 1138.93 | 230 | | < 1.3 | 200 | 0.73 | 110 | < 5 | 220 | 7.06 | 381 | -4 |
| 2003-04 | MW-1005S | | 1138.82 | 170 | | < 1.3 | 160 | 4.2 | 220 | < 5 | 250 | 6.99 | 298 | |
| 2003-04 | MW-1010P | | 1087.55 | 150 | | 4.8 | 140 | < 0.010 | 14 | 5.3 | 170 | 7.58 | 253 | -32 |
| 2003-04 | MW-1013 | | 1106.02 | | | | | | | | | | | |
| 2003-04 | MW-1013A | | 1097.95 | | | | | | | | | | | |
| 2003-04 | MW-1013B | | 1097.87 | 660 | | 160 | 2200 | 1.2 | 39000 | 1500 | 3500 | 6.21 | 3340 | 203 |
| 2003-04 | MW-1013C | | 1099.98 | 540 | | < 13 | 2200 | 4.7 | 9600 | 1700 | 3500 | 6.39 | 3450 | 44 |
| 2003-04 | MW-1014 | | 1118.91 | | | | | | | | | | | |
| 2003-04 | MW-1014A | | 1116.82 | 500 | | < 13 | 1400 | < 0.29 | 4600 | 930 | 2000 | 6.38 | 2280 | 156 |
| 2003-04 | MW-1014B | | 1113.96 | 610 | | 690 | 2100 | < 0.29 | 19000 | 1500 | 3400 | 6.29 | 2970 | 228 |
| 2003-04 | MW-1014C | | 1109.35 | 380 | | < 13 | 690 | 8 | 2400 | 340 | 990 | 6.42 | 1287 | 7 |
| 2003-04 | MW-1015A | | 1088.49 | 78 | | < 1.3 | 88 | < 0.010 | 16 | 7.7 | 120 | 6.89 | 163.3 | |
| 2003-04 | MW-1015B | | 1088.45 | 180 | | < 1.3 | 150 | 0.3 | 180 | < 5 | 310 | 7.83 | 456 | |
| 2003-04 | MW-1015B | Dup. | | 190 | | < 1.3 | 140 | 0.21 | 250 | < 5 | 320 | | | |
| 2003-07 | MW-1000PR | | 1087.76 | 200 | 12 | < 6.7 | 580 | 6.6 | 3200 | 360 | 810 | 6.26 | 1027 | 150 |
| 2003-07 | MW-1000R | | 1088.41 | | | | | | | | | | | |
| 2003-07 | MW-1002 | | 1093 | 63 | < 1.2 | < 1.3 | 65 | 0.0079 | < 1 | 2.9 | 100 | 6.48 | 121.8 | |
| 2003-07 | MW-1002G | | 1092.92 | 90 | < 1.2 | < 1.3 | 110 | 0.0066 | < 1 | 8 | 150 | 6.49 | 209 | |
| 2003-07 | MW-1004 | | 1109.01 | | | | | | | | | | | |
| 2003-07 | MW-1004P | | 1107.3 | 160 | < 1.2 | < 1.3 | 150 | 0.066 | 43 | < 2.5 | 160 | 7.25 | 263 | 96 |
| 2003-07 | MW-1004S | | 1109.16 | 42 | < 1.2 | < 1.3 | 69 | < 0.005 | < 1 | 20 | 110 | 6.36 | 141.9 | 186 |
| 2003-07 | MW-1005 | | 1140.38 | 53 | < 1.2 | 1.4 | 350 | 16 | 450 | 11 | 580 | 5.53 | 1014 | |
| 2003-07 | MW-1005P | | 1140.27 | 240 | < 1.2 | < 1.3 | 230 | 1.1 | 74 | < 2.5 | 260 | 7.11 | 439 | -3 |
| 2003-07 | MW-1005S | | 1140.12 | 170 | 2.1 | < 1.3 | 160 | 4.2 | 230 | < 2.5 | 200 | 6.95 | 305 | |
| 2003-07 | MW-1010P | | 1087.54 | 150 | 11 | < 1.3 | 150 | 0.031 | 120 | 5.9 | 170 | 7.34 | 255 | -20 |
| 2003-07 | MW-1013 | | 1109.38 | | | | | | | | | | | |
| 2003-07 | MW-1013A | | 1098.2 | | | | | | | | | | | |
| 2003-07 | MW-1013B | | 1098.71 | 620 | < 2.6 | 120 | 2300 | 0.61 | 38000 | 1600 | 3100 | 6.25 | 3290 | 200 |
| 2003-07 | MW-1013B | Dup. | | 580 | 4.3 | 110 | 2300 | 0.36 | 37000 | 1500 | 3100 | | | |
| 2003-07 | MW-1013C | | 1100.31 | 500 | 17 | < 13 | 2300 | 4.2 | 9600 | 1700 | 3200 | 6.32 | 3430 | 27 |
| 2003-07 | MW-1014 | | 1119.06 | | | | | | | | | | | |
| 2003-07 | MW-1014A | | 1116.45 | 420 | < 2.6 | < 13 | 1400 | 0.32 | 4200 | 910 | 1900 | 6.62 | 2230 | 206 |
| 2003-07 | MW-1014B | | 1114.33 | 530 | < 2.6 | 500 | 1900 | < 0.29 | 16000 | 1400 | 3800 | 6.28 | 2900 | 240 |
| 2003-07 | MW-1014C | | 1109.74 | 340 | 13 | < 13 | 700 | 8.2 | 2500 | 330 | 920 | 6.43 | 1239 | 40 |
| 2003-07 | MW-1015A | | 1088.38 | 79 | < 1.2 | < 1.3 | 90 | < 0.005 | 12 | 6.6 | 130 | 6.89 | 166.3 | |
| 2003-07 | MW-1015B | | 1088.49 | 180 | < 1.2 | < 1.3 | 140 | 0.45 | 170 | < 2.5 | 270 | 7.58 | 463 | |
| 2003-10 | MW-1000PR | | 1086.98 | 210 | | < 6.7 | 560 | 6.5 | 3100 | 350 | 810 | 6.2 | 1040 | 166 |
| 2003-10 | MW-1000R | | 1087.08 | | | | | | | | | | | |
| 2003-10 | MW-1002 | | 1090.23 | 65 | | < 1.3 | 66 | < 0.005 | 4.9 | 4.6 | 110 | 6.3 | 135 | |
| 2003-10 | MW-1002G | | 1090.23 | 88 | | < 1.3 | 100 | < 0.005 | 1.5 | 8 | 160 | 6.5 | 209 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003-10 | MW-1004 | | 1106.23 | | | | | | | | | | | |
| 2003-10 | MW-1004P | | 1104.84 | 160 | | < 1.3 | 130 | 0.13 | 69 | < 2.5 | 170 | 7.3 | 272 | 48 |
| 2003-10 | MW-1004S | | 1106.29 | 42 | | < 1.3 | 62 | < 0.005 | 5.4 | 17 | 120 | 6.3 | 143 | 167 |
| 2003-10 | MW-1005 | | 1138.41 | 55 | | < 1.3 | 420 | 18 | 440 | 11 | 850 | 5.6 | 1260 | |
| 2003-10 | MW-1005P | | 1138.32 | 240 | | < 1.3 | 210 | 1 | 74 | < 2.5 | 260 | 7.3 | 436 | -18 |
| 2003-10 | MW-1005S | | 1138.15 | 170 | | < 1.3 | 150 | 4 | 210 | < 2.5 | 210 | 7.2 | 317 | |
| 2003-10 | MW-1010P | | 1086.76 | 140 | | < 1.3 | 140 | 0.064 | 130 | 6.4 | 180 | 7.3 | 343 | -47 |
| 2003-10 | MW-1013 | | 1109.3 | | | | | | | | | | | |
| 2003-10 | MW-1013A | | 1097 | | | | | | | | | | | |
| 2003-10 | MW-1013B | | 1097.29 | 590 | | 110 | 2300 | < 0.29 | 35000 | 1500 | 3200 | 6.3 | 3350 | 199 |
| 2003-10 | MW-1013B | Dup. | | 550 | | 140 | 2200 | 0.83 | 37000 | 1500 | 3200 | | | |
| 2003-10 | MW-1013C | | 1099.27 | 540 | | < 13 | 2200 | 6.2 | 9800 | 1700 | 3200 | 6.4 | 3520 | 16 |
| 2003-10 | MW-1014 | | 1119.25 | | | | | | | | | | | |
| 2003-10 | MW-1014A | | 1116.5 | 440 | | < 13 | 1400 | 1 | 3000 | 980 | 2000 | 6.6 | 2310 | 218 |
| 2003-10 | MW-1014B | | 1113.77 | 540 | | 640 | 2100 | < 0.29 | 19000 | 1500 | 3000 | 6.4 | 2930 | 251 |
| 2003-10 | MW-1014C | | 1109.01 | 340 | | < 1.3 | 680 | 7.8 | 2400 | 320 | 910 | 6.6 | 1256 | 55 |
| 2003-10 | MW-1015A | | 1087.24 | 78 | | < 1.3 | 83 | < 0.005 | 11 | 7.1 | 140 | 7.1 | 167 | |
| 2003-10 | MW-1015B | | 1087.21 | 170 | | < 1.3 | 130 | 0.67 | 290 | < 2.5 | 320 | 7.8 | 480 | |
| 2004-01 | MW-1000PR | | 1087.59 | 210 | | < 6.7 | 530 | 4.3 | 2900 | 360 | 790 | 6.25 | 1065 | 98 |
| 2004-01 | MW-1000R | | 1087.45 | | | | | | | | | | | |
| 2004-01 | MW-1002 | | 1089.83 | 64 | | < 1.3 | 69 | 0.006 | 3.1 | 6.1 | 130 | 6.55 | 141.5 | |
| 2004-01 | MW-1002G | | 1089.8 | 89 | | < 1.3 | 100 | < 0.005 | 2.6 | 8.6 | 160 | 6.62 | 215 | |
| 2004-01 | MW-1004 | | 1105.52 | | | | | | | | | | | |
| 2004-01 | MW-1004P | | 1104.23 | 160 | | < 1.3 | 140 | 0.11 | 78 | < 2.5 | 220 | 7.22 | 290 | 52 |
| 2004-01 | MW-1004S | | 1105.62 | 42 | | < 1.3 | 62 | < 0.005 | < 1 | 19 | 170 | 6.21 | 133.7 | 208 |
| 2004-01 | MW-1005 | | 1137.52 | 56 | | < 1.3 | 260 | 15 | 360 | 14 | 430 | 5.73 | 829 | |
| 2004-01 | MW-1005 | Dup. | | 58 | | < 1.3 | 270 | 19 | 540 | 14 | 510 | | | |
| 2004-01 | MW-1005P | | 1137.38 | 240 | | < 1.3 | 220 | 0.38 | 43 | < 2.5 | 260 | 7.28 | 438 | -2 |
| 2004-01 | MW-1005S | | 1137.23 | 170 | | < 1.3 | 150 | 4.2 | 220 | < 2.5 | 240 | 6.9 | 329 | |
| 2004-01 | MW-1010P | | 1083.41 | | | | | | | | | | | |
| 2004-01 | MW-1013 | | 1108.22 | | | | | | | | | | | |
| 2004-01 | MW-1013A | | 1096.91 | | | | | | | | | | | |
| 2004-01 | MW-1013B | | 1097.13 | 580 | | 170 | 2200 | 1.6 | 40000 | 1600 | 3200 | 6.15 | 3370 | 212 |
| 2004-01 | MW-1013C | | 1099.18 | 490 | | 40 | 2200 | 2.8 | 9100 | 1700 | 3300 | 6.32 | 3510 | 51 |
| 2004-01 | MW-1014 | | 1118.37 | | | | | | | | | | | |
| 2004-01 | MW-1014A | | 1116.08 | 490 | | < 13 | 1300 | 1 | 3100 | 1000 | 2000 | 6.63 | 2310 | 185 |
| 2004-01 | MW-1014B | | 1113.07 | 570 | | 590 | 2000 | < 0.29 | 17000 | 1600 | 3100 | 6.26 | 3130 | 198 |
| 2004-01 | MW-1014C | | 1108.52 | 310 | | < 1.3 | 650 | 7.4 | 2300 | 320 | 930 | 6.42 | 1259 | 34 |
| 2004-01 | MW-1015A | | 1087.39 | 79 | | < 1.3 | 85 | < 0.005 | 14 | 8.7 | 160 | 7.17 | 165.1 | |
| 2004-01 | MW-1015B | | 1087.43 | 180 | | < 1.3 | 130 | 0.44 | 240 | < 2.5 | 310 | 7.78 | 471 | |
| 2004-03 | MW-1010P | | | 150 | | 2.1 | 150 | 0.095 | 180 | 6.9 | 160 | 7.66 | 269 | |
| 2004-04 | MW-1000PR | RD | | 205 | 13.5 | 2.1 | 540 | 6.6 | 3010 | 363 | 750 | | | |
| 2004-04 | MW-1000PR | | 1088.38 | 210 | | < 6.7 | 530 | 7 | 2900 | 330 | 720 | 6.73 | 1025 | 105 |
| 2004-04 | MW-1000R | | 1091.37 | | | | | | | | | | | |
| 2004-04 | MW-1002 | | 1092.45 | 61 | | < 1.3 | 65 | < 0.005 | < 1 | 6 | 37 | 6.74 | 128.4 | |
| 2004-04 | MW-1002G | | 1092.38 | 90 | | < 1.3 | 100 | 0.022 | < 1 | 8.3 | 92 | 6.76 | 206 | |
| 2004-04 | MW-1004 | | 1105.88 | | | | | | | | | | | |
| 2004-04 | MW-1004P | | 1104.46 | 160 | | < 1.3 | 140 | 0.1 | 77 | < 2.5 | 160 | 7.26 | 275 | 117 |
| 2004-04 | MW-1004S | | 1105.94 | 43 | | 6.4 | 64 | < 0.005 | < 1 | 19 | 66 | 6.58 | 143.3 | 156 |
| 2004-04 | MW-1005 | | 1139.18 | 57 | | < 1.3 | 280 | 17 | 430 | 14 | 500 | 6.29 | 807 | |
| 2004-04 | MW-1005P | | 1137.86 | 240 | | < 1.3 | 220 | 0.11 | 20 | < 2.5 | 220 | 7.05 | 436 | 4 |
| 2004-04 | MW-1005S | | 1138.11 | 160 | | < 1.3 | 150 | 4.3 | 210 | 3.7 | 130 | 6.92 | 298 | |
| 2004-04 | MW-1010P | RD | | 144 | 14.5 | 1.6 | 145 | < 0.1 | 92 | 7.8 | 178 | | | |
| 2004-04 | MW-1010P | | 1088.35 | 140 | | < 1.3 | 140 | 0.013 | 97 | 8.8 | 130 | 7.55 | 276 | 20 |
| 2004-04 | MW-1013 | | 1108.2 | | | | | | | | | | | |
| 2004-04 | MW-1013A | | 1097.43 | | | | | | | | | | | |
| 2004-04 | MW-1013B | | 1097.77 | 560 | | 230 | 2200 | < 0.33 | 32000 | 1500 | 3100 | 6.29 | 3260 | 188 |
| 2004-04 | MW-1013C | RD | | 527 | 9.9 | 2.3 | 2180 | 7.2 | 9830 | 1840 | 3210 | | | |
| 2004-04 | MW-1013C | | 1099.81 | 490 | | < 13 | 2200 | 7.8 | 9700 | 1600 | 3200 | 6.65 | 3520 | 59 |
| 2004-04 | MW-1014 | | 1117.83 | | | | | | | | | | | |
| 2004-04 | MW-1014A | RD | | 463 | < 1 | 6 | 1320 | 0.1 | 3050 | 1040 | 1920 | | | |
| 2004-04 | MW-1014A | | 1116.64 | 470 | | < 13 | 1300 | 0.13 | 3100 | 910 | 1800 | 6.82 | 2250 | 211 |
| 2004-04 | MW-1014B | RD | | 461 | < 1 | 492 | 1920 | < 0.1 | 18800 | 1480 | 2530 | | | |
| 2004-04 | MW-1014B | | 1112.89 | 530 | | 440 | 1700 | < 0.33 | 14000 | 1400 | 2800 | 6.51 | 2880 | 246 |
| 2004-04 | MW-1014B | Dup. | | 570 | | 440 | 1700 | < 0.33 | 14000 | 1400 | 2800 | | | |
| 2004-04 | MW-1014C | RD | | | 8.4 | 1.2 | 657 | 6.9 | 2220 | 330 | 868 | | | |
| 2004-04 | MW-1014C | | 1108.53 | 330 | | < 13 | 640 | 7.5 | 2300 | 290 | 820 | 6.77 | 1233 | 53 |
| 2004-04 | MW-1015A | | 1089.17 | 79 | | < 1.3 | 86 | < 0.005 | 15 | 9 | 62 | 7.17 | 167.7 | |
| 2004-04 | MW-1015B | | 1089.08 | 180 | | < 1.3 | 140 | 0.38 | 120 | < 2.5 | 210 | 7.49 | 481 | |
| 2004-07 | MW-1000PR | | 1087.4 | 200 | < 1.8 | 28 | 530 | 2.3 | 2800 | 310 | 690 | 6.1 | 998 | 146 |
| 2004-07 | MW-1000R | | 1087.74 | | | | | | | | | | | |
| 2004-07 | MW-1002 | | 1092.22 | 53 | < 1.8 | < 1.3 | 60 | < 0.005 | < 1 | 5.6 | 93 | 6.5 | 114 | |
| 2004-07 | MW-1002G | | 1092.14 | 90 | < 1.8 | < 1.3 | 110 | < 0.005 | < 1 | 8.7 | 140 | 6.8 | 202 | |
| 2004-07 | MW-1004 | | 1108.26 | | | | | | | | | | | |
| 2004-07 | MW-1004P | | 1106.68 | 160 | < 1.8 | < 1.3 | 140 | 0.066 | 97 | < 2.5 | 120 | 6.8 | 275 | 114 |
| 2004-07 | MW-1004S | | 1108.32 | 44 | < 1.8 | < 1.3 | 71 | < 0.005 | < 1 | 21 | 100 | 6.3 | 152 | 184 |
| 2004-07 | MW-1005 | | 1139.35 | 55 | < 1.8 | 1.9 | 280 | 18 | 520 | 13 | 480 | 6 | 733 | |
| 2004-07 | MW-1005P | | 1139.37 | 240 | < 1.8 | < 1.3 | 220 | 0.45 | 93 | < 2.5 | 170 | 7 | 428 | -5 |
| 2004-07 | MW-1005S | | 1139.16 | 160 | < 1.8 | < 1.3 | 160 | 4.2 | 220 | 4.2 | 150 | 6.8 | 294 | |
| 2004-07 | MW-1010P | | 1087.09 | 160 | 2.3 | < 1.3 | 160 | 0.18 | 210 | 4.3 | 130 | 7 | 284 | 55 |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004-07 | MW-1013 | | 1111.69 | | | | | | | | | | | |
| 2004-07 | MW-1013A | | 1097.86 | | | | | | | | | | | |
| 2004-07 | MW-1013B | | 1098.27 | 550 | < 2.6 | 150 | 2200 | < 0.33 | 24000 | 1600 | 3100 | 6.1 | 3340 | 191 |
| 2004-07 | MW-1013C | | 1099.75 | 520 | 16 | < 13 | 2300 | 7.4 | 10000 | 1400 | 3200 | 6.2 | 3490 | 45 |
| 2004-07 | MW-1013C | Dup. | | 490 | 9.7 | < 13 | 2200 | 7.3 | 10000 | 1600 | 3200 | | | |
| 2004-07 | MW-1014 | | 1118.45 | | | | | | | | | | | |
| 2004-07 | MW-1014A | | 1115.52 | 440 | < 2.6 | < 13 | 1400 | 0.43 | 2100 | 940 | 1900 | 6.7 | 2250 | 175 |
| 2004-07 | MW-1014B | | 1113.85 | 450 | < 2.6 | 520 | 1900 | < 0.33 | 15000 | 1300 | 2600 | 6.3 | 2950 | 191 |
| 2004-07 | MW-1014C | | 1109.22 | 300 | 15 | < 13 | 660 | 7.2 | 2300 | 290 | 820 | 6.4 | 1171 | 31 |
| 2004-07 | MW-1015A | | 1087.88 | 78 | < 1.8 | < 1.3 | 89 | < 0.005 | 12 | 7.7 | 88 | 6.8 | 165 | 183 |
| 2004-07 | MW-1015B | | 1087.97 | 170 | < 1.8 | < 1.3 | 140 | 0.45 | 190 | < 2.5 | 220 | 7.1 | 458 | -104 |
| 2004-10 | MW-1000PR | | 1087.16 | 210 | 3.2 | 15 | 500 | 0.37 | 2700 | 320 | 670 | 6.4 | 970 | |
| 2004-10 | MW-1000R | | 1087.39 | | | | | | | | | | | |
| 2004-10 | MW-1002 | | 1090.26 | 56 | < 1.8 | < 1.3 | 56 | < 0.005 | 3 | 4.6 | 59 | 6.7 | 116 | |
| 2004-10 | MW-1002G | | 1090.23 | 93 | < 1.8 | < 1.3 | 98 | < 0.005 | 4.1 | 8.4 | 110 | 6.7 | 204 | |
| 2004-10 | MW-1004 | | 1106.01 | | | | | | | | | | | |
| 2004-10 | MW-1004P | | 1104.64 | 160 | < 1.8 | 1.5 | 130 | < 0.005 | 17 | < 2.5 | 120 | 7.3 | 271 | 109 |
| 2004-10 | MW-1004S | | 1106.12 | 46 | < 1.8 | < 1.3 | 65 | < 0.005 | 1.3 | 19 | 76 | 6.7 | 146 | |
| 2004-10 | MW-1005 | | 1138.67 | 55 | 4.3 | < 1.3 | 270 | 15 | 390 | 14 | 550 | 5.9 | 799 | |
| 2004-10 | MW-1005P | | 1138.05 | 240 | 2.6 | < 1.3 | 210 | 0.47 | 87 | < 2.5 | 210 | 7.1 | 436 | -2 |
| 2004-10 | MW-1005S | | 1138.06 | 170 | 3.9 | < 1.3 | 150 | 3.7 | 210 | 3.6 | 160 | 6.6 | 298 | |
| 2004-10 | MW-1010P | | 1086.86 | 160 | 3.3 | < 1.3 | 150 | 0.19 | 200 | 6.1 | 140 | 6.9 | 281 | 64 |
| 2004-10 | MW-1013 | | 1110.47 | | | | | | | | | | | |
| 2004-10 | MW-1013A | | 1097.11 | | | | | | | | | | | |
| 2004-10 | MW-1013B | | 1097.1 | 640 | 4.2 | 380 | 2200 | < 0.33 | 34000 | 1600 | 3100 | 6.3 | 3250 | 204 |
| 2004-10 | MW-1013C | | 1099.48 | 520 | 17 | < 13 | 2200 | 7 | 9800 | 1700 | 3200 | 6.3 | 3450 | 50 |
| 2004-10 | MW-1014 | | 1119.12 | | | | | | | | | | | |
| 2004-10 | MW-1014A | | 1114.83 | 490 | 2.9 | < 13 | 1300 | < 0.33 | 2000 | 930 | 1800 | 6.7 | 2220 | 184 |
| 2004-10 | MW-1014B | | 1113.33 | 620 | 3.6 | 550 | 2000 | < 0.33 | 17000 | 1500 | 2800 | 6.3 | 2950 | 215 |
| 2004-10 | MW-1014C | | 1108.87 | 350 | 17 | < 13 | 610 | 6.6 | 2100 | 300 | 780 | 6.5 | 1175 | 60 |
| 2004-10 | MW-1015A | | 1087.22 | 79 | < 1.8 | < 1.3 | 83 | < 0.005 | 11 | 7.6 | 95 | 7.3 | 164 | 116 |
| 2004-10 | MW-1015B | | 1087.21 | 180 | < 1.8 | < 1.3 | 130 | 0.3 | 140 | < 2.5 | 220 | 7.6 | 459 | -99 |
| 2004-10 | MW-1015B | Dup. | | 180 | < 1.8 | < 1.3 | 130 | 0.3 | 140 | < 2.5 | 230 | | | |
| 2005-01 | MW-1000PR | | 1087.9 | 220 | 1.3 | 16 | 510 | 0.51 | 2500 | 310 | 660 | 6.2 | 991 | 133 |
| 2005-01 | MW-1000R | | 1087.88 | | | | | | | | | | | |
| 2005-01 | MW-1002 | | 1090.2 | 59 | < 0.73 | < 1.3 | 62 | < 0.005 | < 1 | 5.1 | 24 | 6.9 | 122 | |
| 2005-01 | MW-1002G | | 1090.42 | 93 | < 0.73 | < 1.3 | 100 | < 0.005 | < 1 | 9.6 | 93 | 6.6 | 208 | |
| 2005-01 | MW-1004 | | 1105.9 | | | | | | | | | | | |
| 2005-01 | MW-1004P | | 1104.67 | 160 | < 0.73 | < 1.3 | 130 | 0.058 | 75 | < 2.5 | 94 | 7 | 270 | 102 |
| 2005-01 | MW-1004S | | 1106.02 | 46 | < 0.73 | < 1.3 | 65 | < 0.005 | < 1 | 19 | 110 | 6.5 | 146 | 187 |
| 2005-01 | MW-1004S | Dup. | | 46 | < 0.73 | < 1.3 | 65 | < 0.005 | < 1 | 19 | 79 | | | |
| 2005-01 | MW-1005 | | 1138.48 | 54 | 2.3 | < 1.3 | 180 | 12 | 310 | 13 | 280 | 6.1 | 510 | |
| 2005-01 | MW-1005P | | 1137.86 | 250 | < 0.73 | < 1.3 | 210 | 0.85 | 79 | < 2.5 | 210 | 7.1 | 428 | 15 |
| 2005-01 | MW-1005S | | 1137.89 | 160 | 2.4 | < 1.3 | 150 | 3.8 | 210 | 4.8 | 130 | 6.4 | 301 | |
| 2005-01 | MW-1010P | | 1087.56 | 150 | 18 | < 1.3 | 140 | < 0.005 | 92 | 11 | 130 | 6.7 | 284 | 72 |
| 2005-01 | MW-1013 | | 1109.19 | | | | | | | | | | | |
| 2005-01 | MW-1013A | | 1097.27 | | | | | | | | | | | |
| 2005-01 | MW-1013B | | 1097.29 | 580 | 4.8 | 180 | 2200 | < 0.33 | 24000 | 1700 | 3000 | 6.3 | 3390 | 207 |
| 2005-01 | MW-1013C | | 1099.34 | 540 | 20 | < 13 | 2100 | 7.2 | 9500 | 1700 | 3000 | 6.3 | 3540 | 67 |
| 2005-01 | MW-1014 | | 1118.5 | | | | | | | | | | | |
| 2005-01 | MW-1014A | | 1115.84 | 480 | 2.3 | < 13 | 1300 | < 0.33 | 2000 | 990 | 1800 | 6.7 | 2330 | 246 |
| 2005-01 | MW-1014B | | 1113.05 | 550 | 5.3 | 520 | 2000 | < 0.33 | 16000 | 1500 | 2700 | 6.4 | 3210 | 277 |
| 2005-01 | MW-1014C | | 1108.62 | 340 | 21 | < 13 | 600 | 6.4 | 2000 | 300 | 730 | 6.5 | 1174 | 70 |
| 2005-01 | MW-1015A | | 1087.45 | 79 | < 0.73 | < 1.3 | 83 | < 0.005 | 11 | 7.7 | 65 | 6.9 | 162 | 128 |
| 2005-01 | MW-1015B | | 1087.61 | 180 | < 0.73 | < 1.3 | 130 | 0.22 | 120 | < 2.5 | 230 | 7.4 | 464 | -89 |
| 2005-04 | MW-1000PR | | 1088.23 | 210 | 2.7 | 17 | 530 | 0.75 | 3000 | 320 | 660 | 6.3 | 882 | 105 |
| 2005-04 | MW-1000R | | 1088.69 | | | | | | | | | | | |
| 2005-04 | MW-1002 | | 1091.64 | 56 | < 0.66 | < 1.3 | 61 | < 0.005 | < 1 | 6.1 | 8 | 6.8 | 117 | |
| 2005-04 | MW-1002G | | 1091.79 | 91 | < 0.66 | < 1.3 | 100 | < 0.005 | < 1 | 9.2 | 95 | 6.7 | 206 | |
| 2005-04 | MW-1004 | | 1106.18 | | | | | | | | | | | |
| 2005-04 | MW-1004P | | 1104.74 | 160 | < 0.66 | < 1.3 | 140 | < 0.005 | 26 | < 2.5 | 120 | 6.6 | 265 | 124 |
| 2005-04 | MW-1004S | | 1106.28 | 46 | < 0.66 | < 1.3 | 69 | < 0.005 | < 1 | 21 | 45 | 6.2 | 148 | 202 |
| 2005-04 | MW-1005 | | 1139.08 | 52 | 2.3 | < 1.3 | 190 | 17 | 450 | 14 | 300 | 6.1 | 528 | |
| 2005-04 | MW-1005 | Dup. | | 51 | 2.2 | < 1.3 | 190 | 17 | 460 | 14 | 290 | | | |
| 2005-04 | MW-1005P | | 1137.9 | 240 | < 0.66 | < 1.3 | 220 | 0.11 | 17 | < 2.5 | 200 | 6.7 | 437 | -2 |
| 2005-04 | MW-1005S | | 1137.95 | 160 | 2.8 | < 1.3 | 150 | 4.4 | 240 | 4.3 | 170 | 6.3 | 294 | |
| 2005-04 | MW-1010P | | 1088.2 | 150 | 9.9 | < 1.3 | 150 | 0.034 | 150 | 11 | 110 | 6.7 | 284 | 60 |
| 2005-04 | MW-1013 | | 1108.43 | | | | | | | | | | | |
| 2005-04 | MW-1013A | | 1097.16 | | | | | | | | | | | |
| 2005-04 | MW-1013B | | 1097.61 | 630 | 1.7 | 450 | 2200 | < 0.33 | 42000 | 1700 | 3100 | 6.2 | 3420 | 238 |
| 2005-04 | MW-1013C | | 1099.38 | 520 | 16 | < 13 | 2200 | 8.2 | 10000 | 1700 | 3100 | 6.3 | 3390 | 66 |
| 2005-04 | MW-1014 | | 1117.72 | | | | | | | | | | | |
| 2005-04 | MW-1014A | | 1115.68 | 440 | 1.9 | < 13 | 1300 | < 0.33 | 2000 | 1000 | 1800 | 6.6 | 2250 | 276 |
| 2005-04 | MW-1014B | | 1112.91 | 520 | 2.6 | 460 | 1900 | < 0.33 | 16000 | 1400 | 2700 | 6.4 | 2790 | 288 |
| 2005-04 | MW-1014C | | 1108.19 | 330 | 16 | < 13 | 660 | 7 | 2300 | 290 | 750 | 6.3 | 1202 | 64 |
| 2005-04 | MW-1015A | | 1088.58 | 79 | < 0.66 | < 1.3 | 87 | < 0.005 | 16 | 8.6 | 51 | 6.8 | 162 | 194 |
| 2005-04 | MW-1015B | | 1088.6 | 180 | < 0.66 | < 1.3 | 140 | 0.29 | 130 | < 2.5 | 190 | 7.1 | 451 | -93 |
| 2005-07 | MW-1000PR | | 1087.41 | 210 | 4 | 27 | 560 | 1.5 | 2900 | 330 | 680 | 6.7 | 962 | 139 |
| 2005-07 | MW-1000R | | 1087.59 | | | | | | | | | | | |
| 2005-07 | MW-1002 | | 1090.63 | 47 | < 0.66 | 1.6 | 53 | < 0.005 | < 1 | 4.9 | 82 | 6.7 | 98 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005-07 | MW-1002G | | 1090.54 | 91 | < 0.66 | < 1.3 | 110 | < 0.005 | < 1 | 8.8 | 140 | 6.8 | 184 | |
| 2005-07 | MW-1004 | | 1105.97 | | | | | | | | | | | |
| 2005-07 | MW-1004P | | 1104.59 | 160 | < 0.66 | < 1.3 | 150 | 0.059 | 41 | < 2.5 | 130 | 7.4 | 270 | 58 |
| 2005-07 | MW-1004S | | 1106.1 | 47 | < 0.66 | 2 | 77 | < 0.005 | < 1 | 24 | 100 | 6.3 | 158 | 211 |
| 2005-07 | MW-1004S | Dup. | | 47 | < 0.66 | 2.8 | 78 | < 0.005 | < 1 | 24 | 260 | | | |
| 2005-07 | MW-1005 | | 1138.52 | 46 | 1.5 | < 1.3 | 180 | 14 | 370 | 16 | 270 | 6.2 | 497 | |
| 2005-07 | MW-1005P | | 1138.3 | 240 | < 0.66 | < 1.3 | 230 | 0.17 | 82 | < 2.5 | 230 | 7.4 | 428 | -1 |
| 2005-07 | MW-1005S | | 1138.25 | 170 | 3 | < 1.3 | 160 | 4.5 | 240 | 3.9 | 180 | 7.2 | 296 | |
| 2005-07 | MW-1010P | | 1087.16 | 150 | 22 | < 1.3 | 160 | < 0.005 | 85 | 14 | 170 | 7.9 | 288 | 94 |
| 2005-07 | MW-1013 | | 1110.98 | | | | | | | | | | | |
| 2005-07 | MW-1013A | | 1096.86 | | | | | | | | | | | |
| 2005-07 | MW-1013B | | 1097.22 | 640 | 1.9 | 400 | 2300 | < 0.33 | 39000 | 1700 | 3100 | 6.4 | 3200 | 229 |
| 2005-07 | MW-1013C | | 1098.89 | 510 | 13 | < 13 | 2300 | 8.5 | 11000 | 1800 | 3100 | 6.6 | 3400 | 17 |
| 2005-07 | MW-1014 | | 1117.46 | | | | | | | | | | | |
| 2005-07 | MW-1014A | | 1114.86 | 500 | 1.2 | < 13 | 1300 | < 0.33 | 1400 | 1000 | 1800 | 6.8 | 2170 | 269 |
| 2005-07 | MW-1014B | | 1112.42 | 570 | 2.3 | 560 | 2100 | < 0.33 | 17000 | 1500 | 2800 | 6.5 | 3010 | 299 |
| 2005-07 | MW-1014C | | 1107.8 | 350 | 15 | < 13 | 650 | 6.9 | 2200 | 300 | 760 | 6.9 | 1150 | 57 |
| 2005-07 | MW-1015A | | 1087.37 | 78 | < 0.66 | < 1.3 | 89 | < 0.005 | 12 | 8.5 | 110 | 7.2 | 162 | |
| 2005-07 | MW-1015B | | 1087.49 | 180 | < 0.66 | < 1.3 | 150 | 0.4 | 140 | < 2.5 | 260 | 8 | 457 | -91 |
| 2005-10 | MW-1000PR | | 1087.92 | 210 | 2.9 | 25 | 580 | 0.73 | 2900 | 330 | 730 | 6.6 | 955 | 141 |
| 2005-10 | MW-1000R | | 1088.17 | | | | | | | | | | | |
| 2005-10 | MW-1002 | | 1092.07 | 50 | < 0.66 | < 2.7 | 60 | < 0.005 | < 1 | 5.2 | 120 | 6.5 | 104 | |
| 2005-10 | MW-1002G | | 1091.97 | 89 | < 0.66 | < 2.7 | 110 | < 0.005 | < 1 | 9 | 120 | 6.5 | 201 | |
| 2005-10 | MW-1004 | | 1107.51 | | | | | | | | | | | |
| 2005-10 | MW-1004P | | 1105.6 | 170 | < 0.66 | < 2.7 | 140 | < 0.005 | 21 | < 2.5 | 150 | 7.1 | 277 | 83 |
| 2005-10 | MW-1004S | | 1107.58 | 49 | < 0.66 | < 2.7 | 75 | 0.008 | < 1 | 23 | 150 | 7.2 | 162 | 186 |
| 2005-10 | MW-1005 | | 1138.49 | 61 | 2 | < 2.7 | 290 | 17 | 480 | 14 | 450 | 6 | 786 | |
| 2005-10 | MW-1005P | | 1137.53 | 240 | < 0.66 | < 2.7 | 220 | 0.03 | 48 | < 2.5 | 210 | 6.5 | 427 | -6 |
| 2005-10 | MW-1005S | | 1137.6 | 170 | 1.9 | < 2.7 | 180 | 4.2 | 240 | 4.2 | 200 | 6.4 | 298 | |
| 2005-10 | MW-1010P | | 1087.81 | 160 | 3.9 | < 2.7 | 170 | 0.044 | 160 | 8.8 | 150 | 7.1 | 283 | 25 |
| 2005-10 | MW-1013 | | 1109.89 | 510 | 2.5 | < 13 | 600 | 22 | 25000 | 62 | 760 | 6.1 | 1332 | 73 |
| 2005-10 | MW-1013A | | 1096.84 | 370 | 0.86 | < 13 | 680 | < 0.33 | 4500 | 380 | 870 | 6.7 | 1576 | 153 |
| 2005-10 | MW-1013B | | 1096.98 | 630 | < 0.85 | 230 | 2300 | < 0.33 | 30000 | 1500 | 3100 | 6.4 | 3260 | 222 |
| 2005-10 | MW-1013C | | 1099.2 | 510 | 9.2 | < 13 | 2200 | 8.3 | 11000 | 1700 | 3200 | 6.7 | 3410 | 37 |
| 2005-10 | MW-1013C | Dup. | | 500 | 9.4 | < 13 | 2300 | 8.7 | 11000 | 1700 | 3100 | | | |
| 2005-10 | MW-1014 | | 1117.7 | 170 | < 0.85 | < 13 | 350 | < 0.33 | 1300 | 200 | 500 | 7.1 | 726 | 202 |
| 2005-10 | MW-1014A | | 1114.97 | 450 | < 0.85 | < 13 | 1300 | < 0.33 | 1500 | 890 | 1800 | 6.7 | 2270 | 213 |
| 2005-10 | MW-1014B | | 1112.41 | 470 | 1.2 | 400 | 1800 | < 0.33 | 15000 | 1300 | 2400 | 6.5 | 2820 | 261 |
| 2005-10 | MW-1014C | | 1108.06 | 320 | 14 | < 13 | 630 | 7 | 2200 | 290 | 790 | 6.7 | 1157 | 54 |
| 2005-10 | MW-1015A | | 1088.12 | 85 | < 0.66 | 3.8 | 96 | < 0.005 | 13 | 8.8 | 110 | 6.2 | 161 | 70 |
| 2005-10 | MW-1015B | | 1088.24 | 180 | < 0.66 | < 2.7 | 150 | 0.3 | 140 | < 2.5 | 260 | 6.3 | 461 | -93 |
| 2006-01 | MW-1000PR | | 1087.71 | 210 | 3 | 58 | 480 | 0.68 | 2400 | 300 | 670 | 6.8 | 1014 | 126 |
| 2006-01 | MW-1000R | | 1088.41 | | | | | | | | | | | |
| 2006-01 | MW-1002 | | 1090.67 | 51 | < 0.66 | < 2.7 | 52 | < 0.005 | < 1 | 4.6 | 33 | 7.1 | 112 | |
| 2006-01 | MW-1002G | | 1090.58 | 89 | < 0.66 | < 2.7 | 94 | < 0.005 | < 1 | 8.3 | 95 | 7 | 213 | |
| 2006-01 | MW-1004 | | 1106.31 | | | | | | | | | | | |
| 2006-01 | MW-1004P | | 1105.59 | 160 | < 0.66 | < 2.7 | 140 | 0.35 | 170 | < 2.5 | 110 | 7.1 | 290 | 95 |
| 2006-01 | MW-1004S | | 1106.51 | 48 | < 0.66 | < 2.7 | 58 | < 0.005 | 1 | 23 | 75 | 7 | 165 | 175 |
| 2006-01 | MW-1005 | | 1138.33 | 51 | 1.7 | < 2.7 | 200 | 15 | 440 | 14 | 350 | 6.5 | 597 | |
| 2006-01 | MW-1005P | | 1137.24 | 250 | < 0.66 | < 2.7 | 200 | 0.49 | 75 | < 2.5 | 200 | 6.9 | 434 | 20 |
| 2006-01 | MW-1005S | | 1137.47 | 160 | 2.4 | < 2.7 | 140 | 4 | 210 | 3.2 | 160 | 6.8 | 316 | |
| 2006-01 | MW-1010P | | 1087.51 | 150 | 4.3 | < 2.7 | 140 | 0.057 | 170 | 9.2 | 130 | 7.2 | 301 | 90 |
| 2006-01 | MW-1013 | | 1108.54 | 680 | 0.98 | < 13 | 560 | 12 | 22000 | 79 | 700 | 6.4 | 1211 | 72 |
| 2006-01 | MW-1013A | | 1097.01 | 340 | < 0.85 | < 13 | 500 | < 0.33 | 2900 | 240 | 650 | 6.8 | 1271 | 156 |
| 2006-01 | MW-1013B | | 1097.17 | 590 | 1.1 | 210 | 2200 | < 0.33 | 22000 | 1500 | 3000 | 6.4 | 3480 | 223 |
| 2006-01 | MW-1013C | | | 550 | 13 | < 13 | 2100 | 7.6 | 9700 | 1700 | 3100 | 6.3 | 3480 | 61 |
| 2006-01 | MW-1014 | | 1117.27 | 170 | < 0.85 | < 13 | 310 | < 0.33 | 1100 | 190 | 540 | 6.9 | 748 | 261 |
| 2006-01 | MW-1014A | | 1114.81 | 480 | < 0.85 | 17 | 1200 | < 0.33 | 1500 | 970 | 1800 | 6.8 | 2390 | 252 |
| 2006-01 | MW-1014B | | 1112.12 | 570 | 2.4 | 560 | 1900 | < 0.33 | 16000 | 1400 | 2800 | 6.5 | 3350 | 287 |
| 2006-01 | MW-1014C | | 1107.25 | 300 | 16 | < 13 | 590 | 6.2 | 2000 | 280 | 740 | 6.9 | 1182 | 67 |
| 2006-01 | MW-1014C | Dup. | | 310 | 18 | < 13 | 570 | 6 | 1900 | 270 | 750 | | | |
| 2006-01 | MW-1015A | | 1088.05 | 76 | < 0.66 | < 2.7 | 80 | < 0.005 | 9 | 8.4 | 79 | 7.2 | 165 | 160 |
| 2006-01 | MW-1015B | | 1087.8 | 180 | < 0.66 | < 2.7 | 140 | 0.32 | 110 | < 2.5 | 270 | 7.2 | 472 | -73 |
| 2006-02 | MW-1013C | | 1099.3 | | | | | | | | | | | |
| 2006-04 | MW-1000PR | | 1088.35 | 210 | 1.8 | 30 | 530 | 0.46 | 2600 | 300 | 620 | 6.62 | 926 | 129 |
| 2006-04 | MW-1000R | | 1088.82 | | | | | | | | | | | |
| 2006-04 | MW-1002 | | 1092.17 | 52 | < 0.57 | < 2.7 | 61 | 0.006 | < 1 | 6.2 | 26 | 6.72 | 112 | |
| 2006-04 | MW-1002G | | 1092.06 | 89 | < 0.57 | < 2.7 | 110 | 0.015 | < 1 | 9.1 | 67 | 6.76 | 201 | |
| 2006-04 | MW-1004 | | 1106.96 | | | | | | | | | | | |
| 2006-04 | MW-1004P | | 1105.34 | 160 | < 0.57 | < 2.7 | 140 | 0.2 | 89 | 2.5 | 93 | 6.31 | 270 | 88 |
| 2006-04 | MW-1004S | | 1107.08 | 49 | < 0.57 | < 2.7 | 78 | 0.008 | 2.6 | 25 | 63 | 5.85 | 161.6 | 176 |
| 2006-04 | MW-1005 | | 1139.51 | 52 | 2.2 | < 2.7 | 210 | 13 | 320 | 14 | 290 | 6.23 | 596 | |
| 2006-04 | MW-1005P | | 1138.47 | 250 | < 0.57 | < 2.7 | 230 | 0.22 | 40 | < 2.5 | 210 | 6.71 | 439 | 6 |
| 2006-04 | MW-1005S | | 1138.64 | 170 | 2.8 | < 2.7 | 160 | 4.4 | 230 | 4 | 140 | 6.56 | 298 | |
| 2006-04 | MW-1005S | Dup. | | 170 | 2.3 | < 2.7 | 160 | 4.4 | 230 | 4 | 110 | | | |
| 2006-04 | MW-1010P | | 1088.21 | 150 | 4.2 | < 2.7 | 160 | 0.029 | 150 | 13 | 89 | 7 | 278 | 101 |
| 2006-04 | MW-1013 | | 1108.42 | 510 | < 1 | 23 | 550 | 2.2 | 21000 | 65 | 640 | 5.95 | 1040 | 150 |
| 2006-04 | MW-1013A | | 1097.29 | 340 | < 1 | 17 | 730 | < 0.33 | 3900 | 270 | 640 | 6.23 | 1571 | 152 |
| 2006-04 | MW-1013B | | 1097.65 | 590 | < 1 | 280 | 2200 | < 0.33 | 25000 | 1600 | 3000 | 6.1 | 3300 | 210 |
| 2006-04 | MW-1013C | | 1099.24 | 520 | 12 | < 13 | 2300 | 8.9 | 11000 | 1600 | 3000 | 6.21 | 3380 | 51 |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006-04 | MW-1014 | | 1117.25 | 150 | < 1 | 36 | 340 | < 0.33 | 1200 | 170 | 410 | 6.49 | 677 | 271 |
| 2006-04 | MW-1014A | | 1114.95 | 440 | < 1 | 22 | 1300 | < 0.33 | 2100 | 880 | 1700 | 6.39 | 2200 | 268 |
| 2006-04 | MW-1014B | | 1112.27 | 550 | 1.1 | 530 | 1900 | < 0.33 | 14000 | 1400 | 2700 | 6.23 | 2740 | 292 |
| 2006-04 | MW-1014C | | 1107.9 | 340 | 16 | < 13 | 620 | 6.4 | 2100 | 270 | 700 | 6.4 | 1124 | 80 |
| 2006-04 | MW-1015A | | 1088.71 | 77 | < 0.57 | < 2.7 | 90 | < 0.005 | 11 | 9.1 | 39 | 6.96 | 161.5 | 173 |
| 2006-04 | MW-1015B | | 1088.89 | 180 | < 0.57 | < 2.7 | 140 | 0.44 | 100 | < 2.5 | 190 | 7.11 | 464 | -84 |
| 2006-07 | MW-1000PR | | 1086.96 | 270 | 1.7 | 21 | 480 | 0.62 | 2400 | 310 | 660 | 6.47 | 928 | 100 |
| 2006-07 | MW-1000R | | 1088.31 | | | | | | | | | | | |
| 2006-07 | MW-1002 | | 1089.57 | 50 | < 0.57 | 2.9 | 53 | < 0.005 | < 1 | 5.1 | 88 | 6.49 | 108.8 | |
| 2006-07 | MW-1002G | | 1088.49 | 86 | < 0.57 | < 2.7 | 99 | < 0.005 | 2.9 | 8.7 | 140 | 6.55 | 199.4 | |
| 2006-07 | MW-1004 | | | | | | | | | | | | | |
| 2006-07 | MW-1004P | | 1103.79 | 160 | < 0.57 | 26 | 130 | < 0.005 | 5.6 | < 2.5 | 170 | 7.11 | 266 | 72 |
| 2006-07 | MW-1004S | | 1105.22 | 50 | < 0.57 | 8.9 | 77 | < 0.005 | < 1 | 26 | 93 | 7.11 | 165.3 | 199 |
| 2006-07 | MW-1005 | | 1137.18 | 54 | 1.7 | < 2.7 | 220 | 12 | 340 | 14 | 560 | 6.44 | 715 | |
| 2006-07 | MW-1005P | | 1136.8 | 240 | < 0.57 | < 2.7 | 210 | 0.6 | 86 | < 2.5 | 200 | 6.59 | 423 | 1 |
| 2006-07 | MW-1005S | | 1137.26 | 170 | 2.8 | < 2.7 | 150 | 4 | 210 | 3.8 | 170 | 6.66 | 302 | |
| 2006-07 | MW-1010P | | 1086.63 | 150 | 4.4 | 2.8 | 150 | 0.045 | 150 | 14 | 150 | 7.16 | 290 | 104 |
| 2006-07 | MW-1013 | | 1111.08 | 520 | < 1 | 24 | 530 | 3.2 | 20000 | 58 | 630 | 6.05 | 1091 | 92 |
| 2006-07 | MW-1013 | Dup. | | 560 | < 1 | 29 | 520 | 3.2 | 19000 | 58 | 670 | | | |
| 2006-07 | MW-1013A | | 1096.52 | 320 | < 1 | 16 | 460 | < 0.33 | 1700 | 220 | 600 | 6.52 | 1104 | 160 |
| 2006-07 | MW-1013B | | 1096.73 | 610 | 1.4 | 470 | 2200 | < 0.33 | 36000 | 1600 | 3000 | 6.17 | 3280 | 249 |
| 2006-07 | MW-1013C | | 1098.2 | 520 | 18 | 14 | 2200 | 7 | 9800 | 1700 | 3100 | 6.09 | 3300 | 51 |
| 2006-07 | MW-1014 | | 1117.53 | 170 | < 1 | 26 | 320 | < 0.33 | 940 | 180 | 490 | 6.54 | 713 | 175 |
| 2006-07 | MW-1014A | | 1114.77 | 450 | < 1 | 31 | 1300 | < 0.33 | 1400 | 1000 | 1800 | 6.62 | 2190 | 190 |
| 2006-07 | MW-1014B | | 1112.1 | 520 | 1.8 | 510 | 1700 | < 0.33 | 12000 | 1400 | 2400 | 6.41 | 2780 | 222 |
| 2006-07 | MW-1014C | | 1107.35 | 350 | 16 | 16 | 580 | 5.9 | 1900 | 260 | 770 | 6.55 | 1080 | 63 |
| 2006-07 | MW-1015A | | 1086.95 | 79 | < 0.57 | 3.3 | 82 | < 0.005 | 8.2 | 8.6 | 100 | 6.02 | 160.8 | 73 |
| 2006-07 | MW-1015B | | 1086.84 | 170 | 0.97 | < 2.7 | 140 | 0.052 | 97 | < 2.5 | 270 | 6.33 | 466 | -63 |
| 2006-10 | MW-1000PR | | 1085.87 | 210 | 2.8 | 12 | 550 | 0.49 | 2700 | 290 | 600 | 7 | 948 | 108 |
| 2006-10 | MW-1000R | | 1087.12 | | | | | | | | | | | |
| 2006-10 | MW-1002 | | 1089.47 | 52 | < 0.57 | < 2.7 | 62 | < 0.005 | < 1 | 6.3 | < 2 | 6.8 | 109 | |
| 2006-10 | MW-1002G | | 1089.42 | 87 | < 0.57 | < 2.7 | 110 | < 0.005 | < 1 | 9.3 | 37 | 6.9 | 200 | |
| 2006-10 | MW-1004 | | 1104.87 | | | | | | | | | | | |
| 2006-10 | MW-1004P | | 1103.68 | 150 | < 0.57 | < 2.7 | 150 | < 0.005 | 6.1 | 3.1 | 120 | 7.3 | 280 | 75 |
| 2006-10 | MW-1004P | Dup. | | 160 | < 0.57 | < 2.7 | 150 | < 0.005 | 6.2 | 4.5 | 66 | | | |
| 2006-10 | MW-1004S | | 1104.98 | 51 | < 0.57 | < 2.7 | 87 | < 0.005 | < 1 | 26 | 83 | 6.8 | 185 | 181 |
| 2006-10 | MW-1005 | | 1137.03 | 54 | 2.3 | < 2.7 | 300 | 16 | 380 | 15 | 320 | 6.3 | 833 | |
| 2006-10 | MW-1005P | | 1136.78 | 240 | < 0.57 | < 2.7 | 230 | 0.019 | 39 | < 2.5 | 140 | 7 | 456 | -3 |
| 2006-10 | MW-1005S | | 1136.55 | 160 | 2.3 | < 2.7 | 170 | 4.4 | 240 | 4.1 | 83 | 7.3 | 302 | |
| 2006-10 | MW-1010P | | 1086.79 | 160 | 5.7 | < 2.7 | 170 | 0.017 | 110 | 8.1 | 92 | 7.8 | 289 | 71 |
| 2006-10 | MW-1013 | | 1109.73 | 520 | < 1 | < 13 | 580 | 11 | 24000 | 55 | 620 | 6.5 | 1233 | 81 |
| 2006-10 | MW-1013A | | 1096.36 | 300 | < 1 | < 13 | 490 | < 0.33 | 2400 | 200 | 560 | 7 | 1015 | 130 |
| 2006-10 | MW-1013B | | 1096.54 | 480 | < 1 | 200 | 2400 | < 0.33 | 23000 | 1600 | 3000 | 6.5 | 3360 | 309 |
| 2006-10 | MW-1013C | | 1097.94 | 580 | 15 | < 13 | 2200 | 9.1 | 11000 | 1600 | 3000 | 6.7 | 3390 | 16 |
| 2006-10 | MW-1014 | | 1117.45 | 170 | < 1 | < 13 | 350 | < 0.33 | 880 | 180 | 430 | 6.7 | 739 | 165 |
| 2006-10 | MW-1014A | | 1114.6 | 480 | < 1 | < 13 | 1400 | 0.66 | 820 | 1000 | 1800 | 6.7 | 2290 | 176 |
| 2006-10 | MW-1014B | | 1111.88 | 460 | < 1 | 460 | 1900 | < 0.33 | 13000 | 1300 | 2400 | 6.5 | 2900 | 215 |
| 2006-10 | MW-1014C | | 1106.97 | 330 | 20 | < 13 | 620 | 6.1 | 2000 | 260 | 700 | 7 | 1113 | 36 |
| 2006-10 | MW-1015A | | 1086.85 | 78 | < 0.57 | < 2.7 | 92 | < 0.005 | 9.5 | 9.3 | 21 | 7.1 | 162 | 156 |
| 2006-10 | MW-1015B | | 1086.94 | 180 | < 0.57 | < 2.7 | 160 | 0.32 | 110 | 2.5 | 230 | 7.5 | 466 | -73 |
| 2007-01 | MW-1000PR | | 1087.12 | 220 | 1.7 | 29 | 530 | 0.26 | 2600 | 290 | 570 | 6.8 | 959 | 175 |
| 2007-01 | MW-1000R | | 1087.25 | | | | | | | | | | | |
| 2007-01 | MW-1002 | | 1089.38 | 39 | < 0.57 | < 2.7 | 57 | < 0.005 | < 1 | 5.5 | 5 | 6.9 | 106 | |
| 2007-01 | MW-1002G | | 1089.34 | 81 | < 0.57 | < 2.7 | 110 | < 0.005 | < 1 | 8.3 | 43 | 6.7 | 208 | |
| 2007-01 | MW-1004 | | 1104.37 | | | | | | | | | | | |
| 2007-01 | MW-1004P | | 1103.05 | 160 | < 0.57 | < 2.7 | 140 | 0.04 | 79 | < 2.5 | 91 | 7.2 | 285 | 157 |
| 2007-01 | MW-1004S | | 1104.49 | 48 | < 0.57 | < 2.7 | 83 | < 0.005 | < 1 | 27 | 46 | 6.9 | 178 | 227 |
| 2007-01 | MW-1005 | | 1137.54 | 49 | 1.5 | < 2.7 | 200 | 16 | 460 | 14 | 290 | 6.2 | 528 | |
| 2007-01 | MW-1005P | | 1136.27 | 250 | < 0.57 | < 2.7 | 230 | 0.41 | 89 | 3.7 | 180 | 6.9 | 441 | 11 |
| 2007-01 | MW-1005S | | 1136.33 | 170 | 1.9 | < 2.7 | 170 | 4.1 | 230 | 3.5 | 130 | 6.7 | 312 | |
| 2007-01 | MW-1010P | | 1087 | 160 | 4.3 | < 2.7 | 160 | 0.038 | 160 | 8.7 | 120 | 7.3 | 303 | 97 |
| 2007-01 | MW-1010P | Dup. | | 150 | 4.4 | < 2.7 | 160 | 0.035 | 160 | 8.4 | 130 | | | |
| 2007-01 | MW-1013 | | 1108.4 | 560 | 4 | < 13 | 600 | 12 | 24000 | 72 | 680 | 6.4 | 1168 | 100 |
| 2007-01 | MW-1013A | | 1096.32 | 320 | 1.9 | < 13 | 400 | < 0.33 | 1700 | 170 | 510 | 7 | 885 | 147 |
| 2007-01 | MW-1013B | | 1096.44 | 570 | < 1 | 290 | 2200 | < 0.33 | 24000 | 1600 | 2900 | 6.5 | 3370 | 286 |
| 2007-01 | MW-1013C | | 1098.06 | 540 | 9 | < 13 | 2300 | 9.5 | 11000 | 1700 | 3000 | 6.6 | 3460 | 68 |
| 2007-01 | MW-1014 | | 1117.15 | 170 | 2.1 | 39 | 330 | < 0.33 | 1300 | 170 | 420 | 6.8 | 710 | 218 |
| 2007-01 | MW-1014A | | 1114.68 | 470 | < 1 | < 13 | 1300 | < 0.33 | 780 | 1000 | 1700 | 6.6 | 3150 | 254 |
| 2007-01 | MW-1014B | | 1111.42 | 570 | < 1 | 600 | 1900 | < 0.33 | 15000 | 1400 | 2600 | 6.6 | 3150 | 254 |
| 2007-01 | MW-1014C | | 1106.92 | 300 | 21 | < 13 | 580 | 6 | 1900 | 260 | 680 | 6.8 | 1122 | 76 |
| 2007-01 | MW-1015A | | 1087.99 | 69 | < 0.57 | < 2.7 | 90 | < 0.005 | 8.9 | 8.8 | 57 | 7 | 163 | 83 |
| 2007-01 | MW-1015B | | 1086.98 | 160 | < 0.57 | < 2.7 | 160 | 0.35 | 120 | < 2.5 | 200 | 7.2 | 541 | -60 |
| 2007-04 | MW-1000PR | | 1087.43 | 230 | 3.9 | 13 | 530 | 0.38 | 2600 | 300 | 630 | 6.1 | 929 | 207 |
| 2007-04 | MW-1000R | | 1087.88 | | | | | | | | | | | |
| 2007-04 | MW-1002 | | 1090.43 | 50 | 1.7 | < 2.7 | 56 | < 0.005 | < 1 | 5.6 | 43 | 7.2 | 101 | |
| 2007-04 | MW-1002G | | 1090.34 | 88 | 1.9 | < 2.7 | 110 | < 0.005 | < 1 | 9.2 | 190 | 6.8 | 203 | |
| 2007-04 | MW-1004 | | | | | | | | | | | | | |
| 2007-04 | MW-1004P | | 1103.86 | 160 | 1.8 | < 2.7 | 140 | 0.22 | 82 | 2.5 | 110 | 6.5 | 266 | 128 |
| 2007-04 | MW-1004S | | 1105.59 | 54 | 2.1 | < 2.7 | 92 | < 0.005 | < 1 | 30 | 100 | 6.4 | 181 | 212 |
| 2007-04 | MW-1005 | | 1137.26 | 50 | 3.1 | < 2.7 | 190 | 16 | 430 | 14 | 89 | 6.5 | 508 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007-04 | MW-1005 | Dup. | | 51 | 2.9 | < 2.7 | 190 | 16 | 430 | 14 | 170 | | | |
| 2007-04 | MW-1005P | | 1135.62 | 240 | 2 | < 2.7 | 230 | 0.24 | 28 | < 2.5 | 170 | 6.8 | 427 | 7 |
| 2007-04 | MW-1005S | | 1135.91 | 170 | 3.6 | < 2.7 | 160 | 4.2 | 230 | 3.5 | 230 | 6.9 | 297 | |
| 2007-04 | MW-1010P | | 1087.48 | 160 | 5.2 | < 2.7 | 160 | 0.037 | 170 | 8.1 | 140 | 6.5 | 289 | 154 |
| 2007-04 | MW-1013 | | 1108.02 | 550 | 1.4 | < 13 | 620 | 3.3 | 24000 | 74 | 670 | 6.1 | 1149 | 87 |
| 2007-04 | MW-1013A | | 1096.2 | 330 | < 1 | < 13 | 460 | < 0.33 | 1700 | 180 | 540 | 6.3 | 1006 | 137 |
| 2007-04 | MW-1013B | | 1096.45 | 620 | 3.2 | 230 | 2400 | < 0.33 | 23000 | 1700 | 3000 | 5.9 | 3260 | 255 |
| 2007-04 | MW-1013C | | 1098.24 | 560 | 16 | < 13 | 2300 | 9.3 | 11000 | 1700 | 3100 | 6.2 | 3320 | 51 |
| 2007-04 | MW-1014 | | 1116.26 | 170 | 1.1 | 17 | 350 | < 0.033 | 610 | 180 | 420 | 6.2 | 677 | 188 |
| 2007-04 | MW-1014A | | 1113.98 | 470 | 3.7 | < 13 | 1400 | 0.53 | 920 | 950 | 1800 | 6.2 | 2180 | 180 |
| 2007-04 | MW-1014B | | 1111.12 | 550 | 3.2 | 470 | 1900 | < 0.33 | 14000 | 1300 | 2500 | 6 | 2750 | 189 |
| 2007-04 | MW-1014C | | 1106.71 | 340 | 19 | < 13 | 620 | 6.1 | 2000 | 670 | 670 | 6.2 | 1072 | 68 |
| 2007-04 | MW-1015A | | 1087.59 | 78 | 1.6 | < 2.7 | 89 | < 0.005 | 9.3 | 8.9 | 67 | 7.3 | 162 | 75 |
| 2007-04 | MW-1015B | | 1087.75 | 180 | 1.2 | < 2.7 | 140 | 0.16 | 81 | < 2.5 | 200 | 7.2 | 458 | -71 |
| 2007-06 | MW-1000PR | | 1086.72 | 230 | 2.7 | 12 | 500 | 0.66 | 2600 | 300 | 660 | 6.4 | 887 | 89 |
| 2007-06 | MW-1000R | | 1087.06 | | | | | | | | | | | |
| 2007-06 | MW-1002 | | 1089.67 | 42 | < 0.83 | < 2.7 | 46 | < 0.005 | < 1 | 4.6 | 46 | 6.5 | 105 | |
| 2007-06 | MW-1002G | | 1089.6 | 88 | < 0.83 | < 2.7 | 100 | < 0.005 | < 1 | 8.1 | 130 | 6.7 | 227 | |
| 2007-06 | MW-1004 | | 1104.83 | | | | | | | | | | | |
| 2007-06 | MW-1004P | | 1103.49 | 160 | < 0.83 | < 2.7 | 140 | 0.075 | 110 | < 2.5 | 120 | 7.1 | 297 | 151 |
| 2007-06 | MW-1004S | | 1104.94 | 54 | < 0.83 | < 2.7 | 87 | < 0.005 | < 1 | 29 | 110 | 6.2 | 205 | 201 |
| 2007-06 | MW-1005 | | 1136.98 | 50 | 2.2 | < 2.7 | 180 | 15 | 410 | 14 | 340 | 6.1 | 527 | |
| 2007-06 | MW-1005P | | 1135.99 | 260 | < 0.83 | < 2.7 | 220 | 0.24 | 71 | < 2.5 | 200 | 7 | 464 | 6 |
| 2007-06 | MW-1005S | | 1136.17 | 170 | 2.1 | < 2.7 | 160 | 4.2 | 230 | 2.9 | 220 | 7 | 331 | |
| 2007-06 | MW-1010P | | 1086.67 | 150 | 4.7 | < 2.7 | 160 | 0.031 | 150 | 15 | 180 | 7.4 | 326 | 86 |
| 2007-06 | MW-1013 | | 1110.51 | 610 | 3 | < 13 | 560 | 9.6 | 23000 | 61 | 700 | 6.1 | 1144 | 84 |
| 2007-06 | MW-1013A | | 1096.07 | 360 | 2.1 | < 13 | 430 | < 0.33 | 1200 | 170 | 530 | 6.6 | 974 | 100 |
| 2007-06 | MW-1013B | | 1096.39 | 620 | 3.8 | 240 | 2100 | < 0.33 | 21000 | 1600 | 3000 | 6.2 | 3131 | 216 |
| 2007-06 | MW-1013C | | 1097.64 | 590 | 22 | < 13 | 2200 | 11 | 10000 | 1700 | 3100 | 6.4 | | 71 |
| 2007-06 | MW-1014 | | 1115.87 | 180 | 1.8 | < 13 | 260 | < 0.33 | 310 | 170 | 450 | 6.4 | 701 | 187 |
| 2007-06 | MW-1014 | Dup. | | 190 | 2.8 | 15 | 330 | < 0.33 | 380 | 170 | 430 | | | |
| 2007-06 | MW-1014A | | 1113.49 | 490 | 4.4 | < 13 | 1300 | < 0.33 | 640 | 1000 | 1800 | 6.5 | 2187 | 182 |
| 2007-06 | MW-1014B | | 1110.64 | 570 | 6.6 | 600 | 1900 | < 0.33 | 14000 | 1400 | 2500 | 6.3 | 2888 | 197 |
| 2007-06 | MW-1014C | | 1106.19 | 360 | 19 | < 13 | 580 | 5.8 | 1900 | 270 | 720 | 6.6 | 1050 | 51 |
| 2007-06 | MW-1015A | | 1086.78 | 79 | < 0.83 | < 2.7 | 86 | < 0.005 | 8.8 | 8.5 | 110 | 6.9 | 187 | 285 |
| 2007-06 | MW-1015B | | 1086.85 | | | | | | | | | | | |
| 2007-07 | MW-1015B | | | 180 | < 0.83 | < 2.7 | 140 | 0.34 | 100 | < 2.5 | 290 | 7.6 | 594 | -27 |
| 2007-10 | MW-1000PR | | 1089.31 | 230 | 26 | < 2.7 | 520 | 4.7 | 2800 | 300 | 650 | 6.5 | 933 | 74 |
| 2007-10 | MW-1000R | | 1090.03 | | | | | | | | | | | |
| 2007-10 | MW-1002 | | 1090.85 | 44 | < 0.83 | < 2.7 | 50 | < 0.005 | < 1 | 4.9 | 27 | 6.7 | 113 | |
| 2007-10 | MW-1002G | | 1090.79 | 90 | < 0.83 | < 2.7 | 110 | < 0.005 | < 1 | 8.5 | 77 | 6.7 | 228 | |
| 2007-10 | MW-1004 | | 1109.54 | | | | | | | | | | | |
| 2007-10 | MW-1004P | | 1105.02 | 160 | < 0.83 | < 2.7 | 150 | 0.19 | 84 | < 2.5 | 110 | 7.3 | 296 | 72 |
| 2007-10 | MW-1004S | | 1109.7 | 51 | 1.5 | < 2.7 | 93 | < 0.005 | < 1 | 31 | 120 | 6.3 | 214 | 211 |
| 2007-10 | MW-1005 | | 1137.93 | 51 | 2.6 | < 2.7 | 190 | 14 | 330 | 14 | 320 | 6.1 | 560 | |
| 2007-10 | MW-1005P | | 1136 | 250 | < 0.83 | < 2.7 | 230 | 0.31 | 61 | < 2.5 | 220 | 7.1 | 457 | -12 |
| 2007-10 | MW-1005S | | 1136.38 | 180 | 3.1 | < 2.7 | 160 | 4.3 | 230 | < 2.5 | 220 | 7.1 | 326 | |
| 2007-10 | MW-1010P | | 1089.09 | 160 | 13 | < 2.7 | 170 | 0.009 | 90 | 16 | 160 | 7.6 | 319 | 159 |
| 2007-10 | MW-1013 | | 1110.28 | 620 | < 1 | < 13 | 610 | 15 | 24000 | 53 | 740 | 6.2 | 1261 | 68 |
| 2007-10 | MW-1013A | | 1095.72 | 380 | < 1 | < 13 | 490 | < 0.33 | 2600 | 210 | 610 | 6.6 | 912 | 85 |
| 2007-10 | MW-1013B | | 1095.86 | 690 | 3.7 | 500 | 2300 | < 0.33 | 38000 | 1600 | 3100 | 6.3 | 3182 | 227 |
| 2007-10 | MW-1013C | | 1097.98 | 570 | 16 | < 13 | 2300 | 9.7 | 11000 | 1800 | 3100 | 6.3 | 3108 | 56 |
| 2007-10 | MW-1014 | | 1115.95 | 190 | < 1 | 33 | 350 | < 0.33 | 580 | 180 | 470 | 6.4 | 739 | 220 |
| 2007-10 | MW-1014A | | 1113.13 | 560 | < 1 | < 13 | 1400 | < 0.33 | 890 | 940 | 1900 | 6.6 | 2175 | 218 |
| 2007-10 | MW-1014A | Dup. | | 510 | 1.5 | 27 | 1400 | < 0.33 | 880 | 860 | 1800 | | | |
| 2007-10 | MW-1014B | | 1110.47 | 520 | 1.9 | 490 | 1900 | < 0.33 | 13000 | 1300 | 2500 | 6.4 | 2670 | 234 |
| 2007-10 | MW-1014C | | 1106.22 | 360 | 19 | < 13 | 600 | 5.8 | 2000 | 260 | 670 | 6.6 | 1041 | 57 |
| 2007-10 | MW-1015A | | 1087.98 | 86 | < 0.83 | < 2.7 | 91 | < 0.005 | 8.7 | 9.2 | 140 | 7 | 188 | 169 |
| 2007-10 | MW-1015A | Dup. | | 80 | < 0.83 | < 2.7 | 91 | < 0.005 | 8.6 | 9.4 | 55 | | | |
| 2007-10 | MW-1015B | | 1087.7 | 180 | < 0.83 | < 2.7 | 160 | 0.33 | 100 | < 2.5 | 300 | 7.7 | 573 | -68 |
| 2008-01 | MW-1000PR | | 1087.62 | 230 | 4.6 | 13 | 460 | 0.31 | 2400 | 310 | 690 | 6.4 | 921 | 161 |
| 2008-01 | MW-1000PR | Dup. | | 220 | 5.3 | 12 | 490 | 0.32 | 2500 | 310 | 670 | | | |
| 2008-01 | MW-1000R | | 1088.01 | | | | | | | | | | | |
| 2008-01 | MW-1002 | | 1090.08 | 50 | 1 | < 2.7 | 53 | < 0.005 | < 1 | 6.2 | 97 | 6.6 | 122 | |
| 2008-01 | MW-1002G | | 1090.02 | 89 | < 0.83 | < 2.7 | 97 | < 0.005 | < 1 | 9.4 | 150 | 6.6 | 227 | |
| 2008-01 | MW-1004 | | 1106.62 | | | | | | | | | | | |
| 2008-01 | MW-1004P | | 1105.32 | 160 | 1.8 | < 2.7 | 140 | 0.036 | 66 | 2.7 | 230 | 7.2 | 286 | 122 |
| 2008-01 | MW-1004S | | 1106.72 | 63 | < 0.83 | < 2.7 | 89 | < 0.005 | < 1 | 33 | 150 | 6.3 | 215 | 208 |
| 2008-01 | MW-1005 | | 1137.51 | 51 | 2.7 | < 2.7 | 170 | 14 | 360 | 15 | 350 | 6.2 | 508 | |
| 2008-01 | MW-1005P | | 1136.5 | 220 | < 0.83 | < 2.7 | 170 | 0.25 | 33 | < 2.5 | 410 | 7.3 | 520 | -5 |
| 2008-01 | MW-1005S | | 1136.74 | 180 | 2 | < 2.7 | 150 | 4.1 | 220 | < 2.5 | 220 | 7 | 332 | |
| 2008-01 | MW-1010P | | 1087.63 | 160 | 5.3 | < 2.7 | 150 | 0.035 | 160 | 14 | 210 | 7.5 | 321 | 72 |
| 2008-01 | MW-1013 | | 1109.61 | 600 | 2.2 | < 13 | 590 | 14 | 24000 | 78 | 800 | 6.2 | 1183 | 63 |
| 2008-01 | MW-1013A | | 1097.1 | 370 | < 1 | < 13 | 410 | < 0.33 | 2100 | 170 | 590 | 6.6 | 963 | 85 |
| 2008-01 | MW-1013B | | 1097.27 | 620 | 3.9 | 400 | 2200 | < 0.33 | 31000 | 1500 | 3200 | 6.2 | 3141 | 206 |
| 2008-01 | MW-1013C | | 1098.85 | 590 | 22 | < 13 | 2100 | 9.1 | 10000 | 1800 | 3200 | 6.5 | 3203 | 58 |
| 2008-01 | MW-1014 | | 1117.28 | 170 | < 1 | < 13 | 310 | < 0.33 | 800 | 160 | 480 | 6.3 | 661 | 188 |
| 2008-01 | MW-1014A | | 1114.15 | 490 | < 1 | < 13 | 1300 | < 0.33 | 940 | 940 | 1900 | 6.6 | 2202 | 189 |
| 2008-01 | MW-1014B | | 1112.06 | 600 | 4.4 | 500 | 1900 | < 0.33 | 14000 | 1400 | 2800 | 6.4 | 2882 | 211 |
| 2008-01 | MW-1014C | | 1107.58 | 310 | 24 | < 13 | 550 | 5.4 | 1800 | 280 | 750 | 6.6 | 1081 | 59 |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008-01 | MW-1015A | | 1087.41 | 79 | < 0.83 | < 2.7 | 85 | < 0.005 | 7.3 | 11 | 140 | 7.1 | 189 | 248 |
| 2008-01 | MW-1015B | | 1087.61 | 180 | < 0.83 | < 2.7 | 140 | 0.29 | 94 | < 2.5 | 450 | 7.7 | 586 | -53 |
| 2008-04 | MW-1000PR | | 1091.29 | 230 | 4 | 7.8 | 490 | 0.33 | 2500 | 280 | 710 | 6.5 | 880 | 157 |
| 2008-04 | MW-1000R | | 1092.39 | | | | | | | | | | | |
| 2008-04 | MW-1002 | | 1092.08 | 53 | < 1.5 | < 2.7 | 56 | < 0.005 | < 1 | 5.8 | 96 | 6.5 | 134 | |
| 2008-04 | MW-1002G | | 1092.04 | 89 | < 1.5 | < 2.7 | 98 | < 0.005 | < 1 | 8.8 | 150 | 6.6 | 225 | |
| 2008-04 | MW-1004 | | 1109.95 | | | | | | | | | | | |
| 2008-04 | MW-1004P | | 1107.14 | 160 | < 1.5 | < 2.7 | 190 | 0.18 | 170 | 2.5 | 190 | 7.1 | 279 | 119 |
| 2008-04 | MW-1004S | | 1110.09 | 56 | < 1.5 | < 2.7 | 91 | < 0.005 | < 1 | 30 | 140 | 6.3 | 211 | 171 |
| 2008-04 | MW-1005 | | 1139.01 | 46 | 2.5 | < 2.7 | 170 | 14 | 330 | 14 | 320 | 6.1 | 453 | |
| 2008-04 | MW-1005P | | 1137.53 | 260 | < 1.5 | < 2.7 | 220 | 1.1 | 72 | < 0.25 | 350 | 6.9 | 478 | -7 |
| 2008-04 | MW-1005P | Dup. | | 220 | < 1.5 | < 2.7 | 220 | 1.1 | 72 | < 2.5 | 350 | 7.1 | 474 | |
| 2008-04 | MW-1005S | | 1137.92 | 180 | 2.9 | < 2.7 | 150 | 4.3 | 230 | 12 | 220 | 6.9 | 324 | |
| 2008-04 | MW-1010P | | 1091.2 | 160 | 5 | < 2.7 | 160 | 0.014 | 150 | 9.5 | 190 | 7.5 | 319 | 117 |
| 2008-04 | MW-1013 | | 1110.52 | 570 | 5.1 | < 13 | 580 | 4.1 | 23000 | 66 | 770 | 6.2 | 1155 | 52 |
| 2008-04 | MW-1013A | | 1096.94 | 330 | 1.5 | < 13 | 500 | < 0.33 | 2800 | 180 | 640 | 6.7 | 862 | 83 |
| 2008-04 | MW-1013B | | 1097.36 | 640 | < 1 | 530 | 2200 | < 0.33 | 40000 | 1500 | 3200 | 6.2 | 3200 | 201 |
| 2008-04 | MW-1013B | Dup. | | 630 | 2.9 | 550 | 2200 | < 0.33 | 39000 | 1400 | 3200 | 6.2 | 3209 | |
| 2008-04 | MW-1013C | | 1099.98 | 530 | 16 | < 13 | 2200 | 9.6 | 11000 | 1600 | 3200 | 6.4 | 3156 | 29 |
| 2008-04 | MW-1014 | | 1116.86 | 180 | < 1 | < 13 | 320 | < 0.33 | 260 | 160 | 490 | 6.3 | 683 | 149 |
| 2008-04 | MW-1014A | | 1114.25 | 480 | 1.2 | < 13 | 1700 | < 0.33 | 1100 | 880 | 1900 | 6.6 | 2202 | 142 |
| 2008-04 | MW-1014B | | 1111.97 | 570 | 1.9 | 570 | 1900 | < 0.33 | 14000 | 1400 | 2800 | 6.4 | 2815 | 157 |
| 2008-04 | MW-1014C | | 1107.87 | 310 | 24 | < 13 | 570 | 5.6 | 1900 | 190 | 780 | 6.6 | 1069 | 48 |
| 2008-04 | MW-1015A | | 1090.43 | 78 | < 1.5 | < 2.7 | 88 | < 0.005 | 8.1 | 9.7 | 140 | 6.9 | 185 | 153 |
| 2008-04 | MW-1015B | | 1090.08 | 180 | < 1.5 | < 2.7 | 150 | 0.3 | 86 | < 0.25 | 350 | 7.5 | 580 | -57 |
| 2008-06 | MW-1000PR | | 1087.84 | 220 | 3.7 | 21 | 500 | 0.46 | 2500 | 240 | 640 | 6.4 | 932 | 117 |
| 2008-06 | MW-1000R | | 1089.12 | | | | | | | | | | | |
| 2008-06 | MW-1002 | | 1092.92 | 56 | < 1.5 | < 2.7 | 66 | < 0.005 | < 1 | 7.1 | 81 | 6.6 | 143 | |
| 2008-06 | MW-1002G | | 1092.84 | 88 | < 1.5 | < 2.7 | 110 | < 0.005 | < 1 | 9.2 | 150 | 6.7 | 233 | |
| 2008-06 | MW-1002G | Dup. | | 88 | < 1.5 | < 2.7 | 110 | 0.035 | < 1 | 11 | 150 | 6.7 | 231 | |
| 2008-06 | MW-1004 | | 1109.48 | | | | | | | | | | | |
| 2008-06 | MW-1004P | | 1107.51 | 160 | < 1.5 | < 2.7 | 140 | 0.055 | 70 | 2.8 | 130 | 7.3 | 301 | 143 |
| 2008-06 | MW-1004S | | 1109.6 | 57 | < 1.5 | < 2.7 | 95 | < 0.005 | < 1 | 31 | 130 | 6.2 | 215 | 178 |
| 2008-06 | MW-1005 | | 1140.12 | 50 | 2.8 | < 2.7 | 180 | 15 | 380 | 16 | 440 | 6.1 | 511 | |
| 2008-06 | MW-1005P | | 1139 | 250 | < 1.5 | < 2.7 | 230 | 1.2 | 76 | < 2.5 | 230 | 7.2 | 460 | -8 |
| 2008-06 | MW-1005S | | 1139.17 | 170 | 1.6 | < 2.7 | 160 | 4.5 | 230 | < 2.5 | 190 | 7 | 332 | |
| 2008-06 | MW-1010P | | 1087.77 | 150 | 23 | < 2.7 | 160 | < 0.005 | 67 | 13 | 170 | 7.5 | 322 | 76 |
| 2008-06 | MW-1013 | | 1112.75 | 470 | 1.7 | 22 | 550 | 3.6 | 22000 | 60 | 660 | 6.2 | 1150 | 88 |
| 2008-06 | MW-1013A | | 1097.88 | 340 | 2 | < 13 | 630 | < 0.33 | 3500 | 270 | 740 | 6.6 | 1195 | 94 |
| 2008-06 | MW-1013B | | 1098.29 | 550 | 2.7 | 270 | 2200 | < 0.33 | 21000 | 1600 | 3100 | 6.2 | 3159 | 216 |
| 2008-06 | MW-1013C | | 1100 | 480 | 18 | < 13 | 2200 | 10 | 10000 | 1700 | 3100 | 6.4 | 3288 | 36 |
| 2008-06 | MW-1014 | | 1118.17 | 160 | < 1.5 | 22 | 310 | < 0.005 | 830 | 140 | 410 | 6.3 | 676 | 167 |
| 2008-06 | MW-1014A | | 1114.85 | 530 | 2 | < 13 | 1300 | < 0.33 | 410 | 910 | 1900 | 6.6 | 2211 | 167 |
| 2008-06 | MW-1014B | | 1113.44 | 580 | 4.8 | 580 | 1900 | < 0.33 | 14000 | 1300 | 2600 | 6.4 | 2972 | 202 |
| 2008-06 | MW-1014B | Dup. | | 480 | 5.5 | 570 | 2000 | < 0.33 | 14000 | 1400 | 2700 | 6.5 | 2975 | |
| 2008-06 | MW-1014C | | 1108.96 | 280 | 22 | < 13 | 550 | 5.4 | 1800 | 220 | 690 | 6.5 | 1061 | 52 |
| 2008-06 | MW-1015A | | 1088.69 | 79 | < 1.5 | 3 | 89 | < 0.005 | 6.3 | 10 | 110 | 7 | 189 | 132 |
| 2008-06 | MW-1015B | | 1088.85 | 180 | < 1.5 | < 2.7 | 150 | 0.2 | 89 | < 2.5 | 270 | 7.8 | 580 | 40 |
| 2008-10 | MW-1000PR | | 1086.95 | 230 | 2.7 | 13 | 480 | 0.63 | 2600 | 290 | 660 | 6.5 | 919 | 175 |
| 2008-10 | MW-1000R | | 1087.38 | | | | | | | | | | | |
| 2008-10 | MW-1002 | | 1090.2 | 54 | < 1.5 | < 2.7 | 58 | < 0.005 | < 1 | 6.4 | 87 | 6.5 | 135 | |
| 2008-10 | MW-1002G | | 1090.15 | 93 | < 1.5 | < 2.7 | 100 | < 0.005 | < 1 | 9.3 | 140 | 6.6 | 237 | |
| 2008-10 | MW-1004 | | 1105.94 | | | | | | | | | | | |
| 2008-10 | MW-1004P | | 1104.58 | 160 | < 1.5 | < 2.7 | 140 | 0.17 | 160 | 2.5 | 190 | 7.2 | 302 | 132 |
| 2008-10 | MW-1004S | | 1106.05 | 53 | < 1.5 | < 2.7 | 85 | < 0.005 | < 1 | 30 | 190 | 6.3 | 203 | 170 |
| 2008-10 | MW-1005 | | 1137.82 | 48 | 1.7 | < 2.7 | 270 | 13 | 330 | 13 | 460 | 5.9 | 861 | |
| 2008-10 | MW-1005P | | 1137.23 | 250 | < 1.5 | < 2.7 | 220 | 1.1 | 80 | < 2.5 | 240 | 7 | 468 | 6 |
| 2008-10 | MW-1005S | | 1137.36 | 180 | 2.2 | < 2.7 | 160 | 3.8 | 220 | < 2.5 | 230 | 7 | 336 | |
| 2008-10 | MW-1010P | | 1086.88 | 170 | 8.6 | < 2.7 | 160 | 0.024 | 120 | 9.5 | 190 | 7.5 | 328 | 133 |
| 2008-10 | MW-1013 | | 1111.19 | 610 | < 2.4 | < 13 | 590 | 14 | 24000 | 51 | 760 | 6.2 | 1389 | 62 |
| 2008-10 | MW-1013A | | 1096.84 | 310 | < 2.4 | < 13 | 450 | < 0.33 | 2700 | 210 | 620 | 6.7 | 854 | 78 |
| 2008-10 | MW-1013A | Dup. | | 340 | < 2.4 | < 13 | 460 | < 0.33 | 2700 | 200 | 620 | | | |
| 2008-10 | MW-1013B | | 1097.1 | 210 | < 2.4 | 260 | 2200 | < 0.33 | 20000 | 1700 | 3100 | 6.3 | 3134 | 213 |
| 2008-10 | MW-1013C | | 1098.96 | 530 | 17 | < 13 | 2200 | 9.4 | 10000 | 1700 | 3000 | 6.5 | 3163 | 50 |
| 2008-10 | MW-1014 | | 1119.24 | 190 | < 2.4 | 14 | 320 | < 0.33 | 310 | 180 | 540 | 6.4 | 739 | 165 |
| 2008-10 | MW-1014A | | 1116.06 | 470 | < 2.4 | < 13 | 1300 | < 0.33 | 590 | 970 | 2000 | 6.6 | 2185 | 162 |
| 2008-10 | MW-1014B | | 1113.37 | 460 | 2.8 | 480 | 1100 | < 0.33 | 13000 | 1400 | 2700 | 6.4 | 2814 | 174 |
| 2008-10 | MW-1014C | | 1108.49 | 310 | 17 | < 13 | 570 | 5.5 | 1800 | 260 | 730 | 6.6 | 1058 | 68 |
| 2008-10 | MW-1015A | | 1087.15 | 82 | < 1.5 | < 2.7 | 88 | < 0.005 | 6.5 | 11 | 130 | 6.9 | 188 | 62 |
| 2008-10 | MW-1015B | | 1087.16 | 180 | < 1.5 | < 2.7 | 150 | 0.32 | 66 | < 2.5 | 310 | 7.5 | 581 | -37 |
| 2008-10 | MW-1015B | Dup. | | 180 | < 1.5 | < 2.7 | 150 | 0.32 | 65 | < 2.5 | 300 | | | |
| 2009-01 | MW-1000PR | | 1087.63 | 220 | 4.9 | 17 | 470 | 0.34 | 2400 | 260 | 680 | 6.4 | 873 | 132 |
| 2009-01 | MW-1000R | | 1087.94 | | | | | | | | | | | |
| 2009-01 | MW-1002 | | 1089.6 | 52 | < 1.5 | < 2.7 | 63 | < 0.005 | < 1 | 6.5 | 140 | 6.7 | 141 | |
| 2009-01 | MW-1002G | | 1089.54 | 81 | < 1.5 | < 2.7 | 100 | < 0.005 | < 1 | 8.5 | 140 | 6.7 | 225 | |
| 2009-01 | MW-1004 | | 1104.46 | | | | | | | | | | | |
| 2009-01 | MW-1004P | | 1104.25 | 150 | 2.5 | < 2.7 | 140 | 0.41 | 170 | < 2.5 | 180 | 7.1 | 296 | 124 |
| 2009-01 | MW-1004S | | 1104.54 | 38 | < 1.5 | < 2.7 | 80 | < 0.005 | < 1 | 27 | 150 | 6.3 | 194 | 170 |
| 2009-01 | MW-1004S | Dup. | | 48 | < 1.5 | < 2.7 | 80 | 0.006 | < 1 | 28 | 120 | | | |
| 2009-01 | MW-1005 | | 1136.78 | 42 | 2.1 | 4.2 | 260 | 14 | 340 | 14 | 470 | 6.1 | 814 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009-01 | MW-1005P | | 1136.22 | 240 | < 1.5 | < 2.7 | 210 | 0.91 | 70 | < 2.5 | 260 | 7.2 | 472 | 7 |
| 2009-01 | MW-1005S | | 1136.46 | 170 | 1.8 | < 2.7 | 160 | 3.8 | 220 | < 2.5 | 230 | 7 | 339 | |
| 2009-01 | MW-1010P | | 1087.44 | 150 | 3.5 | < 2.7 | 160 | 0.02 | 140 | 13 | 200 | 7.5 | 315 | 106 |
| 2009-01 | MW-1013 | | 1109.57 | 560 | < 2.4 | < 13 | 620 | 13 | 25000 | 73 | 800 | 6.1 | 1230 | 52 |
| 2009-01 | MW-1013A | | 1096.69 | 300 | < 2.4 | < 13 | 440 | < 0.33 | 2400 | 180 | 620 | 6.6 | 953 | 62 |
| 2009-01 | MW-1013B | | 1096.95 | 660 | < 2.4 | 240 | 2200 | < 0.33 | 19000 | 1500 | 3200 | 6.2 | 3075 | 197 |
| 2009-01 | MW-1013C | | 1098.87 | 520 | 17 | < 13 | 2100 | 10 | 10000 | 1600 | 3100 | 6.3 | 3277 | 51 |
| 2009-01 | MW-1014 | | 1118.33 | 160 | < 2.4 | < 13 | 320 | < 0.33 | 260 | 140 | 540 | 6.4 | 729 | 196 |
| 2009-01 | MW-1014A | | 1115.84 | 490 | < 2.4 | < 13 | 1300 | < 0.33 | 560 | 1000 | 2100 | 6.6 | 2138 | 192 |
| 2009-01 | MW-1014B | | 1112.54 | 480 | < 2.4 | 480 | 1800 | < 0.33 | 13000 | 1300 | 2700 | 6.4 | 2908 | 216 |
| 2009-01 | MW-1014C | | 1107.83 | 300 | 23 | < 13 | 540 | 5.3 | 1800 | 240 | 810 | 6.6 | 1061 | 76 |
| 2009-01 | MW-1014C | Dup. | | 320 | 22 | < 13 | 540 | 5.3 | 1800 | 240 | 730 | | | |
| 2009-01 | MW-1015A | | 1087.52 | 78 | < 1.5 | < 2.7 | 86 | < 0.005 | 6.7 | 11 | 150 | 7.1 | 187 | 155 |
| 2009-01 | MW-1015B | | 1087.51 | 180 | < 1.5 | < 2.7 | 150 | 0.26 | 70 | < 2.5 | 300 | 7.6 | 599 | -38 |
| 2009-04 | MW-1000PR | | 1086.89 | 220 | 3.5 | 8.4 | 470 | 0.26 | 2300 | 280 | 650 | 6.5 | 906 | 155 |
| 2009-04 | MW-1000R | | 1087.37 | | | | | | | | | | | |
| 2009-04 | MW-1002 | | 1090.13 | 53 | < 1.5 | < 2.7 | 60 | < 0.005 | < 1 | 8.7 | 70 | 6.5 | 142 | |
| 2009-04 | MW-1002G | | 1090.07 | 85 | < 1.5 | < 2.7 | 100 | < 0.005 | < 1 | 7 | 89 | 6.6 | 237 | |
| 2009-04 | MW-1004 | | 1105.47 | | | | | | | | | | | |
| 2009-04 | MW-1004P | | 1103.73 | 160 | < 1.5 | < 2.7 | 140 | 0.072 | 63 | < 2.5 | 140 | 7.3 | 302 | 87 |
| 2009-04 | MW-1004S | | 1105.58 | 55 | < 1.5 | < 2.7 | 80 | 0.049 | 1.5 | 28 | 140 | 6.3 | 193 | 198 |
| 2009-04 | MW-1005 | | 1137.45 | 47 | < 1.5 | < 2.7 | 190 | 13 | 340 | 14 | 310 | 6.1 | 576 | |
| 2009-04 | MW-1005P | | 1135.83 | 210 | < 1.5 | < 2.7 | 210 | 0.27 | 62 | 2.7 | 280 | 7.1 | 540 | 22 |
| 2009-04 | MW-1005S | | 1136.18 | 170 | 3.6 | < 2.7 | 150 | 4 | 220 | < 2.5 | 200 | 7 | 330 | |
| 2009-04 | MW-1005S | Dup. | | 170 | 2.4 | < 2.7 | 150 | 4 | 220 | < 2.5 | 130 | 7 | 336 | |
| 2009-04 | MW-1010P | | 1086.85 | 160 | 18 | < 2.7 | 160 | 0.042 | 140 | 11 | 170 | 7.4 | 325 | 125 |
| 2009-04 | MW-1013 | | 1108.25 | 680 | < 2.4 | 4.4 | 570 | 4.3 | 23000 | 65 | 730 | 6.2 | 1172 | 91 |
| 2009-04 | MW-1013A | | 1096 | 390 | < 2.4 | < 1.3 | 370 | 0.071 | 960 | 150 | 530 | 6.7 | 856 | 98 |
| 2009-04 | MW-1013B | | 1096.3 | 490 | < 2.4 | 390 | 2100 | < 0.033 | 26000 | 1700 | 3000 | 6.2 | 3181 | 215 |
| 2009-04 | MW-1013C | | 1097.96 | 500 | 15 | < 1.3 | 2100 | 9.8 | 9100 | 1500 | 3100 | 6.4 | 3241 | 55 |
| 2009-04 | MW-1013C | Dup. | | 460 | 14 | < 1.3 | 2700 | 13 | 12000 | 1700 | 3100 | 6.4 | 3265 | 55 |
| 2009-04 | MW-1014 | | 1117.03 | 170 | < 2.4 | 6.3 | 300 | < 0.033 | 330 | 160 | 470 | 6.4 | 711 | 166 |
| 2009-04 | MW-1014A | | 1114.88 | 470 | < 2.4 | 4.8 | 1200 | < 0.033 | 210 | 1100 | 1900 | 6.6 | 2203 | 162 |
| 2009-04 | MW-1014B | | 1111.43 | 460 | < 2.4 | 550 | 1700 | < 0.033 | 11000 | 1400 | 2600 | 6.4 | 2850 | 178 |
| 2009-04 | MW-1014C | | 1106.8 | 310 | 20 | < 1.3 | 510 | 4.8 | 1600 | 260 | 720 | 6.6 | 1059 | 72 |
| 2009-04 | MW-1015A | | 1087.28 | 77 | < 1.5 | < 2.7 | 85 | < 0.005 | 6.5 | 10 | 120 | 7 | 193 | 162 |
| 2009-04 | MW-1015B | | 1087.27 | 170 | < 1.5 | < 2.7 | 150 | 0.28 | 69 | < 2.5 | 290 | 7.5 | 583 | -44 |
| 2009-06 | MW-1000PR | | 1086.9 | 230 | 3.5 | 15 | 450 | 0.52 | 2200 | 280 | 690 | 6.48 | 904 | 158 |
| 2009-06 | MW-1000R | | 1087.29 | | | | | | | | | | | |
| 2009-06 | MW-1002 | | 1089.92 | 47 | < 1.5 | < 2.7 | 49 | < 0.005 | < 1 | 5.2 | 64 | 6.64 | 120 | |
| 2009-06 | MW-1002G | | 1089.84 | 87 | < 1.5 | < 2.7 | 98 | < 0.005 | < 1 | 8.3 | 170 | 6.55 | 242 | |
| 2009-06 | MW-1002G | Dup. | | 86 | < 1.5 | < 2.7 | 98 | < 0.005 | < 1 | 8.7 | 150 | | | |
| 2009-06 | MW-1004 | | 1105.72 | | | | | | | | | | | |
| 2009-06 | MW-1004P | | 1104.32 | 160 | < 1.5 | < 2.7 | 130 | 0.067 | 57 | < 2.5 | 150 | 7.2 | 299.4 | 105 |
| 2009-06 | MW-1004S | | 1105.83 | 52 | < 1.5 | < 2.7 | 77 | 0.016 | < 1 | 28 | 95 | 6.3 | 189.4 | 202 |
| 2009-06 | MW-1005 | | 1137.78 | 47 | 1.8 | < 2.7 | 160 | 14 | 310 | 15 | 400 | 6.16 | 516 | |
| 2009-06 | MW-1005P | | 1136.49 | 240 | 2.1 | < 2.7 | 200 | 1.2 | 65 | < 2.5 | 270 | 7.09 | 488.1 | -4 |
| 2009-06 | MW-1005S | | 1136.79 | 170 | 5.9 | < 2.7 | 150 | 4.2 | 210 | < 2.5 | 240 | 6.98 | 332 | |
| 2009-06 | MW-1010P | | 1086.83 | 150 | 18 | < 2.7 | 150 | 0.026 | 120 | 16 | 200 | 7.44 | 333.8 | 100 |
| 2009-06 | MW-1013 | | 1110.6 | 580 | 3.2 | 14 | 520 | 5.3 | 21000 | 51 | 710 | 6.11 | 1153 | 86 |
| 2009-06 | MW-1013A | | 1096.57 | 320 | < 2.4 | < 13 | 460 | 0.044 | 2400 | 200 | 610 | 6.61 | 887 | 126 |
| 2009-06 | MW-1013B | | 1096.97 | 580 | 3.9 | 300 | 2000 | < 0.033 | 20000 | 1700 | 3200 | 6.17 | 3160 | 235 |
| 2009-06 | MW-1013B | Dup. | | 630 | 3.9 | 270 | 2000 | < 0.033 | 19000 | 1600 | 3200 | | | |
| 2009-06 | MW-1013C | | 1098.14 | 550 | 18 | < 13 | 2000 | 9.8 | 9800 | 1900 | 3100 | 6.35 | 3251 | 51 |
| 2009-06 | MW-1014 | | 1117.02 | 170 | < 2.4 | 30 | 290 | < 0.033 | 320 | 170 | 460 | 6.34 | 710 | 176 |
| 2009-06 | MW-1014A | | 1114.7 | 500 | 4.1 | 18 | 1200 | 0.12 | 200 | 970 | 1900 | 6.54 | 2195 | 180 |
| 2009-06 | MW-1014B | | 1111.48 | 510 | 2.4 | 490 | 1800 | < 0.033 | 13000 | 1300 | 2800 | 6.33 | 2893 | 216 |
| 2009-06 | MW-1014C | | 1106.86 | 300 | 19 | < 13 | 510 | 5 | 1600 | 260 | 720 | 6.59 | 1026 | 69 |
| 2009-06 | MW-1015A | | 1087.06 | 81 | < 1.5 | < 2.7 | 83 | < 0.005 | 6.4 | 11 | 130 | 6.83 | 196 | 172 |
| 2009-06 | MW-1015B | | 1087.01 | 180 | < 1.5 | < 2.7 | 140 | 0.23 | 73 | < 2.5 | 300 | 7.59 | 585 | -46 |
| 2009-10 | MW-1000PR | | 1086.56 | 220 | 2.8 | 9.7 | 500 | 0.38 | 2600 | 270 | 610 | 6.4 | 929 | 93 |
| 2009-10 | MW-1000R | | 1086.74 | | | | | | | | | | | |
| 2009-10 | MW-1002 | | 1088.96 | 51 | < 1.5 | 12 | 56 | < 0.0037 | 0.34 | 5.1 | 64 | 6.57 | 131 | |
| 2009-10 | MW-1002G | | 1088.91 | 80 | < 1.5 | < 0.31 | 110 | < 0.0037 | 0.21 | 8 | 130 | 6.59 | 240.8 | |
| 2009-10 | MW-1004 | | 1104.19 | | | | | | | | | | | |
| 2009-10 | MW-1004P | | 1103.1 | 160 | < 1.5 | < 0.31 | 150 | 1.3 | 350 | < 2.5 | 150 | 7.16 | 315.1 | 24 |
| 2009-10 | MW-1004S | | 1104.28 | 52 | < 1.5 | 1.5 | 77 | < 0.0037 | 2.3 | 24 | 110 | 6.21 | 185.5 | 182 |
| 2009-10 | MW-1005 | | 1135.95 | 33 | < 1.5 | 1.2 | 230 | 11 | 300 | 15 | 370 | 6.03 | 724 | |
| 2009-10 | MW-1005P | | 1135.44 | 250 | < 1.5 | < 0.31 | 220 | 0.83 | 72 | < 2.5 | 230 | 7.05 | 468.6 | -1 |
| 2009-10 | MW-1005S | | 1135.59 | 180 | 3.3 | < 0.31 | 170 | 4 | 220 | < 2.5 | 170 | 7.02 | 338.6 | |
| 2009-10 | MW-1005S | Dup. | | 180 | 4.1 | < 0.31 | 170 | 3.6 | 240 | < 2.5 | 180 | | | |
| 2009-10 | MW-1010P | | 1086.42 | 150 | 25 | < 0.31 | 160 | 0.02 | 110 | 18 | 160 | 7.43 | 327 | 74 |
| 2009-10 | MW-1013 | | 1110.93 | 600 | < 2.4 | 6.8 | 1100 | 10 | 23000 | 40 | 700 | 6.05 | 1153 | 75 |
| 2009-10 | MW-1013A | | 1096.23 | 320 | < 2.4 | 1.4 | 380 | 0.012 | 1400 | 170 | 520 | 6.61 | 862 | 98 |
| 2009-10 | MW-1013B | | 1096.47 | 600 | < 2.4 | 360 | 2100 | 0.031 | 23000 | 1600 | 3000 | 6.15 | 3185 | 227 |
| 2009-10 | MW-1013C | | 1097.8 | 510 | 15 | < 0.31 | 2100 | 9.8 | 10000 | 1700 | 3000 | 6.32 | 3289 | 63 |
| 2009-10 | MW-1014 | | 1117.09 | 170 | < 2.4 | 7.1 | 310 | < 0.0037 | 270 | 170 | 440 | 6.33 | 735 | 167 |
| 2009-10 | MW-1014A | | 1114.28 | 490 | < 2.4 | 19 | 1300 | 0.076 | 330 | 940 | 1800 | 6.52 | 2173 | 173 |
| 2009-10 | MW-1014B | | 1111.21 | 590 | 2.7 | 490 | 1900 | 0.010 | 13000 | 1500 | 2600 | 6.32 | 2964 | 209 |
| 2009-10 | MW-1014C | | 1106.57 | 300 | 20 | < 0.31 | 540 | 4.3 | 1700 | 230 | 670 | 6.55 | 1034 | 71 |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009-10 | MW-1014C | Dup. | | 290 | 20 | < 0.31 | 520 | 4.2 | 1600 | 250 | 670 | | | |
| 2009-10 | MW-1015A | | 1086.54 | 82 | < 1.5 | 0.37 | 88 | < 0.0037 | 7 | 11 | 98 | 6.82 | 192.4 | 105 |
| 2009-10 | MW-1015B | | 1086.53 | 180 | < 1.5 | < 0.31 | 150 | 0.12 | 69 | < 2.5 | 280 | 7.57 | 596 | -13 |
| 2009-12 | MW-1004P | | 1103.61 | 130 | < 0.80 | < 2.7 | 140 | 0.63 | 180 | < 2.5 | 110 | 7.1 | 301 | 105 |
| 2009-12 | MW-1004P | Dup. | | 130 | < 0.80 | < 2.7 | 73 | 0.32 | 95 | < 2.5 | 98 | | | |
| 2010-01 | MW-1000PR | | 1087.06 | 170 | < 1.5 | 12 | 450 | 0.32 | 2300 | 280 | 660 | 6.54 | 926 | 87 |
| 2010-01 | MW-1000R | | 1087.22 | | | | | | | | | | | |
| 2010-01 | MW-1002 | | 1089.13 | 39 | < 1.5 | < 2.7 | 54 | 0.007 | < 1 | 5.6 | 77 | 6.63 | 134.6 | |
| 2010-01 | MW-1002G | | 1089.07 | 65 | < 1.5 | < 2.7 | 100 | < 0.005 | < 1 | 8.4 | 160 | 6.64 | 257.9 | |
| 2010-01 | MW-1004 | | 1104.43 | | | | | | | | | | | |
| 2010-01 | MW-1004P | | 1103.32 | 130 | < 1.5 | < 2.7 | 130 | 0.09 | 72 | < 2.5 | 140 | 7.3 | 296.7 | 100 |
| 2010-01 | MW-1004P | Dup. | | 130 | < 1.5 | < 2.7 | 130 | 0.087 | 77 | < 2.5 | 170 | | | |
| 2010-01 | MW-1004S | | 1104.51 | 34 | < 1.5 | < 2.7 | 75 | < 0.005 | < 1 | 26 | 120 | 6.41 | 194.7 | 190 |
| 2010-01 | MW-1005 | | 1136.33 | 28 | < 1.5 | < 2.7 | 160 | 12 | 340 | 15 | 290 | 6.21 | 513 | |
| 2010-01 | MW-1005P | | 1135.48 | 190 | < 1.5 | < 2.7 | 200 | 1.2 | 62 | < 2.5 | 220 | 7.22 | 563 | -4 |
| 2010-01 | MW-1005S | | 1135.72 | 150 | 3.1 | < 2.7 | 150 | 4.2 | 220 | < 2.5 | 220 | 7.17 | 336.6 | |
| 2010-01 | MW-1010P | | 1086.94 | 120 | 18 | < 2.7 | 150 | 0.005 | 52 | 22 | 210 | 7.57 | 327.7 | 69 |
| 2010-01 | MW-1013 | | 1110.28 | 410 | < 2.4 | 8 | 550 | 5.7 | 23000 | 56 | 900 | 6.24 | 1133 | 70 |
| 2010-01 | MW-1013A | | 1096.36 | 250 | < 2.4 | < 1.3 | 450 | 0.077 | 3100 | 180 | 610 | 6.69 | 959 | 80 |
| 2010-01 | MW-1013B | | 1096.54 | 470 | < 2.4 | 290 | 2100 | < 0.033 | 20000 | 2400 | 3100 | 6.31 | 3180 | 220 |
| 2010-01 | MW-1013C | | 1098.23 | 440 | 18 | < 1.3 | 2000 | 9.2 | 9300 | 1700 | 3100 | 6.46 | 3249 | 54 |
| 2010-01 | MW-1014 | | 1116.71 | 120 | < 2.4 | 4.2 | 300 | 0.066 | 120 | 140 | 480 | 6.45 | 691 | 161 |
| 2010-01 | MW-1014A | | 1113.9 | 400 | < 2.4 | 7.6 | 1200 | < 0.033 | 190 | 1100 | 1900 | 6.67 | 2167 | 158 |
| 2010-01 | MW-1014B | | 1111.26 | 440 | 3.9 | 530 | 1700 | < 0.033 | 12000 | 1400 | 2700 | 6.4 | 2899 | 170 |
| 2010-01 | MW-1014C | | 1106.72 | 240 | 21 | < 1.3 | 500 | 4.9 | 1600 | 250 | 710 | 6.69 | 1026 | 67 |
| 2010-01 | MW-1014C | Dup. | | 240 | 18 | < 1.3 | 510 | 4.9 | 1600 | 240 | 700 | | | |
| 2010-01 | MW-1015A | | 1086.91 | 62 | < 1.5 | < 2.7 | 82 | 0.005 | 6.5 | 11 | 120 | 7.02 | 192 | 127 |
| 2010-01 | MW-1015B | | 1087.01 | 150 | < 1.5 | < 2.7 | 140 | 0.23 | 62 | < 2.5 | 300 | 7.6 | 581 | -16 |
| 2010-04 | MW-1000PR | | 1086.84 | 230 | 2.6 | 12 | 480 | 0.21 | 2300 | 240 | 650 | 6.44 | 914 | 131 |
| 2010-04 | MW-1000R | | 1087.42 | | | | | | | | | | | |
| 2010-04 | MW-1002 | | 1090.03 | 51 | < 1.5 | < 2.7 | 54 | < 0.005 | < 1 | 4 | 80 | 6.8 | 123.5 | |
| 2010-04 | MW-1002G | | 1089.96 | 88 | < 1.5 | < 2.7 | 110 | < 0.005 | < 1 | 7.3 | 160 | 6.62 | 262.2 | |
| 2010-04 | MW-1004 | | 1105.22 | | | | | | | | | | | |
| 2010-04 | MW-1004P | | 1103.76 | 170 | < 1.5 | < 2.7 | 140 | 0.35 | 190 | < 2.5 | 140 | 7.08 | 289.4 | 47 |
| 2010-04 | MW-1004S | | 1105.33 | 51 | < 1.5 | < 2.7 | 76 | < 0.005 | 1.1 | 23 | 85 | 6.29 | 180.3 | 257 |
| 2010-04 | MW-1005 | | 1137.52 | 48 | < 1.5 | < 2.7 | 160 | 14 | 330 | 13 | 370 | 6.29 | 504 | |
| 2010-04 | MW-1005P | | 1136.03 | 260 | < 1.5 | < 2.7 | 210 | 1.2 | 69 | < 2.5 | 240 | 6.98 | 469.5 | 6 |
| 2010-04 | MW-1005S | | 1136.33 | 180 | 2.2 | < 2.7 | 160 | 4.6 | 240 | < 2.5 | 190 | 6.9 | 345 | |
| 2010-04 | MW-1010P | | 1086.83 | 150 | 21 | < 2.7 | 160 | 0.028 | 110 | 16 | 170 | 7.44 | 329.7 | 111 |
| 2010-04 | MW-1013 | | 1110.58 | 580 | < 2.4 | < 13 | 570 | 3.7 | 24000 | 51 | 700 | 6.15 | 1133 | 110 |
| 2010-04 | MW-1013A | | 1096.1 | 360 | < 2.4 | < 13 | 450 | 0.072 | 2800 | 170 | 590 | 6.61 | 922 | 140 |
| 2010-04 | MW-1013B | | 1096.39 | 540 | < 2.4 | 400 | 2100 | < 0.066 | 29000 | 1400 | 3000 | 6.23 | 3181 | 260 |
| 2010-04 | MW-1013C | | 1097.76 | 550 | 16 | < 13 | 2100 | 11 | 10000 | 1600 | 3100 | 6.39 | 3280 | 57 |
| 2010-04 | MW-1014 | | 1115.93 | 170 | < 2.4 | < 13 | 310 | < 0.033 | 170 | 150 | 460 | 6.38 | 718 | 189 |
| 2010-04 | MW-1014A | | 1113.52 | 450 | < 2.4 | < 13 | 1300 | < 0.033 | 140 | 870 | 1800 | 6.55 | 2216 | 198 |
| 2010-04 | MW-1014B | | 1110.65 | 520 | < 2.4 | 510 | 1900 | < 0.033 | 13000 | 1400 | 2700 | 6.36 | 2879 | 233 |
| 2010-04 | MW-1014C | | 1106.17 | 300 | 20 | < 13 | 530 | 4.9 | 1700 | 210 | 690 | 6.59 | 1051 | 66 |
| 2010-04 | MW-1015A | | 1087.17 | 80 | < 1.5 | < 2.7 | 87 | < 0.005 | 6.8 | 9.5 | 130 | 6.97 | 217 | 75 |
| 2010-04 | MW-1015B | | 1087.2 | 180 | < 1.5 | < 2.7 | 150 | 0.1 | 58 | < 2.5 | 310 | 7.51 | 587 | -28 |
| 2010-06 | MW-1000PR | | 1091.22 | 240 | 4.9 | 19 | 440 | 0.35 | 2200 | 220 | 620 | 6.43 | 907 | 84 |
| 2010-06 | MW-1000R | | 1091.99 | | | | | | | | | | | |
| 2010-06 | MW-1002 | | 1091.26 | 49 | < 2.5 | 4.1 | 45 | < 0.005 | < 1 | 3.7 | 46 | 6.8 | 112.4 | |
| 2010-06 | MW-1002G | | 1091.23 | 93 | < 2.5 | 3.4 | 110 | < 0.005 | < 1 | 7.4 | 140 | 6.52 | 269.4 | |
| 2010-06 | MW-1004 | | 1108.24 | | | | | | | | | | | |
| 2010-06 | MW-1004P | | 1105.73 | 170 | < 2.5 | 3.4 | 140 | 0.32 | 160 | < 2.5 | 130 | 7.16 | 285.9 | 18 |
| 2010-06 | MW-1004S | | 1108.35 | 55 | < 2.5 | 5.1 | 74 | < 0.005 | < 1 | 23 | 84 | 6.29 | 177.3 | 205 |
| 2010-06 | MW-1005 | | 1139.47 | 52 | < 2.5 | 4.3 | 160 | 13 | 310 | 13 | 370 | 6.02 | 517 | |
| 2010-06 | MW-1005P | | 1137.87 | 240 | < 2.5 | 3.1 | 160 | 0.2 | 49 | < 2.5 | 300 | 7.01 | 617 | -11 |
| 2010-06 | MW-1005S | | 1138.29 | 190 | 3.6 | 2.9 | 150 | 4.3 | 220 | < 2.5 | 260 | 6.84 | 349.1 | |
| 2010-06 | MW-1010P | | 1091.45 | 170 | 23 | 7.2 | 150 | 0.022 | 100 | 18 | 140 | 7.39 | 331.1 | 68 |
| 2010-06 | MW-1013 | | 1113.03 | 590 | < 1.3 | < 13 | 550 | 2.4 | 23000 | 44 | 690 | 6.18 | 1096 | 96 |
| 2010-06 | MW-1013A | | 1096.58 | 350 | < 1.3 | < 13 | 450 | 0.08 | 2400 | 170 | 580 | 6.65 | 900 | 102 |
| 2010-06 | MW-1013B | | 1096.97 | 690 | 5 | 590 | 2100 | < 0.05 | 37000 | 1300 | 3100 | 6.22 | 3251 | 243 |
| 2010-06 | MW-1013C | | 1099.95 | 620 | 23 | < 13 | 2000 | 9.3 | 9800 | 1600 | 3000 | 6.37 | 3245 | 44 |
| 2010-06 | MW-1014 | | 1116.51 | 190 | < 1.3 | < 13 | 290 | < 0.05 | 140 | 140 | 450 | 6.44 | 691 | 162 |
| 2010-06 | MW-1014A | | 1113.64 | 510 | 3.7 | < 13 | 1300 | < 0.05 | 130 | 1000 | 1800 | 6.59 | 2186 | 158 |
| 2010-06 | MW-1014B | | 1111.55 | 550 | 3.9 | 560 | 1800 | < 0.05 | 12000 | 1000 | 2800 | 6.37 | 2888 | 166 |
| 2010-06 | MW-1014C | | 1107.56 | 310 | 24 | 16 | 500 | 4.6 | 1600 | 200 | 730 | 6.52 | 1011 | 59 |
| 2010-06 | MW-1015A | | 1090.08 | 84 | < 2.5 | 3.8 | 83 | < 0.005 | 7.2 | 10 | 110 | 6.71 | 194.6 | 165 |
| 2010-06 | MW-1015B | | 1090.43 | 190 | < 2.5 | 2.9 | 140 | 0.14 | 56 | < 2.5 | 270 | 7.45 | 600 | -55 |
| 2010-07 | MW-1014B | | 1111.44 | | | | | | | | | 6.31 | 2930 | |
| 2010-10 | MW-1000PR | | 1089.9 | 230 | 2.9 | < 2.7 | 460 | 0.56 | 2500 | 240 | 580 | 6.5 | 651 | 89 |
| 2010-10 | MW-1000R | | 1090.87 | 440 | < 2.5 | 99 | 530 | < 0.005 | 12000 | 110 | 640 | 6.29 | 747 | 162 |
| 2010-10 | MW-1002 | | 1094.8 | 54 | < 2.5 | < 2.7 | 60 | < 0.005 | < 1 | 5.3 | 55 | 6.59 | 108.8 | |
| 2010-10 | MW-1002G | | 1094.7 | 86 | < 2.5 | < 2.7 | 110 | < 0.005 | < 1 | 7.3 | 110 | 6.54 | 190.7 | |
| 2010-10 | MW-1002G | Dup. | | 85 | < 2.5 | < 2.7 | 110 | 0.007 | < 1 | 7.1 | 120 | | | |
| 2010-10 | MW-1004 | | 1110.13 | 37 | < 2.5 | < 2.7 | 39 | 0.032 | 1.6 | 8.4 | 43 | 6.44 | 77.3 | 245 |
| 2010-10 | MW-1004P | | 1107.78 | 160 | < 2.5 | < 2.7 | 140 | 0.45 | 160 | < 2.5 | 140 | 7.09 | 216.4 | 6 |
| 2010-10 | MW-1004S | | 1110.23 | 51 | < 2.5 | < 2.7 | 74 | < 0.005 | < 1 | 23 | 79 | 6.38 | 136.7 | 235 |
| 2010-10 | MW-1005 | | 1140.03 | 43 | < 2.5 | < 2.7 | 160 | 14 | 340 | 13 | 300 | 6.13 | 354 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010-10 | MW-1005P | | 1139.28 | 250 | < 2.5 | < 2.7 | 220 | 1.2 | 72 | < 2.5 | 220 | 7.02 | 303.5 | 3 |
| 2010-10 | MW-1005S | | 1139.5 | 190 | < 2.5 | < 2.7 | 160 | 4.4 | 230 | < 2.5 | 190 | 7.01 | 225.9 | |
| 2010-10 | MW-1010P | | 1089.72 | 150 | 21 | < 2.7 | 160 | 0.036 | 120 | 17 | 130 | 7.49 | 233.4 | 87 |
| 2010-10 | MW-1013 | | 1112.84 | 600 | < 1.3 | < 13 | 560 | 6.6 | 24000 | 40 | 730 | 6.15 | 870 | 80 |
| 2010-10 | MW-1013A | | 1097.84 | 370 | < 1.3 | < 13 | 470 | 0.12 | 3200 | 180 | 630 | 6.67 | 697 | 94 |
| 2010-10 | MW-1013B | | 1098.15 | 640 | < 1.3 | 530 | 2200 | < 0.05 | 37000 | 1500 | 3100 | 6.23 | 2334 | 248 |
| 2010-10 | MW-1013B | Dup. | | 670 | < 1.3 | 520 | 2200 | < 0.5 | 37000 | 1300 | 3100 | | | |
| 2010-10 | MW-1013C | | 1100.78 | 540 | 18 | < 13 | 2200 | 11 | 11000 | 1600 | 3000 | 6.37 | 2511 | 46 |
| 2010-10 | MW-1014 | | 1118.04 | 160 | < 1.3 | < 13 | 310 | < 0.05 | 520 | 130 | 400 | 6.42 | 488 | 167 |
| 2010-10 | MW-1014A | | 1114.4 | 490 | < 1.3 | < 13 | 1300 | < 0.05 | 130 | 630 | 1800 | 6.56 | 1595 | 159 |
| 2010-10 | MW-1014B | | 1113.34 | 550 | < 1.3 | 460 | 1900 | < 0.05 | 13000 | 1300 | 2700 | 6.39 | 1943 | 163 |
| 2010-10 | MW-1014C | | 1109.12 | 280 | 20 | < 13 | 530 | 5 | 1700 | 220 | 640 | 6.62 | 750 | 65 |
| 2010-10 | MW-1015A | | 1090.62 | 79 | < 2.5 | < 2.7 | 85 | < 0.005 | 7.9 | 9 | 61 | 6.7 | 140.3 | 113 |
| 2010-10 | MW-1015B | | 1090.67 | 180 | < 2.5 | < 2.7 | 150 | 0.16 | 58 | < 2.5 | 270 | 7.37 | 412.4 | 85 |
| 2011-02 | MW-1000PR | | 1090.08 | 230 | 5.1 | 8.7 | 420 | 0.16 | 2000 | 240 | 540 | 6.48 | 872 | 118 |
| 2011-02 | MW-1000R | | 1090.78 | 480 | < 2.5 | 110 | 430 | < 0.05 | 14000 | 110 | 570 | 6.35 | 910 | 133 |
| 2011-02 | MW-1002 | | 1092.56 | 64 | < 2.5 | < 2.7 | 68 | < 0.005 | < 1 | 6.2 | 87 | 6.53 | 166.2 | |
| 2011-02 | MW-1002G | | 1092.49 | 88 | < 2.5 | < 2.7 | 110 | 0.008 | < 1 | 7.7 | 85 | 6.57 | 272 | |
| 2011-02 | MW-1004 | | 1107.28 | 38 | < 2.5 | < 2.7 | 46 | 0.017 | < 1 | 14 | 5 | 6.61 | 118.2 | 229 |
| 2011-02 | MW-1004P | | 1106.13 | 160 | < 2.5 | < 2.7 | 130 | 0.09 | 68 | < 2.5 | 83 | 7.01 | 297 | 36 |
| 2011-02 | MW-1004S | | 1107.34 | 49 | < 2.5 | < 2.7 | 67 | 0.005 | < 1 | 22 | 45 | 6.72 | 177.2 | 254 |
| 2011-02 | MW-1005 | | 1140.68 | 47 | 2.5 | < 2.7 | 170 | 11 | 330 | 13 | 260 | 6.14 | 580 | |
| 2011-02 | MW-1005P | | 1140.33 | 250 | < 2.5 | < 2.7 | 200 | 1.2 | 59 | < 2.5 | 200 | 7.05 | 466.3 | -4 |
| 2011-02 | MW-1005S | | 1140.4 | 180 | 3.6 | < 2.7 | 150 | 4.1 | 220 | < 2.5 | 160 | 6.82 | 342.1 | |
| 2011-02 | MW-1005S | Dup. | | 190 | 3.2 | < 2.7 | 150 | 4.1 | 220 | < 2.5 | 130 | | | |
| 2011-02 | MW-1010P | | 1089.83 | 160 | 23 | < 2.7 | 150 | 0.010 | 92 | 15 | 130 | 7.22 | 330.6 | 235 |
| 2011-02 | MW-1013 | | 1112.81 | 640 | < 1.3 | < 13 | 580 | 1.8 | 24000 | 56 | 690 | 6.19 | 1164 | 157 |
| 2011-02 | MW-1013A | | 1099.29 | 340 | 1.4 | < 13 | 500 | 0.12 | 3600 | 180 | 570 | 6.59 | 990 | 267 |
| 2011-02 | MW-1013B | | 1099.55 | 570 | < 1.3 | 310 | 2100 | < 0.005 | 22000 | 1600 | 3000 | 6.17 | 3149 | 325 |
| 2011-02 | MW-1013C | | 1101.87 | 550 | 22 | < 13 | 2000 | 10 | 10000 | 1600 | 3000 | 6.35 | 2970 | 77 |
| 2011-02 | MW-1014 | | 1121.03 | 260 | < 1.3 | < 13 | 290 | 0.74 | 1900 | 110 | 420 | 6.56 | 793 | 135 |
| 2011-02 | MW-1014A | | 1117.75 | 490 | 3.7 | < 13 | 1300 | 0.016 | 210 | 960 | 1800 | 6.57 | 2215 | 192 |
| 2011-02 | MW-1014B | | 1115.76 | 550 | 1.7 | 370 | 1800 | < 0.005 | 12000 | 1300 | 2500 | 6.34 | 2903 | 221 |
| 2011-02 | MW-1014B | Dup. | | 530 | 4.2 | 370 | 1800 | < 0.005 | 12000 | 1300 | 2500 | | | |
| 2011-02 | MW-1014C | | 1110.94 | 280 | 23 | < 13 | 510 | 4.7 | 1600 | 220 | 600 | 6.64 | 1021 | 85 |
| 2011-02 | MW-1015A | | 1090.29 | 78 | < 2.5 | < 2.7 | 80 | < 0.005 | 6.4 | 11 | 63 | 6.56 | 185.8 | 90 |
| 2011-02 | MW-1015B | | 1090.29 | 180 | < 2.5 | < 2.7 | 140 | 0.14 | 58 | < 2.5 | 220 | 7.06 | 585 | -4 |
| 2011-04 | MW-1000PR | | 1088.85 | 230 | 5 | 6.4 | 430 | 0.36 | 2000 | 240 | 550 | 6.45 | 857 | 186 |
| 2011-04 | MW-1000R | | 1090.2 | 350 | < 2.5 | 100 | 420 | < 0.05 | 12000 | 140 | 520 | 6.4 | 831 | 198 |
| 2011-04 | MW-1002 | | 1094.24 | 68 | < 2.5 | < 2.7 | 74 | < 0.005 | < 1 | 7.2 | 43 | 6.51 | 169.8 | |
| 2011-04 | MW-1002G | | 1094.12 | 90 | < 2.5 | < 2.7 | 110 | 0.011 | < 1 | 8.9 | 120 | 6.67 | 272.6 | |
| 2011-04 | MW-1004 | | 1109.9 | 34 | < 2.5 | < 2.7 | 36 | 0.024 | 1.3 | 10 | 23 | 6.47 | 90 | 215 |
| 2011-04 | MW-1004P | | 1107.84 | 160 | < 2.5 | < 2.7 | 130 | 0.088 | 59 | < 2.5 | 90 | 7.12 | 296.6 | 41 |
| 2011-04 | MW-1004S | | 1109.97 | 49 | < 2.5 | 3 | 66 | < 0.005 | < 1 | 22 | 81 | 6.45 | 165.9 | 194 |
| 2011-04 | MW-1005 | | | 43 | < 2.5 | < 2.7 | 200 | 13 | 330 | 15 | 360 | 6.16 | 677 | |
| 2011-04 | MW-1005P | | 1140.97 | 250 | < 2.5 | < 2.7 | 210 | 1.3 | 61 | < 2.5 | 200 | 7.06 | 457.1 | 5 |
| 2011-04 | MW-1005S | | 1142.13 | 190 | < 2.5 | < 2.7 | 160 | 4.1 | 230 | < 2.5 | 190 | 6.96 | 349.7 | |
| 2011-04 | MW-1010P | | 1088.56 | 150 | 22 | < 2.7 | 160 | 0.022 | 65 | 25 | 140 | 7.29 | 326.7 | 118 |
| 2011-04 | MW-1013 | | 1114.4 | 630 | 2.2 | 43 | 600 | 1 | 25000 | 53 | 710 | 6.14 | 1159 | 128 |
| 2011-04 | MW-1013A | | 1099.34 | 350 | < 1.3 | 18 | 470 | 0.12 | 3300 | 190 | 560 | 6.57 | 913 | 105 |
| 2011-04 | MW-1013B | | 1099.78 | 630 | < 1.3 | 610 | 1800 | < 0.05 | 39000 | 1600 | 3200 | 6.22 | 3076 | 252 |
| 2011-04 | MW-1013C | | 1101.96 | 560 | 20 | < 13 | 2000 | 11 | 10000 | 1600 | 3000 | 6.36 | 3121 | 64 |
| 2011-04 | MW-1014 | | 1121.5 | 190 | 2 | 15 | 260 | 0.32 | 3700 | 120 | 410 | 6.41 | 700 | 169 |
| 2011-04 | MW-1014A | | 1118.32 | 480 | 2.1 | 14 | 1200 | < 0.05 | 180 | 990 | 1800 | 6.54 | 2205 | 168 |
| 2011-04 | MW-1014A | Dup. | | 500 | 2.4 | 19 | 1300 | < 0.05 | 180 | 910 | 1800 | | | |
| 2011-04 | MW-1014B | | 1116.4 | 540 | 3.3 | 420 | 1600 | < 0.05 | 11000 | 1300 | 2500 | 6.41 | 2369 | 157 |
| 2011-04 | MW-1014C | | 1111.43 | 290 | 21 | 16 | 500 | 4.9 | 1700 | 220 | 640 | 6.56 | 1007 | 80 |
| 2011-04 | MW-1015A | | 1089.95 | 77 | < 2.5 | < 2.7 | 82 | < 0.005 | 5.2 | 10 | 61 | 6.84 | 181.5 | 179 |
| 2011-04 | MW-1015B | | 1090.04 | 180 | < 2.5 | < 2.7 | 140 | 0.071 | 52 | < 2.5 | 210 | 7.37 | 586 | -21 |
| 2011-04 | MW-1015B | Dup. | | 190 | < 2.5 | < 2.7 | 140 | 0.072 | 52 | < 2.5 | 230 | | | |
| 2011-07 | MW-1000PR | | 1087.39 | 230 | 5.7 | 4.5 | 460 | 0.48 | 2200 | 230 | 590 | 6.44 | 848 | 168 |
| 2011-07 | MW-1000R | | 1088.49 | 350 | < 2.5 | 90 | 420 | 0.069 | 11000 | 120 | 540 | 6.35 | 794 | 182 |
| 2011-07 | MW-1002 | | 1092.27 | 66 | < 2.5 | < 1.3 | 82 | 0.015 | < 1 | 7 | 89 | 6.43 | 177.7 | |
| 2011-07 | MW-1002G | | 1092.17 | 88 | < 2.5 | < 1.3 | 130 | 0.04 | < 1 | 8.5 | 170 | 6.49 | 283.8 | |
| 2011-07 | MW-1002G | Dup. | | 88 | 2.9 | < 1.3 | 130 | 0.04 | < 1 | 9.2 | 170 | | | |
| 2011-07 | MW-1004 | | 1108.55 | 40 | < 2.5 | 3.5 | 45 | 0.044 | 2.5 | 11 | 52 | 6.29 | 95.4 | 264 |
| 2011-07 | MW-1004P | | 1107.09 | 160 | < 2.5 | < 1.3 | 150 | 0.19 | 90 | < 2.5 | 140 | 6.98 | 299.5 | -11 |
| 2011-07 | MW-1004S | | 1108.64 | 52 | < 2.5 | < 1.3 | 80 | 0.0083 | < 1 | 23 | 100 | 6.32 | 183.2 | 129 |
| 2011-07 | MW-1005 | | 1140.62 | 50 | < 2.5 | < 1.3 | 360 | 19 | 490 | 14 | 770 | 6.01 | 972 | |
| 2011-07 | MW-1005P | | 1140.79 | 250 | < 2.5 | < 1.3 | 230 | 1.3 | 74 | < 2.5 | 230 | 6.92 | 458.2 | -22 |
| 2011-07 | MW-1005S | | 1140.87 | 190 | < 2.5 | < 1.3 | 170 | 4.3 | 230 | < 2.5 | 200 | 6.84 | 353.3 | |
| 2011-07 | MW-1010P | | 1087.17 | 150 | 18 | < 1.3 | 170 | 0.031 | 58 | 25 | 160 | 7.29 | 328.4 | 80 |
| 2011-07 | MW-1013 | | 1115.09 | 660 | < 1.3 | 13 | 610 | 2.8 | 23000 | 38 | 700 | 6.01 | 1081 | 134 |
| 2011-07 | MW-1013 | Dup. | | 580 | 1.5 | 13 | 600 | 2.7 | 23000 | 37 | 720 | | | |
| 2011-07 | MW-1013A | | 1099.12 | 350 | < 1.3 | < 0.73 | 480 | 0.18 | 2700 | 150 | 540 | 6.52 | 856 | 299 |
| 2011-07 | MW-1013B | | 1099.58 | 620 | 3.2 | 560 | 2200 | 0.16 | 36000 | 1600 | 3100 | 6.16 | 3062 | 324 |
| 2011-07 | MW-1013C | | 1101.68 | 520 | 20 | < 1.5 | 2300 | 12 | 9900 | 1600 | 3000 | 6.24 | 3054 | 70 |
| 2011-07 | MW-1014 | | 1123.51 | 170 | 2 | 6.3 | 300 | 0.046 | 1600 | 120 | 440 | 6.34 | 638 | 148 |
| 2011-07 | MW-1014A | | 1119.85 | 500 | 2.4 | 2.1 | 1300 | 0.11 | 130 | 980 | 1900 | 6.52 | 2164 | 226 |
| 2011-07 | MW-1014B | | 1117.57 | 550 | 3.4 | 360 | 1800 | 0.12 | 11000 | 1300 | 2500 | 6.28 | 2720 | 244 |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011-07 | MW-1014C | | 1112.18 | 290 | 22 | < 0.73 | 540 | 4.9 | 1600 | 220 | 690 | 6.56 | 1017 | 81 |
| 2011-07 | MW-1015A | | 1088.12 | 84 | < 2.5 | < 1.3 | 92 | 0.016 | 4.8 | 10 | 88 | 6.45 | 187.6 | 176 |
| 2011-07 | MW-1015B | | 1088.27 | 180 | < 2.5 | < 1.3 | 160 | 0.15 | 58 | < 2.5 | 280 | 7.22 | 589 | -45 |
| 2011-10 | MW-1000PR | | 1087.64 | 260 | 7.6 | < 1.3 | 450 | 0.6 | 2200 | 220 | 590 | 6.5 | 825 | 104 |
| 2011-10 | MW-1000R | | 1088.35 | 350 | < 2.5 | 80 | 420 | 0.056 | 7200 | 77 | 550 | 6.35 | 771 | 130 |
| 2011-10 | MW-1002 | | 1090.82 | 75 | < 2.5 | < 1.3 | 73 | 0.0056 | < 1 | 5.3 | 95 | 6.81 | 148.5 | |
| 2011-10 | MW-1002G | | 1090.74 | 92 | < 2.5 | < 1.3 | 130 | 0.0076 | 1.8 | 8.9 | 180 | 6.71 | 279.9 | |
| 2011-10 | MW-1004 | | 1106.9 | 46 | < 2.5 | < 1.3 | 58 | 0.0062 | < 1 | 17 | 89 | 6.3 | 133 | 275 |
| 2011-10 | MW-1004 | Dup. | | 50 | < 2.5 | < 1.3 | 59 | 0.007 | < 1 | 17 | 70 | | | |
| 2011-10 | MW-1004P | | 1105.68 | 160 | < 2.5 | < 1.3 | 150 | 0.2 | 90 | < 2.5 | 150 | 7.14 | 300.2 | -30 |
| 2011-10 | MW-1004S | | 1106.96 | 53 | < 2.5 | < 1.3 | 72 | < 0.003 | 1 | 23 | 120 | 6.37 | 161.6 | 274 |
| 2011-10 | MW-1005 | | 1140 | 61 | < 2.5 | < 1.3 | 360 | 18 | 470 | 15 | 930 | 6.04 | 1117 | |
| 2011-10 | MW-1005P | | 1139.25 | 260 | < 2.5 | < 1.3 | 220 | 1.2 | 60 | < 2.5 | 220 | 7.08 | 458.7 | -33 |
| 2011-10 | MW-1005S | | 1139.8 | 180 | 2.8 | < 1.3 | 170 | 4.3 | 220 | < 2.5 | 200 | 6.85 | 338.1 | |
| 2011-10 | MW-1010P | | 1087.35 | 170 | 22 | < 1.3 | 170 | 0.011 | 43 | 26 | 190 | 7.44 | 337.2 | 15 |
| 2011-10 | MW-1013 | | 1113.28 | 610 | 2.2 | 5.7 | 600 | 5.5 | 25000 | 30 | 760 | 6.21 | 1198 | 56 |
| 2011-10 | MW-1013A | | 1098.53 | 350 | < 1.3 | < 0.73 | 440 | 0.15 | 2900 | 160 | 580 | 6.66 | 850 | 10 |
| 2011-10 | MW-1013B | | 1098.86 | 550 | < 1.3 | 520 | 2200 | 0.1 | 37000 | 1600 | 3100 | 6.28 | 3124 | 248 |
| 2011-10 | MW-1013C | | 1101.18 | 520 | 16 | < 0.73 | 2100 | 11 | 9400 | 1600 | 3100 | 6.24 | 3154 | 31 |
| 2011-10 | MW-1014 | | 1123.37 | 190 | < 1.3 | 1.6 | 310 | < 0.014 | 660 | 140 | 460 | 6.44 | 682 | 188 |
| 2011-10 | MW-1014A | | 1120.43 | 490 | < 1.3 | 4.2 | 1300 | 0.023 | 260 | 1000 | 1900 | 6.59 | 2166 | 206 |
| 2011-10 | MW-1014B | | 1116.86 | 470 | < 1.3 | 380 | 1800 | 0.035 | 11000 | 1400 | 2600 | 6.34 | 2860 | 218 |
| 2011-10 | MW-1014B | Dup. | | 500 | 1.8 | 380 | 1900 | 0.034 | 11000 | 1400 | 2600 | | | |
| 2011-10 | MW-1014C | | 1111.48 | 280 | 18 | < 0.73 | 530 | 4.9 | 1500 | 220 | 690 | 6.62 | 992 | 44 |
| 2011-10 | MW-1015A | | 1087.79 | 90 | < 2.5 | < 1.3 | 91 | 0.005 | 5.5 | 10 | 110 | 7.34 | 187.2 | 173 |
| 2011-10 | MW-1015B | | 1087.82 | 170 | < 2.5 | < 1.3 | 150 | 0.12 | 54 | < 2.5 | 290 | 7.62 | 588 | 106 |
| 2012-02 | MW-1000PR | | 1087.01 | 210 | 3.9 | 9.9 | 450 | 0.23 | 2100 | 240 | 560 | 6.5 | 849 | 303 |
| 2012-02 | MW-1000R | | 1087.58 | 380 | < 1.9 | 94 | 430 | 0.011 | 5500 | 41 | 510 | 6.43 | 772 | 307 |
| 2012-02 | MW-1002 | | 1089.73 | 65 | < 1.9 | < 1.3 | 76 | 0.0033 | < 1 | 5.3 | 89 | 6.53 | 168 | |
| 2012-02 | MW-1002G | | 1089.64 | 88 | < 1.9 | < 1.3 | 130 | 0.0044 | < 1 | 8.7 | 150 | 6.57 | 193.8 | |
| 2012-02 | MW-1004 | | 1105.22 | 47 | < 1.9 | 3.3 | 78 | 0.012 | 1.9 | 29 | 71 | 6.31 | 176.5 | 369 |
| 2012-02 | MW-1004P | | 1103.91 | 160 | < 1.9 | < 1.3 | 150 | 0.14 | 74 | < 2.5 | 130 | 7.05 | 303.7 | |
| 2012-02 | MW-1004S | | 1105.28 | 45 | < 1.9 | 2.4 | 71 | < 0.003 | < 1 | 21 | 73 | 6.46 | 164.2 | 365 |
| 2012-02 | MW-1005 | | 1138.42 | 51 | 1.9 | 3 | 380 | 19 | 500 | 15 | 670 | 5.93 | 1132 | |
| 2012-02 | MW-1005P | | 1138.16 | 240 | < 1.9 | < 1.3 | 230 | 1.3 | 60 | < 2.5 | 230 | 6.85 | 466.8 | -14 |
| 2012-02 | MW-1005S | | 1138.3 | 190 | 2.9 | < 1.3 | 170 | 4.2 | 220 | < 2.5 | 180 | 6.67 | 348.2 | |
| 2012-02 | MW-1010P | | 1086.7 | 150 | 22 | < 1.3 | 170 | 0.0072 | 61 | 24 | 160 | 7.89 | 334.7 | 196 |
| 2012-02 | MW-1013 | | 1110.98 | 600 | < 1.3 | 8.6 | 610 | 7 | 23000 | 45 | 740 | 6.16 | 1190 | 105 |
| 2012-02 | MW-1013A | | 1097.52 | 350 | < 1.3 | 2.1 | 440 | 0.11 | 2900 | 190 | 570 | 6.69 | 920 | 106 |
| 2012-02 | MW-1013B | | 1097.87 | 570 | 1.9 | 550 | 2200 | 0.04 | 32000 | 1700 | 3100 | 6.24 | 3157 | 353 |
| 2012-02 | MW-1013B | Dup. | | 590 | 6 | 550 | 2200 | 0.046 | 32000 | 1700 | 3200 | | | |
| 2012-02 | MW-1013C | | 1099.83 | 510 | 20 | 9.9 | 2200 | 13 | 9500 | 1700 | 3100 | 6.34 | 3169 | 72 |
| 2012-02 | MW-1014 | | 1120.98 | 180 | < 1.3 | 9.2 | 320 | < 0.014 | 1200 | 130 | 430 | 6.49 | 684 | 287 |
| 2012-02 | MW-1014A | | 1118.66 | 450 | 8.2 | 12 | 1300 | < 0.014 | 390 | 1100 | 1900 | 6.66 | 2189 | 279 |
| 2012-02 | MW-1014B | | 1114.78 | 500 | 6 | 440 | 1900 | < 0.014 | 11000 | 1400 | 2600 | 6.4 | 2859 | 211 |
| 2012-02 | MW-1014C | | 1109.59 | 290 | 22 | 2.9 | 530 | 4.9 | 1600 | 240 | 650 | 6.76 | 1035 | 68 |
| 2012-02 | MW-1015A | | 1087.22 | 77 | < 1.9 | < 1.3 | 92 | < 0.003 | 6 | 9.7 | 100 | 7.08 | 191.8 | 309 |
| 2012-02 | MW-1015B | | 1087.22 | 180 | < 1.9 | < 1.3 | 150 | 0.12 | 50 | < 2.5 | 240 | 7.38 | 607 | 41 |
| 2012-02 | MW-1015B | Dup. | | 180 | < 1.9 | < 1.3 | 150 | 0.12 | 51 | < 2.5 | 250 | | | |
| 2012-05 | MW-1000PR | | 1088.04 | 220 | 5.8 | 6.3 | 460 | 0.75 | 2000 | 250 | 570 | 6.93 | 303.8 | 117 |
| 2012-05 | MW-1000R | | 1088.85 | 140 | 1.9 | 20 | 130 | 0.0031 | 800 | 27 | 200 | 5.88 | 229.5 | 279 |
| 2012-05 | MW-1002 | | 1090.95 | 58 | < 1.9 | < 1.3 | 69 | < 0.003 | < 1 | 4.9 | 73 | 7.12 | 150.3 | |
| 2012-05 | MW-1002G | | 1090.86 | 88 | < 1.9 | < 1.3 | 130 | < 0.003 | < 1 | 8.4 | 160 | 6.73 | 285 | |
| 2012-05 | MW-1002G | Dup. | | 88 | < 1.9 | < 1.3 | 130 | < 0.003 | < 1 | 8.5 | 170 | | | |
| 2012-05 | MW-1004 | | 1108.29 | 49 | < 1.9 | 1.6 | 85 | 0.0066 | 3.1 | 31 | 120 | 6.33 | 171.8 | 366 |
| 2012-05 | MW-1004P | | 1105.73 | 160 | < 1.9 | < 1.3 | 150 | 0.079 | 89 | < 2.5 | 130 | 6.93 | 303.8 | |
| 2012-05 | MW-1004S | | 1108.35 | 46 | < 1.9 | < 1.3 | 73 | < 0.003 | < 1 | 22 | 84 | 7.59 | 167.8 | 347 |
| 2012-05 | MW-1005 | | 1140.64 | 51 | < 1.9 | < 1.3 | 300 | 14 | 370 | 15 | 770 | 6.18 | 920 | |
| 2012-05 | MW-1005P | | 1139.63 | 240 | < 1.9 | < 1.3 | 230 | 1.3 | 61 | < 2.5 | 240 | 6.99 | 472 | -20 |
| 2012-05 | MW-1005S | | 1139.93 | 180 | 2.4 | < 1.3 | 180 | 4.1 | 220 | < 2.5 | 200 | 6.89 | 351.1 | |
| 2012-05 | MW-1010P | | 1087.88 | 140 | 25 | < 1.3 | 180 | < 0.003 | 35 | 26 | 180 | 7.22 | 344.5 | 194 |
| 2012-05 | MW-1013 | | 1112 | 610 | 1.8 | 7.6 | 600 | 5 | 22000 | 31 | 730 | 6.12 | 1148 | 85 |
| 2012-05 | MW-1013A | | 1097.79 | 340 | 3.8 | 1.2 | 510 | 0.059 | 3000 | 190 | 610 | 6.69 | 938 | 135 |
| 2012-05 | MW-1013B | | 1098.26 | 560 | < 1.3 | 540 | 2100 | < 0.028 | 32000 | 1700 | 3100 | 6.2 | 3236 | 358 |
| 2012-05 | MW-1013C | | 1100.12 | 500 | 10 | 6.7 | 2000 | 12 | 9600 | 1700 | 3000 | 6.41 | 3220 | 57 |
| 2012-05 | MW-1014 | | 1120.13 | 170 | < 1.3 | 7 | 310 | < 0.014 | 1000 | 130 | 440 | 6.38 | 670 | 278 |
| 2012-05 | MW-1014A | | 1117.79 | 440 | < 2.6 | 7.1 | 1300 | < 0.014 | 95 | 930 | 1900 | 6.53 | 2178 | 242 |
| 2012-05 | MW-1014A | Dup. | | 500 | < 2.6 | 7.4 | 1300 | < 0.014 | 97 | 940 | 1800 | | | |
| 2012-05 | MW-1014B | | 1114.33 | 490 | 2.9 | 520 | 1800 | < 0.014 | 10000 | 1400 | 2600 | 6.32 | 2857 | 139 |
| 2012-05 | MW-1014C | | 1109.42 | 280 | 28 | 0.86 | 540 | 4.8 | 1500 | 240 | 690 | 6.56 | 1016 | 60 |
| 2012-05 | MW-1015A | | 1088.07 | 78 | < 1.9 | < 1.3 | 92 | < 0.003 | 5.9 | 9.9 | 100 | 7.61 | 191.6 | 237 |
| 2012-05 | MW-1015B | | 1087.97 | 180 | < 1.9 | < 1.3 | 150 | 0.077 | 47 | < 2.5 | 260 | 7.63 | 605 | 226 |
| 2012-06 | MW-1000PR | | 1089.54 | 220 | < 1.9 | 9.4 | 440 | 0.3 | 2300 | 240 | 580 | 6.4 | 862 | -121 |
| 2012-06 | MW-1000R | | 1090.43 | 120 | 22 | 18 | 150 | < 0.003 | 140 | 45 | 200 | 5.9 | 357.3 | 235 |
| 2012-06 | MW-1002 | | 1091.56 | 57 | 3.2 | < 1.3 | 61 | < 0.003 | < 1 | 4.2 | 41 | 6.69 | 130.5 | |
| 2012-06 | MW-1002G | | 1091.46 | 89 | < 1.9 | < 1.3 | 130 | < 0.006 | < 1 | 8.8 | 150 | 6.56 | 292 | |
| 2012-06 | MW-1004 | | 1109.28 | 41 | 3.3 | 2.3 | 56 | 0.0095 | 2.6 | 18 | 51 | 6.25 | 131.4 | 366 |
| 2012-06 | MW-1004P | | 1106.62 | 160 | < 1.9 | < 1.3 | 140 | 0.15 | 99 | < 2.5 | 110 | 7.01 | 305.4 | |
| 2012-06 | MW-1004S | | 1109.35 | 50 | < 1.9 | 1.7 | 76 | < 0.003 | < 1 | 23 | 98 | 6.32 | 175.9 | 344 |
| 2012-06 | MW-1005 | | 1140.74 | 52 | < 1.9 | < 1.3 | 300 | 14 | 410 | 15 | 700 | 5.99 | 973 | |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012-06 | MW-1005P | | 1139.98 | 250 | < 1.9 | < 1.3 | 220 | 1.3 | 66 | < 2.5 | 210 | 6.97 | 489.99 | -38 |
| 2012-06 | MW-1005S | | 1140.22 | 190 | < 1.9 | < 1.3 | 170 | 4.1 | 250 | < 2.5 | 170 | 6.84 | 355.4 | |
| 2012-06 | MW-1010P | | 1089.51 | 150 | 24 | < 1.3 | 170 | < 0.003 | 49 | 27 | 160 | 7.21 | 349.5 | 171 |
| 2012-06 | MW-1013 | | 1113.7 | 610 | < 1.3 | 9.3 | 570 | 3.8 | 22000 | 34 | 700 | 6.1 | 1134 | 143 |
| 2012-06 | MW-1013A | | 1097.96 | 340 | < 1.3 | 0.99 | 480 | 0.039 | 3300 | 190 | 610 | 6.62 | 934 | 172 |
| 2012-06 | MW-1013B | | 1098.44 | 580 | 16 | 570 | 2200 | < 0.014 | 34000 | 1600 | 3100 | 6.17 | 3257 | 345 |
| 2012-06 | MW-1013C | | 1100.99 | 560 | 6.3 | 5 | 2100 | 11 | 10000 | 1700 | 3000 | 6.38 | 3234 | 40 |
| 2012-06 | MW-1014 | | 1120.6 | 170 | < 1.3 | 7.1 | 300 | < 0.014 | 1300 | 120 | 380 | 6.35 | 664 | 297 |
| 2012-06 | MW-1014 | Dup. | | 170 | 8.5 | 6.2 | 300 | < 0.014 | 1300 | 120 | 410 | | | |
| 2012-06 | MW-1014A | | 1117.63 | 500 | < 1.3 | 6 | 1300 | < 0.028 | 38 | 1200 | 1800 | 6.56 | 2179 | 288 |
| 2012-06 | MW-1014B | | 1114.98 | 470 | < 1.3 | 400 | 1800 | < 0.014 | 11000 | 1300 | 2400 | 6.33 | 2919 | 146 |
| 2012-06 | MW-1014C | | 1110.19 | 290 | 24 | 0.79 | 530 | 4.6 | 1800 | 240 | 720 | 6.6 | 1033 | 56 |
| 2012-06 | MW-1015A | | 1088.95 | 79 | < 1.9 | < 1.3 | 89 | < 0.003 | 7 | 10 | 78 | 7.28 | 196.8 | 203 |
| 2012-06 | MW-1015A | Dup. | | 81 | < 1.9 | < 1.3 | 90 | < 0.003 | 6.9 | 10 | 83 | | | |
| 2012-06 | MW-1015B | | 1088.84 | 190 | < 1.9 | < 1.3 | 150 | 0.038 | 38 | < 2.5 | 240 | 7.57 | 611 | 123 |
| 2012-10 | MW-1000PR | | 1086.82 | 220 | < 1.9 | 8 | 480 | 0.23 | 2200 | 250 | 570 | 6.53 | 833 | -48 |
| 2012-10 | MW-1000R | | 1087.3 | 450 | < 1.9 | 160 | 500 | 0.0058 | 14000 | 32 | 560 | 6.5 | 854 | 283 |
| 2012-10 | MW-1002 | | 1089.16 | 60 | < 1.9 | < 1.3 | 69 | < 0.003 | < 1 | 4.5 | 30 | 6.79 | 149.3 | |
| 2012-10 | MW-1002G | | 1089.1 | 87 | < 1.9 | < 1.3 | 140 | < 0.003 | < 1 | 8.3 | 120 | 6.58 | 283.7 | |
| 2012-10 | MW-1004 | | 1104.99 | 50 | < 1.9 | 1.9 | 85 | 0.016 | 1.9 | 32 | 97 | 6.35 | 181.9 | 332 |
| 2012-10 | MW-1004P | | 1103.75 | 160 | < 1.9 | < 1.3 | 160 | 0.22 | 100 | < 2.5 | 140 | 6.94 | 307.6 | |
| 2012-10 | MW-1004S | | 1105.09 | 49 | < 1.9 | < 1.3 | 77 | < 0.003 | < 1 | 23 | 88 | 6.66 | 165.4 | 346 |
| 2012-10 | MW-1005 | | 1136.89 | 55 | < 1.9 | 1.9 | 500 | 17 | 520 | 15 | 800 | 5.92 | 1502 | |
| 2012-10 | MW-1005P | | 1134.07 | 250 | < 1.9 | < 1.3 | 240 | 1.4 | 61 | < 2.5 | 210 | 6.74 | 468.4 | -2 |
| 2012-10 | MW-1005S | | 1137.04 | 190 | 2.7 | < 1.3 | 180 | 4.4 | 230 | < 2.5 | 170 | 6.84 | 340.5 | |
| 2012-10 | MW-1010P | | 1086.45 | 150 | 19 | < 1.3 | 190 | < 0.003 | 34 | 28 | 160 | 7.11 | 345.3 | 255 |
| 2012-10 | MW-1013 | | 1111.26 | 630 | < 1.3 | 6.4 | 630 | 9.2 | 22000 | 27 | 810 | 6.15 | 1252 | 106 |
| 2012-10 | MW-1013 | Dup. | | 670 | < 1.3 | 7.8 | 730 | 10 | 27000 | 26 | 780 | | | |
| 2012-10 | MW-1013A | | 1097.36 | 320 | < 1.3 | 1.1 | 430 | 0.092 | 2700 | 150 | 530 | 6.61 | 881 | 318 |
| 2012-10 | MW-1013B | | 1097.7 | 600 | < 1.3 | 550 | 2200 | < 0.014 | 32000 | 1700 | 3100 | 6.21 | 3240 | 340 |
| 2012-10 | MW-1013C | | 1099.48 | 560 | 20 | 9.5 | 2200 | 13 | 8800 | 1700 | 3100 | 6.42 | 3250 | 41 |
| 2012-10 | MW-1014 | | 1120.8 | 190 | < 1.3 | 4.1 | 330 | < 0.014 | 600 | 130 | 420 | 6.49 | 686 | 255 |
| 2012-10 | MW-1014A | | 1118.09 | 480 | < 1.3 | 12 | 1500 | < 0.014 | 160 | 930 | 1800 | 6.55 | 2197 | 286 |
| 2012-10 | MW-1014B | | 1114.32 | 430 | < 1.3 | 350 | 1800 | < 0.014 | 10000 | 1200 | 2300 | 6.33 | 2702 | 193 |
| 2012-10 | MW-1014C | | 1109.18 | 290 | 24 | 1.3 | 550 | 4.9 | 1600 | 240 | 670 | 6.53 | 1032 | 63 |
| 2012-10 | MW-1015A | | 1086.79 | 80 | < 1.9 | < 1.3 | 99 | < 0.003 | 6.4 | 9.8 | 77 | 7.26 | 192.7 | 199 |
| 2012-10 | MW-1015B | | 1086.74 | 180 | < 1.9 | < 1.3 | 160 | 0.042 | 36 | < 2.5 | 230 | 7.36 | 601 | -23 |
| 2012-10 | MW-1015B | Dup. | | 180 | < 1.9 | < 1.3 | 150 | 0.046 | 41 | < 2.5 | 230 | | | |
| 2013-03 | MW-1000PR | | 1086.71 | 220 | 4.6 | 11 | 450 | 1.1 | 2100 | 230 | 570 | 6.61 | 848 | |
| 2013-03 | MW-1000PR | Dup. | | 220 | 5 | 11 | 460 | 1.1 | 2200 | 240 | 570 | | | |
| 2013-03 | MW-1000R | | 1087.19 | 470 | < 0.5 | 170 | 470 | 0.0098 | 13000 | 17 | 540 | 6.54 | 832 | 241 |
| 2013-03 | MW-1002 | | 1088.82 | 57 | < 0.5 | < 1.3 | 70 | 0.0035 | < 1 | 4.9 | 63 | 7.38 | 153 | |
| 2013-03 | MW-1002G | | 1088.75 | 80 | < 0.5 | 1.5 | 130 | < 0.003 | < 1 | 8.4 | 150 | 6.81 | 289.1 | |
| 2013-03 | MW-1004 | | | | | | | | | | | | | |
| 2013-03 | MW-1004P | | 1102.12 | 150 | < 0.5 | < 1.3 | 150 | 0.12 | 81 | 2.7 | 120 | 7.1 | 302.8 | |
| 2013-03 | MW-1004S | | 1103.3 | 49 | < 0.5 | 2.3 | 78 | < 0.003 | < 1 | 24 | 92 | 6.82 | 179.3 | 340 |
| 2013-03 | MW-1005 | | 1135.76 | 62 | < 0.5 | 3.6 | 530 | 21 | 580 | 15 | 930 | 5.93 | 1626 | |
| 2013-03 | MW-1005P | | 1135.2 | 240 | < 0.5 | < 1.3 | 230 | 1.4 | 63 | < 2.5 | 250 | 6.83 | 468.3 | 9 |
| 2013-03 | MW-1005S | | 1135.39 | 170 | 2.3 | < 1.3 | 170 | 4.3 | 230 | < 2.5 | 200 | 6.44 | 343.7 | |
| 2013-03 | MW-1010P | | 1086.43 | 150 | 20 | 1.4 | 180 | 0.0063 | 54 | 26 | 180 | 7.16 | 347.7 | 159 |
| 2013-03 | MW-1013 | | 1108.36 | 580 | 1.6 | 5.3 | 590 | 14 | 27000 | 39 | 760 | 6.17 | 1133 | 81 |
| 2013-03 | MW-1013A | | 1096.32 | 310 | < 1 | 0.87 | 410 | 0.14 | 2500 | 150 | 490 | 6.73 | 868 | |
| 2013-03 | MW-1013B | | 1096.68 | 580 | < 5 | 510 | 2400 | 0.058 | 37000 | 1700 | 3200 | 6.26 | 3222 | 326 |
| 2013-03 | MW-1013C | | 1098.53 | 550 | 20 | 8.1 | 2300 | 13 | 9900 | 1600 | 3000 | 6.34 | 3157 | 51 |
| 2013-03 | MW-1014 | | 1118.33 | 180 | < 1 | 3.6 | 310 | < 0.014 | 520 | 120 | 420 | 6.46 | 691 | 205 |
| 2013-03 | MW-1014A | | 1116.13 | 430 | < 2 | 10 | 1300 | < 0.014 | 360 | 890 | 1900 | 6.63 | 2180 | 272 |
| 2013-03 | MW-1014B | | 1112.33 | 480 | 2.3 | 370 | 1900 | < 0.014 | 11000 | 1300 | 2600 | 6.37 | 2752 | 291 |
| 2013-03 | MW-1014C | | 1107.49 | 270 | 21 | 1.5 | 530 | 4.9 | 1600 | 230 | 710 | 6.68 | 989 | 69 |
| 2013-03 | MW-1015A | | 1086.75 | 75 | < 0.5 | 1.4 | 93 | < 0.003 | 7 | 9.7 | 110 | 7.67 | 195.1 | 174 |
| 2013-03 | MW-1015B | | 1086.81 | 170 | < 0.5 | < 1.3 | 150 | 0.043 | 41 | < 2.5 | 230 | 7.43 | 593 | 141 |
| 2013-03 | MW-1015B | Dup. | | 180 | < 0.5 | < 1.3 | 150 | 0.046 | 40 | 2.6 | 250 | | | |
| 2013-05 | MW-1000PR | | 1089.45 | 210 | 2 | 7.5 | 440 | 0.17 | 1800 | 220 | 540 | 6.5 | 842 | 55 |
| 2013-05 | MW-1000R | | 1090.65 | 340 | < 0.5 | 37 | 390 | < 0.003 | 270 | 33 | 440 | 6.32 | 712 | 385 |
| 2013-05 | MW-1002 | | 1094.68 | 65 | < 0.5 | 1.5 | 71 | 0.0063 | < 1 | 5.8 | 42 | 6.78 | 162.6 | |
| 2013-05 | MW-1002G | | 1094.54 | 82 | < 0.5 | < 1.3 | 130 | < 0.003 | < 1 | 8.3 | 150 | 6.63 | 284 | |
| 2013-05 | MW-1004 | | 1109.12 | 36 | < 0.5 | 3.5 | 36 | 0.05 | 1.5 | 9.1 | 19 | 6.55 | 84.1 | 406 |
| 2013-05 | MW-1004P | | 1106.71 | 150 | < 0.5 | < 1.3 | 140 | 0.14 | 74 | 2.5 | 130 | 6.75 | 223.4 | |
| 2013-05 | MW-1004P | Dup. | | 150 | < 0.5 | < 1.3 | 140 | 0.13 | 71 | 2.6 | 140 | | | |
| 2013-05 | MW-1004S | | 1109.18 | 48 | < 0.5 | 1.8 | 78 | < 0.003 | < 1 | 25 | 84 | 6.5 | 182.4 | 374 |
| 2013-05 | MW-1005 | | 1138.68 | 50 | 0.97 | 1.6 | 330 | 16 | 430 | 15 | 740 | 5.98 | 1032 | |
| 2013-05 | MW-1005P | | 1137.03 | 220 | < 0.5 | < 1.3 | 220 | 0.37 | 64 | 4.1 | 250 | 6.66 | 556 | -3 |
| 2013-05 | MW-1005S | | 1137.47 | 170 | 2.1 | < 1.3 | 160 | 4.4 | 220 | < 2.5 | 170 | 6.55 | 340.3 | |
| 2013-05 | MW-1010P | | 1089.39 | 140 | 17 | < 1.3 | 170 | < 0.003 | 39 | 27 | 180 | 7.24 | 346.4 | 186 |
| 2013-05 | MW-1013 | | 1108.56 | 580 | < 1 | 6.3 | 540 | 12 | 24000 | 31 | 760 | 6.12 | 1181 | 45 |
| 2013-05 | MW-1013A | | 1097.63 | 330 | < 1 | 1.7 | 470 | 0.11 | 3100 | 190 | 640 | 6.69 | 870 | 127 |
| 2013-05 | MW-1013B | | 1098.09 | 520 | < 1 | 550 | 2100 | 0.053 | 35000 | 1600 | 3200 | 6.22 | 3229 | 372 |
| 2013-05 | MW-1013C | | 1100.47 | 540 | 15 | 6.4 | 2100 | 12 | 9100 | 1500 | 3100 | 6.32 | 3202 | 37 |
| 2013-05 | MW-1014 | | 1117.71 | 160 | < 1 | 5 | 290 | < 0.014 | 830 | 120 | 400 | 6.63 | 673 | 275 |
| 2013-05 | MW-1014A | | 1115.45 | 420 | < 1 | 6.5 | 1300 | < 0.014 | 53 | 970 | 1800 | 6.6 | 2251 | 283 |
| 2013-05 | MW-1014B | | 1112.67 | 470 | < 1 | 430 | 1800 | < 0.014 | 10000 | 1300 | 2700 | 6.41 | 2828 | 220 |

## Historical Groundwater Results - Quarterly Parameters

| Sample Date (yyyy-mm) | Location | | Water Elevation ft | Alkalinity as CaCO3 mg/l | Arsenic ug/l | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Total Dissolved Solids mg/l | pH s.u. | Conductivity umhos/cm | Redox Potential mV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013-05 | MW-1014C | | 1108.37 | 260 | 19 | 1.9 | 510 | 4.7 | 1500 | 210 | 720 | 6.73 | 1028 | 54 |
| 2013-05 | MW-1014C | Dup. | | 270 | 19 | 2.5 | 510 | 4.7 | 1500 | 220 | 670 | | | |
| 2013-05 | MW-1015A | | 1090.49 | 81 | < 0.5 | < 1.3 | 90 | < 0.003 | 6 | 9.9 | 92 | 6.86 | 189.2 | 200 |
| 2013-05 | MW-1015B | | 1090.73 | 170 | < 0.5 | < 1.3 | 150 | 0.17 | 58 | < 2.5 | 290 | 7.13 | 596 | -14 |
| 2013-06 | MW-1000PR | | 1089.33 | 210 | 14 | 4.6 | 470 | 1.3 | 2400 | 220 | 550 | 6.46 | 814 | 112 |
| 2013-06 | MW-1000R | | 1090.79 | 100 | < 0.5 | 11 | 110 | 0.0047 | 380 | 81 | 220 | 6.18 | 680 | 105 |
| 2013-06 | MW-1002 | | 1094.51 | 61 | < 0.5 | < 1.3 | 83 | < 0.003 | < 1 | 6.1 | 76 | 6.88 | 169 | |
| 2013-06 | MW-1002G | | 1094.41 | 81 | < 0.5 | < 1.3 | 140 | < 0.003 | < 1 | 8.1 | 150 | 6.76 | 282 | |
| 2013-06 | MW-1002G | Dup. | | 82 | < 0.5 | < 1.3 | 130 | < 0.003 | < 1 | 8.3 | 160 | | | |
| 2013-06 | MW-1004 | | 1110.6 | 30 | < 0.5 | 4.8 | 44 | 0.036 | 1.1 | 13 | 37 | 6.73 | 99 | 65 |
| 2013-06 | MW-1004P | | 1107.24 | 150 | 0.52 | 1.3 | 150 | 0.43 | 150 | 2.8 | 140 | 7.38 | 296 | 84 |
| 2013-06 | MW-1004S | | 1110.73 | 45 | < 0.5 | 3.1 | 82 | < 0.003 | < 1 | 27 | 110 | 6.31 | 181.2 | 75 |
| 2013-06 | MW-1005 | | 1139.69 | 47 | 1.3 | 2.4 | 330 | 18 | 460 | 14 | 690 | 5.96 | 891 | |
| 2013-06 | MW-1005P | | 1138.5 | 220 | < 0.5 | < 1.3 | 230 | 0.16 | 110 | 3 | 240 | 7.1 | 472 | 94 |
| 2013-06 | MW-1005S | | 1138.93 | 160 | 2.4 | < 1.3 | 180 | 4.8 | 240 | < 2.5 | 170 | 6.97 | 327 | |
| 2013-06 | MW-1010P | | 1089.16 | 140 | 22 | < 1.3 | 180 | 0.0051 | 82 | 26 | 170 | 7.66 | 346 | 111 |
| 2013-06 | MW-1013 | | 1110.7 | 560 | 1.3 | 5.2 | 600 | 17 | 27000 | 28 | 780 | 6.11 | 1168 | 46 |
| 2013-06 | MW-1013A | | 1098.36 | 320 | < 1 | 2.5 | 520 | 0.097 | 3000 | 220 | 670 | 6.64 | 934 | 47 |
| 2013-06 | MW-1013B | | 1098.83 | 510 | < 1 | 310 | 2200 | < 0.07 | 18000 | 1600 | 3100 | 6.18 | 3147 | 96 |
| 2013-06 | MW-1013C | | 1100.81 | 530 | 19 | 9.3 | 2200 | 15 | 10000 | 1600 | 3100 | 6.39 | 3162 | 91 |
| 2013-06 | MW-1014 | | 1118.1 | 150 | < 1 | 6.4 | 320 | 0.014 | 2100 | 110 | 440 | 6.49 | 633 | 57 |
| 2013-06 | MW-1014A | | 1115.44 | 430 | < 1 | 5.9 | 1300 | < 0.014 | 16 | 1000 | 1900 | 6.58 | 2155 | 80 |
| 2013-06 | MW-1014B | | 1113.25 | 450 | < 1 | 560 | 2000 | < 0.07 | 12000 | 1400 | 2800 | 6.3 | 2908 | 92 |
| 2013-06 | MW-1014B | Dup. | | 460 | < 1 | 610 | 1900 | < 0.07 | 13000 | 1400 | 2800 | | | |
| 2013-06 | MW-1014C | | 1109.06 | 270 | 21 | 1.6 | 550 | 5.1 | 1700 | 210 | 700 | 6.62 | 1017 | 60 |
| 2013-06 | MW-1015A | | 1090.03 | 73 | < 0.5 | < 1.3 | 96 | < 0.003 | 5.9 | 9.8 | 59 | 7.15 | 187 | 100 |
| 2013-06 | MW-1015B | | 1090.24 | 170 | < 0.5 | 1.4 | 160 | 0.089 | 55 | < 2.5 | 230 | 7.68 | 510 | 124 |
| 2013-10 | MW-1000PR | | 1087.73 | 210 | 6.6 | 10 | 420 | 0.72 | 2300 | 210 | 560 | 6.29 | 862 | 277.7 |
| 2013-10 | MW-1000R | | 1088.3 | 320 | < 1 | 88 | 400 | < 0.018 | 4500 | 93 | 510 | 6.2 | 816 | 334.7 |
| 2013-10 | MW-1002 | | 1090.67 | 52 | < 1 | < 1 | 120 | < 0.018 | < 1 | 4.8 | 81 | 6.31 | 149 | 363.5 |
| 2013-10 | MW-1002G | | 1090.62 | 80 | < 1 | < 1 | 61 | < 0.018 | < 1 | 7.9 | 150 | 6.36 | 281 | 351.5 |
| 2013-10 | MW-1002G | Dup. | | 81 | < 1 | < 1 | 120 | < 0.018 | < 1 | 7.7 | 140 | | | |
| 2013-10 | MW-1004 | | 1106.16 | 40 | < 1 | 3.1 | 59 | 0.028 | < 1 | 22 | 77 | 6.09 | 166 | 348.5 |
| 2013-10 | MW-1004P | | 1104.77 | 150 | < 1 | < 1 | 140 | 0.21 | 96 | < 2.5 | 150 | 7.08 | 336 | 256 |
| 2013-10 | MW-1004S | | 1106.27 | 46 | < 1 | 1 | 75 | 0.021 | < 1 | 29 | 110 | 6.0 | 212 | 361.4 |
| 2013-10 | MW-1005 | | 1137.63 | 57 | 1 | 1.8 | 430 | 17 | 470 | 15 | 860 | 5.78 | 1340 | 254.1 |
| 2013-10 | MW-1005P | | 1136.64 | 230 | < 1 | < 1 | 210 | 0.92 | 84 | < 2.5 | 250 | 7.05 | 503 | 117.6 |
| 2013-10 | MW-1005S | | 1136.84 | 170 | 2.3 | < 1 | 160 | 4.3 | 240 | < 2.5 | 210 | 6.95 | 357 | 45 |
| 2013-10 | MW-1010P | | 1087.5 | 150 | 18 | < 1 | 170 | < 0.018 | 60 | 23 | 180 | 7.42 | 358 | 259.4 |
| 2013-10 | MW-1013 | | 1110.51 | 600 | 1.2 | 3.9 | 570 | 11 | 28000 | 24 | 760 | 5.97 | 1296 | 173.4 |
| 2013-10 | MW-1013A | | 1096.77 | 310 | < 1 | < 1 | 410 | 0.13 | 3400 | 160 | 570 | 6.53 | 975 | 275 |
| 2013-10 | MW-1013B | | 1097.19 | 560 | < 1 | 500 | 2200 | 0.06 | 34000 | 1500 | 3100 | 6.1 | 3490 | 301.6 |
| 2013-10 | MW-1013C | | 1099.24 | 100 | 18 | < 1 | 2000 | 13 | 9700 | 1500 | 3200 | 6.31 | 3192 | 138 |
| 2013-10 | MW-1014 | | 1118.83 | 170 | < 1 | 4.6 | 300 | < 0.018 | 990 | 120 | 420 | 6.31 | 735 | 295.8 |
| 2013-10 | MW-1014A | | 1115.77 | 450 | < 1 | 3.8 | 1200 | 0.045 | 81 | 800 | 1900 | 6.48 | 2213 | 300 |
| 2013-10 | MW-1014B | | 1112.96 | 460 | < 1 | 510 | 1800 | < 0.018 | 12000 | 1300 | 2600 | 6.22 | 2942 | 260.5 |
| 2013-10 | MW-1014B | Dup. | | 510 | < 1 | 460 | 1800 | < 0.018 | 13000 | 1200 | 2600 | | | |
| 2013-10 | MW-1014C | | 1108.19 | 260 | 20 | < 1 | 490 | 4.7 | 1700 | 200 | 680 | 6.39 | 1155 | 163 |
| 2013-10 | MW-1015A | | 1087.76 | 75 | < 1 | < 1 | 81 | < 0.018 | 5.3 | 9 | 110 | 6.85 | 186 | 202.1 |
| 2013-10 | MW-1015B | | 1087.79 | 170 | < 1 | < 1 | 150 | 0.12 | 46 | < 2.5 | 280 | 7.65 | 553 | 257.1 |

## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2013

| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1000PR** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 3 | 5 | 0 | 2 | -4 | -1 | 6 | 0 | 2 | 0 | 4 | -5 | 0 |
| p-Level | 0.650 | 0.359 | 1.000 | 0.816 | 0.484 | 1.000 | 0.234 | 1.000 | 0.816 | 1.000 | 0.484 | 0.209 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 19 | 19 | 19 | 13 | 19 | 19 | 19 | 19 | 11 | 19 | 19 | 10 | 27 |
| Mann-Kendall S | -6 | 13 | -134 | 60 | -2 | 29 | -132 | 0 | 28 | 8 | 13 | -4 | -186 |
| p-Level | 0.863 | 0.678 | 0.000 | 0.000 | 0.973 | 0.332 | 0.000 | 1.000 | 0.033 | 0.809 | 0.678 | 0.795 | 0.000 |
| Trend | | | - | + | | | - | | | | | | - |
| **MW-1000R** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Mann-Kendall S | -3 | 0 | -3 | -3 | 3 | 0 | -3 | 0 | -3 | 0 | 1 | -1 | 0 |
| p-Level | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Mann-Kendall S | -3 | 0 | -3 | -3 | 3 | 0 | -3 | 0 | -3 | 0 | 1 | -1 | 0 |
| p-Level | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Trend | | | | | | | | | | | | | |
| **MW-1002** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 7 | 0 | 5 | 4 | 7 | 2 | 6 | 0 | 4 | 0 | 0 | 6 | 0 |
| p-Level | 0.159 | 1.000 | 0.359 | 0.484 | 0.159 | 0.816 | 0.234 | 1.000 | 0.484 | 1.000 | 1.000 | 0.084 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 15 | 15 | 14 | 10 | 15 | 15 | 14 | 15 | 10 | 15 | 15 | 9 | 25 |
| Mann-Kendall S | -9 | -14 | -3 | 31 | -21 | 12 | 1 | 0 | 14 | 4 | 4 | 2 | 0 |
| p-Level | 0.698 | 0.527 | 0.914 | 0.004 | 0.328 | 0.592 | 1.000 | 1.000 | 0.254 | 0.884 | 0.884 | 0.920 | 1.000 |
| Trend | | | | + | | | | | | | | | |
| **MW-1002G** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 8 | 0 | 8 | 8 | 3 | 0 | 7 | 0 | 10 | 0 | 0 | 4 | 0 |
| p-Level | 0.084 | 1.000 | 0.084 | 0.084 | 0.650 | 1.000 | 0.159 | 1.000 | 0.016 | 1.000 | 1.000 | 0.334 | 1.000 |
| Trend | | | | | | | | | + | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 15 | 15 | 14 | 10 | 15 | 15 | 14 | 15 | 10 | 15 | 15 | 9 | 25 |
| Mann-Kendall S | 47 | -14 | 25 | 39 | 5 | 0 | 27 | 0 | 13 | -17 | 0 | 12 | -14 |
| p-Level | 0.020 | 0.527 | 0.192 | 0.000 | 0.846 | 1.000 | 0.158 | 1.000 | 0.292 | 0.436 | 1.000 | 0.260 | 0.764 |
| Trend | | | | + | | | | | | | | | |
| **MW-1004** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Mann-Kendall S | -1 | 0 | 0 | 0 | -1 | 0 | -1 | 0 | -1 | 0 | 2 | -1 | 0 |
| p-Level | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Mann-Kendall S | -1 | 0 | 0 | 0 | -1 | 0 | -1 | 0 | -1 | 0 | 2 | -1 | 0 |
| p-Level | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Trend | | | | | | | | | | | | | |

## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2013

| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1004P** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 3 | -2 | 6 | 0 | 0 | 0 | 6 | 0 | 10 | -4 | 0 | -3 | 0 |
| p-Level | 0.650 | 0.816 | 0.234 | 1.000 | 1.000 | 1.000 | 0.234 | 1.000 | 0.016 | 0.484 | 1.000 | 0.542 | 1.000 |
| Trend | | | | | | | | | + | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 17 | 17 | 17 | 11 | 17 | 17 | 17 | 17 | 11 | 17 | 17 | 10 | 26 |
| Mann-Kendall S | 44 | 1 | 29 | -2 | -31 | 0 | 20 | 0 | 14 | 13 | 0 | -2 | 11 |
| p-Level | 0.076 | 0.984 | 0.253 | 0.940 | 0.220 | 1.000 | 0.440 | 1.000 | 0.320 | 0.627 | 1.000 | 0.931 | 0.828 |
| Trend | | | | | | | | | | | | | |
| **MW-1004S** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 3 | 0 | 5 | -4 | 5 | 1 | 6 | 0 | 8 | -4 | 0 | -2 | 0 |
| p-Level | 0.650 | 1.000 | 0.359 | 0.484 | 0.359 | 1.000 | 0.234 | 1.000 | 0.084 | 0.484 | 1.000 | 0.750 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 17 | 17 | 17 | 11 | 17 | 17 | 17 | 17 | 11 | 17 | 17 | 10 | 26 |
| Mann-Kendall S | 72 | -14 | 90 | -2 | -32 | 37 | 81 | 0 | -3 | -3 | 0 | -12 | 0 |
| p-Level | 0.002 | 0.598 | 0.000 | 0.940 | 0.204 | 0.140 | 0.000 | 1.000 | 0.880 | 0.936 | 1.000 | 0.336 | 1.000 |
| Trend | + | | + | | | | + | | | | | | |
| **MW-1005** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 4 | -7 | 4 | 5 | -1 | -1 | 5 | 0 | 4 | 0 | 0 | 6 | 0 |
| p-Level | 0.484 | 0.159 | 0.484 | 0.359 | 1.000 | 1.000 | 0.359 | 1.000 | 0.484 | 1.000 | 1.000 | 0.084 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 15 | 15 | 14 | 10 | 15 | 15 | 14 | 15 | 10 | 15 | 15 | 9 | 25 |
| Mann-Kendall S | 6 | 22 | -10 | 5 | -34 | 19 | -3 | 0 | 17 | 0 | -2 | 15 | 0 |
| p-Level | 0.808 | 0.305 | 0.629 | 0.728 | 0.103 | 0.380 | 0.914 | 1.000 | 0.156 | 1.000 | 0.961 | 0.150 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **MW-1005P** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 5 | 2 | 6 | 1 | 0 | 7 | 2 | 0 | 4 | 0 | 0 | 0 | 0 |
| p-Level | 0.359 | 0.816 | 0.234 | 1.000 | 1.000 | 0.159 | 0.816 | 1.000 | 0.484 | 1.000 | 1.000 | 1.000 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 15 | 15 | 15 | 10 | 15 | 15 | 15 | 15 | 10 | 15 | 15 | 9 | 25 |
| Mann-Kendall S | 3 | -11 | -8 | 28 | -10 | 31 | -4 | 0 | 11 | 4 | 0 | 21 | 8 |
| p-Level | 0.922 | 0.626 | 0.734 | 0.013 | 0.662 | 0.140 | 0.884 | 1.000 | 0.380 | 0.884 | 1.000 | 0.034 | 0.872 |
| Trend | | | | | | | | | | | | | |
| **MW-1005S** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 5 | 0 | 8 | 1 | 0 | 2 | 7 | 0 | 5 | -4 | 0 | 1 | 0 |
| p-Level | 0.359 | 1.000 | 0.084 | 1.000 | 1.000 | 0.816 | 0.159 | 1.000 | 0.359 | 0.484 | 1.000 | 1.000 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 15 | 15 | 14 | 10 | 15 | 15 | 14 | 15 | 10 | 15 | 15 | 9 | 25 |
| Mann-Kendall S | 42 | 0 | 26 | 4 | -9 | 12 | 36 | 0 | 24 | -5 | 4 | -4 | 0 |
| p-Level | 0.041 | 1.000 | 0.175 | 0.795 | 0.698 | 0.592 | 0.055 | 1.000 | 0.037 | 0.846 | 0.884 | 0.762 | 1.000 |
| Trend | | | | | | | | | | | | | |

## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2013

| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1010P** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 4 | 1 | 7 | 2 | 0 | 4 | 9 | 0 | 3 | 2 | 4 | -1 | 4 |
| p-Level | 0.484 | 1.000 | 0.159 | 0.816 | 1.000 | 0.484 | 0.050 | 1.000 | 0.650 | 0.816 | 0.484 | 1.000 | 0.484 |
| Trend | | | | | | | + | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 19 | 19 | 19 | 13 | 19 | 19 | 19 | 19 | 11 | 19 | 19 | 10 | 27 |
| Mann-Kendall S | 80 | -4 | 96 | 49 | -4 | 25 | 104 | 0 | 15 | -7 | 9 | -20 | 26 |
| p-Level | 0.005 | 0.918 | 0.000 | 0.002 | 0.918 | 0.406 | 0.000 | 1.000 | 0.282 | 0.836 | 0.782 | 0.090 | 0.606 |
| Trend | + | | + | + | | | + | | | | | | |
| **MW-1013** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 7 | 3 | 7 | 1 | 0 | 0 | 3 | 0 | 5 | 0 | 5 | 4 | 0 |
| p-Level | 0.159 | 0.650 | 0.159 | 1.000 | 1.000 | 1.000 | 0.650 | 1.000 | 0.359 | 1.000 | 0.359 | 0.334 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 9 | 9 | 7 | 9 |
| Mann-Kendall S | 2 | 11 | 15 | -21 | 0 | -1 | 11 | 0 | 12 | -2 | 13 | 4 | 0 |
| p-Level | 0.920 | 0.309 | 0.150 | 0.034 | 1.000 | 1.000 | 0.309 | 1.000 | 0.178 | 0.920 | 0.220 | 0.667 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **MW-1013A** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 8 | 0 | 5 | 1 | 0 | 2 | 7 | 0 | 8 | 0 | 4 | 1 | 0 |
| p-Level | 0.084 | 1.000 | 0.359 | 1.000 | 1.000 | 0.816 | 0.159 | 1.000 | 0.084 | 1.000 | 0.484 | 1.000 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 9 | 9 | 7 | 9 |
| Mann-Kendall S | -14 | 0 | -3 | 9 | 0 | -3 | 1 | 0 | 17 | 0 | 5 | -3 | -8 |
| p-Level | 0.180 | 1.000 | 0.841 | 0.417 | 1.000 | 0.841 | 1.000 | 1.000 | 0.047 | 1.000 | 0.687 | 0.772 | 0.476 |
| Trend | | | | | | | | | | | | | |
| **MW-1013B** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 4 | 0 | 7 | 0 | 0 | 9 | 7 | 0 | 0 | 0 | 5 | 0 | -3 |
| p-Level | 0.484 | 1.000 | 0.159 | 1.000 | 1.000 | 0.050 | 0.159 | 1.000 | 1.000 | 1.000 | 0.359 | 1.000 | 0.650 |
| Trend | | | | | | + | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 21 | 21 | 22 | 16 | 21 | 21 | 22 | 21 | 14 | 21 | 21 | 13 | 29 |
| Mann-Kendall S | 52 | 27 | -35 | 42 | -93 | 56 | -53 | 0 | 2 | -20 | -3 | -11 | 265 |
| p-Level | 0.124 | 0.438 | 0.342 | 0.064 | 0.004 | 0.098 | 0.144 | 1.000 | 0.957 | 0.570 | 0.952 | 0.550 | 0.000 |
| Trend | | | | | - | | | | | | | | + |
| **MW-1013C** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 7 | 0 | 4 | -2 | 0 | 9 | 4 | 0 | 2 | 0 | 4 | -2 | -6 |
| p-Level | 0.159 | 1.000 | 0.484 | 0.816 | 1.000 | 0.050 | 0.484 | 1.000 | 0.816 | 1.000 | 0.484 | 0.750 | 0.234 |
| Trend | | | | | | + | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 21 | 21 | 22 | 16 | 21 | 21 | 22 | 21 | 14 | 21 | 21 | 13 | 29 |
| Mann-Kendall S | 62 | -7 | -16 | 81 | -15 | 62 | -31 | 0 | 27 | -15 | -10 | -12 | -178 |
| p-Level | 0.064 | 0.858 | 0.676 | 0.000 | 0.676 | 0.064 | 0.402 | 1.000 | 0.158 | 0.676 | 0.788 | 0.510 | 0.000 |
| Trend | | | | + | | | | | | | | | - |

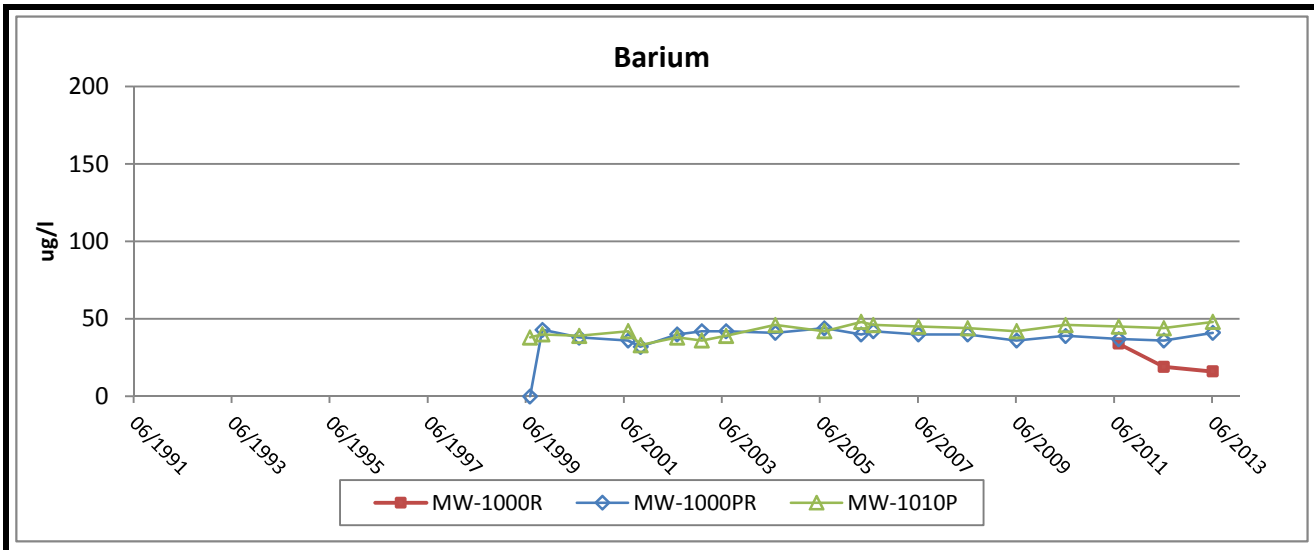
## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2013

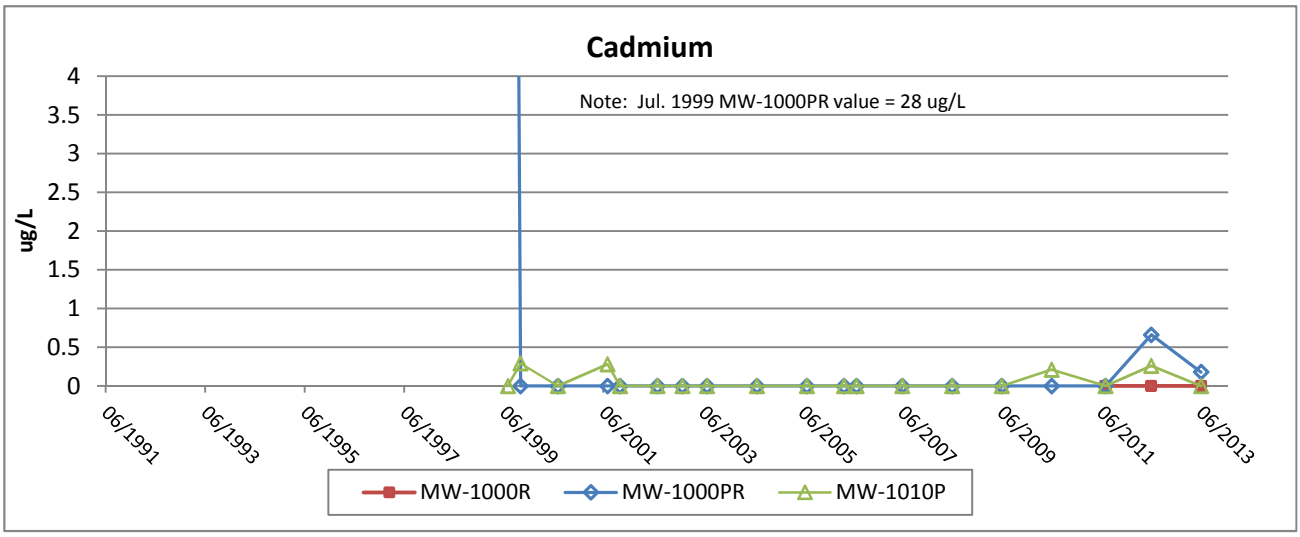
| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1014** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 0 | 2 | 7 | 7 | 0 | 2 | 8 | 0 | 6 | -2 | 4 | -3 | 7 |
| p-Level | 1.000 | 0.816 | 0.159 | 0.159 | 1.000 | 0.816 | 0.084 | 1.000 | 0.234 | 0.816 | 0.484 | 0.542 | 0.159 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 9 | 9 | 7 | 9 |
| Mann-Kendall S | 16 | 3 | -7 | 22 | 0 | 6 | -1 | 0 | -4 | 2 | 5 | 0 | -9 |
| p-Level | 0.120 | 0.841 | 0.544 | 0.024 | 1.000 | 0.612 | 1.000 | 1.000 | 0.720 | 0.920 | 0.687 | 1.000 | 0.417 |
| Trend | | | | | | | | | | | | | |
| **MW-1014A** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 7 | 2 | 5 | -2 | 0 | 6 | 6 | 0 | 3 | 0 | 4 | -2 | 5 |
| p-Level | 0.159 | 0.816 | 0.359 | 0.816 | 1.000 | 0.234 | 0.234 | 1.000 | 0.650 | 1.000 | 0.484 | 0.750 | 0.359 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 18 | 18 | 19 | 13 | 18 | 18 | 19 | 18 | 11 | 18 | 18 | 10 | 26 |
| Mann-Kendall S | -12 | 15 | -88 | -8 | -30 | 29 | -19 | 0 | 0 | 3 | 6 | 26 | 81 |
| p-Level | 0.681 | 0.600 | 0.002 | 0.676 | 0.277 | 0.294 | 0.534 | 1.000 | 1.000 | 0.940 | 0.852 | 0.022 | 0.078 |
| Trend | | | - | | | | | | | | | | |
| **MW-1014B** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 4 | 0 | -1 | 6 | -4 | 4 | 5 | 0 | 1 | 0 | -1 | -1 | -1 |
| p-Level | 0.484 | 1.000 | 1.000 | 0.084 | 0.484 | 0.484 | 0.359 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 21 | 21 | 22 | 15 | 21 | 21 | 22 | 21 | 14 | 21 | 21 | 13 | 29 |
| Mann-Kendall S | 52 | -124 | -114 | 62 | -20 | 68 | -100 | 0 | 3 | -53 | 20 | -22 | -251 |
| p-Level | 0.124 | 0.000 | 0.001 | 0.002 | 0.570 | 0.042 | 0.004 | 1.000 | 0.914 | 0.117 | 0.570 | 0.204 | 0.000 |
| Trend | | - | - | + | | | - | | | | | | - |
| **MW-1014C** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 8 | 2 | 5 | 0 | 0 | -2 | 7 | 0 | 5 | 0 | 4 | 5 | -9 |
| p-Level | 0.084 | 0.816 | 0.359 | 1.000 | 1.000 | 0.816 | 0.159 | 1.000 | 0.359 | 1.000 | 0.484 | 0.209 | 0.050 |
| Trend | | | | | | | | | | | | | - |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 21 | 21 | 22 | 16 | 21 | 21 | 22 | 21 | 14 | 21 | 21 | 13 | 29 |
| Mann-Kendall S | 108 | 25 | -194 | 76 | -21 | 15 | -184 | 0 | -12 | -35 | 11 | -10 | -390 |
| p-Level | 0.000 | 0.474 | 0.000 | 0.000 | 0.550 | 0.676 | 0.000 | 1.000 | 0.554 | 0.309 | 0.765 | 0.590 | 0.000 |
| Trend | + | | - | + | | | - | | | | | | - |
| **MW-1015A** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 2 | 2 | 7 | 2 | 0 | -3 | 8 | 0 | 8 | 2 | 0 | 5 | 0 |
| p-Level | 0.816 | 0.816 | 0.159 | 0.816 | 1.000 | 0.650 | 0.084 | 1.000 | 0.084 | 0.816 | 1.000 | 0.209 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 24 | 24 | 14 | 9 | 24 | 24 | 14 | 24 | 9 | 24 | 24 | 8 | 29 |
| Mann-Kendall S | -227 | 33 | 21 | 24 | 0 | 48 | 26 | 0 | -5 | 21 | -15 | 3 | 0 |
| p-Level | 0.000 | 0.432 | 0.280 | 0.012 | 1.000 | 0.246 | 0.175 | 1.000 | 0.687 | 0.623 | 0.731 | 0.812 | 1.000 |
| Trend | - | | | | | | | | | | | | |

## Trend Analysis Results - Groundwater (Annual Parameters)
## Year Ending 2013

| | Barium | Cadmium | Calcium | Chloride | Chromium | Lead | Magnesium | Mercury | Potassium | Selenium | Silver | Sodium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1015B** | | | | | | | | | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | | | | | | | | | |
| Sample Size | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Mann-Kendall S | 4 | 0 | 6 | -6 | 0 | -5 | 7 | 0 | 4 | 0 | 0 | 2 | 0 |
| p-Level | 0.484 | 1.000 | 0.234 | 0.234 | 1.000 | 0.359 | 0.159 | 1.000 | 0.484 | 1.000 | 1.000 | 0.750 | 1.000 |
| Trend | | | | | | | | | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | | | | | | | | | |
| Sample Size | 24 | 24 | 14 | 9 | 24 | 24 | 14 | 24 | 9 | 24 | 24 | 8 | 29 |
| Mann-Kendall S | -11 | 0 | 35 | -1 | 11 | 33 | 54 | 0 | 22 | 13 | 0 | 12 | 0 |
| p-Level | 0.807 | 1.000 | 0.062 | 1.000 | 0.807 | 0.432 | 0.003 | 1.000 | 0.024 | 0.769 | 1.000 | 0.178 | 1.000 |
| Trend | | | | | | | + | | | | | | |

Notes: Overall increasing trend denoted by "+".
Overall decreasing trend denoted by "-"
Long term trend tests performed at a Type I (two-tailed) error rate of 0.01.
5-Year Trend tests performed at a Type I (two-tailed) error rate of 0.05.
N/A - No trend test performed due to insufficient data.



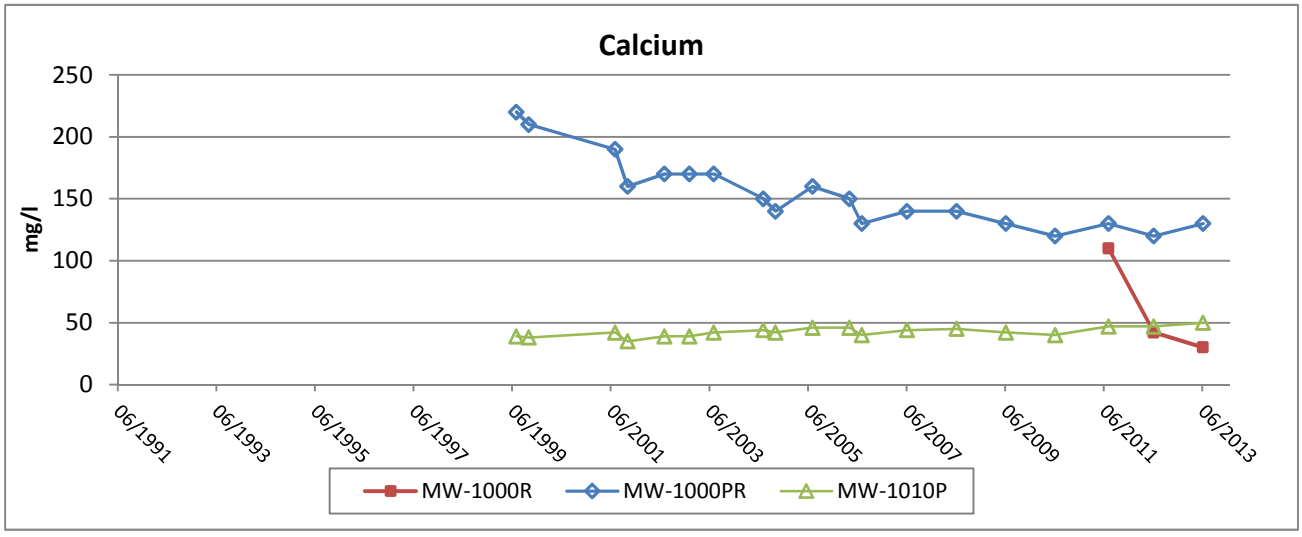




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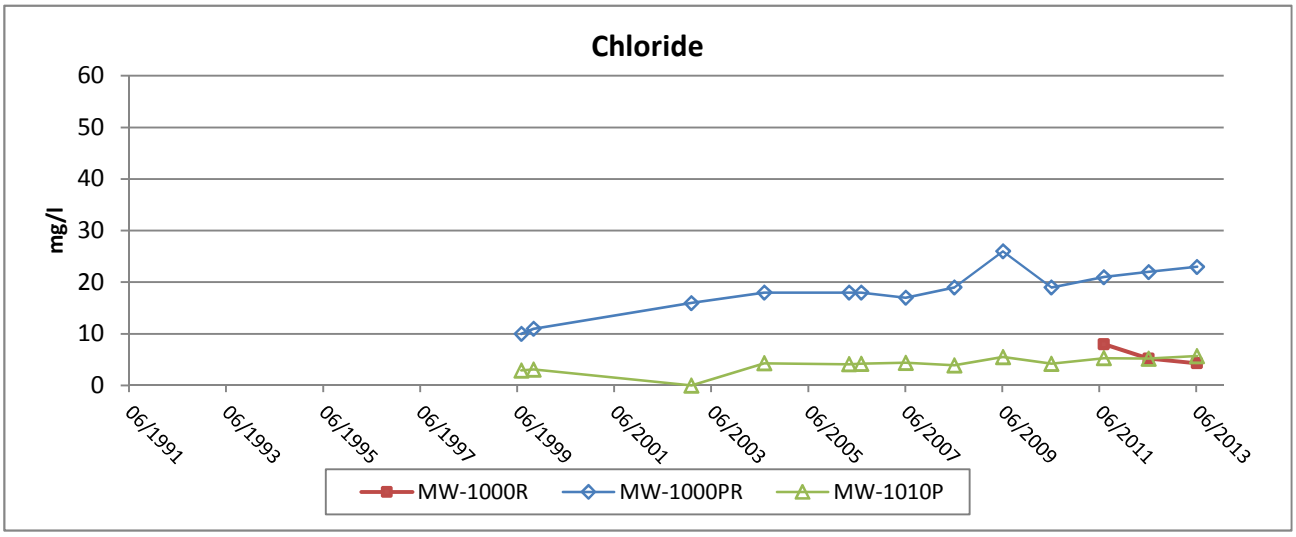
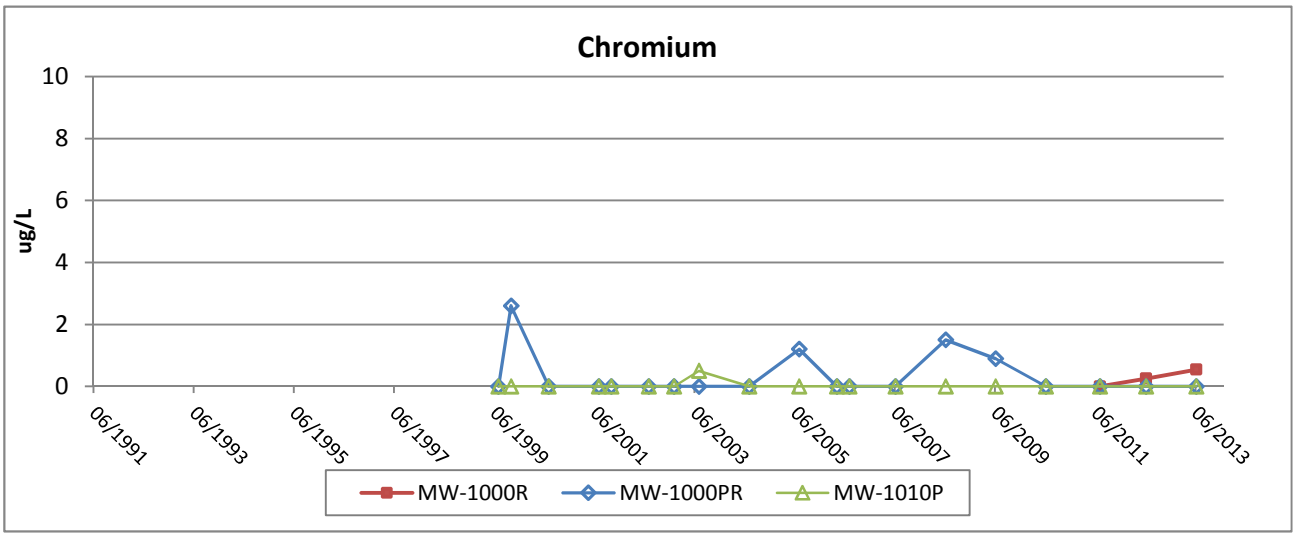
Figure B-8a

Groundwater Trend Graphs - Annual Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



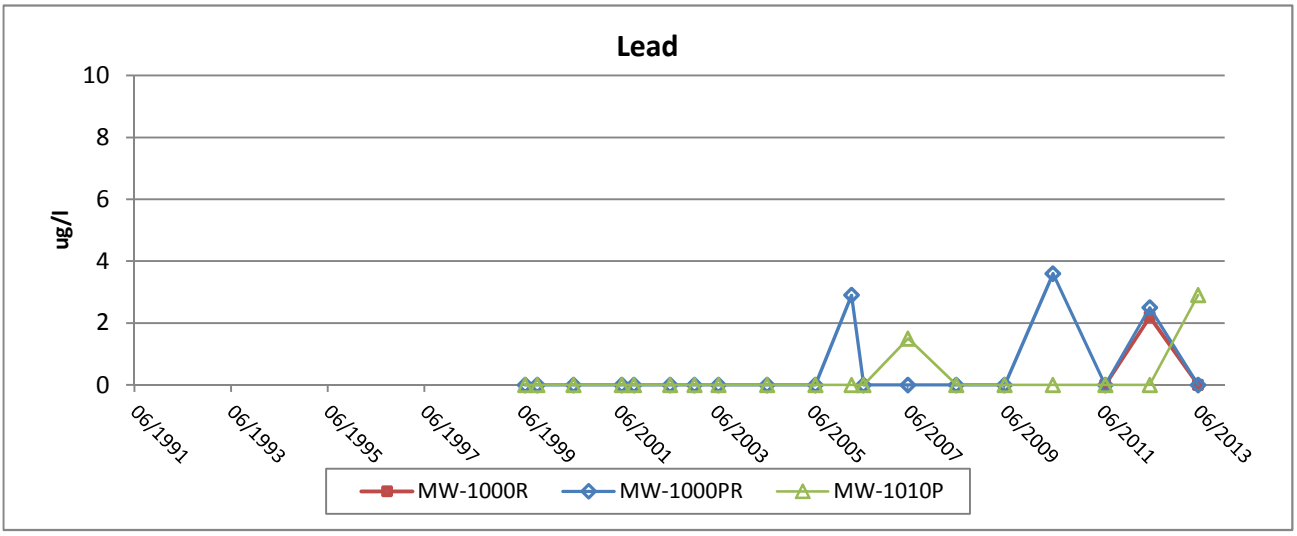




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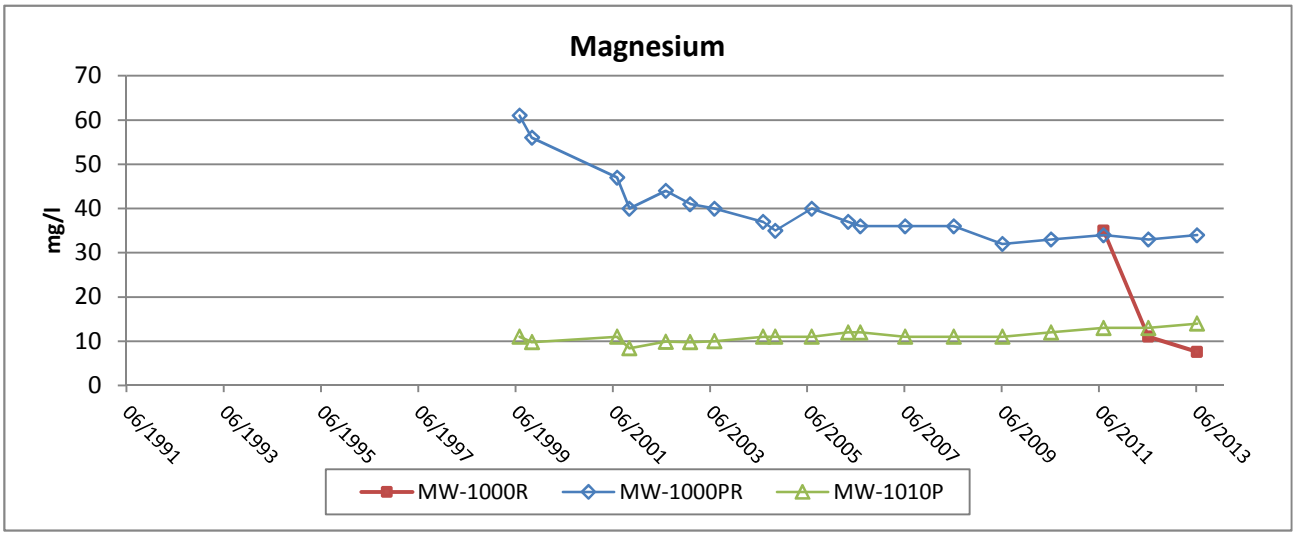
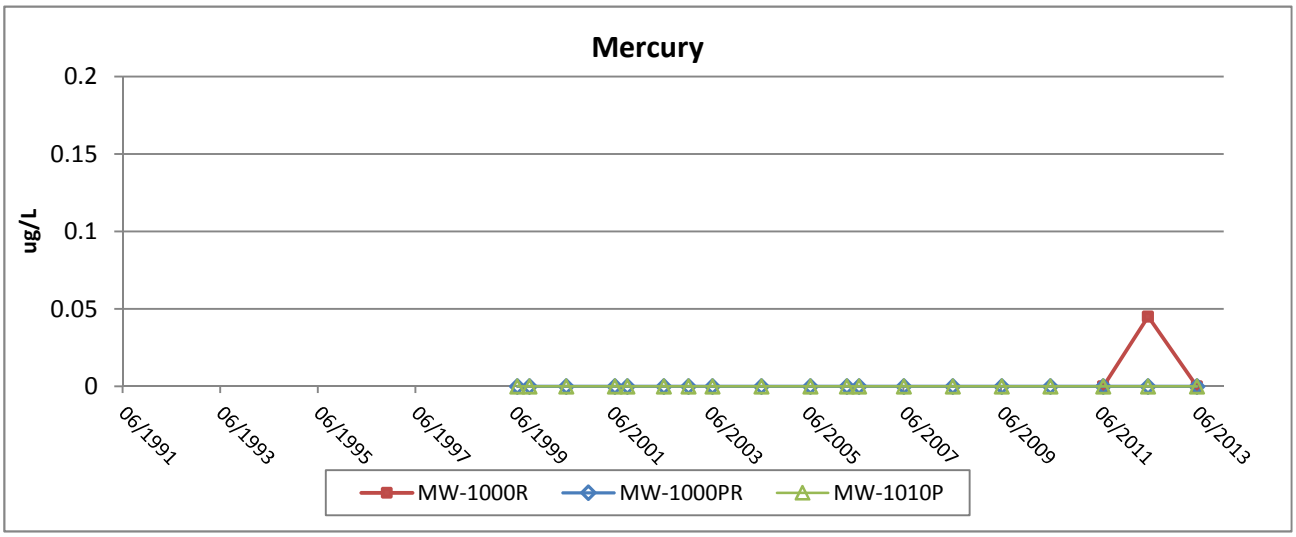
Figure B-8b

Groundwater Trend Graphs - Annual Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



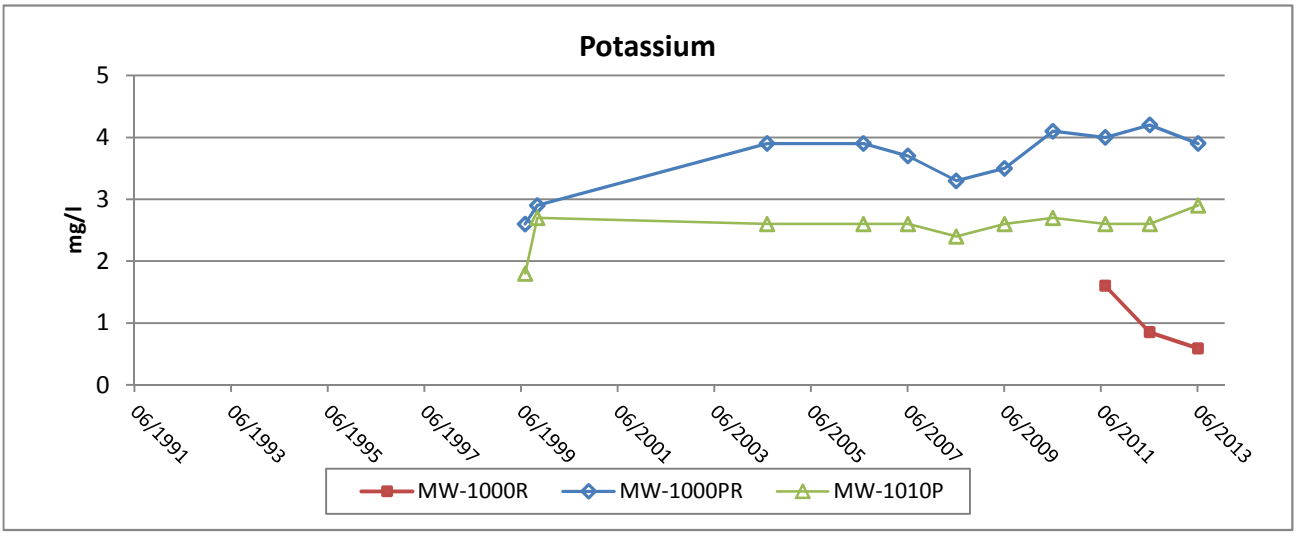




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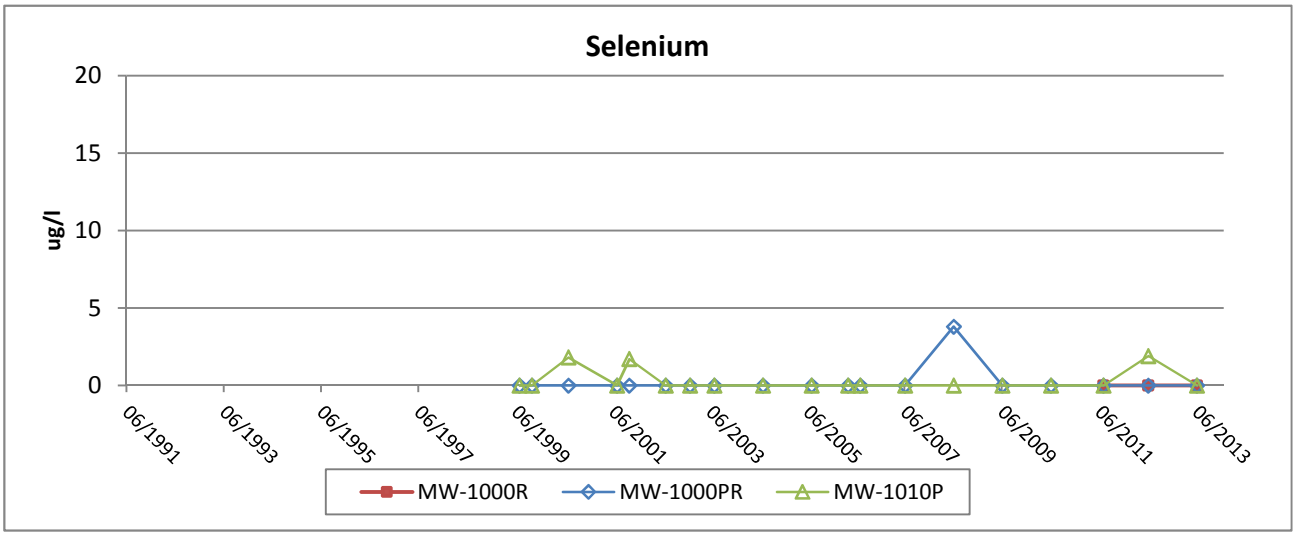
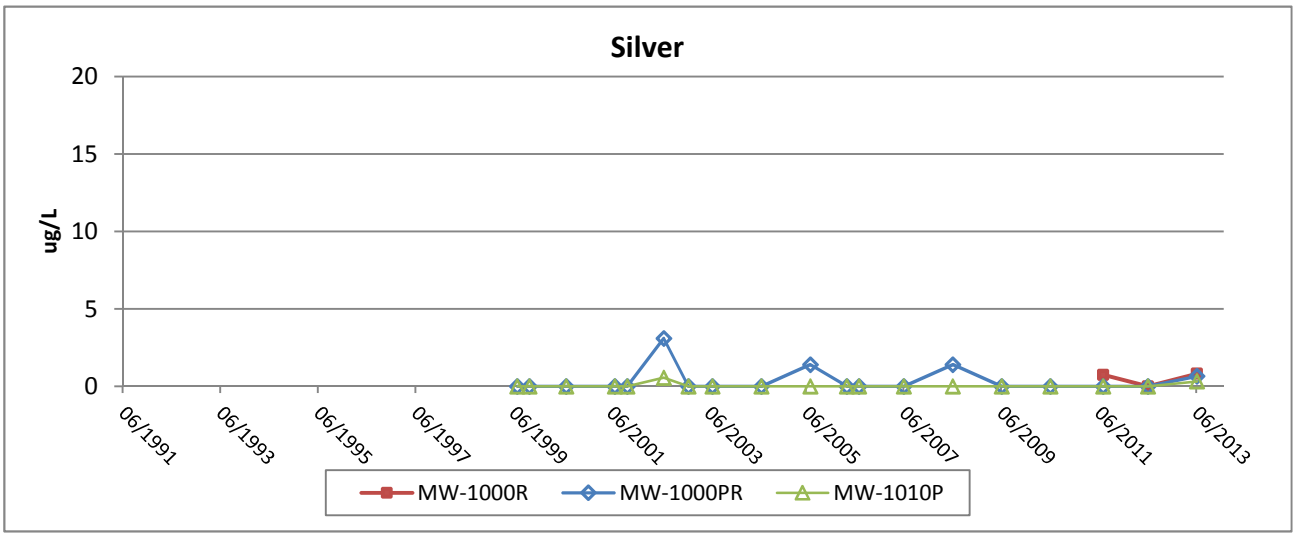
Figure B-8c

Groundwater Trend Graphs - Annual Results

MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



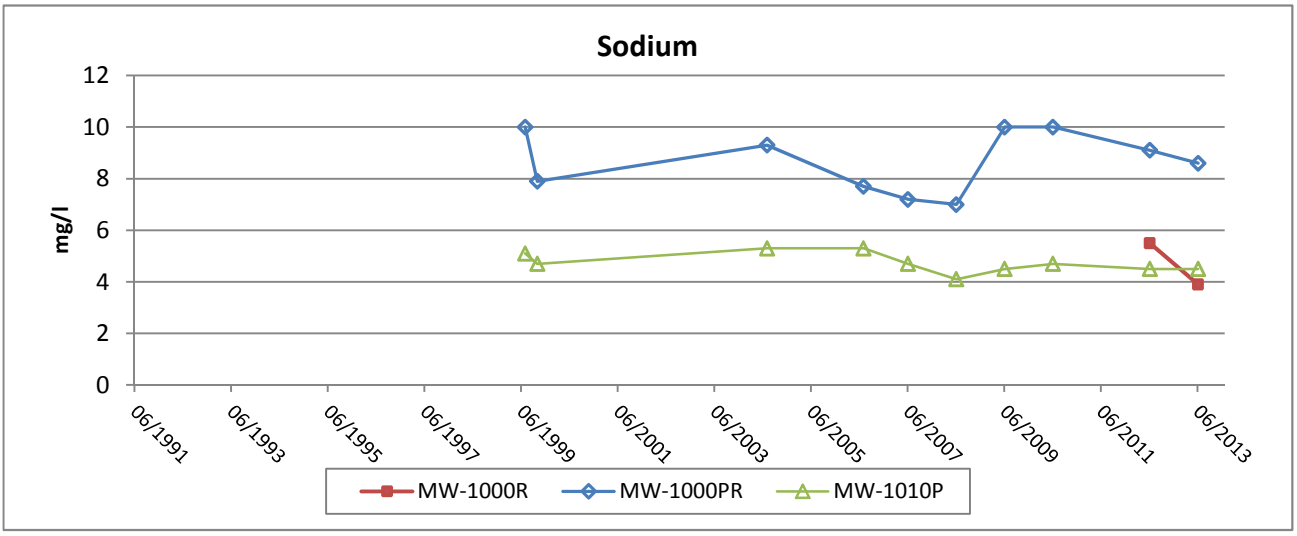




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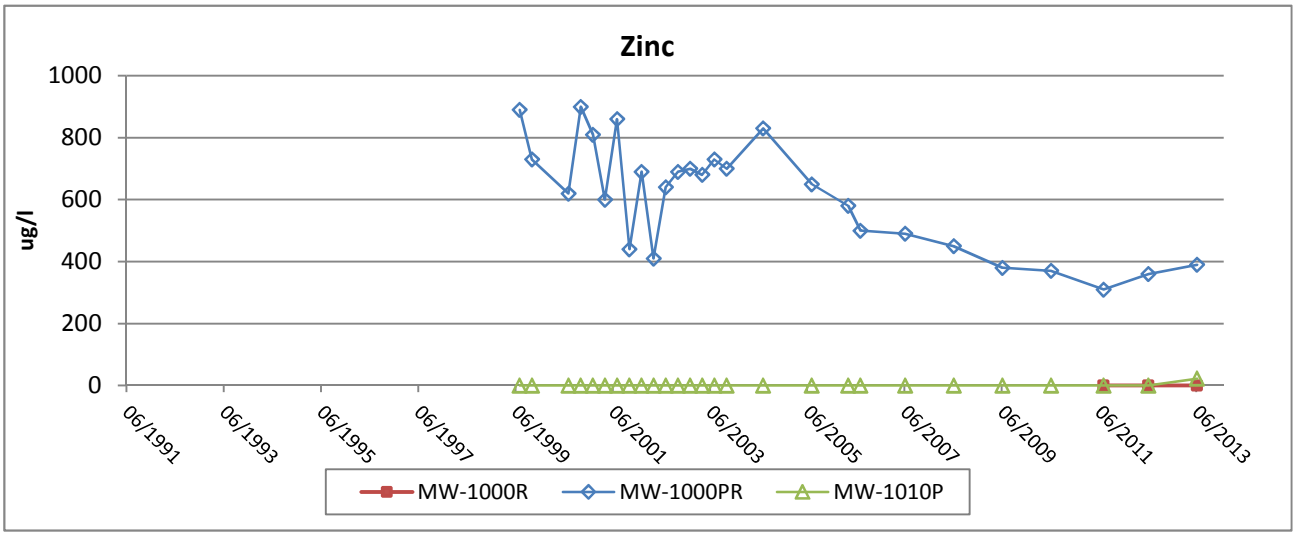
Figure B-8d

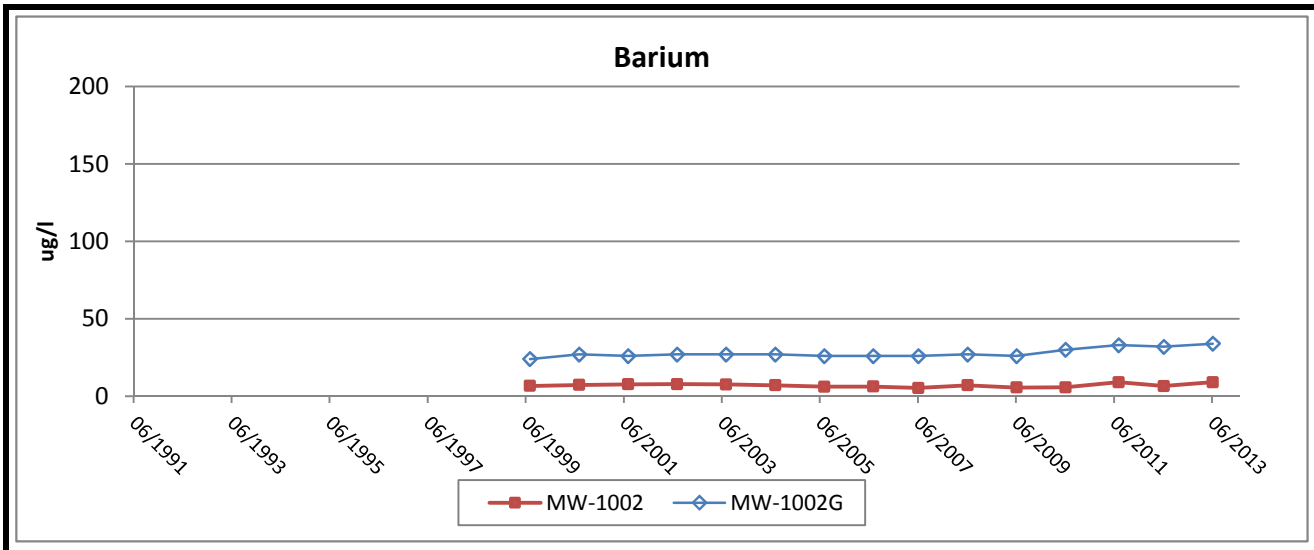
Groundwater Trend Graphs - Annual Results

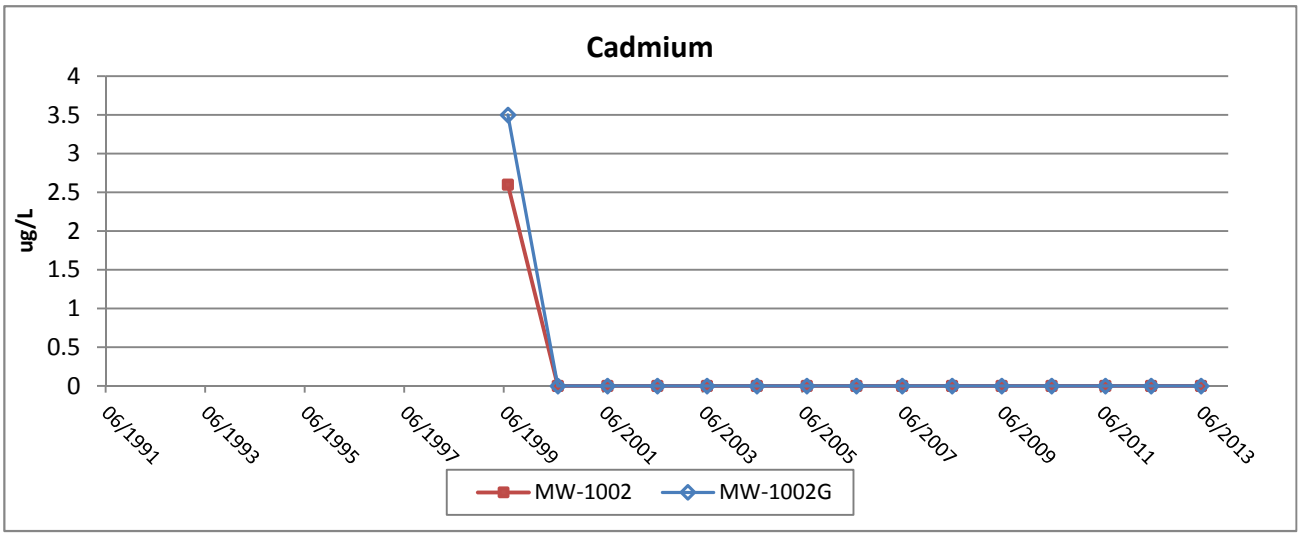
MW-1000R/MW-1000PR/MW-1010P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |




| | | |
|---|---|---|
| FLAMBEAU MINING COMPANY | | |
| Figure B-8e<br>Groundwater Trend Graphs - Annual Results<br>MW-1000R/MW-1000PR/MW-1010P | | |
| Scale: NA | Date: January 2014 | |
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



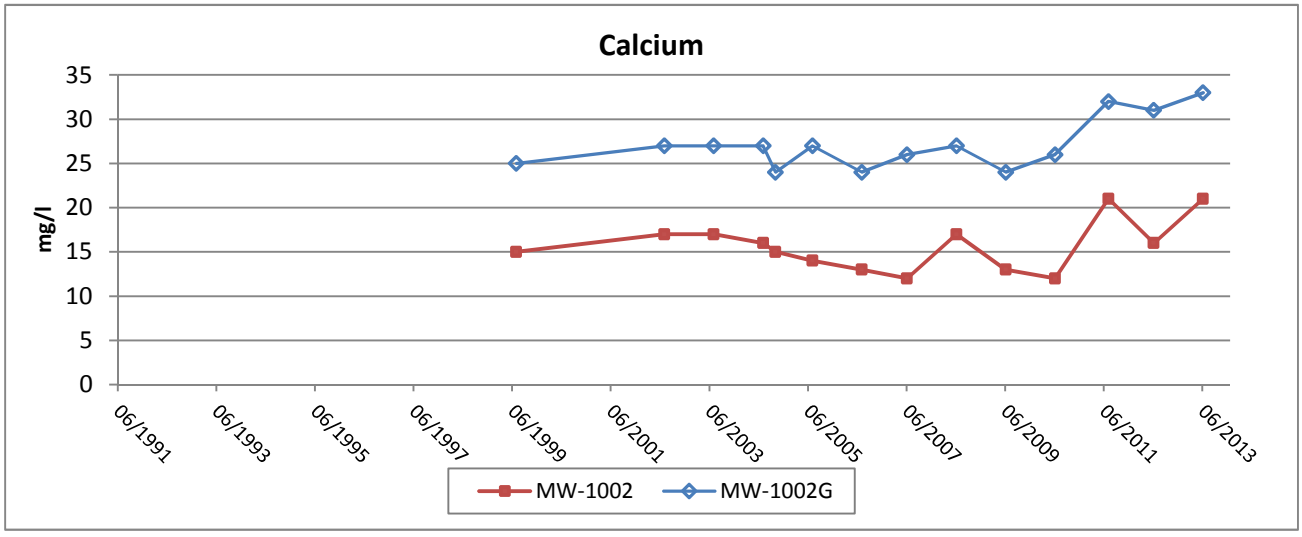




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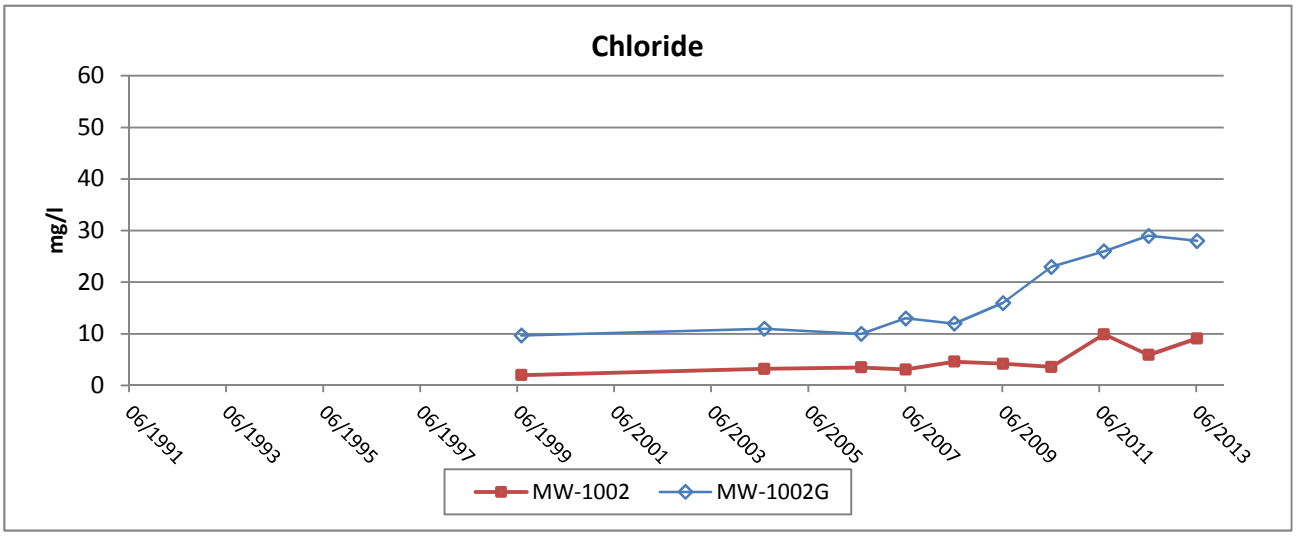
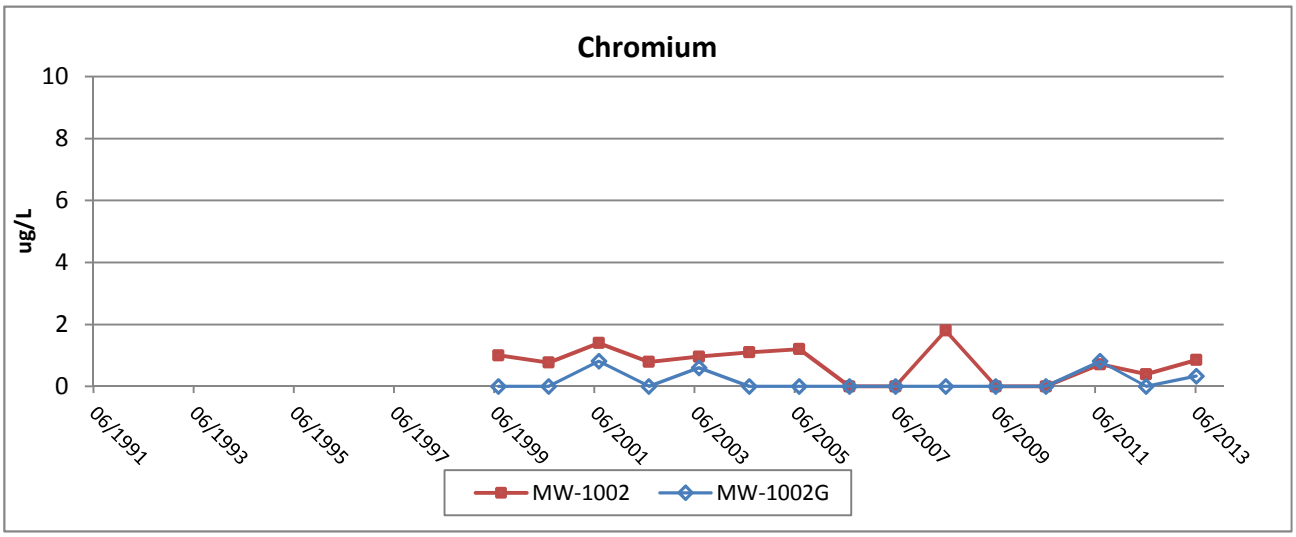
Figure B-9a

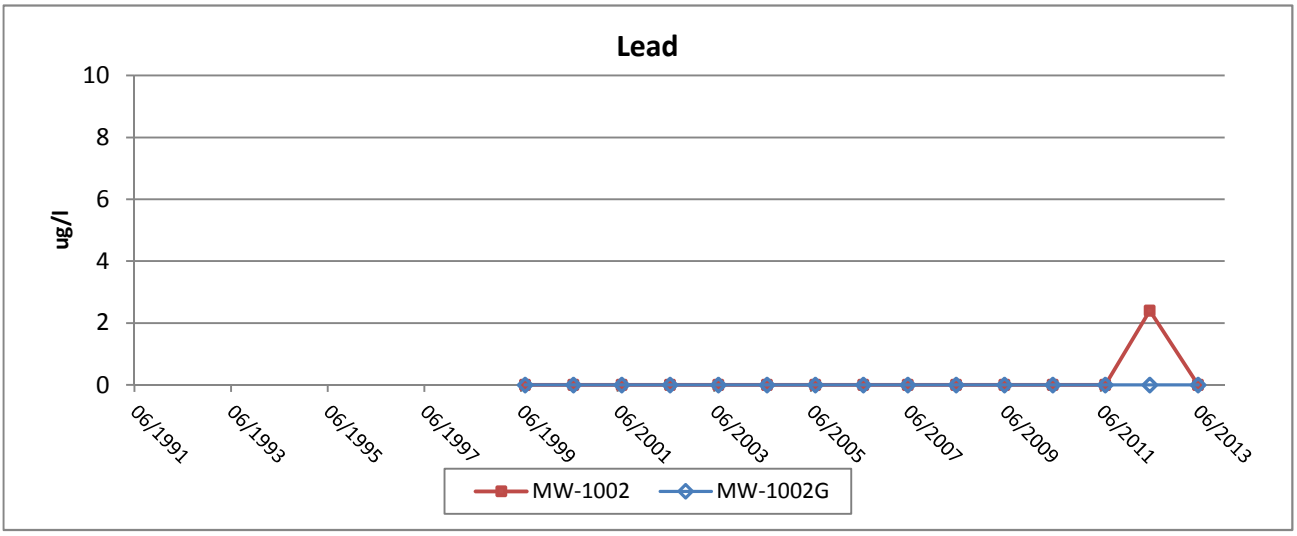
Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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FLAMBEAU MINING COMPANY

Figure B-9b

Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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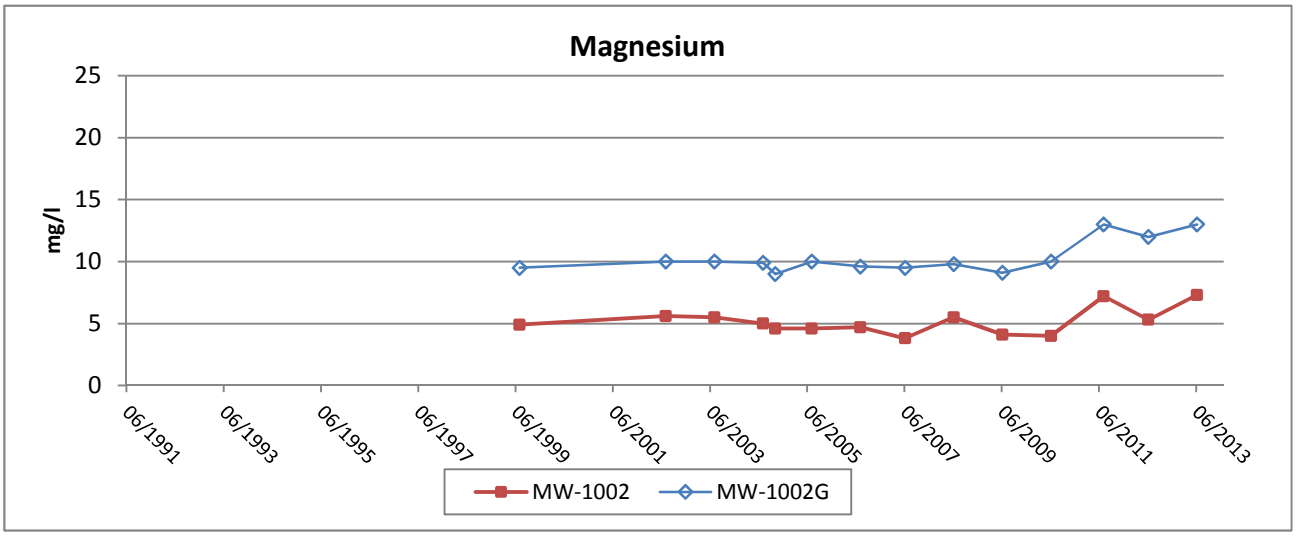


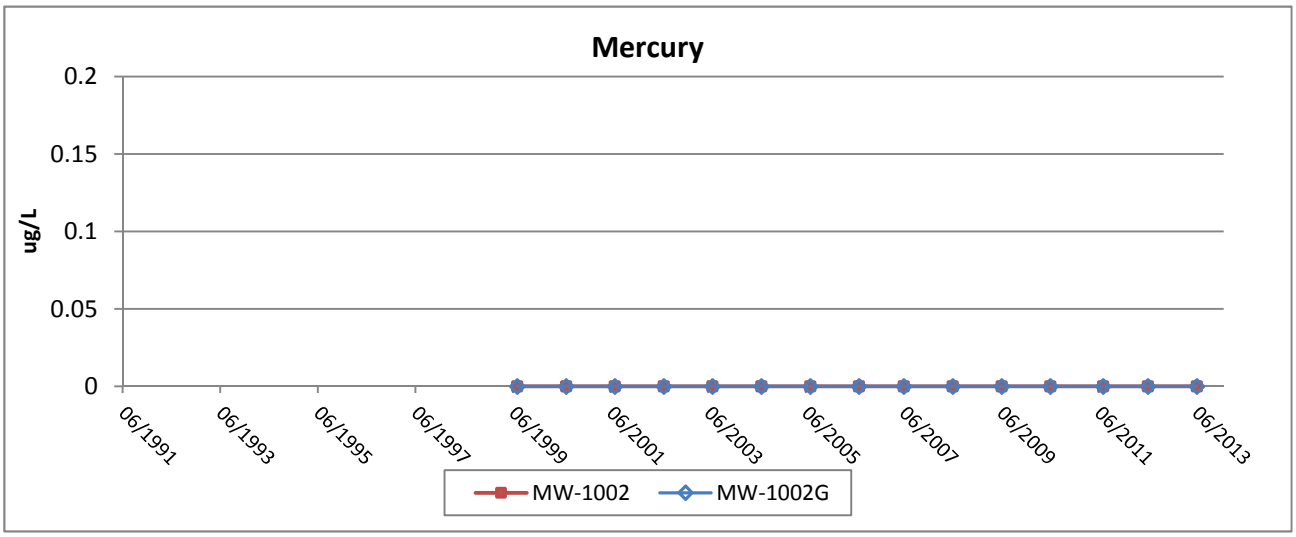


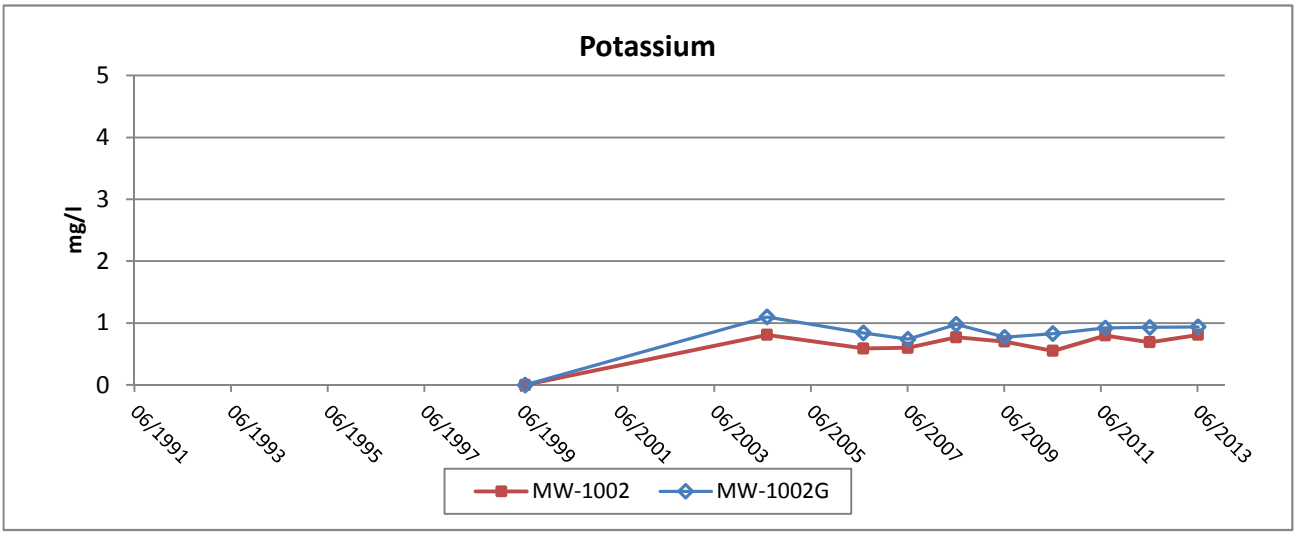


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Figure B-9c

Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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2013 Annual Report



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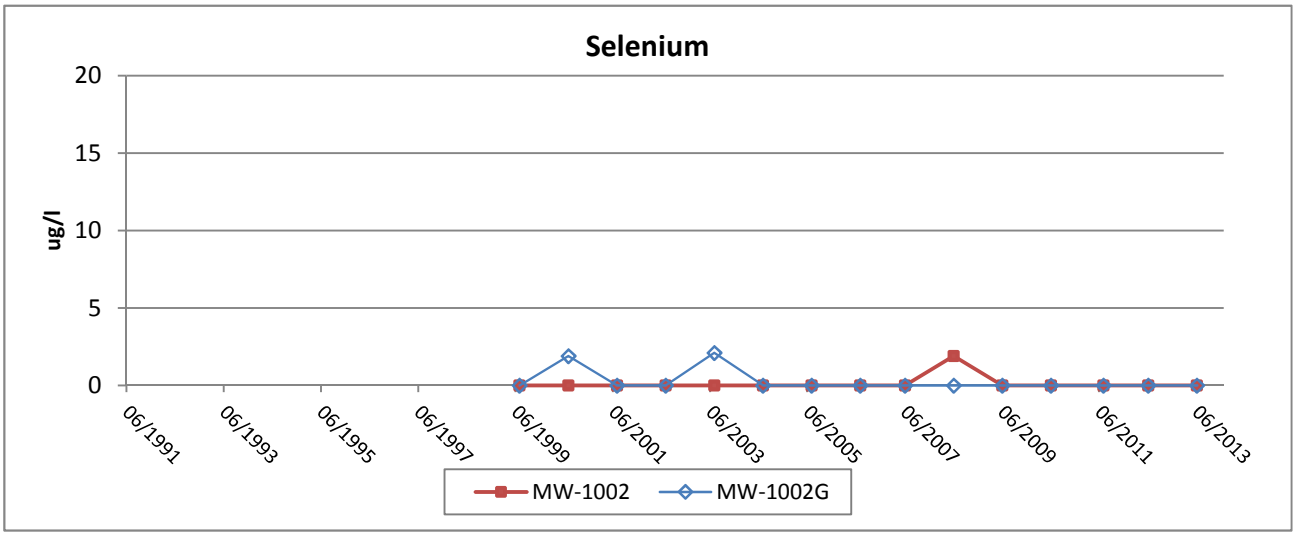


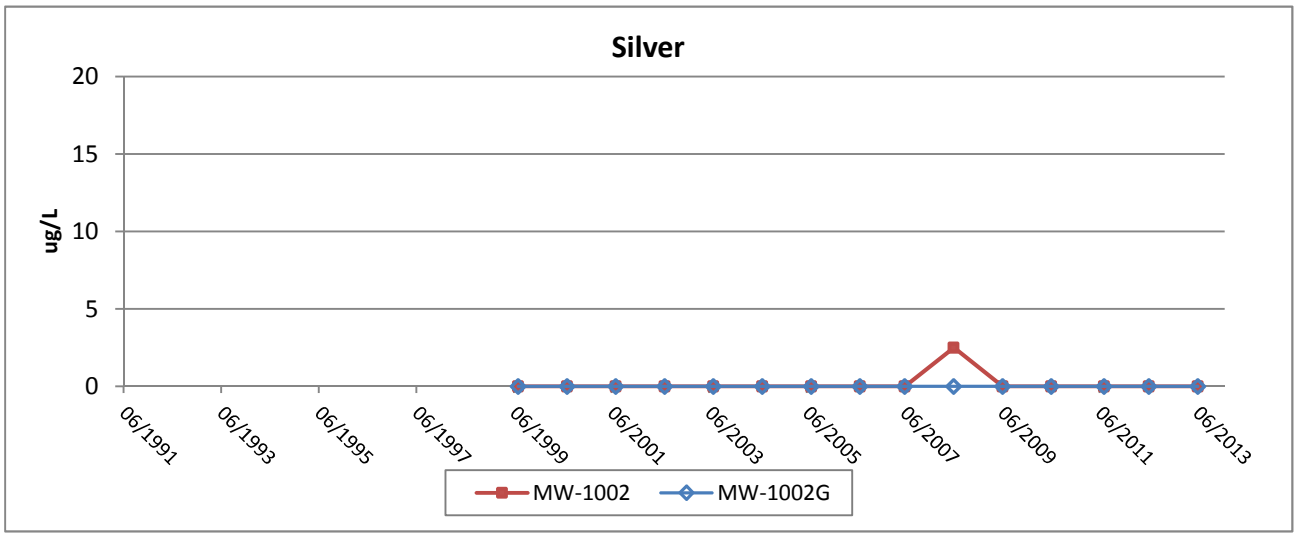


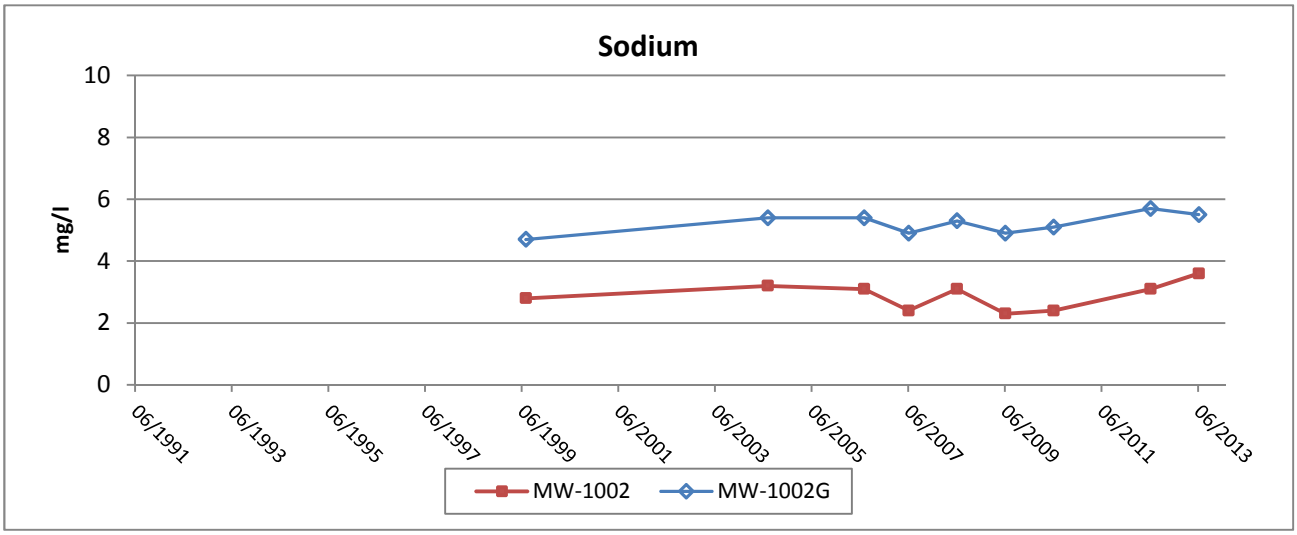


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Figure B-9d

Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

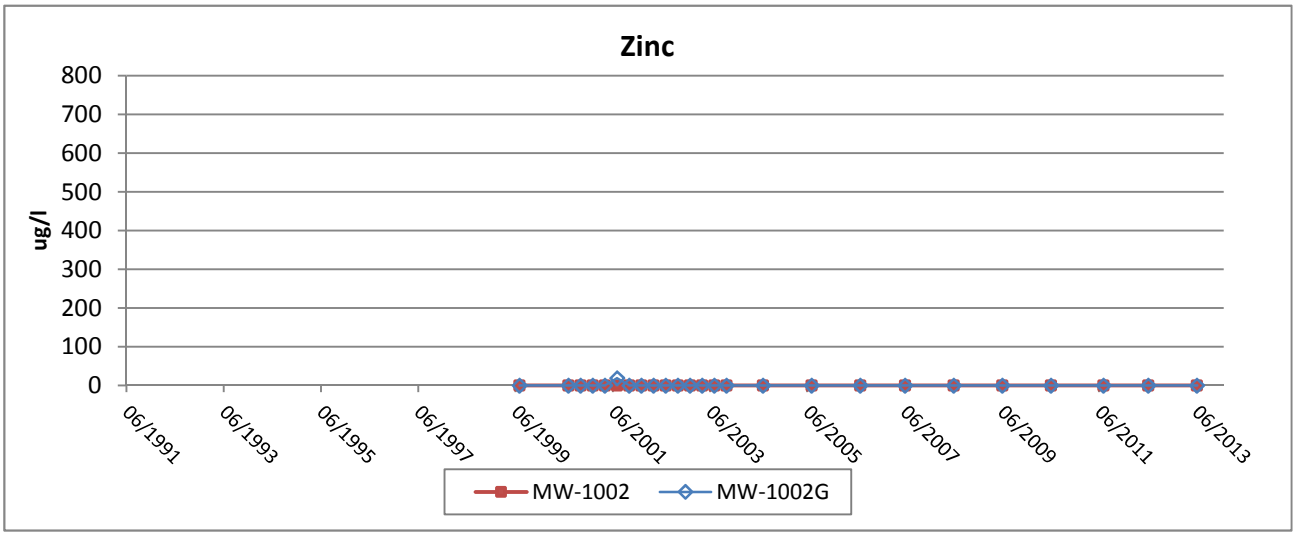


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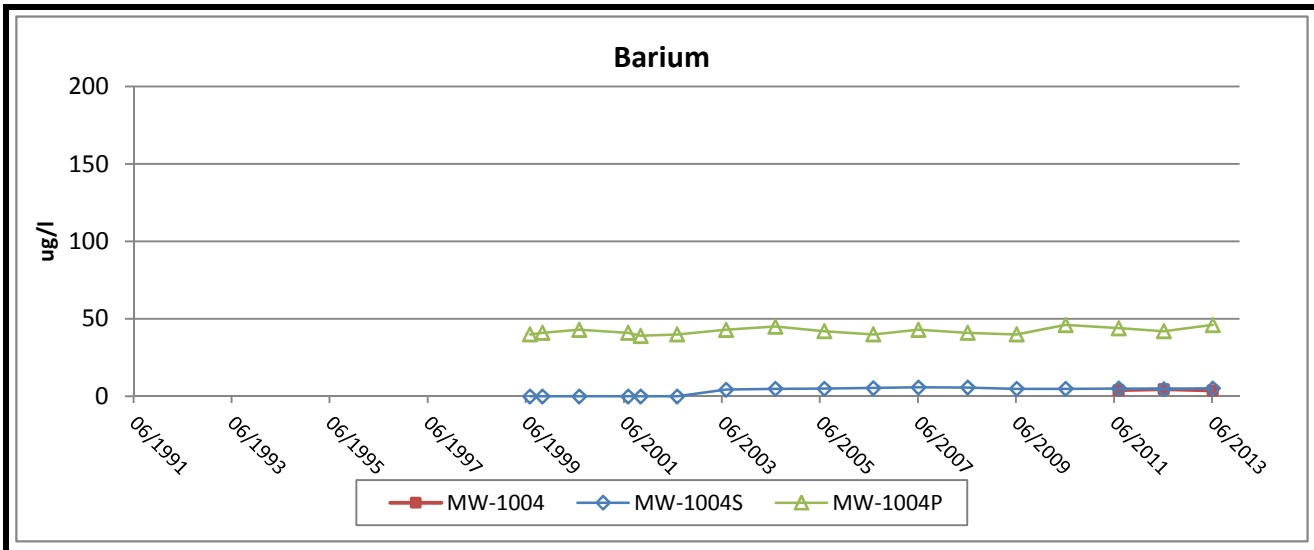
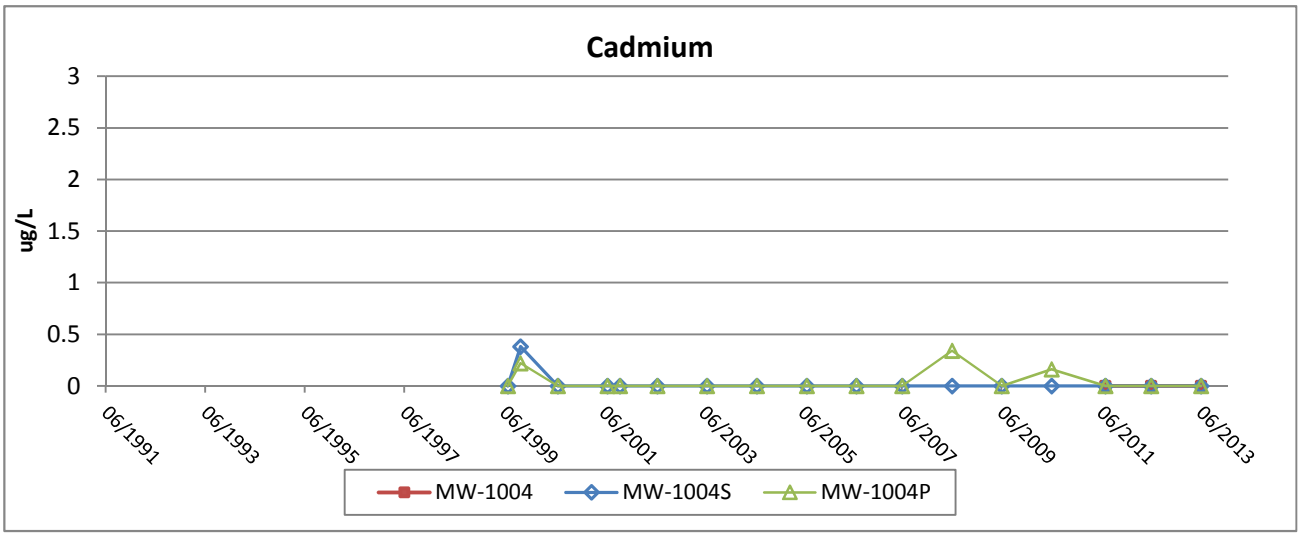
Figure B-9e

Groundwater Trend Graphs - Annual Results

MW-1002/MW-1002G

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



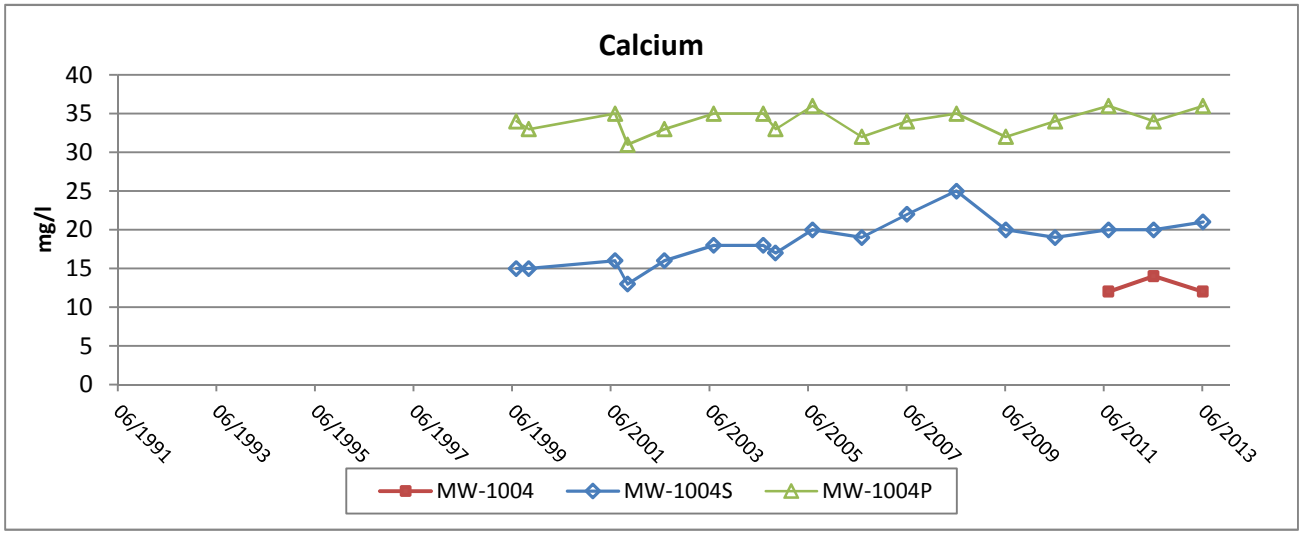




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Figure B-10a

Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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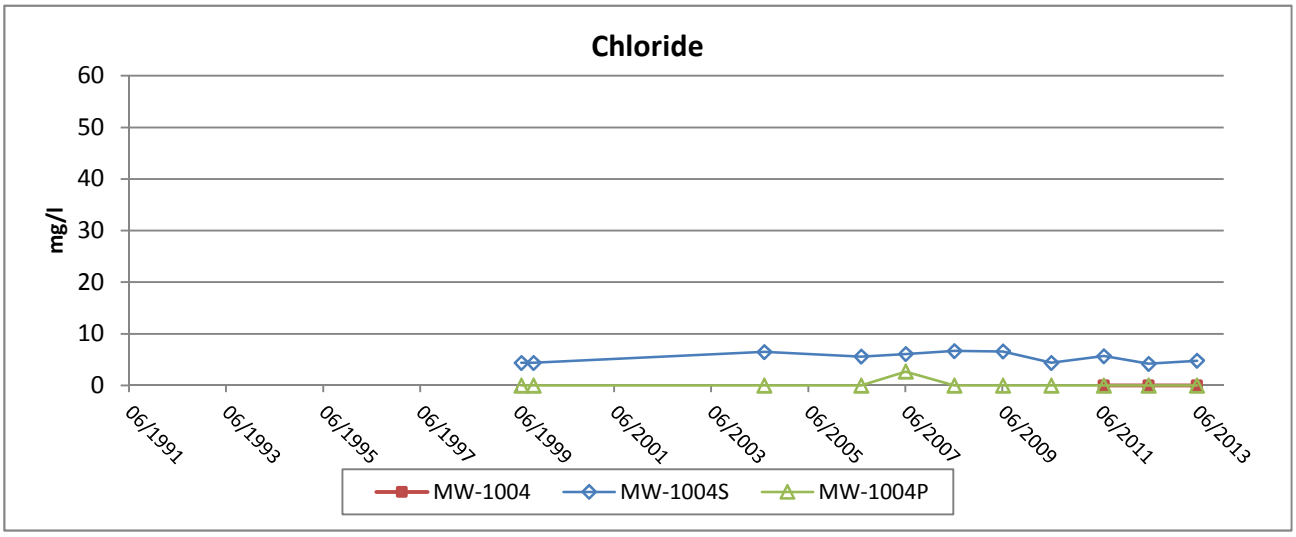


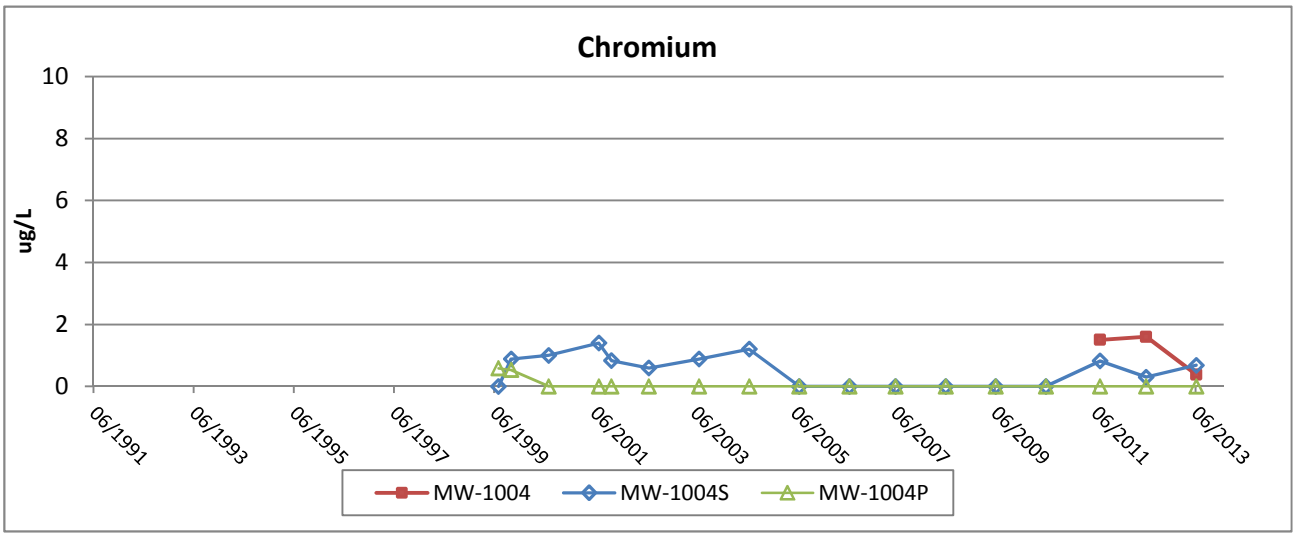


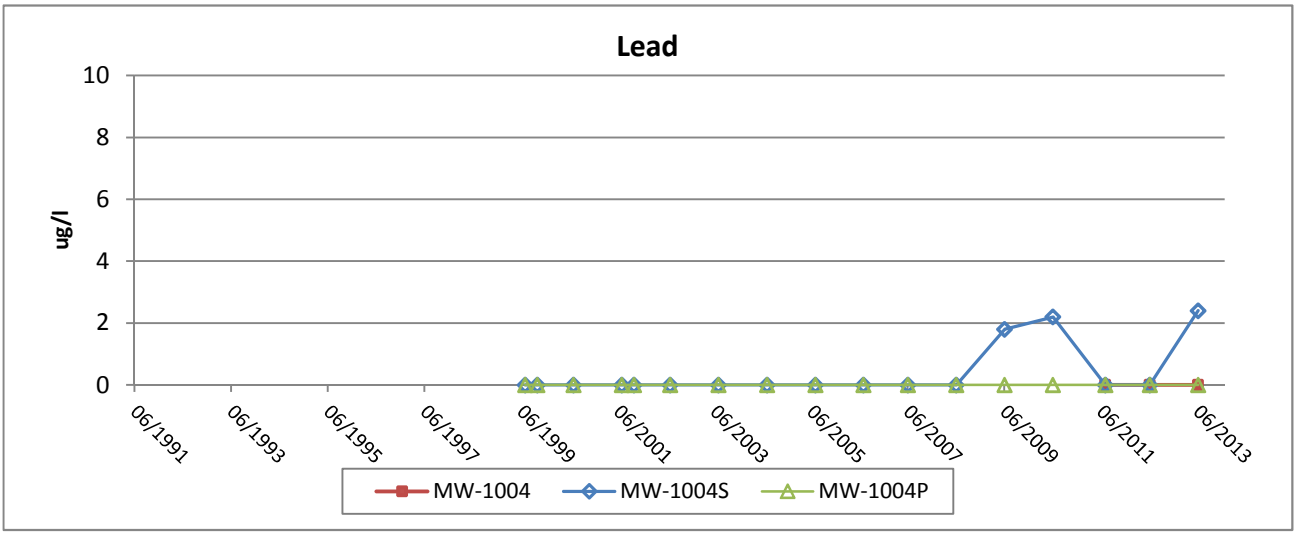


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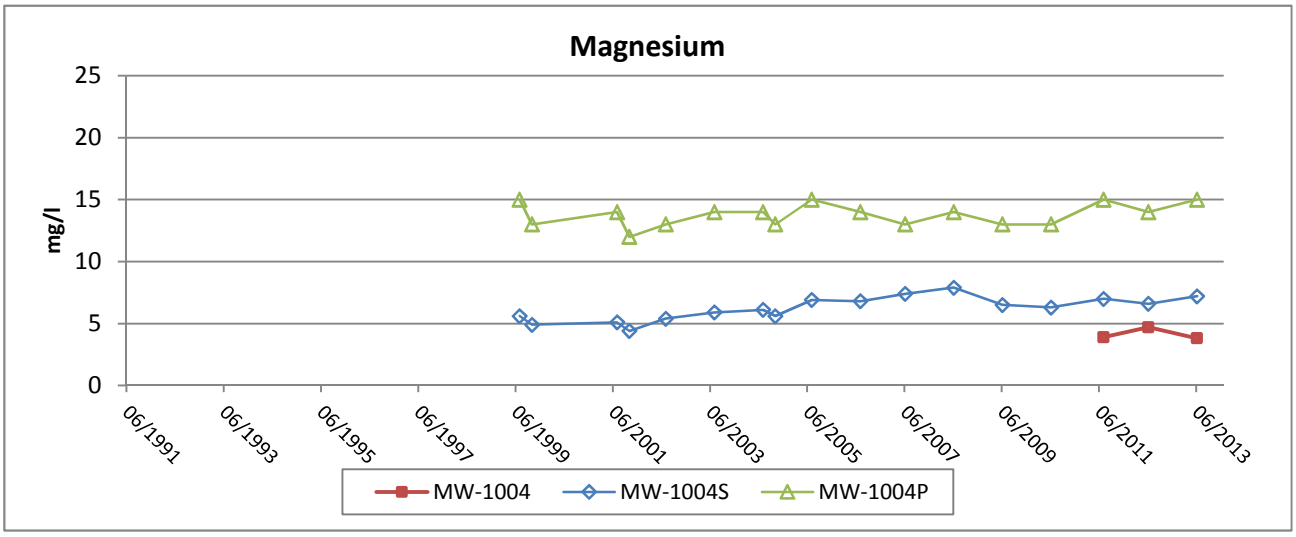
FLAMBEAU MINING COMPANY

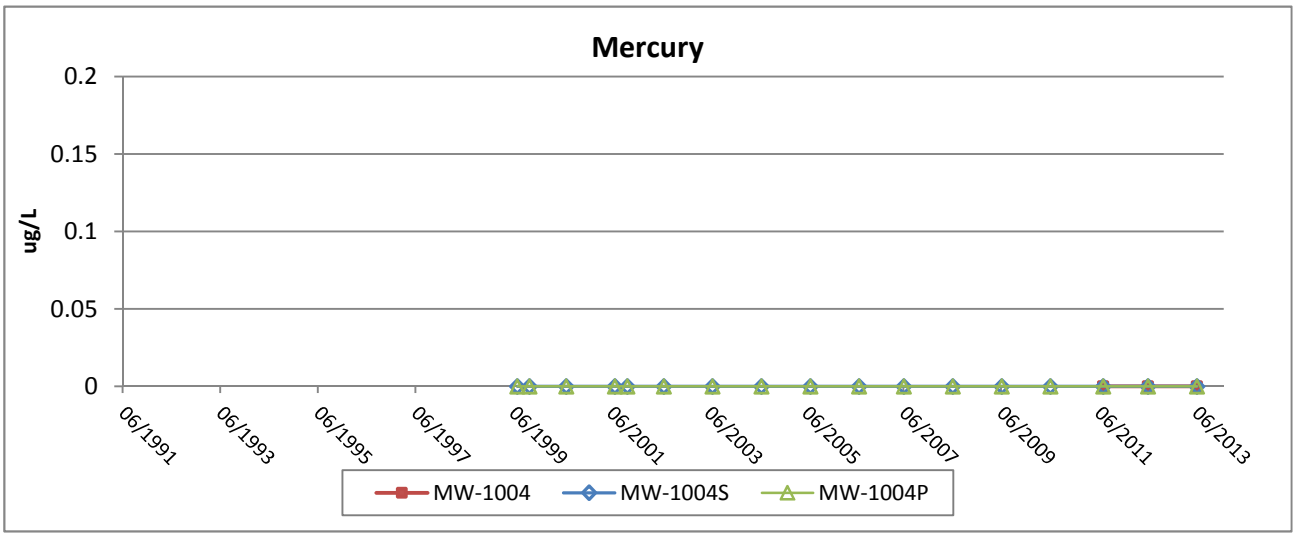
Figure B-10b

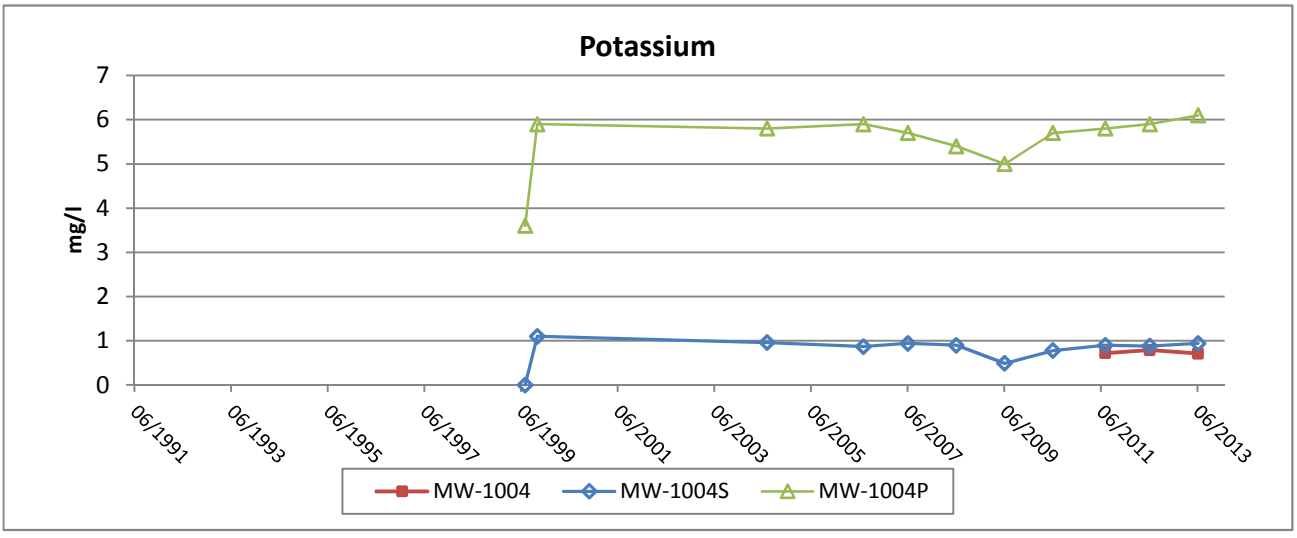
Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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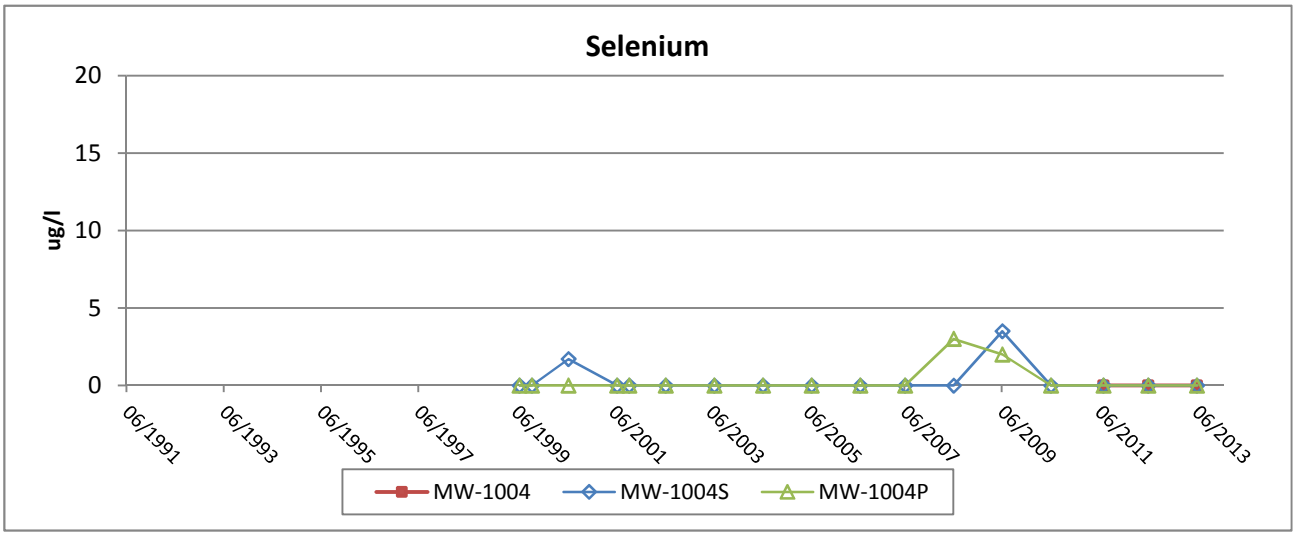
FLAMBEAU MINING COMPANY

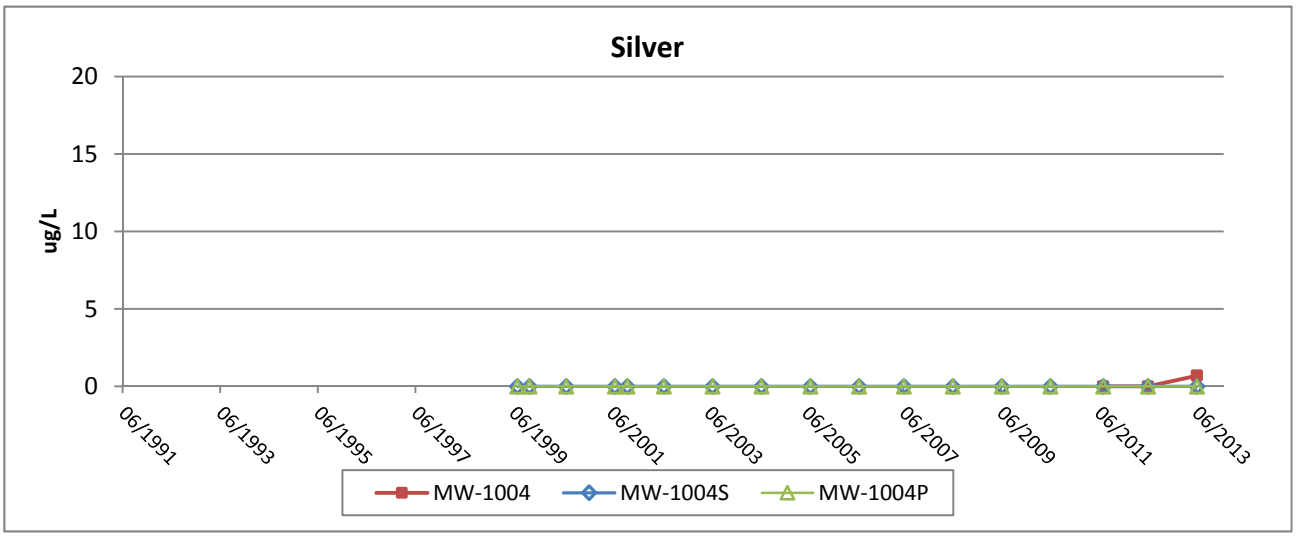
Figure B-10c

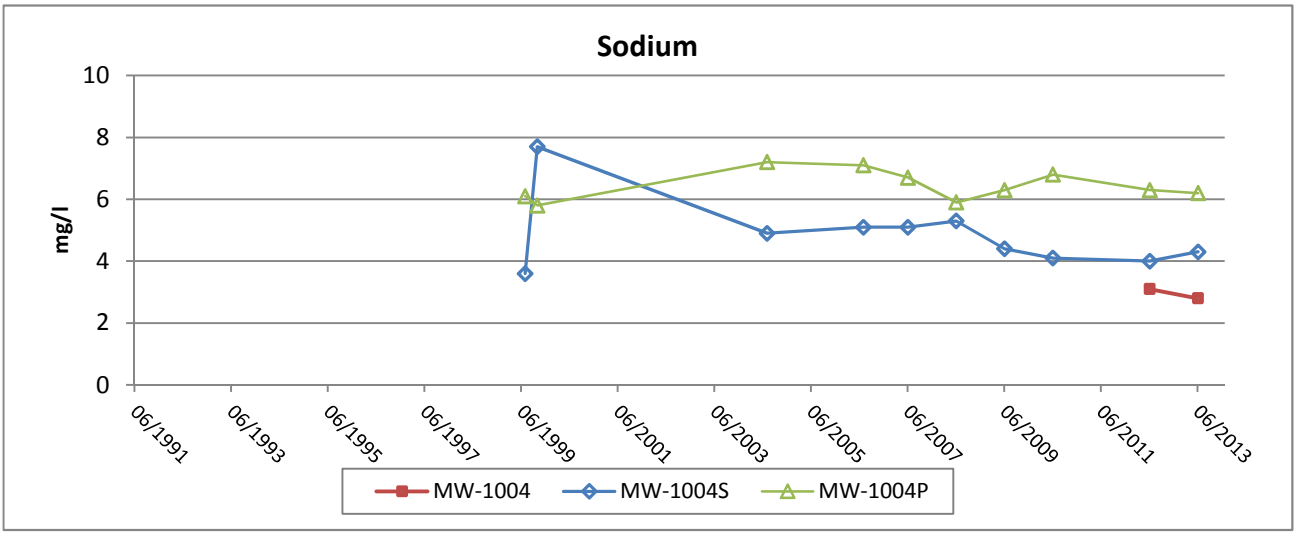
Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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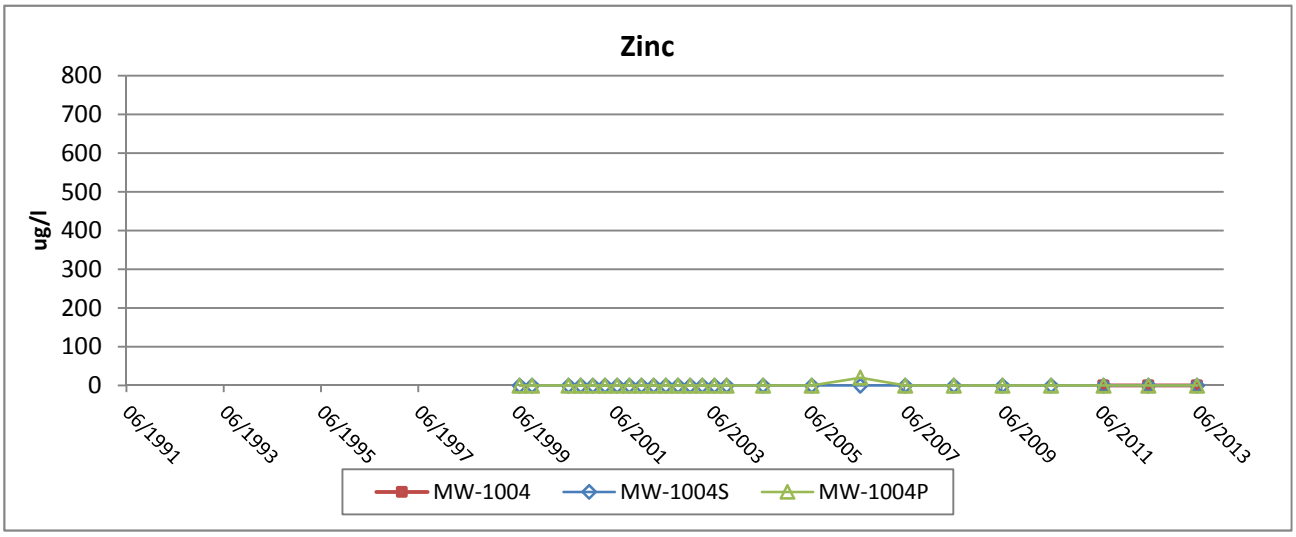
FLAMBEAU MINING COMPANY

Figure B-10d

Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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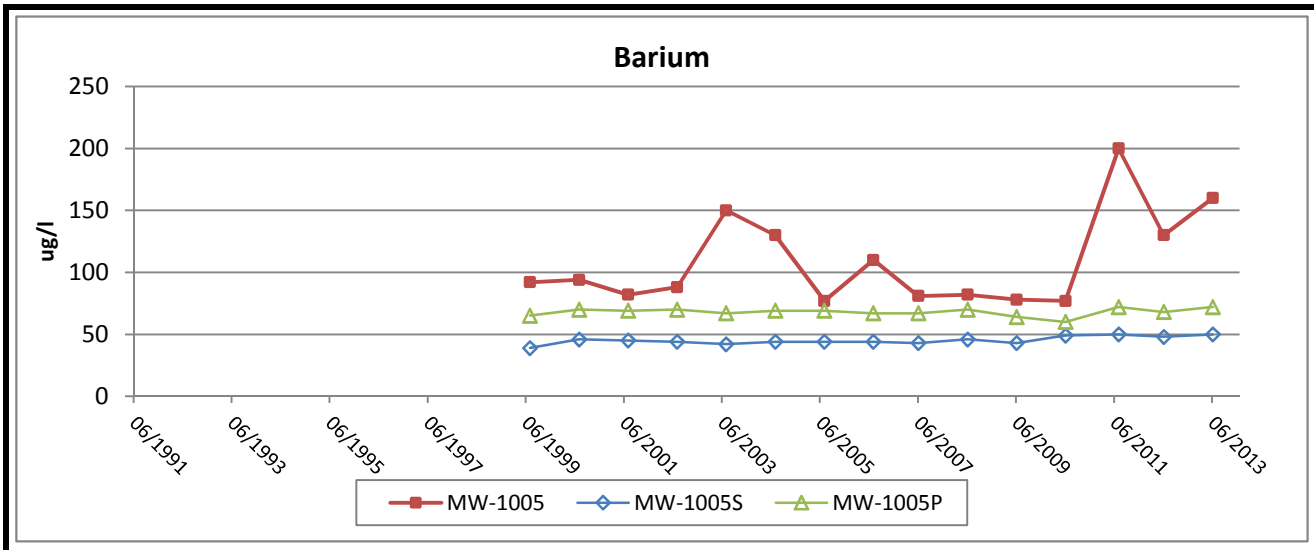
FLAMBEAU MINING COMPANY

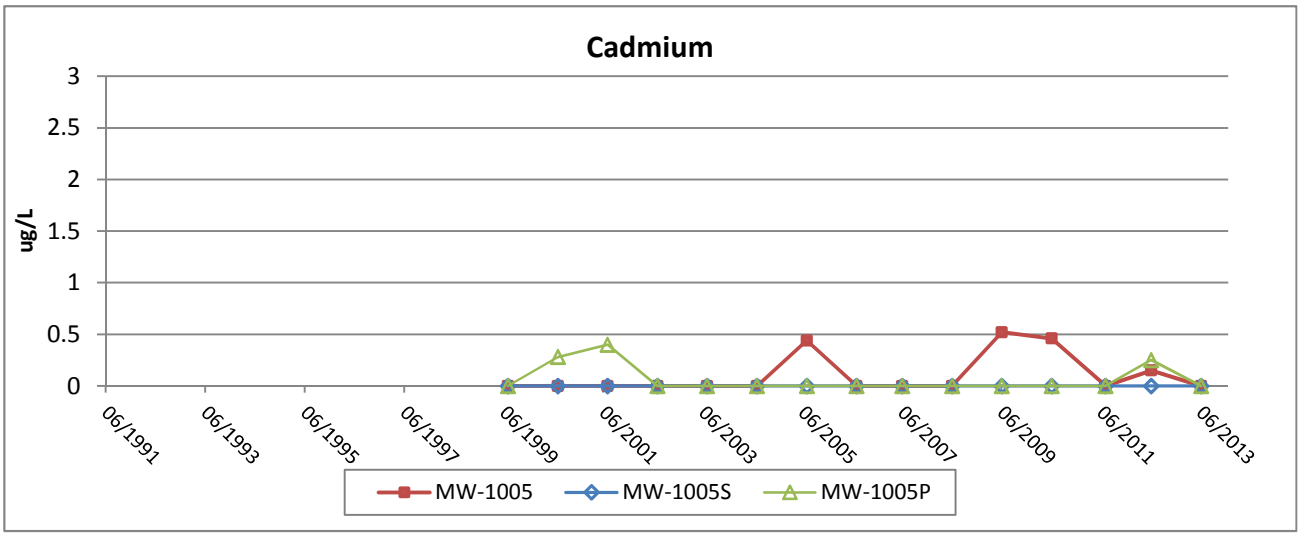
Figure B-10e

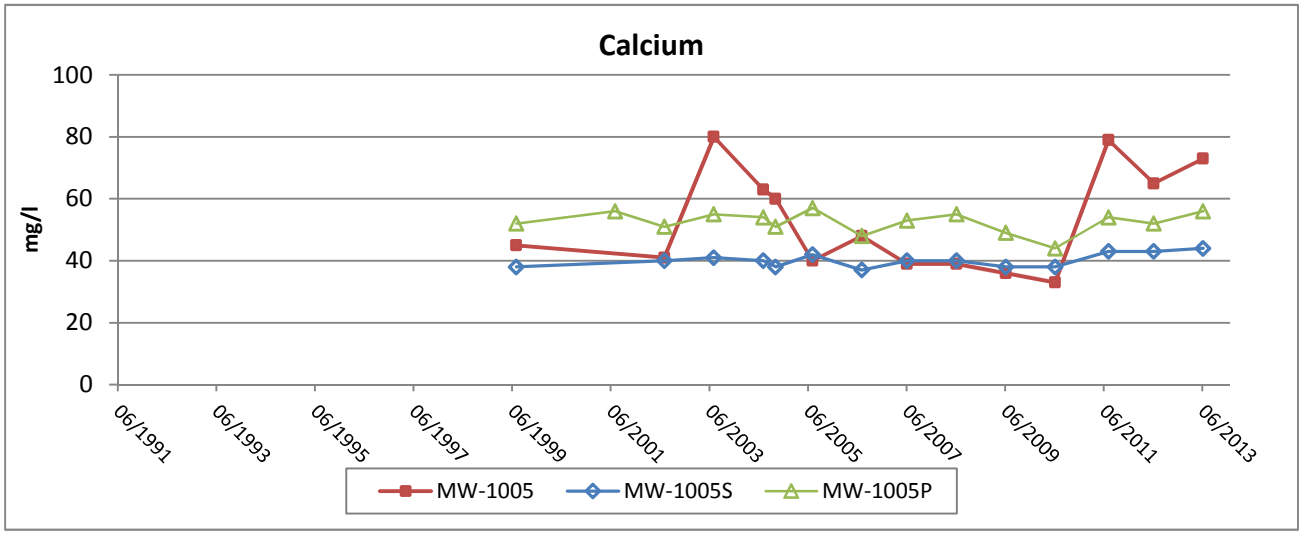
Groundwater Trend Graphs - Annual Results

MW-1004/MW-1004S/MW-1004P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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FLAMBEAU MINING COMPANY

Figure B-11a

Groundwater Trend Graphs - Annual Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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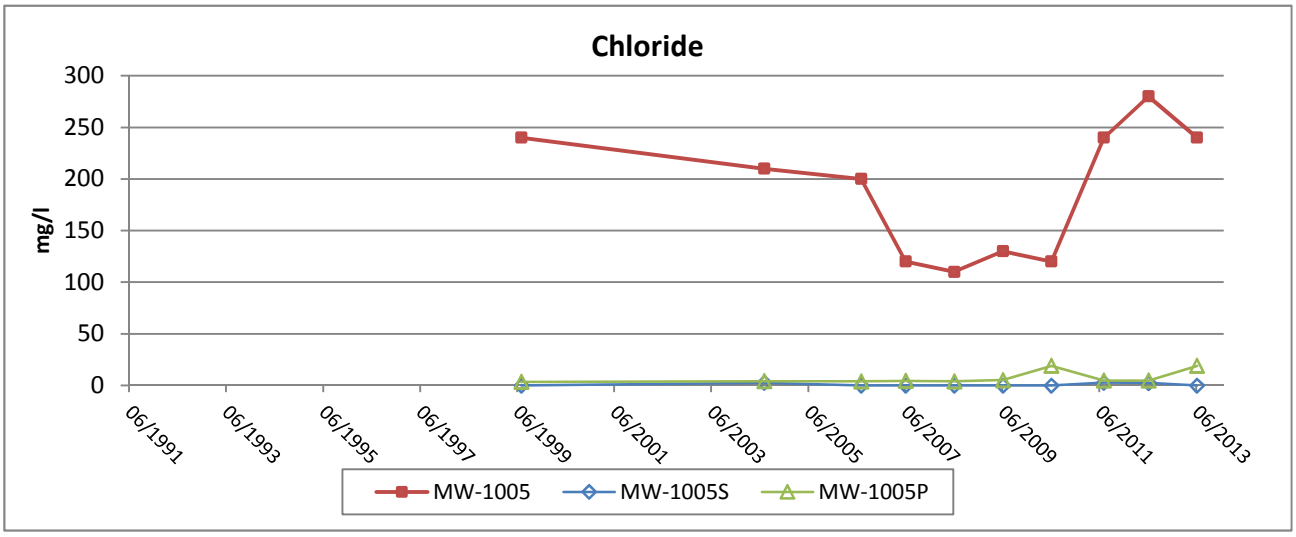


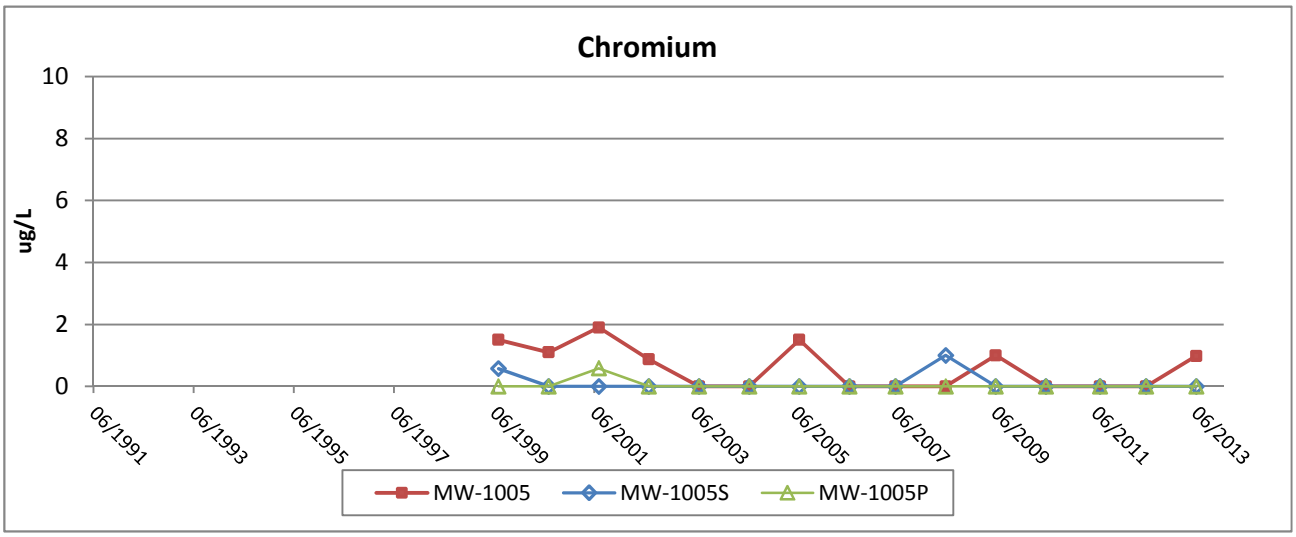


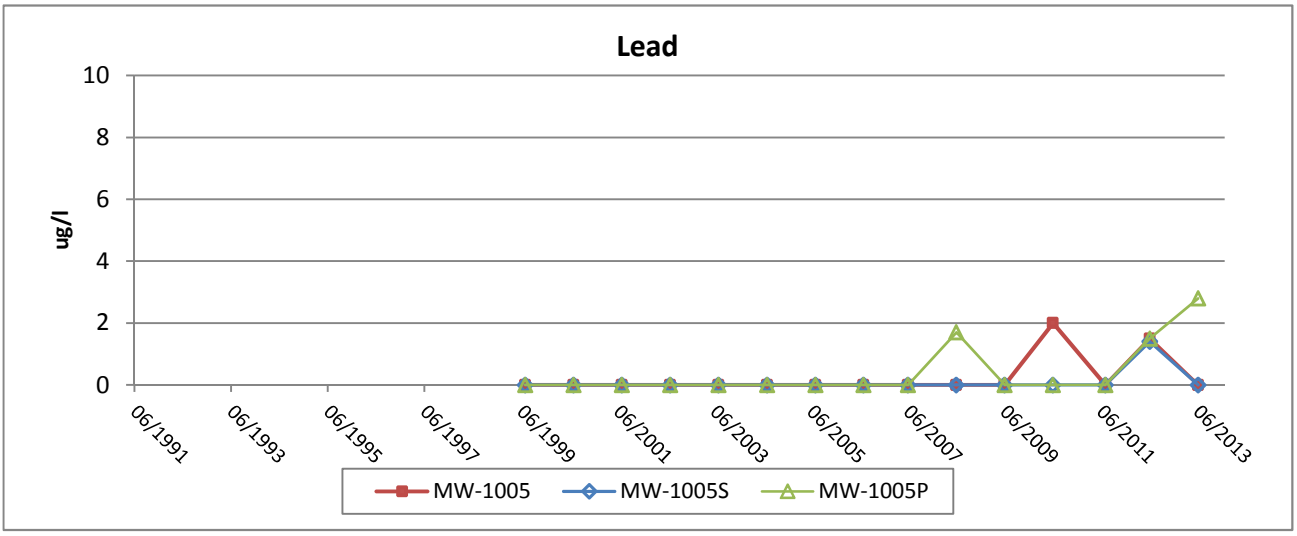


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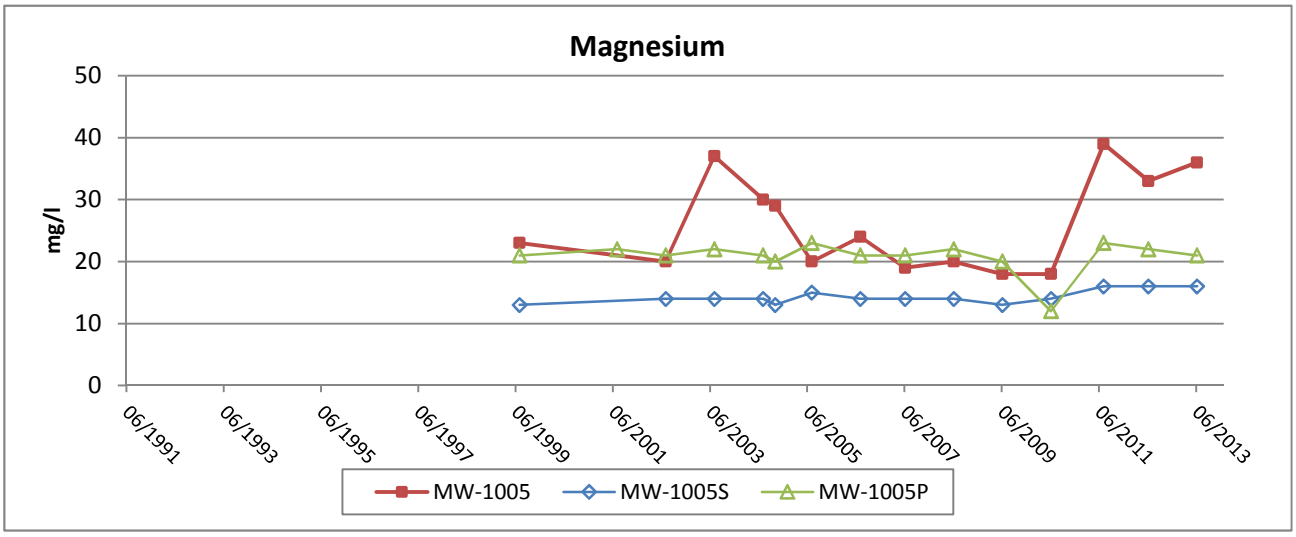
FLAMBEAU MINING COMPANY

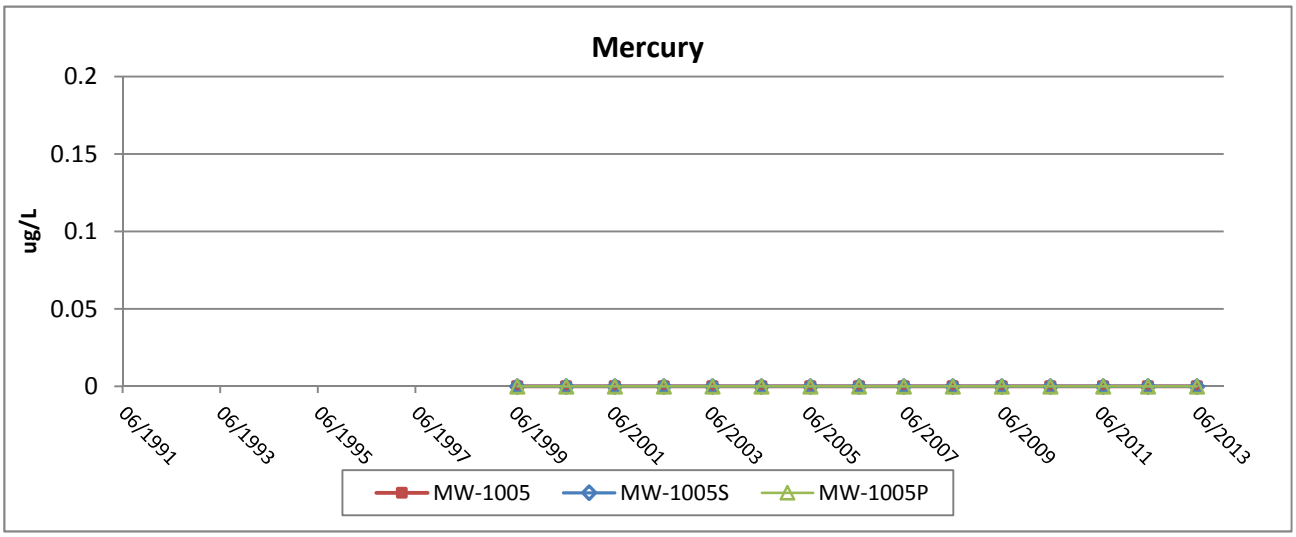
Figure B-11b

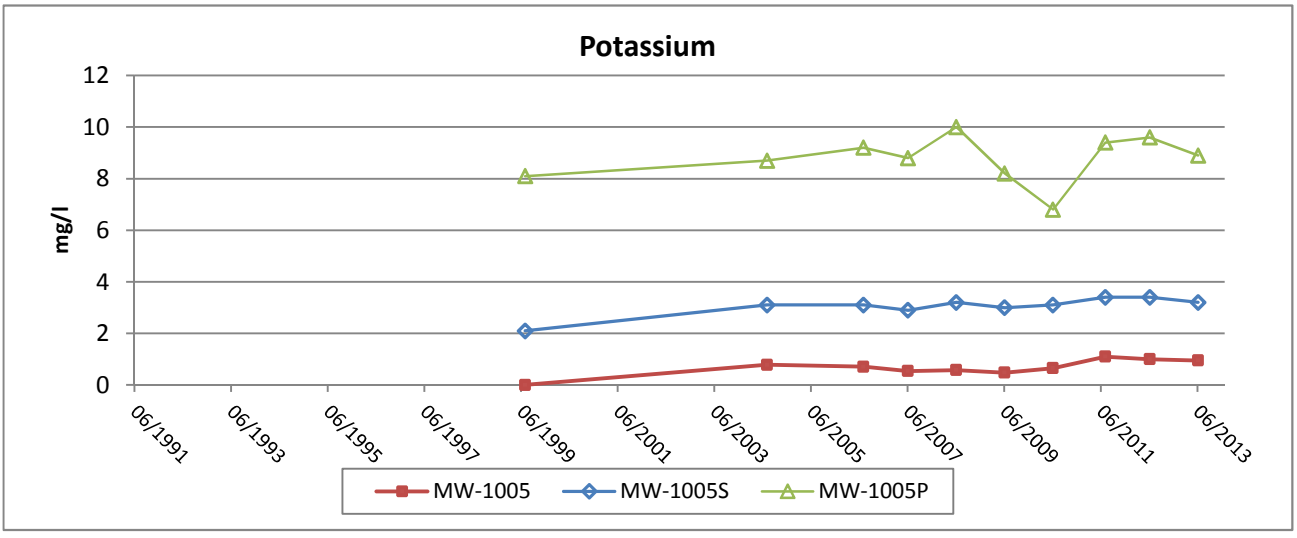
Groundwater Trend Graphs - Annual Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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FLAMBEAU MINING COMPANY

Figure B-11c

Groundwater Trend Graphs - Quarterly Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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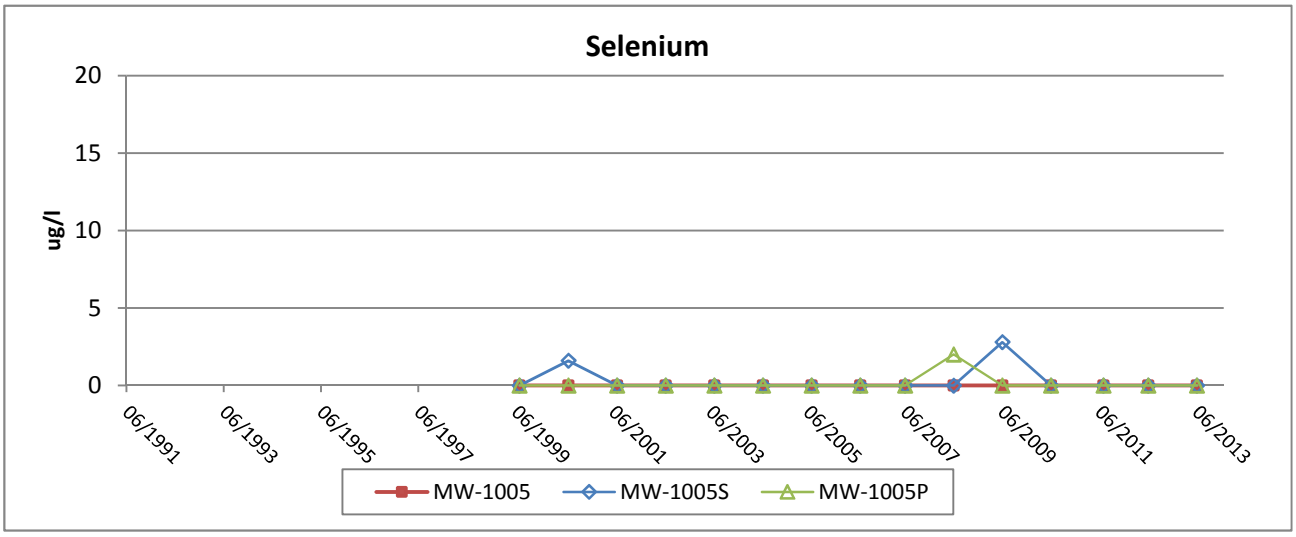


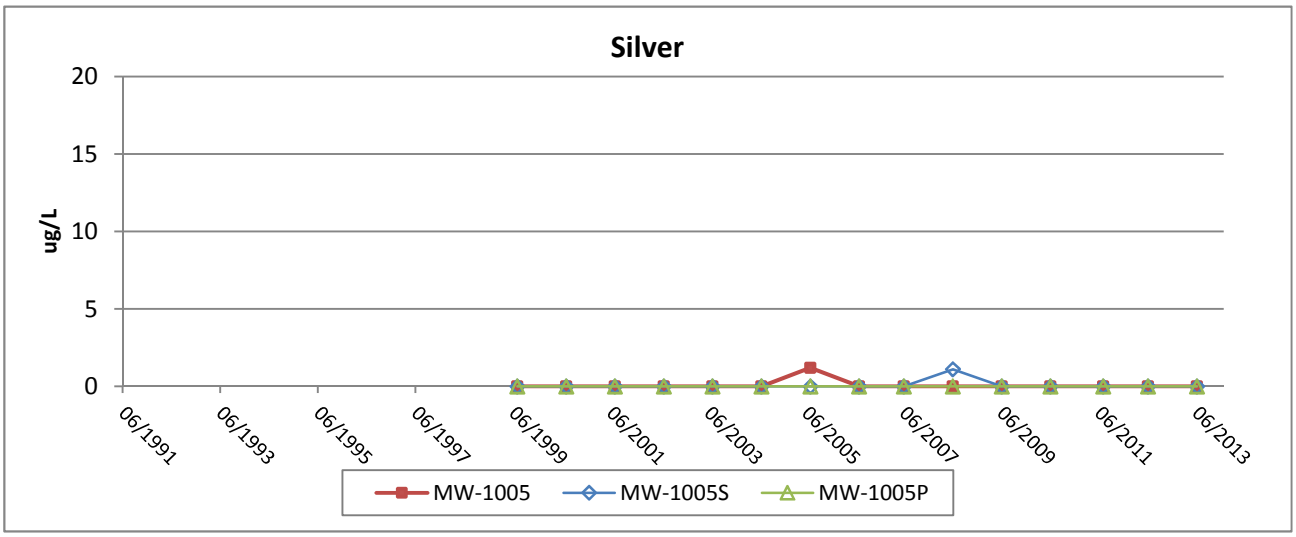


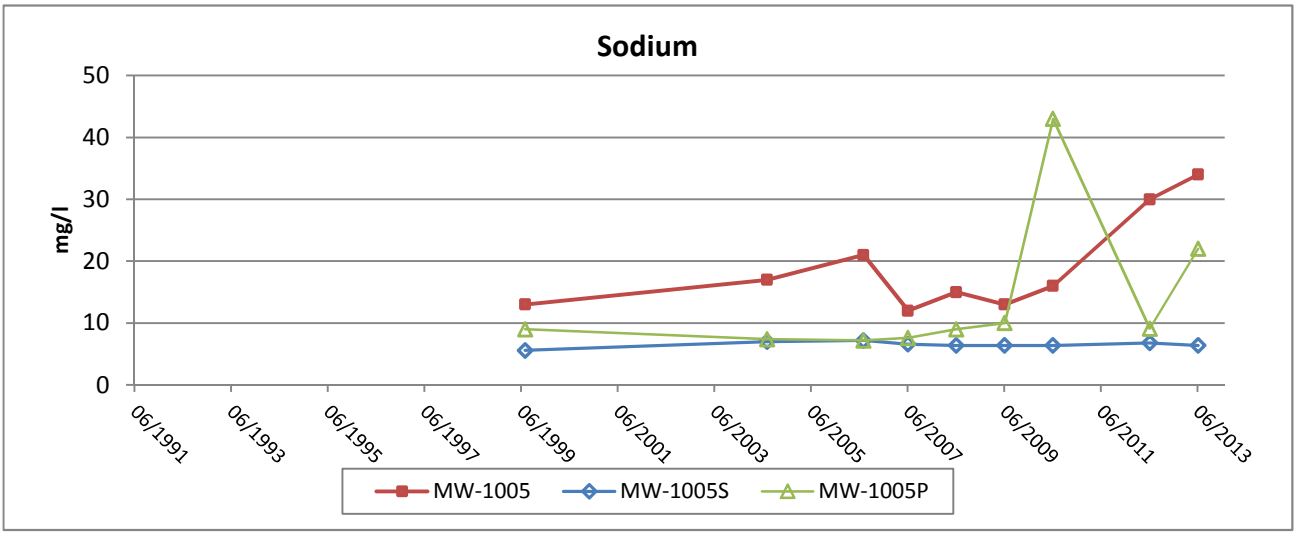


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FLAMBEAU MINING COMPANY

Figure B-11d

Groundwater Trend Graphs - Annual Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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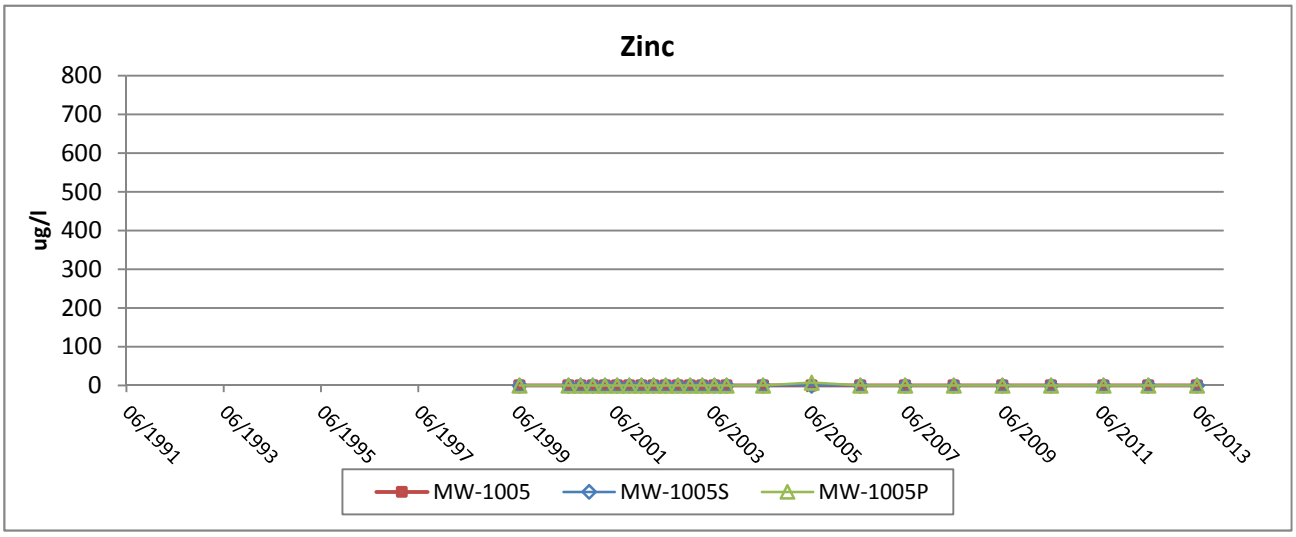


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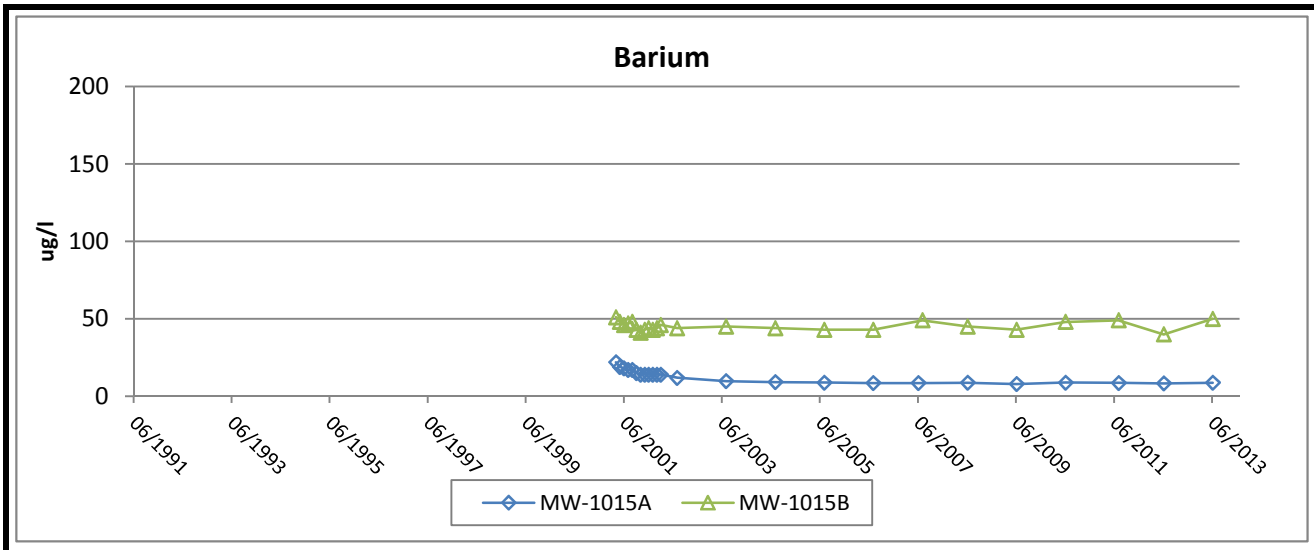
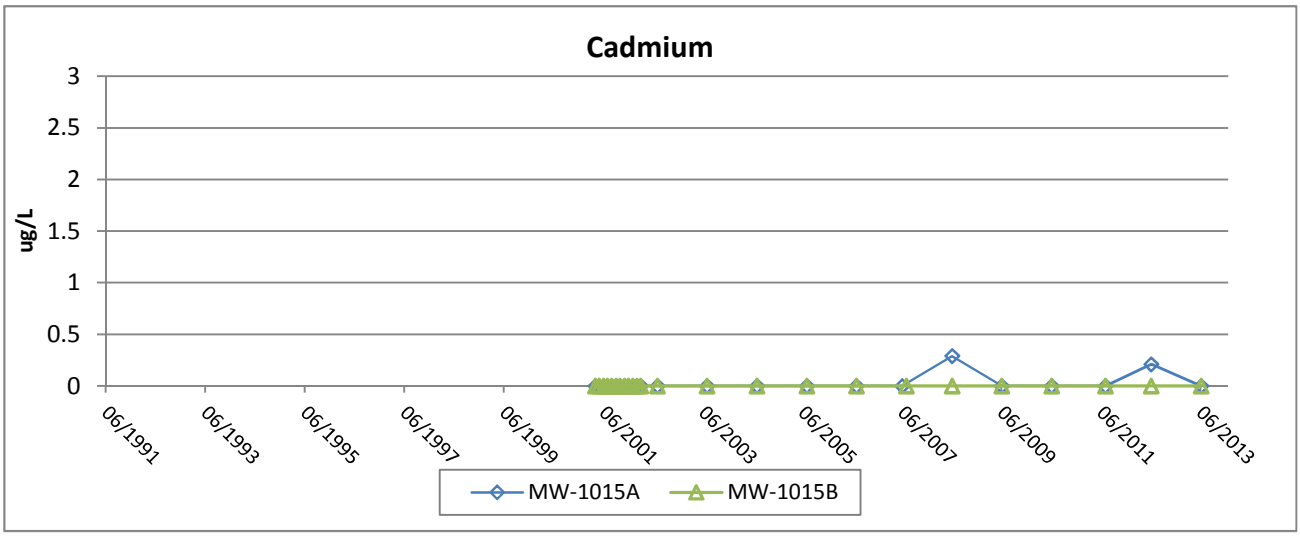
Figure B-11e

Groundwater Trend Graphs - Annual Results

MW-1005/MW-1005S/MW-1005P

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



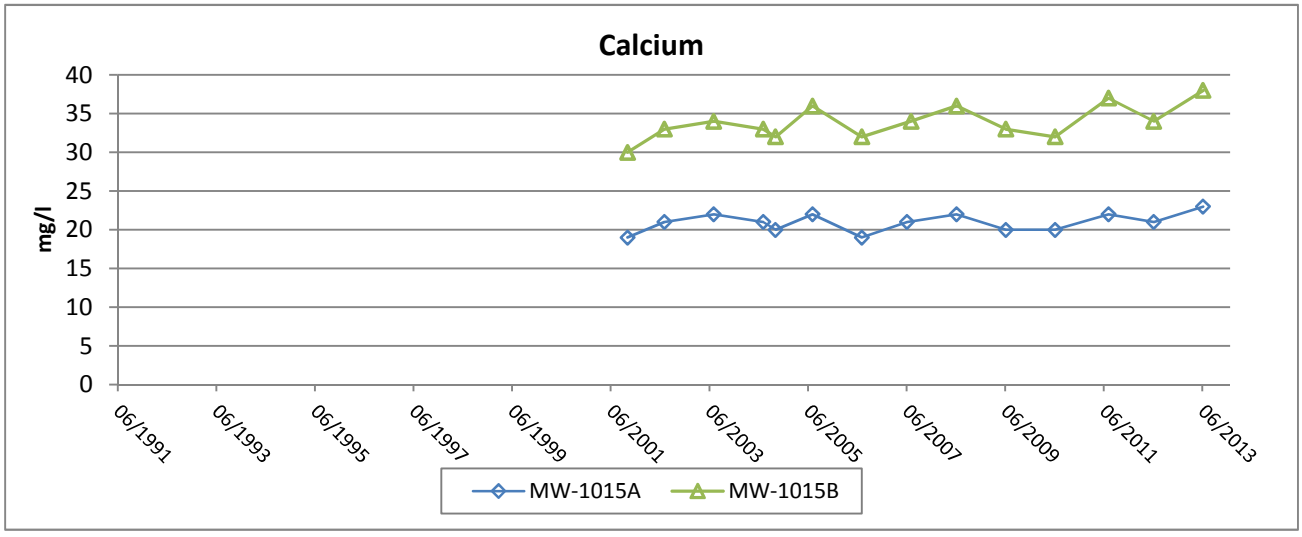




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Figure B-12a

Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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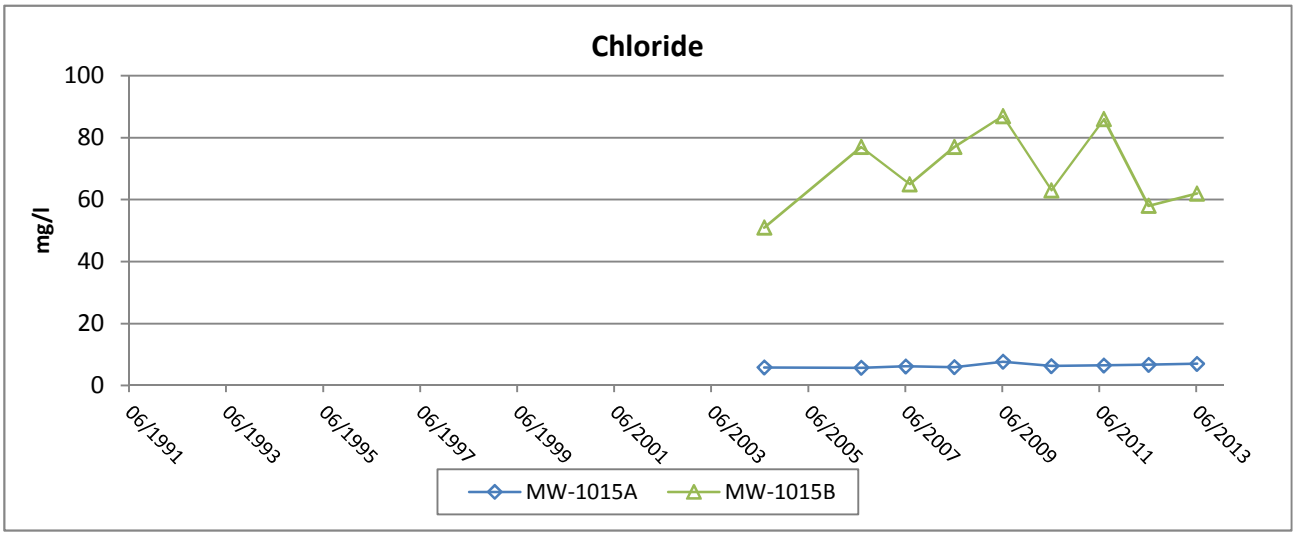


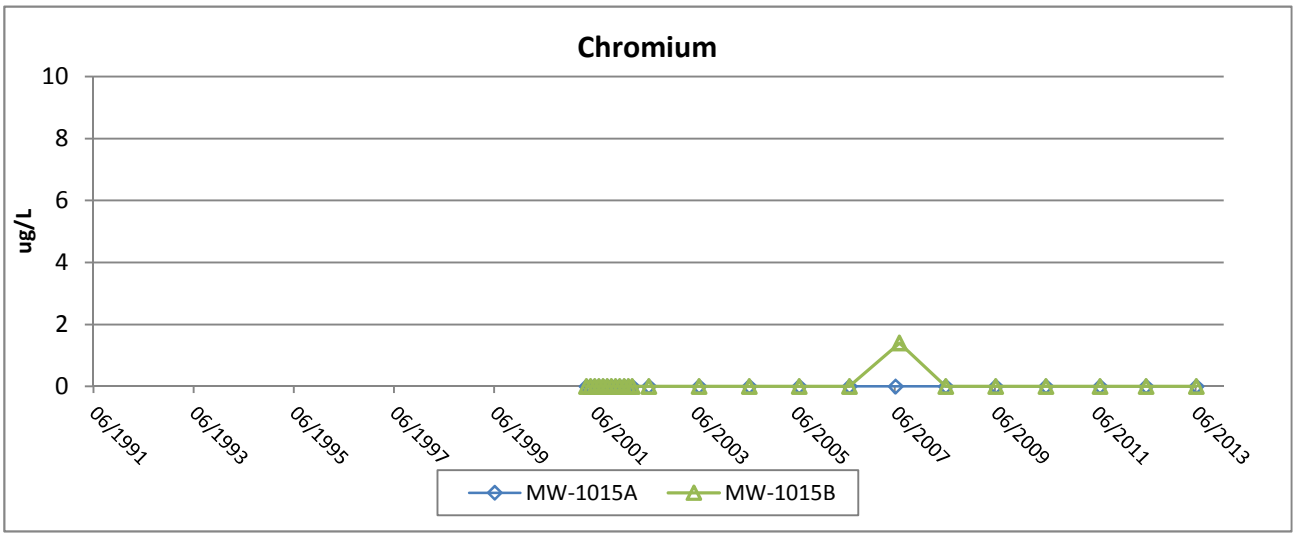


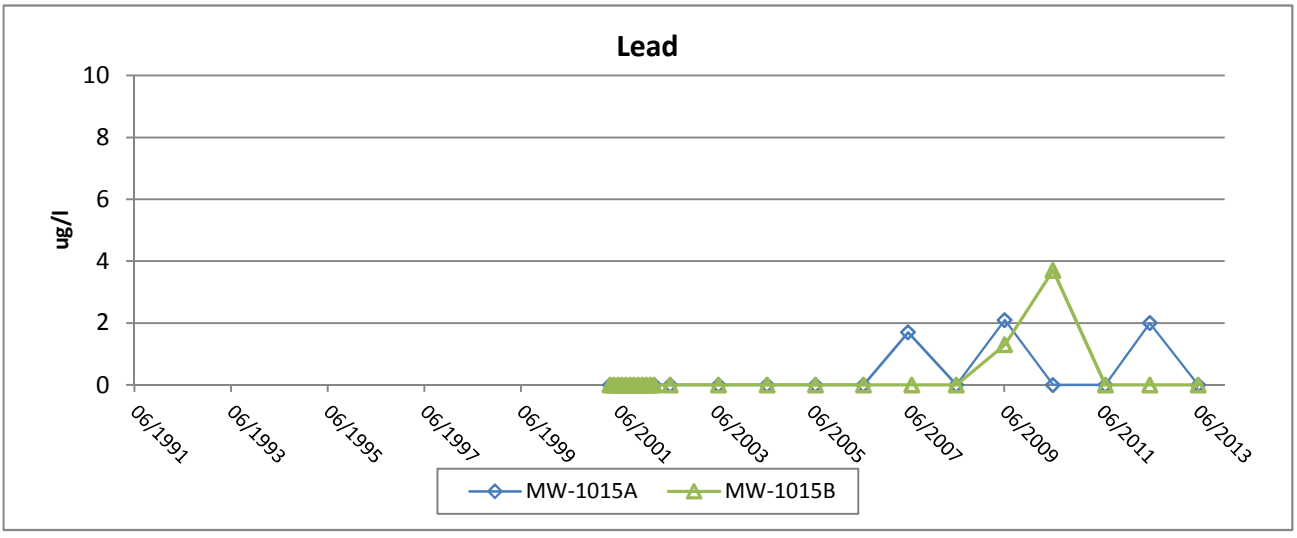


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Figure B-12b

Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
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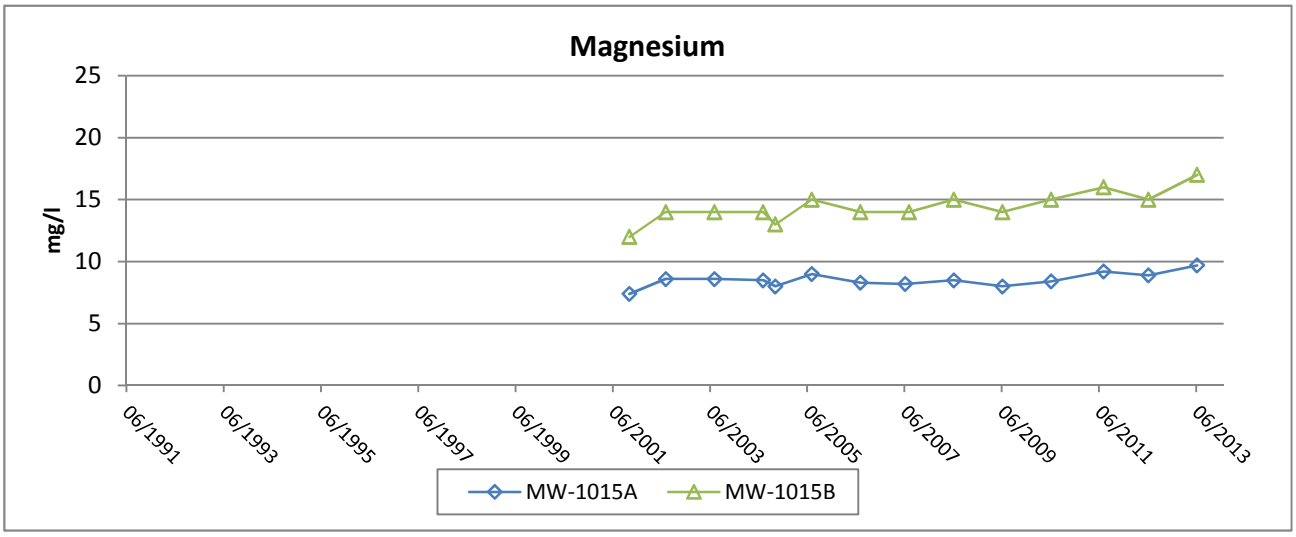


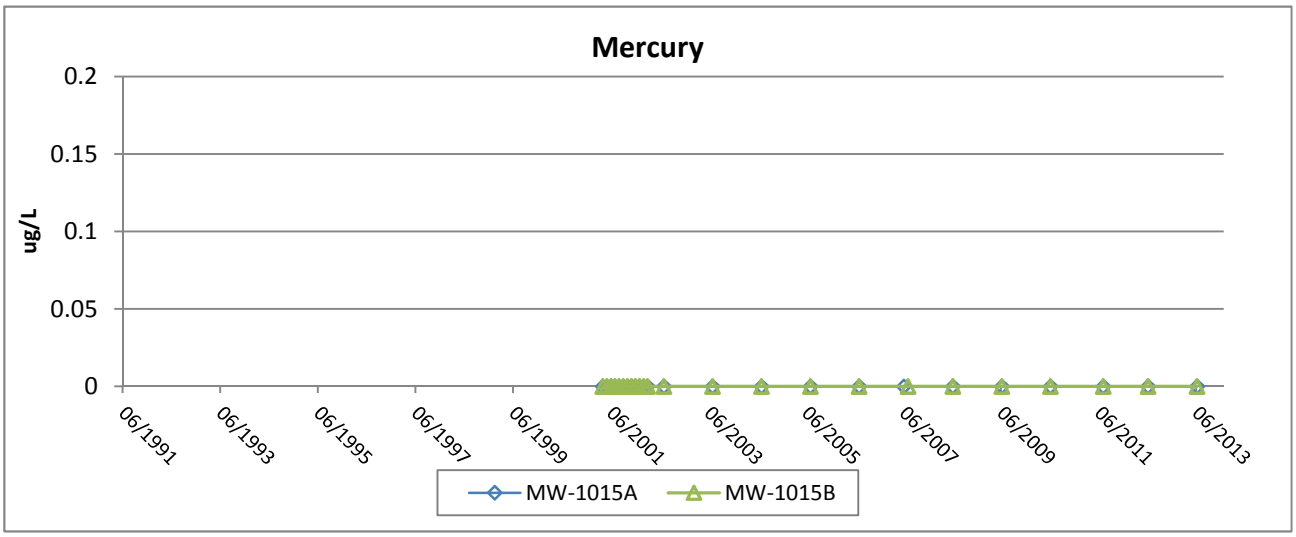


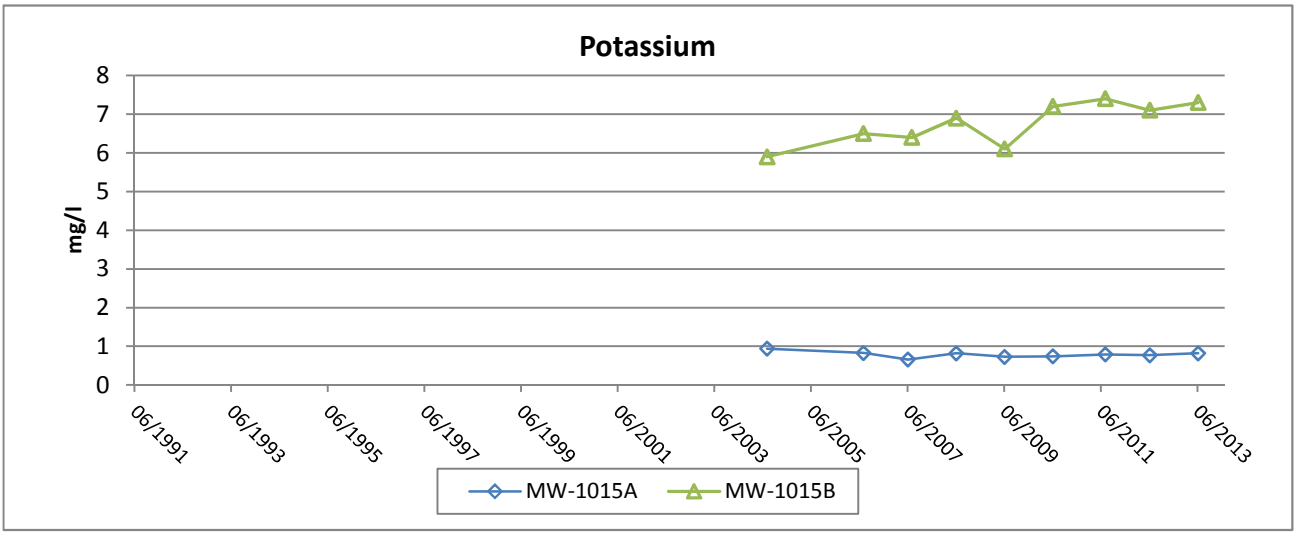


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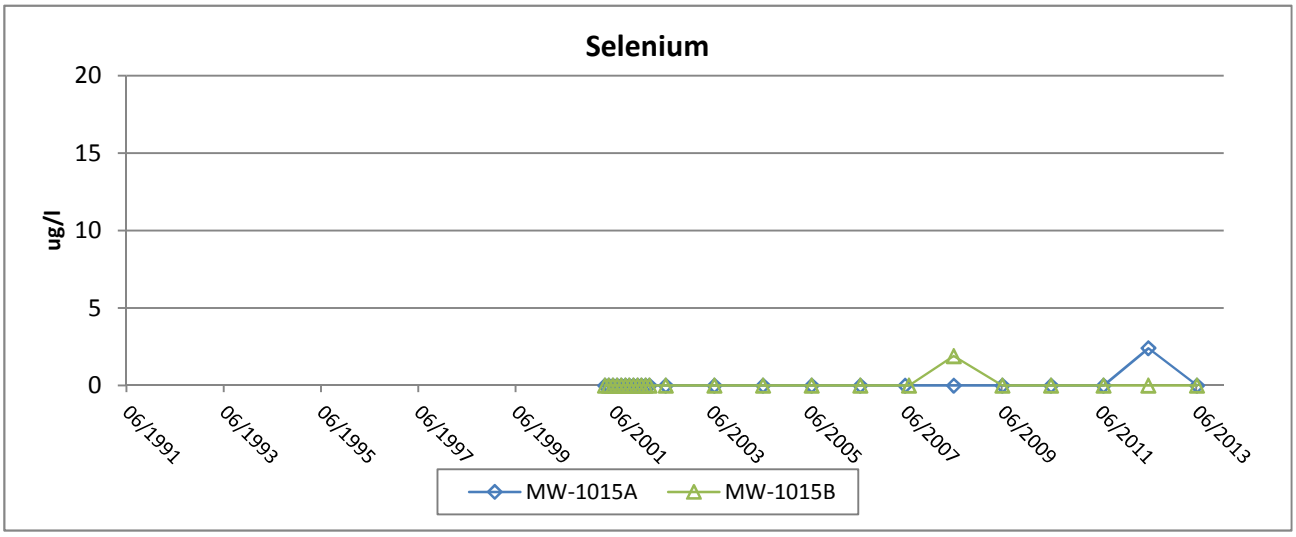
FLAMBEAU MINING COMPANY

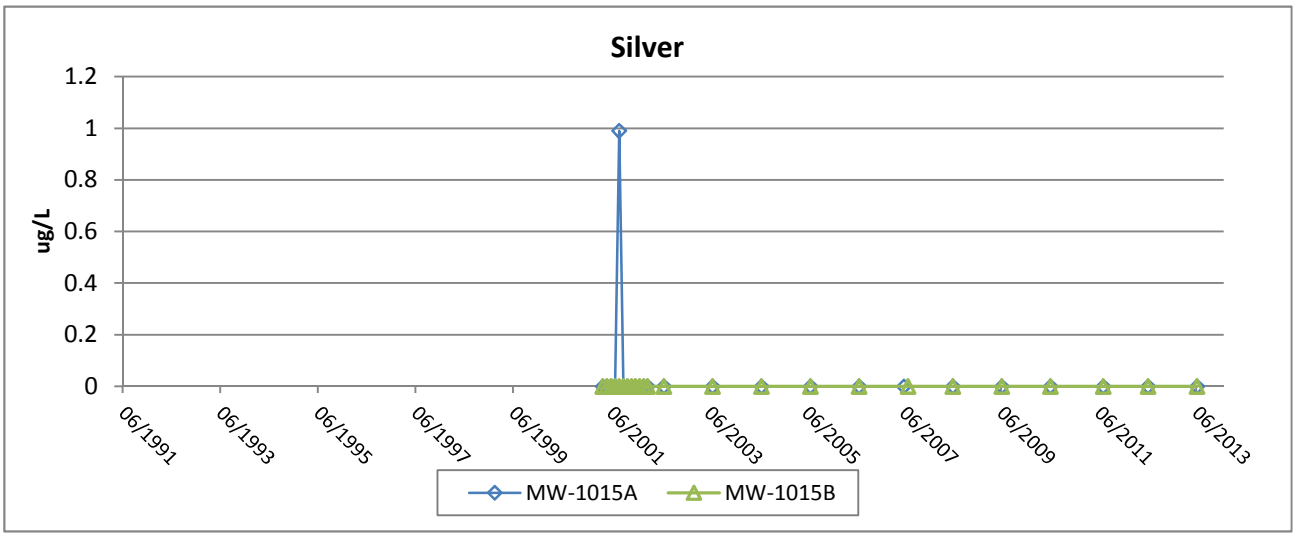
Figure B-12c

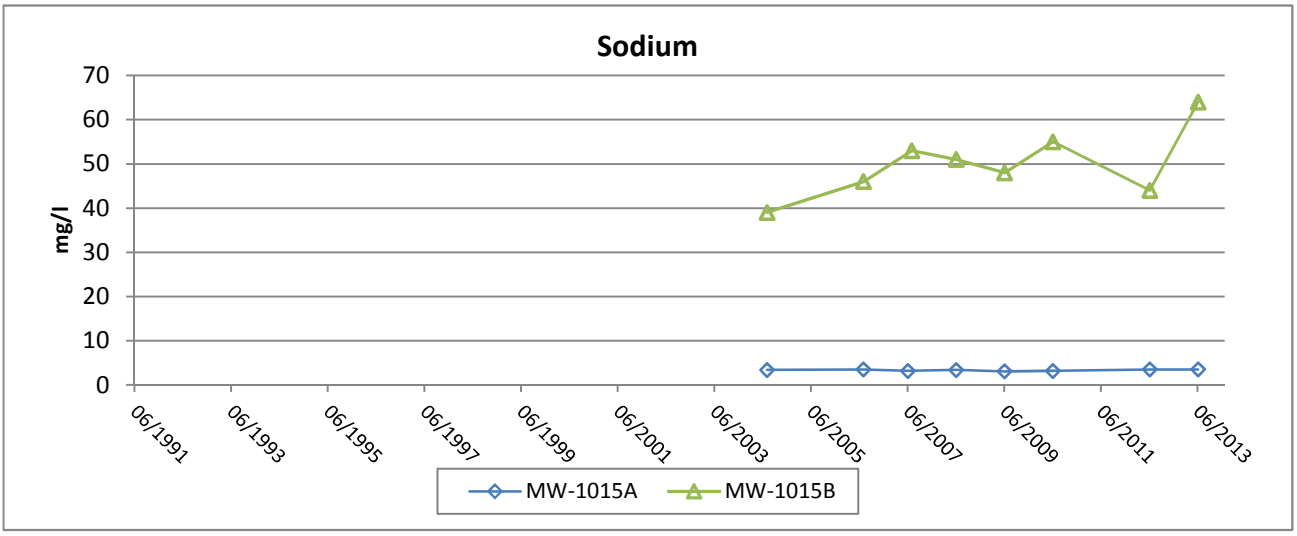
Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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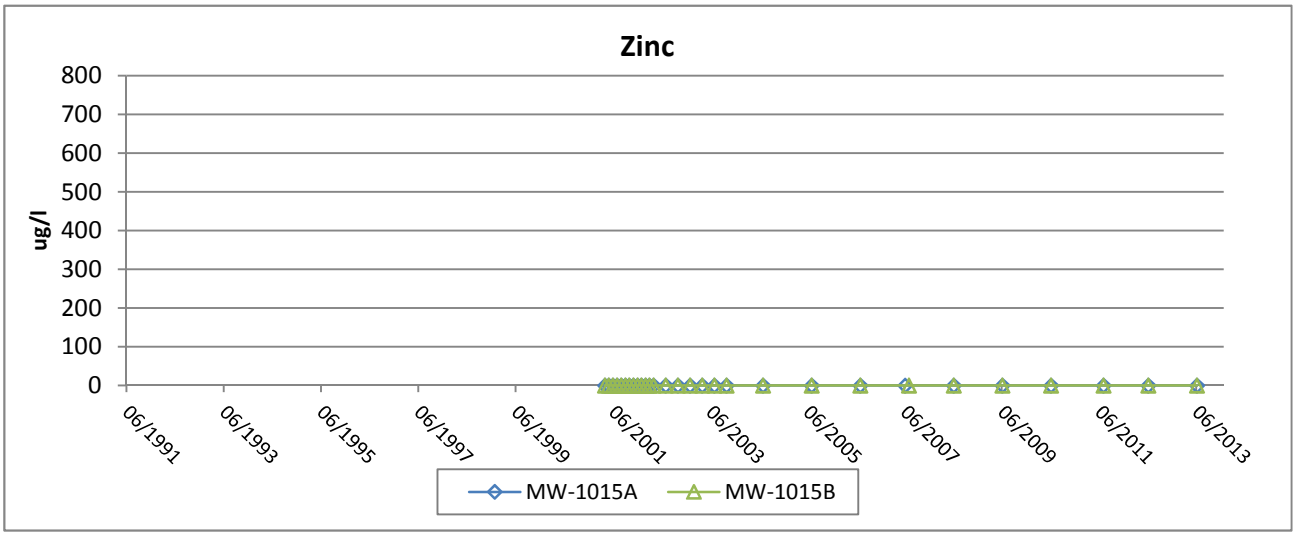
FLAMBEAU MINING COMPANY

Figure B-12d

Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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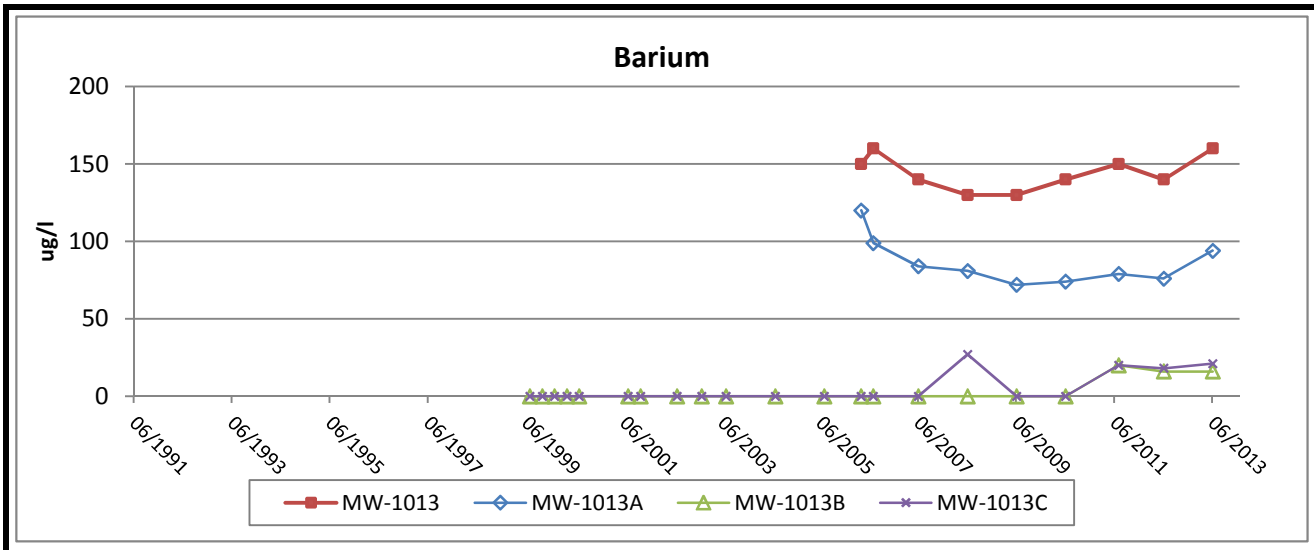
FLAMBEAU MINING COMPANY

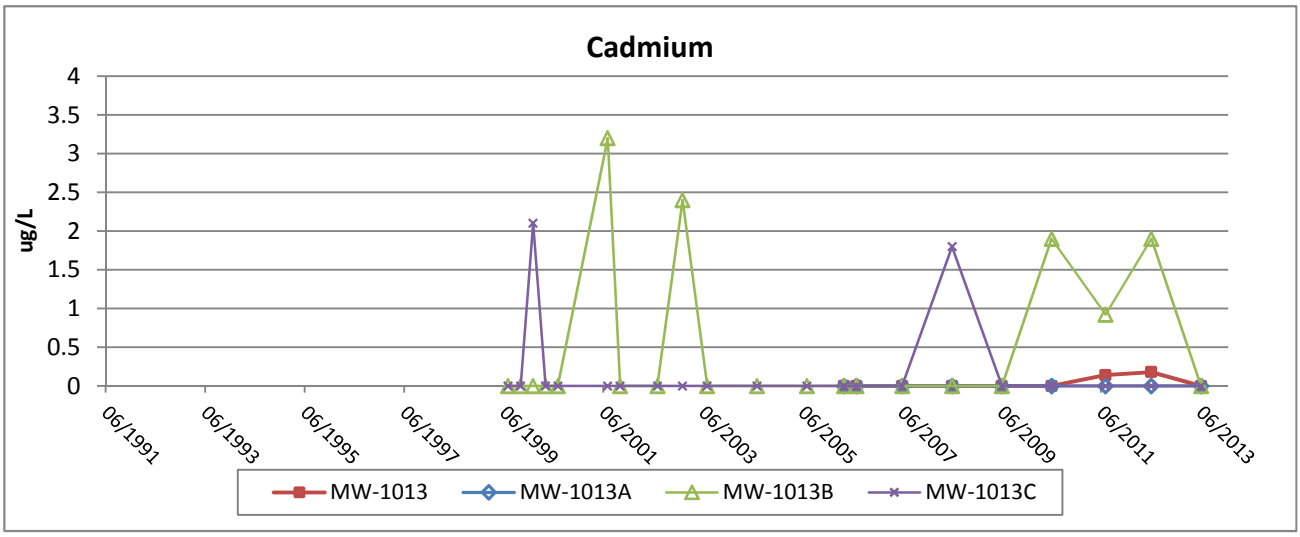
Figure B-12e

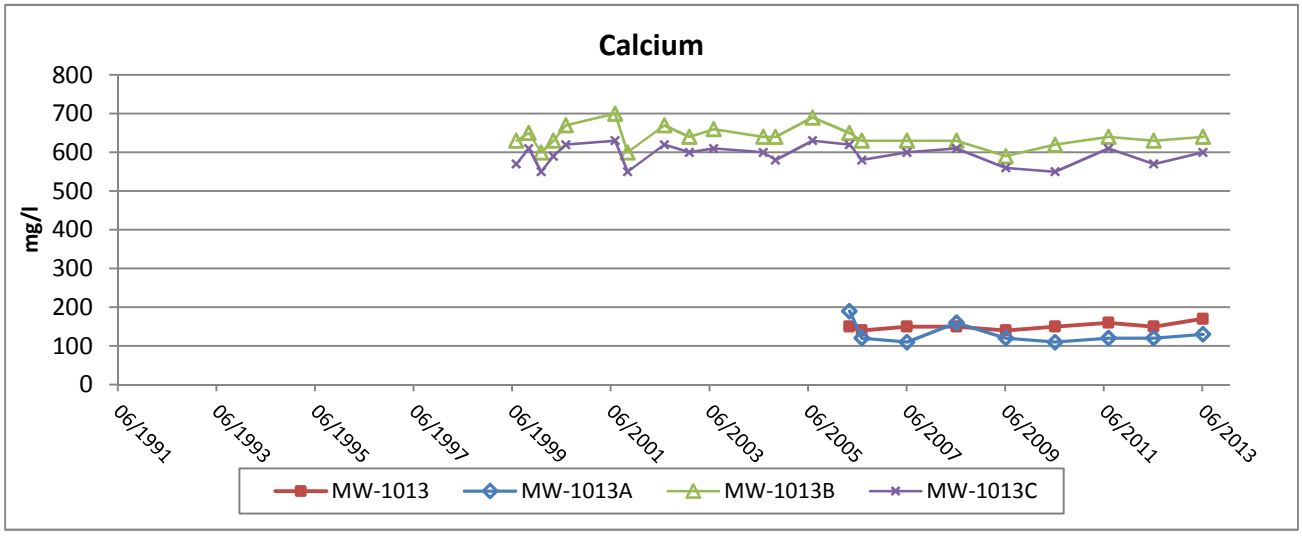
Groundwater Trend Graphs - Annual Results

MW-1015A/MW-1015B

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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FLAMBEAU MINING COMPANY

Figure B-13a

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



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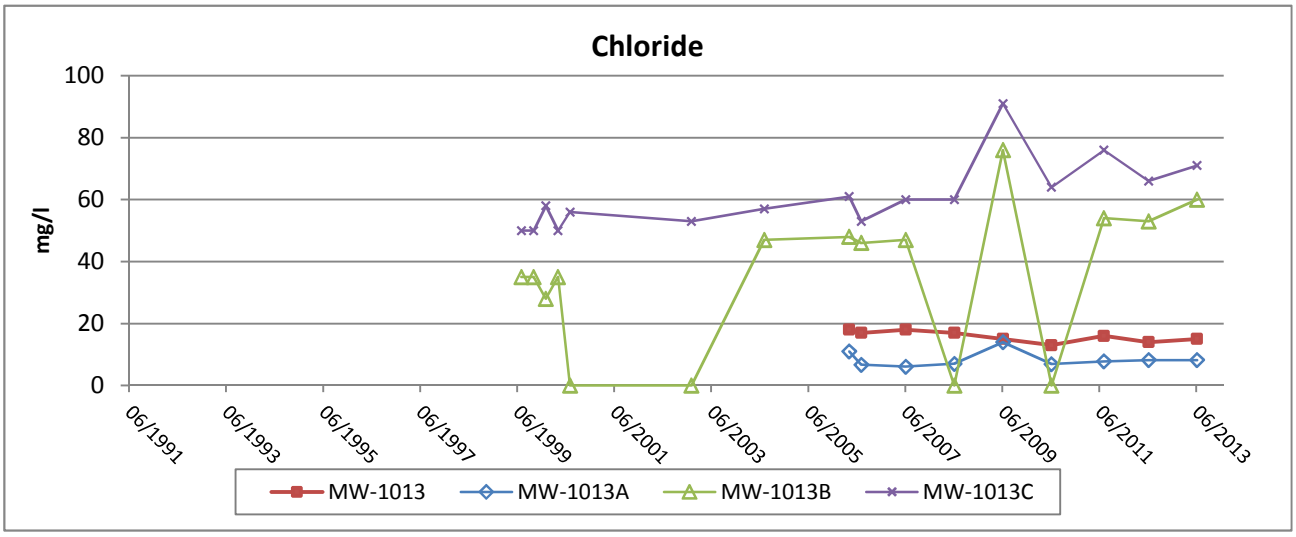


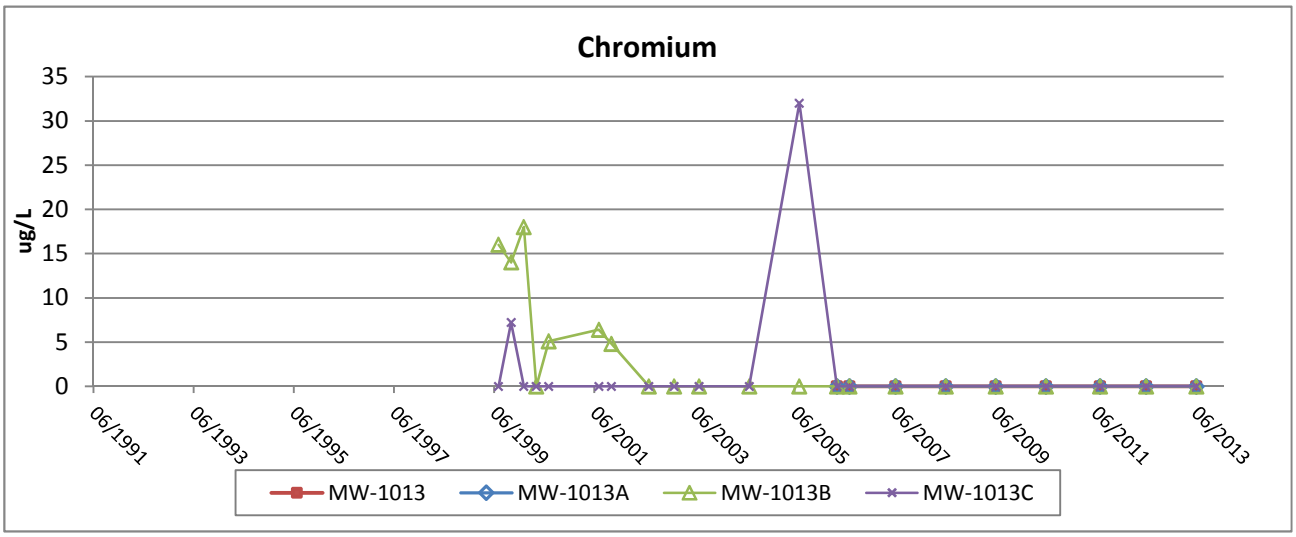


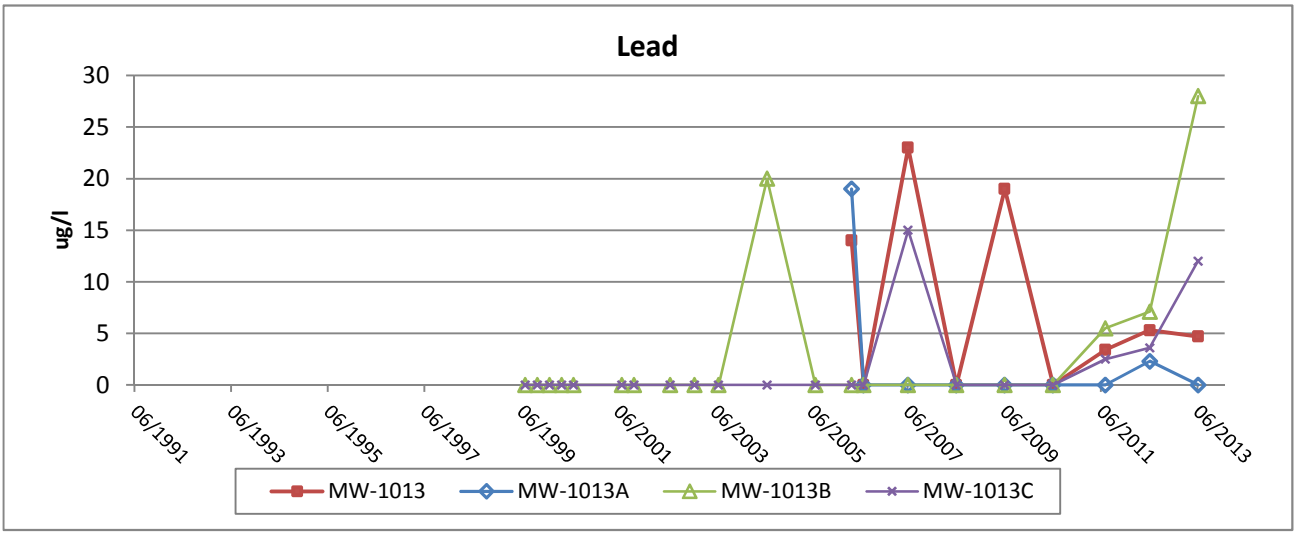


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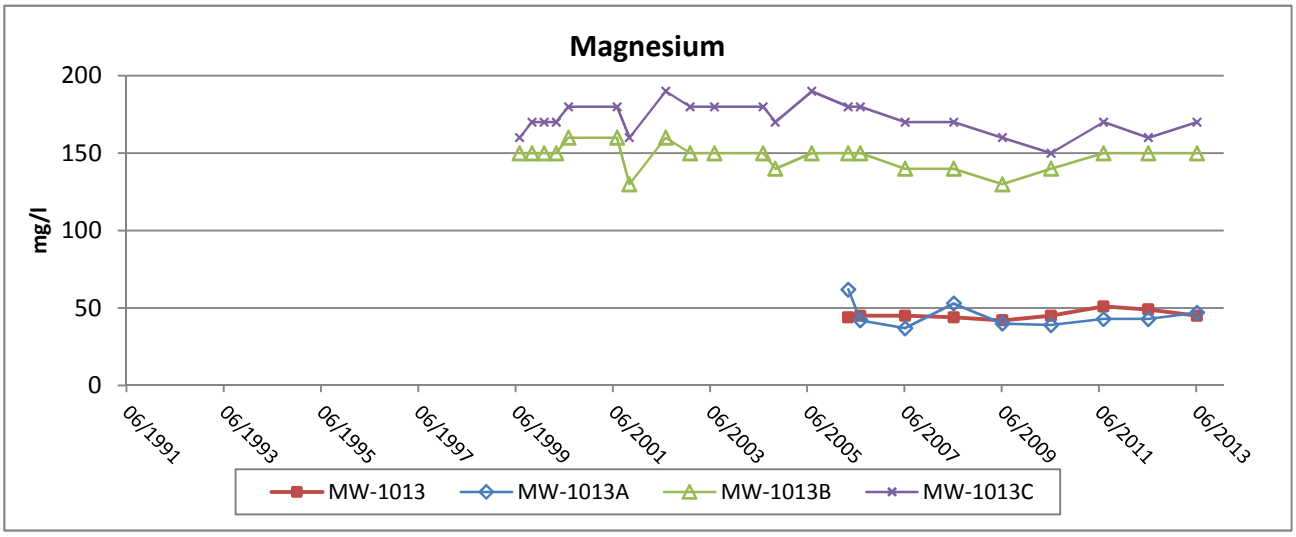
FLAMBEAU MINING COMPANY

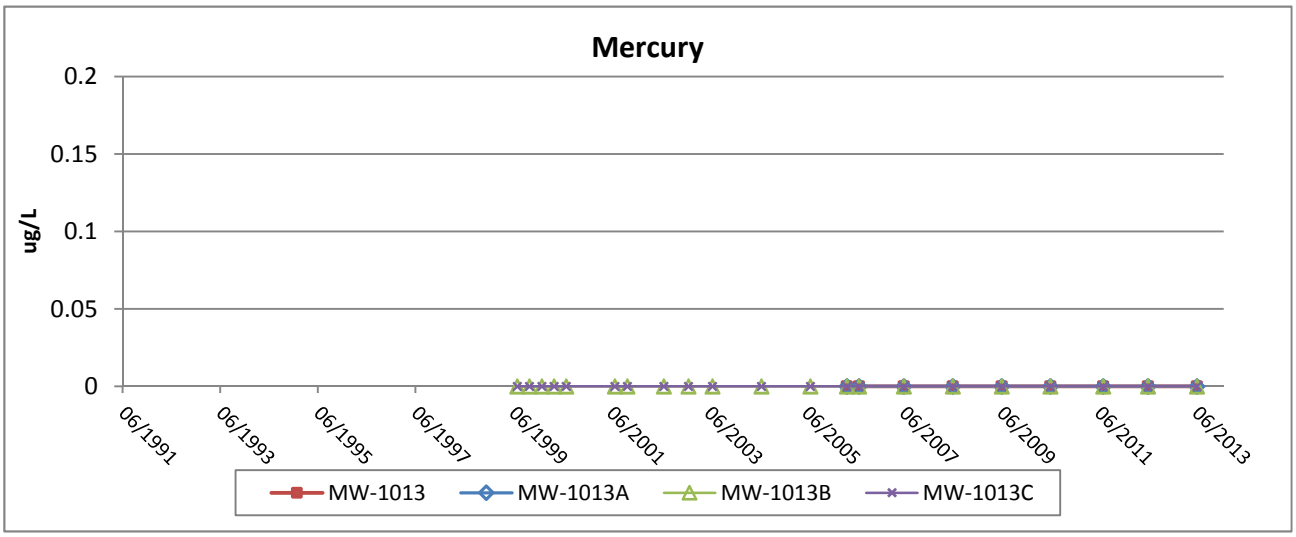
Figure B-13b

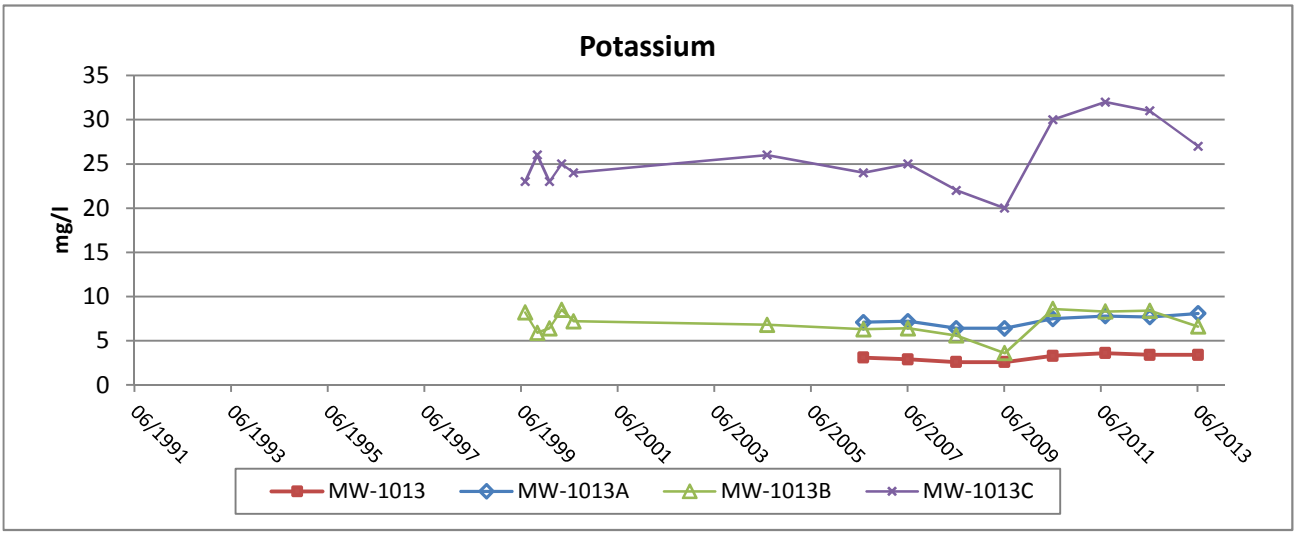
Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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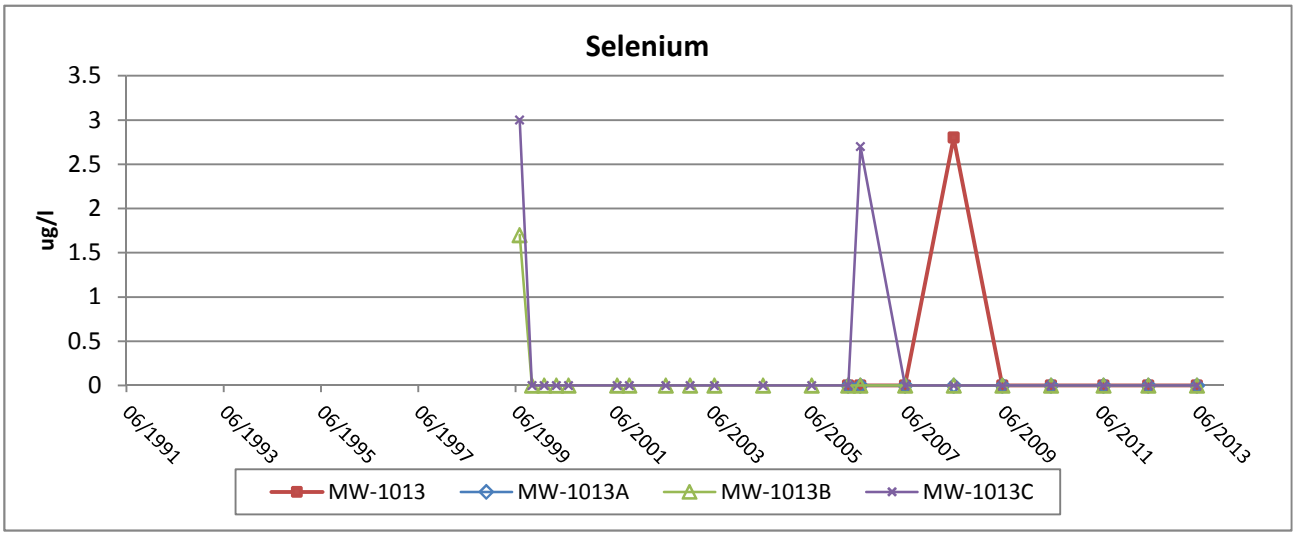
FLAMBEAU MINING COMPANY

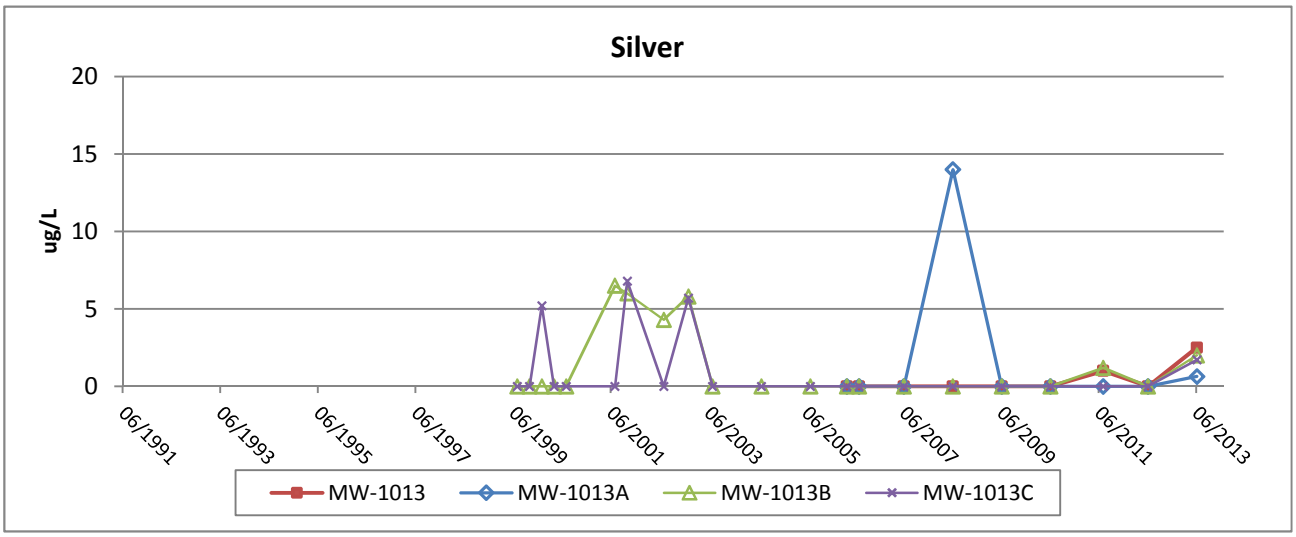
Figure B-13c

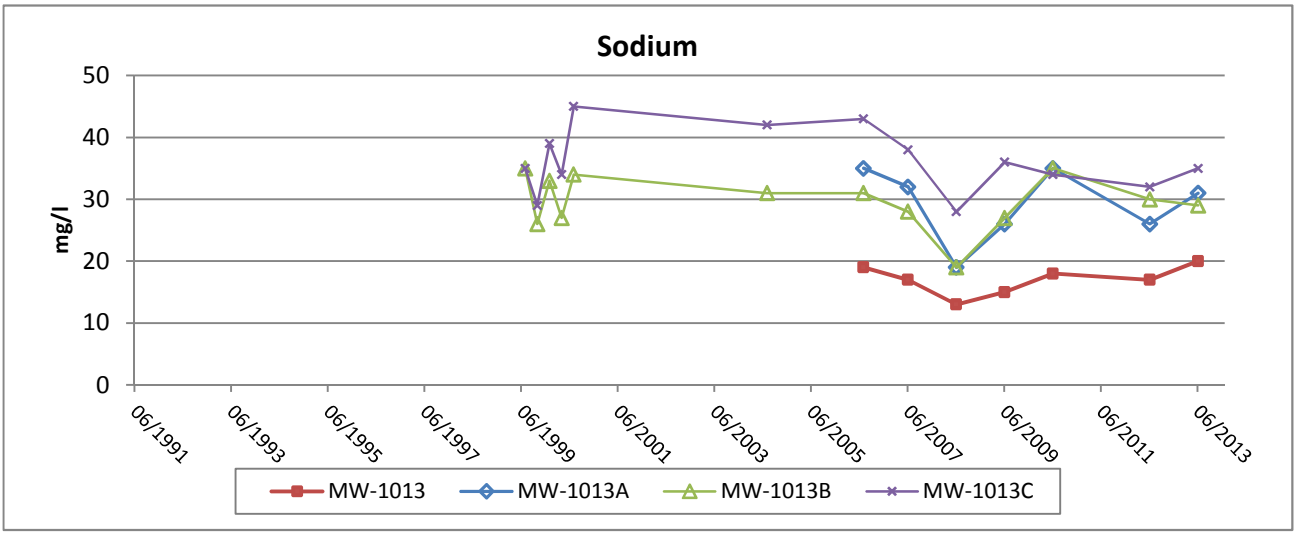
Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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FLAMBEAU MINING COMPANY

Figure B-13d

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

Flambeau Mining Co.
2013 Annual Report



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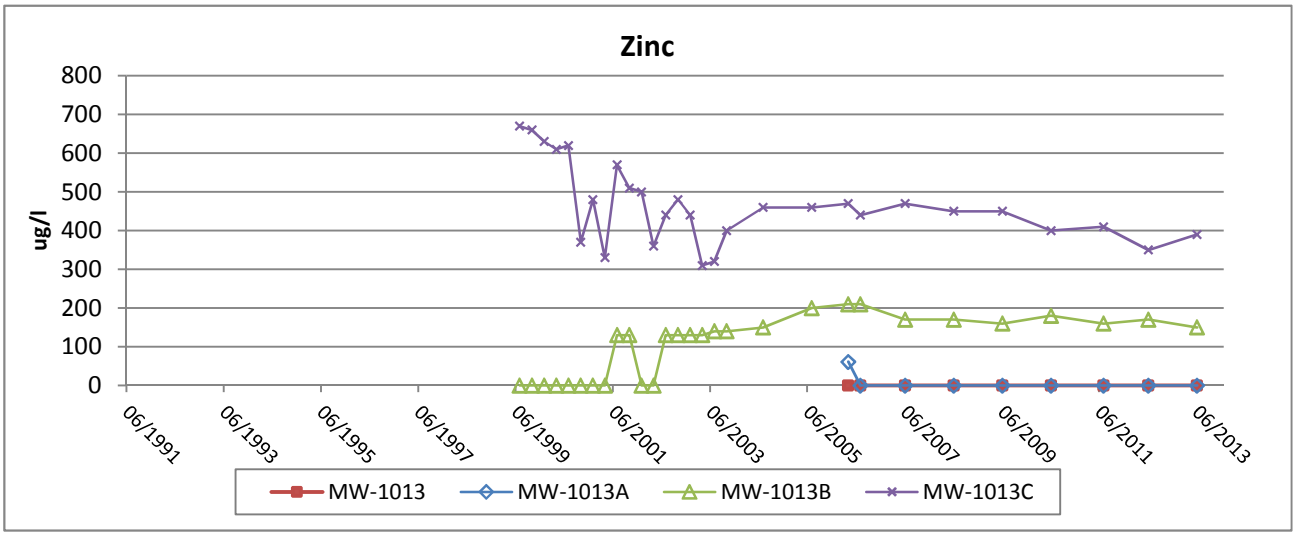


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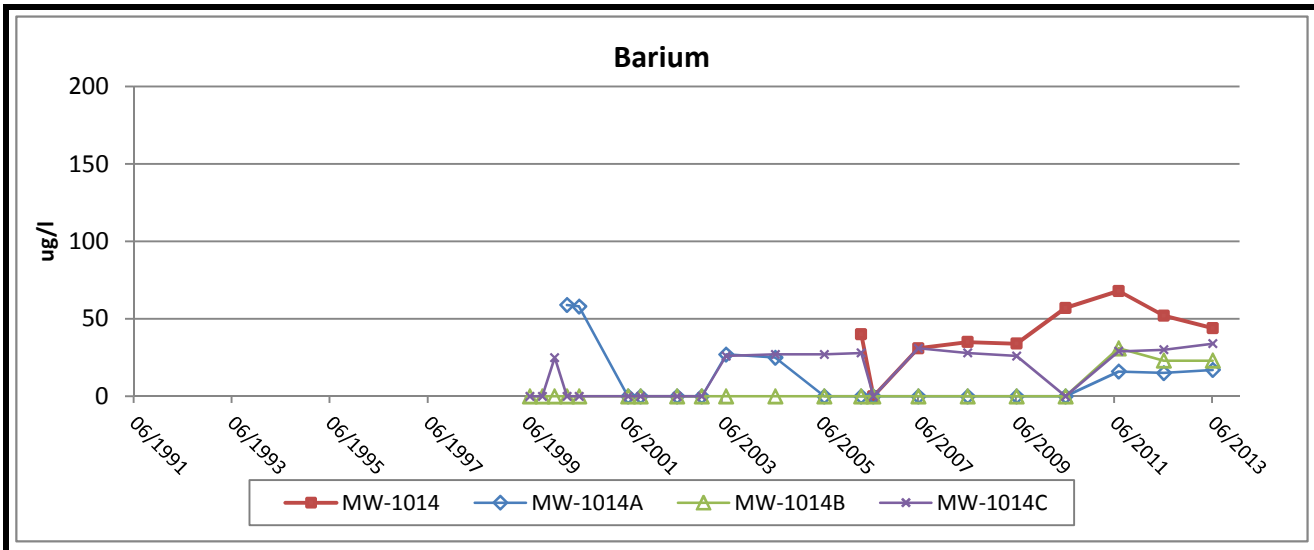
FLAMBEAU MINING COMPANY

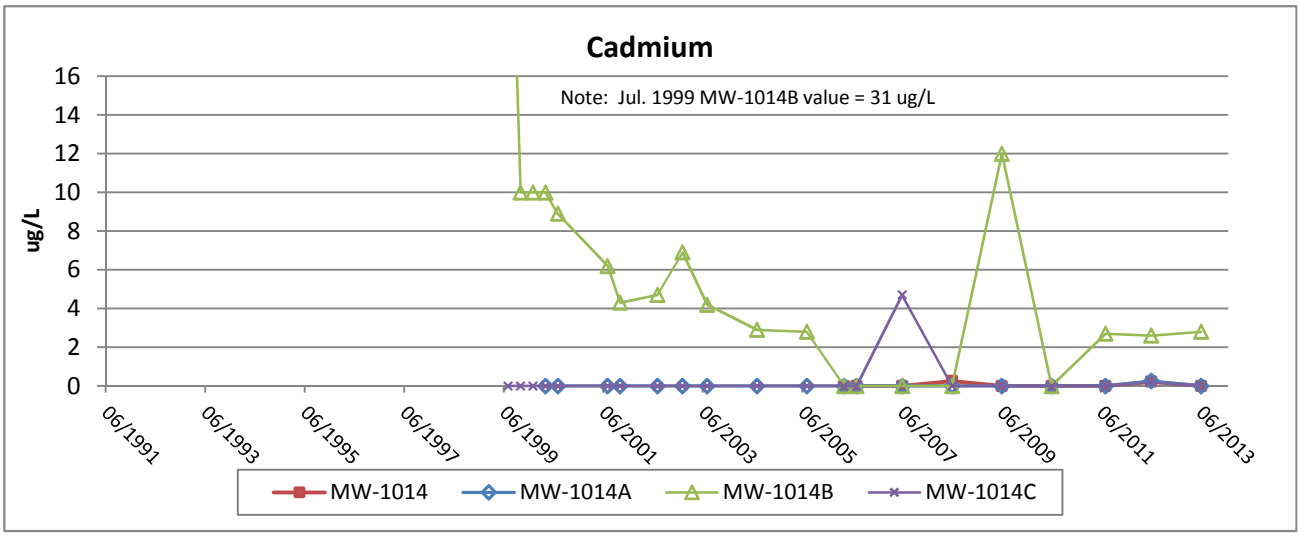
Figure B-13e

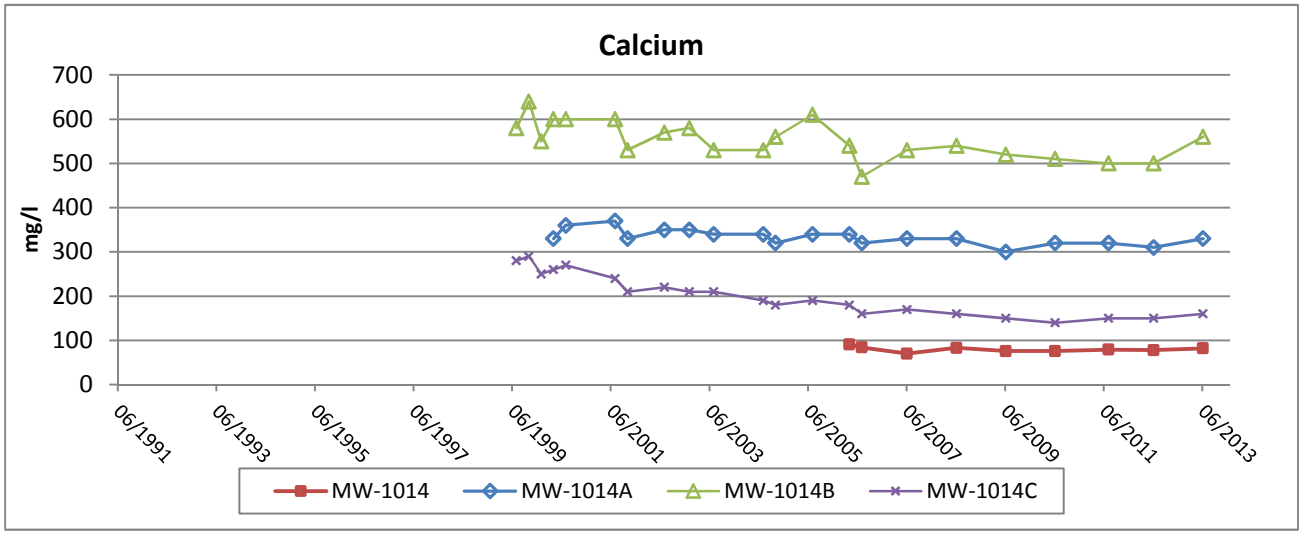
Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1013/MW-1013A/MW-1013B/MW-1013C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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FLAMBEAU MINING COMPANY

Figure B-14a

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



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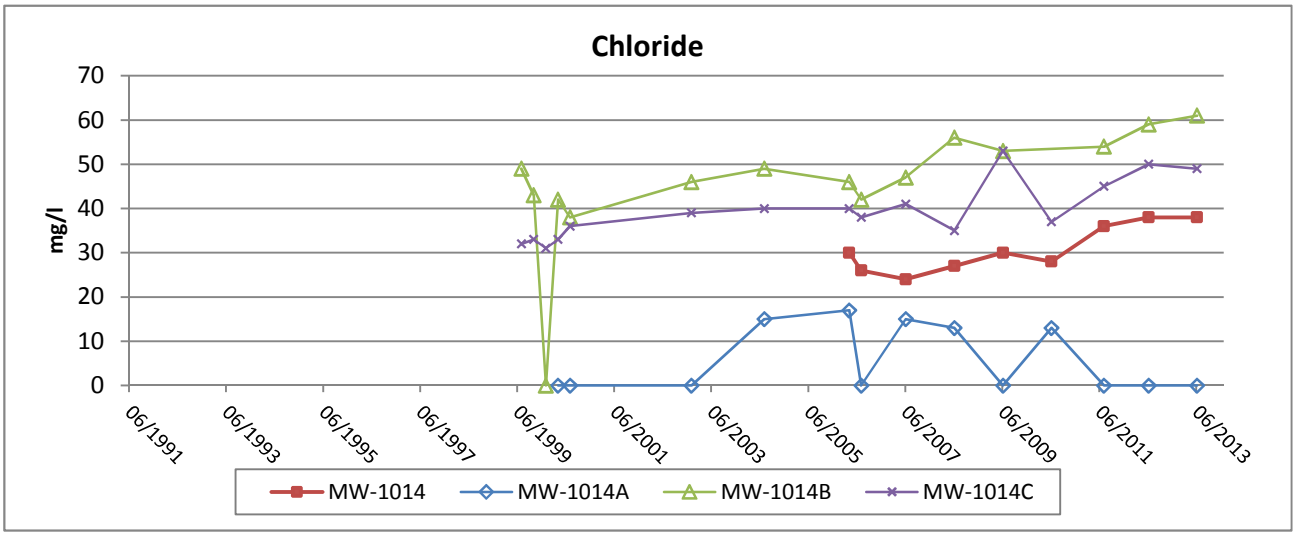


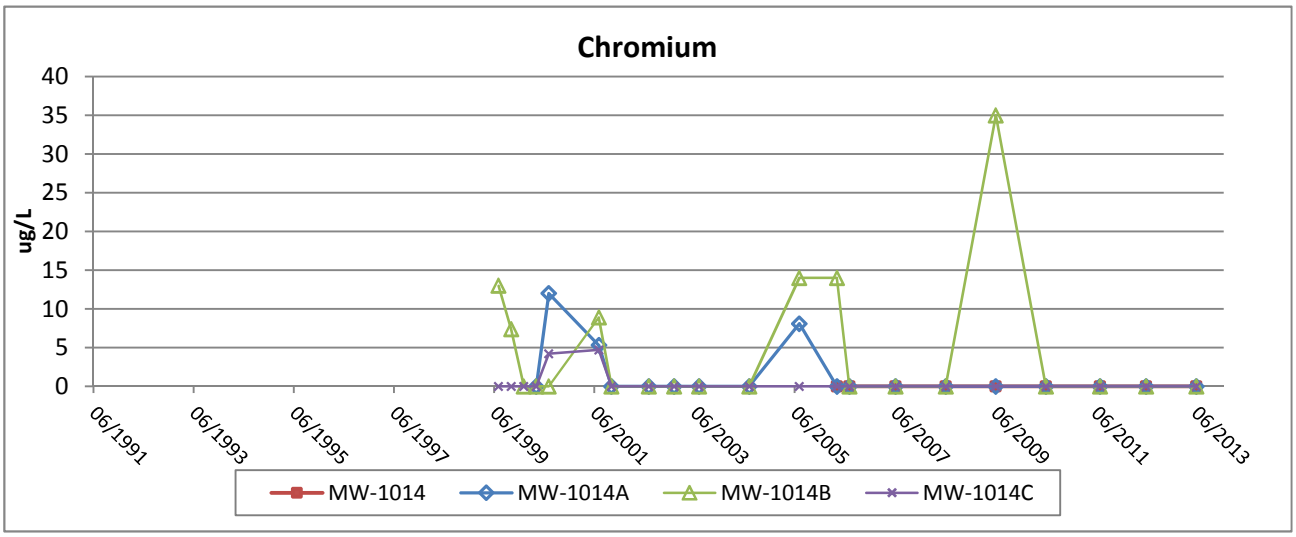


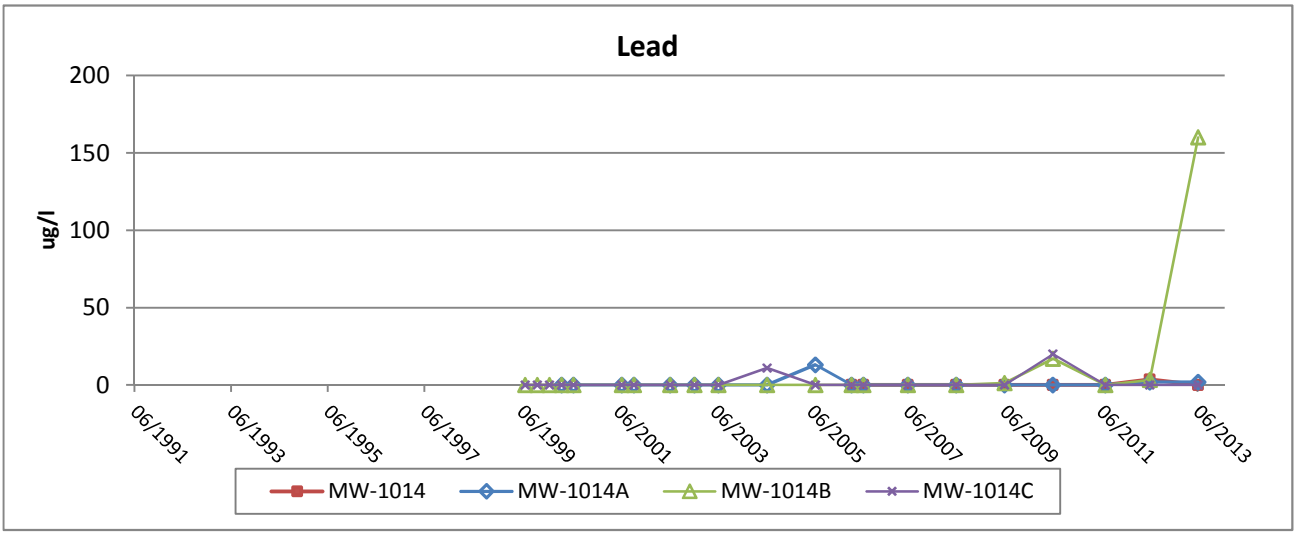


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FLAMBEAU MINING COMPANY

Figure B-14b

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |



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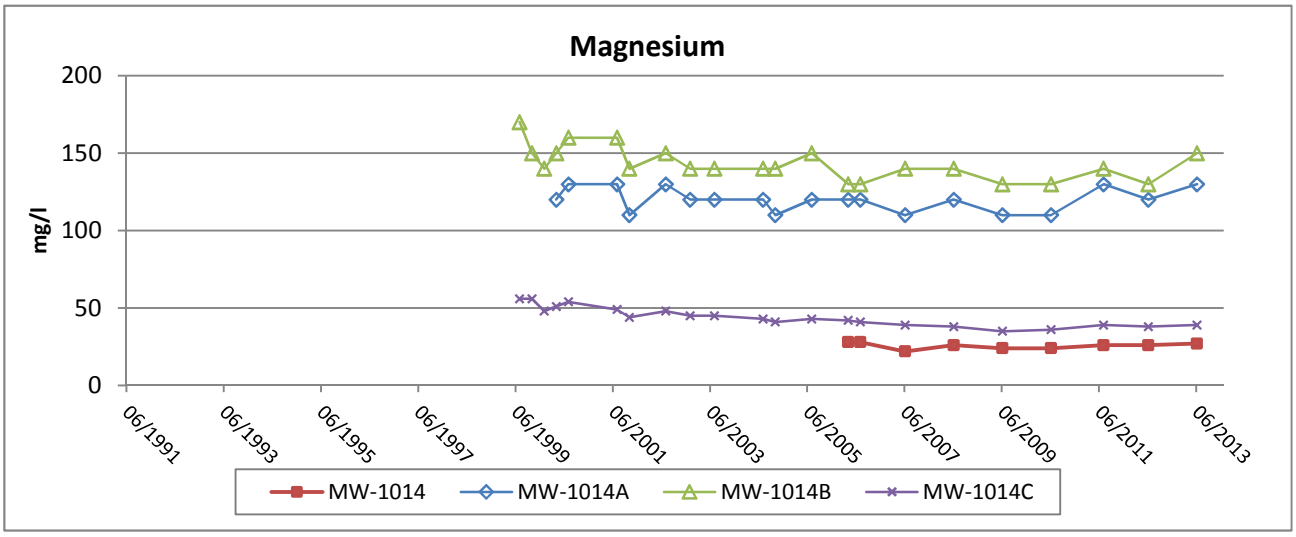


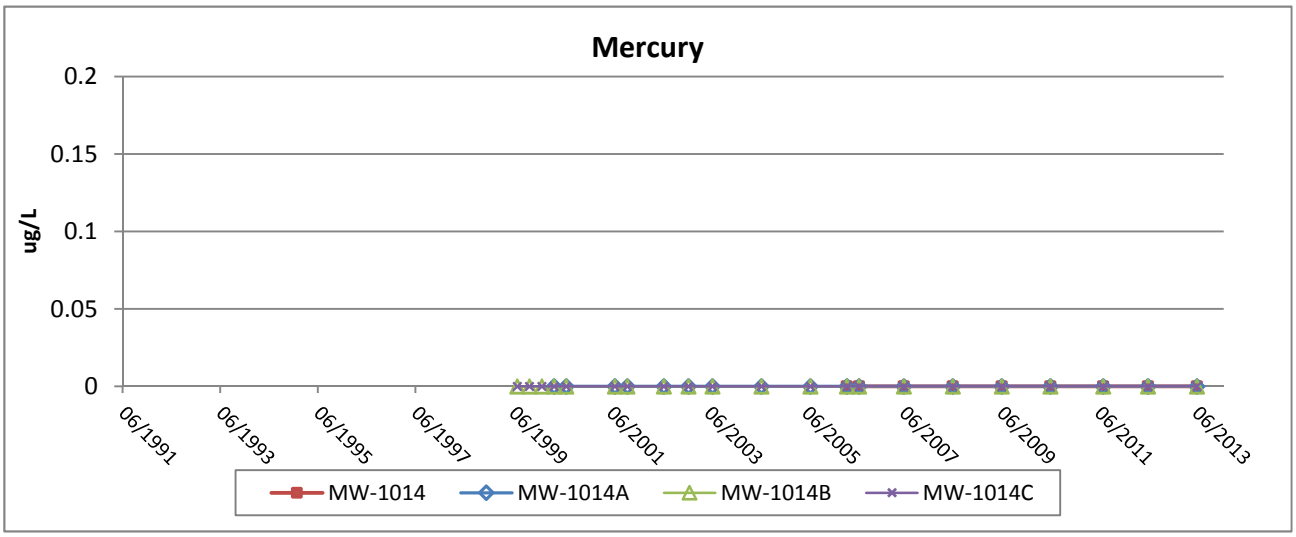


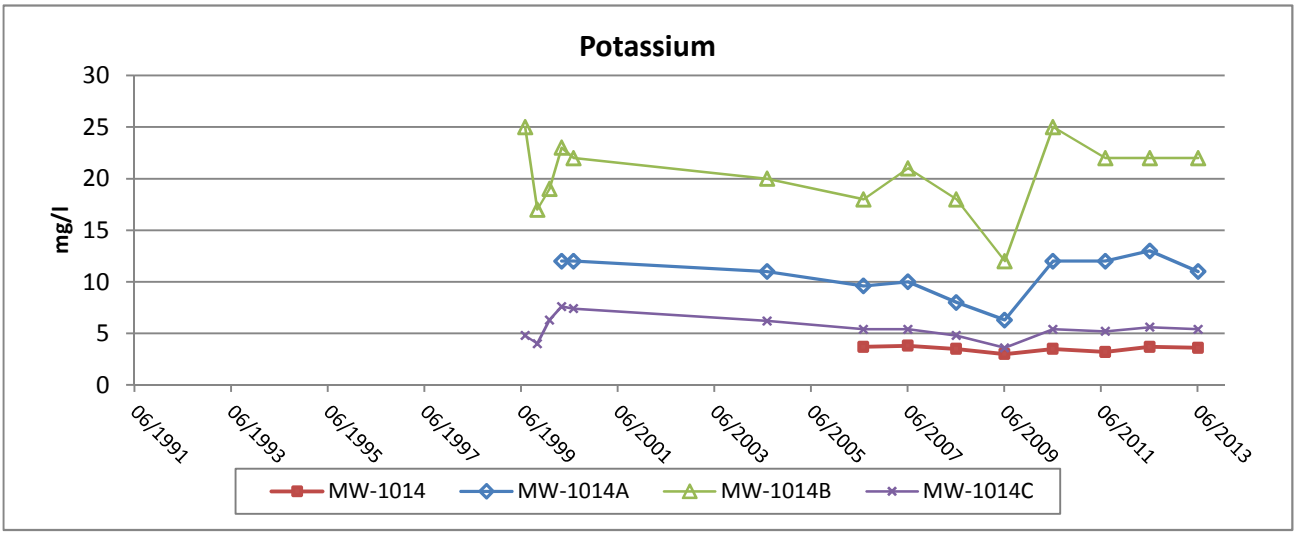


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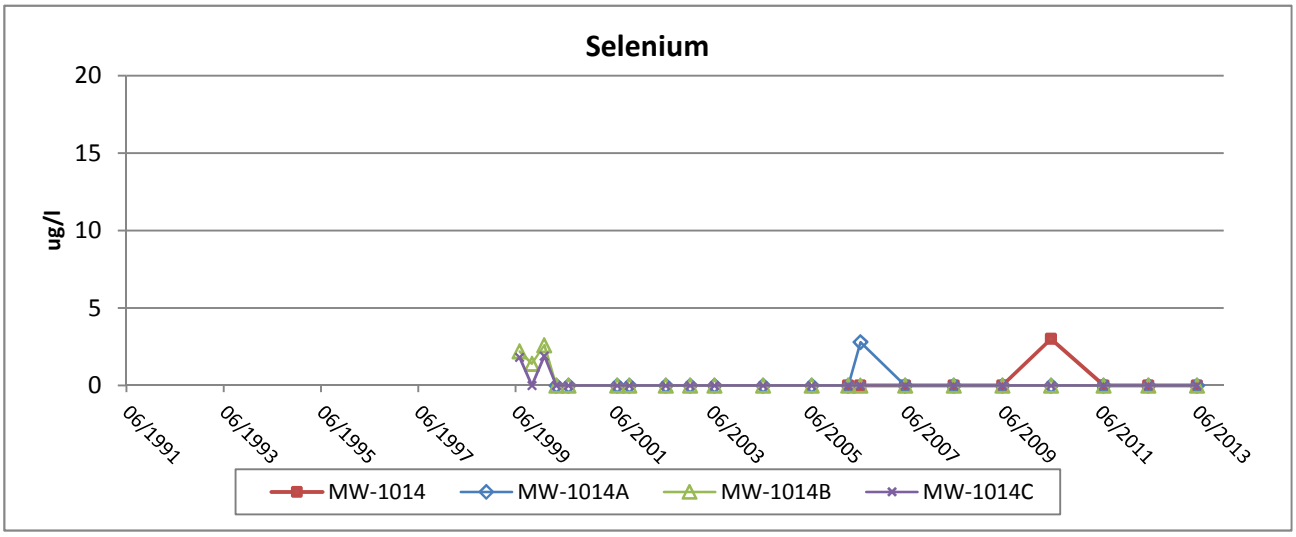
FLAMBEAU MINING COMPANY

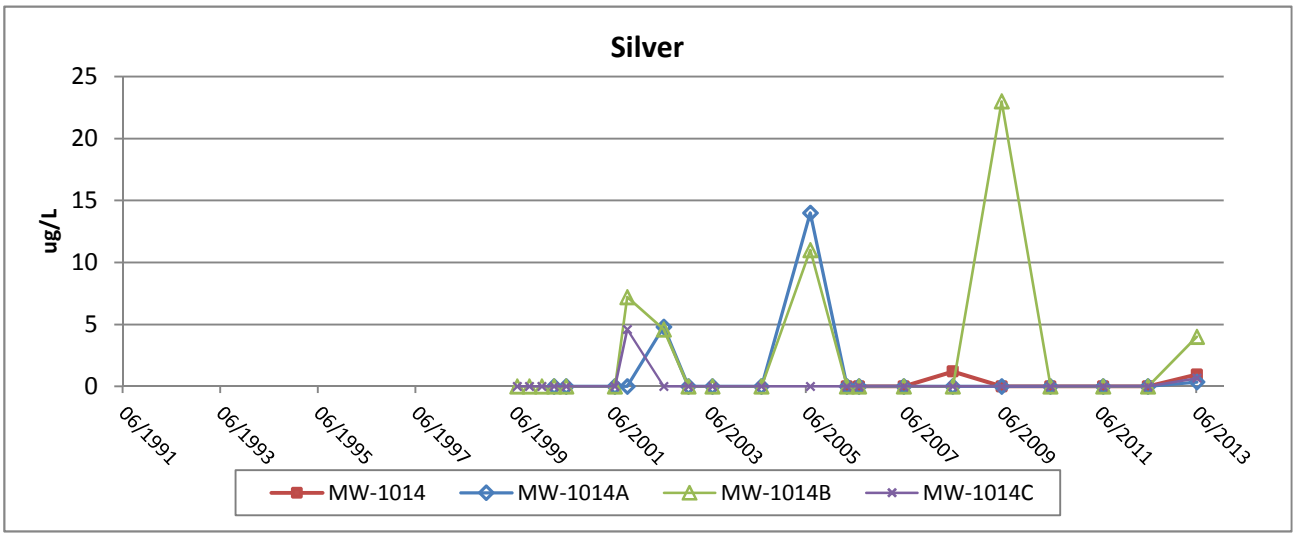
Figure B-14c

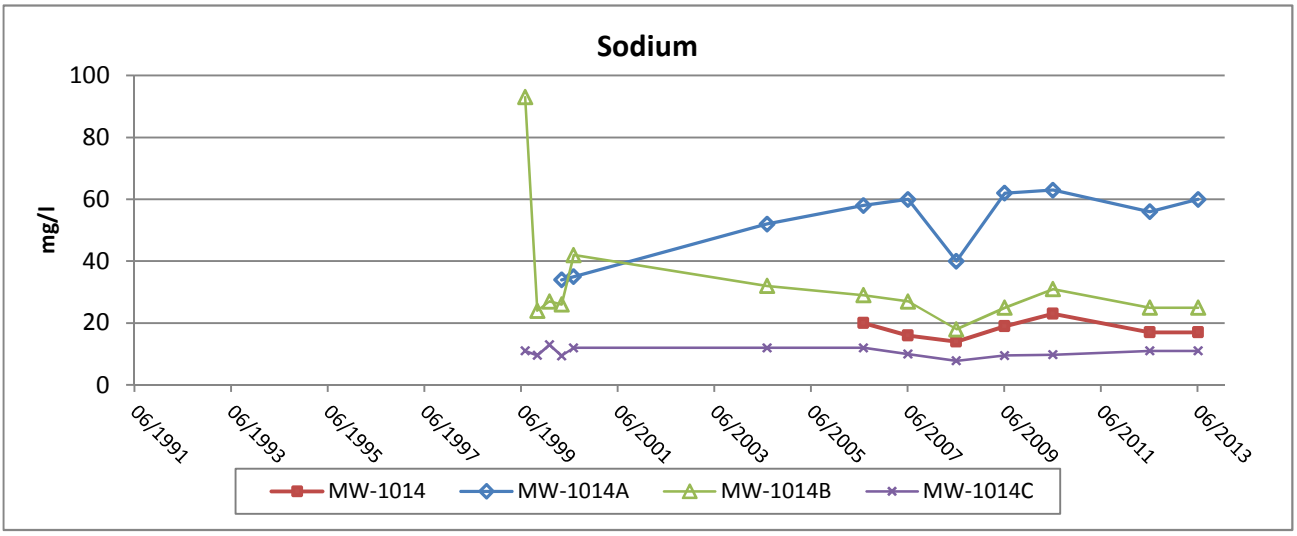
Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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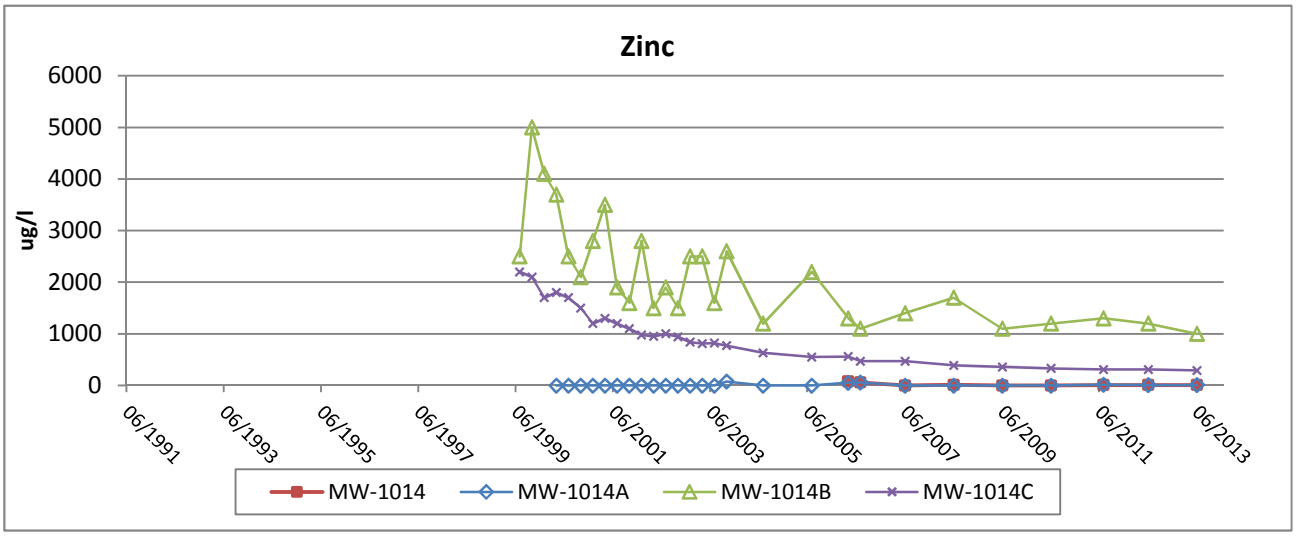
FLAMBEAU MINING COMPANY

Figure B-14d

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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FLAMBEAU MINING COMPANY

Figure B-14e

Groundwater Trend Graphs - Annual Results (In-Pit Wells)

MW-1014/MW-1014A/MW-1014B/MW-1014C

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

# Attachment 3

## Statistical Results

## Trend Graphs

## Historical Data

## (Surface Water)

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999-07 | MW-1000PR | | < 50 | 28 | 220 | 10 | < 4.2 | < 14 | 61 | < 0.05 | 2.6 | < 1.3 | < 4.5 | 10 | 890 |
| 1999-07 | MW-1000PR | Dup. | < 50 | < 21 | 220 | 10 | < 4.2 | < 14 | 62 | < 0.05 | 2.8 | 1.6 | < 4.5 | 10 | 880 |
| 1999-07 | MW-1002 | | 6.7 | 2.6 | 15 | 2 | 1 | < 1.4 | 4.9 | < 0.05 | < 1.1 | < 1.3 | < 0.45 | 2.8 | < 12 |
| 1999-07 | MW-1002G | | 24 | 3.5 | 25 | 9.7 | < 0.42 | < 1.4 | 9.5 | < 0.05 | < 1.1 | < 1.3 | < 0.45 | 4.7 | < 12 |
| 1999-07 | MW-1004P | | 40 | < 2.1 | 34 | < 1.7 | 0.58 | < 1.4 | 15 | < 0.05 | 3.6 | < 1.3 | < 0.45 | 6.1 | < 12 |
| 1999-07 | MW-1004S | | < 5 | < 2.1 | 15 | 4.4 | < 0.42 | < 1.4 | 5.6 | < 0.05 | < 1.1 | < 1.3 | < 0.45 | 3.6 | < 12 |
| 1999-07 | MW-1005 | | 92 | < 2.1 | 45 | 240 | 1.5 | < 1.4 | 23 | < 0.05 | < 1.1 | < 1.3 | < 0.45 | 13 | < 12 |
| 1999-07 | MW-1005P | | 65 | < 2.1 | 52 | 3.5 | < 0.42 | < 1.4 | 21 | < 0.05 | 8.1 | < 1.3 | < 0.45 | 9 | < 12 |
| 1999-07 | MW-1005S | | 39 | < 2.1 | 38 | < 1.7 | 0.57 | < 1.4 | 13 | < 0.05 | 2.1 | < 1.3 | < 0.45 | 5.6 | < 12 |
| 1999-07 | MW-1010P | | 38 | < 2.1 | 39 | 2.9 | < 0.42 | < 1.4 | 11 | < 0.05 | 1.8 | < 1.3 | < 0.45 | 5.1 | < 12 |
| 1999-07 | MW-1013B | | < 50 | < 21 | 630 | 35 | 16 | < 14 | 150 | < 0.05 | 8.2 | 1.7 | < 4.5 | 35 | < 120 |
| 1999-07 | MW-1013C | | < 50 | < 21 | 570 | 50 | < 4.2 | < 14 | 160 | < 0.05 | 23 | 3 | < 4.5 | 35 | 670 |
| 1999-07 | MW-1014B | | < 50 | 31 | 580 | 49 | 13 | < 14 | 170 | < 0.05 | 25 | 2.2 | < 45 | 93 | 2500 |
| 1999-07 | MW-1014C | | < 50 | < 21 | 280 | 32 | < 4.2 | < 14 | 56 | < 0.05 | 4.8 | 1.8 | < 45 | 11 | 2200 |
| 1999-10 | MW-1000PR | | 43 | < 2.1 | 210 | 11 | 2.6 | < 2.9 | 56 | < 0.05 | 2.9 | < 1.3 | < 0.9 | 7.9 | 730 |
| 1999-10 | MW-1004P | | 41 | 0.22 | 33 | < 1.7 | 0.53 | < 1.4 | 13 | < 0.05 | 5.9 | < 1.3 | < 0.45 | 5.8 | < 12 |
| 1999-10 | MW-1004S | | < 5 | 0.38 | 15 | 4.4 | 0.88 | < 1.4 | 4.9 | < 0.05 | 1.1 | < 1.3 | < 0.45 | 7.7 | < 12 |
| 1999-10 | MW-1010P | | 40 | 0.29 | 38 | 3.1 | < 0.42 | < 1.4 | 9.8 | < 0.05 | 2.7 | < 1.3 | < 0.45 | 4.7 | < 12 |
| 1999-10 | MW-1010P | Dup. | 41 | < 0.21 | 40 | 2.6 | < 0.42 | < 1.4 | 10 | < 0.05 | 2.6 | < 1.3 | < 0.45 | 3.7 | < 12 |
| 1999-10 | MW-1013B | | < 50 | < 4.2 | 650 | 35 | 14 | < 14 | 150 | < 0.05 | 5.9 | < 1.3 | < 4.5 | 26 | < 120 |
| 1999-10 | MW-1013C | | < 50 | < 4.2 | 610 | 50 | 7.2 | < 14 | 170 | < 0.05 | 26 | < 1.3 | < 4.5 | 29 | 660 |
| 1999-10 | MW-1014B | | < 50 | 10 | 640 | 43 | 7.4 | < 14 | 150 | < 0.05 | 17 | 1.4 | < 4.5 | 24 | 5000 |
| 1999-10 | MW-1014C | | < 50 | < 4.2 | 290 | 33 | < 4.2 | < 14 | 56 | < 0.05 | 4 | < 1.3 | < 4.5 | 9.6 | 2100 |
| 2000-01 | MW-1013B | | < 50 | < 2.1 | 600 | 28 | 18 | < 14 | 150 | < 0.05 | 6.4 | < 1.3 | < 4.5 | 33 | < 120 |
| 2000-01 | MW-1013C | | < 50 | 2.1 | 550 | 58 | < 4.2 | < 14 | 170 | < 0.05 | 23 | < 1.3 | 5.2 | 39 | 630 |
| 2000-01 | MW-1014B | | < 50 | 10 | 550 | < 100 | < 4.2 | < 14 | 140 | < 0.05 | 19 | 2.6 | < 4.5 | 27 | 4100 |
| 2000-01 | MW-1014C | | 25 | < 0.21 | 250 | 31 | < 0.42 | < 1.4 | 48 | < 0.05 | 6.3 | 1.9 | < 0.45 | 13 | 1700 |
| 2000-01 | MW-1014C | Dup. | 25 | < 0.21 | 230 | 30 | 2 | 2 | 46 | < 0.05 | 6.3 | 1.6 | < 0.45 | 11 | 1600 |
| 2000-04 | MW-1013B | | < 50 | < 3.1 | 630 | 35 | < 6.2 | < 24 | 150 | < 0.05 | 8.5 | < 7.8 | < 4.7 | 27 | < 120 |
| 2000-04 | MW-1013C | | < 50 | < 3.1 | 590 | 50 | < 6.2 | < 24 | 170 | < 0.05 | 25 | < 7.8 | < 4.7 | 34 | 610 |
| 2000-04 | MW-1014A | | 59 | < 3.1 | 330 | < 50 | < 6.2 | < 24 | 120 | < 0.05 | 12 | < 7.8 | < 4.7 | 34 | < 120 |
| 2000-04 | MW-1014B | | < 50 | 10 | 600 | 42 | < 6.2 | < 24 | 150 | < 0.05 | 23 | < 7.8 | < 4.7 | 26 | 3700 |
| 2000-04 | MW-1014C | | < 50 | < 3.1 | 260 | 33 | < 6.2 | < 24 | 51 | < 0.05 | 7.6 | < 7.8 | < 4.7 | 9.4 | 1800 |
| 2000-07 | MW-1000PR | | 38 | < 1 | | | < 3.7 | < 7.2 | | < 0.05 | | < 1.6 | < 2.7 | | 620 |
| 2000-07 | MW-1002 | | 7.3 | < 0.21 | | | 0.77 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1002G | | 27 | < 0.21 | | | < 0.74 | < 1.4 | | < 0.05 | | 1.9 | < 0.55 | | < 12 |
| 2000-07 | MW-1004P | | 43 | < 0.21 | | | < 0.74 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1004S | | < 5 | < 0.21 | | | 1 | < 1.4 | | < 0.05 | | 1.7 | < 0.55 | | < 12 |
| 2000-07 | MW-1005 | | 94 | < 0.21 | | | 1.1 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1005P | | 70 | 0.28 | | | < 0.74 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1005S | | 46 | < 0.21 | | | < 0.74 | < 1.4 | | < 0.05 | | 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1010P | | 39 | < 1 | | | < 3.7 | < 7.2 | | < 0.05 | | 1.8 | < 2.7 | | < 60 |
| 2000-07 | MW-1010P | Dup. | 39 | 0.69 | | | < 0.74 | < 1.4 | | < 0.05 | | < 1.6 | < 0.55 | | < 12 |
| 2000-07 | MW-1013B | | < 50 | < 2.3 | 670 | < 40 | 5.1 | < 9.6 | 160 | < 0.05 | 7.2 | < 17 | < 5.5 | 34 | < 120 |
| 2000-07 | MW-1013C | | < 50 | < 2.3 | 620 | 56 | < 4 | < 9.6 | 180 | < 0.05 | 24 | < 17 | < 5.5 | 45 | 620 |
| 2000-07 | MW-1014A | | 58 | < 2.3 | 360 | < 25 | 12 | < 9.6 | 130 | < 0.05 | 12 | < 17 | < 5.5 | 35 | < 120 |
| 2000-07 | MW-1014B | | < 50 | 8.9 | 600 | 38 | < 4 | < 9.6 | 160 | < 0.05 | 22 | < 17 | < 5.5 | 42 | 2500 |
| 2000-07 | MW-1014C | | < 50 | < 2.3 | 270 | 36 | 4.2 | < 9.6 | 54 | < 0.05 | 7.4 | < 17 | < 5.5 | 12 | 1700 |
| 2000-10 | MW-1000PR | | | | | | | | | | | | | | 900 |
| 2000-10 | MW-1002 | | | | | | | | | | | | | | < 12 |

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# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000-10 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1004P | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1004P | Dup. | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1004S | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1010P | | | | | | | | | | | | | | < 12 |
| 2000-10 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2000-10 | MW-1013C | | | | | | | | | | | | | | 370 |
| 2000-10 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2000-10 | MW-1014B | | | | | | | | | | | | | | 2100 |
| 2000-10 | MW-1014C | | | | | | | | | | | | | | 1500 |
| 2001-01 | MW-1000PR | | | | | | | | | | | | | | 810 |
| 2001-01 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1004P | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1004S | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1010P | | | | | | | | | | | | | | < 12 |
| 2001-01 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2001-01 | MW-1013C | | | | | | | | | | | | | | 480 |
| 2001-01 | MW-1013C | Dup. | | | | | | | | | | | | | 470 |
| 2001-01 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2001-01 | MW-1014B | | | | | | | | | | | | | | 2800 |
| 2001-01 | MW-1014C | | | | | | | | | | | | | | 1200 |
| 2001-04 | MW-1000PR | | | | | | | | | | | | | | 600 |
| 2001-04 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1002G | Dup. | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1004P | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1004S | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1010P | | | | | | | | | | | | | | < 12 |
| 2001-04 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2001-04 | MW-1013C | | | | | | | | | | | | | | 330 |
| 2001-04 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2001-04 | MW-1014B | | | | | | | | | | | | | | 3500 |
| 2001-04 | MW-1014C | | | | | | | | | | | | | | 1300 |
| 2001-04 | MW-1015A | | 22 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-04 | MW-1015B | | 51 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-05 | MW-1015A | | 19 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-05 | MW-1015B | | 48 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-06 | MW-1015A | | 18 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-06 | MW-1015B | | 46 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1000PR | | 36 | < 1.1 | 190 | | < 2.9 | < 4.6 | 47 | < 0.05 | | < 1.6 | < 2.8 | | 860 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001-07 | MW-1002 | | 7.7 | < 0.23 | | | 1.4 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1002G | | 26 | < 0.23 | | | 0.81 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | 19 |
| 2001-07 | MW-1004P | | 41 | < 0.23 | 35 | | < 0.57 | < 0.92 | 14 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1004S | | < 5 | < 0.23 | 16 | | 1.4 | < 0.92 | 5.1 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1005 | | 82 | < 0.23 | | | 1.9 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1005P | | 69 | 0.4 | 56 | | 0.58 | < 0.92 | 22 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1005P | Dup. | 68 | < 0.23 | 56 | | < 0.57 | < 0.92 | 22 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1005S | | 45 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1010P | | 42 | 0.28 | 42 | | < 0.57 | < 0.92 | 11 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1013B | | < 50 | 3.2 | 700 | | 6.4 | < 7.9 | 160 | < 0.05 | | < 10 | 6.5 | | 130 |
| 2001-07 | MW-1013C | | < 50 | < 1.7 | 630 | | < 3.4 | < 7.9 | 180 | < 0.05 | | < 10 | < 3.1 | | 570 |
| 2001-07 | MW-1014A | | < 50 | < 1.7 | 370 | | 5.3 | < 7.9 | 130 | < 0.05 | | < 10 | < 3.1 | | < 120 |
| 2001-07 | MW-1014B | | < 50 | 6.2 | 600 | | 8.9 | < 7.9 | 160 | < 0.05 | | < 10 | < 3.1 | | 1900 |
| 2001-07 | MW-1014C | | < 50 | < 1.7 | 240 | | 4.7 | < 7.9 | 49 | < 0.05 | | < 10 | < 3.1 | | 1200 |
| 2001-07 | MW-1015A | | 17 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-07 | MW-1015B | | 47 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-08 | MW-1015A | | 17 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | 0.99 | | < 12 |
| 2001-08 | MW-1015B | | 48 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-09 | MW-1015A | | 15 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-09 | MW-1015B | | 43 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-10 | MW-1000PR | | 32 | < 1.1 | 160 | | < 2.9 | < 4.6 | 40 | < 0.05 | | < 1.6 | < 2.8 | | 440 |
| 2001-10 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1004P | | 39 | < 0.23 | 31 | | < 0.57 | < 0.92 | 12 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-10 | MW-1004S | | < 5 | < 0.23 | 13 | | 0.83 | < 0.92 | 4.4 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-10 | MW-1004S | Dup. | < 5 | < 0.23 | 13 | | 0.68 | < 0.92 | 4.3 | < 0.05 | | 2.2 | < 0.56 | | < 12 |
| 2001-10 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1005S | | | | | | | | | | | | | | < 12 |
| 2001-10 | MW-1010P | | 33 | < 0.23 | 35 | | < 0.57 | < 0.92 | 8.4 | < 0.05 | | 1.7 | < 0.56 | | < 12 |
| 2001-10 | MW-1013B | | < 50 | < 1.7 | 600 | | 4.8 | < 7.9 | 130 | < 0.05 | | < 16 | 6 | | 130 |
| 2001-10 | MW-1013C | | < 50 | < 1.7 | 550 | | < 3.4 | < 7.9 | 160 | < 0.05 | | < 16 | 6.8 | | 510 |
| 2001-10 | MW-1014A | | < 50 | < 1.7 | 330 | | < 3.4 | < 7.9 | 110 | < 0.05 | | < 16 | < 3.1 | | < 120 |
| 2001-10 | MW-1014B | | < 50 | 4.3 | 530 | | < 3.4 | < 7.9 | 140 | < 0.05 | | < 16 | 7.2 | | 1600 |
| 2001-10 | MW-1014C | | < 50 | < 1.7 | 210 | | < 3.4 | < 7.9 | 44 | < 0.05 | | < 1.6 | 4.6 | | 1100 |
| 2001-10 | MW-1015A | | 14 | < 0.23 | 19 | | < 0.57 | < 0.92 | 7.4 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-10 | MW-1015B | | 41 | < 0.23 | 30 | | < 0.57 | < 0.92 | 12 | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-11 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-11 | MW-1015B | | 43 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-12 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2001-12 | MW-1015B | | 44 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2002-01 | MW-1000PR | | | | | | | | | | | | | | 690 |
| 2002-01 | MW-1002 | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1002G | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1004P | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1004P | Dup. | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1004S | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1005 | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1005P | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1005S | | | | | | | | | | | | | | < 12 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002-01 | MW-1010P | | | | | | | | | | | | | | < 12 |
| 2002-01 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2002-01 | MW-1013C | | | | | | | | | | | | | | 500 |
| 2002-01 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2002-01 | MW-1014B | | | | | | | | | | | | | | 2800 |
| 2002-01 | MW-1014C | | | | | | | | | | | | | | 980 |
| 2002-01 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2002-01 | MW-1015B | | 43 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 1.6 | < 0.56 | | < 12 |
| 2002-02 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 2.5 | < 0.56 | | < 12 |
| 2002-02 | MW-1015B | | 44 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 2.5 | < 0.56 | | < 12 |
| 2002-03 | MW-1015A | | 14 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 2.5 | < 0.56 | | < 12 |
| 2002-03 | MW-1015B | | 46 | < 0.23 | | | < 0.57 | < 0.92 | | < 0.05 | | < 2.5 | < 0.56 | | < 12 |
| 2002-04 | MW-1000PR | | | | | | | | | | | | | | 410 |
| 2002-04 | MW-1002 | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1002 | Dup. | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1002G | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1004P | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1004S | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1005 | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1005P | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1005S | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1010P | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1013B | | | | | | | | | | | | | | < 120 |
| 2002-04 | MW-1013C | | | | | | | | | | | | | | 360 |
| 2002-04 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2002-04 | MW-1014B | | | | | | | | | | | | | | 1500 |
| 2002-04 | MW-1014C | | | | | | | | | | | | | | 950 |
| 2002-04 | MW-1015A | | | | | | | | | | | | | | < 10 |
| 2002-04 | MW-1015B | | | | | | | | | | | | | | < 10 |
| 2002-07 | MW-1000PR | | 40 | < 1.1 | 170 | | < 2.2 | < 9.2 | 44 | < 0.05 | | < 2.5 | 3.1 | | 640 |
| 2002-07 | MW-1002 | | 7.8 | < 0.23 | 17 | | 0.79 | < 0.92 | 5.6 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1002G | | 27 | < 0.23 | 27 | | < 0.44 | < 0.92 | 10 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1004P | | 40 | < 0.23 | 33 | | < 0.44 | < 0.92 | 13 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1004S | | < 5 | < 0.23 | 16 | | 0.59 | < 0.92 | 5.4 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1005 | | 88 | < 0.23 | 41 | | 0.87 | < 0.92 | 20 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1005P | | 70 | < 0.23 | 51 | | < 0.44 | < 0.92 | 21 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1005S | | 44 | < 0.23 | 40 | | < 0.44 | < 0.92 | 14 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1010P | | 38 | < 0.23 | 39 | | < 0.44 | < 0.92 | 9.9 | < 0.05 | | < 2.5 | 0.55 | | < 10 |
| 2002-07 | MW-1013B | | < 50 | < 1.7 | 670 | | < 4.5 | < 7.4 | 160 | < 0.05 | | < 15 | 4.3 | | 130 |
| 2002-07 | MW-1013C | | < 50 | < 1.7 | 620 | | < 4.5 | < 7.4 | 190 | < 0.05 | | < 15 | < 4.3 | | 440 |
| 2002-07 | MW-1014A | | < 50 | < 1.7 | 350 | | < 4.5 | < 7.4 | 130 | < 0.05 | | < 15 | 4.8 | | < 120 |
| 2002-07 | MW-1014A | Dup. | < 50 | < 1.7 | 370 | | < 4.5 | < 7.4 | 130 | < 0.05 | | < 15 | < 4.3 | | < 120 |
| 2002-07 | MW-1014B | | < 50 | 4.7 | 570 | | < 4.5 | < 7.4 | 150 | < 0.05 | | < 15 | 4.6 | | 1900 |
| 2002-07 | MW-1014C | | < 50 | < 1.7 | 220 | | < 4.5 | < 7.4 | 48 | < 0.05 | | < 15 | < 4.3 | | 1000 |
| 2002-07 | MW-1015A | | 12 | < 0.23 | 21 | | < 0.44 | < 0.92 | 8.6 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-07 | MW-1015B | | 44 | < 0.23 | 33 | | < 0.44 | < 0.92 | 14 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2002-10 | MW-1000PR | | | | | | | | | | | | | | 690 |
| 2002-10 | MW-1002 | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1002G | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1004P | | | | | | | | | | | | | | < 10 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002-10 | MW-1004S | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1005 | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1005 | Dup. | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1005P | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1005S | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1010P | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1013B | | | | | | | | | | | | | | 130 |
| 2002-10 | MW-1013C | | | | | | | | | | | | | | 480 |
| 2002-10 | MW-1014A | | | | | | | | | | | | | | < 120 |
| 2002-10 | MW-1014B | | | | | | | | | | | | | | 1500 |
| 2002-10 | MW-1014C | | | | | | | | | | | | | | 940 |
| 2002-10 | MW-1015A | | | | | | | | | | | | | | < 10 |
| 2002-10 | MW-1015B | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1000PR | | 42 | < 1.1 | 170 | 16 | < 2.2 | < 9.2 | 41 | < 0.05 | | < 13 | < 2.4 | | 700 |
| 2003-01 | MW-1002 | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1002G | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1004P | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1004S | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1005 | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1005P | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1005S | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1010P | | 36 | < 0.23 | 39 | < 5 | < 0.44 | < 0.92 | 9.8 | < 0.05 | | < 2.5 | < 0.47 | | < 10 |
| 2003-01 | MW-1013B | | < 50 | 2.4 | 640 | < 50 | < 4.5 | < 7.4 | 150 | < 0.05 | | < 30 | 5.8 | | 130 |
| 2003-01 | MW-1013C | | < 50 | < 1.7 | 600 | 53 | < 4.5 | < 7.4 | 180 | < 0.05 | | < 30 | 5.7 | | 440 |
| 2003-01 | MW-1014A | | < 50 | < 1.7 | 350 | < 20 | < 4.5 | < 7.4 | 120 | < 0.05 | | < 30 | < 4.3 | | < 120 |
| 2003-01 | MW-1014B | | < 50 | 6.9 | 580 | 46 | < 4.5 | < 74 | 140 | < 0.05 | | < 30 | < 4.3 | | 2500 |
| 2003-01 | MW-1014C | | < 50 | < 1.7 | 210 | 39 | < 4.5 | < 7.4 | 45 | < 0.05 | | < 30 | < 4.3 | | 840 |
| 2003-01 | MW-1014C | Dup. | < 50 | < 1.7 | 200 | 42 | < 4.5 | < 7.4 | 45 | < 0.05 | | < 30 | < 4.3 | | 860 |
| 2003-01 | MW-1015A | | | | | | | | | | | | | | < 10 |
| 2003-01 | MW-1015B | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1000PR | | | | | | | | | | | | | | 680 |
| 2003-04 | MW-1002 | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1002G | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1004P | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1004S | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1005 | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1005P | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1005S | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1010P | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1013B | | | | | | | | | | | | | | 130 |
| 2003-04 | MW-1013C | | | | | | | | | | | | | | 310 |
| 2003-04 | MW-1014A | | | | | | | | | | | | | | < 100 |
| 2003-04 | MW-1014B | | | | | | | | | | | | | | 2500 |
| 2003-04 | MW-1014C | | | | | | | | | | | | | | 810 |
| 2003-04 | MW-1015A | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1015B | | | | | | | | | | | | | | < 10 |
| 2003-04 | MW-1015B | Dup. | | | | | | | | | | | | | < 10 |
| 2003-07 | MW-1000PR | | 42 | < 0.85 | 170 | | < 2.2 | < 4.7 | 40 | < 0.025 | | < 2 | < 2 | | 730 |
| 2003-07 | MW-1002 | | 7.6 | < 0.17 | 17 | | 0.96 | < 0.94 | 5.5 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1002G | | 27 | < 0.17 | 27 | | 0.6 | < 0.94 | 10 | < 0.025 | | 2.1 | < 0.4 | | < 5 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003-07 | MW-1004P | | 43 | < 0.17 | 35 | | < 0.43 | < 0.94 | 14 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1004S | | 4.3 | < 0.17 | 18 | | 0.88 | < 0.94 | 5.9 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1005 | | 150 | < 0.85 | 80 | | < 0.43 | < 0.94 | 37 | < 0.025 | | < 2 | < 2 | | < 5 |
| 2003-07 | MW-1005P | | 67 | < 0.17 | 55 | | < 0.43 | < 0.94 | 22 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1005S | | 42 | < 0.17 | 41 | | < 0.43 | < 0.94 | 14 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1010P | | 39 | < 0.17 | 42 | | 0.5 | < 0.94 | 10 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1013B | | < 25 | < 2.1 | 660 | | < 6.4 | < 10 | 150 | < 0.025 | | < 2.7 | < 7.7 | | 140 |
| 2003-07 | MW-1013B | Dup. | < 25 | < 2.1 | 660 | | < 6.4 | < 10 | 150 | < 0.025 | | < 2.7 | < 7.7 | | 130 |
| 2003-07 | MW-1013C | | < 25 | < 2.1 | 610 | | < 6.4 | < 10 | 180 | < 0.025 | | < 27 | < 7.7 | | 320 |
| 2003-07 | MW-1014A | | 27 | < 2.1 | 340 | | < 6.4 | < 10 | 120 | < 0.025 | | < 2.7 | < 7.7 | | < 50 |
| 2003-07 | MW-1014B | | < 25 | 4.2 | 530 | | < 6.4 | < 10 | 140 | < 0.025 | | < 2.7 | < 7.7 | | 1600 |
| 2003-07 | MW-1014C | | 26 | < 2.1 | 210 | | < 6.4 | < 10 | 45 | < 0.025 | | < 13 | < 7.7 | | 820 |
| 2003-07 | MW-1015A | | 9.8 | < 0.17 | 22 | | < 0.43 | < 0.94 | 8.6 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-07 | MW-1015B | | 45 | < 0.17 | 34 | | < 0.43 | < 4.7 | 14 | < 0.025 | | < 2 | < 0.4 | | < 5 |
| 2003-10 | MW-1000PR | | | | | | | | | | | | | | 700 |
| 2003-10 | MW-1002 | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1002G | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1004P | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1004S | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1005 | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1005P | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1005S | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1010P | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1013B | | | | | | | | | | | | | | 140 |
| 2003-10 | MW-1013B | Dup. | | | | | | | | | | | | | 150 |
| 2003-10 | MW-1013C | | | | | | | | | | | | | | 400 |
| 2003-10 | MW-1014A | | | | | | | | | | | | | | 77 |
| 2003-10 | MW-1014B | | | | | | | | | | | | | | 2600 |
| 2003-10 | MW-1014C | | | | | | | | | | | | | | 770 |
| 2003-10 | MW-1015A | | | | | | | | | | | | | | < 5 |
| 2003-10 | MW-1015B | | | | | | | | | | | | | | < 5 |
| 2004-04 | MW-1000PR | RD | 43 | 0.3 | 151 | 17.3 | < 1 | < 1 | 39.7 | < 0.03 | | < 1 | < 0.1 | | 623 |
| 2004-04 | MW-1010P | RD | 33 | 0.06 | 40.9 | 3.2 | < 1 | < 1 | 10.4 | < 0.03 | | < 1 | < 0.1 | | < 16 |
| 2004-04 | MW-1013C | RD | 15 | 0.1 | 576 | 52.4 | 5.4 | < 1 | 180 | < 0.03 | | < 1 | 0.3 | | 454 |
| 2004-04 | MW-1014A | RD | 20 | 1.05 | 331 | 10.9 | 1.5 | < 1 | 119 | < 0.03 | | < 1 | < 0.1 | | < 16 |
| 2004-04 | MW-1014B | RD | 15 | 4.39 | 538 | 39 | 4.3 | < 1 | 139 | < 0.03 | | < 1 | < 0.1 | | 1470 |
| 2004-04 | MW-1014C | RD | 26 | < 0.05 | 185 | 38.2 | < 1 | < 1 | 47.3 | < 0.03 | | < 1 | < 0.1 | | 638 |
| 2004-07 | MW-1000PR | | 41 | < 0.8 | 150 | 18 | < 2.3 | < 5.2 | 37 | < 0.025 | 3.9 | < 2.1 | < 3.4 | 9.3 | 830 |
| 2004-07 | MW-1002 | | 7.1 | < 0.16 | 16 | 3.2 | 1.1 | < 1 | 5 | < 0.025 | 0.81 | < 2.1 | < 0.67 | 3.2 | < 5 |
| 2004-07 | MW-1002G | | 27 | < 0.16 | 27 | 11 | < 0.45 | < 1 | 9.9 | < 0.025 | 1.1 | < 2.1 | < 0.67 | 5.4 | < 5 |
| 2004-07 | MW-1004P | | 45 | < 0.16 | 35 | < 2.5 | < 0.45 | < 1 | 14 | < 0.025 | 5.8 | < 2.1 | < 0.67 | 7.2 | < 5 |
| 2004-07 | MW-1004S | | 4.8 | < 0.16 | 18 | 6.5 | 1.2 | < 1 | 6.1 | < 0.025 | 0.96 | < 2.1 | < 0.67 | 4.9 | < 5 |
| 2004-07 | MW-1005 | | 130 | < 0.16 | 63 | 210 | < 0.45 | < 1 | 30 | < 0.025 | 0.78 | < 2.1 | < 0.67 | 17 | < 5 |
| 2004-07 | MW-1005P | | 69 | < 0.16 | 54 | 4.2 | < 0.45 | < 1 | 21 | < 0.025 | 8.7 | < 2.1 | < 0.67 | 7.4 | < 5 |
| 2004-07 | MW-1005S | | 44 | < 0.16 | 40 | 2.6 | < 0.45 | < 1 | 14 | < 0.025 | 3.1 | < 2.1 | < 0.67 | 7 | < 5 |
| 2004-07 | MW-1010P | | 46 | < 0.16 | 44 | 4.3 | < 0.45 | < 1 | 11 | < 0.025 | 2.6 | < 2.1 | < 0.67 | 5.3 | < 5 |
| 2004-07 | MW-1013B | | < 25 | < 1.7 | 640 | 47 | < 5.1 | 20 | 150 | < 0.025 | 6.8 | < 8 | < 6.7 | 31 | 150 |
| 2004-07 | MW-1013C | | < 25 | < 1.7 | 600 | 57 | < 5.1 | < 8.7 | 180 | < 0.025 | 26 | < 16 | < 6.7 | 42 | 460 |
| 2004-07 | MW-1013C | Dup. | < 25 | < 1.7 | 590 | 61 | < 5.1 | 14 | 180 | < 0.025 | 25 | < 8 | < 6.7 | 41 | 460 |
| 2004-07 | MW-1014A | | 25 | < 1.7 | 340 | 15 | < 5.1 | < 8.7 | 120 | < 0.025 | 11 | < 8 | < 6.7 | 52 | < 50 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004-07 | MW-1014B | | < 25 | 2.9 | 530 | 49 | < 5.1 | < 8.7 | 140 | < 0.025 | 20 | < 8 | < 6.7 | 32 | 1200 |
| 2004-07 | MW-1014C | | 27 | < 1.7 | 190 | 40 | < 5.1 | 11 | 43 | < 0.025 | 6.2 | < 8 | < 6.7 | 12 | 630 |
| 2004-07 | MW-1015A | | 9.2 | < 0.16 | 21 | 5.8 | < 0.45 | < 1 | 8.5 | < 0.025 | 0.94 | < 2.1 | < 0.67 | 3.4 | < 5 |
| 2004-07 | MW-1015B | | 44 | < 0.16 | 33 | 51 | < 0.45 | < 1 | 14 | < 0.13 | 5.9 | < 2.1 | < 0.67 | 39 | < 5 |
| 2004-10 | MW-1000PR | | | | 140 | | | | 35 | | | | | | |
| 2004-10 | MW-1002 | | | | 15 | | | | 4.6 | | | | | | |
| 2004-10 | MW-1002G | | | | 24 | | | | 9 | | | | | | |
| 2004-10 | MW-1004P | | | | 33 | | | | 13 | | | | | | |
| 2004-10 | MW-1004S | | | | 17 | | | | 5.6 | | | | | | |
| 2004-10 | MW-1005 | | | | 60 | | | | 29 | | | | | | |
| 2004-10 | MW-1005P | | | | 51 | | | | 20 | | | | | | |
| 2004-10 | MW-1005S | | | | 38 | | | | 13 | | | | | | |
| 2004-10 | MW-1010P | | | | 42 | | | | 11 | | | | | | |
| 2004-10 | MW-1013B | | | | 640 | | | | 140 | | | | | | |
| 2004-10 | MW-1013C | | | | 580 | | | | 170 | | | | | | |
| 2004-10 | MW-1014A | | | | 320 | | | | 110 | | | | | | |
| 2004-10 | MW-1014B | | | | 560 | | | | 140 | | | | | | |
| 2004-10 | MW-1014C | | | | 180 | | | | 41 | | | | | | |
| 2004-10 | MW-1015A | | | | 20 | | | | 8 | | | | | | |
| 2004-10 | MW-1015B | | | | 32 | | | | 13 | | | | | | |
| 2004-10 | MW-1015B | Dup. | | | 32 | | | | 13 | | | | | | |
| 2005-07 | MW-1000PR | | 44 | < 0.17 | 160 | | 1.2 | < 1.2 | 40 | < 0.025 | | < 2 | 1.4 | | 650 |
| 2005-07 | MW-1002 | | 6.2 | < 0.17 | 14 | | 1.2 | < 1.2 | 4.6 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1002G | | 26 | < 0.17 | 27 | | < 0.55 | < 1.2 | 10 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1004P | | 42 | < 0.17 | 36 | | < 0.55 | < 1.2 | 15 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1004S | | 4.9 | < 0.17 | 20 | | < 0.55 | < 1.2 | 6.9 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1004S | Dup. | 4.8 | < 0.17 | 20 | | 1.3 | < 1.2 | 6.9 | < 0.025 | | < 2 | 0.95 | | < 5 |
| 2005-07 | MW-1005 | | 77 | 0.44 | 40 | | 1.5 | < 1.2 | 20 | < 0.025 | | < 2 | 1.2 | | < 5 |
| 2005-07 | MW-1005P | | 69 | < 0.17 | 57 | | < 0.55 | < 1.2 | 23 | < 0.025 | | < 2 | < 0.47 | | 7.1 |
| 2005-07 | MW-1005S | | 44 | < 0.17 | 42 | | < 0.55 | < 1.2 | 15 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1010P | | 42 | < 0.17 | 46 | | < 0.55 | < 1.2 | 11 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1013B | | < 25 | < 1.7 | 690 | | < 4.5 | < 10 | 150 | < 0.025 | | < 1.9 | < 6.7 | | 200 |
| 2005-07 | MW-1013C | | < 25 | < 1.7 | 630 | | 32 | < 10 | 190 | < 0.025 | | < 1.9 | < 6.7 | | 460 |
| 2005-07 | MW-1014A | | < 25 | < 1.7 | 340 | | 8.1 | 13 | 120 | < 0.025 | | < 7.4 | 14 | | < 50 |
| 2005-07 | MW-1014B | | < 25 | 2.8 | 610 | | 14 | < 10 | 150 | < 0.025 | | < 1.9 | 11 | | 2200 |
| 2005-07 | MW-1014C | | 27 | < 1.7 | 190 | | < 4.5 | < 10 | 43 | < 0.025 | | < 1.9 | < 6.7 | | 550 |
| 2005-07 | MW-1015A | | 8.9 | < 0.17 | 22 | | < 0.55 | < 1.2 | 9 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2005-07 | MW-1015B | | 43 | < 0.17 | 36 | | < 0.55 | < 1.2 | 15 | < 0.025 | | < 2 | < 0.47 | | < 5 |
| 2006-04 | MW-1000PR | | 40 | < 0.17 | 150 | 18 | < 0.88 | 2.9 | 37 | < 0.025 | | < 1.8 | < 1.1 | | 580 |
| 2006-04 | MW-1010P | | 48 | < 0.17 | 46 | 4.1 | < 0.88 | < 1.3 | 12 | < 0.025 | | < 1.8 | < 1.1 | | < 5 |
| 2006-04 | MW-1013 | | 150 | < 1.7 | 150 | 18 | < 10 | 14 | 44 | < 0.025 | | < 2.4 | < 12 | | < 50 |
| 2006-04 | MW-1013A | | 120 | < 1.7 | 190 | 11 | < 10 | 19 | 62 | < 0.025 | | < 2.4 | < 12 | | 61 |
| 2006-04 | MW-1013B | | < 25 | < 1.7 | 650 | 48 | < 10 | < 13 | 150 | < 0.025 | | < 2.4 | < 12 | | 210 |
| 2006-04 | MW-1013C | | < 25 | < 1.7 | 620 | 61 | < 10 | < 13 | 180 | < 0.025 | | < 2.4 | < 12 | | 470 |
| 2006-04 | MW-1014 | | 40 | < 1.7 | 91 | 30 | < 10 | < 13 | 28 | < 0.025 | | < 2.4 | < 12 | | 79 |
| 2006-04 | MW-1014A | | < 25 | < 1.7 | 340 | 17 | < 10 | < 13 | 120 | < 0.025 | | < 2.4 | < 12 | | 55 |
| 2006-04 | MW-1014B | | < 25 | < 1.7 | 540 | 46 | 14 | < 13 | 130 | < 0.025 | | < 2.4 | < 12 | | 1300 |
| 2006-04 | MW-1014C | | 28 | < 1.7 | 180 | 40 | < 10 | < 13 | 42 | < 0.025 | | < 2.4 | < 12 | | 560 |
| 2006-07 | MW-1000PR | | 42 | < 0.17 | 130 | 18 | < 0.88 | < 1.3 | 36 | < 0.025 | 3.9 | < 1.8 | < 1.1 | 7.7 | 500 |
| 2006-07 | MW-1002 | | 6.3 | < 0.17 | 13 | 3.5 | < 0.88 | < 1.3 | 4.7 | < 0.025 | 0.59 | < 1.8 | < 1.1 | 3.1 | < 5 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006-07 | MW-1002G | | 26 | < 0.17 | 24 | 10 | < 0.88 | < 1.3 | 9.6 | < 0.025 | 0.84 | < 1.8 | < 1.1 | 5.4 | < 5 |
| 2006-07 | MW-1004P | | 40 | < 0.17 | 32 | < 2.5 | < 0.88 | < 1.3 | 14 | < 0.025 | 5.9 | < 1.8 | < 1.1 | 7.1 | 20 |
| 2006-07 | MW-1004S | | 5.3 | < 0.17 | 19 | 5.6 | < 0.88 | < 1.3 | 6.8 | < 0.025 | 0.87 | < 1.8 | < 1.1 | 5.1 | < 5 |
| 2006-07 | MW-1005 | | 110 | < 0.17 | 48 | 200 | < 0.88 | < 1.3 | 24 | < 0.025 | 0.71 | < 1.8 | < 1.1 | 21 | < 5 |
| 2006-07 | MW-1005P | | 67 | < 0.17 | 48 | 4 | < 0.88 | < 1.3 | 21 | < 0.025 | 9.2 | < 1.8 | < 1.1 | 7.2 | < 5 |
| 2006-07 | MW-1005S | | 44 | < 0.17 | 37 | < 2.5 | < 0.88 | < 1.3 | 14 | < 0.025 | 3.1 | < 1.8 | < 1.1 | 7.2 | < 5 |
| 2006-07 | MW-1010P | | 46 | < 0.17 | 40 | 4.2 | < 0.88 | < 1.3 | 12 | < 0.025 | 2.6 | < 1.8 | < 1.1 | 5.3 | < 5 |
| 2006-07 | MW-1013 | | 160 | < 1.7 | 140 | 17 | < 10 | < 13 | 45 | < 0.025 | 3.1 | < 2.4 | < 12 | 19 | < 50 |
| 2006-07 | MW-1013 | Dup. | 150 | < 1.7 | 140 | 17 | < 10 | < 13 | 43 | < 0.025 | 3.1 | 3.4 | < 12 | 18 | < 50 |
| 2006-07 | MW-1013A | | 99 | < 1.7 | 120 | 6.7 | < 10 | < 13 | 42 | < 0.025 | 7.1 | < 2.4 | < 12 | 35 | < 50 |
| 2006-07 | MW-1013B | | < 25 | < 1.7 | 630 | 46 | < 10 | < 13 | 150 | < 0.025 | 6.3 | < 4.8 | < 12 | 31 | 210 |
| 2006-07 | MW-1013C | | < 25 | < 1.7 | 580 | 53 | < 10 | < 13 | 180 | < 0.025 | 24 | 2.7 | < 12 | 43 | 440 |
| 2006-07 | MW-1014 | | < 25 | < 1.7 | 84 | 26 | < 10 | < 13 | 28 | < 0.025 | 3.7 | < 2.4 | < 12 | 20 | 59 |
| 2006-07 | MW-1014A | | < 25 | < 1.7 | 320 | < 18 | < 10 | < 13 | 120 | < 0.025 | 9.6 | 2.8 | < 12 | 58 | 57 |
| 2006-07 | MW-1014B | | < 25 | < 1.7 | 470 | 42 | < 10 | < 13 | 130 | < 0.025 | 18 | < 2.4 | < 12 | 29 | 1100 |
| 2006-07 | MW-1014C | | < 25 | < 1.7 | 160 | 38 | < 10 | < 13 | 41 | < 0.025 | 5.4 | < 2.4 | < 12 | 12 | 470 |
| 2006-07 | MW-1015A | | 8.5 | < 0.17 | 19 | 5.7 | < 0.88 | < 1.3 | 8.3 | < 0.025 | 0.83 | < 1.8 | < 1.1 | 3.5 | < 5 |
| 2006-07 | MW-1015B | | 43 | < 0.17 | 32 | 77 | < 0.88 | < 1.3 | 14 | < 0.025 | 6.5 | < 1.8 | < 1.1 | 46 | < 5 |
| 2007-06 | MW-1000PR | | 40 | < 0.17 | 140 | 17 | < 0.88 | < 1.3 | 36 | < 0.025 | 3.7 | < 1.8 | < 1.1 | 7.2 | 490 |
| 2007-06 | MW-1002 | | 5.3 | < 0.17 | 12 | 3.1 | < 0.88 | < 1.3 | 3.8 | < 0.025 | 0.6 | < 1.8 | < 1.1 | 2.4 | < 5 |
| 2007-06 | MW-1002G | | 26 | < 0.17 | 26 | 13 | < 0.88 | < 1.3 | 9.5 | < 0.025 | 0.74 | < 1.8 | < 1.1 | 4.9 | < 5 |
| 2007-06 | MW-1004P | | 43 | < 0.17 | 34 | 2.7 | < 0.88 | < 1.3 | 13 | < 0.025 | 5.7 | < 1.8 | < 1.1 | 6.7 | < 5 |
| 2007-06 | MW-1004S | | 5.7 | < 0.17 | 22 | 6.1 | < 0.88 | < 1.3 | 7.4 | < 0.025 | 0.94 | < 1.8 | < 1.1 | 5.1 | < 5 |
| 2007-06 | MW-1005 | | 81 | < 0.17 | 39 | 120 | < 0.88 | < 1.3 | 19 | < 0.025 | 0.54 | < 1.8 | < 1.1 | 12 | < 5 |
| 2007-06 | MW-1005P | | 67 | < 0.17 | 53 | 4.4 | < 0.88 | < 1.3 | 21 | < 0.025 | 8.8 | < 1.8 | < 1.1 | 7.6 | < 5 |
| 2007-06 | MW-1005S | | 43 | < 0.17 | 40 | < 2.5 | < 0.88 | < 1.3 | 14 | < 0.025 | 2.9 | < 1.8 | < 1.1 | 6.6 | < 5 |
| 2007-06 | MW-1010P | | 45 | < 0.17 | 44 | 4.4 | < 0.88 | 1.5 | 11 | < 0.025 | 2.6 | < 1.8 | < 1.1 | 4.7 | < 5 |
| 2007-06 | MW-1013 | | 140 | < 1.7 | 150 | 18 | < 10 | 23 | 45 | < 0.025 | 2.9 | < 2.4 | < 12 | 17 | < 50 |
| 2007-06 | MW-1013A | | 84 | < 1.7 | 110 | 6.1 | < 10 | < 13 | 37 | < 0.025 | 7.2 | < 2.4 | < 12 | 32 | < 50 |
| 2007-06 | MW-1013B | | < 25 | < 1.7 | 630 | 47 | < 10 | < 13 | 140 | < 0.025 | 6.4 | < 2.4 | < 12 | 28 | 170 |
| 2007-06 | MW-1013C | | < 25 | < 1.7 | 600 | 60 | < 10 | 15 | 170 | < 0.025 | 25 | < 2.4 | < 12 | 38 | 470 |
| 2007-06 | MW-1014 | | 31 | < 1.7 | 70 | 24 | < 10 | < 13 | 22 | < 0.025 | 3.8 | < 2.4 | < 12 | 16 | < 50 |
| 2007-06 | MW-1014 | Dup. | 39 | < 1.7 | 86 | 24 | < 10 | < 13 | 27 | < 0.025 | 3.8 | < 2.4 | < 12 | 20 | < 50 |
| 2007-06 | MW-1014A | | < 25 | < 1.7 | 330 | 15 | < 10 | < 13 | 110 | < 0.025 | 10 | < 2.4 | < 12 | 60 | < 50 |
| 2007-06 | MW-1014B | | < 25 | < 1.7 | 530 | 47 | < 10 | < 13 | 140 | < 0.025 | 21 | < 2.4 | < 12 | 27 | 1400 |
| 2007-06 | MW-1014C | | 31 | 4.7 | 170 | 41 | < 10 | < 13 | 39 | < 0.025 | 5.4 | < 2.4 | < 12 | 10 | 470 |
| 2007-06 | MW-1015A | | 8.5 | < 0.17 | 21 | 6.2 | < 0.88 | 1.7 | 8.2 | < 0.025 | 0.66 | < 1.8 | < 1.1 | 3.2 | < 5 |
| 2007-07 | MW-1015B | | 49 | < 0.17 | 34 | 65 | 1.4 | < 1.3 | 14 | < 0.025 | 6.4 | < 1.8 | < 1.1 | 53 | < 5 |
| 2008-06 | MW-1000PR | | 40 | < 0.17 | 140 | 19 | 1.5 | < 1.3 | 36 | < 0.025 | 3.3 | 3.8 | 1.4 | 7 | 450 |
| 2008-06 | MW-1002 | | 7.1 | < 0.17 | 17 | 4.6 | 1.8 | < 1.3 | 5.5 | < 0.025 | 0.77 | 1.9 | 2.5 | 3.1 | < 5 |
| 2008-06 | MW-1002G | | 27 | < 0.17 | 27 | 12 | < 0.88 | < 1.3 | 9.8 | < 0.025 | 0.98 | < 1.8 | < 1.1 | 5.3 | < 5 |
| 2008-06 | MW-1002G | Dup. | 27 | 0.4 | 26 | 13 | < 0.88 | < 1.3 | 9.8 | < 0.025 | 0.79 | < 1.8 | < 1.1 | 4.9 | < 5 |
| 2008-06 | MW-1004P | | 41 | 0.34 | 35 | < 2.5 | < 0.88 | < 1.3 | 14 | < 0.025 | 5.4 | 3 | < 1.1 | 5.9 | < 5 |
| 2008-06 | MW-1004S | | 5.6 | < 0.17 | 25 | 6.7 | < 0.88 | < 1.3 | 7.9 | < 0.025 | 0.9 | < 1.8 | < 1.1 | 5.3 | < 5 |
| 2008-06 | MW-1005 | | 82 | < 0.17 | 39 | 110 | < 0.88 | < 1.3 | 20 | < 0.025 | 0.58 | < 1.8 | < 1.1 | 15 | < 5 |
| 2008-06 | MW-1005P | | 70 | < 0.17 | 55 | 3.9 | < 0.88 | 1.7 | 22 | < 0.025 | 10 | 2 | < 1.1 | 9 | < 5 |
| 2008-06 | MW-1005S | | 46 | < 0.17 | 40 | < 2.5 | 1 | < 1.3 | 14 | < 0.025 | 3.2 | < 1.8 | 1.1 | 6.4 | < 5 |
| 2008-06 | MW-1010P | | 44 | < 0.17 | 45 | 3.9 | < 0.88 | < 1.3 | 11 | < 0.025 | 2.4 | < 1.8 | < 1.1 | 4.1 | < 5 |
| 2008-06 | MW-1013 | | 130 | < 1.7 | 150 | 17 | < 10 | < 13 | 44 | < 0.025 | 2.6 | 2.8 | < 12 | 13 | < 50 |
| 2008-06 | MW-1013A | | 81 | < 1.7 | 160 | 7 | < 10 | < 13 | 53 | < 0.025 | 6.4 | < 2.4 | 14 | 19 | < 50 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008-06 | MW-1013B | | < 25 | < 1.7 | 630 | < 50 | < 10 | < 13 | 140 | < 0.025 | 5.6 | < 2.4 | < 12 | 19 | 170 |
| 2008-06 | MW-1013C | | 27 | 1.8 | 610 | 60 | < 10 | < 13 | 170 | < 0.025 | 22 | < 2.4 | < 12 | 28 | 450 |
| 2008-06 | MW-1014 | | 35 | 0.25 | 83 | 27 | < 0.88 | < 1.3 | 26 | < 0.025 | 3.5 | < 1.8 | 1.2 | 14 | 12 |
| 2008-06 | MW-1014A | | < 25 | < 1.7 | 330 | 13 | < 10 | < 13 | 120 | < 0.025 | 8 | < 2.4 | < 12 | 40 | < 50 |
| 2008-06 | MW-1014B | | < 25 | < 1.7 | 540 | 56 | < 10 | < 13 | 140 | < 0.025 | 18 | < 2.4 | < 12 | 18 | 1700 |
| 2008-06 | MW-1014B | Dup. | < 25 | 4.2 | 550 | 36 | < 10 | < 13 | 140 | < 0.025 | 21 | < 2.4 | < 12 | 29 | 1700 |
| 2008-06 | MW-1014C | | 28 | < 1.7 | 160 | 35 | < 10 | < 13 | 38 | < 0.025 | 4.8 | < 2.4 | < 12 | 7.8 | 390 |
| 2008-06 | MW-1015A | | 8.7 | 0.29 | 22 | 5.9 | < 0.88 | < 1.3 | 8.5 | < 0.025 | 0.82 | < 1.8 | < 1.1 | 3.4 | < 5 |
| 2008-06 | MW-1015B | | 45 | < 0.17 | 36 | 77 | < 0.88 | < 1.3 | 15 | < 0.025 | 6.9 | 1.9 | < 1.1 | 51 | < 5 |
| 2009-06 | MW-1000PR | | 36 | < 0.17 | 130 | 26 | 0.89 | < 1.3 | 32 | < 0.025 | 3.5 | < 1.8 | < 1.1 | 10 | 380 |
| 2009-06 | MW-1002 | | 5.6 | < 0.17 | 13 | 4.2 | < 0.88 | < 1.3 | 4.1 | < 0.025 | 0.7 | < 1.8 | < 1.1 | 2.3 | < 5 |
| 2009-06 | MW-1002G | | 26 | < 0.17 | 24 | 16 | < 0.88 | < 1.3 | 9.1 | < 0.025 | 0.77 | < 1.8 | < 1.1 | 4.9 | < 5 |
| 2009-06 | MW-1002G | Dup. | 26 | < 0.17 | 24 | 17 | < 0.88 | 1.6 | 9 | < 0.025 | 0.71 | < 1.8 | < 1.1 | 4.7 | < 5 |
| 2009-06 | MW-1004P | | 40 | < 0.17 | 32 | < 2.5 | < 0.88 | < 1.3 | 13 | < 0.025 | 5 | 2 | < 1.1 | 6.3 | < 5 |
| 2009-06 | MW-1004S | | 4.8 | < 0.17 | 20 | 6.6 | < 0.88 | 1.8 | 6.5 | < 0.025 | 0.49 | 3.5 | < 1.1 | 4.4 | < 5 |
| 2009-06 | MW-1005 | | 78 | 0.52 | 36 | 130 | 1 | < 1.3 | 18 | < 0.025 | 0.48 | < 1.8 | < 1.1 | 13 | < 5 |
| 2009-06 | MW-1005P | | 64 | < 0.17 | 49 | 5.2 | < 0.88 | < 1.3 | 20 | < 0.025 | 8.2 | < 1.8 | < 1.1 | 10 | < 5 |
| 2009-06 | MW-1005S | | 43 | < 0.17 | 38 | < 2.5 | < 0.88 | < 1.3 | 13 | < 0.025 | 3 | 2.8 | < 1.1 | 6.4 | < 5 |
| 2009-06 | MW-1010P | | 42 | < 0.17 | 42 | 5.5 | < 0.88 | < 1.3 | 11 | < 0.025 | 2.6 | < 1.8 | < 1.1 | 4.5 | < 5 |
| 2009-06 | MW-1013 | | 130 | < 1.7 | 140 | 15 | < 10 | 19 | 42 | < 0.025 | 2.6 | < 3.1 | < 12 | 15 | < 50 |
| 2009-06 | MW-1013A | | 72 | < 1.7 | 120 | 14 | < 10 | < 13 | 40 | < 0.025 | 6.4 | < 3.1 | < 12 | 26 | < 50 |
| 2009-06 | MW-1013B | | < 25 | < 1.7 | 590 | 76 | < 10 | < 13 | 130 | < 0.025 | 3.6 | < 3.1 | < 12 | 27 | 160 |
| 2009-06 | MW-1013B | Dup. | < 25 | < 1.7 | 580 | 77 | < 10 | < 13 | 130 | < 0.025 | 2.7 | < 3.1 | < 12 | 27 | 160 |
| 2009-06 | MW-1013C | | < 25 | < 1.7 | 560 | 91 | < 10 | < 13 | 160 | < 0.025 | 20 | < 24 | < 12 | 36 | 450 |
| 2009-06 | MW-1014 | | 34 | < 1.7 | 76 | 30 | < 10 | < 13 | 24 | < 0.025 | 3 | < 3.1 | < 12 | 19 | < 50 |
| 2009-06 | MW-1014A | | < 25 | < 1.7 | 300 | < 50 | < 10 | < 13 | 110 | < 0.025 | 6.3 | < 3.1 | < 12 | 62 | < 50 |
| 2009-06 | MW-1014B | | < 25 | 12 | 520 | 53 | 35 | 1.3 | 130 | < 0.025 | 12 | < 3.1 | 23 | 25 | 1100 |
| 2009-06 | MW-1014C | | 26 | < 1.7 | 150 | 53 | < 10 | < 13 | 35 | < 0.025 | 3.6 | < 3.1 | < 12 | 9.5 | 360 |
| 2009-06 | MW-1015A | | 7.9 | < 0.17 | 20 | 7.7 | < 0.88 | 2.1 | 8 | < 0.025 | 0.73 | < 1.8 | < 1.1 | 3.1 | < 5 |
| 2009-06 | MW-1015B | | 43 | < 0.17 | 33 | 87 | < 0.88 | 1.3 | 14 | < 0.025 | 6.1 | < 1.8 | < 1.1 | 48 | < 5 |
| 2010-06 | MW-1000PR | | 39 | < 0.16 | 120 | 19 | < 1.3 | 3.6 | 33 | < 0.025 | 4.1 | < 1.8 | < 0.77 | 10 | 370 |
| 2010-06 | MW-1002 | | 5.7 | < 0.16 | 12 | 3.6 | < 1.3 | < 1.2 | 4 | < 0.025 | 0.55 | < 1.8 | < 0.77 | 2.4 | < 5 |
| 2010-06 | MW-1002G | | 30 | < 0.16 | 26 | 23 | < 1.3 | < 1.2 | 10 | < 0.025 | 0.83 | < 1.8 | < 0.77 | 5.1 | < 5 |
| 2010-06 | MW-1004P | | 46 | 0.16 | 34 | < 2.5 | < 1.3 | < 1.2 | 13 | < 0.025 | 5.7 | < 1.8 | < 0.77 | 6.8 | < 5 |
| 2010-06 | MW-1004S | | 4.8 | < 0.16 | 19 | 4.4 | < 1.3 | 2.2 | 6.3 | < 0.025 | 0.78 | < 1.8 | < 0.77 | 4.1 | < 5 |
| 2010-06 | MW-1005 | | 77 | 0.46 | 33 | 120 | < 1.3 | 2 | 18 | < 0.025 | 0.65 | < 1.8 | < 0.77 | 16 | < 5 |
| 2010-06 | MW-1005P | | 60 | < 0.16 | 44 | 19 | < 1.3 | < 1.2 | 12 | < 0.025 | 6.8 | < 1.8 | < 0.77 | 43 | < 5 |
| 2010-06 | MW-1005S | | 49 | < 0.16 | 38 | < 2.5 | < 1.3 | < 1.2 | 14 | < 0.025 | 3.1 | < 1.8 | < 0.77 | 6.4 | < 5 |
| 2010-06 | MW-1010P | | 46 | 0.21 | 40 | 4.2 | < 1.3 | < 1.2 | 12 | < 0.025 | 2.7 | < 1.8 | < 0.77 | 4.7 | < 5 |
| 2010-06 | MW-1013 | | 140 | < 1.7 | 150 | 13 | < 11 | < 13 | 45 | < 0.025 | 3.3 | < 2.4 | < 14 | 18 | < 50 |
| 2010-06 | MW-1013A | | 74 | < 1.7 | 110 | 6.9 | < 11 | < 13 | 39 | < 0.025 | 7.5 | < 2.4 | < 14 | 35 | < 50 |
| 2010-06 | MW-1013B | | < 25 | 1.9 | 620 | < 50 | < 11 | < 13 | 140 | < 0.025 | 8.6 | < 2.4 | < 14 | 35 | 180 |
| 2010-06 | MW-1013C | | < 25 | < 1.7 | 550 | 64 | < 11 | < 13 | 150 | < 0.025 | 30 | < 2.4 | < 14 | 34 | 400 |
| 2010-06 | MW-1014 | | 57 | < 1.7 | 76 | 28 | < 11 | < 13 | 24 | < 0.025 | 3.5 | 3 | < 14 | 23 | < 50 |
| 2010-06 | MW-1014A | | < 25 | < 1.7 | 320 | 13 | < 11 | < 13 | 110 | < 0.025 | 12 | < 2.4 | < 14 | 63 | < 50 |
| 2010-06 | MW-1014B | | < 25 | < 1.7 | 510 | | < 11 | 17 | 130 | < 0.025 | 25 | < 2.4 | < 14 | 31 | 1200 |
| 2010-06 | MW-1014C | | < 25 | < 1.7 | 140 | 37 | < 11 | 20 | 36 | < 0.025 | 5.4 | < 2.4 | < 14 | 9.8 | 330 |
| 2010-06 | MW-1015A | | 8.9 | < 0.16 | 20 | 6.3 | < 1.3 | < 1.2 | 8.4 | < 0.025 | 0.74 | < 1.8 | < 0.77 | 3.2 | < 5 |
| 2010-06 | MW-1015B | | 48 | < 0.16 | 32 | 63 | < 1.3 | 3.7 | 15 | < 0.025 | 7.2 | < 1.8 | < 0.77 | 55 | < 5 |
| 2011-07 | MW-1000PR | | 37 | < 0.13 | 130 | 21 | < 0.18 | < 1.4 | 34 | < 0.025 | 4 | < 1.8 | < 0.26 | | 310 |

# Historical Groundwater Results - Annual Parameters

| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011-07 | MW-1000R | | 34 | < 0.13 | 110 | 8 | < 0.18 | < 1.4 | 35 | < 0.025 | 1.6 | < 1.8 | 0.74 | | < 5 |
| 2011-07 | MW-1002 | | 9.1 | < 0.13 | 21 | 9.9 | 0.71 | < 1.4 | 7.2 | < 0.025 | 0.8 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1002G | | 33 | < 0.13 | 32 | 26 | 0.81 | < 1.4 | 13 | < 0.025 | 0.92 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1002G | Dup. | 32 | < 0.13 | 32 | 26 | 0.83 | < 1.4 | 12 | < 0.025 | 0.91 | < 1.8 | 3.1 | | < 5 |
| 2011-07 | MW-1004 | | 3.9 | < 0.13 | 12 | < 2.5 | 1.5 | < 1.4 | 3.9 | < 0.025 | 0.72 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1004P | | 44 | < 0.13 | 36 | < 2.5 | < 0.18 | < 1.4 | 15 | < 0.025 | 5.8 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1004S | | 5 | < 0.13 | 20 | 5.7 | 0.82 | < 1.4 | 7 | < 0.025 | 0.9 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1005 | | 200 | < 0.13 | 79 | 240 | < 0.18 | < 1.4 | 39 | < 0.025 | 1.1 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1005P | | 72 | < 0.13 | 54 | 4.7 | < 0.18 | < 1.4 | 23 | < 0.025 | 9.4 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1005S | | 50 | < 0.13 | 43 | 2.7 | < 0.18 | < 1.4 | 16 | < 0.025 | 3.4 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1010P | | 45 | < 0.13 | 47 | 5.3 | < 0.18 | < 1.4 | 13 | < 0.025 | 2.6 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1013 | | 150 | 0.14 | 160 | 16 | < 0.67 | 3.4 | 51 | < 0.025 | 3.6 | < 12 | 1 | | < 5 |
| 2011-07 | MW-1013 | Dup. | 150 | < 0.12 | 160 | 16 | < 0.67 | 2.1 | 50 | < 0.025 | 3.6 | < 12 | 2.3 | | < 5 |
| 2011-07 | MW-1013A | | 79 | < 0.12 | 120 | 7.8 | < 0.67 | < 1.4 | 43 | < 0.025 | 7.8 | < 12 | < 0.28 | | < 5 |
| 2011-07 | MW-1013B | | 20 | 0.92 | 640 | 54 | < 0.67 | 5.5 | 150 | < 0.025 | 8.3 | < 12 | 1.2 | | 160 |
| 2011-07 | MW-1013C | | 20 | < 0.12 | 610 | 76 | < 0.67 | 2.5 | 170 | < 0.025 | 32 | < 12 | < 0.28 | | 410 |
| 2011-07 | MW-1014 | | 68 | < 0.12 | 79 | 36 | < 0.67 | < 1.4 | 26 | < 0.025 | 3.2 | < 12 | < 0.28 | | 7.2 |
| 2011-07 | MW-1014A | | 16 | < 0.12 | 320 | < 25 | < 0.67 | < 1.4 | 130 | < 0.025 | 12 | < 12 | < 0.28 | | 13 |
| 2011-07 | MW-1014B | | 31 | 2.7 | 500 | 54 | < 0.67 | < 1.4 | 140 | < 0.025 | 22 | < 12 | < 0.28 | | 1300 |
| 2011-07 | MW-1014C | | 29 | < 0.12 | 150 | 45 | < 0.67 | < 1.4 | 39 | < 0.025 | 5.2 | < 12 | < 0.28 | | 310 |
| 2011-07 | MW-1015A | | 8.6 | < 0.13 | 22 | 6.5 | < 0.18 | < 1.4 | 9.2 | < 0.025 | 0.79 | < 1.8 | < 0.26 | | < 5 |
| 2011-07 | MW-1015B | | 49 | < 0.13 | 37 | 86 | < 0.18 | < 1.4 | 16 | < 0.025 | 7.4 | < 1.8 | < 0.26 | | < 5 |
| 2012-06 | MW-1000PR | | 36 | 0.66 | 120 | 22 | < 0.23 | 2.5 | 33 | < 0.025 | 4.2 | < 1.8 | < 0.26 | 9.1 | 360 |
| 2012-06 | MW-1000R | | 19 | < 0.13 | 42 | 5.2 | 0.25 | 2.2 | 11 | 0.045 | 0.85 | < 1.8 | < 0.26 | 5.5 | < 5 |
| 2012-06 | MW-1002 | | 6.6 | < 0.13 | 16 | 5.9 | 0.39 | 2.4 | 5.3 | < 0.025 | 0.69 | < 1.8 | < 0.26 | 3.1 | < 5 |
| 2012-06 | MW-1002G | | 32 | < 0.13 | 31 | 29 | < 0.23 | < 1.4 | 12 | < 0.025 | 0.93 | < 1.8 | < 0.26 | 5.7 | < 5 |
| 2012-06 | MW-1004 | | 4.5 | < 0.13 | 14 | < 2.5 | 1.6 | < 1.4 | 4.7 | < 0.025 | 0.79 | < 1.8 | < 0.26 | 3.1 | < 5 |
| 2012-06 | MW-1004P | | 42 | < 0.13 | 34 | < 2.5 | < 0.23 | < 1.4 | 14 | < 0.025 | 5.9 | < 1.8 | < 0.26 | 6.3 | < 5 |
| 2012-06 | MW-1004S | | 4.7 | < 0.13 | 20 | 4.2 | 0.3 | < 1.4 | 6.6 | < 0.025 | 0.88 | < 1.8 | < 0.26 | 4 | < 5 |
| 2012-06 | MW-1005 | | 130 | 0.15 | 65 | 280 | < 0.23 | 1.5 | 33 | < 0.025 | 1 | < 1.8 | < 0.26 | 30 | < 5 |
| 2012-06 | MW-1005P | | 68 | 0.25 | 52 | 4.8 | < 0.23 | 1.5 | 22 | < 0.025 | 9.6 | < 1.8 | < 0.26 | 9.1 | < 5 |
| 2012-06 | MW-1005S | | 48 | < 0.13 | 43 | 2.5 | < 0.23 | 1.4 | 16 | < 0.025 | 3.4 | < 1.8 | < 0.26 | 6.8 | < 5 |
| 2012-06 | MW-1010P | | 44 | 0.26 | 47 | 5.2 | < 0.23 | < 1.4 | 13 | < 0.025 | 2.6 | 1.9 | < 0.26 | 4.5 | < 5 |
| 2012-06 | MW-1013 | | 140 | 0.18 | 150 | 14 | < 0.67 | 5.3 | 49 | < 0.025 | 3.4 | < 2.7 | < 0.28 | 17 | < 5 |
| 2012-06 | MW-1013A | | 76 | < 0.12 | 120 | 8.2 | < 0.67 | 2.3 | 43 | < 0.025 | 7.7 | < 2.7 | < 0.28 | 26 | < 5 |
| 2012-06 | MW-1013B | | 16 | 1.9 | 630 | 53 | < 0.67 | 7.1 | 150 | < 0.025 | 8.4 | < 2.7 | < 0.28 | 30 | 170 |
| 2012-06 | MW-1013C | | 18 | < 0.6 | 570 | 66 | < 0.67 | 3.6 | 160 | < 0.025 | 31 | < 2.7 | < 0.28 | 32 | 350 |
| 2012-06 | MW-1014 | | 52 | 0.22 | 78 | 38 | < 0.67 | 3.5 | 26 | < 0.025 | 3.7 | < 2.7 | < 0.28 | 17 | 7 |
| 2012-06 | MW-1014 | Dup. | 53 | < 0.12 | 78 | 39 | < 0.67 | < 1.4 | 26 | < 0.025 | 3.7 | < 2.7 | 3.9 | 17 | 7 |
| 2012-06 | MW-1014A | | 15 | 0.25 | 310 | < 25 | < 0.67 | 1.9 | 120 | < 0.025 | 13 | < 2.7 | < 0.28 | 56 | 7.2 |
| 2012-06 | MW-1014B | | 23 | 2.6 | 500 | 59 | < 0.67 | 3.2 | 130 | < 0.025 | 22 | < 2.7 | < 0.56 | 25 | 1200 |
| 2012-06 | MW-1014C | | 30 | 0.18 | 150 | 50 | < 0.67 | < 1.4 | 38 | < 0.025 | 5.6 | < 2.7 | < 0.28 | 11 | 310 |
| 2012-06 | MW-1015A | | 8.3 | 0.21 | 21 | 6.7 | < 0.23 | 2 | 8.9 | < 0.025 | 0.77 | 2.4 | < 0.26 | 3.5 | < 5 |
| 2012-06 | MW-1015A | Dup. | 8.3 | < 0.13 | 21 | 6.8 | < 0.23 | < 1.4 | 8.9 | < 0.025 | 0.77 | < 1.8 | < 0.26 | 3.4 | < 5 |
| 2012-06 | MW-1015B | | 40 | < 0.13 | 34 | 58 | < 0.23 | < 1.4 | 15 | < 0.025 | 7.1 | < 1.8 | < 0.26 | 44 | < 5 |
| 2013-06 | MW-1000PR | | 41 | 0.18 | 130 | 23 | < 0.23 | < 1.4 | 34 | < 0.025 | 3.9 | < 2 | 0.65 | 8.6 | 390 |
| 2013-06 | MW-1000R | | 16 | < 0.13 | 30 | 4.3 | 0.54 | < 1.4 | 7.6 | < 0.025 | 0.59 | < 2 | 0.81 | 3.9 | < 5 |
| 2013-06 | MW-1002 | | 9.1 | < 0.13 | 21 | 9.1 | 0.85 | < 1.4 | 7.3 | < 0.025 | 0.81 | < 2 | < 0.26 | 3.6 | < 5 |
| 2013-06 | MW-1002G | | 34 | < 0.13 | 33 | 28 | 0.33 | < 1.4 | 13 | < 0.025 | 0.94 | < 2 | < 0.26 | 5.5 | < 5 |
| 2013-06 | MW-1002G | Dup. | 33 | < 0.13 | 31 | 28 | < 0.23 | 3 | 13 | < 0.025 | 0.94 | < 2 | < 0.26 | 6.2 | < 5 |

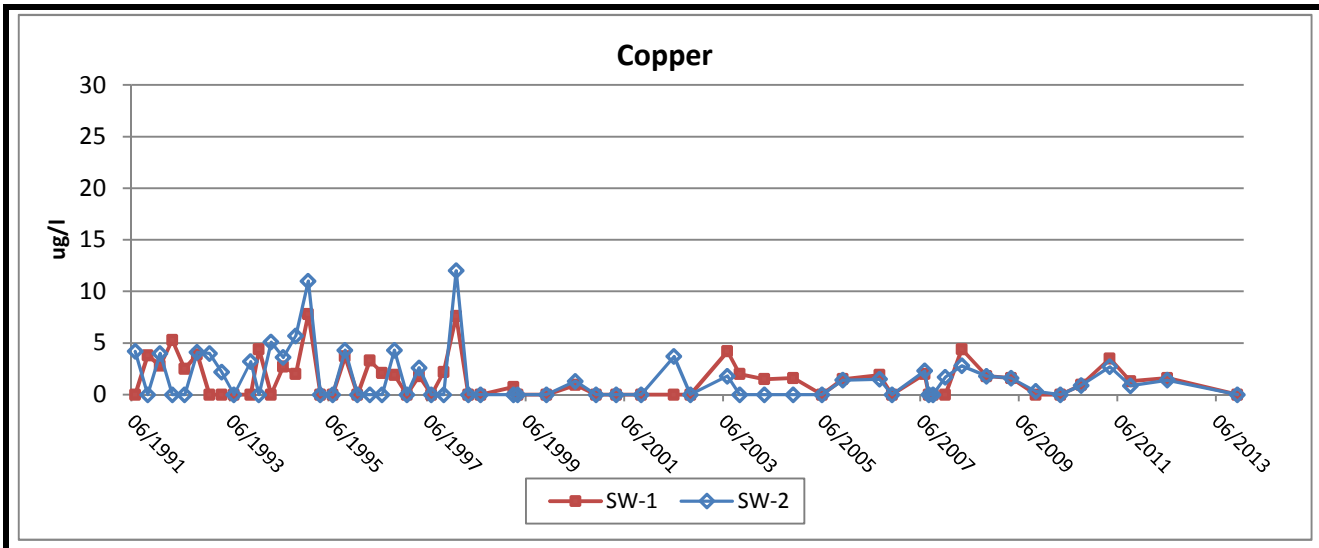
# Historical Groundwater Results - Annual Parameters

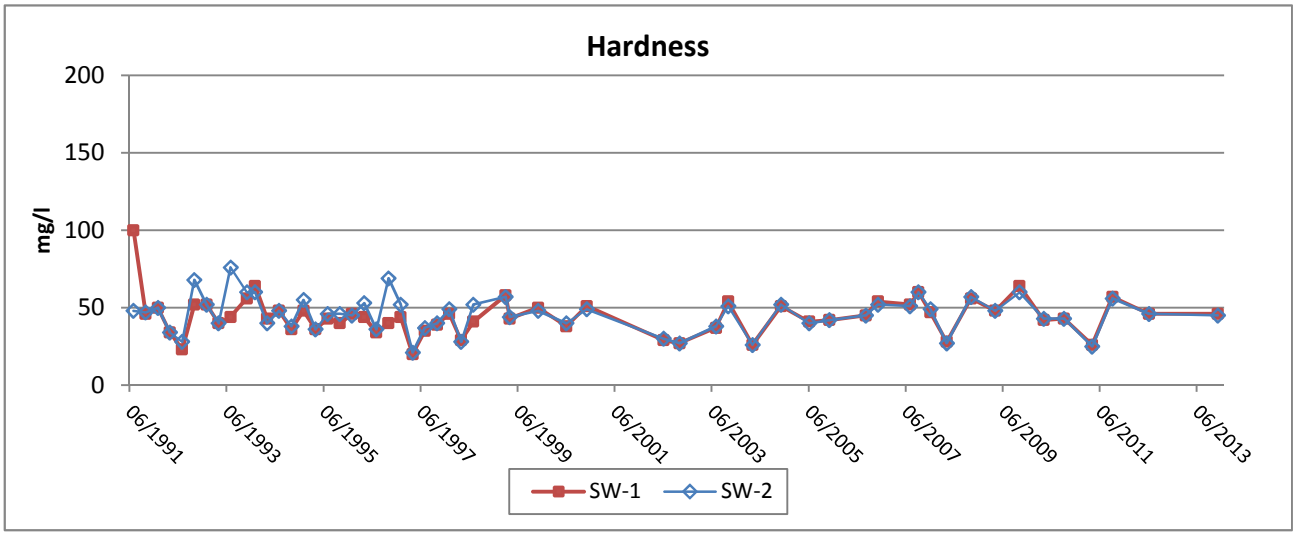
| Sample Date (yyyy-mm) | Location | | Barium ug/l | Cadmium ug/l | Calcium mg/l | Chloride mg/l | Chromium ug/l | Lead ug/l | Magnesium mg/l | Mercury ug/l | Potassium mg/l | Selenium ug/l | Silver ug/l | Sodium mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013-06 | MW-1004 | | 3.7 | < 0.13 | 12 | < 2.5 | 0.38 | < 1.4 | 3.8 | < 0.025 | 0.71 | < 2 | 0.69 | 2.8 | < 5 |
| 2013-06 | MW-1004P | | 46 | < 0.13 | 36 | < 2.5 | < 0.23 | < 1.4 | 15 | < 0.025 | 6.1 | < 2 | < 0.26 | 6.2 | < 5 |
| 2013-06 | MW-1004S | | 5.1 | < 0.13 | 21 | 4.8 | 0.68 | 2.4 | 7.2 | < 0.025 | 0.94 | < 2 | < 0.26 | 4.3 | < 5 |
| 2013-06 | MW-1005 | | 160 | < 0.13 | 73 | 240 | 0.98 | < 1.4 | 36 | < 0.025 | 0.95 | < 2 | < 0.26 | 34 | < 5 |
| 2013-06 | MW-1005P | | 72 | < 0.13 | 56 | 19 | < 0.23 | 2.8 | 21 | < 0.025 | 8.9 | < 2 | < 0.26 | 22 | < 5 |
| 2013-06 | MW-1005S | | 50 | < 0.13 | 44 | < 2.5 | < 0.23 | < 1.4 | 16 | < 0.025 | 3.2 | < 2 | < 0.26 | 6.4 | < 5 |
| 2013-06 | MW-1010P | | 48 | < 0.13 | 50 | 5.7 | < 0.23 | 2.9 | 14 | < 0.025 | 2.9 | < 2 | 0.32 | 4.5 | 22 |
| 2013-06 | MW-1013 | | 160 | < 0.12 | 170 | 15 | < 0.67 | 4.7 | 45 | < 0.025 | 3.4 | < 2 | 2.5 | 20 | < 5 |
| 2013-06 | MW-1013A | | 94 | < 0.12 | 130 | 8.2 | < 0.67 | < 1.4 | 47 | < 0.025 | 8.1 | < 2 | 0.64 | 31 | < 5 |
| 2013-06 | MW-1013B | | 16 | < 0.6 | 640 | 60 | < 3.4 | 28 | 150 | < 0.025 | 6.6 | < 2 | 2 | 29 | 150 |
| 2013-06 | MW-1013C | | 21 | < 0.6 | 600 | 71 | < 3.4 | 12 | 170 | < 0.025 | 27 | < 2 | 1.7 | 35 | 390 |
| 2013-06 | MW-1014 | | 44 | < 0.12 | 82 | 38 | < 0.67 | < 1.4 | 27 | < 0.025 | 3.6 | < 2 | 0.95 | 17 | 7.8 |
| 2013-06 | MW-1014A | | 17 | < 0.12 | 330 | < 25 | < 0.67 | 1.9 | 130 | < 0.025 | 11 | < 2 | 0.35 | 60 | 7.6 |
| 2013-06 | MW-1014B | | 23 | 2.8 | 560 | 61 | < 3.4 | 160 | 150 | < 0.025 | 22 | < 2 | 4 | 25 | 1000 |
| 2013-06 | MW-1014B | Dup. | 23 | 2.2 | 540 | 44 | < 3.4 | 29 | 170 | < 0.025 | 24 | < 2 | < 1.4 | 36 | 1200 |
| 2013-06 | MW-1014C | | 34 | < 0.12 | 160 | 49 | < 0.67 | < 1.4 | 39 | < 0.025 | 5.4 | < 2 | 0.65 | 11 | 290 |
| 2013-06 | MW-1015A | | 8.7 | < 0.13 | 23 | 7 | < 0.23 | < 1.4 | 9.7 | < 0.025 | 0.82 | < 2 | < 0.26 | 3.5 | < 5 |
| 2013-06 | MW-1015B | | 50 | < 0.13 | 38 | 62 | < 0.23 | < 1.4 | 17 | < 0.025 | 7.3 | < 2 | < 0.26 | 64 | < 5 |

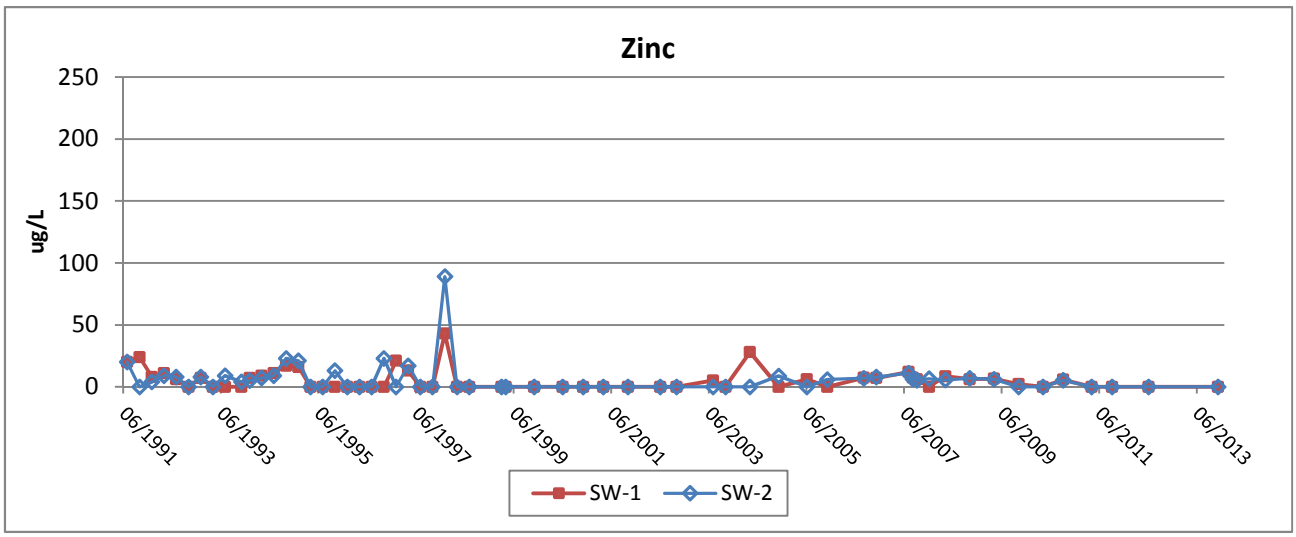
## Trend Analysis Results - Surface Water
## Year Ending 2013

| | Conductivity (Field) (umhos) | pH(Field) (su) | Copper | Hardness | Zinc |
|---|---|---|---|---|---|
| **SW-1** | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | |
| Sample Size | 8 | 8 | 8 | 8 | 8 |
| Mann-Kendall S | -10 | -16 | 2 | -3 | -14 |
| p-Level | 0.276 | 0.062 | 0.904 | 0.812 | 0.108 |
| Trend | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | |
| Sample Size | 35 | 35 | 35 | 32 | 35 |
| Mann-Kendall S | -24 | 32 | 37 | 80 | 68 |
| p-Level | 0.746 | 0.662 | 0.612 | 0.202 | 0.344 |
| Trend | | | | | |
| **SW-2** | | | | | |
| **Trend Results for Most Recent 5 Years** | | | | | |
| Sample Size | 8 | 8 | 8 | 8 | 8 |
| Mann-Kendall S | -8 | -18 | -3 | -5 | -9 |
| p-Level | 0.398 | 0.032 | 0.812 | 0.634 | 0.337 |
| Trend | | | | | |
| **Trend Results for All Data Since Oct. 1997** | | | | | |
| Sample Size | 35 | 35 | 35 | 32 | 35 |
| Mann-Kendall S | -50 | 82 | 112 | 42 | 65 |
| p-Level | 0.489 | 0.252 | 0.115 | 0.510 | 0.366 |
| Trend | | | | | |

Notes: Overall increasing trend denoted by "+".
Overall decreasing trend denoted by "-"
All trend tests performed at a Type I (two-tailed) error rate of 0.01.




Foth

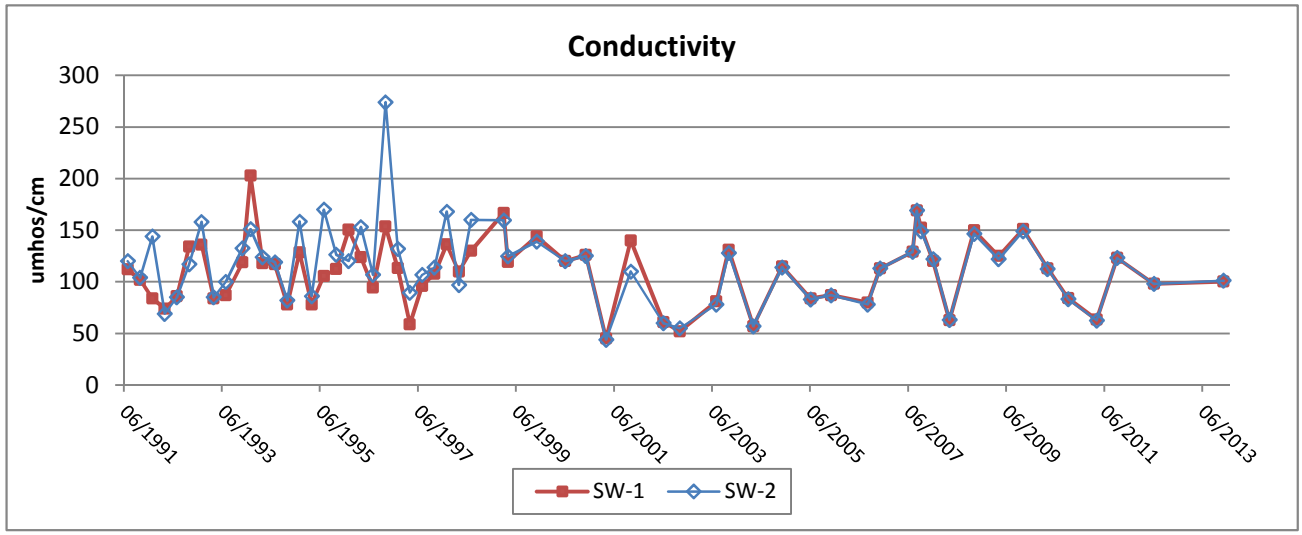
FLAMBEAU MINING COMPANY

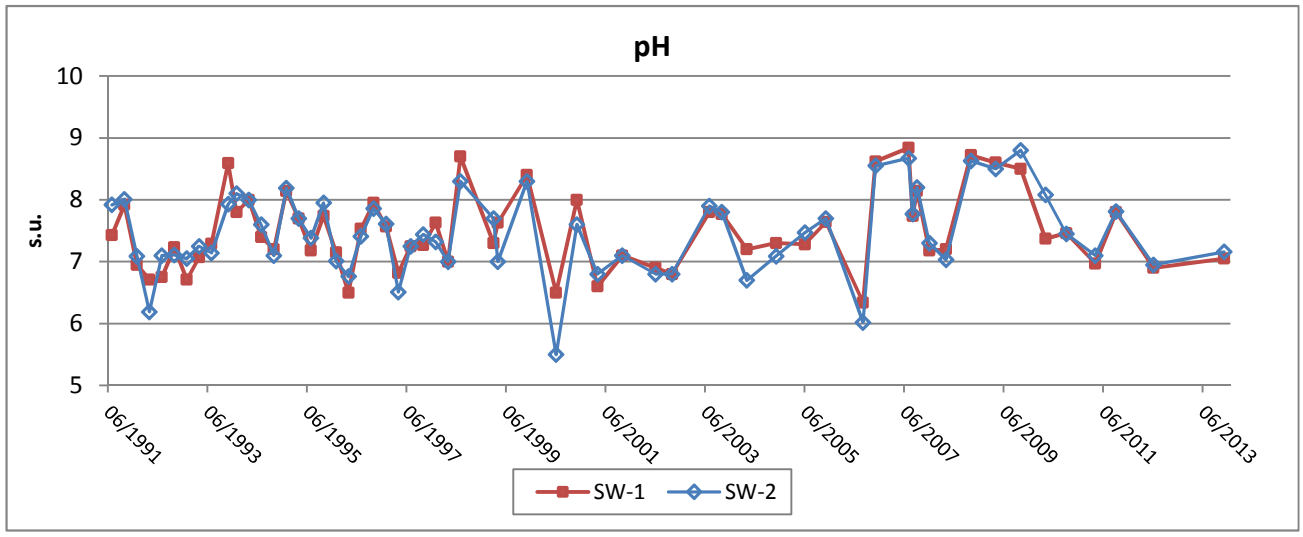
Figure B-15a

Surface Water Trend Graphs

SW-1/SW-2

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |




Foth

FLAMBEAU MINING COMPANY

Figure B-15b

Surface Water Trend Graphs

SW-1/SW-2

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

# Historical Surface Water Results

| Sample Date (yyyy-mm) | Location | | Conductivity umhos/cm | pH s.u. | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|
| 1991-07 | SW-1 | | 112 | 7.43 | < 3 | 100 | | | | 20 |
| 1991-07 | SW-2 | | 120 | 7.92 | 4.2 | 48 | | | | 20 |
| 1991-10 | SW-1 | | 102 | 7.92 | 3.8 | 46 | | | | 24 |
| 1991-10 | SW-2 | | 104 | 8.01 | < 2 | 47 | | | | < 3 |
| 1992-01 | SW-1 | | 84 | 6.95 | 2.8 | 50 | | | | 8 |
| 1992-01 | SW-2 | | 144 | 7.09 | 4 | 50 | | | | 4 |
| 1992-04 | SW-1 | | 74 | 6.71 | 5.3 | 34 | | | | 11 |
| 1992-04 | SW-2 | | 69 | 6.19 | < 2 | 34 | | | | 9 |
| 1992-07 | SW-1 | | 86 | 6.75 | 2.5 | 23 | | | | 6 |
| 1992-07 | SW-2 | | 85 | 7.1 | < 2 | 28 | | | | 8 |
| 1992-10 | SW-1 | | 134 | 7.23 | 3.9 | 52 | | | | < 3 |
| 1992-10 | SW-2 | | 117 | 7.11 | 4.1 | 68 | | | | < 3 |
| 1993-01 | SW-1 | | 136 | 6.71 | < 2 | 52 | | | | 7 |
| 1993-01 | SW-2 | | 158 | 7.05 | 4 | 52 | | | | 8 |
| 1993-04 | SW-1 | | 84 | 7.07 | < 2 | 40 | | | | < 3 |
| 1993-04 | SW-2 | | 85 | 7.25 | 2.2 | 40 | | | | < 3 |
| 1993-07 | SW-1 | | 87 | 7.29 | < 12 | 44 | | | | < 3 |
| 1993-07 | SW-2 | | 100 | 7.14 | < 12 | 76 | | | | 9 |
| 1993-11 | SW-1 | | 118.9 | 8.59 | < 2 | 56 | | | | < 3 |
| 1993-11 | SW-2 | | 132.6 | 7.93 | 3.2 | 60 | | | | 4 |
| 1994-01 | SW-1 | | 203 | 7.8 | 4.4 | 64 | | | | 7 |
| 1994-01 | SW-2 | | 151 | 8.1 | < 2 | 60 | | | | 5 |
| 1994-04 | SW-1 | | 118 | 8 | < 2 | 43 | | | | 9 |
| 1994-04 | SW-2 | | 124 | 8 | 5.1 | 40 | | | | 7 |
| 1994-07 | SW-1 | | 117 | 7.4 | 2.7 | 48 | | | | 11 |
| 1994-07 | SW-2 | | 119 | 7.6 | 3.6 | 48 | | | | 9 |
| 1994-10 | SW-1 | | 78 | 7.2 | 2 | 36 | | | | 17 |
| 1994-10 | SW-2 | | 82 | 7.1 | 5.7 | 38 | | | | 23 |
| 1995-01 | SW-1 | | 128.5 | 8.14 | 7.8 | 48 | | | | 16 |
| 1995-01 | SW-2 | | 158.3 | 8.19 | 11 | 55 | | | | 21 |
| 1995-04 | SW-1 | | 78.1 | 7.7 | < 3.8 | 36 | | | | < 12 |
| 1995-04 | SW-2 | | 86.2 | 7.7 | < 3.8 | 36 | | | | < 12 |
| 1995-04 | SW-2 | Dup. | | | < 3.8 | 36 | | | | < 12 |
| 1995-07 | SW-1 | | 105.5 | 7.18 | < 1.7 | 43 | | | | < 12 |
| 1995-07 | SW-2 | | 170 | 7.38 | < 1.7 | 46 | | | | < 12 |
| 1995-10 | SW-1 | | 112.5 | 7.74 | 3.7 | 40 | | | | < 12 |
| 1995-10 | SW-2 | | 126.3 | 7.95 | 4.3 | 46 | | | | 13 |
| 1996-01 | SW-1 | | 150.5 | 7.15 | < 1.7 | 46 | | | | < 12 |
| 1996-01 | SW-2 | | 120.2 | 7.01 | < 1.7 | 45 | | | | < 12 |
| 1996-04 | SW-1 | | 124 | 6.5 | 3.3 | 44 | | | | < 12 |
| 1996-04 | SW-2 | | 153.1 | 6.76 | < 1.7 | 53 | | | | < 12 |
| 1996-07 | SW-1 | | 94.5 | 7.53 | 2.1 | 34 | | | | < 12 |
| 1996-07 | SW-2 | | 106.8 | 7.41 | < 1.7 | 36 | | | | < 12 |
| 1996-10 | SW-1 | | 153.5 | 7.95 | 1.9 | 40 | | | | < 12 |
| 1996-10 | SW-2 | | 274 | 7.86 | 4.3 | 69 | | | | 23 |
| 1997-01 | SW-1 | | 113.3 | 7.57 | < 1.7 | 44 | | | | 21 |
| 1997-01 | SW-2 | | 132 | 7.61 | < 1.7 | 52 | | | | < 12 |
| 1997-04 | SW-1 | | 58.9 | 6.82 | 1.8 | 20 | | | | 13 |
| 1997-04 | SW-2 | | 89.6 | 6.51 | 2.6 | 21 | | | | 17 |
| 1997-07 | SW-1 | | 96.1 | 7.25 | < 1.7 | 35 | | | | < 12 |
| 1997-07 | SW-2 | | 106.8 | 7.25 | < 1.7 | 37 | | | | < 12 |
| 1997-10 | SW-1 | | 107.6 | 7.27 | 2.2 | 39 | | | | < 12 |
| 1997-10 | SW-2 | | 113.8 | 7.44 | < 1.7 | 40 | | | | < 12 |
| 1998-01 | SW-1 | | 136.3 | 7.63 | 7.6 | 46 | | | | 43 |
| 1998-01 | SW-2 | | 167.9 | 7.32 | 12 | 49 | | | | 89 |
| 1998-04 | SW-1 | | 110 | 7 | < 1.7 | 29 | | | | < 12 |
| 1998-04 | SW-2 | | 97 | 7 | < 1.7 | 28 | | | | < 12 |
| 1998-07 | SW-1 | | 130 | 8.7 | < 1.7 | 41 | | | | < 12 |

# Historical Surface Water Results

| Sample Date (yyyy-mm) | Location | | Conductivity umhos/cm | pH s.u. | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|
| 1998-07 | SW-2 | | 160 | 8.3 | < 1.7 | 52 | | | | < 12 |
| 1999-03 | SW-1 | | 166.7 | 7.3 | 0.74 | 58 | | | | < 12 |
| 1999-03 | SW-2 | | 159.6 | 7.7 | < 0.6 | 57 | | | | < 12 |
| 1999-04 | SW-1 | | 119.3 | 7.63 | < 0.6 | 43 | | | | < 12 |
| 1999-04 | SW-2 | | 124.7 | 7 | < 0.6 | 44 | | | | < 12 |
| 1999-11 | SW-1 | | 144 | 8.4 | < 0.6 | 50 | 0.34 | 42 | 7.7 | < 12 |
| 1999-11 | SW-2 | | 139 | 8.3 | < 0.6 | 48 | 0.34 | 38 | 7.9 | < 12 |
| 2000-06 | SW-1 | | 120 | 6.5 | 0.94 | 38 | 0.36 | 60 | 5.2 | < 12 |
| 2000-06 | SW-2 | | 120 | 5.5 | 1.3 | 40 | 0.54 | 89 | 5.2 | < 12 |
| 2000-11 | SW-1 | | 126 | 8 | < 1.2 | 51 | 0.48 | 56 | 8.6 | < 12 |
| 2000-11 | SW-2 | | 125 | 7.6 | < 1.2 | 49 | 0.46 | 53 | 8.4 | < 12 |
| 2001-04 | SW-1 | | 45 | 6.6 | < 1.3 | | 0.65 | 68 | < 5 | < 12 |
| 2001-04 | SW-2 | | 44 | 6.8 | < 1.3 | | 0.65 | 66 | < 5 | < 12 |
| 2001-10 | SW-1 | | 140 | 7.1 | < 1.3 | | 0.36 | 83 | 8.8 | < 12 |
| 2001-10 | SW-2 | | 110 | 7.1 | < 1.3 | | 0.39 | 95 | 8.9 | < 12 |
| 2002-06 | SW-1 | | 61 | 6.9 | < 1.3 | 29 | 0.43 | 45 | < 5 | < 12 |
| 2002-06 | SW-2 | | 60 | 6.8 | 3.7 | 30 | 0.49 | 58 | < 5 | < 12 |
| 2002-10 | SW-1 | | 52 | 6.8 | < 1.3 | 27 | 0.74 | 48 | < 5 | < 12 |
| 2002-10 | SW-2 | | 55 | 6.8 | < 1.3 | 27 | 0.78 | 47 | < 5 | < 12 |
| 2003-07 | SW-1 | | 81 | 7.8 | 4.2 | 37 | 0.44 | 44 | 2.6 | 5.1 |
| 2003-07 | SW-2 | | 78 | 7.9 | 1.8 | 38 | 0.51 | 58 | 2.6 | < 5 |
| 2003-10 | SW-1 | | 131 | 7.77 | 2 | 54 | 0.23 | 81 | 6.7 | < 5 |
| 2003-10 | SW-2 | | 128 | 7.8 | < 1.3 | 51 | 0.23 | 68 | 7.1 | < 5 |
| 2004-04 | SW-1 | | 57 | 7.2 | 1.5 | 26 | 0.58 | 64 | 5.4 | 28 |
| 2004-04 | SW-2 | | 57 | 6.7 | < 1.3 | 26 | 0.61 | 63 | 5.4 | < 5 |
| 2004-11 | SW-1 | | 115 | 7.3 | 1.6 | 51 | 0.33 | 45 | 7.2 | < 5 |
| 2004-11 | SW-2 | | 114 | 7.09 | < 1.3 | 52 | 0.37 | 49 | 6.3 | 8.8 |
| 2005-06 | SW-1 | | 84 | 7.28 | < 1.3 | 41 | 0.49 | 82 | < 2.5 | 6 |
| 2005-06 | SW-2 | | 83 | 7.47 | < 1.3 | 40 | 0.56 | 87 | 5.7 | < 5 |
| 2005-11 | SW-1 | | 87 | 7.64 | 1.5 | 42 | 0.56 | 45 | 7.2 | < 5 |
| 2005-11 | SW-2 | | 87 | 7.7 | 1.4 | 42 | 0.85 | 75 | 7.3 | 5.9 |
| 2006-08 | SW-1 | | 80 | 6.34 | 1.9 | 45 | 0.45 | 120 | 4.7 | 7.3 |
| 2006-08 | SW-2 | | 78 | 6.02 | 1.5 | 45 | 0.47 | 120 | 4.3 | 6.9 |
| 2006-11 | SW-1 | | 113 | 8.62 | < 1.3 | 54 | 0.35 | 45 | 8.1 | 7.1 |
| 2006-11 | SW-2 | | 113 | 8.55 | < 1.3 | 52 | 0.34 | 44 | 8.1 | 7.8 |
| 2006-11 | SW-2 | Dup. | | | < 1.3 | 52 | 0.34 | 44 | 8.1 | 7.8 |
| 2007-07 | SW-1 | | 129 | 8.84 | 2 | 52 | 0.41 | 110 | 6.9 | 12 |
| 2007-07 | SW-2 | | 129 | 8.67 | 2.3 | 51 | 0.47 | 81 | 7 | 11 |
| 2007-08 | SW-1 | | 169 | 7.74 | < 1.3 | | 0.34 | 170 | 10 | 7.5 |
| 2007-08 | SW-2 | | 169 | 7.77 | < 1.3 | | 0.36 | 170 | 10 | 6.4 |
| 2007-09 | SW-1 | | 152.4 | 8.14 | < 1.3 | 60 | 0.57 | 130 | 10 | 6 |
| 2007-09 | SW-2 | | 149 | 8.2 | < 1.3 | 60 | 0.5 | 130 | 11 | 5.4 |
| 2007-12 | SW-1 | | 120 | 7.18 | < 1.3 | 47 | 0.72 | 54 | 7.7 | < 5 |
| 2007-12 | SW-1 | Dup. | | | < 1.3 | 51 | 0.76 | 56 | 8.8 | < 5 |
| 2007-12 | SW-2 | | 122 | 7.3 | 1.7 | 49 | 0.77 | 57 | 9.1 | 6.5 |
| 2008-04 | SW-1 | | 62.7 | 7.2 | 4.4 | 28 | 0.78 | 96 | 4.7 | 8.5 |
| 2008-04 | SW-2 | | 63.2 | 7.03 | 2.8 | 27 | 0.72 | 88 | 4.9 | 5.5 |
| 2008-10 | SW-1 | | 149.9 | 8.72 | 1.8 | 56 | 0.23 | 46 | 9.5 | 6.1 |
| 2008-10 | SW-1 | Dup. | | | 2.2 | 58 | 0.24 | 48 | 9.8 | 5.5 |
| 2008-10 | SW-2 | | 146.6 | 8.63 | 1.8 | 57 | 0.22 | 48 | 9.4 | 6.9 |
| 2009-04 | SW-1 | | 125 | 8.6 | 1.6 | 48 | 0.41 | 51 | 8.7 | 6.5 |
| 2009-04 | SW-2 | | 122 | 8.5 | 1.6 | 48 | 0.43 | 51 | 9 | 6 |
| 2009-10 | SW-1 | | 151 | 8.5 | < 0.29 | 64 | 0.18 | 66 | 9.4 | 2.2 |
| 2009-10 | SW-2 | | 149 | 8.8 | 0.32 | 60 | 0.17 | 56 | 9.8 | < 2 |
| 2010-04 | SW-1 | | 113.1 | 7.37 | < 1.3 | 42 | 0.49 | 54 | 6.1 | < 5.0 |
| 2010-04 | SW-2 | | 112.4 | 8.08 | < 1.3 | 43 | 0.49 | 55 | 6.7 | < 5.0 |
| 2010-04 | SW-2 | Dup. | | | < 1.3 | 41 | 0.44 | 54 | 6.5 | < 5.0 |
| 2010-09 | SW-1 | | 84.1 | 7.46 | 0.94 | 43 | 1.9 | 190 | 3.3 | 5.8 |

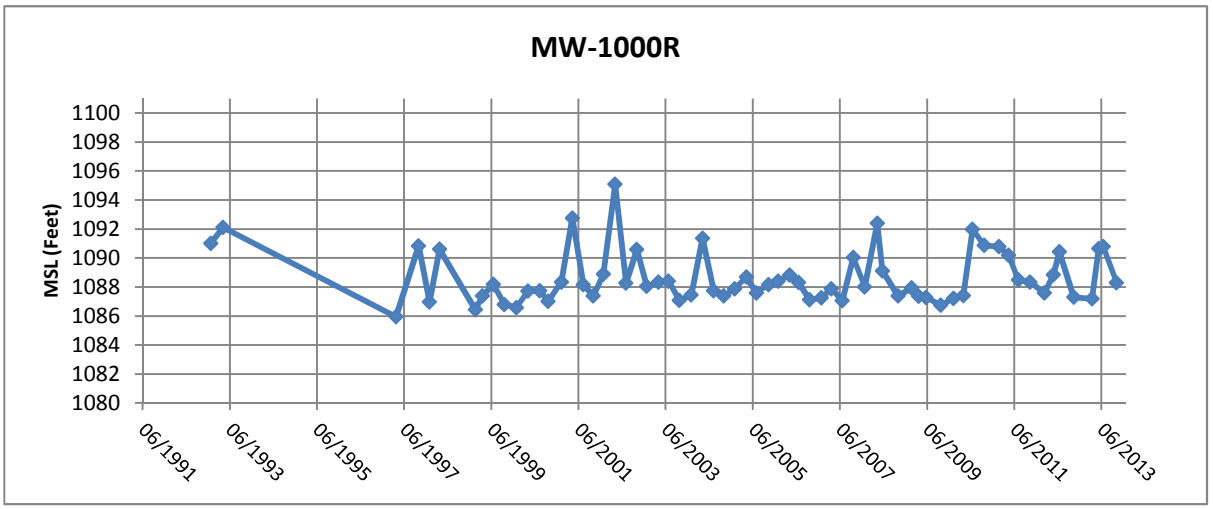
X:\GB\IE\2008\08F777\10500 Support Data\Stats\2013 Annual Report\Support Files\Data Report_SW.xlsx

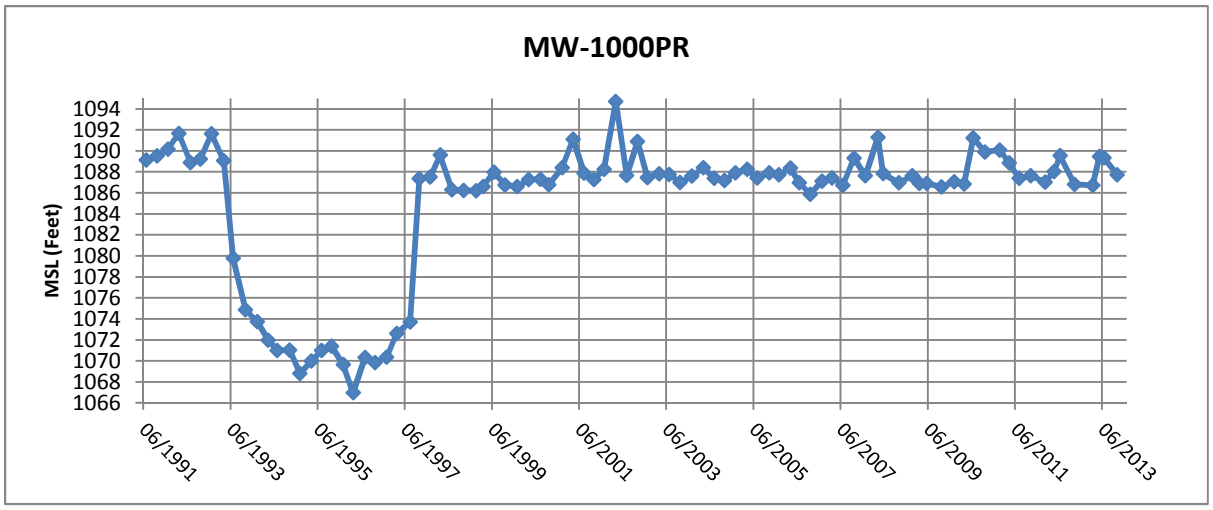
# Historical Surface Water Results

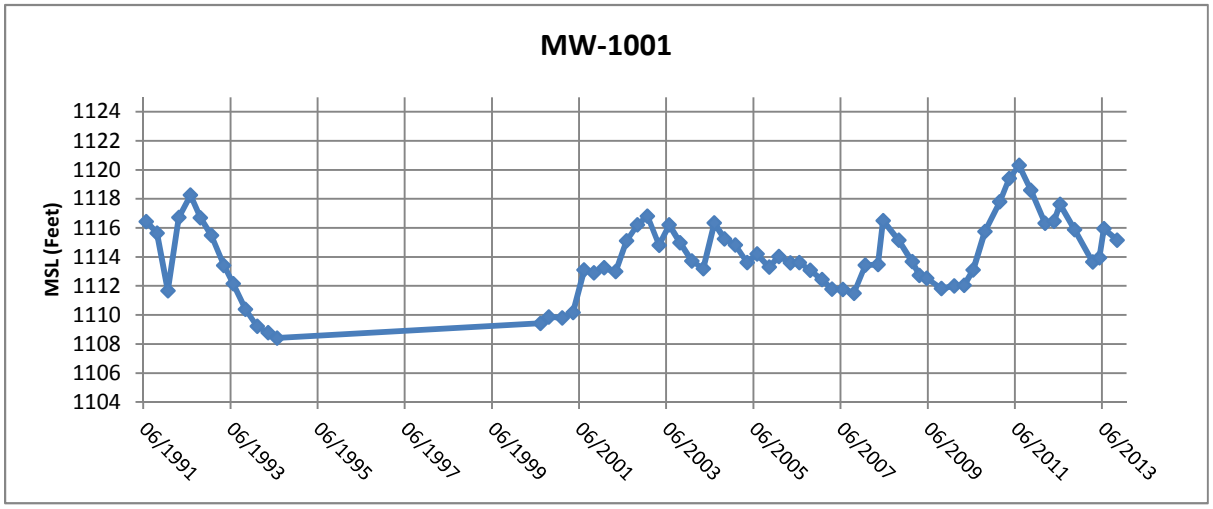
| Sample Date (yyyy-mm) | Location | | Conductivity umhos/cm | pH s.u. | Copper ug/l | Hardness mg/l | Iron mg/l | Manganese ug/l | Sulfate mg/l | Zinc ug/l |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010-09 | SW-2 | | 83.2 | 7.45 | 0.89 | 43 | 1.8 | 180 | 2.9 | 5.2 |
| 2011-04 | SW-1 | | 63.4 | 6.97 | 3.5 | 26 | 0.76 | 37 | 3.3 | < 5 |
| 2011-04 | SW-2 | | 62.5 | 7.10 | 2.7 | 25 | 0.74 | 36 | 3.3 | < 5 |
| 2011-09 | SW-1 | | 123.1 | 7.80 | 1.3 | 57 | 0.57 | 65 | 5.3 | < 5 |
| 2011-09 | SW-2 | | 123.2 | 7.81 | 0.86 | 56 | 0.53 | 58 | 5.4 | < 5 |
| 2012-06 | SW-1 | | 98 | 6.9 | 1.6 | 46 | 0.62 | 120 | 4.7 | < 5 |
| 2012-06 | SW-2 | | 98 | 6.95 | 1.4 | 46 | 0.6 | 110 | 4.8 | < 5 |
| 2013-11 | SW-1 | | 100.3 | 7.05 | < 0.73 | 46 | | | | < 5 |
| 2013-11 | SW-2 | | 101.2 | 7.16 | < 0.73 | 45 | | | | < 5 |

# Attachment 4

# Hydrographs




Foth

FLAMBEAU MINING COMPANY

Figure B-16a
Hydrographs

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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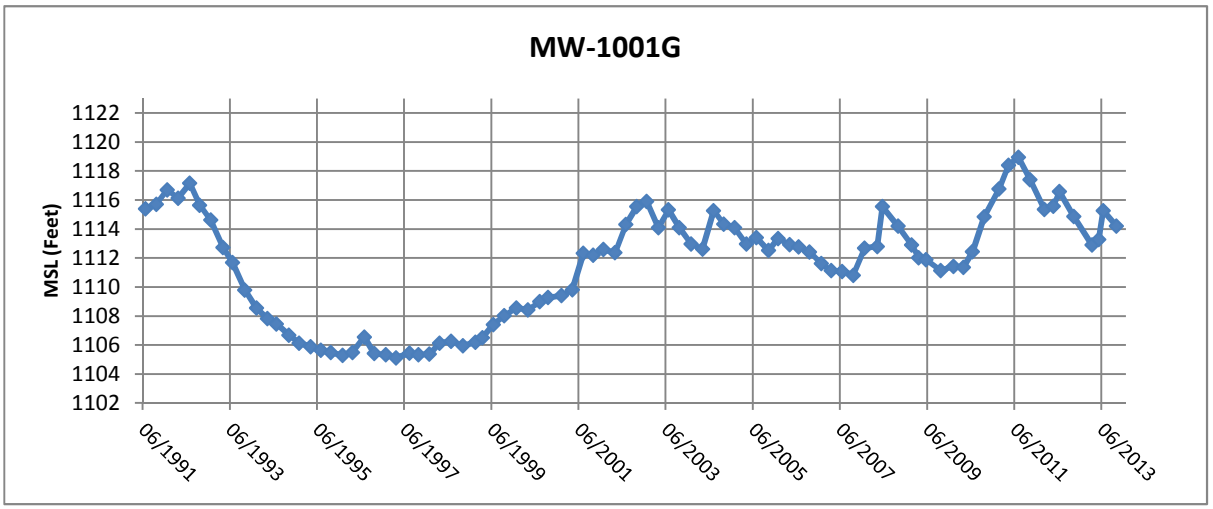


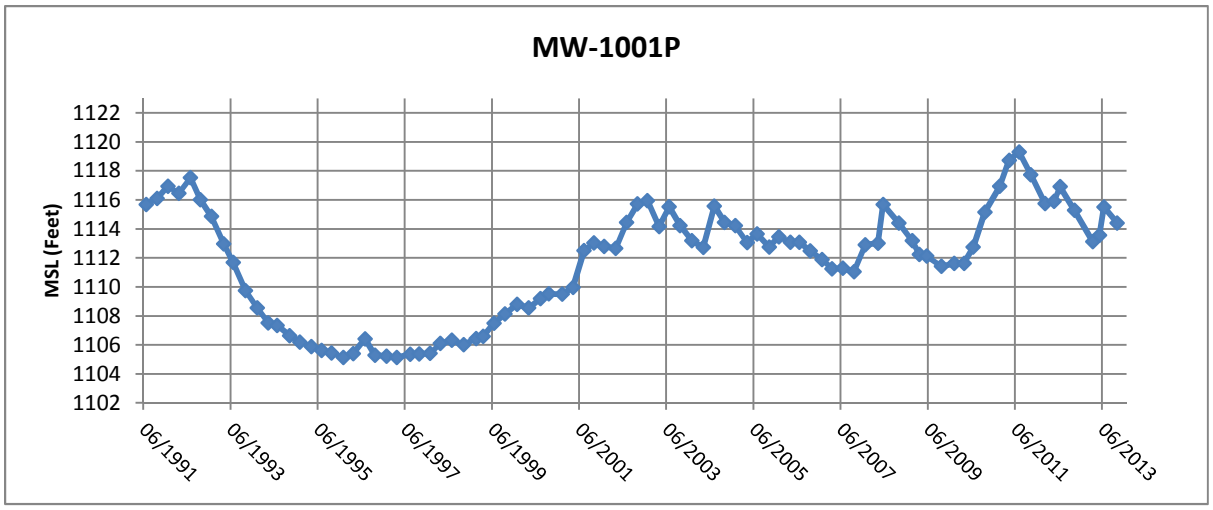


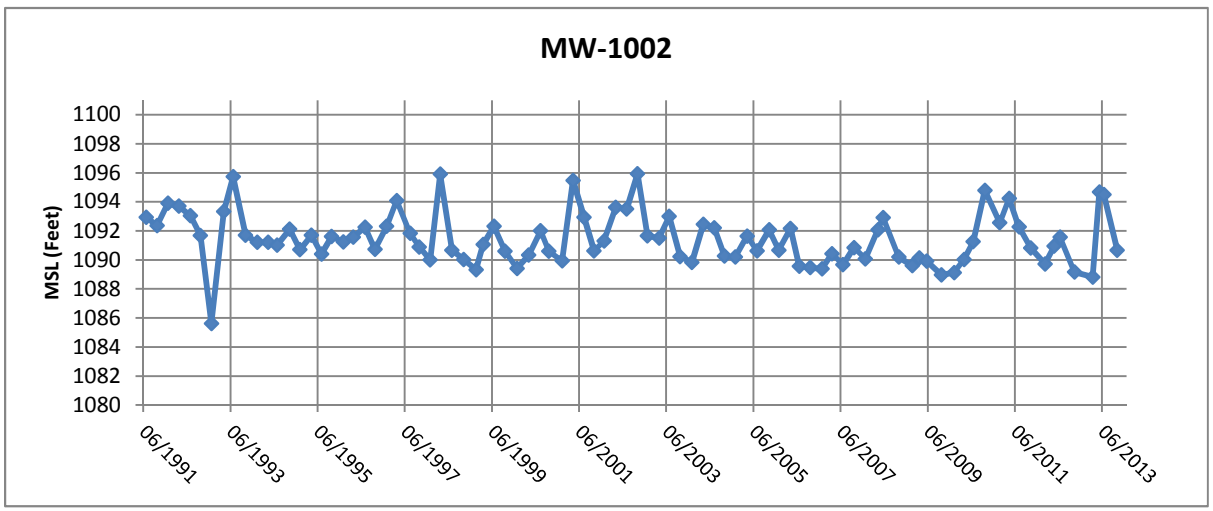


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Figure B-16b
Hydrographs

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| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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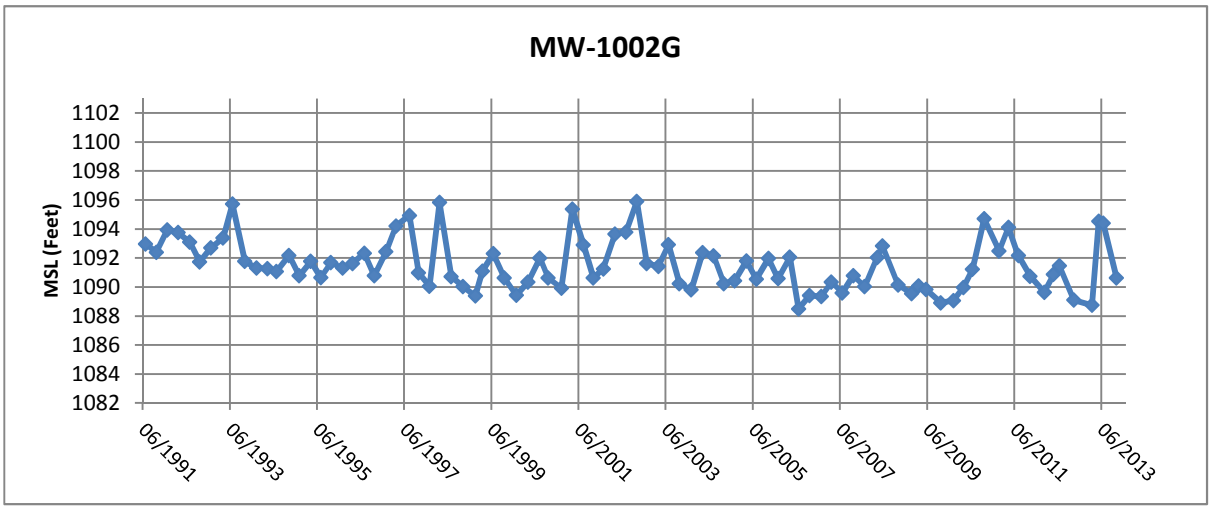


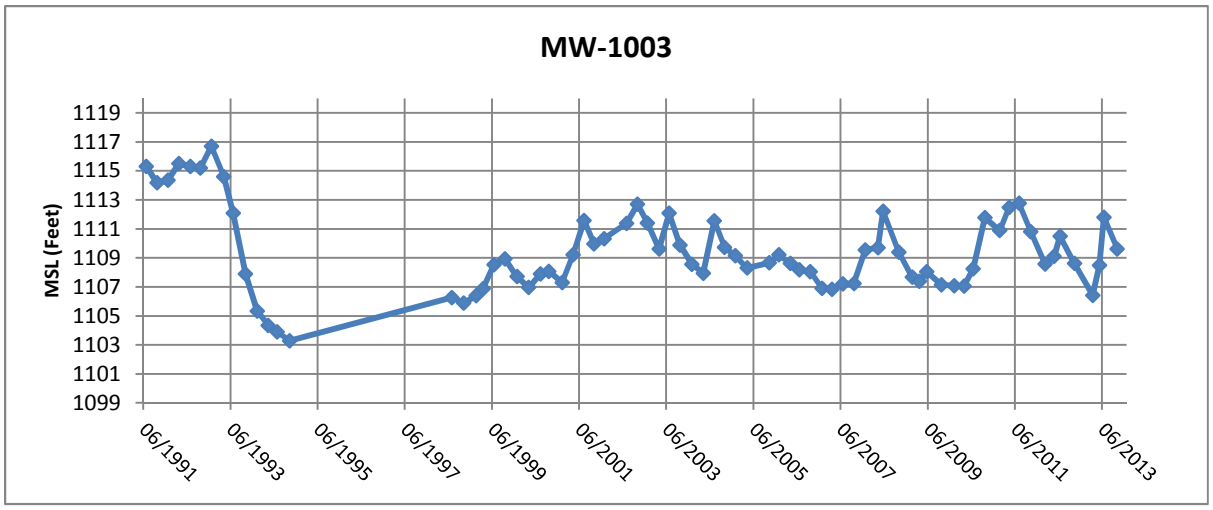


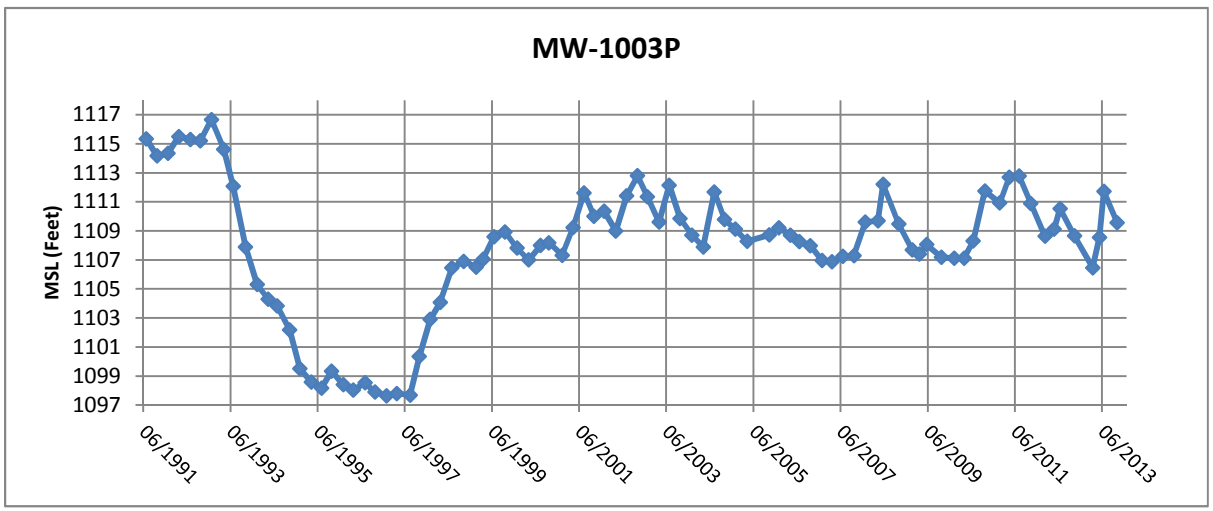


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Figure B-16c
Hydrographs

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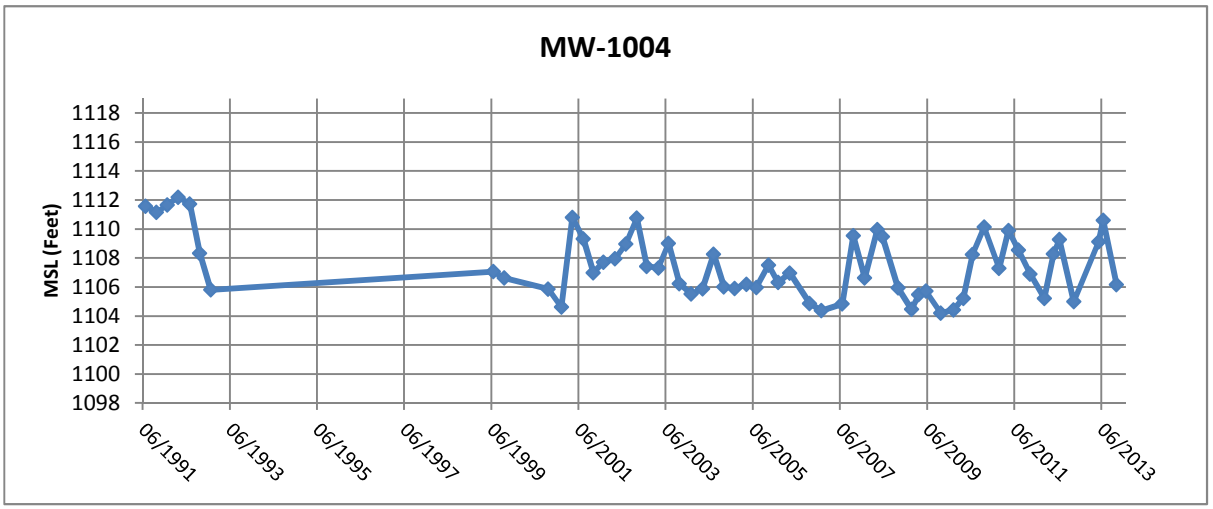


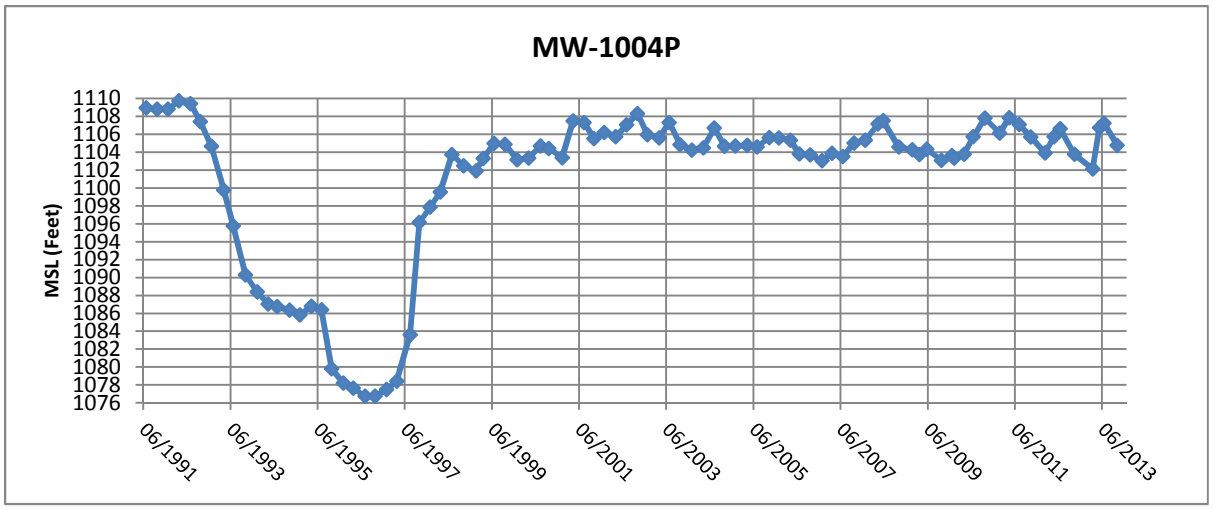


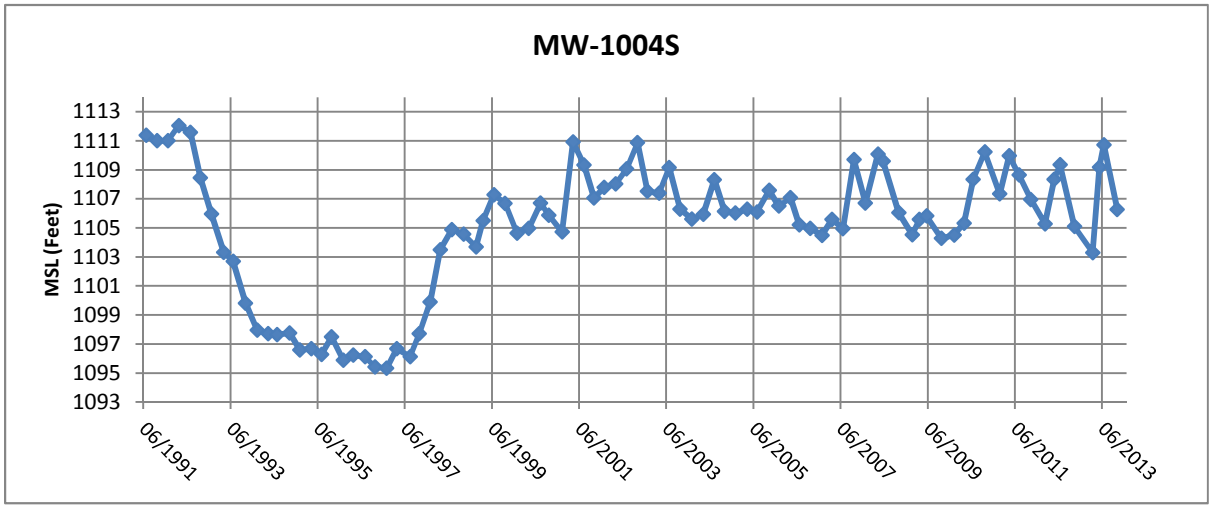


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FLAMBEAU MINING COMPANY

Figure B-16d
Hydrographs

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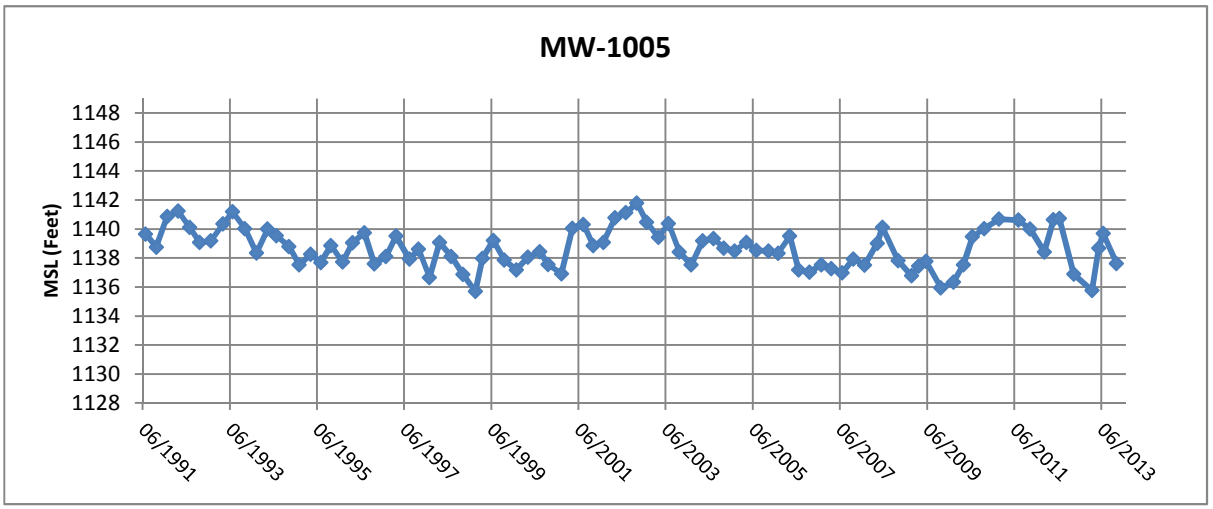


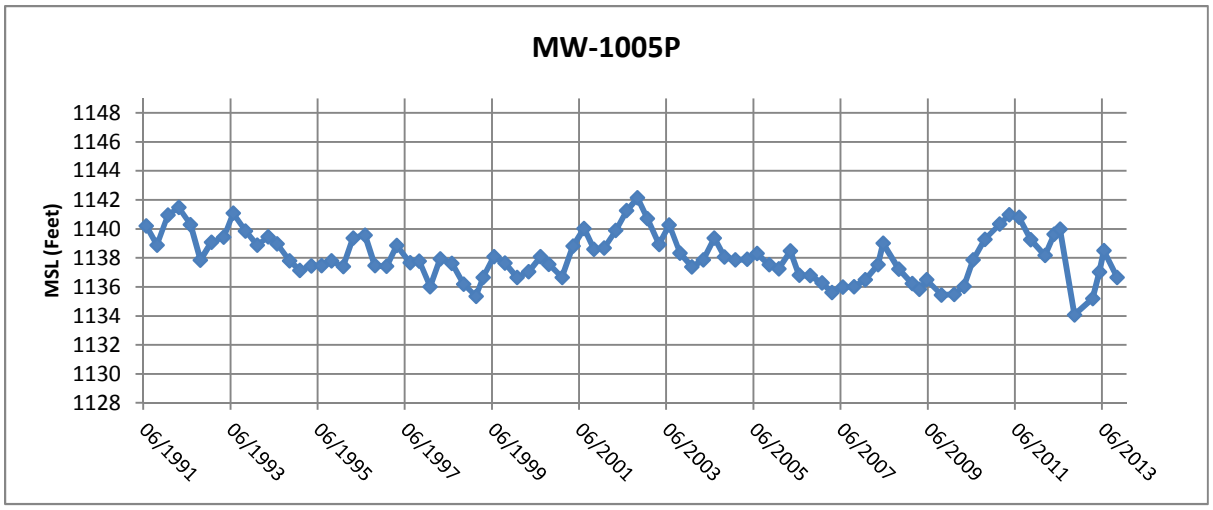


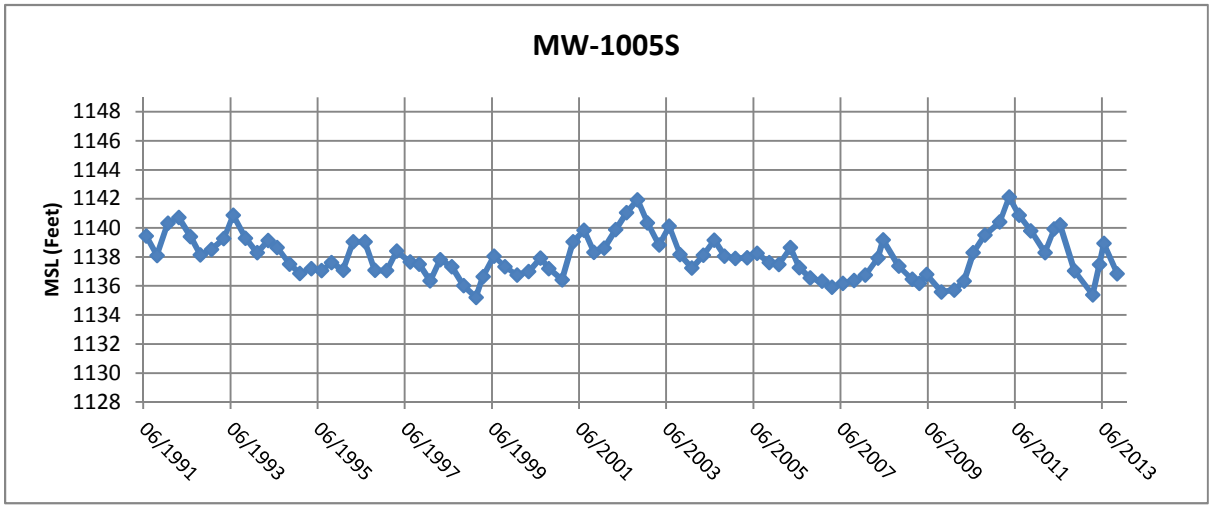


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FLAMBEAU MINING COMPANY

Figure B-16e
Hydrographs

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| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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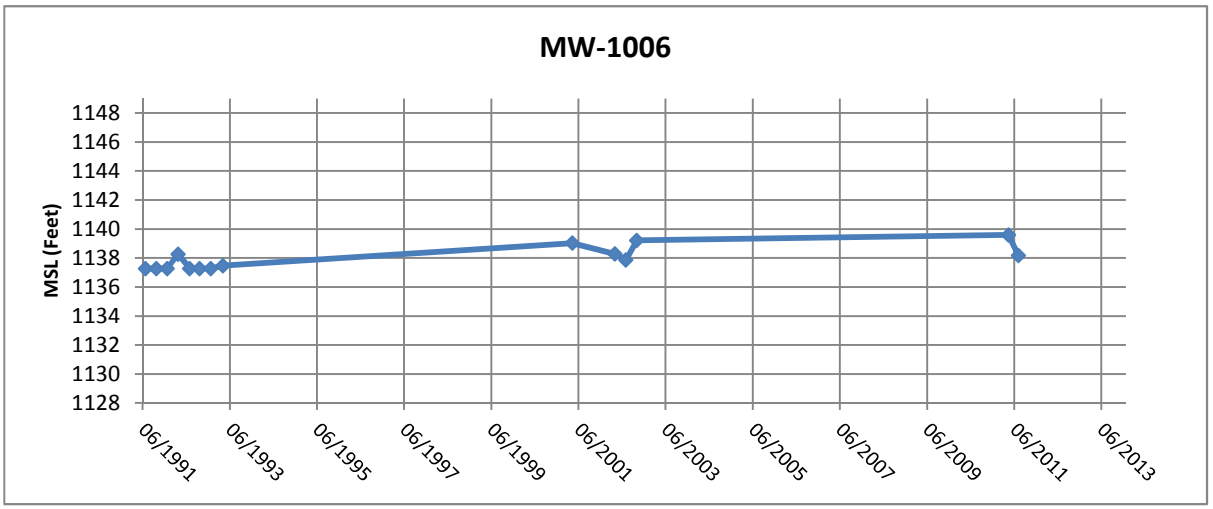


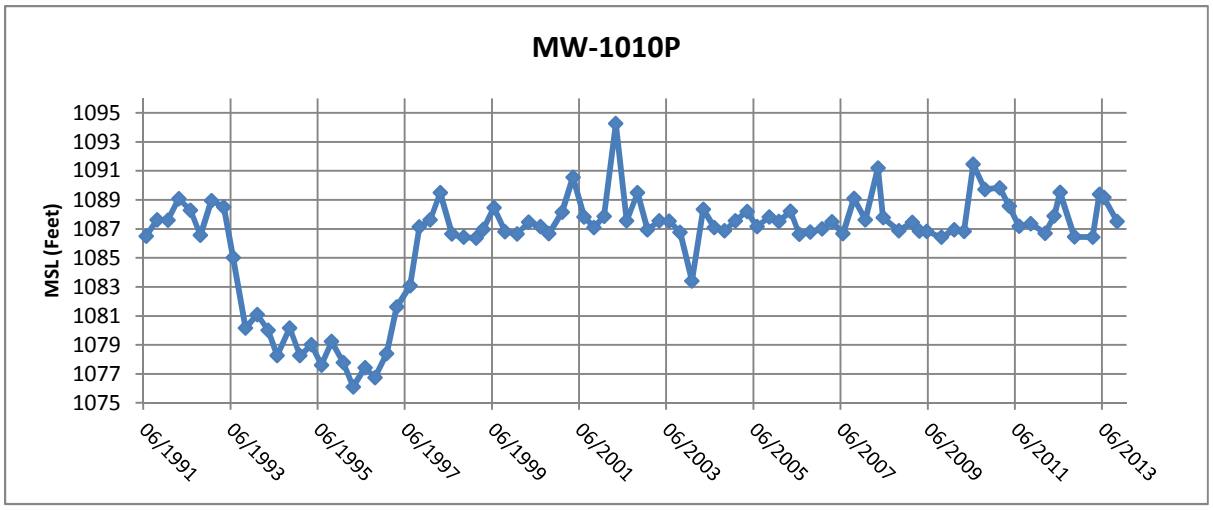


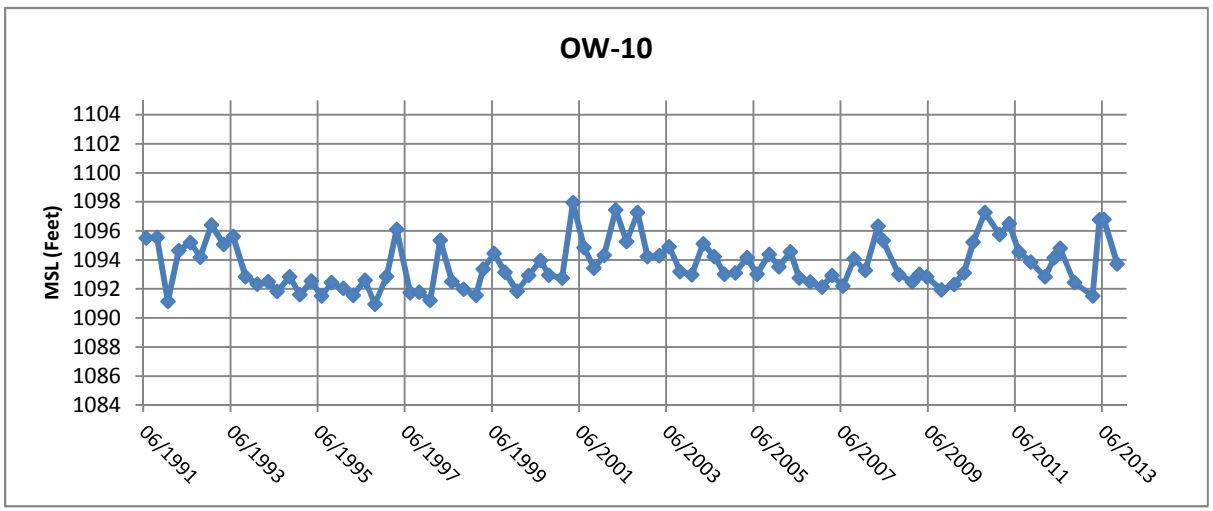


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FLAMBEAU MINING COMPANY

Figure B-16f
Hydrographs

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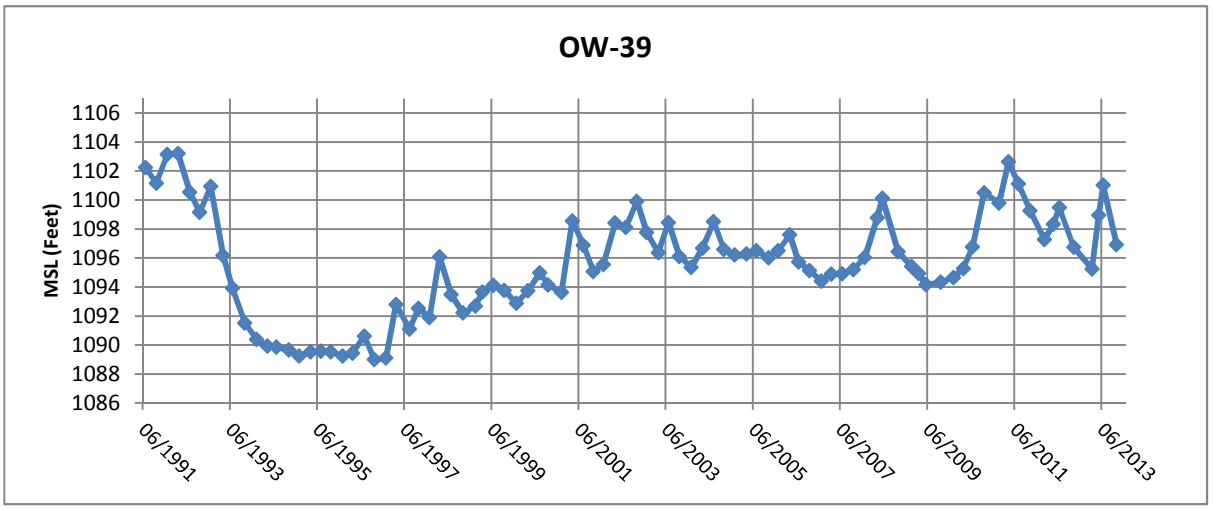


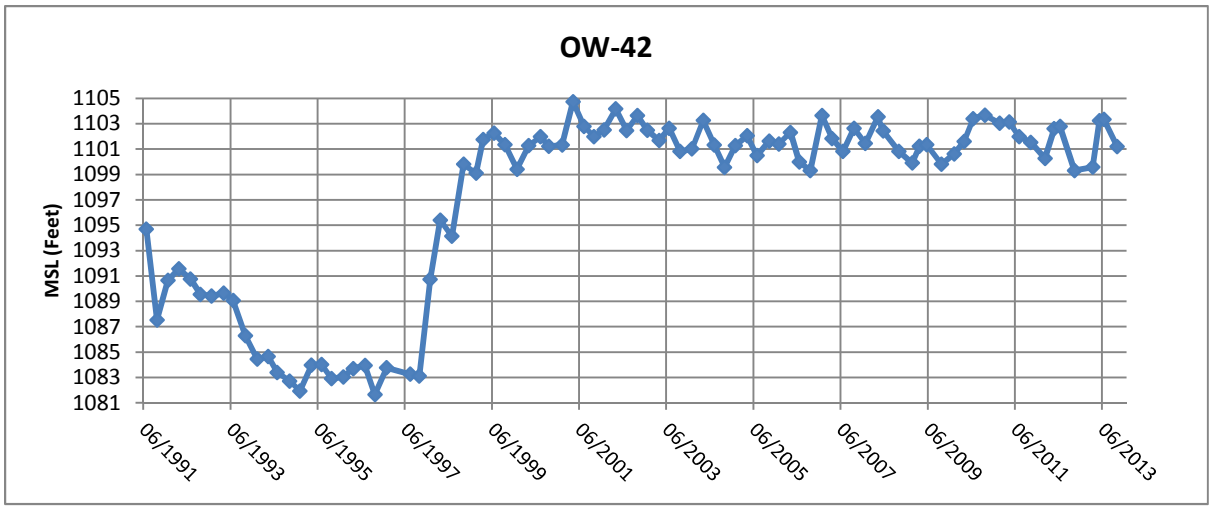


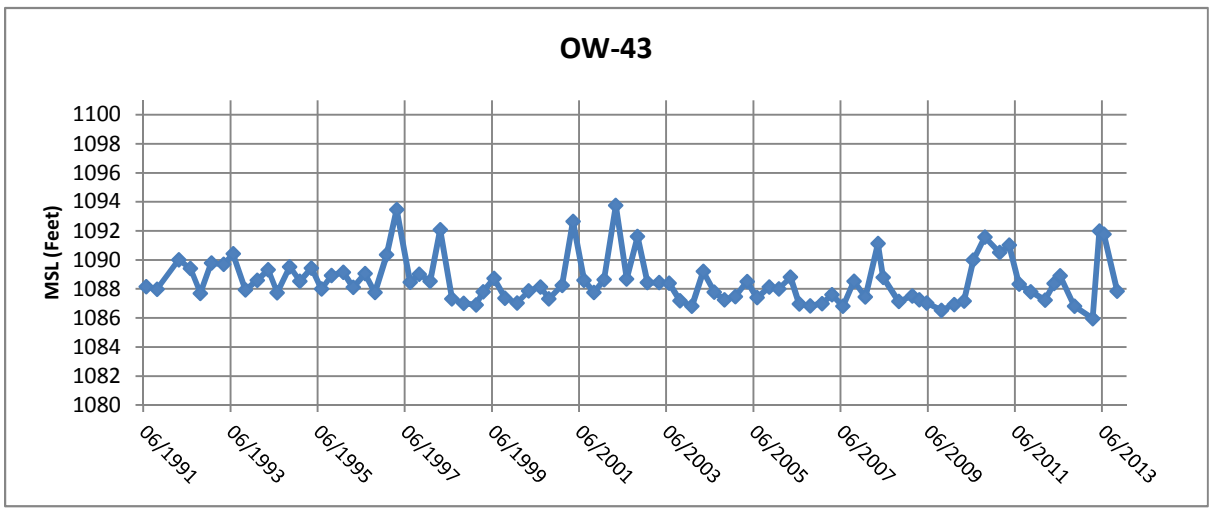


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FLAMBEAU MINING COMPANY

Figure B-16g
Hydrographs

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| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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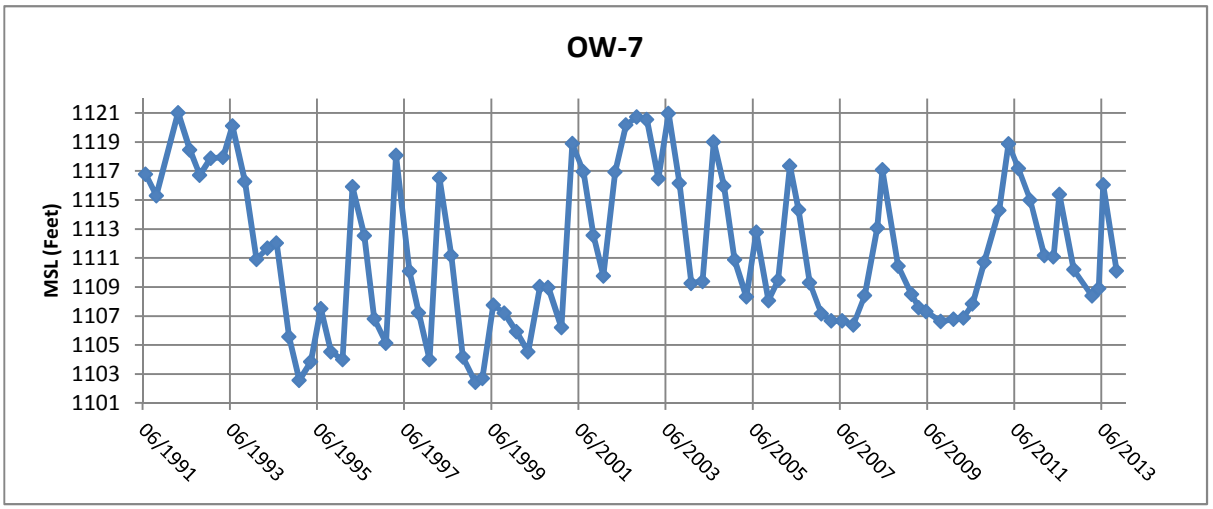
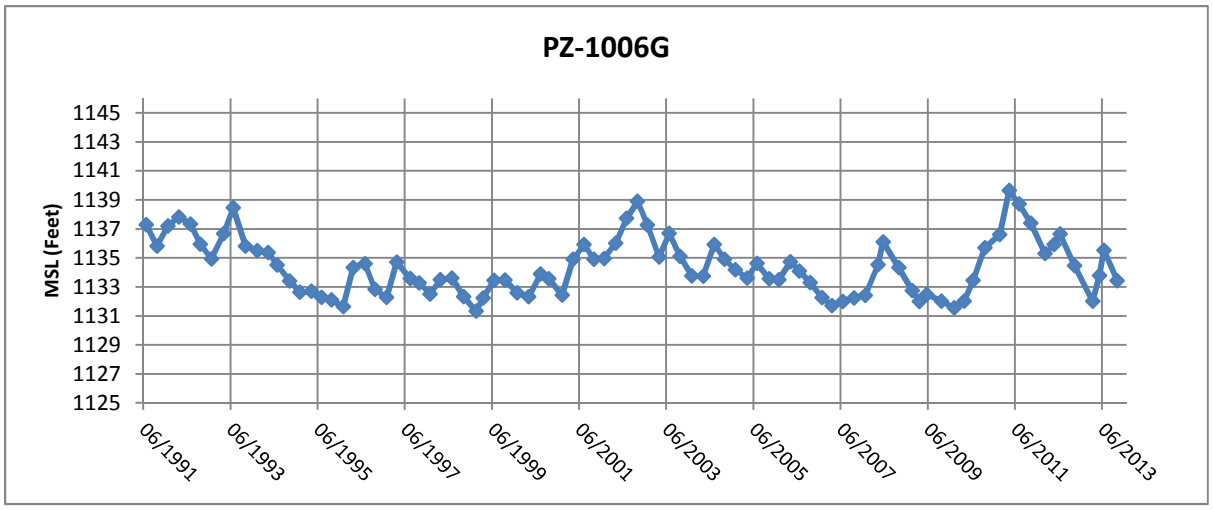
2013 Annual Report



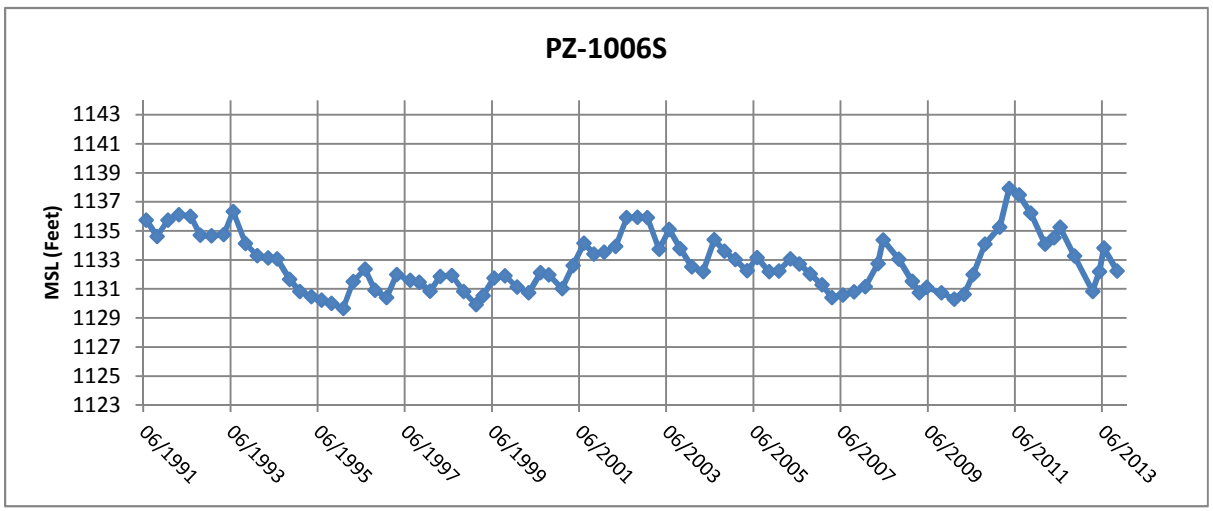




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Figure B-16h
Hydrographs

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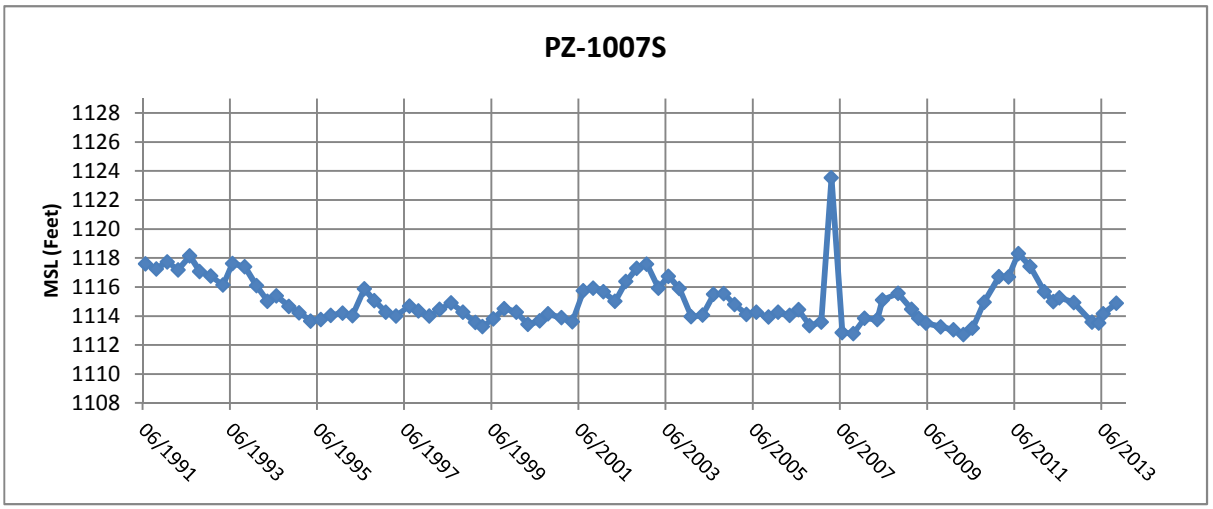
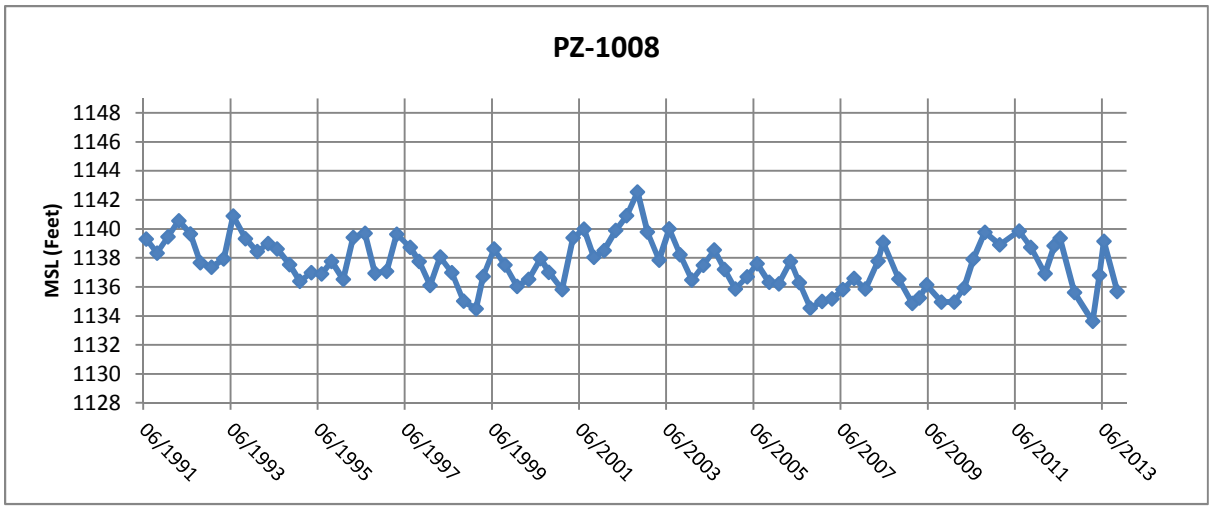
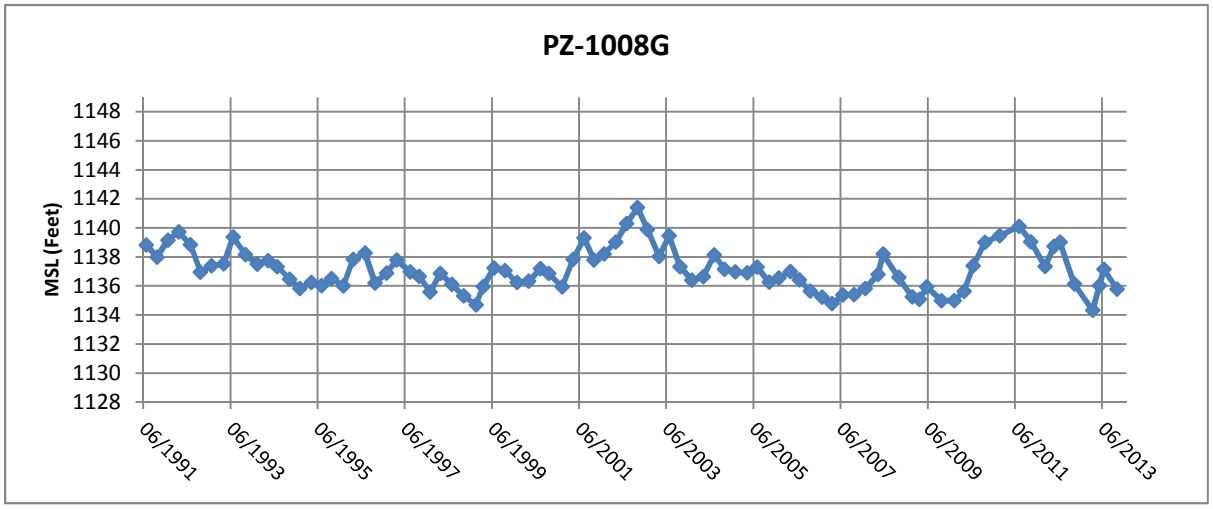
2013 Annual Report

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FLAMBEAU MINING COMPANY

Figure B-16i
Hydrographs

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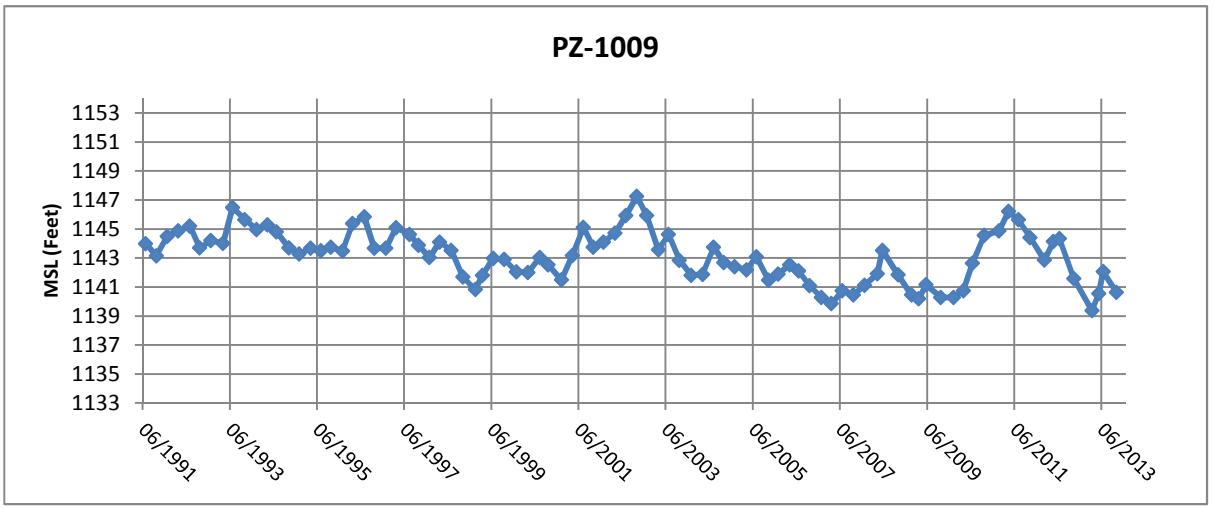
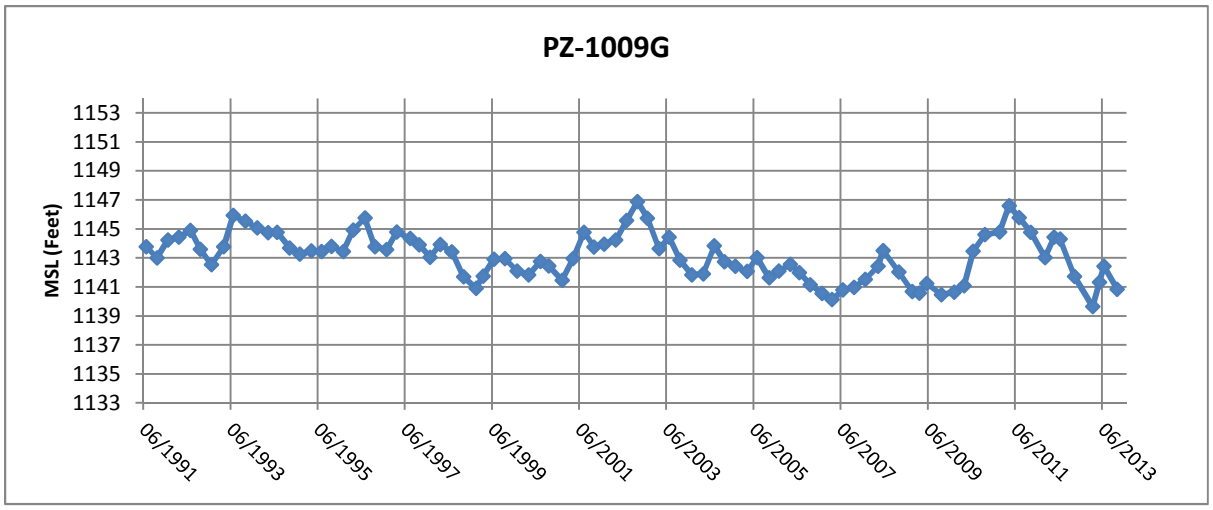
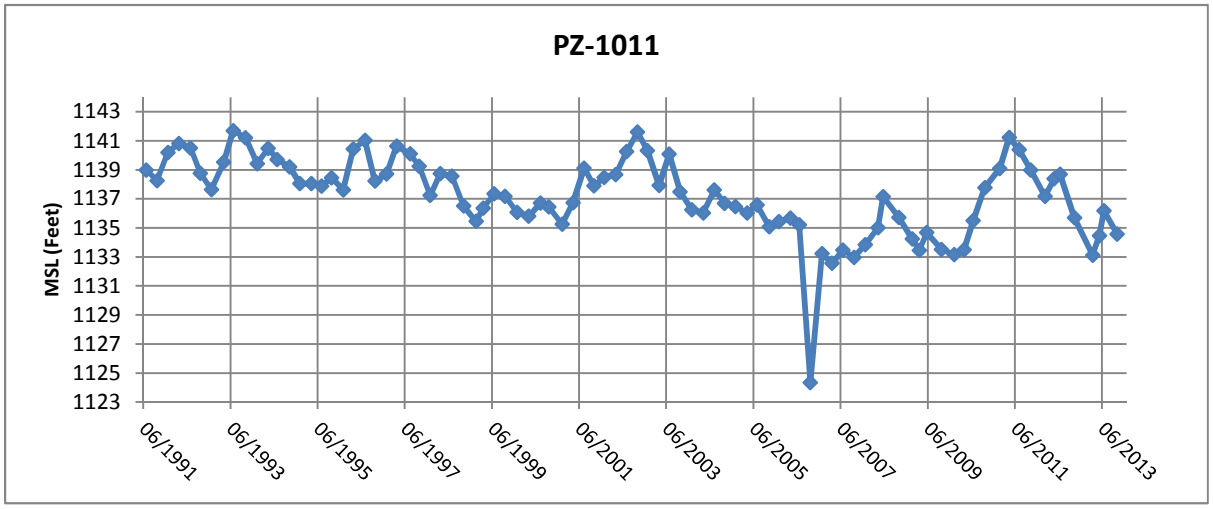
2013 Annual Report

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FLAMBEAU MINING COMPANY

Figure B-16j
Hydrographs

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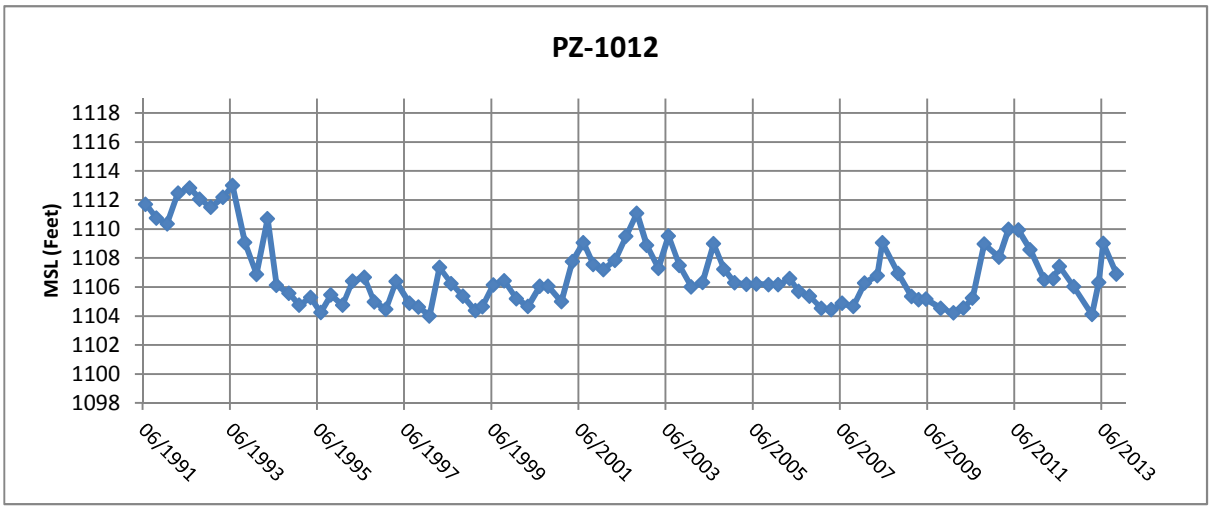


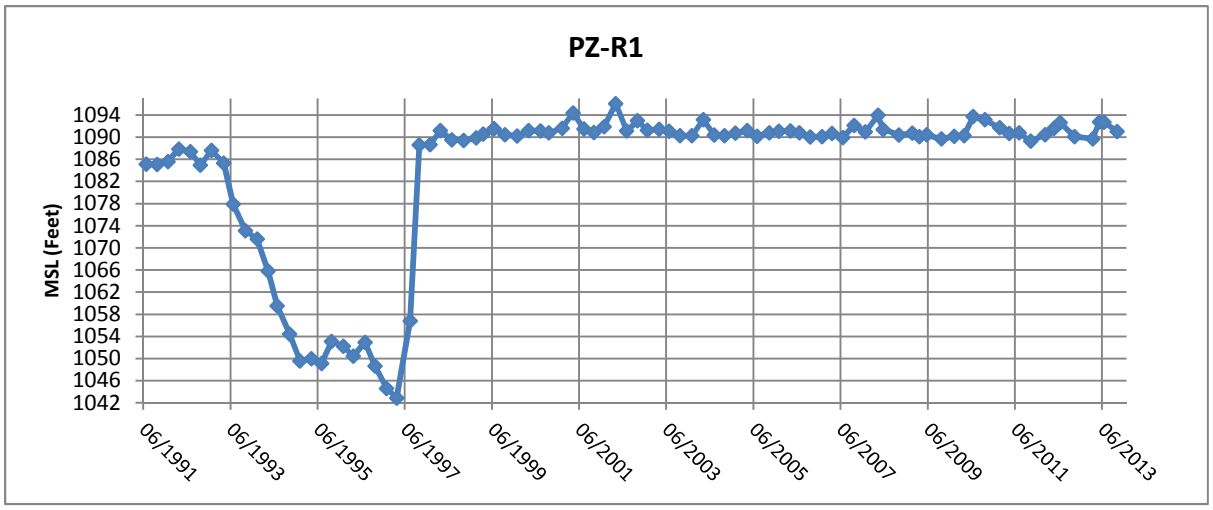


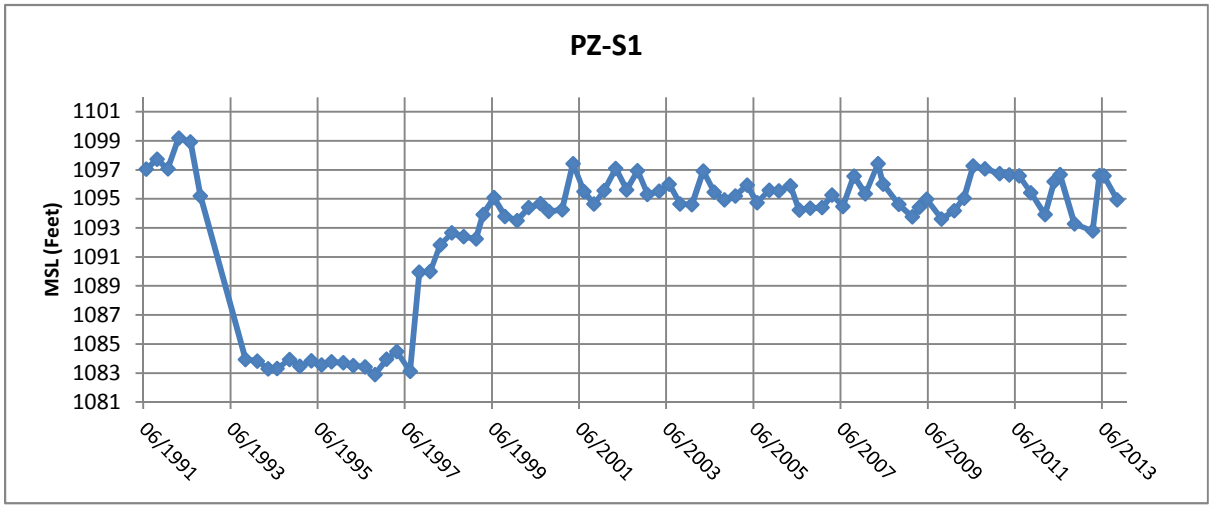


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FLAMBEAU MINING COMPANY

Figure B-16k
Hydrographs

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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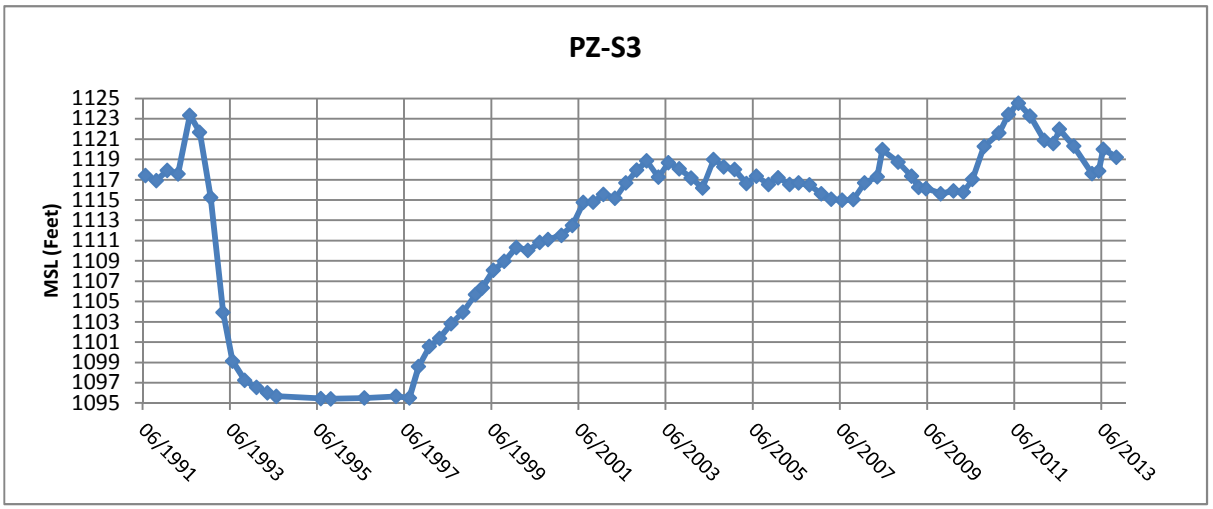


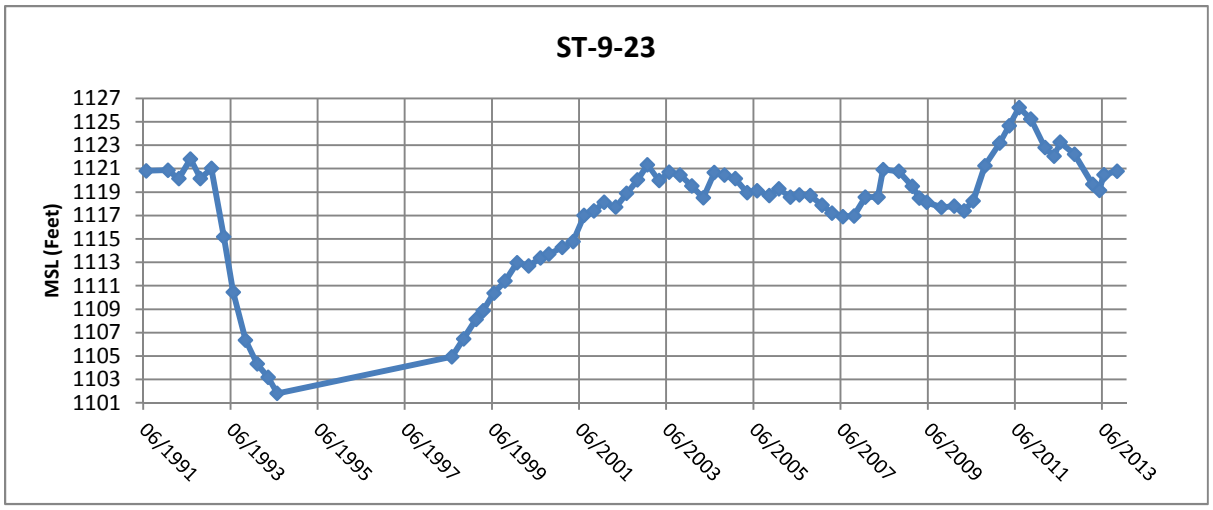


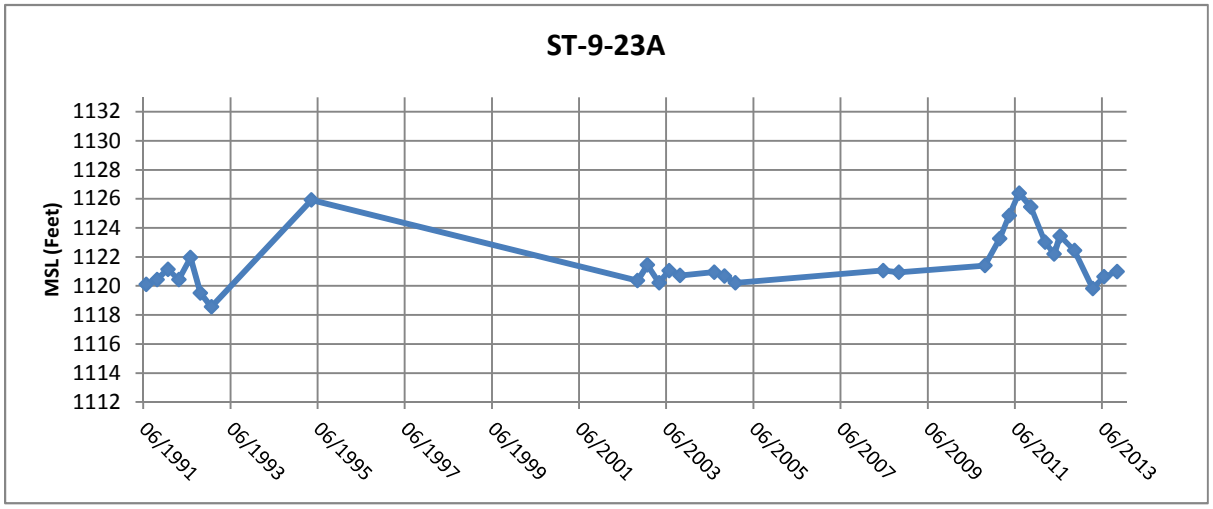


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FLAMBEAU MINING COMPANY

Figure B-16l
Hydrographs

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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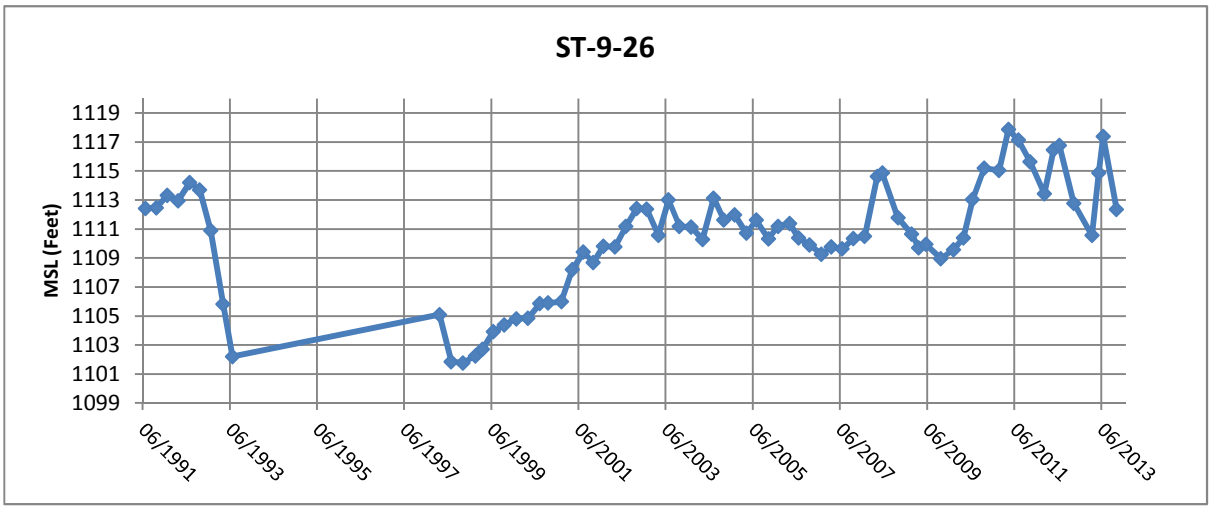


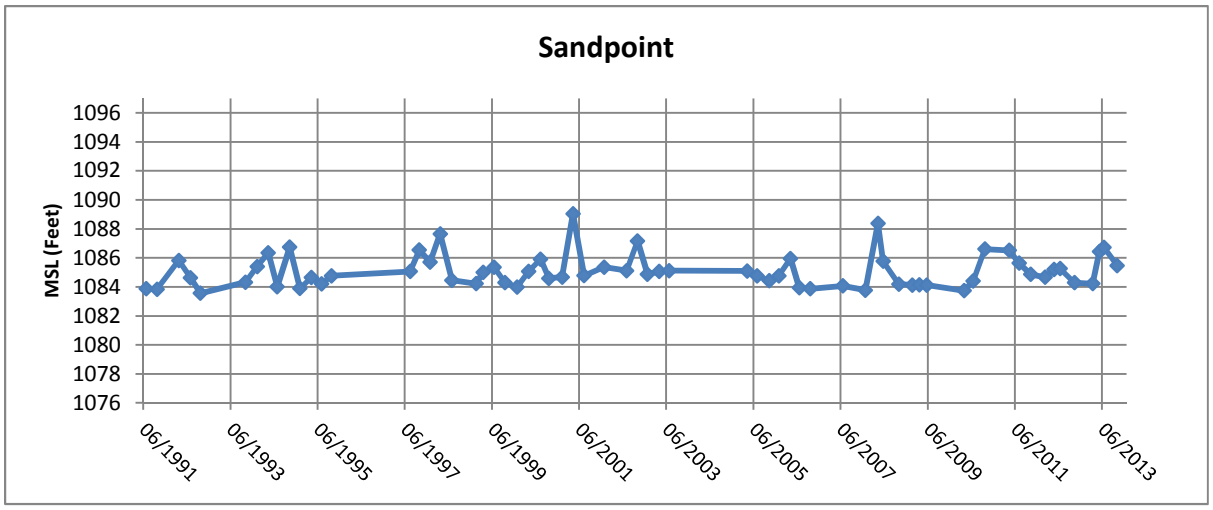


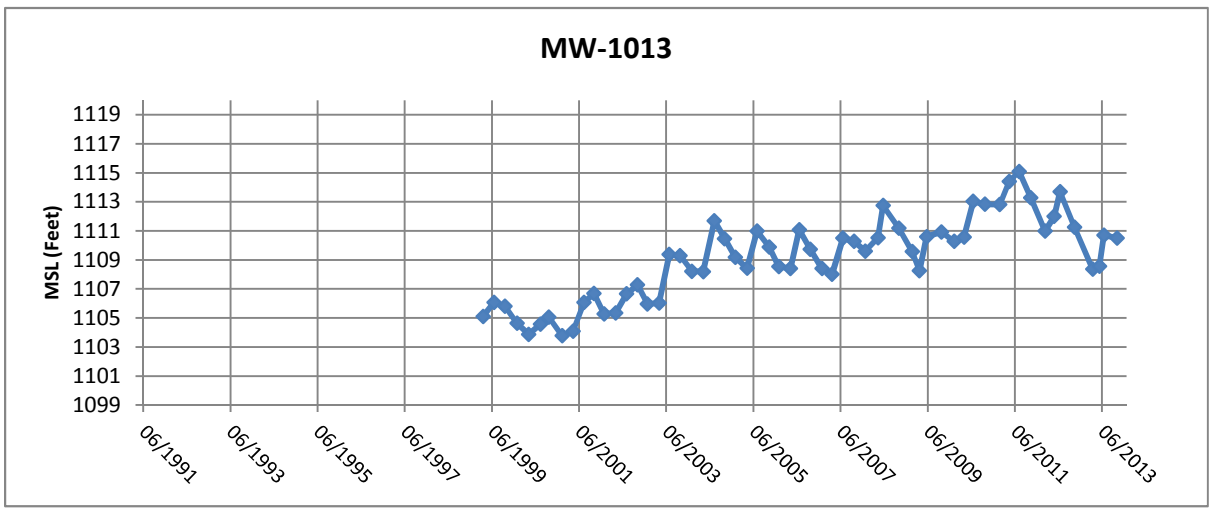


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FLAMBEAU MINING COMPANY

Figure B-16m
Hydrographs

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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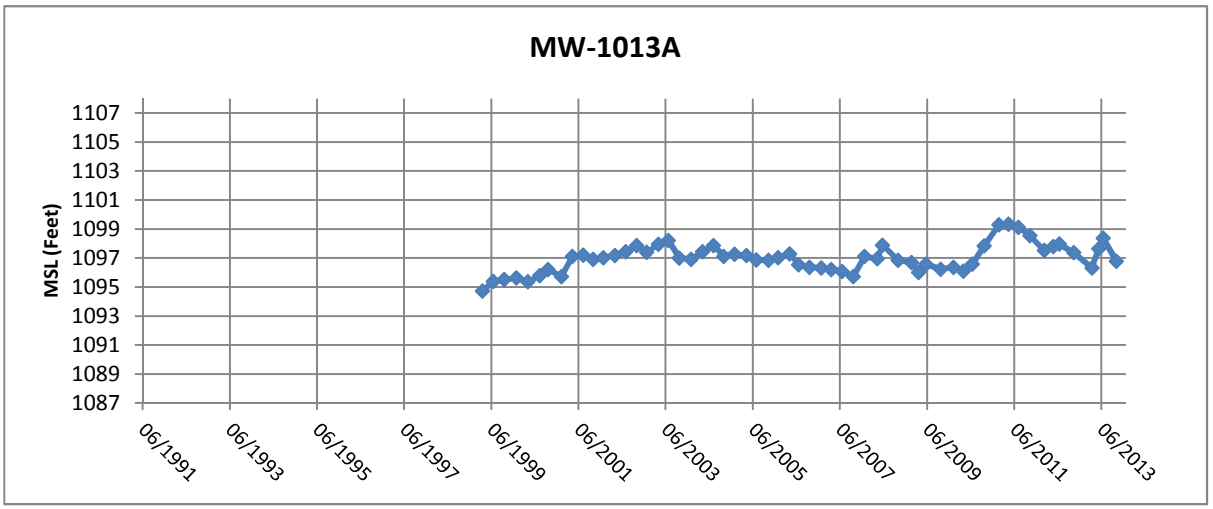
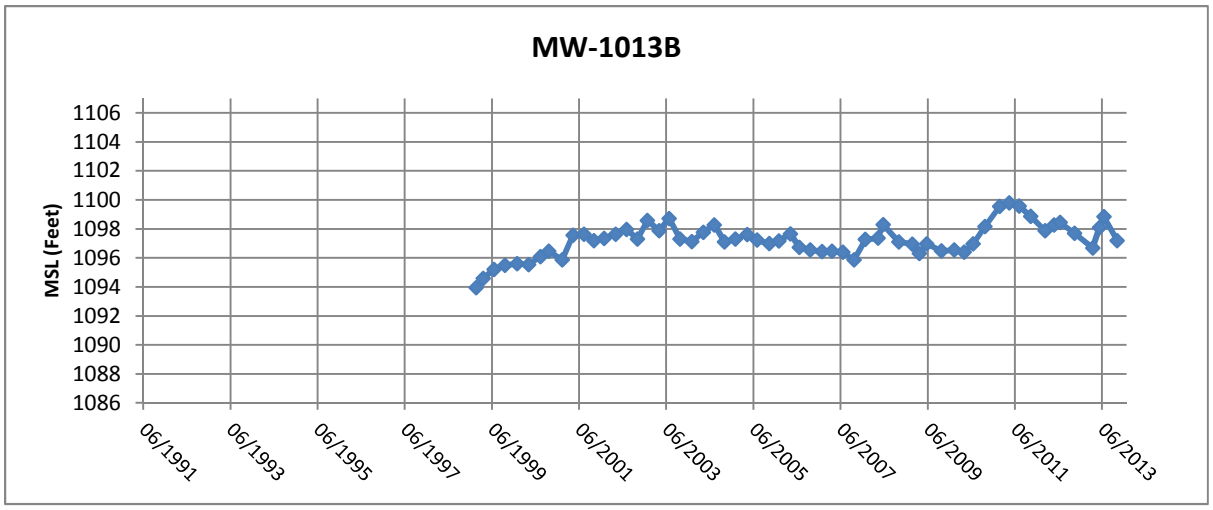
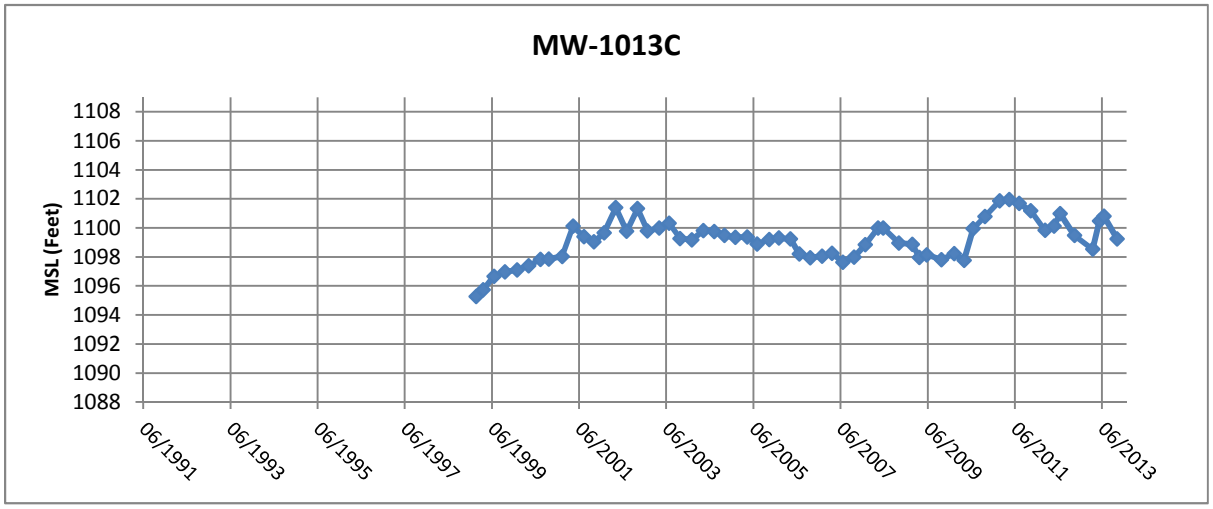
2013 Annual Report

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FLAMBEAU MINING COMPANY

Figure B-16n
Hydrographs

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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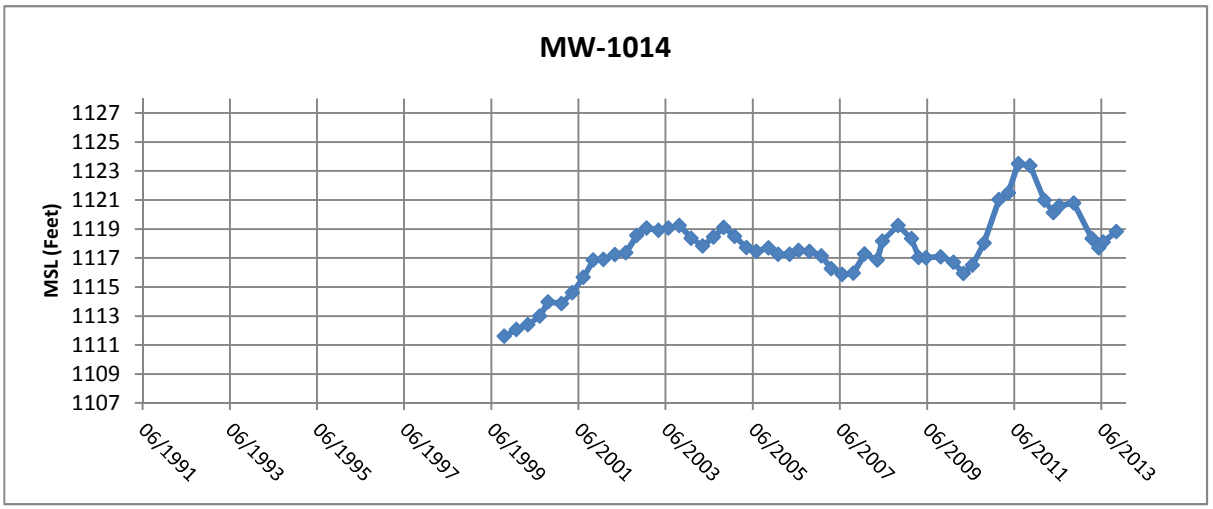


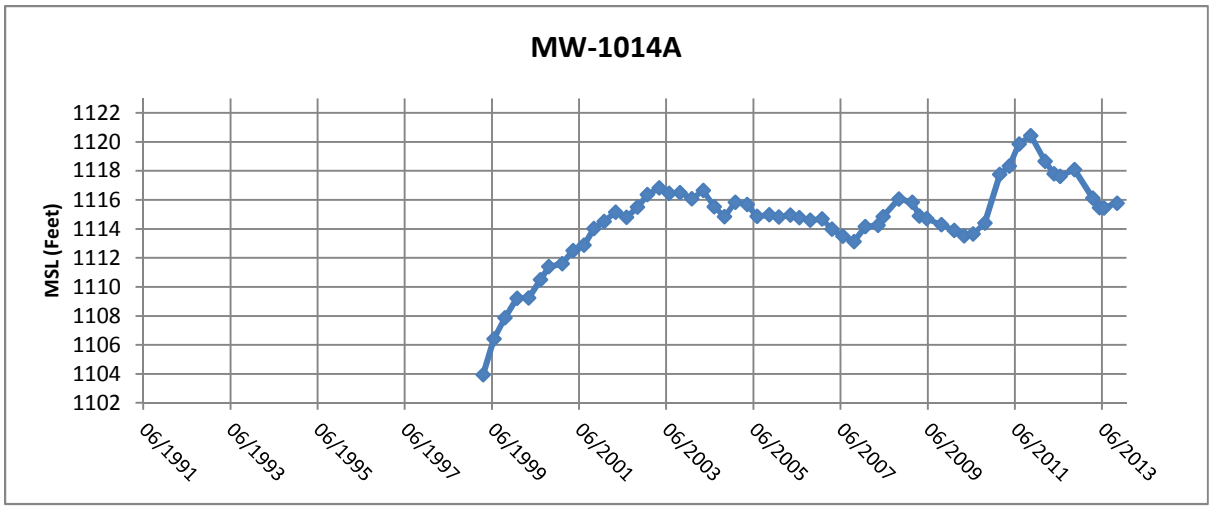


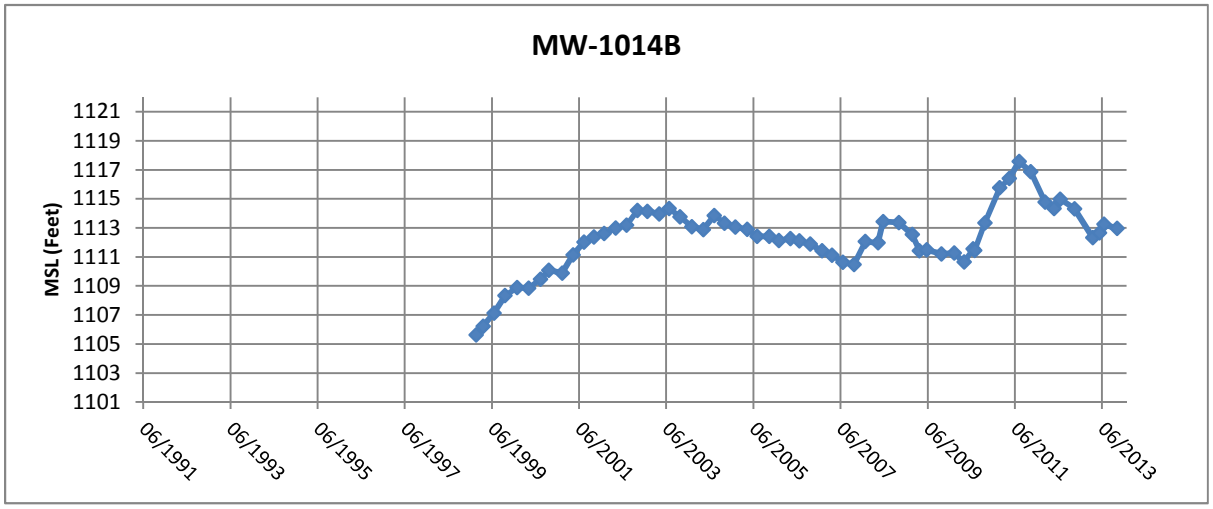


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Figure B-16o
Hydrographs

| Scale: NA | Date: January 2014 | |
|---|---|---|
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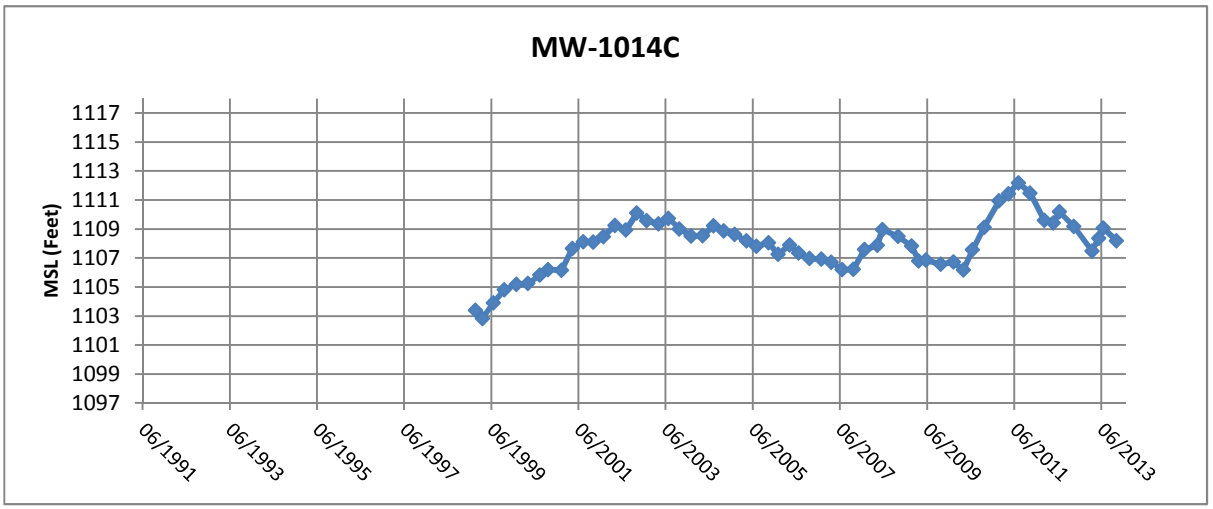


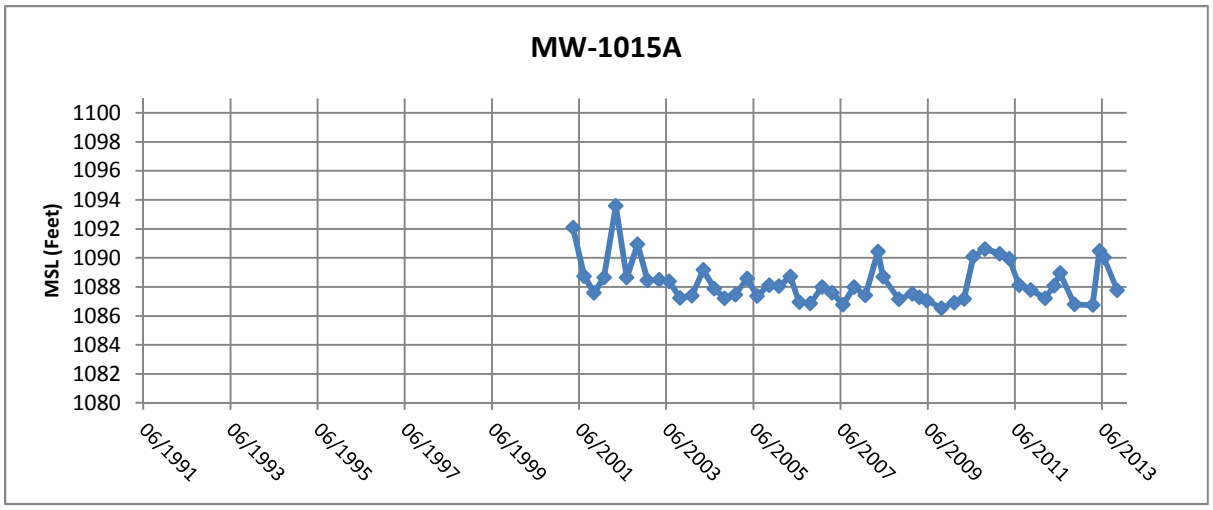


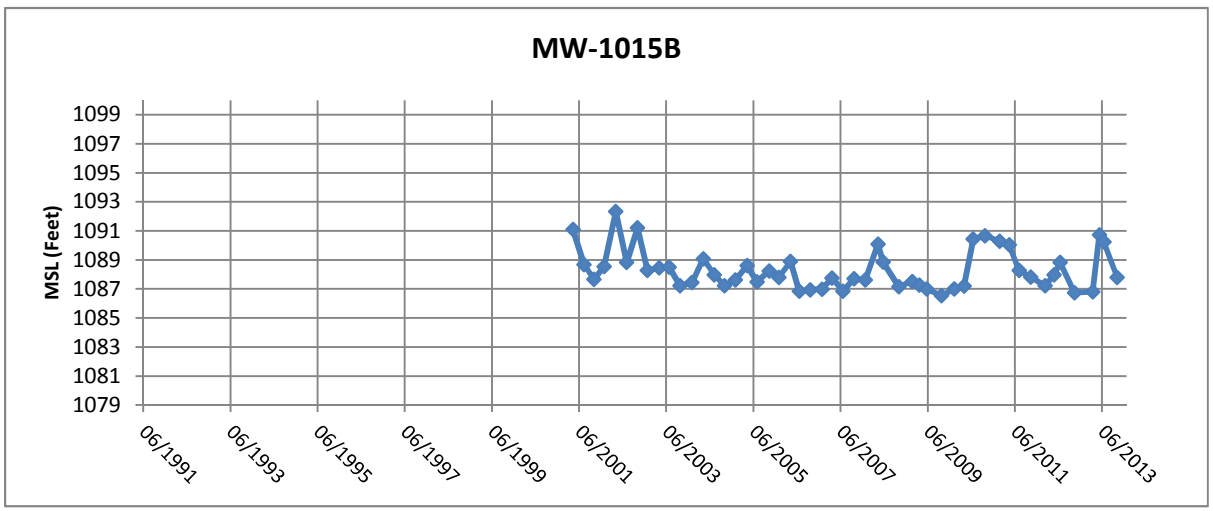


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Figure B-16p
Hydrographs

| Scale: NA | Date: January 2014 | |
|---|---|---|
| Prepared By: SGL | Checked By: SVF | Scope: 08F777 |

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