VEOLIA
ENVIRONMENTAL SERVICES
Technical and Engineering Division

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT

WOODLAWN BIOREACTOR
AND
CRISPS CREEK INTERMODAL FACILITY

Reporting Period
6 September 2011 – 5 September 2012

April 2013

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QUALITY INFORMATION

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Date: April 2013

Reference: WBAEMR0413

Status: FINAL

Distribution List:

Office of Environment & Heritage
Department of Planning and Infrastructure
Goulburn Mulwaree Council
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1. Background

1.1. Site Overview

Woodlawn Bioreactor (the Site) is owned and operated by Veolia Environmental Services (VES) and is located on Collector Road, approximately 7 kilometres west of Tarago in the NSW Southern Highlands. The Bioreactor forms an integral part of the Woodlawn Eco-Precinct, which covers an area of 6000 hectares (Appendix 1). Other site uses include aquaculture, horticulture, wind farm power generation and approval for Alternative Waste Technology.

The Bioreactor occupies the void of a former open cut mine (Woodlawn Mine) which has approximately 27 million cubic metres of airspace. Waste filling commenced in September 2004 and landfill gas has been actively collected for conversion into green electricity at the onsite power station since 2008.

This Annual Environmental Monitoring Report has been prepared in accordance with condition R1.10 of Environmental Protection Licence 11436 (EPL 11436) to detail the environmental performance of the Site relevant to licence conditions. VES also includes analysis of the IMF environmental performance under EPL 11455. This AEMR covers the licence reporting period from 6 September 2011 to 5 September 2012 for both sites.

1.2. Regulatory Requirements

The Bioreactor is operated under EPL 11436 which covers the operational areas of the Site such as the mine void and evaporation dams (Appendix 2) and also details the operating conditions and environmental monitoring requirements.

Special Mining Lease 20 (Crown and private Lands) (known as SML20) covers areas of Woodlawn impacted by mining operations such as the tailings dams, waste rock dump and plant area (Appendix 3). The SML20 also covers the EPL licensed areas. A separate AEMR is submitted to cover the Woodlawn Mine reporting requirements each year (VES, 2012).

This report refers to monitoring data submitted to the Office of Environment and Heritage (OEH) for this reporting period and in previous annual returns.

2. BIORECTOR OPERATIONS

2.1. Introduction

Putrescible waste is transported to Woodlawn by rail from Sydney after being containerised at Clyde Transfer Terminal (CTT) situated in western Sydney. Waste is unloaded by waste collection vehicles at CTT and compacted into shipping containers for transport by rail to Crisps Creek Intermodal Facility (IMF). Waste is transported the remaining 8 kilometres from the IMF to Woodlawn by road.

VES commenced receipt of waste sourced from outside the Sydney region in April 2012. This arrangement is for account customers only and is transported by road.

Waste is placed within the Bioreactor in progressive lifts of 5 – 10m in thickness. Waste is tipped from the trucks in a specially designed Columbia Tipper, which extracts the trailer and container from the truck and tilts upwards until the waste falls out under gravity. The waste is then pushed into position and compacted, while the empty container and trailer are lowered and connected back to the truck. A separate tipping area is established for waste sourced from outside of Sydney.

This section discusses compliance with EPL 11436 conditions.

2.2. Licence Conditions

2.2.1. Pollution of Waters

VES operate the Bioreactor as a zero discharge site, where all contaminated water is captured and managed onsite. To assist in minimising the amount of contaminated water to treat, VES have constructed and maintained drains and bunds to direct uncontaminated water away from contaminated areas. All water collecting on contaminated areas around the site are stored in dams for evaporation.

Under condition L1.3, no discharge of water from the Site is allowed except in a 1 in 100 year rainfall event over 72 hours. No water was discharged during this reporting period.

2.2.2. Waste

All waste received at the Bioreactor was solid waste which was either transported from Clyde Transfer Terminal via the Crisps Creek IMF or direct to the Bioreactor when sourced outside of Sydney. Office waste generated from the operation of the Bioreactor was disposed of in the Bioreactor as allowed by condition L5.2.

2.2.3. Noise Limits

Noise limits for the Bioreactor (condition L6.1) must not exceed 35 dB(A) $L_{Aeq\ (15\ minute)}$ at the nearest residential receiver. No noise complaints have been received since operations commenced in 2004. Therefore, no noise monitoring was undertaken during this reporting period. VES will implement a noise monitoring program in the event that a noise complaint is received.

2.2.4. Hours of Operation

Condition L7 required operational activities to be undertaken on Monday – Saturdays between 6:00am to 7:00pm. Approval from OEH was organised prior to VES operating outside these hours. VES has complied with the requirements of this condition.

2.2.5. Offensive Odour

64 odour complaints were received during this reporting period. VES is in constant communication with the local community and engaged an independent odour audit of the site during the reporting period. The odour audit identified odour sources at the site and recommendation actions for Veolia to minimise odours from these sources. The primary focus is to treat all untreated leachate stored in Evaporation Dam 3 based on the recommendations of the odour audit. VES intends to treat this leachate as a priority and treatment was ongoing at the end of the reporting period. VES will continue to implement other recommended actions and trials to investigate ways to minimise odours over the next reporting period.

VES has also continued the application of increased volumes of daily cover material and to increase the number of active extraction wells to assist in odour management.

2.2.6. Competency of Operations

VES operates the IMF and Bioreactor under International Organisation for Standardisation 14001 to ensure a high standard of environmental management. All activities carried out in accordance with EPL 11436 were carried out in a competent manner during this reporting period.

2.2.7. Maintenance of Plant and Equipment

All plant and equipment were maintained in proper order and serviced as required by qualified technicians. All VES operators hold the appropriate qualifications and licenses to operate plant and equipment used as part of Bioreactor operations.

VES received approval by the NSW Roads and Traffic Authority (RTA) in 2011 to upgrade road transport trailers to quad-axle trailers. The trailer upgrade has

improved the efficiency of road transport by increasing the amount of waste within each container.

2.2.8. Dust Control

All conditions specified in condition O3 have been complied with by VES. All access roads from the IMF to waste level within the Bioreactor are sealed surfaces. VES has also upgraded the haul road within the mine void by applying a spray coated sealing layer in September 2011. This initiative will further minimise dust generation from operational vehicle movements.

All waste loads transferred from the IMF to the Bioreactor are enclosed within containers.

Onsite mining of cover material was undertaken in accordance with the Mining Operations Plan to minimise dust generation. Minimal dust generation is confirmed by results of operational dust monitoring, which is discussed further in Section 3.8.

2.2.9. Closure Plan

VES will submit a suitable closure plan 12 months prior to the closure date of the Bioreactor.

2.2.10. Leachate Management

All conditions of O5 were complied with by VES during this reporting period. Groundwater gradients indicate groundwater flow towards the void (condition O5.1). Improvements to the leachate treatment system were ongoing through the reporting period to optimise the system conditions for improved operational and environmental performance for storage and treatment of leachate (condition O5.2). All treated leachate is stored in evaporation dam 3.

Clay lined barriers (condition O5.3 & O5.4) were installed on the southern portion of the void wall during the reporting period. The extent of the clay lined area is detailed in Appendix 4.

No imported liquids were used within the waste (condition O5.5) and no transfer of Acid Mine Drainage (AMD) water was extracted (condition O5.6) during the reporting period.

2.2.11. Surface Water Management

Surface water management systems have been implemented to ensure compliance with all conditions of O6. Drainage and pumping networks have been previously

established to direct water to the required areas (condition O6.1 – O6.3). All excess surface water collected within the void is pumped to evaporation dam 3.

The operation of mechanical evaporators is controlled by a wind direction sensor to prevent the drifting of sprayed liquids from the premises (condition O6.4).

All container wash waters were collected for transport to the leachate collection system.

2.2.12. Tracking of Mud and Waste

VES constructs temporary access roads on the waste surface to minimise contact with waste. VES also has a number of dedicated site vehicles that only operate within the void and other operational areas. For vehicles exiting the facility a dedicated wheel wash facility is located outside the mine void.

2.2.13. Cover Material

All cover material used onsite is sourced from the borrow area identified within the MOP and applied daily. It is anticipated that the volume of cover material available onsite is sufficient for operational purposes of the Bioreactor beyond the next reporting period (condition O8.5).

Veolia is conducting an ongoing trial to use batch processing fines as an alternative daily cover material, which is being conducted in consultation with the EPA. Further discussion is provided in section 2.4.3.

2.2.14. Screening of Waste

All waste disposed transferred from Clyde Transfer Terminal is screened at Clyde prior to transport to Woodlawn. Regional waste is screened onsite at the Bioreactor. VES has a waste screening and recording procedure (Appendix 5) that is followed to ensure that only the correct wastes are delivered to site under this EPL.

2.2.15. Completion of Landfill Cells

VES will undertake final capping of the Bioreactor when required and in accordance with condition O10.

2.2.16. Landfill Gas Collection

VES operate the Bioreactor to maximise the generation of renewable energy and operate a landfill gas flare to provide backup emissions treatment. A 2000m3/hr flare was installed during this reporting period to provide the site with additional backup emissions abatement. The fourth landfill gas generator was also installed and commissioned in October 2011. VES has submitted all manufacturers' specification

for landfill gas generators and flares to the EPA for approval. The flare and generators meet the design requirements detailed in conditions O11.2 and O11.3.
All pipe work used in the gas collection network are designed to withstand pressures associated with operations. Both steel and high density polyethylene (pressure rating PN8 – PN16) materials are used at the site.

2.2.17. Supervisory Licence Holder

The supervisory licence holder for the Woodlawn Bioreactor is Goulburn-Mulwaree Council. VES has granted the Council's representative access to the site and provided all requested documentation and records, including the annual return for this reporting period. All instructions provided by the Council's representative were complied with by VES.

2.2.18. Sealing of Drill Holes

No drill holes were required to be sealed during this reporting period.

2.3. Complaints

VES operates a 24 hour telephone complaints line that enables the receipt of complaints from members of the public, as required by condition M5. Other complaints that were received were logged by Goulburn-Mulwaree Council and the EPA. VES recorded a total of 64 complaints (refer to Table T-1) relating to odour during this reporting period. Upon receipt of a compliant, VES recorded all details into the site complaints register as required under condition M4.

VES encourages local residents to voice their concerns with the Site and also at the Community Liaison Committee Meetings. VES have commenced activities to eliminate and minimise odour sources at the site based on the odour audit completed during the reporting period as discussed in Section 2.2.5.

2.4. Pollution Reduction Programs

2.4.1. Barrier System for Adits/Portals

No mining adits/portals were required to be sealed during this reporting period. VES will submit a sealing design to the EPA for approval prior to the sealing of the Southern Portal.

2.4.2. Groundwater Monitoring

VES has submitted a replacement program for the WM groundwater wells in March 2011 to the EPA. No correspondence from the EPA has been received by the end of the reporting period.

2.4.3. Alternative Daily Cover Trial

VES applied to EPA to use recovered fines as an alternate cover material from Construction and Demolition waste. The trial, which commenced in April 2012, will involve blending the processed fines with Virgin Extracted Natural Material (VENM) sourced onsite. The trial is ongoing at the end of the reporting period.

VES is continuing to utilise Concover and soil material sourced from borrow areas identified in the MOP as required.

2.4.4. Acid Mine Drainage

All conditions have been met previously by VES. An updated leachate management plan was submitted with a Development Application to the Department of Planning for Woodlawn Expansion Project. Refer to the previous AEMR by Earth2Water for further information (Earth2Water, 2010).

3. Environmental Monitoring

3.1. Monitoring Points

VES is required to monitor environmental performance under EPL 11436. Table 3.1 details the VES monitoring point identification, EPL monitoring point identification number, frequency and the type of monitoring undertaken at each licensed point. A monitoring location plan is included in Appendix 6.

Table 3.1: Licensed Monitoring Points

EPA ID	VES ID	Frequency	Type of Monitoring
1	GMBH1	Quarterly	Subsurface Gas
2	GMBH2		
4	GMBH4		
5	Gas Extraction Booster	Annual	Landfill Gas Input
6	Landfill Surface	Quarterly	Surface Gas
7	Landfill Gas Flare	Annual / Continuous	Air Discharge
8	Landfill Gas Engine Exhaust Point – Gen 1	Annual	Air Discharge
9	Meteorological Station	Continuous	Meteorological
10	DG28 – Pylara	Monthly	Particulates – Deposited Matter
11	DG22		
12	DG24		
13	Site 115 – Allianoyonyige Creek	Quarterly	Surface Water
14	Spring 2 – Crisps Creek		
15	Site 105 – Crisps Creek		
16	WM200 – RWD		
17	WM201 – ERC		
18	WM202 – ED3S		
19	WM203 – ED3N		
21	Pond 2		
22	Pond 3		
23	Leachate Pond	Annual	Leachate
24	Leachate Recirculation System		
25	MB1	Quarterly / Annual	Groundwater
26	MB2		
27	MB3		
28	MB4		
29	MB5		
30	MB6		
31	MB7		
32	MB8		
33	MB10		

EPA ID	VES ID	Frequency	Type of Monitoring
34	MB11		
35	MB12		
36	MB13		
37	MB14		
38	MB15	Quarterly / Annual	Groundwater
39	MB16		
40	MB17		
41	ED3B		
42	WM1		
43	WM3		
44	WM4		
45	WM5		
46	WM6		
47	WM7		
48	P38A & P38B	Quarterly	Groundwater Level
49	P44A & P44B		
50	P45A & P45B		
51	P58A & P58B		
52	P59A & P59B		
53	P100A & P100B		
54	ED3	Monthly	Surface Water Volume
55	MW8S	Quarterly / Annual	Groundwater
56	MW8D		
57	MW9S		
58	MW10S		

All monitoring data collected at the monitoring points identified in Table 3.1 during this reporting period has been tabulated. Trend graphs of data collected have been developed (refer to Figures) to assist in the assessment of trends and variability of the monitoring results.

Trend graphs of water quality indicators are consistent with the graphs generated by Earth2Water and VES from previous versions of the AEMR.

3.2. Subsurface Gas Monitoring

Monitoring of three subsurface gas monitoring locations (refer to Table 3.1) was undertaken quarterly as per EPL requirements. No methane was detected in subsurface gas monitoring locations during this reporting period. These results are consistent with results from the past three years (Table T-2). Trend graphs have not been prepared to present the non detect values.

The results show that the gas collection network is effectively capturing and controlling landfill gas within the Bioreactor. Engineered impermeable barriers and the natural subsurface of the void wall also minimise the potential movement of

landfill gas from the Bioreactor, allowing for maximum extraction through the gas collection system.

3.3. Landfill Gas Extraction Booster Monitoring

The results obtained for the landfill gas extraction booster appear to be corrupted and incorrect. The results are provided for reference, although this VES cannot comment on the validity of these results. It is important to note that this is not an emission point for landfill gas such as the flare and engine stacks.

The incorrect data was only identified after completion of the annual return and VES is in the process of amending the annual return submitted for this reporting period.

3.4. Surface Gas Monitoring

Surface gas monitoring was completed on a quarterly basis as per EPL requirements. Due to the sampling methodology for surface gas monitoring only tabulated data for this reporting period is provided (Table T-4). Methane was detected in varying amounts over the waste surface with an overall average of 0.03% for the reporting period.

The highest methane result was 0.8%, which was recorded in June 2012. This result was due to a combination of a decommissioned well and settlement cracking, which was providing an emissions pathway. Other recorded methane results that registered higher than 0.1% were also found to be caused by similar factors.

After every monitoring round Site Management reviewed the results to address areas where emissions were greater than 0.1%. This included application and maintenance of cover material, commissioning and rebalancing of gas extraction wells and targeting of new gas collection infrastructure.

3.5. Landfill Gas Flare Monitoring

The landfill gas flare is manufactured to a residence time of 0.3 seconds with a destruction efficiency of 98% for methane and non methanogenic organic compounds. Temperature is recorded continuously and an annual reading of 1108.4℃ was recorded (Table T-5). This meets the minimum requirements of the *UK Environment Agency Guidance for Monitoring Enclosed Landfill Gas Flares* which is referenced in condition O11.2 of the EPL.

3.6. Landfill Gas Engine Exhaust Point Monitoring

Monitoring of the landfill gas engines exhaust points was completed annually for each active generator. Only one monitoring point is provided within the EPL (for

generator 1), however VES operated four generators at the onsite power station during the reporting period. All generators were sampled during the reporting period and the results are presented in Table T6.1 – T6.4.

Concentration limits for each exhaust point are specified within condition L3.3 of the EPL. All monitoring results are below the specified concentration limits. Trend graphs of the listed pollutants (Nitrogen Oxides, Hydrogen Sulfide and Sulfuric acid mist and Sulphur Trioxide (as SO_3)) have been generated (Figures 1 – 4). The graphs indicate that all pollutants are consistent with levels previously recorded. Hydrogen sulphide emissions have slightly increased at Generator 2 but are still within acceptable limits.

3.7. Meteorological Station

VES operates a meteorological station to continuously record climatic data listed in condition M7.1 of the EPL. Meteorological data recorded includes (but is not limited to):

- Wind speed at 10m;
- Wind direction at 10m;
- Temperature at 2m;
- Temperature at 10m;
- Rainfall;
- Solar radiation; and
- Sigma theta at 10m

Meteorological data is recorded in 15 minute and 24 hour intervals and can be made available for the 2011/2012 reporting period upon request.

Servicing and calibration of the meteorological station is carried out quarterly by Hydrometric Consulting Services. Copies of the calibration reports are included in (Appendix 7).

3.8. Particulates / Dust Monitoring

Monitoring of three depositional dust gauges (refer to Table 3.1) was completed on a monthly basis as required under the EPL. Results are tabulated in Tables T7.1 – T7.3 and trend graphs are provided as Figure 4.

A value of 31.1g/m^2/month was recorded at DG22 in August 2012 (Figure 4). The elevated dust results can be attributed to rehabilitation works within close proximity to DG22, which included earthworks and carting of material from the Plant Area to the

Southern Tailings Dam. The rehabilitation works were undertaken by Tri Ausmin's subcontractor.

Dust levels in DG24 do not reflect a significant increase from mining of cover material during this reporting period. This indicates that VES is minimising dust generation from mining activities.

Dust levels recorded in DG28 are consistent with historical trends. VES has also recognised that additional recording of activities that occur on the Pylara property will allow VES to more accurately identify non-operational activities that may be the source of dust generation.

3.9. Surface Water Monitoring

Water quality monitoring of nine surface water locations (refer to Table T8.1 – T8.9) is required under EPL 11436. Surface water quality trend graphs have been developed to identify the key pollutants from Bioreactor operations and remnant mining areas that were identified in the 2010 AEMR (Earth2Water, 2010).

3.9.1. Site 115 – Allianoyonyige Creek

Site 115 is situated downstream of the evaporation dams. Quarterly monitoring events were undertaken in accordance with EPL conditions (refer to Table T8.1 and Figure 5).

pH is relatively consistent throughout the monitoring period and indicates alkaline water at an average pH of 7.8. Conductivity ranges from 1104 – 2430µS/cm which indicates fresh to brackish water, while heavy metal concentrations are less than 0.1mg/L. This indicates that no contaminated runoff occurring from land degraded by mining activities is impacting surface water at this monitoring location.

Ammonia (average 0.1mg/L) and Total Organic Carbon (average 19.5mg/L) concentrations recorded in this monitoring period are consistent with historical monitoring results. The presence of Total Organic Carbon and Ammonia at low concentrations reflects natural processes.

Trends at this location indicate variable conductivity and relatively stable iron concentrations during this reporting period with both results consistent with historical monitoring results. Variability is likely due to dilution during wet periods and evapo-concentration during drier periods as previously identified (Earth2Water, 2010).

3.9.2. Spring 2

Spring 2 is located upstream of the Bioreactor and is adjacent to Crisps Creek. This location naturally overflows to Crisps Creek in wet weather events. Quarterly monitoring events were undertaken in accordance with EPL conditions. This point provides background water quality information (refer to Table T8.2 and Figure 6).

Water quality trends in Spring 2 are consistent with water quality from historical monitoring results. pH is slightly acidic (average 6.18), with conductivity (average 507.5µS/cm) indicative of fresh water. Sulphate (average 180mg/L) shows an identical trend to conductivity indicating that the concentration of Sulphate has a direct affect on conductivity. Zinc concentrations (average 9.60mg/L) continue to slowly decline, although variability is still common due to dilution following wet weather periods and concentration during drier periods.

Ammonia (average 0.58mg/L) and Total Organic Carbon (average 19mg/L) concentrations recorded in this monitoring period are consistent with historical monitoring results.

3.9.3. Site 105 – Crisps Creek

Site 105 is located downstream of the Bioreactor and tailings dams. Quarterly monitoring events were undertaken in accordance with EPL conditions (refer to Table T8.3 and Figure 7).

Water quality trends in Site 105 are consistent with previous monitoring results. pH ranges from (7.4–7.9) while conductivity (average 1925µS/cm) reflects brackish water. Concentrations of heavy metals are less than 1mg/L, while sulphate levels ranged from 100 – 140mg/L and generally followed a similar trend to conductivity. These results indicate that runoff from contaminated areas is not impacting water quality at this location.

Total Organic Carbon (average 21mg/L) and Ammonia (average 0.13mg/L) were consistent with historical trends.

3.9.4. WM200 – Raw Water Dam

The Raw Water Dam is located to the west of the dolerite stockpile and collects uncontaminated water. Quarterly monitoring events were undertaken in accordance with EPL conditions (refer to Table T8.4 and Figure 8).

pH (average 6.3) indicates slightly acidic water, while conductivity (average 1275µS/cm) is showing a slight decreasing trend and is indicative of fresh/brackish water. Sulphate and Iron levels were consistent with previous trends, while Zinc

levels have reflected a slight rising trend to 46mg/L through the monitoring period. VES are currently investigating the cause of increasing Zinc trends.

Total Organic Carbon showed a gradual rising trend but are relatively consistent with historical results. Ammonia was not detected during this reporting period.

3.9.5. WM201 – Entrance Road Culvert

The Entrance Road Culvert collects surface water runoff from the Woodlawn administration and workshop areas. Three monitoring events were undertaken (refer to Table T8.5 and Figure 9) with a fourth sample unable to be collected due to insufficient flow.

pH shows a gradual rise to 6.1 from previous results, while conductivity (average 250µS/cm) indicates fresh water. Iron, Zinc and Sulphate concentrations were variable but consistent with previous trends.

Ammonia was not detected during this reporting period.

3.9.6. WM202 – Evaporation Dam 3 South

Evaporation Dam 3 South is a storage point to manage stormwater from the void by evaporation. Quarterly monitoring events were undertaken in accordance with EPL conditions (refer to Table T8.6 and Figure 10).

Water quality results are very similar to previously reported results which indicate acidic water (average pH of 2.8), Iron (average 79.75mg/L), Zinc (average 567.5mg/L), with slightly increased level of Sulphate (average 6425mg/L) and Conductivity (average 7450µS/cm). Sulphate and conductivity do indicate a slight declining trend over this reporting period. These concentrations reflect the AMD contaminated waters stored in Evaporation Dam 3 South.

Ammonia concentrations appear to be stabilising with a smaller range (52 – 82mg/L) identified during this reporting period.

3.9.7. WM203 – Evaporation Dam 3 North

Evaporation Dam 3 North is a storage point to manage AMD/leachate by evaporation. Quarterly monitoring events were undertaken in accordance with EPL conditions (refer to Table T8.7 and Figure 11).

Water quality results indicate acidic water (pH 4.2-5.1), while conductivity (average 18500µS/cm)and sulphate (average 11625mg/L) dropped proportionally from the previous reporting period. Iron levels fluctuated (3.2 – 42mg/L) but Zinc levels were relatively stable (530 – 570mg/L) which is consistent with previous trends. These

concentrations reflect the AMD contaminated waters stored in Evaporation Dam 3 North.

Ammonia (590 – 940mg/L) and Total Organic Carbon (190 – 410mg/L) concentrations showed a declining trend over the reporting period, although levels were consistent with historical trends.

3.9.8. Pond 2

Pond 2 was decommissioned in January 2011 and this sampling point no longer exists. Refer to the 2011 AEMR for the last results and trends obtained at this monitoring location (VES, 2011).

3.9.9. Pond 3

Pond 3 is situated on a bench 740RL on the void wall. Pond 3 acts as a transfer point to extract stormwater from the void to Evaporation Dam 3. Quarterly monitoring events were undertaken in accordance with EPL conditions (refer to Table T8.8 and Figure 13).

All water quality results indicate were consistent with previous monitoring results. Water quality results indicate acidic water pH (2.6 – 3.5) with variable conductivity (2100 – 8100µS/cm). Sulphate (1400 – 8300mg/L) and Iron (37 – 420mg/L) were variable (but within ranges previously detected) throughout the reporting period. Ammonia (3.1 – 23mg/L) and Total Organic Carbon (10 – 88mg/L) were also quite variable.

VES believe that the monitoring results and trends recorded from Pond 3 indicate that monitoring from this location is sufficient to determine water quality of stormwater extracted from the void.

3.9.10. Leachate Monitoring

Leachate quality monitoring at two monitoring locations (refer to Tables T9.1 – T9.2) was undertaken as required by EPL 11436. The characteristics of the leachate are given to assist in contamination assessment at other water monitoring locations.

3.9.11. Leachate Pond

The leachate pond is located at the northwest rim of the void where leachate is treated by aeration to oxidise organic compounds. An annual round was completed during this reporting period, which meets the requirements of the EPL. Additional

monitoring of a reduced suite of analytes was also sampled during this reporting period (refer to Table T9.1 and Figure 14).

The characteristics of the leachate are:

- Slightly alkaline pH (7.9) with bicarbonate (9,710mg/L) the prominent form of alkalinity;
- High levels of Ammonia (1,800mg/L), Total Dissolved Solids (31,000mg/L) and Total Organic Carbon (13,000mg/L), which is expected within typical putrescible waste leachate;
- Levels of Zinc (52mg/L), Iron (320mg/L) and Conductivity (35,000µS/cm) are present in the leachate which indicates minor AMD mixing;
- Aluminium (17mg/L) is the most abundant heavy metal not attributed to mining related activities. Other heavy metals are less than 1mg/L.
- Sodium (4400mg/L) and Potassium (2900mg/L) are the dominant cations, while Sulphate (5100mg/L) and Chloride (5400mg/L) are the dominant anions;
- Total Petroleum Hydrocarbons are present at all fractions.
- Pesticides (Organo-phosphorous (OP) and Organo-chlorine (OC)) and Polycyclic Aromatic Hydrocarbons were below laboratory detection limits;
- Trace amounts of Toluene (0.048mg/L) and Xylene (0.01mg/L) previously detected were not detected during this reporting period;
- Phenolic compounds (1.57mg/L) are present.

3.9.12. Leachate Recirculation System

The leachate recirculation system is located within the void and acts to extract leachate from saturated waste and filter through drier waste. An annual round was completed during this reporting period, which meets the requirements of the EPL (refer to Table T9.2 and Figure 15).

The leachate characteristics are similar to the leachate pond, with the following exceptions:

- Total Organic Carbon (3,100mg/L) showed a decrease of almost one order of magnitude and indicate a decreasing trend
- Sulphate (51mg/L) was two orders of magnitude lower and also indicates a decreasing trend
- Zinc (6.8mg/L) and Iron (31mg/L) were almost one order of magnitude lower and are also indicating decreasing trends

- BTEX were all detected at low levels (<0.077mg/L)

3.9.13. Groundwater Monitoring

Groundwater quality monitoring at 27 locations (refer to Table T10.1 – T10.25) was undertaken as required by EPL 11436. One annual round and three quarterly rounds of monitoring are required to meet the requirements of the EPL.

The groundwater monitoring well networks allows for an assessment of potential impacts from the Bioreactor, evaporation dams and tailing dams. Pesticide (OP and OC) and Benzene, Toluene, Ethyl Benzene and Xylene (BTEX) results for all groundwater monitoring locations were below laboratory detection limits.

3.9.14. MB1

MB1 is located downgradient of the void. The standing water level in MB1 has been consistently around 770RL (+/- 1m) since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.1 and Figure 17) in MB1 indicate a Calcium-Sulphate water type with near neutral pH (average 7.35) and conductivity (average 1075µS/cm) representative of fresh water. These results are consistent with previously reported trends.

Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH) and BTEX were not detected at this monitoring point. All heavy metals were significantly less than 1mg/L.

Ammonia (maximum 0.2mg/L) and Total Organic Carbon (4mg/L) are present at low levels which reflect natural conditions.

All trends indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.15. MB2

MB2 is located upstream of evaporation dam 2. The standing water level in MB2 has been consistently around 778RL (+/- 1m) since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.2 and Figure 18) in MB2 indicate a Magnesium-Sulphate water type with near neutral pH (average 6.95) and stable conductivity (average 6650µS/cm) representative of brackish water. These results are consistent with previously reported trends.

TPH, PAH and BTEX were not detected at this monitoring point. All heavy metals were significantly less than 1mg/L.

Ammonia was not detected during this reporting period. Total Organic Carbon (7mg/L) is present at low levels which reflect natural conditions.

All trends indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.16. MB3

MB3 is located upstream of the Bioreactor and mine site. The standing water level in MB3 has been consistently around 790RL (+/- 1m) since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.3 and Figure 19) in MB3 indicate a Calcium-Chloride water type with near neutral to neutral pH (average 7) and stable conductivity (average 2050µS/cm) representative of brackish water. These results are consistent with previously reported trends.

TPH, PAH and BTEX were not detected at this monitoring point. All heavy metals were significantly less than 1mg/L.

Ammonia was not detected during this reporting period. Total Organic Carbon (1mg/L) is present at low levels which reflect natural conditions.

All trends indicate fairly stable concentration and provide an indication of background groundwater concentrations.

3.9.17. MB4

MB4 is located downstream of the Bioreactor. The standing water level in MB4 has been consistently around 774RL (+/- 1m) since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.4 and Figure 20) in MB4 indicate a Sodium-Chloride water type which is acidic (average pH 5.45) and conductivity (average 1775µS/cm) representative of freshwater. These results are consistent with previously reported trends.

TPH, PAH and BTEX have not been detected at this monitoring point. All heavy metals are less than 1mg/L.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (2mg/L) is present at low levels which reflect natural conditions.

All trends indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.18. MB5

MB5 is located upstream of the western tailings dam at the waste rock dump area. The standing water level in MB5 has generally been around 828RL (+/- 2m) since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.5 and Figure 21) in MB5 indicate a Magnesium-Sulphate water type which is acidic (average pH 4.13) and conductivity (average 8050µS/cm) representative of brackish water. These results are consistent with previously reported trends.

TPH, PAH and BTEX have not been detected at this monitoring point. All heavy metals are less than 1mg/L, with the exception of Aluminium (27mg/L), Manganese (28mg/L) Iron (275mg/L) and Zinc (200mg/L), although these levels are consistent with previously reported trends.

Ammonia (0.2mg/L) and Total Organic Carbon (10mg/L) are present at low levels which reflect natural conditions.

All trends indicate fairly stable concentration and there is no indication of contamination Bioreactor activities. There is indication of impacts from mining activities at this monitoring location although this has been ongoing prior to VES obtaining the site. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.19. MB6

MB6 is located downstream of the Evaporation Dam 3 and upstream of the Bioreactor. The standing water level in MB6 has been on a gradual increasing trend from 786RL to 789RL since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.6 and Figure 22) in MB6 indicate a Sodium-Chloride water type which is acidic (average pH 5.65) and conductivity (average 4975µS/cm) representative of brackish water. These results are consistent with previously reported trends.

TPH and BTEX have not been detected at this monitoring point. PAH was detected at 0.0005mg/L which is minimal. All heavy metals are less than 1mg/L with the exception of Zinc (average 8.7mg/L) which is consistent with previously reported trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (3mg/L) is present at low levels which reflect natural conditions.

There is no defined indication of contamination from mining or Bioreactor activities at this monitoring location. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.20. MB7

MB7 is located upstream of Evaporation Dam 3. The standing water level in MB6 has shown a gradual increasing trend to 786.5RL since 2004, with some minor fluctuations evident over time (refer to Figure 16.1).

Water quality results (refer to Table T10.7 and Figure 23) in MB7 indicate a Sodium-Chloride water type which is near neutral (average pH 7.03) and conductivity (average 9375µS/cm) representative of brackish water. These results are consistent with previously reported trends.

TPH, PAH and BTEX have not been detected at this monitoring point. All heavy metals are less than 1mg/L. with the exception of Manganese (1.5mg/L) which is consistent with previously reported trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (22mg/L) levels have increased which appears to be an anomalous result. Further monitoring is required to determine if this occurrence continues.

All trends indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities. The only significant anomaly recorded was Total Organic Carbon which will be further assessed in the next AEMR.

3.9.21. MB8

MB8 is located downstream of the Bioreactor at the nearest residence, Pylara (which is owned by VES). The standing water level in MB8 has been fairly stable around 748RL (+/- 1m) since 2004 (refer to Figure 16.1). This groundwater well has lower groundwater levels (along with MB13) than the majority of other bores monitored at the site (approximately 20m lower than other locations).

Water quality results (refer to Table T10.8 and Figure 24) in MB8 indicate a Sodium-Chloride water type which is slightly alkaline (average pH 7.55) and conductivity (average 3650µS/cm) representative of brackish water. These results are consistent with previously reported trends.

TPH, PAH and BTEX have not been detected at this monitoring point. All heavy metals are less than 1mg/L which is consistent with previously reported trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (12mg/L) is significantly reduced from last reporting period and is similar with previous results, which may indicate an anomalous result in May 2011.

All trends indicate fairly stable concentrations (with the exception of Total Organic Carbon) and there is no indication of contamination from mining or Bioreactor activities.

3.9.22. MB10

MB10 is located adjacent to Evaporation Dam 1. The standing water level in MB10 has been fairly stable around 780RL (+/- 1m) since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.9 and Figure 25) in MB10 indicate a Magnesium-Sulphate water type which is slightly alkaline (average pH 7.18) and conductivity (average 7300µS/cm) representative of brackish water. These results are consistent with previously reported trends.

TPH, PAH and BTEX have not been detected at this monitoring point. All heavy metals are less than 1mg/L which is consistent with previously reported trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (7mg/L) is present at low levels which reflect natural conditions.

All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.23. MB11

MB11 is located at Evaporation Dam 2 seepage collection trench, which is a dedicated capture area for seepage waters. The standing water level in MB11 has been fairly stable around 777RL (+/- 1m) since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.10 and Figure 26) in MB11 indicate a Magnesium-Sulphate water type which is acidic (average pH 4.1) and conductivity (average 29,250µS/cm) representative of saline water. These results are consistent with previously reported trends.

TPH, PAH and BTEX have not been detected at this monitoring point. A number of heavy metals are greater than 1mg/L including Aluminium (520mg/L), Cadmium (27mg/L), Cobalt (14mg/L), Copper (average 150mg/L), Manganese (520mg/L) and Zinc (5,600mg/L). Heavy metal concentrations fluctuate greatly between sample rounds which reflect concentrations within seepage water from the dam. Seepage

from this dam has been ongoing since VES assumed responsibility for the site and there is no indication of increasing trends. VES are managing the water volume in Evaporation Dam 2 by promoting evaporation and limiting inputs to rainfall to minimise the volume of seepage at this location.

Ammonia (average 0.13mg/L) is present at low levels which reflect natural conditions. Total Organic Carbon (21mg/L) is similar to previous levels and indicates that organic carbon is present in this location. Fluoride (150mg/L) is also present at high levels. Due to the location of the bore, and the proximity away from the bioreactor, these results are likely influenced by microbial communities rather than Bioreactor activities.

The location of this MB11 is between evaporation dam 2 and the seepage collection trench. VES have previously installed two additional monitoring wells (MB19 and MB20) downgradient of the seepage collection trench. Monitoring results from these wells continue to indicate that contamination is managed at the seepage collection trench. Results of these wells have been tabulated and provided in Appendix 8.

The evaporation dams have been previously identified by VES for rehabilitation which will be undertaken in accordance with the MOP.

3.9.24. MB12

MB12 is located at Evaporation Dam 2 seepage collection trench and adjacent to MB11. The standing water level in MB12 reflects water levels and trends in MB11 (refer to Figure 16.1).

Water quality results (refer to Table T10.11 and Figure 27) in MB12 indicate a Magnesium-Sulphate water type which is acidic (average pH 3.58) and conductivity (average 39,500µS/cm) representative of saline water. These results are consistent with previously reported trends.

TPH, PAH and BTEX have not been detected at this monitoring point. A number of heavy metals are greater than 1mg/L including Aluminium (1100mg/L), Cadmium (29mg/L), Cobalt (24mg/L), Copper (260mg/L), Iron (average 5.03mg/L), Lead (1.02mg/L), Manganese (550mg/L) and Zinc (average 7,150mg/L). Heavy metal concentrations generally fluctuate similar to MB11, although Zinc concentrations show a slight rising trend.

Ammonia (average 0.43mg/L) is present at low levels which reflect natural conditions. Total Organic Carbon (22mg/L) is similar to levels in MB11. Fluoride (150mg/L) is also present at high levels. Due to the location of the bore, and the

proximity away from the bioreactor, these results are likely influenced by microbial communities rather than Bioreactor activities.

The location of MB12 (similar to MB11) is between Evaporation Dam 2 and the seepage collection trench. Refer to Appendix 8 for results of groundwater down gradient of the seepage collection trench.

The evaporation dams have been previously identified by VES for rehabilitation which will be undertaken in accordance with the MOP.

3.9.25. MB13

MB13 is located downstream of Evaporation Dam 1 and surface water monitoring point 115. The standing water level in MB13 (745RL +/- 2m) is the lowest recorded in all bores at the site and is comparable with levels in MB8 (refer to Figure 16.1).

Water quality results (refer to Table T10.12 and Figure 28) in MB13 indicate a Sodium-Chloride water type which is slightly alkaline (average pH 7.35) and conductivity (average 3,300µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. All heavy metals are less than 1mg/L with the exception of Zinc (1.1mg/L) although this is consistent with previously reported trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (10mg/L) indicates organic matter is present in the groundwater at this location, which may include microbial communities.

All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.26. MB14

MB14 is located upstream of Evaporation Dam 2. The standing water level in MB14 (783RL +/- 1m) is showing a gradual increase since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.13 and Figure 29) in MB14 indicate a Magnesium-Sulphate water type which is slightly alkaline (average pH 7.4) and conductivity (average 3,475µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. All heavy metals are less than 1mg/L which is consistent with previously reported trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (8mg/L) indicates organic matter is present in the groundwater at this location, which may include microbial communities.

All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.27. MB15

MB15 is located downstream of the waste rock dam. The standing water level in MB15 (764RL +/- 2m) shows minor fluctuations since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.14 and Figure 30) in MB15 indicate a Magnesium-Sulphate water type which is near neutral (average pH 7.1) and conductivity (average 8,575µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. All heavy metals are less than 1mg/L, with the exception of Iron (average 5.52mg/L), Manganese (4.8mg/L) which is consistent with previously reported trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (11mg/L) indicates organic matter is present in the groundwater at this location, which may include microbial communities.

All trends indicate fairly stable concentrations, although Iron concentrations fluctuate over time. The waste rock area has been previously identified by VES for rehabilitation which will be undertaken in accordance with the MOP. There is no indication of contamination from Bioreactor activities.

3.9.28. MB16

MB16 is located downstream of the waste rock dam. The standing water level in MB16 (769RL +/- 1m) and has been fairly stable since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.15 and Figure 31) in MB16 indicate a Magnesium-Sulphate water type which is acidic (average pH 3.23) and conductivity (average 31,750µS/cm) representative of saline water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. A number of heavy metals are greater than 1mg/L including Aluminium (2100mg/L), Cobalt (18mg/L), Copper (160mg/L), Iron (average 44.25mg/L), Manganese (560mg/L) and Zinc

(average 6400mg/L). Heavy metal concentrations are variable but consistent with previously reported trends.

Ammonia (average 7.53mg/L) and Total Organic Carbon (29mg/L) indicates organic matter is present in the groundwater at this location, which may include microbial communities.

The waste rock area has been previously identified by VES for rehabilitation which will be undertaken in accordance with the MOP. There is no indication of contamination from Bioreactor activities.

3.9.29. MB17

MB17 is located downstream of the waste rock dam. The standing water level in MB17 (767RL +/- 1m) and has been fairly stable since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.16 and Figure 32) in MB17 indicate a Magnesium-Sulphate water type which is slightly acidic (average pH 6.63) and conductivity (average 11,325µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. All heavy metals are less than 1mg/L with the exception of Manganese (14mg/L) and Zinc (average 5.7mg/L) which is consistent with previously reported trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (15mg/L) indicates organic matter is present in the groundwater at this location, which may include microbial communities.

The waste rock area has been previously identified by VES for rehabilitation which will be undertaken in accordance with the MOP. There is no indication of contamination from Bioreactor activities.

3.9.30. ED3B

ED3B is located downstream of Evaporation Dam 3. The standing water level in ED3B (784RL +/- 1m) and has been fairly stable since 2004 (refer to Figure 16.1).

Water quality results (refer to Table T10.17 and Figure 33) in ED3B indicate a Sodium-Chloride water type which is near neutral (average pH 7.1) and conductivity (average 8,300µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. All heavy metals are less than 1mg/L with the exception of Manganese (1.4mg/L) which is consistent with historical trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (12mg/L) indicates organic matter is present in the groundwater at this location, which may include microbial communities.

All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.31. WM1

WM1 is located within the northeast of the mine void. The standing water level in WM1 has shown a gradual rise from 732RL to 735RL since 2004 (refer to Figure 16.2).

Water quality results (refer to Table T10.18 and Figure 34) in WM1 indicate a Calcium-Sulphate water type which is slightly alkaline (average pH 7.35) and stable conductivity (2100µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. All heavy metals are less than 1mg/L with the exception of Zinc (1.7mg/L) which is consistent with historical trends.

Ammonia (average 0.13mg/L) and Total Organic Carbon (4mg/L) are present at low levels which reflect natural conditions.

All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.32. WM3

WM3 is located within the south of the mine void. The standing water level in WM3 has shown a noticeable increasing trend from 678RL to 701RL since 2004 (refer to Figure 16.2).

Water quality results (refer to Table T10.19 and Figure 35) in WM3 indicate a Magnesium/Calcium-Sulphate water type which is acidic (average pH 3.8) and conductivity (average 4,225µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. Heavy metals are less than 1mg/L except for Aluminium (140mg/L), Manganese (19mg/L), Iron (130mg/L) and Zinc (360mg/L) which is consistent with previously reported results.

Ammonia (average 1.28mg/L) and Total Organic Carbon (3mg/L) are present at low levels which reflect natural conditions.

WM3 is located in an area of known AMD impacted groundwater. No significant variations or anomalies were recorded for any analyte tested during this monitoring period, although heavy metal concentrations continue to fluctuate as expected in AMD impacted waters.

3.9.33. WM4

The standing water level in WM4 (632RL +/-1m) has been relatively stable since 2004 (refer to Figure 16.2). Only one quarterly round of testing was obtained during this reporting period as there was insufficient water within the monitoring well to complete quarterly sampling rounds.

Water quality results (refer to Table T10.20 and Figure 36) in WM4 indicate a Sodium-Sulphate water type which slightly alkaline (average pH 7.5) and conductivity (average 1,900µS/cm) representative of brackish water. These results are consistent with previously reported trends.

Ammonia was not detected during this reporting period.

All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period from the data available.

3.9.34. WM5

WM5 is located to the west of the mine void near Evaporation Dam 3 South. The standing water level in WM5 has been consistently around 784RL +/-2m since 2004 (refer to Figure 16.2).

Water quality results (refer to Table T10.21 and Figure 37) in WM5 indicate a Sodium-Chloride water type which is slightly alkaline (average pH 7.5) and conductivity (average 6,700µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX and PAH were not detected during this reporting period. TPH fraction $C_{15} – C_{28}$ (230µg/L) was recorded slightly above the detection limit. All heavy metals are less than 1mg/L except Manganese (1.7mg/L) which is consistent with historical trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (10mg/L) indicates organic matter is present in the groundwater at this location, which may include microbial communities. Sulphate appears to be showing a decreasing trend to 100mg/L by the end of the reporting period.

All other trends are relatively consistent and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.35. WM6

WM6 is located to the west of the mine void adjacent to Evaporation Dam 3 North. The standing water level in WM6 has been consistently around 784RL +/-2m since 2004 (refer to Figure 16.2).

Water quality results (refer to Table T10.22 and Figure 38) in WM6 indicate a Sodium-Chloride water type which is slightly acidic (average pH 6.08) and stable conductivity (average 14,000µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX and TPH were not detected at this monitoring point. PAH (0.0005mg/L) was detected at the detection limit. All heavy metals are less than 1mg/L which is consistent with historical trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (4mg/L) is present at low levels which reflect natural conditions.

All trends are relatively consistent and there is no indication of contamination from mining or Bioreactor activities.

3.9.36. WM7

No sampling of WM7 could be undertaken during the reporting period as this well was decommissioned prior to this reporting period. VES have submitted a replacement program to the EPA for approval (condition U2) to replace this location. No response has been received by the end of this reporting period.

Refer to the Earth2Water 2010 AEMR for discussion on trends and groundwater quality for WM7 (Earth2Water, 2010).

3.9.37. MW8S

MW8S is located northern side of Evaporation Dam 3 north. The base reference level of MW8S is 783.4m RL with the water level only reaching a maximum of 785.25m RL during the reporting period (refer to Figure 16.3).

Groundwater generally returns to the well following significant wet weather events which indicates this well intercepts the shallow unconfined aquifer. This monitoring location was dry over the first quarter and therefore only three samples could be collected during this reporting period.

Water quality results (refer to Table T10.23 and Figure 39) in MW8S indicate a Magnesium/Sodium-Sulphate water type which is near neutral (average pH 6.97) and conductivity (average 12,666.67µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. All heavy metals are less than 1mg/L with the exception of Manganese (1.6mg/L) and Zinc (18mg/L) which is consistent with historical trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (7mg/L) are present at low levels which reflect natural conditions.

Trends from this well are difficult to establish due to the limited sampling possible at this well, although no significant variations or anomalies we can be seen in the trend graph. There is no indication of contamination from mining or Bioreactor activities.

3.9.38. MW8D

MW8D is located within is adjacent to MW8S. The standing water level in MW8D has remained relatively stable around 785RL +/-2m since the well was commissioned in 2007 (refer to Figure 16.3). Water level trends reflect those in MW8S and only returns after heavy wet weather events which indicate this well is also connected to the shallow unconfined aquifer.

Water quality results (refer to Table T10.24 and Figure 40) in MW8D indicate a Magnesium-Sulphate water type which is near neutral (average pH 6.65) and conductivity (average 11,175µS/cm) representative of brackish water. These results are consistent with previously reported trends.

BTEX, PAH and TPH were not detected at this monitoring point. All heavy metals are less than 1mg/L with the exception of Manganese (2.3mg/L) and Zinc (15mg/L), which are similar concentrations to MW8S and is consistent with historical trends.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (6mg/L) is present at low levels which reflect natural conditions.

All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.39. MW9S

MW9S is located on the northwest side of Evaporation Dam 3 North. The standing water level in MW9S has shown minor variations between 785RL and 787RL since the well was commissioned in 2007 and appears to show a slight increasing trend since September 2009 (refer to Figure 16.3).

Water quality results (refer to Table T10.25 and Figure 41) in MW8D indicate a Magnesium/Sodium-Sulphate water type which is near neutral (average pH 6.9) and conductivity (average 10,400µS/cm) representative of brackish water.

TPH, PAH and BTEX were not detected at this monitoring point. All heavy metals were significantly less than 1mg/L.

Ammonia (average 0.01mg/L) was not detected during this reporting period. Total Organic Carbon (7mg/L) is present at low levels which reflect natural conditions.

All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

3.9.40. MW10S

MW10S is located on the northeast side of Evaporation Dam 3 North. No sampling of MW10S could be undertaken during the reporting period as this well was continually dry (refer to Figure 16.3 for base of monitoring well level). This has been a consistent observation since the well was commissioned in 2007.

No data is available to produce tables or graphs for this monitoring point.

3.10. Piezometer Water Level Monitoring

Standing water level measurements are undertaken at six monitoring locations around the void in accordance with EPL 11436. Each monitoring location consists of a shallow (reference A) and deep (reference B) piezometer. The piezometers enable measurements of groundwater levels to be made in the immediate vicinity of the Bioreactor.

3.10.1. P38A & P38B

Access to the monitoring location P38 has been restricted by Site Management due to safety concerns regarding the stability of this area of the void. The EPA have been notified of the geotechnical safety concerns surrounding of this area, including the monitoring point.

Refer to the Earth2Water 2010 AEMR for discussion on trends and groundwater levels for P38A and P38B (Earth2Water, 2010).

3.10.2. P44A & P44B

P44 is located within the east of the mine void. Standing water levels are presented in Table T11.1 and Figure 42.

Standing water level in P44A (shallow) indicated a variable standing water level from 715.57RL to 718.46RL during the reporting period. Standing water levels are consistent with historical monitoring results and indicate that the shallow aquifer is influenced by rainfall and infiltration.

Standing water level in P44B (deep) has maintained a gradual increase during this reporting period to 713.08RL. This continues the increasing trend observed since 2005.

3.10.3. P45A & P45B

P45 is located within the east of the mine void, and to the south of P44. Standing water levels are presented in Table T11.2 and Figure 42.

Standing water level in P45A (shallow) showed increased from 714.95RL to 718.05RL. These levels are consistent with historical monitoring results and still reflect a gradual rise in groundwater levels at this location since 2002.

Standing water level in P45B (deep) has continue to increase over the reporting period reflecting a gradual rise in groundwater levels at this location since 2002. Water levels in P45B showed a similar trend to P45A during this reporting period and is generally higher than P45A (up to 3m difference).

3.10.4. P58A & P58B

P58 is located within the west of the mine void. Standing water levels are presented in Table T11.3 and Figure 42.

Standing water level in P58A (shallow) was below the base (764.21RL) of the piezometer during the reporting period.

Standing water level in P58B (deep) indicates the groundwater level is up to 20m lower than the base level of P45A. The groundwater level peaked in May 2012 at 756.5RL, which is approximately 13m above historical measurements. Groundwater levels have slightly subsided since this time; although groundwater levels are still elevated compared with historical values. Further monitoring will determine if sudden rise in groundwater level is maintained.

3.10.5. P59A & P59B

P59 is located within the west of the mine void and to the south of P58. Standing water levels are presented in Table T11.4 and Figure 42.

Standing water level in P59A (shallow) had a similar trend to P59B and P45A . Groundwater levels were relatively stable with results during the previous reporting period.

Standing water level in P59B (deep) indicate the shallow (P59A) and deep piezometers have shown similar groundwater level trends since November 2005.

3.10.6. P100A & P100B

P100 is located within the northeast of the mine void. Standing water levels are presented in Table T11.5 and Figure 42.

The standing water level in P100A (shallow) has showed minor fluctuations throughout the reporting period from 745.4RL to 748.2. The overall trend of standing water level at P100A still reflects a gradual increasing trend.

P100B (deep) was recorded as dry during the reporting period. The base level of the piezometer is approximately 698.21RL. This has been a consistent trend with spikes occurring periodically.

3.11. Volume Monitoring

VES manages the water volume in Evaporation Dam 3 well below the 323 Megalitre limit specified in EPL 11436. Water level readings were taken monthly (refer to Table T12 and Figure 43) as required by EPL 11436. The volume of water which combines extracted leachate and stormwater from the Bioreactor did not exceed 323 megalitres during the reporting period.

4. Crisps Creek Intermodal Facility

4.1. Introduction

VES operates the Crisps Creek Intermodal Facility (IMF) where all waste is received prior to final disposal at the Bioreactor. The IMF is comprised of a hardstand located adjacent to the regional rail network (approximately 1 kilometre south of Tarago train station) to enable transfer of waste (transported from Sydney) from rail to road (Appendix 1).

The IMF is operated under EPL 11455 which covers the operational areas of the Site and details the operating conditions and environmental monitoring requirements.

4.2. Licence Conditions

This section discusses compliance with EPL 11455 conditions.

4.2.1. Pollution of Waters

All discharged water is diverted through the first flush system. Monitoring is undertaken after rainfall ad assessed prior to discharge into the Mulwaree River.

4.2.2. Waste

All waste received at the IMF was putrescible solid waste which was transported from the Clyde Transfer Terminal. All waste was maintained in sealed containers and transported to the Bioreactor on the same day.

4.2.3. Noise Limits

Noise limits for the IMF (condition L6.1) must not exceed 35 dB(A) $L_{Aeq\ (15\ minute)}$ at the nearest residential receiver. No noise complaints have been received since operations commenced in 2004. Therefore, no noise monitoring was undertaken during this reporting period. VES will implement a noise monitoring program in the event that a noise complaint is received.

4.2.4. Hours of Operation

Condition L7 required operational activities to be undertaken on Monday – Saturdays between 6:00am to 6:00pm. Prior approval from the EPA was obtained on each occasion that VES operated outside these hours. VES has complied with the requirements of this condition.

4.2.5. Offensive Odour

No odour complaints were received for the IMF during this reporting period.

4.2.6. Competency of Operations

Refer to section 2.2.6.

4.2.7. Maintenance of Plant and Equipment

All plant and equipment were maintained in proper order and serviced as required by qualified technicians. All VES operators hold the appropriate qualifications and licenses to operate plant and equipment used as part of IMF operations.

4.2.8. Dust Control

The IMF is a hardstand site with fully paved roads to access the site. All waste movements are completed within fully enclosed containers until reaching the Bioreactor.

4.2.9. Stormwater and Wastewater Management

All conditions specified in condition O4 were developed and included within the design and construction of the IMF.

All container and vehicle washing is completed in the dedicated areas at the Bioreactor (condition O4.4). No container or vehicle washing was completed at the IMF during this reporting period.

No sewage was removed from the IMF (condition O4.5) and uncontaminated water was not utilised in vegetated areas (condition O4.6) during this reporting period

4.2.10. Tracking of Mud and Waste

As all waste movements occur within enclosed containers on a hardstand site, tracking of mud and waste from the IMF did not occur during the reporting period. No opening of containers was required to be undertaken at the IMF during this reporting period.

4.2.11. Waste Transportation

All containers utilised in the transportation of waste maintain carbon filters to minimise potential odour emissions. All containers have rubber seals to contain leachate during transportation.

VES last upgraded the containers in 2011 and undertakes maintenance as required to ensure efficient operation.

4.2.12. Fire Extinguishment

There were no fires at the IMF during this reporting period.

4.2.13. Fire Fighting Capability

All VES operators are trained in emergency situations, which include fire fighting. Fire extinguishers and a 20,000L water tank are maintained onsite to enable effective fire fighting capabilities for the different types of fires that could occur onsite.

Crisps Creek and Mulwaree River are located adjacent to the IMF which is an approved and readily available water source for fire fighting. The Tarago fire brigade is also located approximately 1 kilometre from the site which enables fast mobilisation at the site.

4.3. IMF Environmental Monitoring

4.4. Monitoring Points

VES is required to monitor environmental performance of the IMF under EPL 11455. Table 4-1 details the VES monitoring point identification, EPL monitoring point identification number, frequency and the type of monitoring undertaken at each licensed point. A monitoring location plan is included in Appendix 6.

Table 4.4: Licensed Monitoring Points

EPA ID	VES ID	Frequency	Type of Monitoring
1	Site 110	6 x Annually	Surface Water
2	Site 150		
3	IMF First Flush		
4	DG18 IMF	Continuous	Dust / Particulates

VES also undertakes additional surface water quality monitoring (Site 130) to provide additional background quality information.

4.5. Surface Water Monitoring

Surface water quality monitoring at 3 monitoring locations (refer to Table 4.4) was undertaken as required by EPL 11455. Six rounds of monitoring were undertaken to meet the requirements of the EPL at each monitoring location.

4.5.1. Site 110

Site 110 is located upstream of the IMF and approximately 8 kilometres downstream of the Bioreactor.

Results at Site 110 (refer to Table T13.1 and Figure 44) indicate slightly alkaline water (average pH 7.8) and conductivity (average 1,480µS/cm) representative of fresh water.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (average 15.14mg/L) is present at levels which reflect natural organic matter in streams. Oil and Grease was below laboratory detection limits for all sampling events.

Biological Oxygen Demand (average 2.14mg/L), Total Kjeldahl Nitrogen (average 0.86mg/L), Phosphorous (average 0.05mg/L) and Total Suspended Solids (average 5.57mg/L) concentrations are similar with historical trends.

Heavy metals are generally less than 1mg/L, except for Iron (peak reading 1.3mg/L in February 2012) which is showing a variable but decreasing trend over time.

Trends indicate high variability for most parameters tested, although this is not uncommon when sampling intermittent streams.

4.5.2. Site 130

Site 130 is located upstream of the IMF in the Mulwaree River.

Results at Site 130 (refer to Table T13.2 and Figure 45) indicate slightly alkaline water (average pH 7.68) and conductivity (average 521.67µS/cm) representative of fresh water.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (average 15.43mg/L) is present at levels which reflect natural organic matter in streams. Oil and Grease was below laboratory detection limits for all sampling events. These results are consistent with to Site 110.

Biological Oxygen Demand (average 2.43mg/L), Total Kjeldahl Nitrogen (average 0.9mg/L), Phosphorous (average 0.04mg/L) and Total Suspended Solids (average 8.6mg/L) concentrations are similar with historical trends.

All heavy metals are less than 1mg/L except for Iron (peak reading 1.4mg/L in September 2012) which is showing seasonal fluctuation over recent time.

4.5.3. Site 150

Site 150 is located 2 kilometres downstream of the IMF on the Mulwaree River, which is also downstream of a railway bridge and Braidwood Road.

Results at Site 150 (refer to Table T13.3 and Figure 46) indicate slightly alkaline water (average pH 7.77) and conductivity (average 886.67µS/cm) representative of fresh water.

Ammonia (less than 0.1mg/L) was not detected during this reporting period. Total Organic Carbon (average 15.83mg/L) is present at levels which reflect natural

organic matter in streams. Oil and Grease was below laboratory detection limits for all sampling events. These levels are consistent with Site 110 and 130.

Biological Oxygen Demand (3mg/L) was only above detection limits in June 2012. Total Kjeldahl Nitrogen (average 0.87mg/L), Phosphorous (average 0.03mg/L) and Total Suspended Solids (average 4.3mg/L) concentrations are similar with historical trends.

All heavy metals are less than 1mg/L which is consistent with historical trends.

4.5.4. IMF First Flush

The IMF First Flush is located at the surface water outlet point of the site, prior to runoff into Crisps Creek.

Results of the IMF First Flush system (refer to Table T13.4 and Figure 47) indicate slightly alkaline water (average pH 7.56) and conductivity (average 164.29µS/cm) representative of fresh water. Sampling was undertaken in nil to low flow events.

Ammonia (0.1mg/L) was only detected above detection limits in March 2012. Ammonia and Total Organic Carbon (average 17.43mg/L) are present at levels which are similar to levels recorded at Site 110 (upstream of IMF) and Site 150 (downstream of IMF). Oil and Grease was below laboratory detection limits for all sampling events.

Biological Oxygen Demand was variable over the monitoring period, ranging from 3mg/L to 54mg/L. This correlates with monitoring of stagnant water during nil to low flow conditions. Total Suspended Solids concentration was also variable, ranging from 10mg/L to 140mg/L which is consistent with historical trends.

Total Kjeldahl Nitrogen (average 1.79mg/L) and Phosphorous (average 0.20mg/L) are reasonably consistent with upstream and downstream concentrations.

All heavy metals are less than 1mg/L with the exception on Iron (average 2.21mg/L).

4.6. Dust / Particulates Monitoring

VES undertakes onsite dust monitoring at one location within the IMF site boundary. Monitoring was undertaken continuously and samples collected monthly to meet the requirements of EPL 11455.

4.6.1. DG18 IMF

Results at DG18 (refer to Table T14 and Figure 48) indicate average levels of total solid matter is 1.25 g/m^2/month. The range of results is consistent with general total

solid matter trends. Due to enclosed handling of waste on a hardstand site, there does not appear to an operational source for the elevated dust levels.

5. Improvements to Environmental Performance

VES have implemented the proposed improvements identified in the previous AEMR. Additional improvements are suggested to enhance the environmental performance and reporting at the Bioreactor and IMF:

- Implementation of recommendations within the site odour audit, focussing on the processing of untreated leachate stored in Evaporation Dam 3 over the next reporting period as identified by an independent odour assessor.
- Continue to develop and implement a Mechanical Biological Treatment Facility top enhance soil quality and enhance rehabilitation activities at the site.
- Outsource at least one round of groundwater and surface water monitoring to an appropriately qualified consultant as a quality assurance method against current monitoring techniques.
- Organise a licence variation following a review monitoring requirements in EPL and mining lease to justify the purpose of monitoring all parameters at all current monitoring locations. This will ensure that monitoring data collected at each monitoring point is relevant to the potential contamination (mining or waste operations).

REFERENCES

1. Earth2Water (2010). EPL - Annual Assessment of Woodlawn Bioreactor and Intermodal Facility Monitoring Data. 30 November 2010.
2. UK Environment Agency (2010). *Guidance for Monitoring Enclosed Landfill Gas Flares*. Version 2.1.
3. VES (2011). *Annual Environmental Monitoring Report – Woodlawn Bioreactor and Crisps Creek Intermodal Facility*. November 2011.

FIGURES

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Figure 1 - Nitrogen Oxides

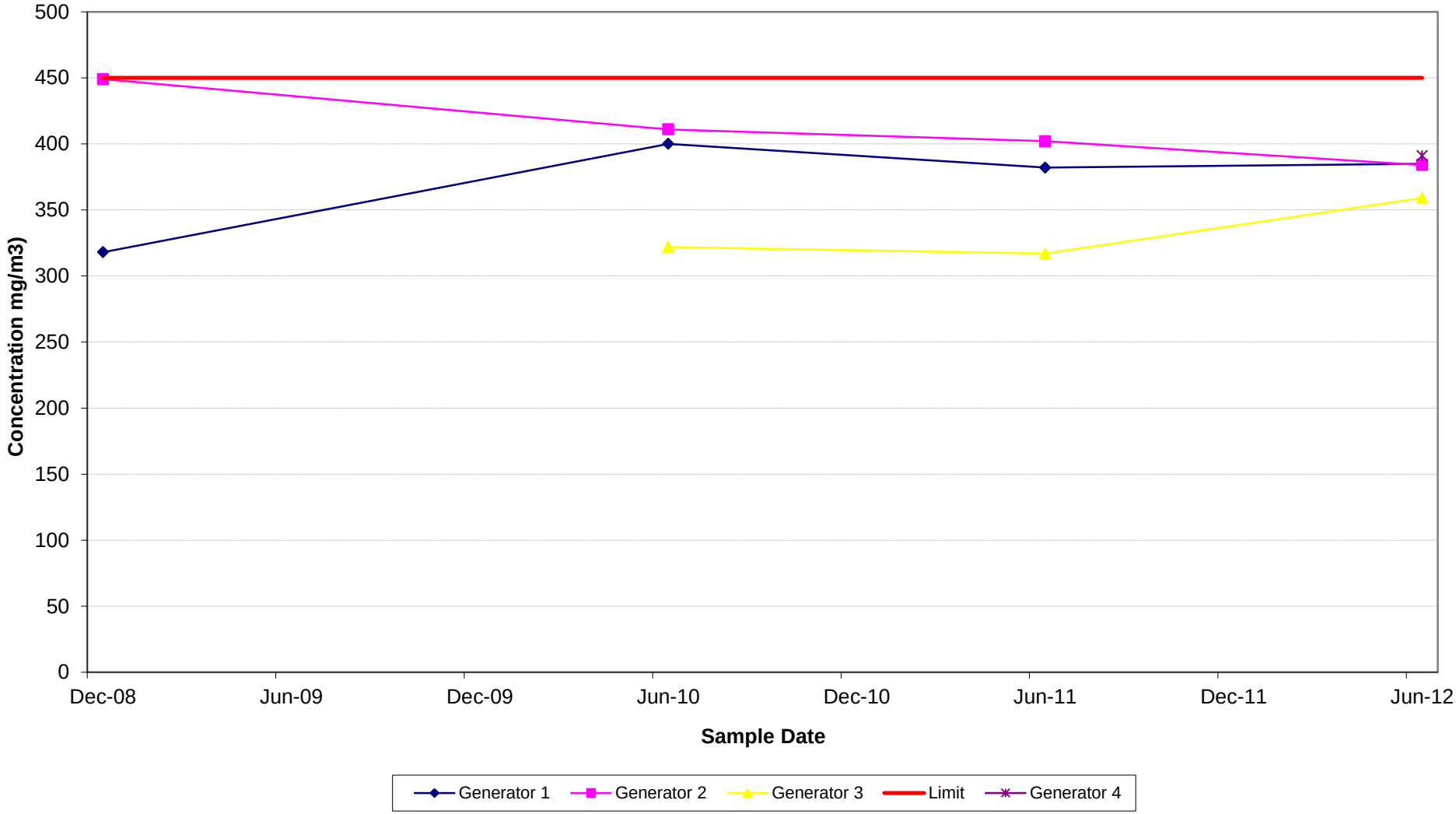


Figure 2 - Hydrogen Sulphide

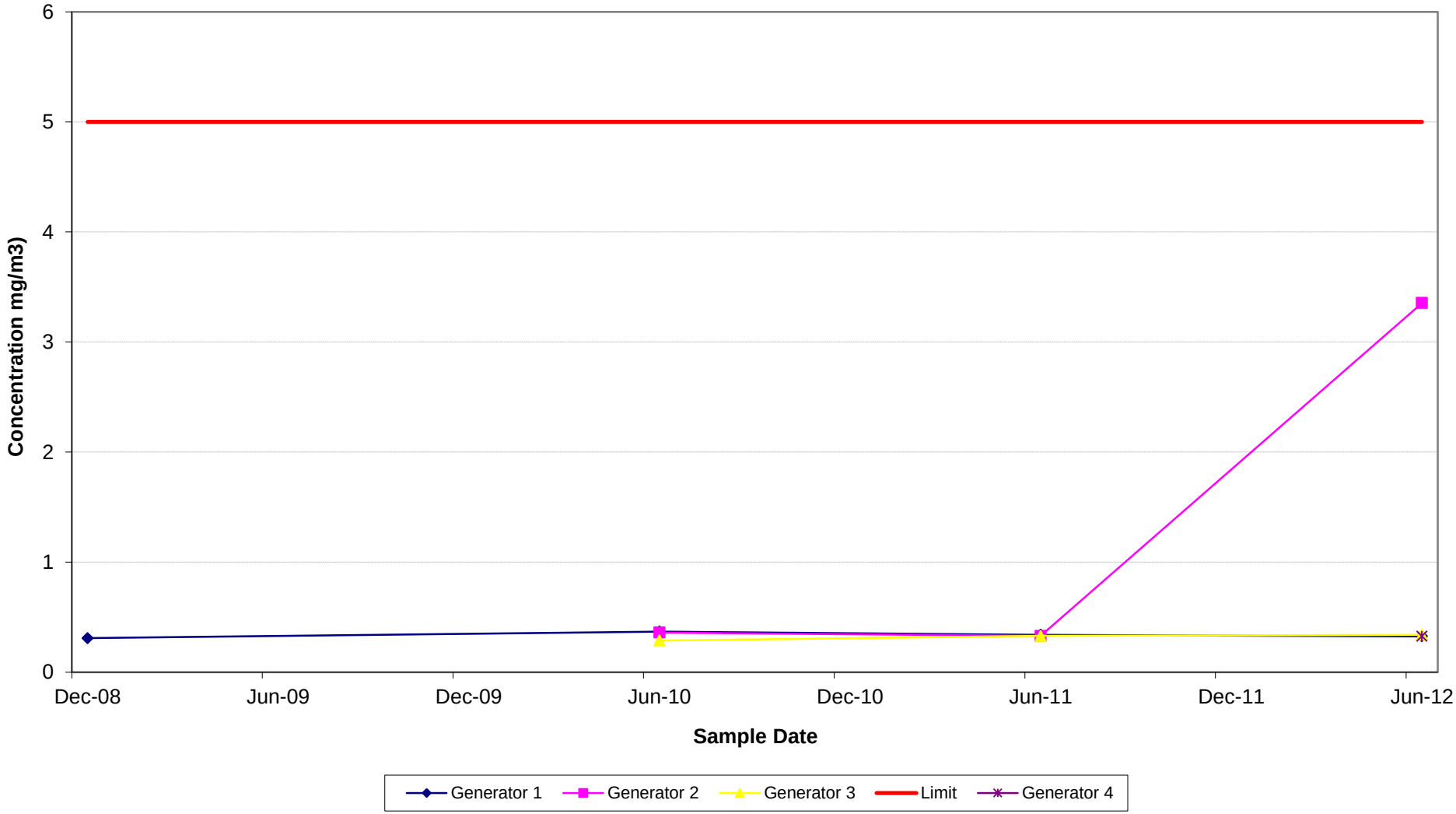


Figure 3 - Sulfuric Acid Mist & Sulfur Trioxide

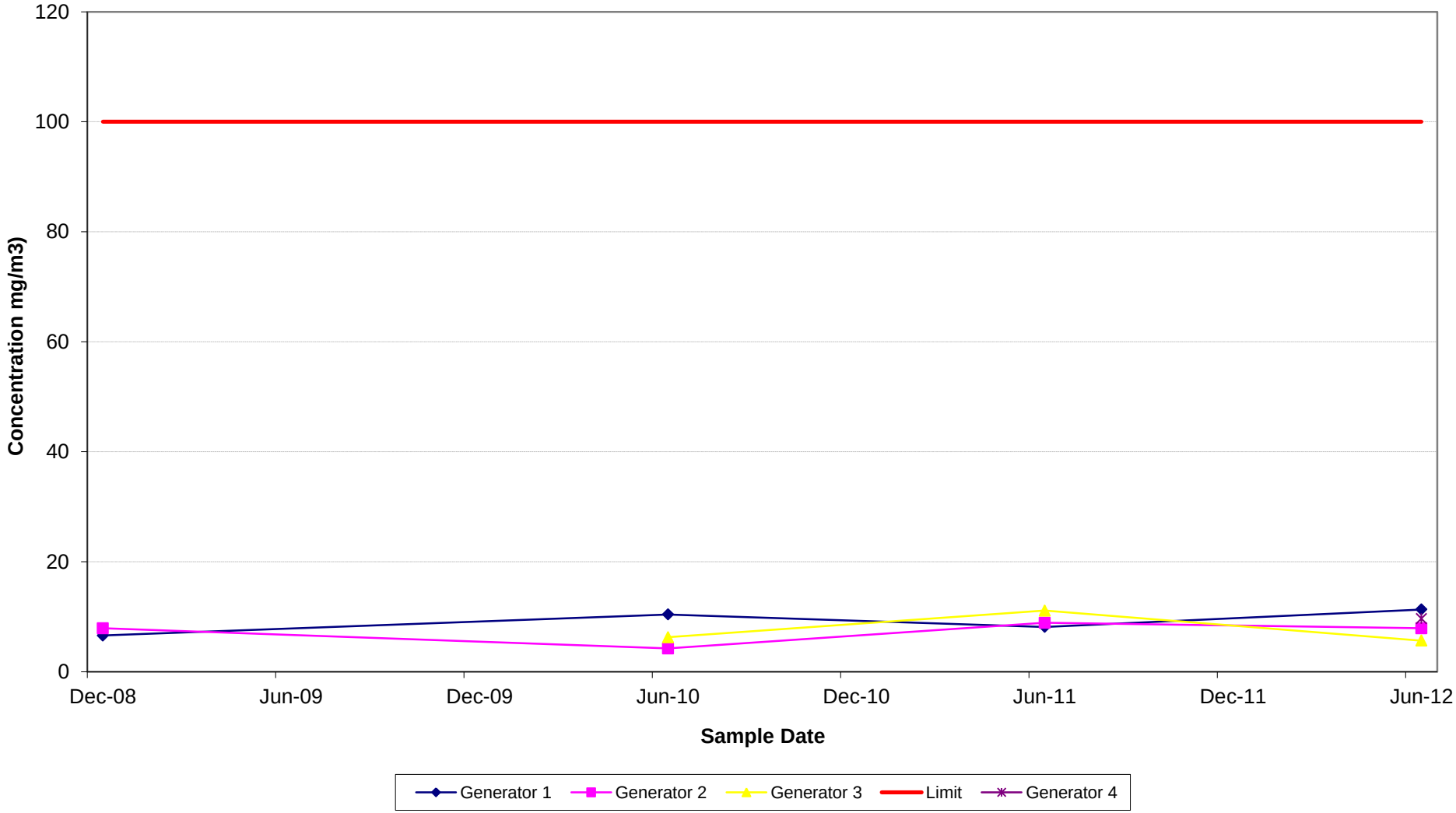


Figure 4 - Depositional Dust Levels

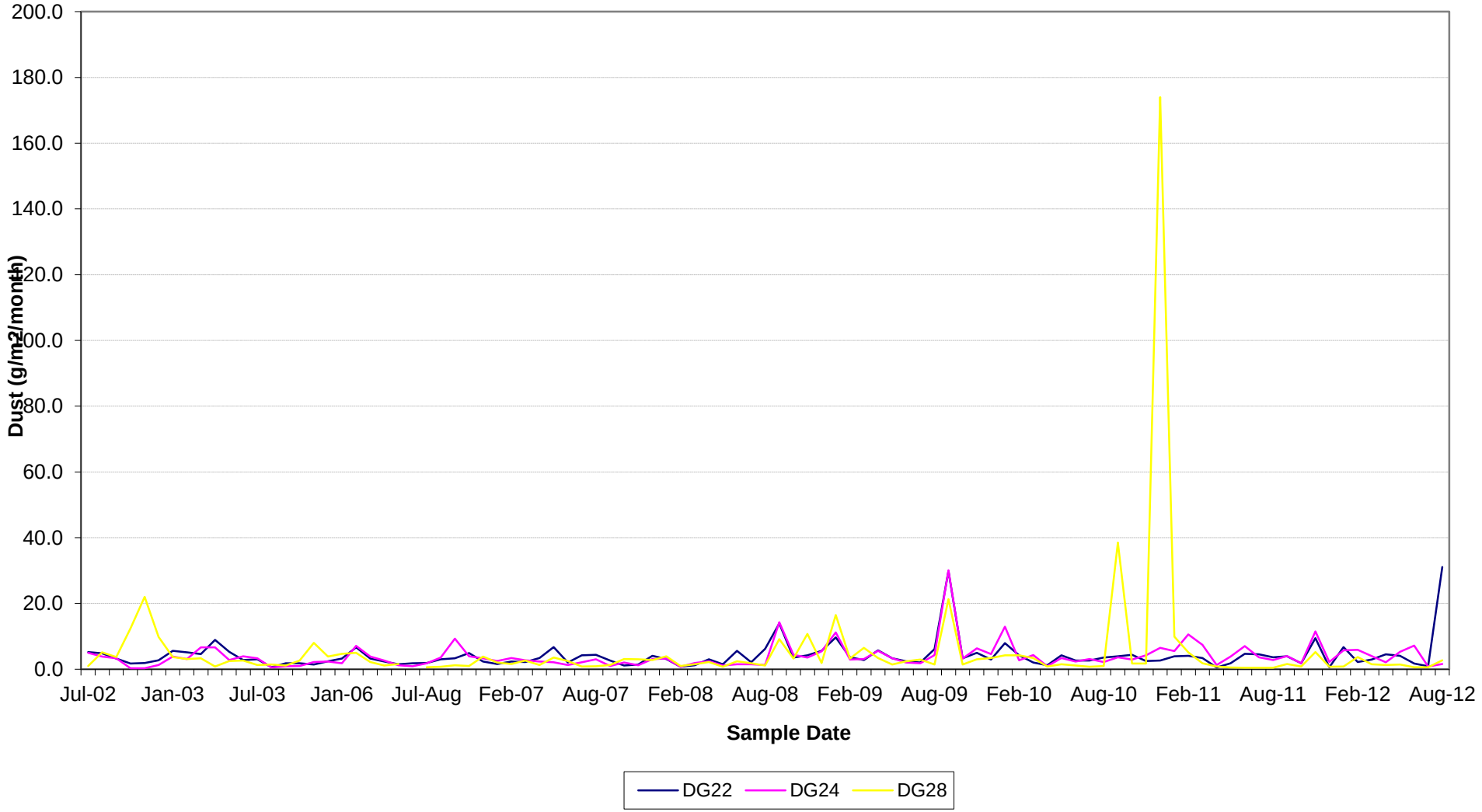


Figure 5 - Surface Water Trends - Site 115

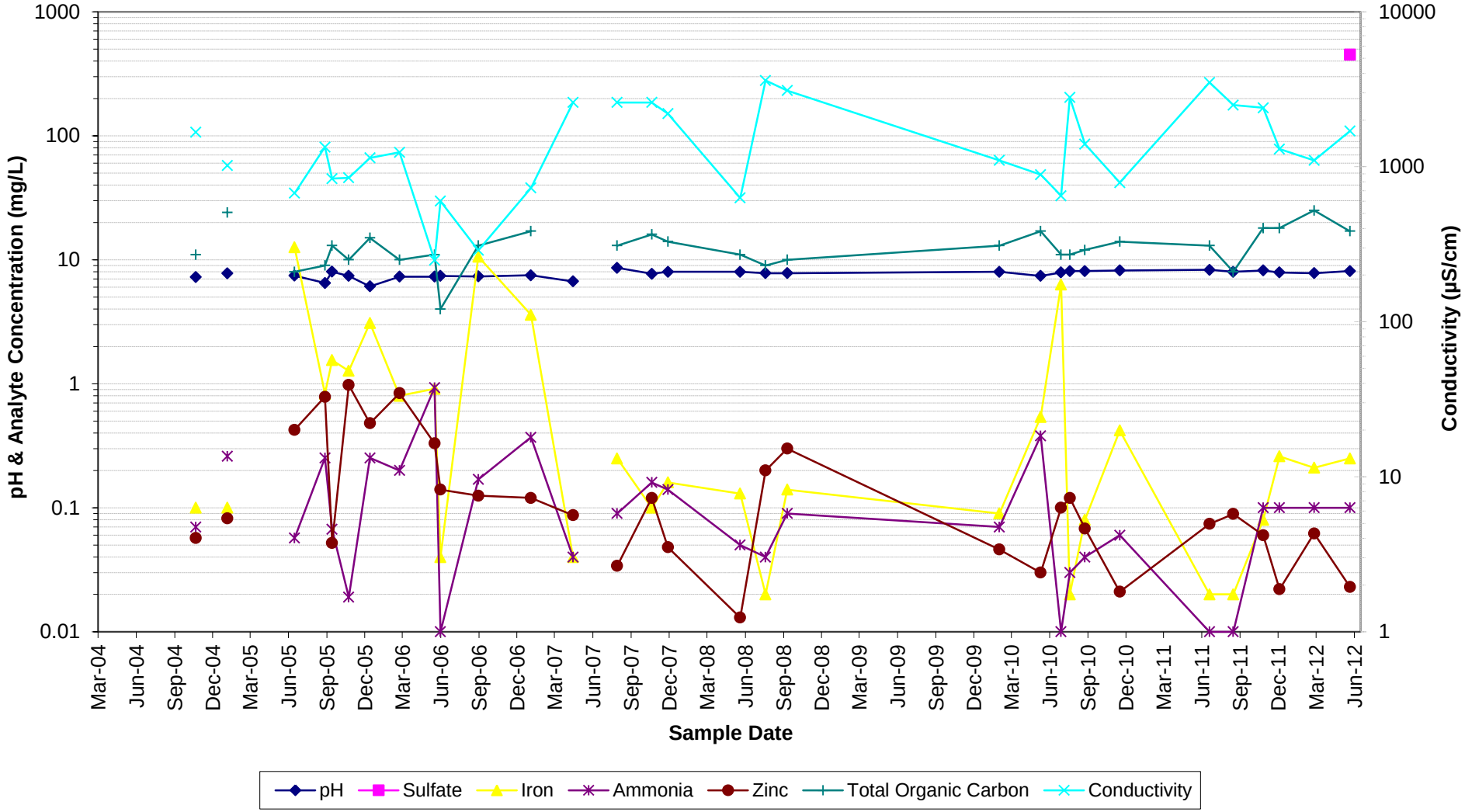


Figure 6 - Surface Water Trends - Spring 2

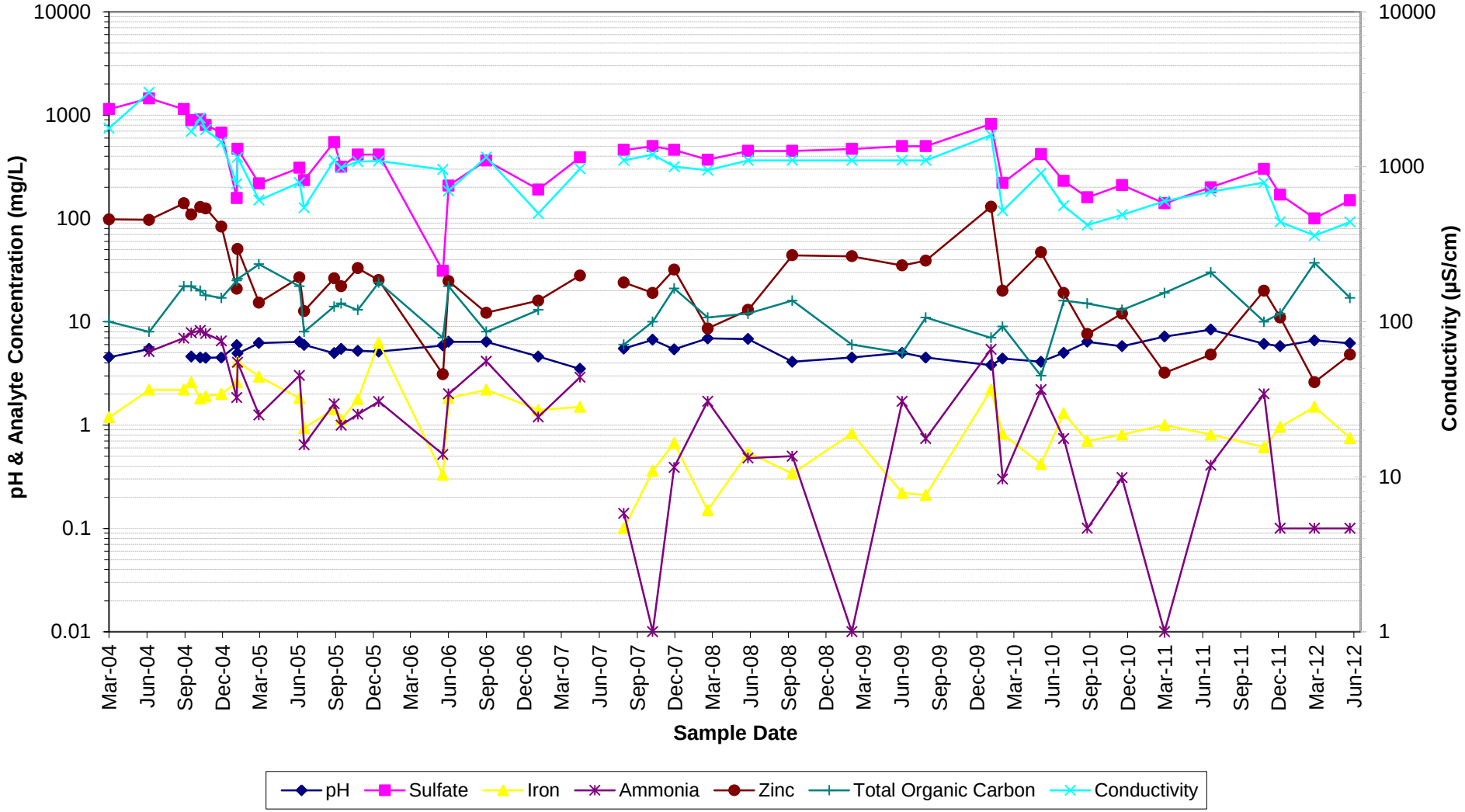


Figure 7 - Surface Water Trends - Site 105

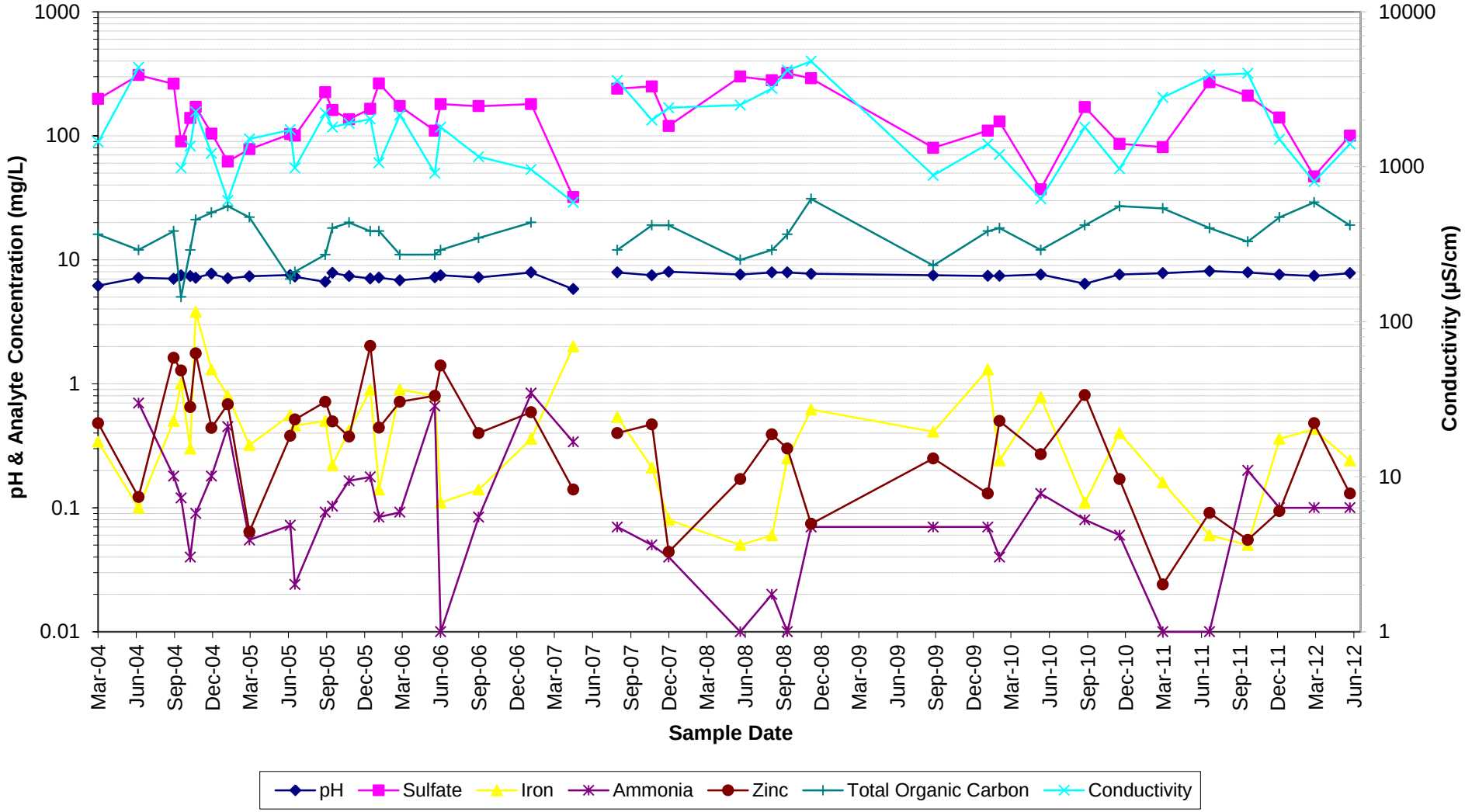


Figure 8 - Surface Water Trends - WM200

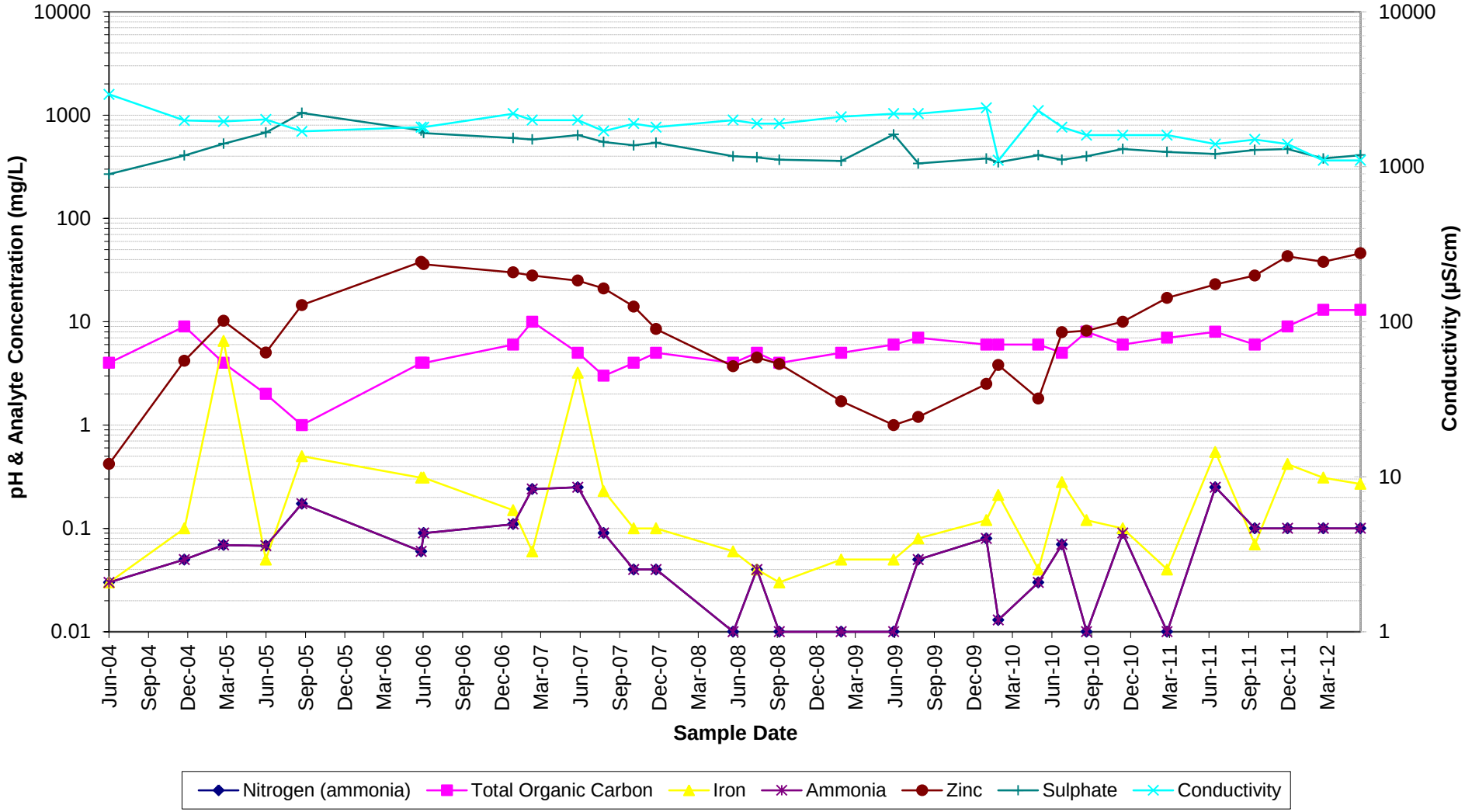


Figure 9 - Surface Water Trends - WM201

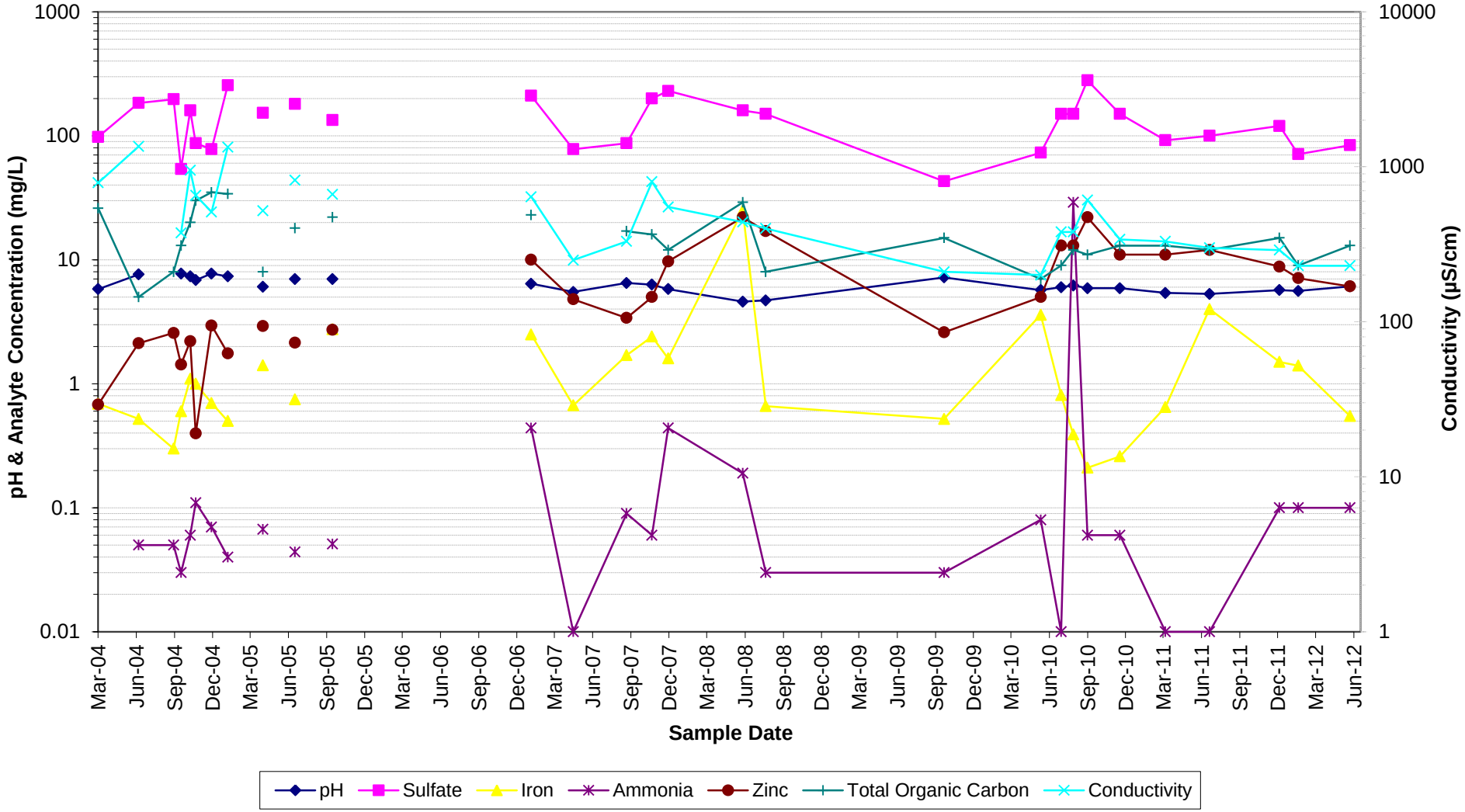


Figure 10 - Surface Water Trends - WM202

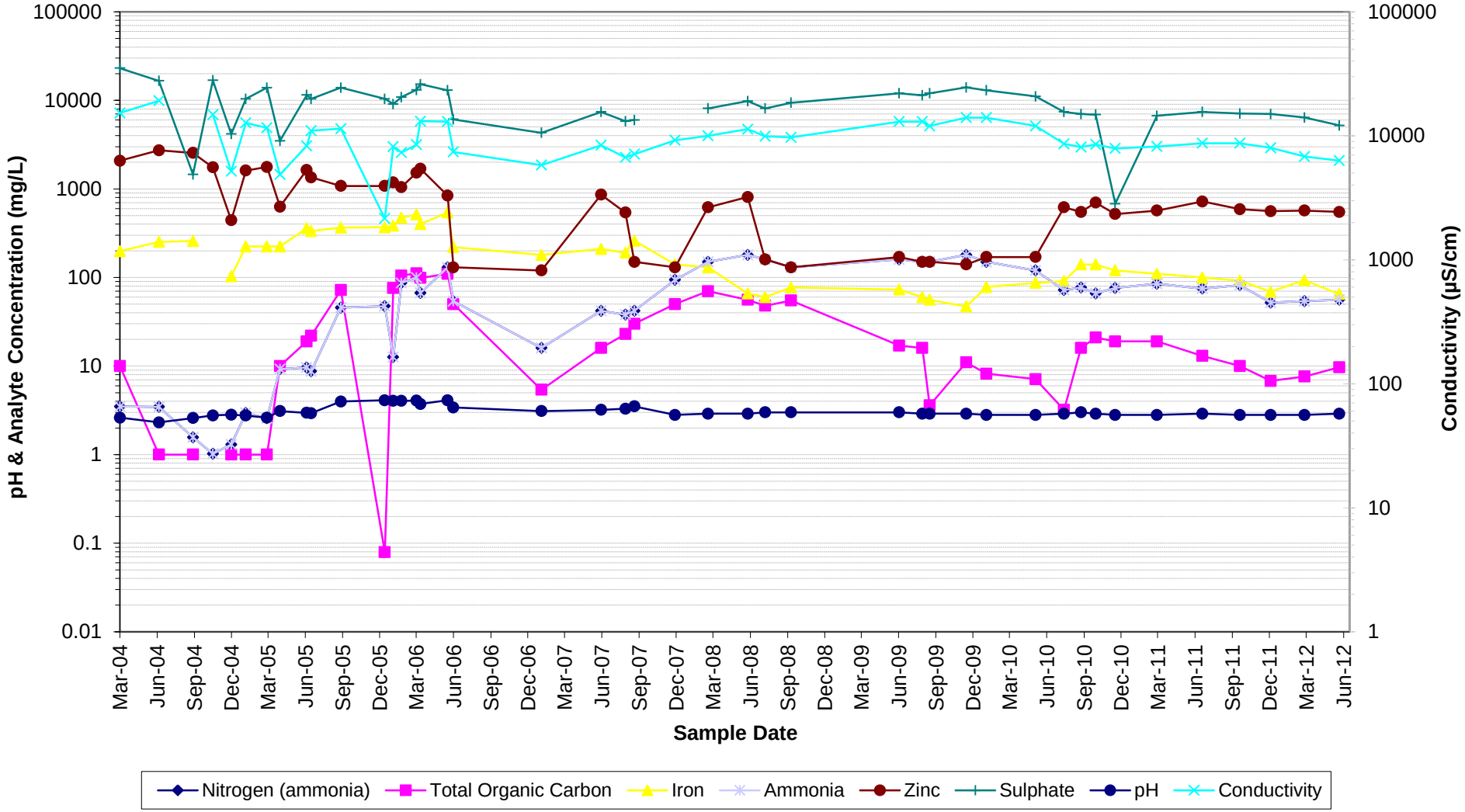


Figure 11 - Surface Water Trends - WM203

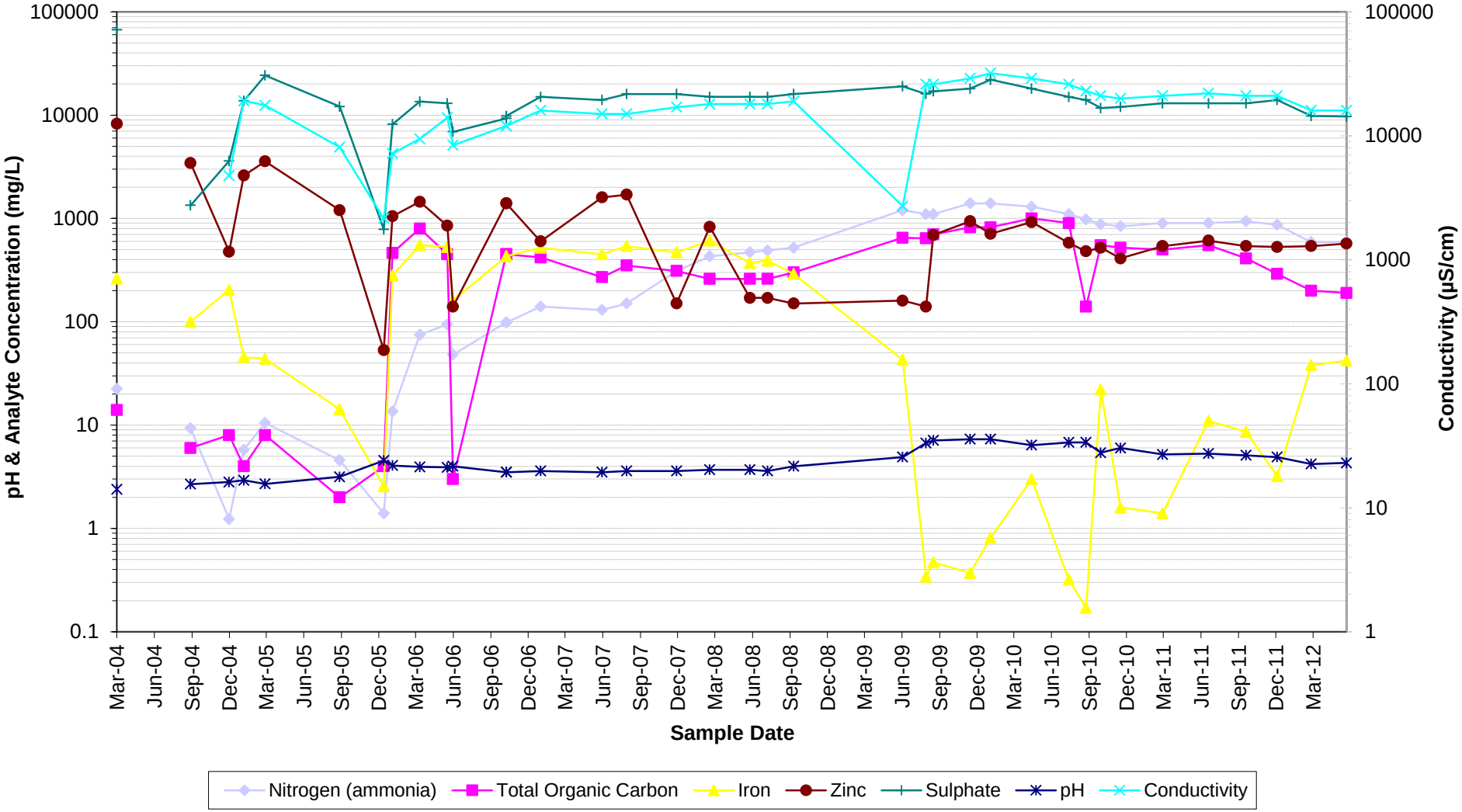


Figure 13 - Surface Water Trends - Pond 3

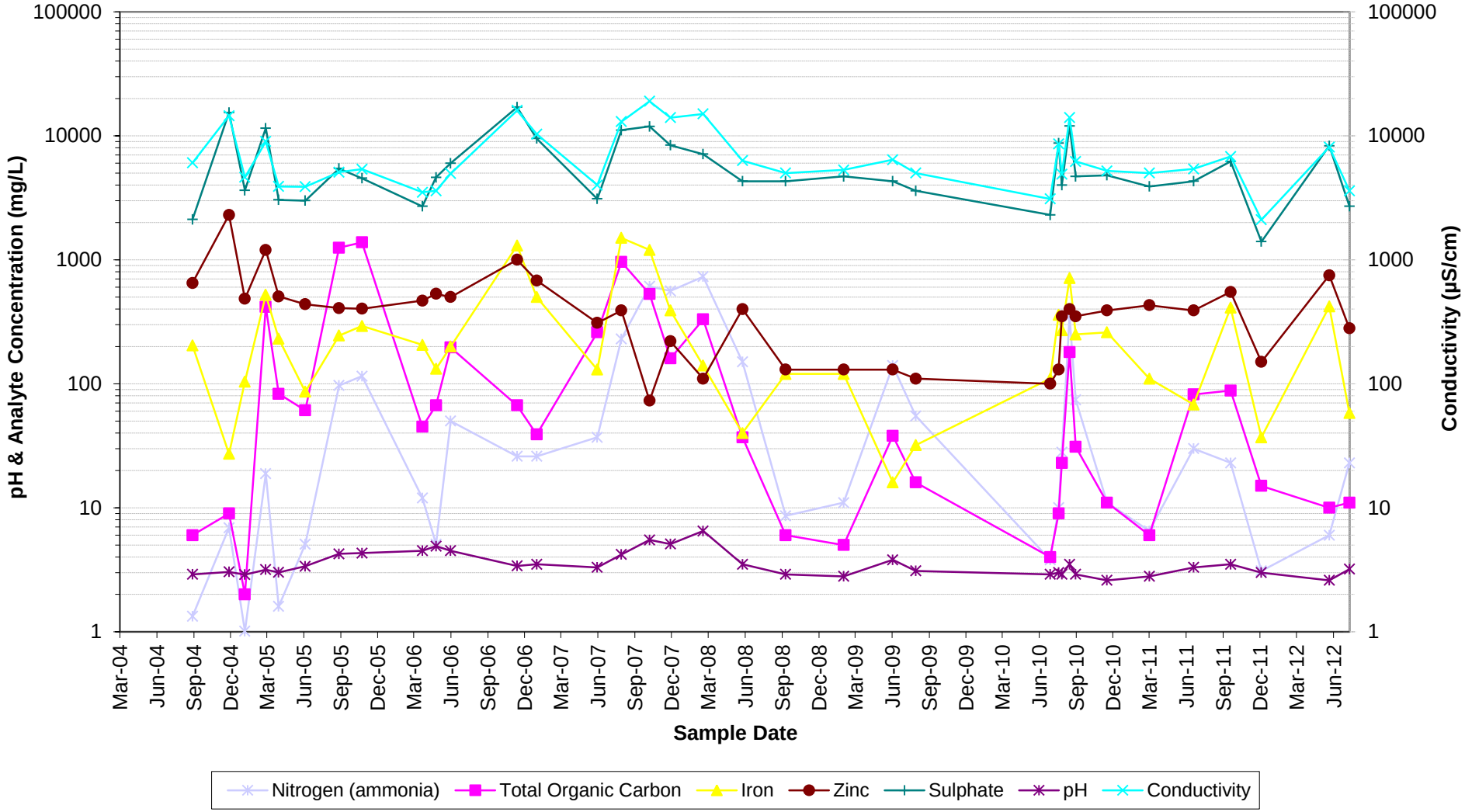


Figure 14 - Leachate Trends - Leachate Pond

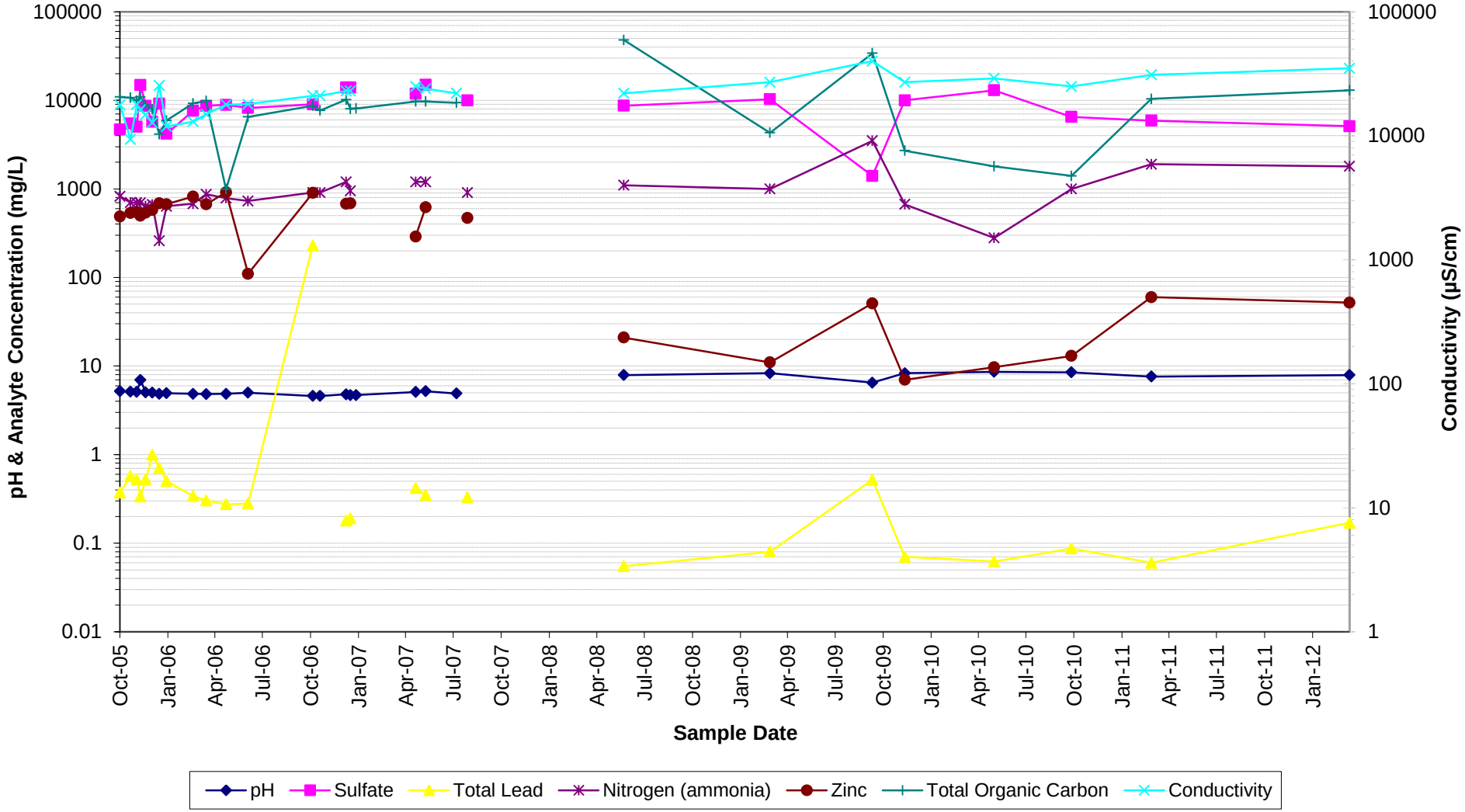


Figure 15 - Leachate Trends - Leachate Recirculation System

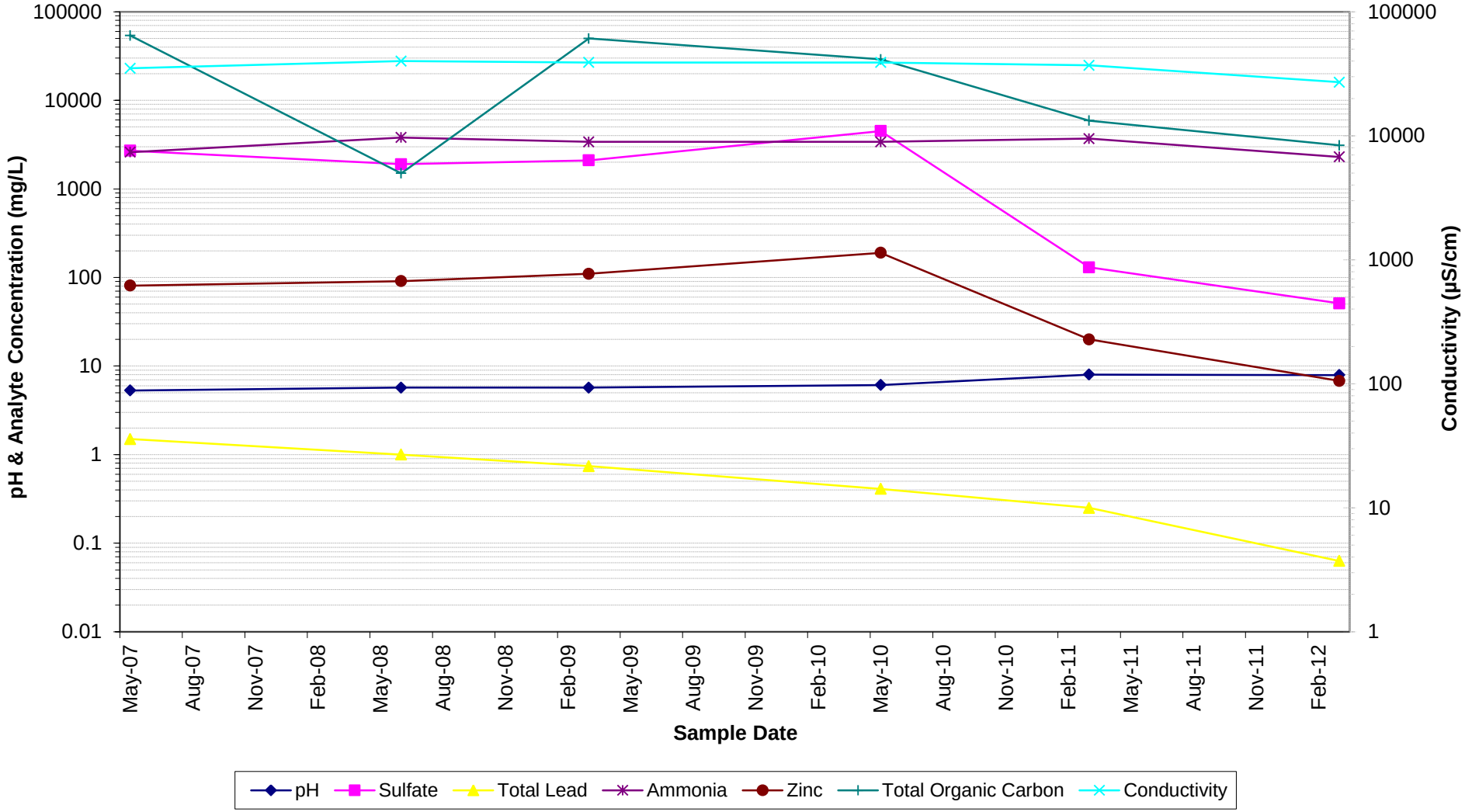


Figure 16.1 - Groundwater Levels - MB1 - MB17 & ED3B

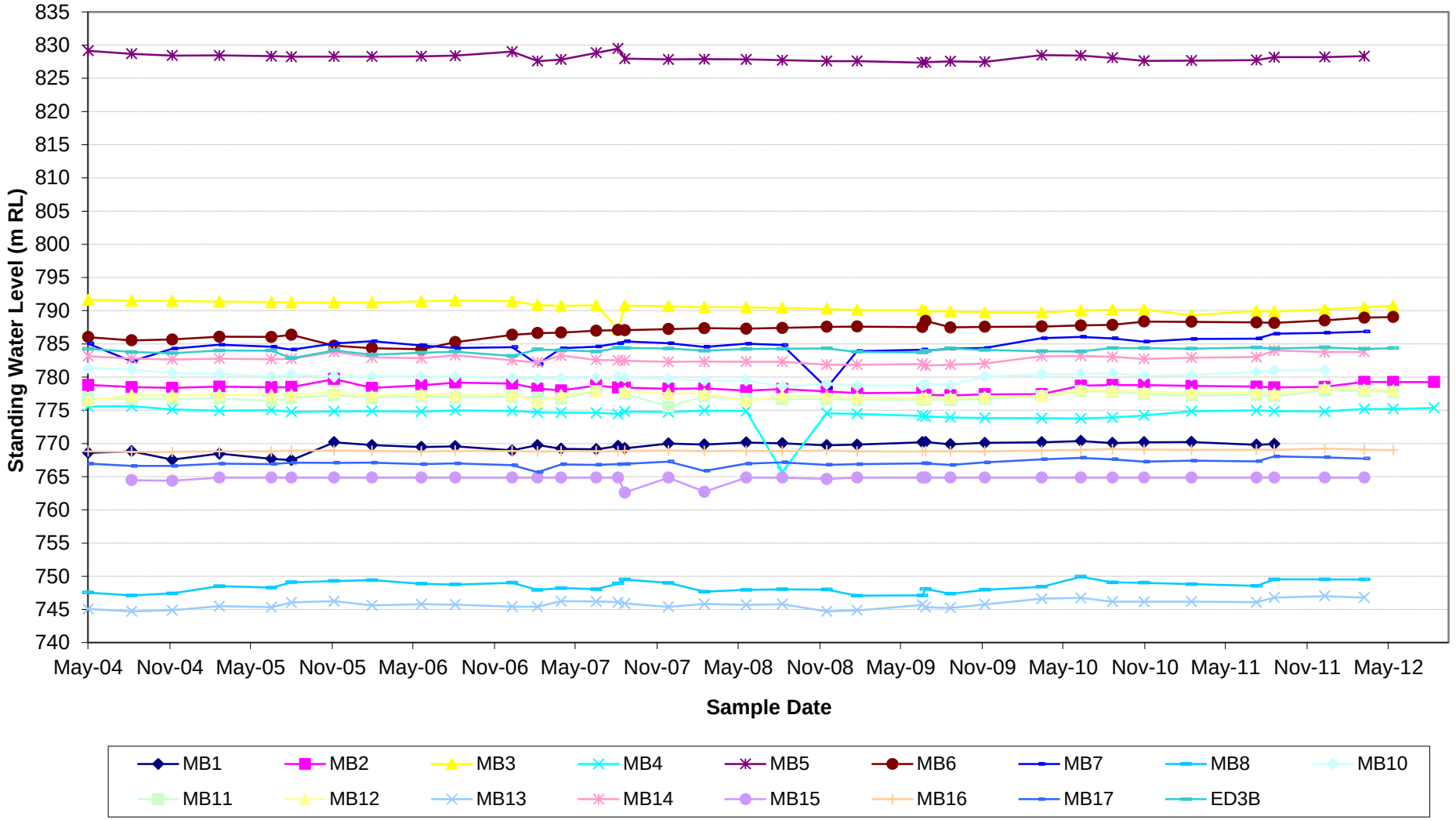


Figure 16.2 - Groundwater Levels - WM1 - WM6

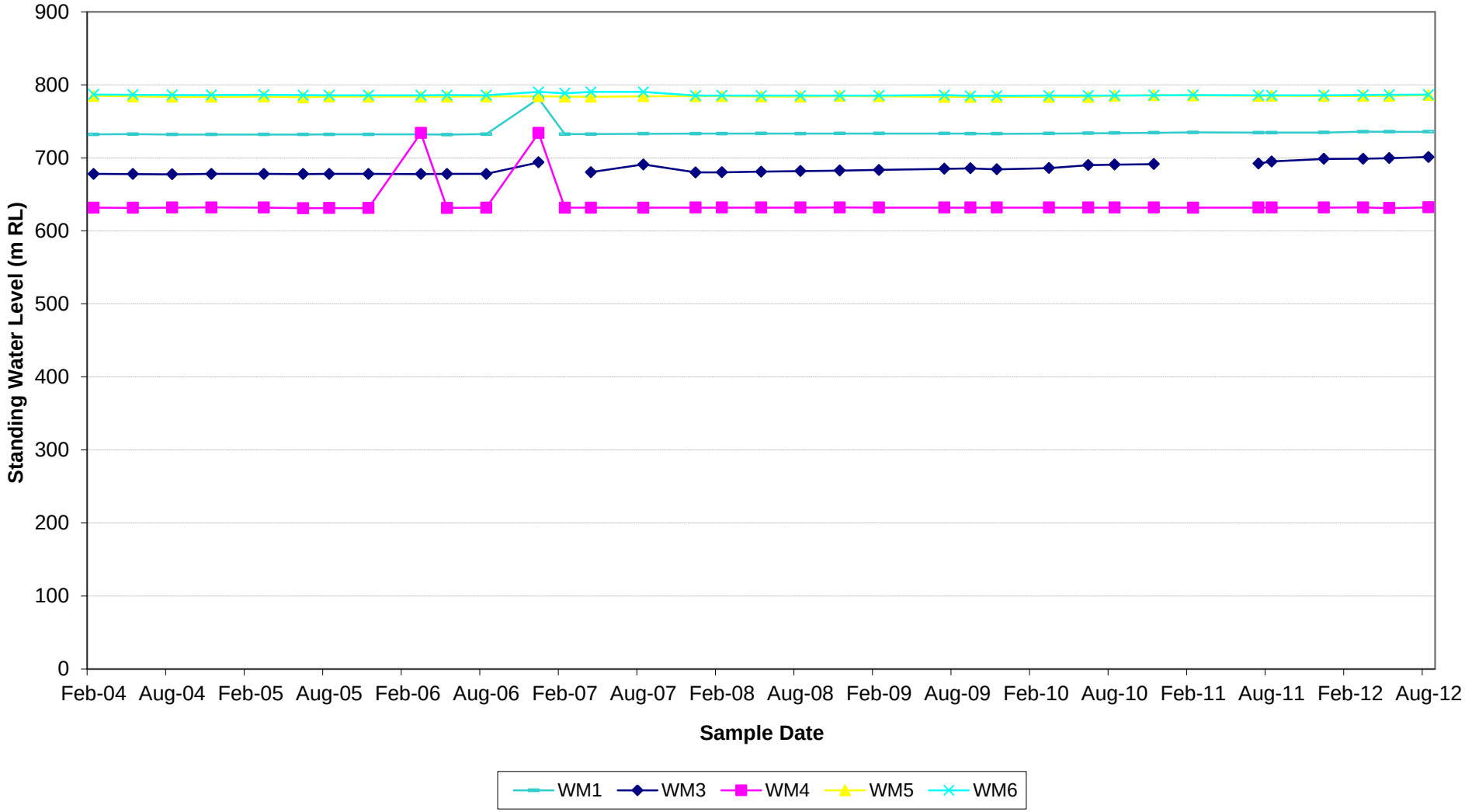


Figure 16.3 - Groundwater Levels - MW8S - MW10S

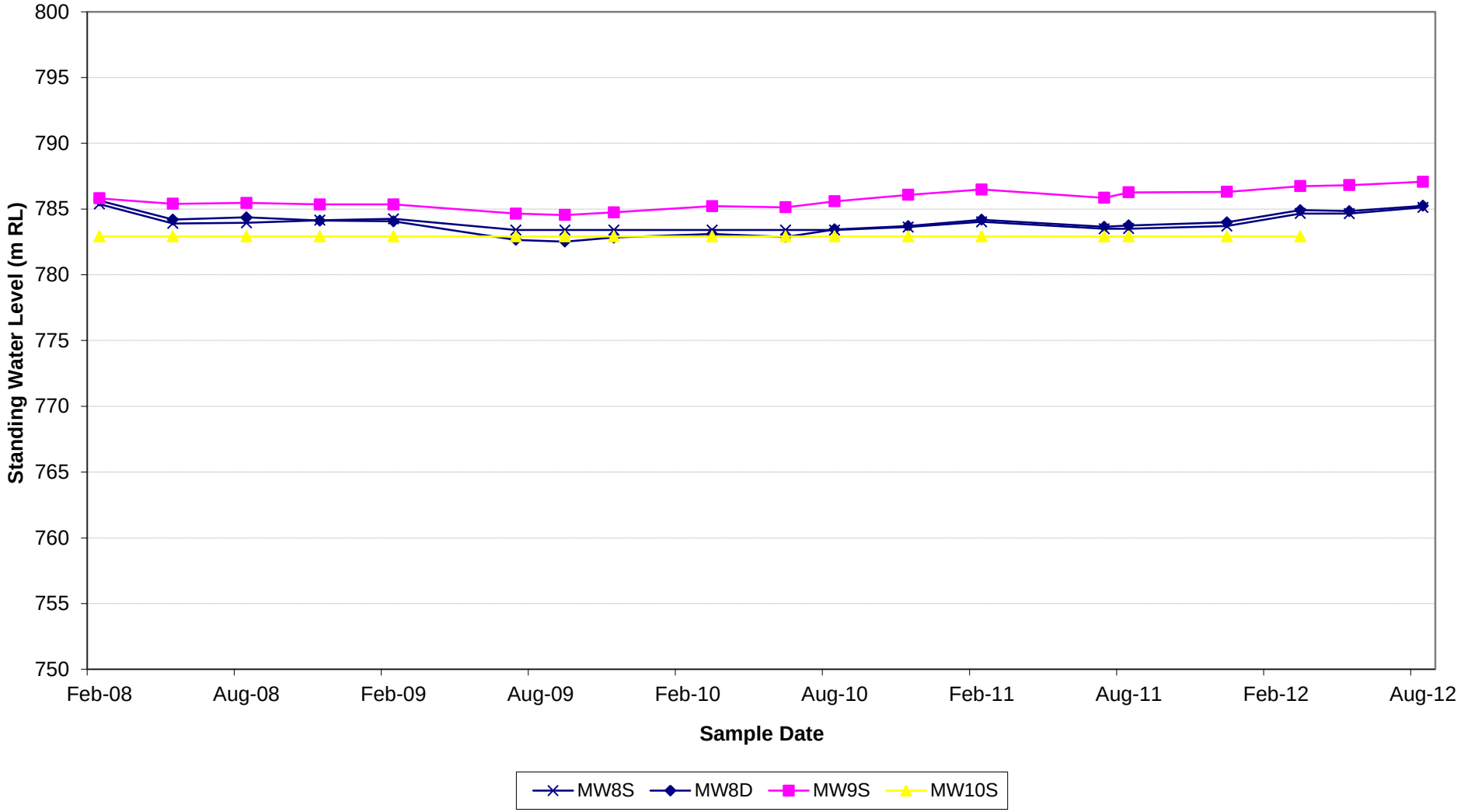


Figure 17 - Groundwater Trends - MB1

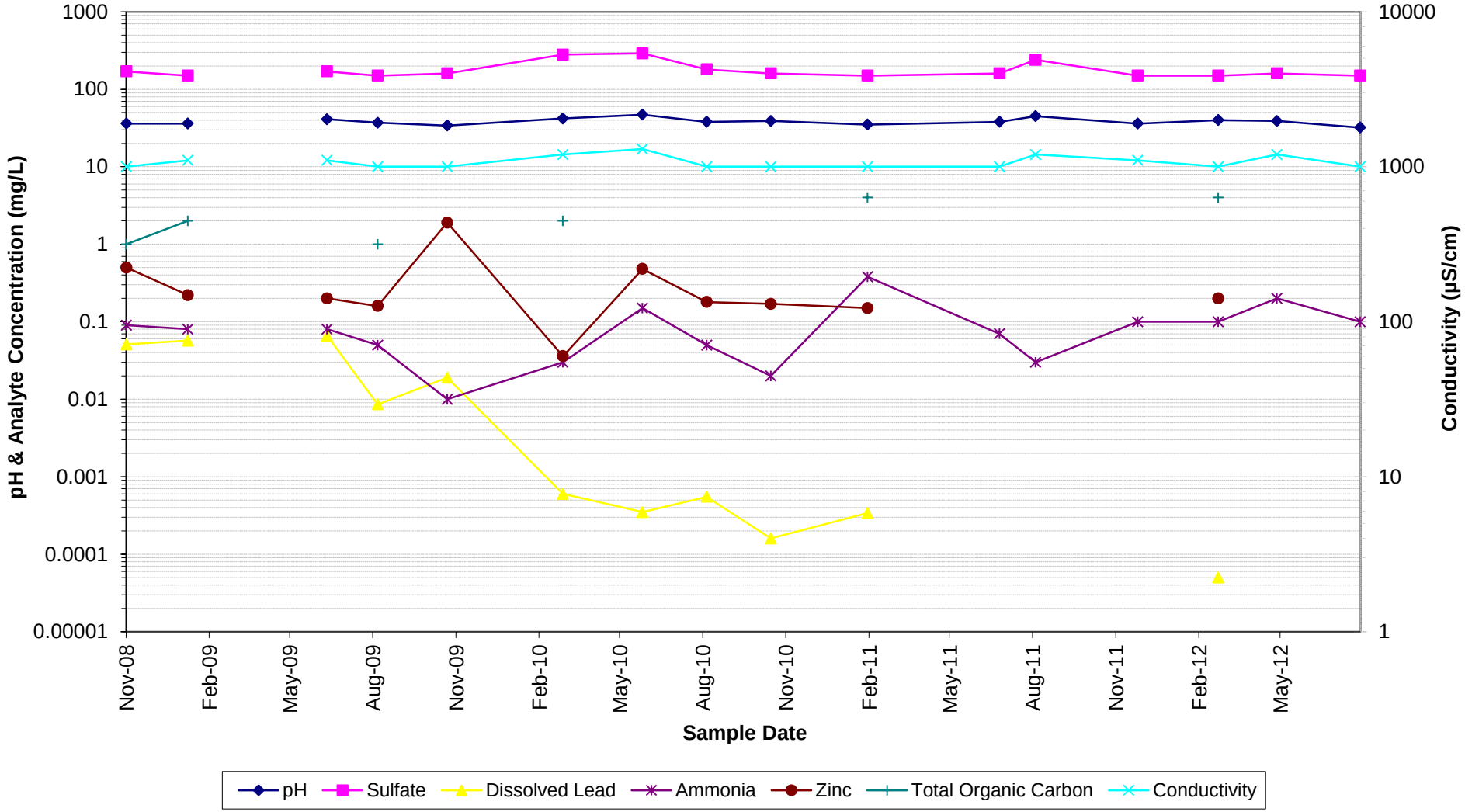


Figure 18 - Groundwater Trends - MB2

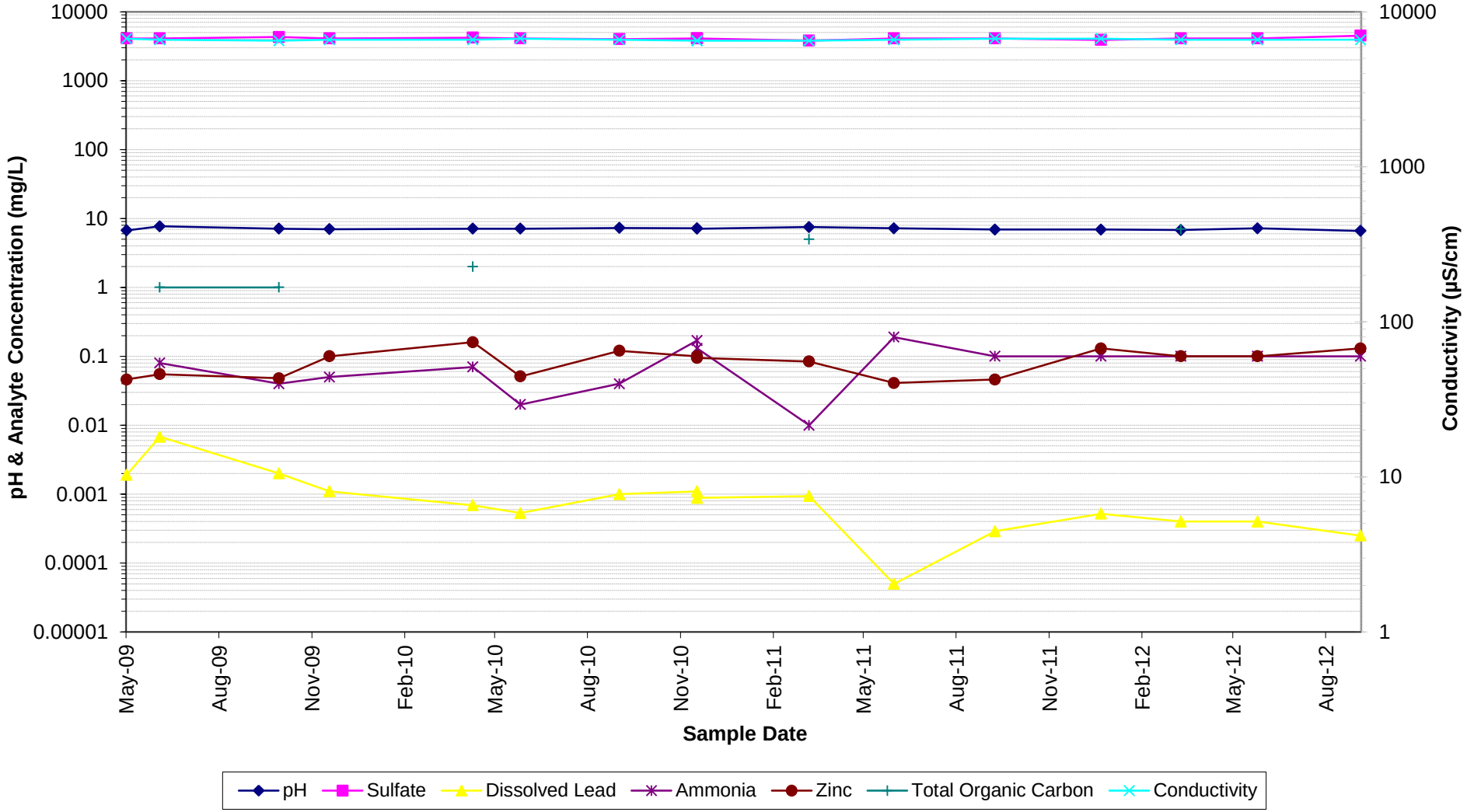


Figure 19 - Groundwater Trends - MB3

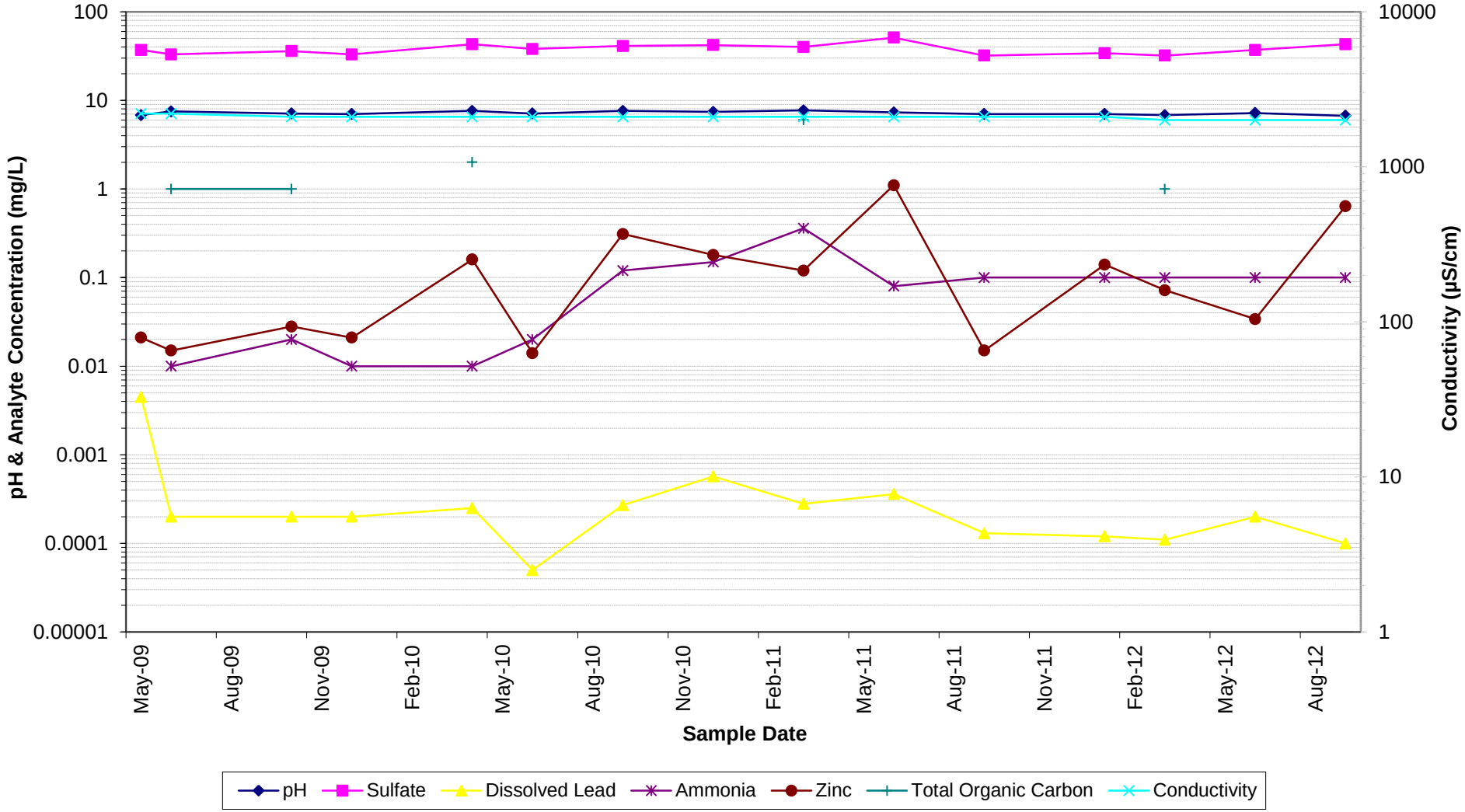


Figure 20 - Groundwater Trends - MB4

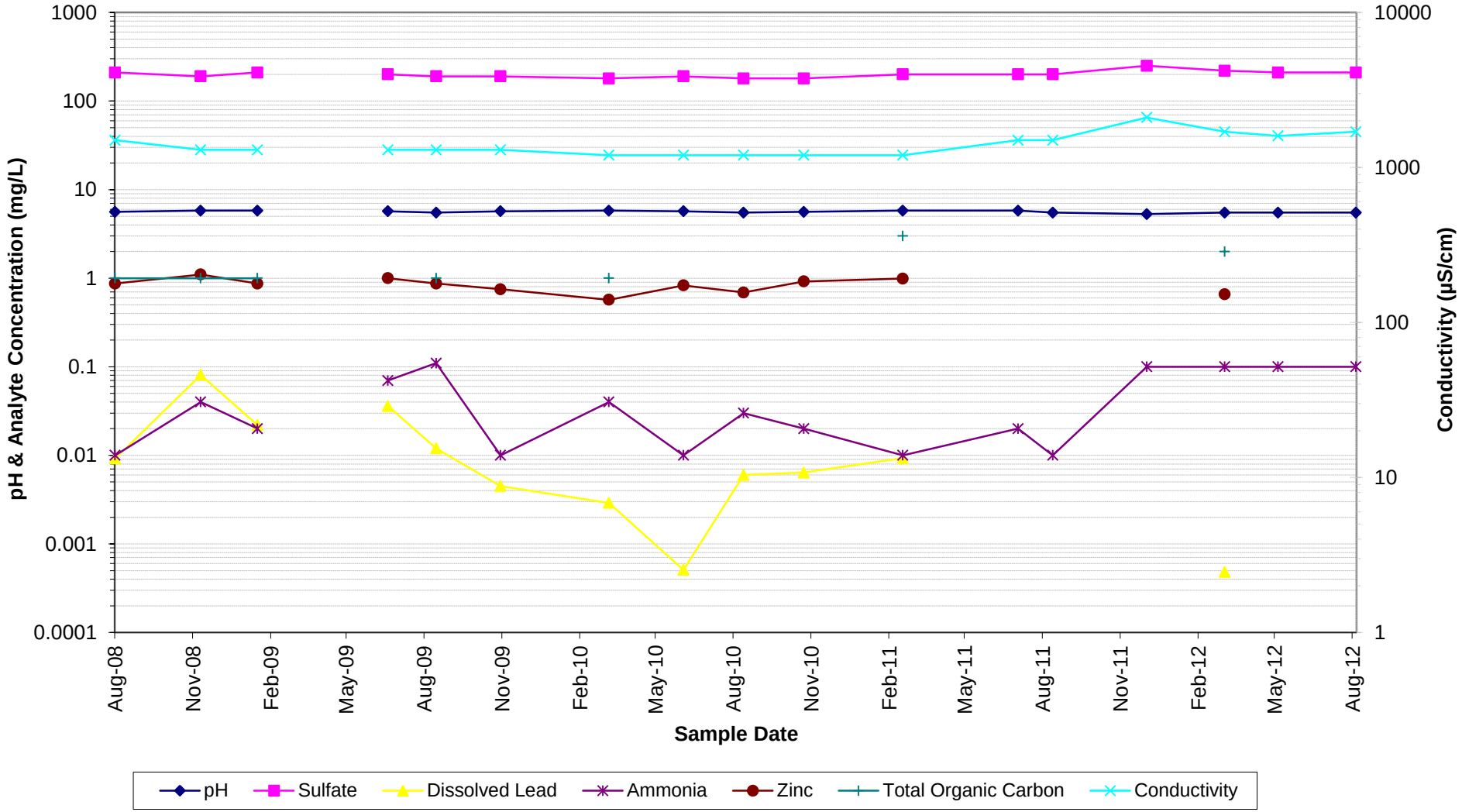


Figure 21 - Groundwater Trends - MB5

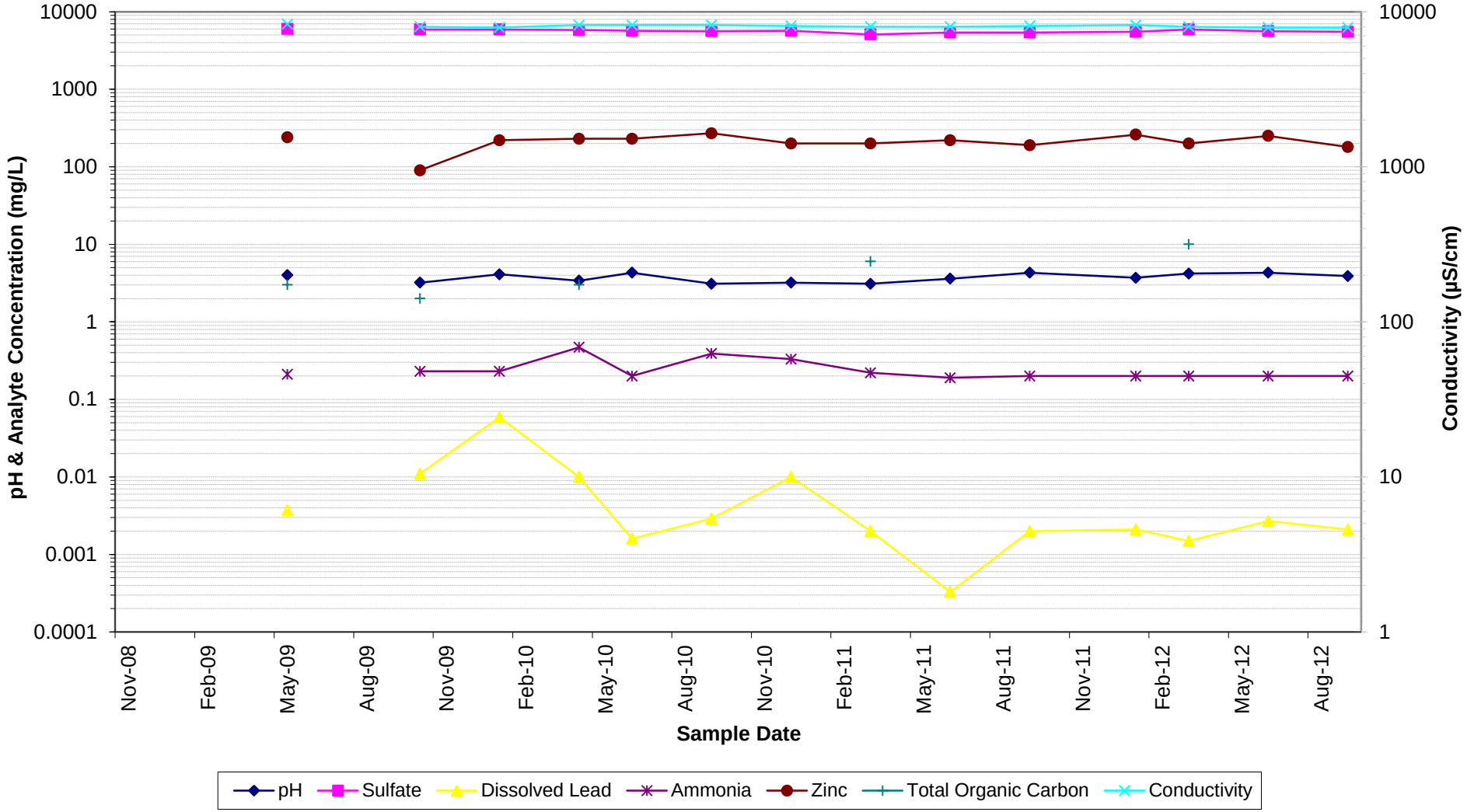


Figure 22 - Groundwater Trends - MB6

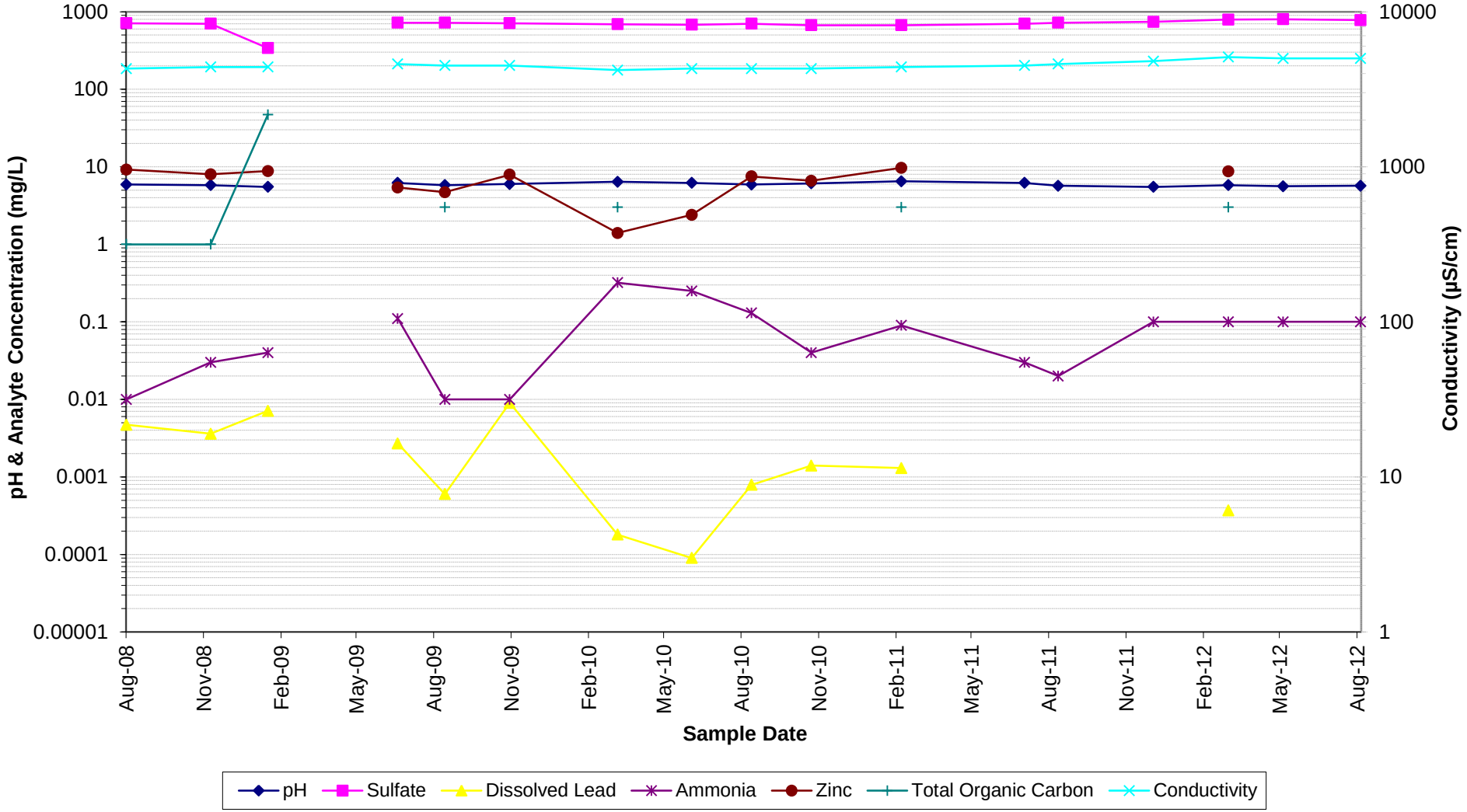


Figure 23 - Groundwater Trends - MB7

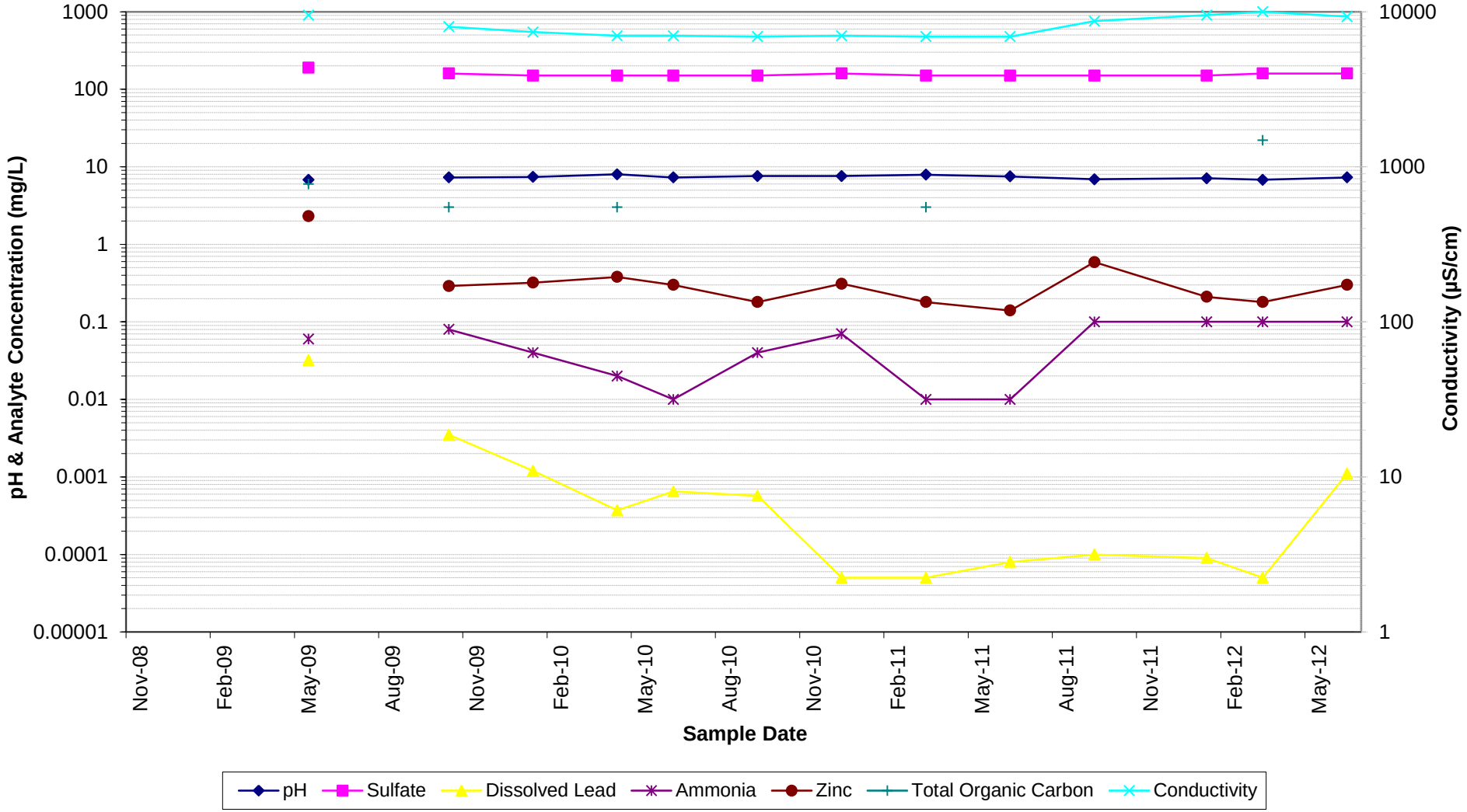


Figure 24 - Groundwater Trends - MB8

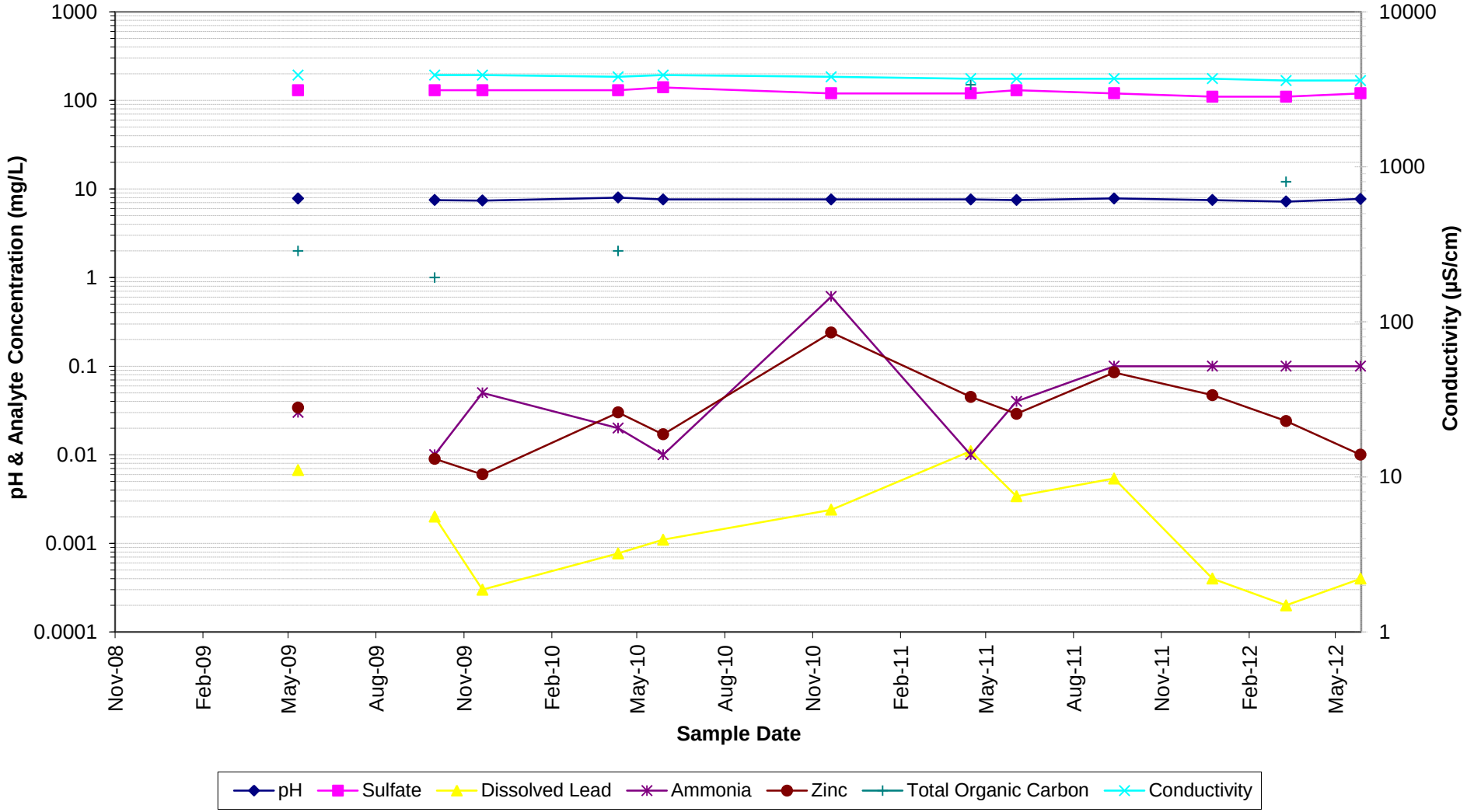


Figure 25 - Groundwater Trends - MB10

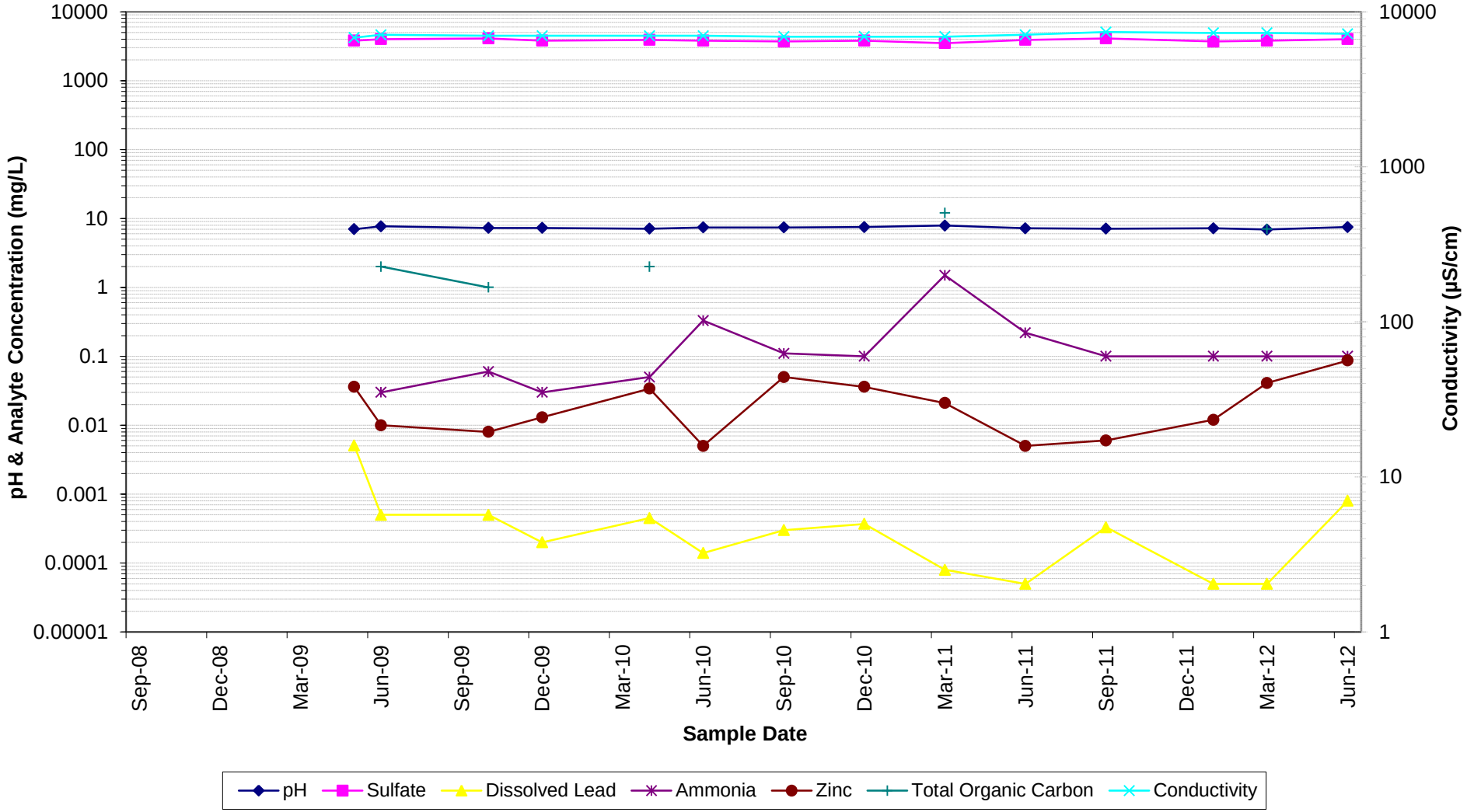


Figure 26 - Groundwater Trends - MB11

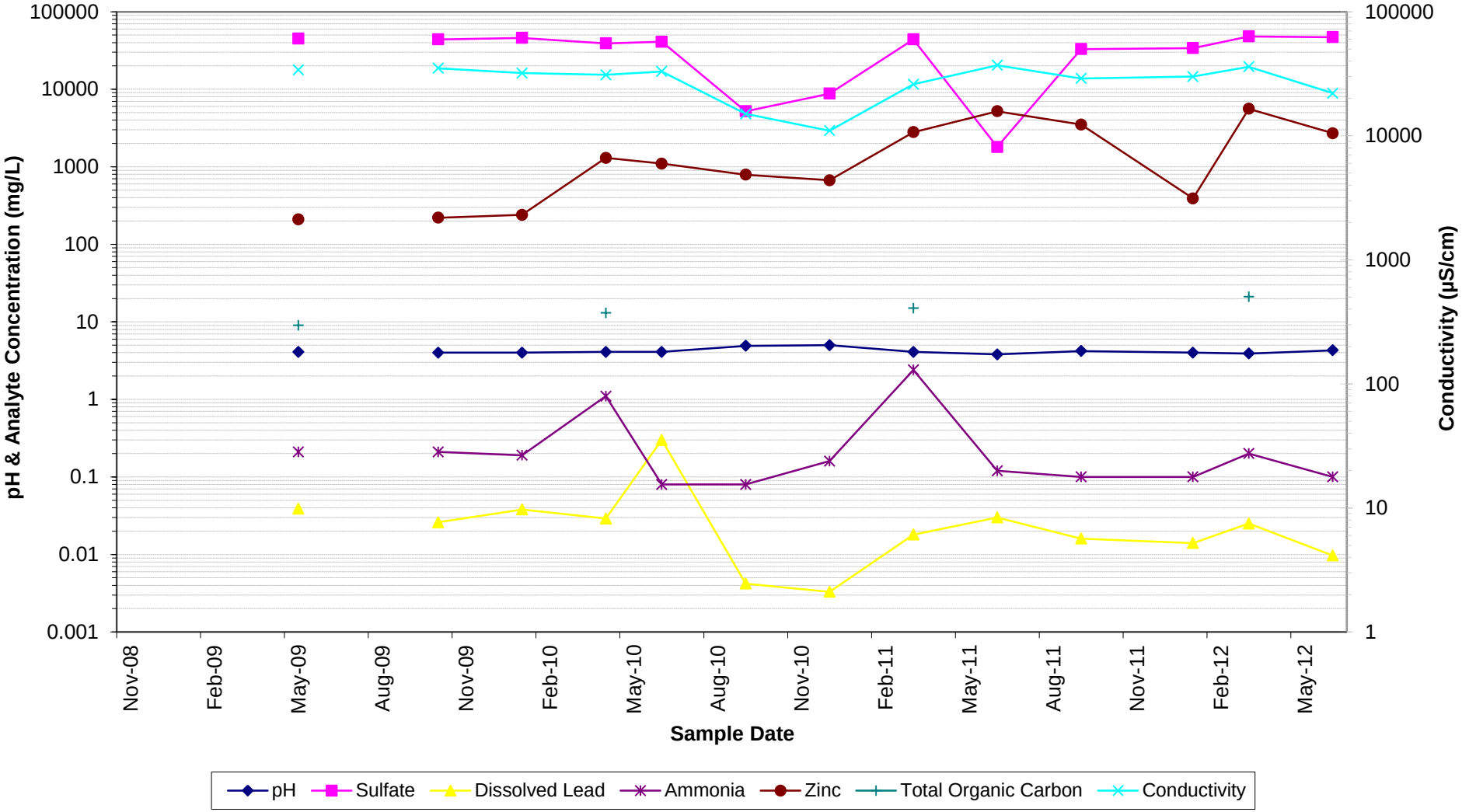


Figure 27 - Groundwater Trends - MB12

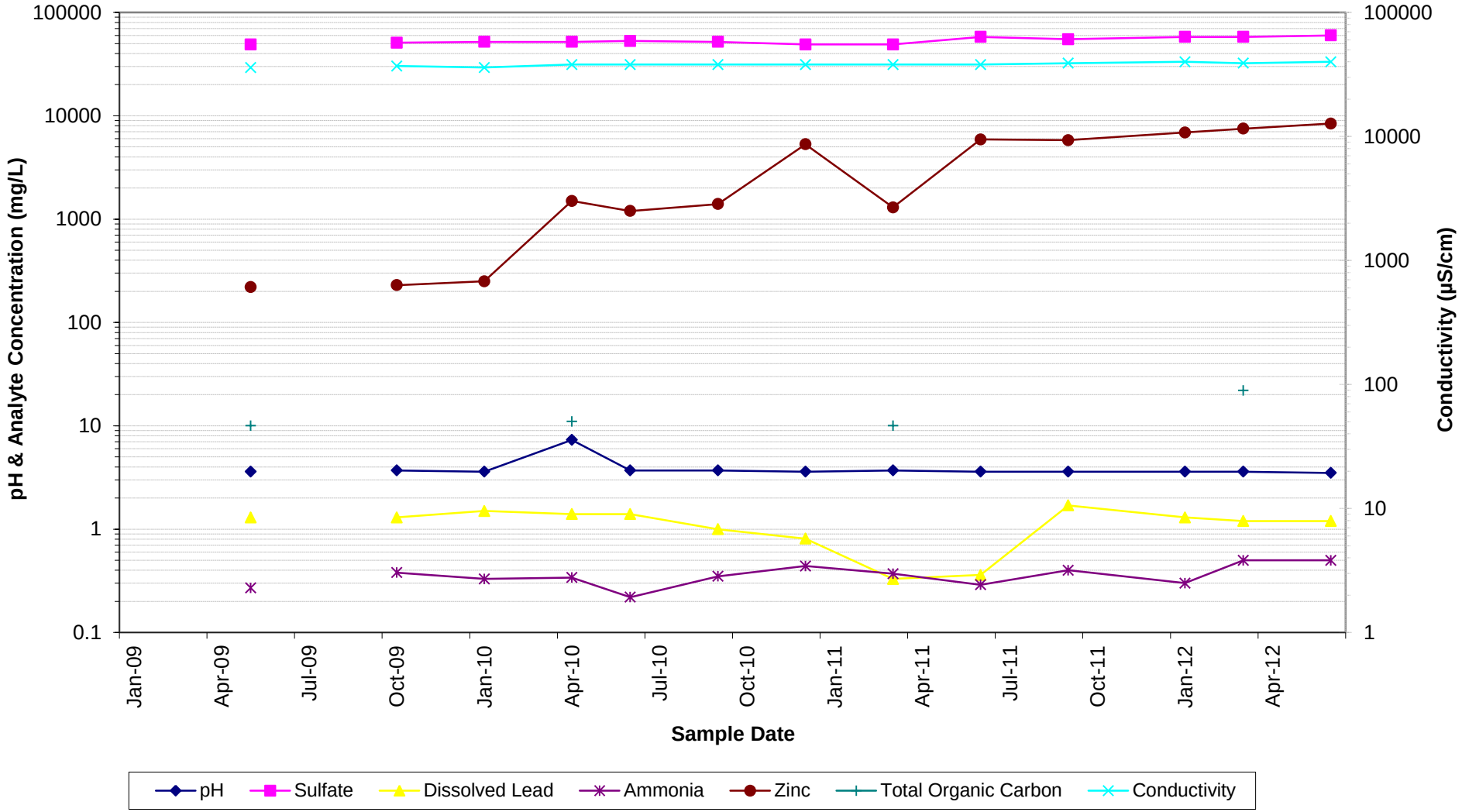


Figure 28 - Groundwater Trends - MB13

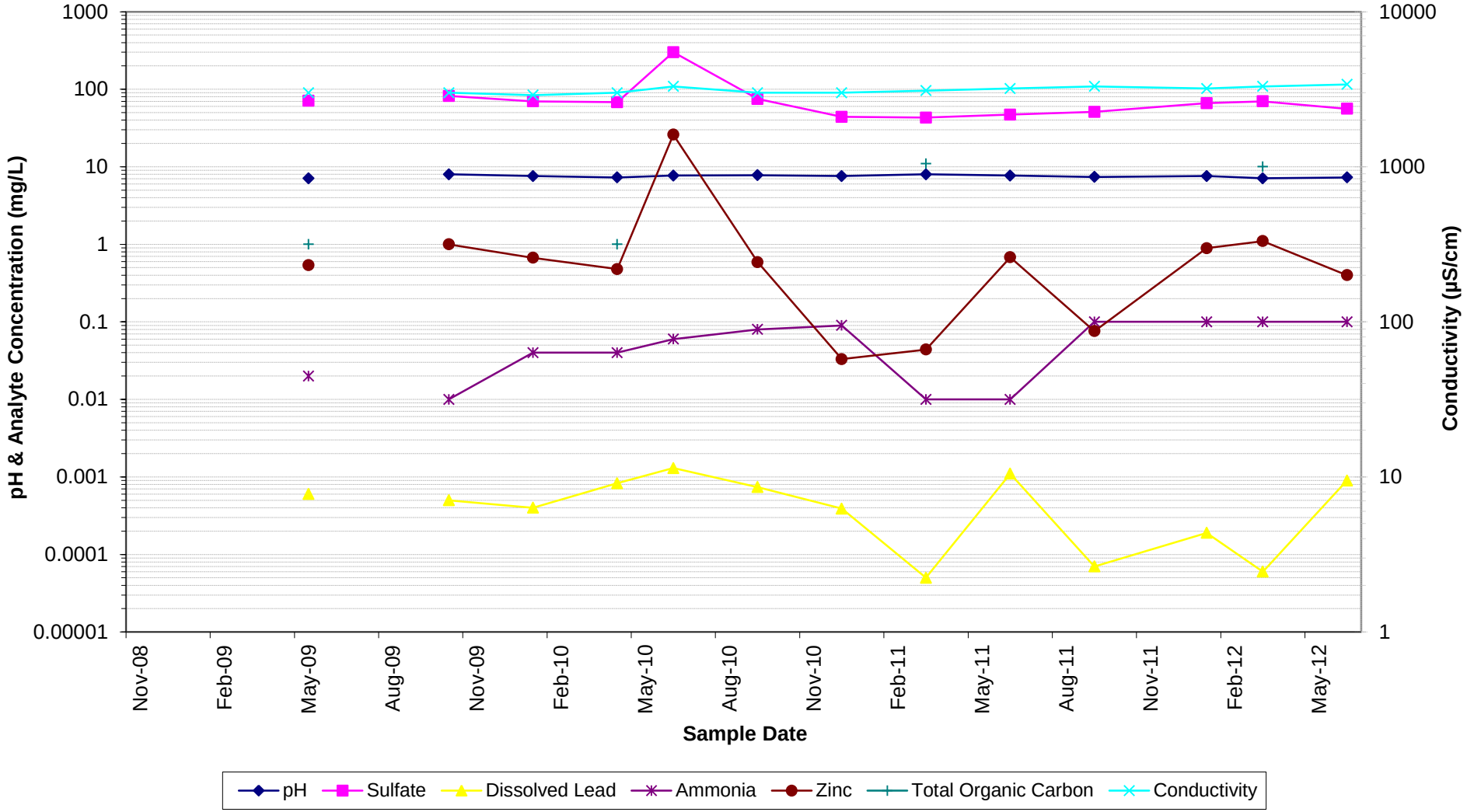


Figure 29 - Groundwater Trends - MB14

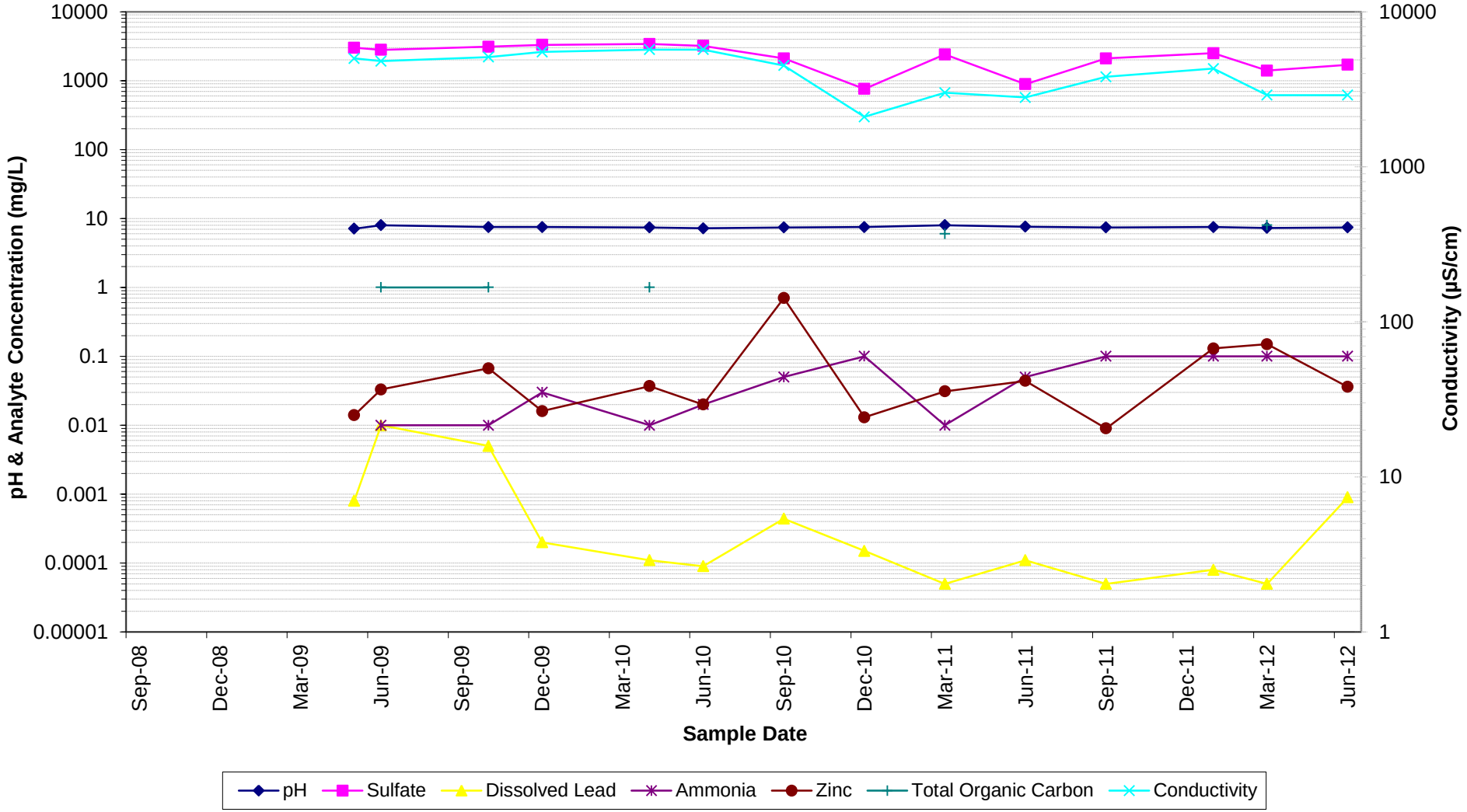


Figure 30 - Groundwater Trends - MB15

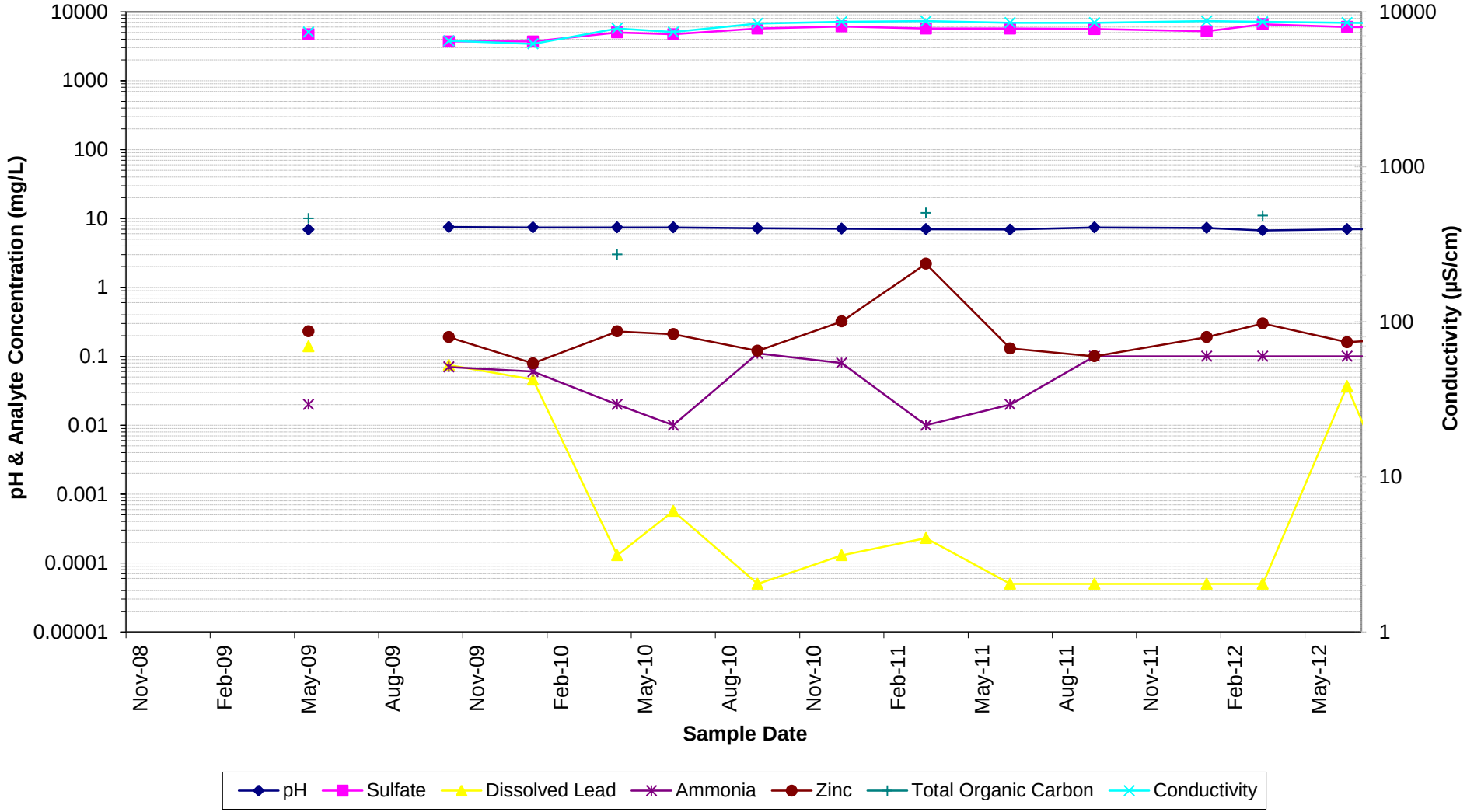


Figure 31 - Groundwater Trends - MB16

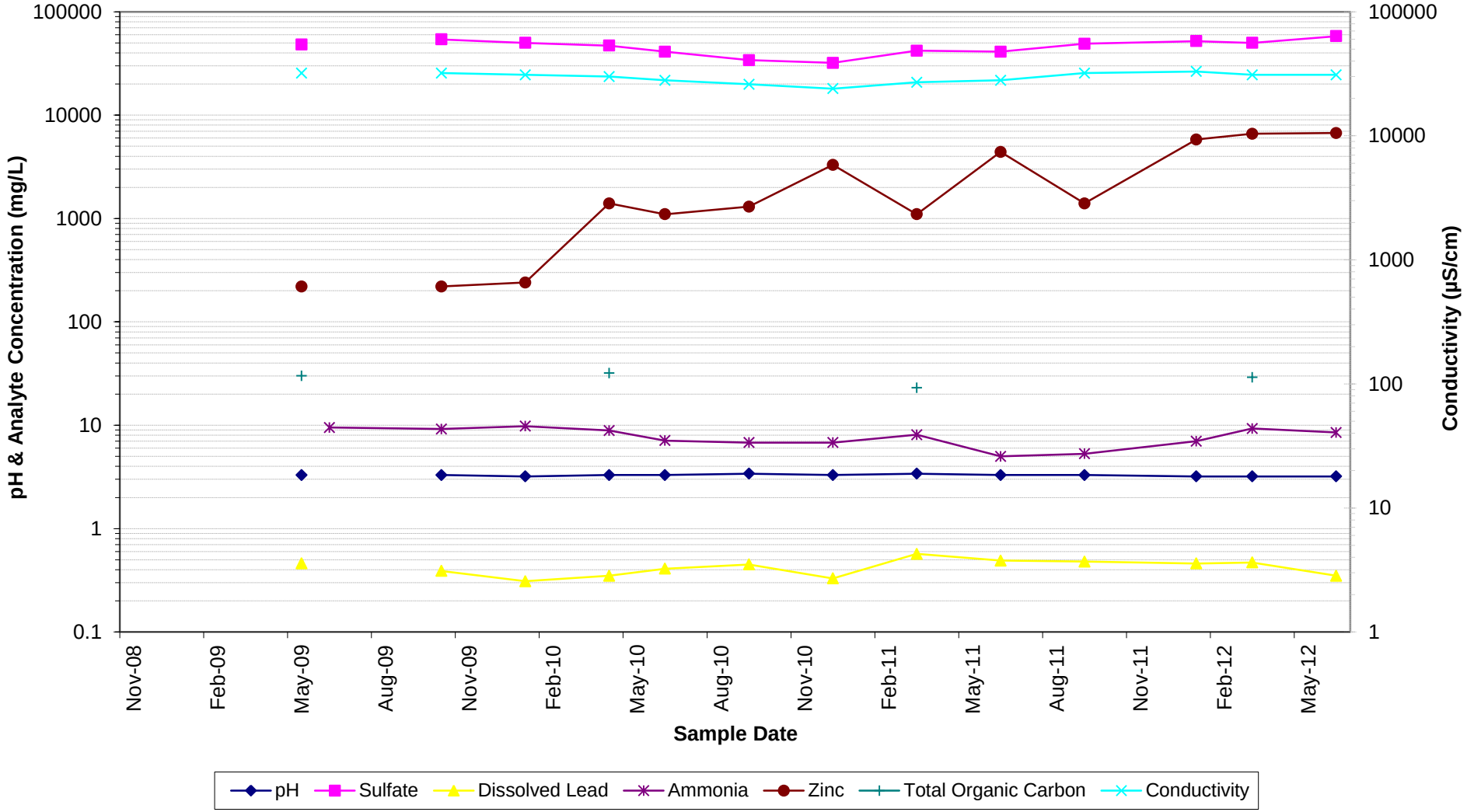


Figure 32 - Groundwater Trends - MB17

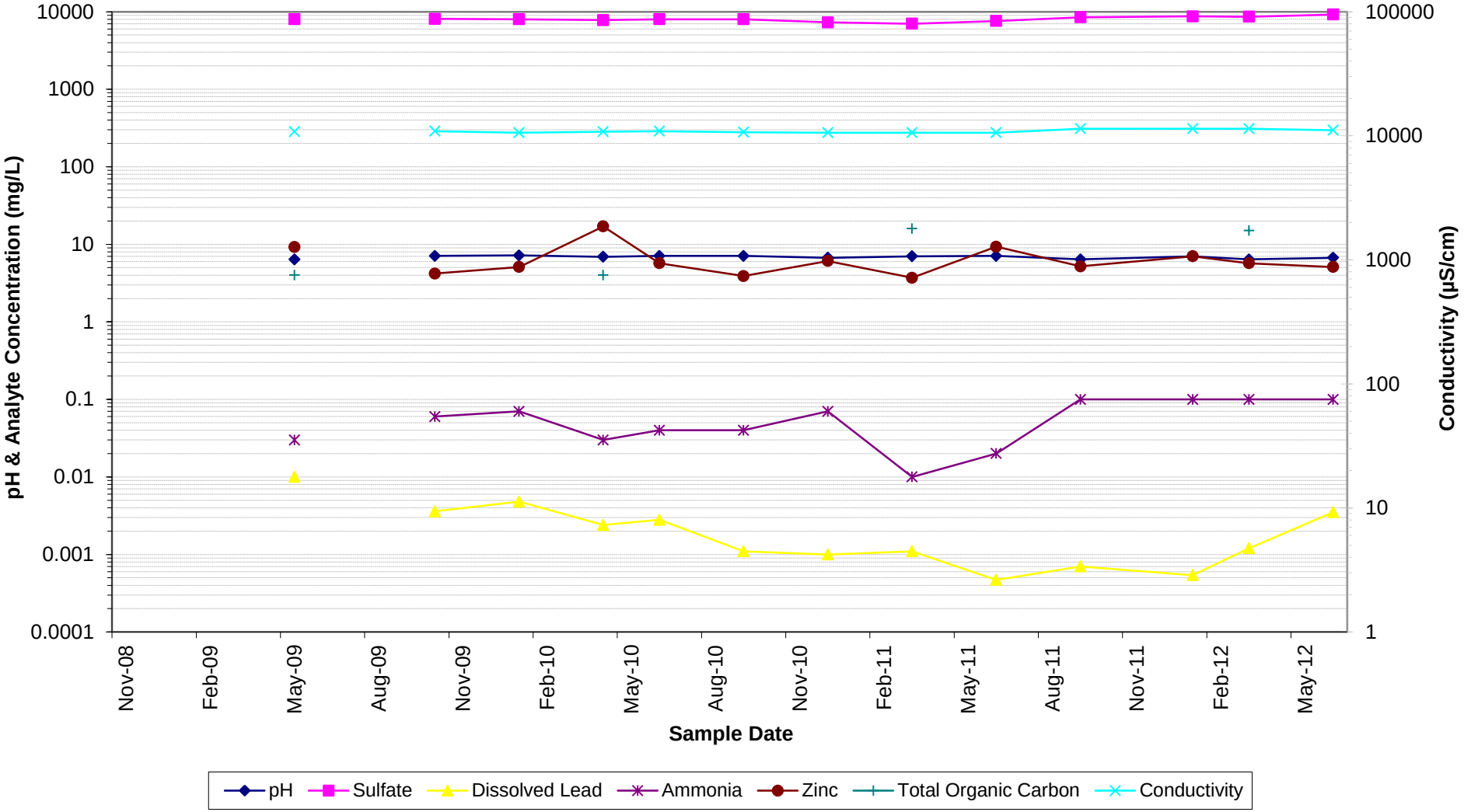


Figure 33 - Groundwater Trends - ED3B

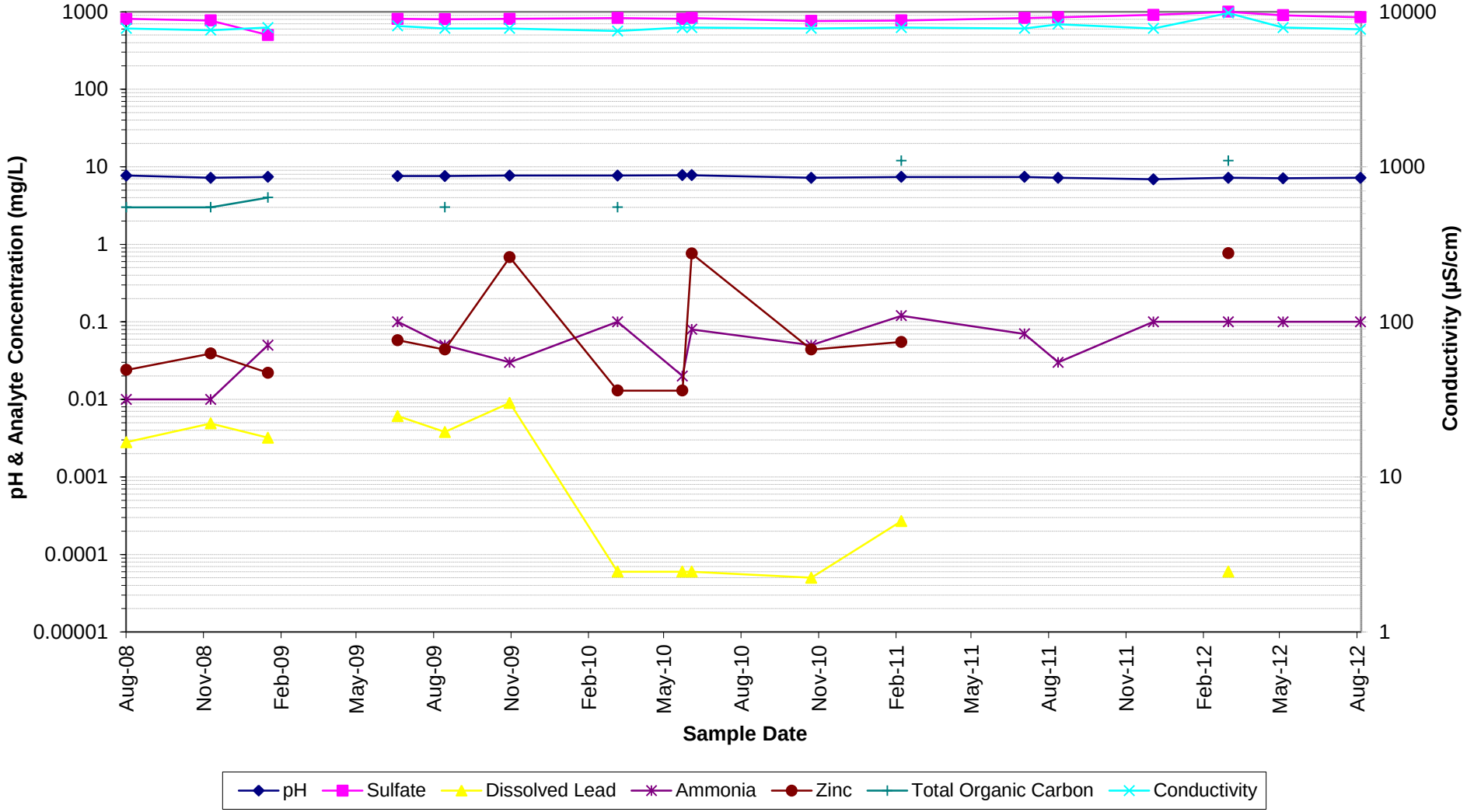


Figure 34 - Groundwater Trends - WM1

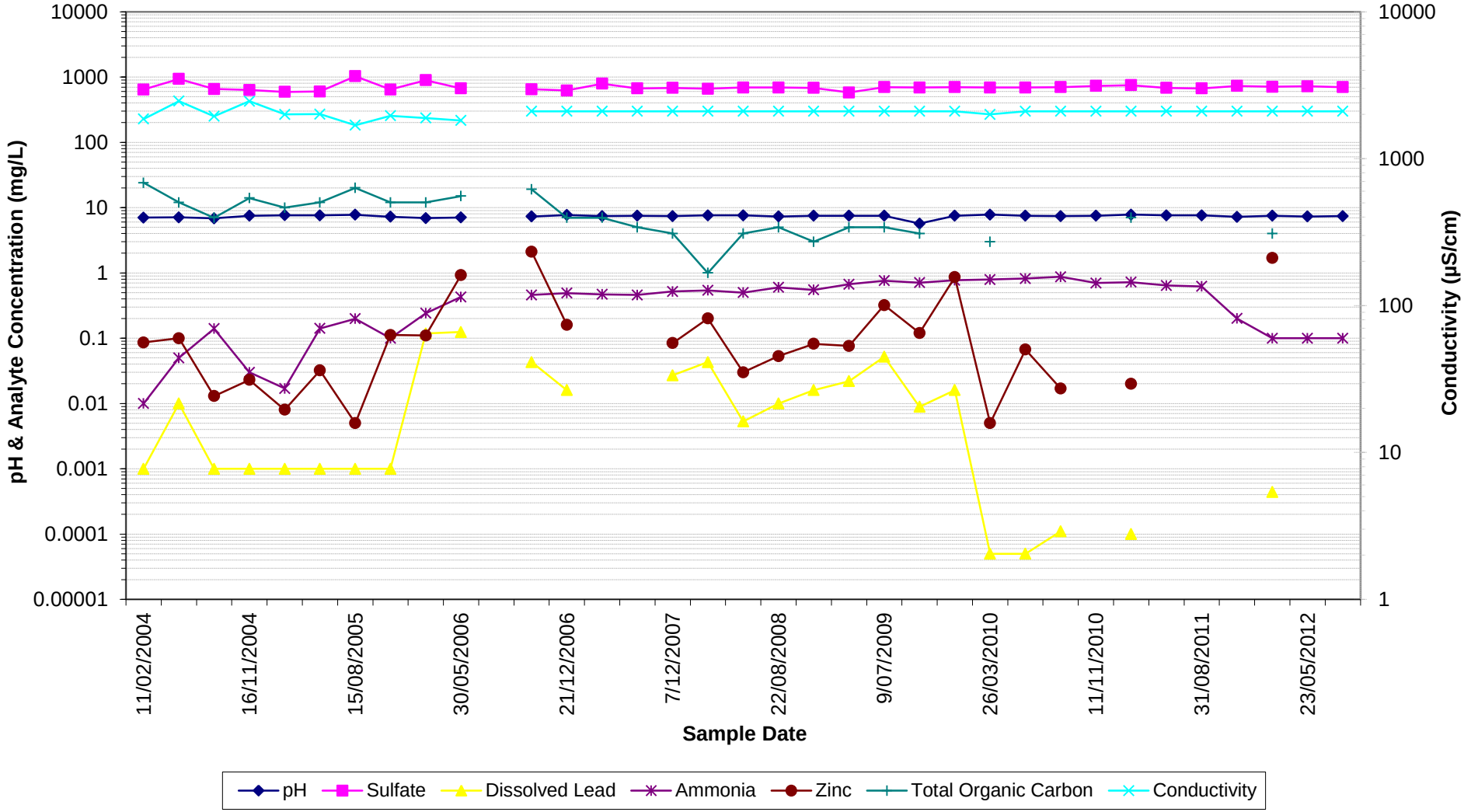


Figure 35 - Groundwater Trends - WM3

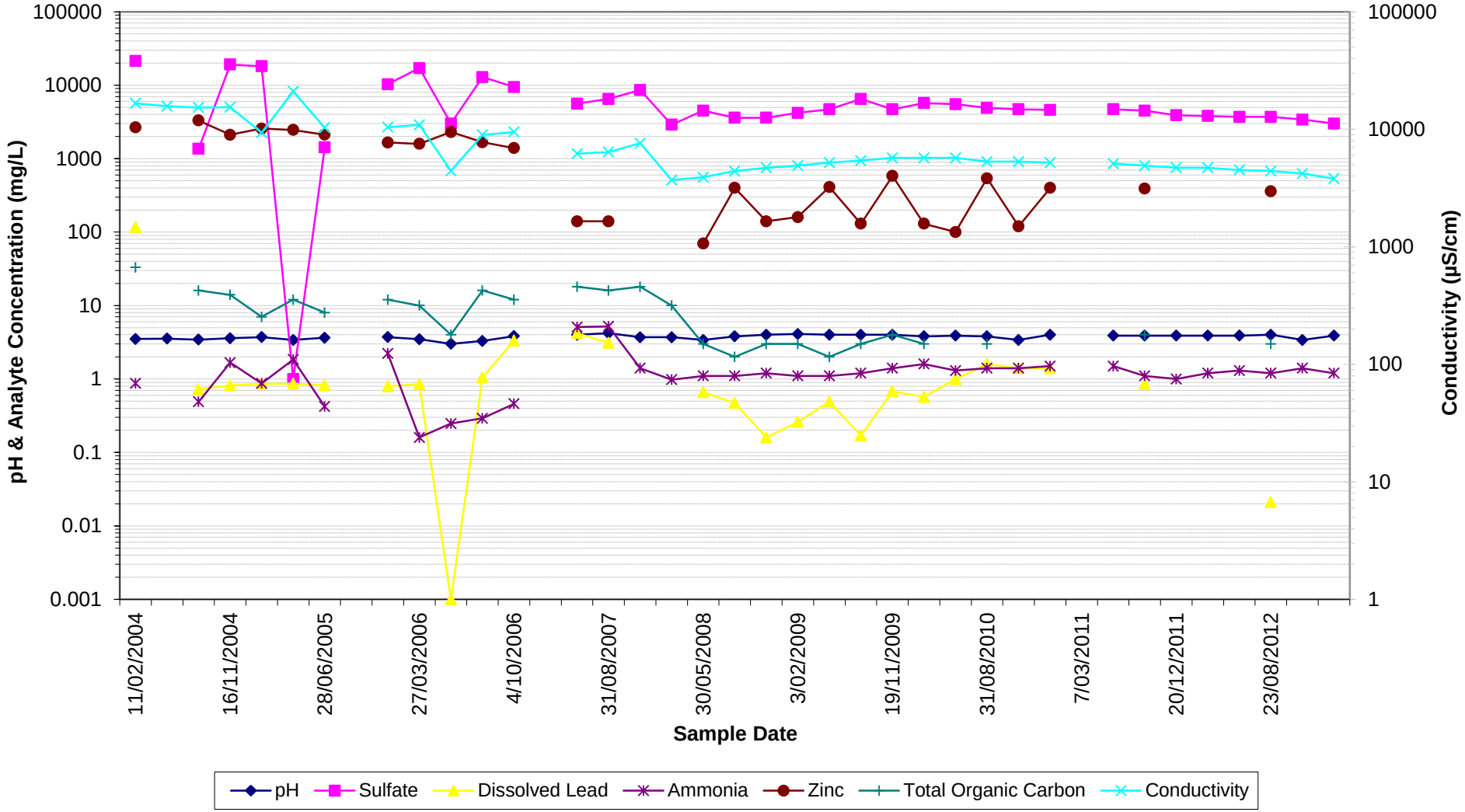


Figure 36 - Groundwater Trends - WM4

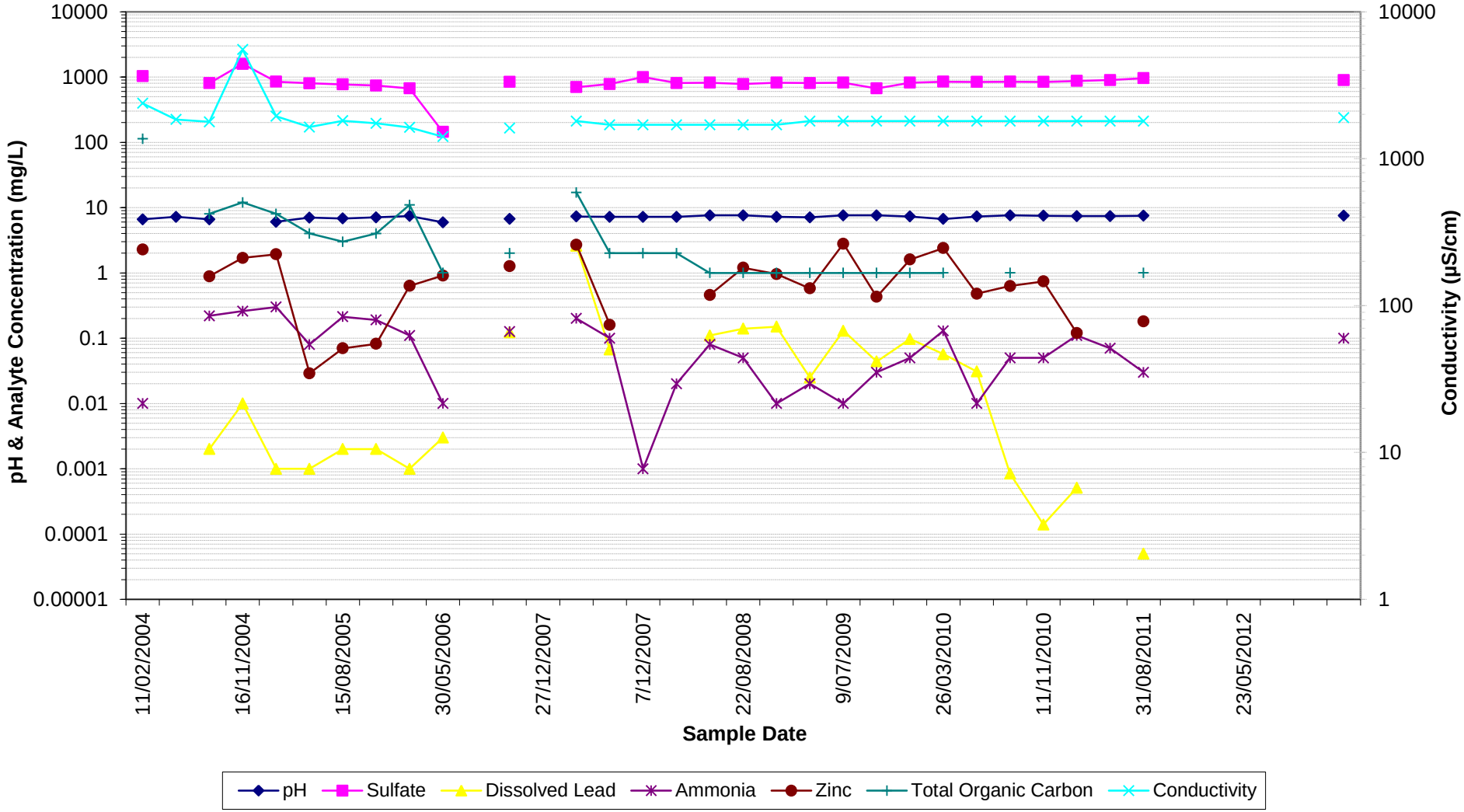


Figure 37 - Groundwater Trends - WM5

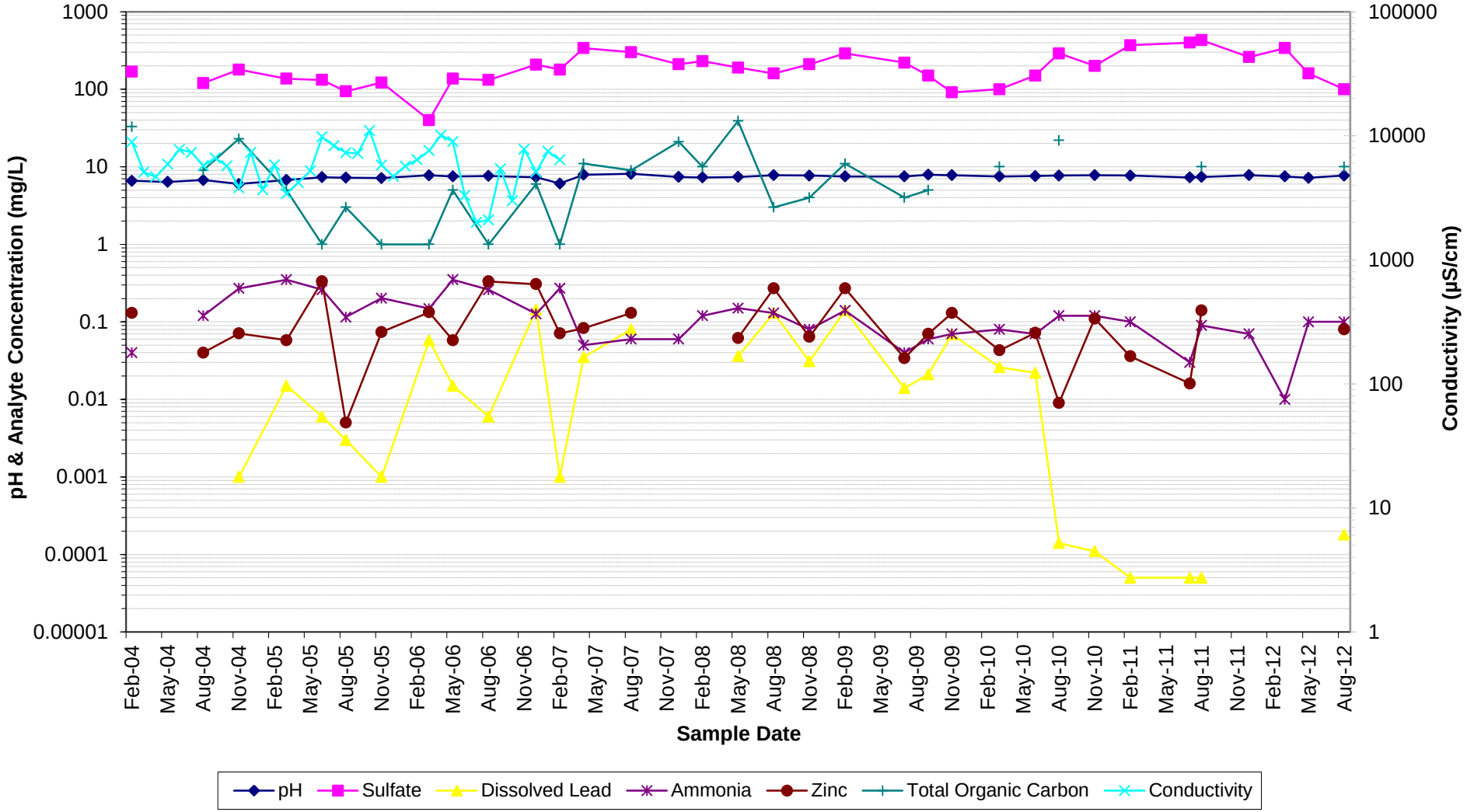


Figure 38 - Groundwater Trends - WM6

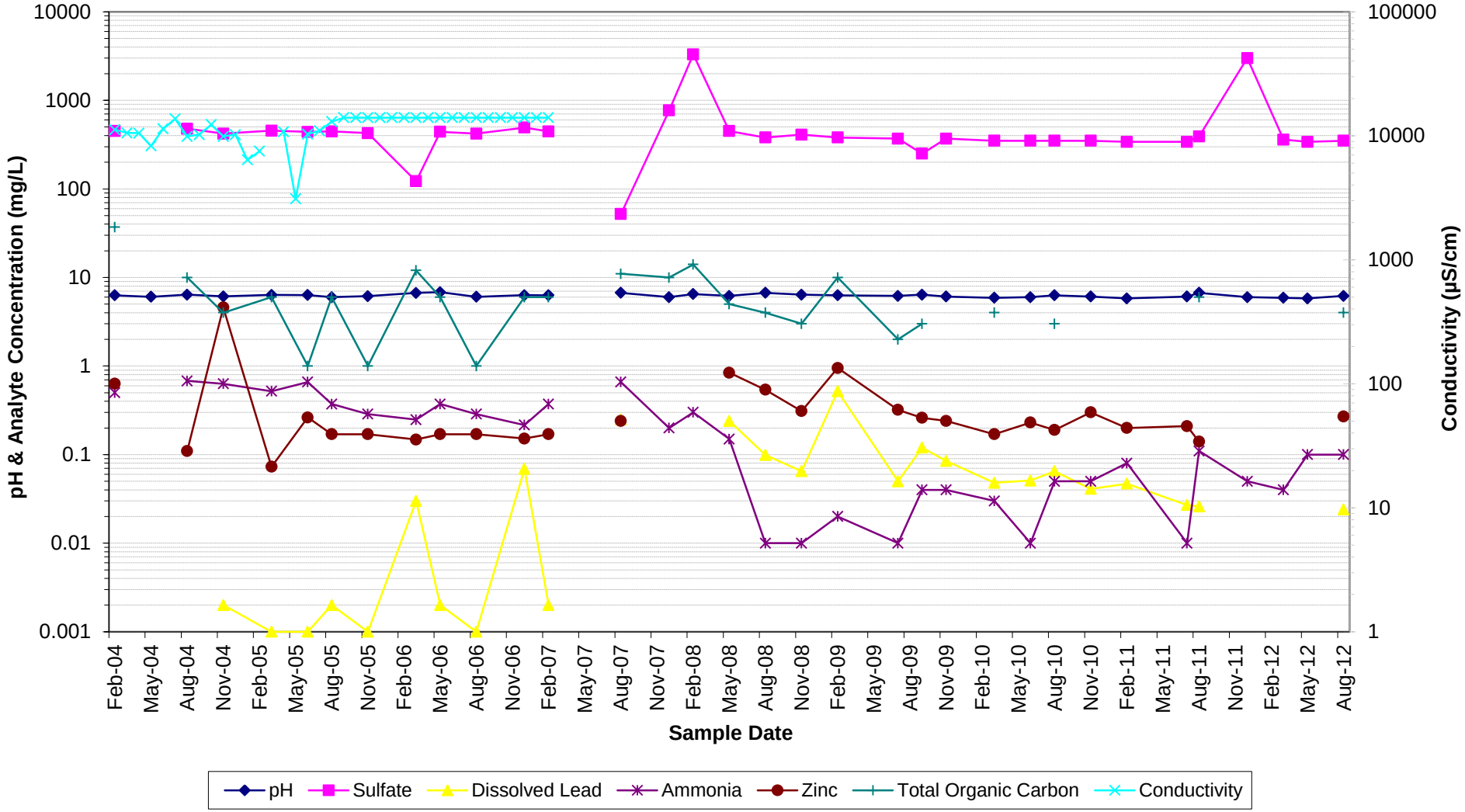


Figure 39 - Groundwater Trends - MW8S

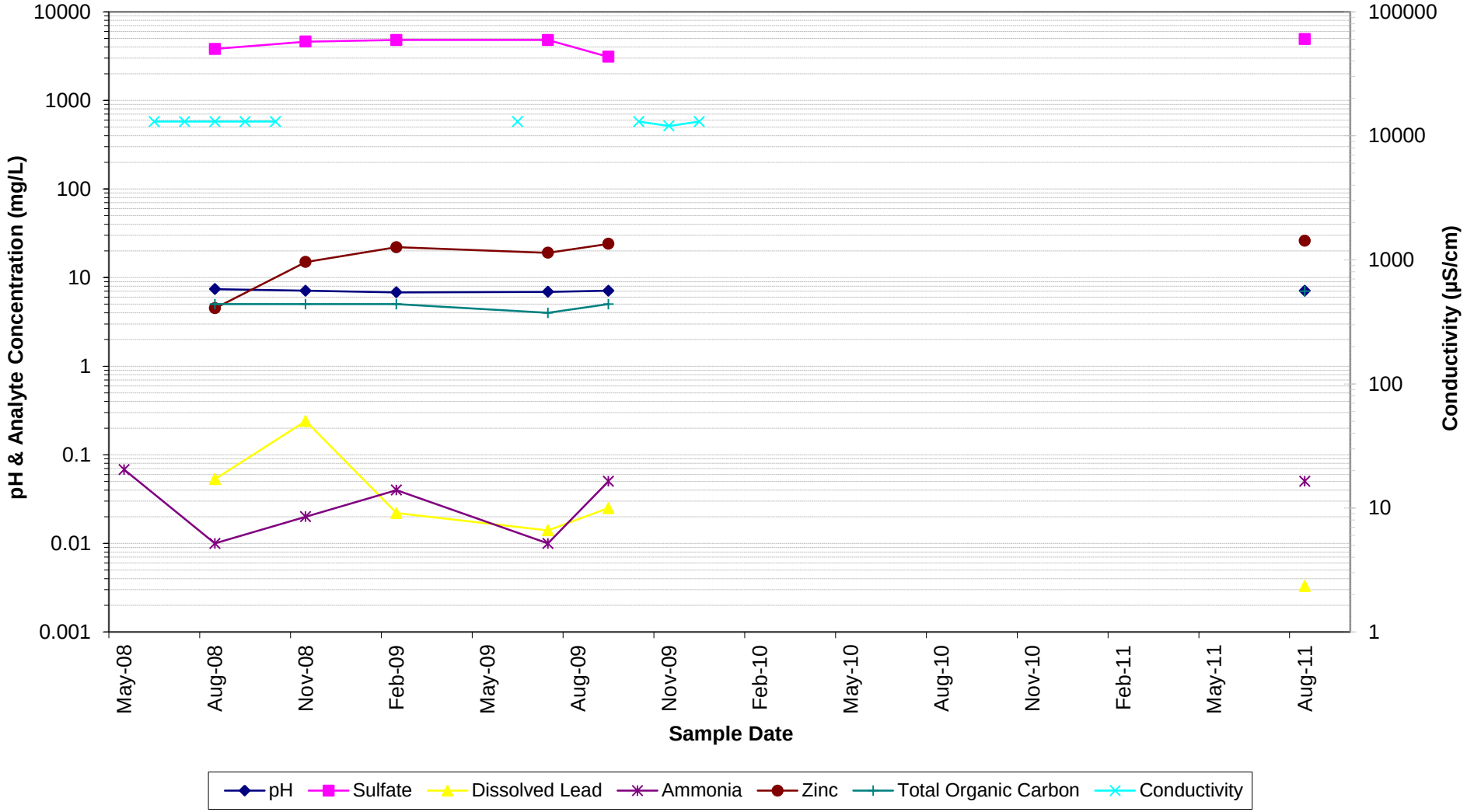


Figure 40 - Groundwater Trends - MW8D

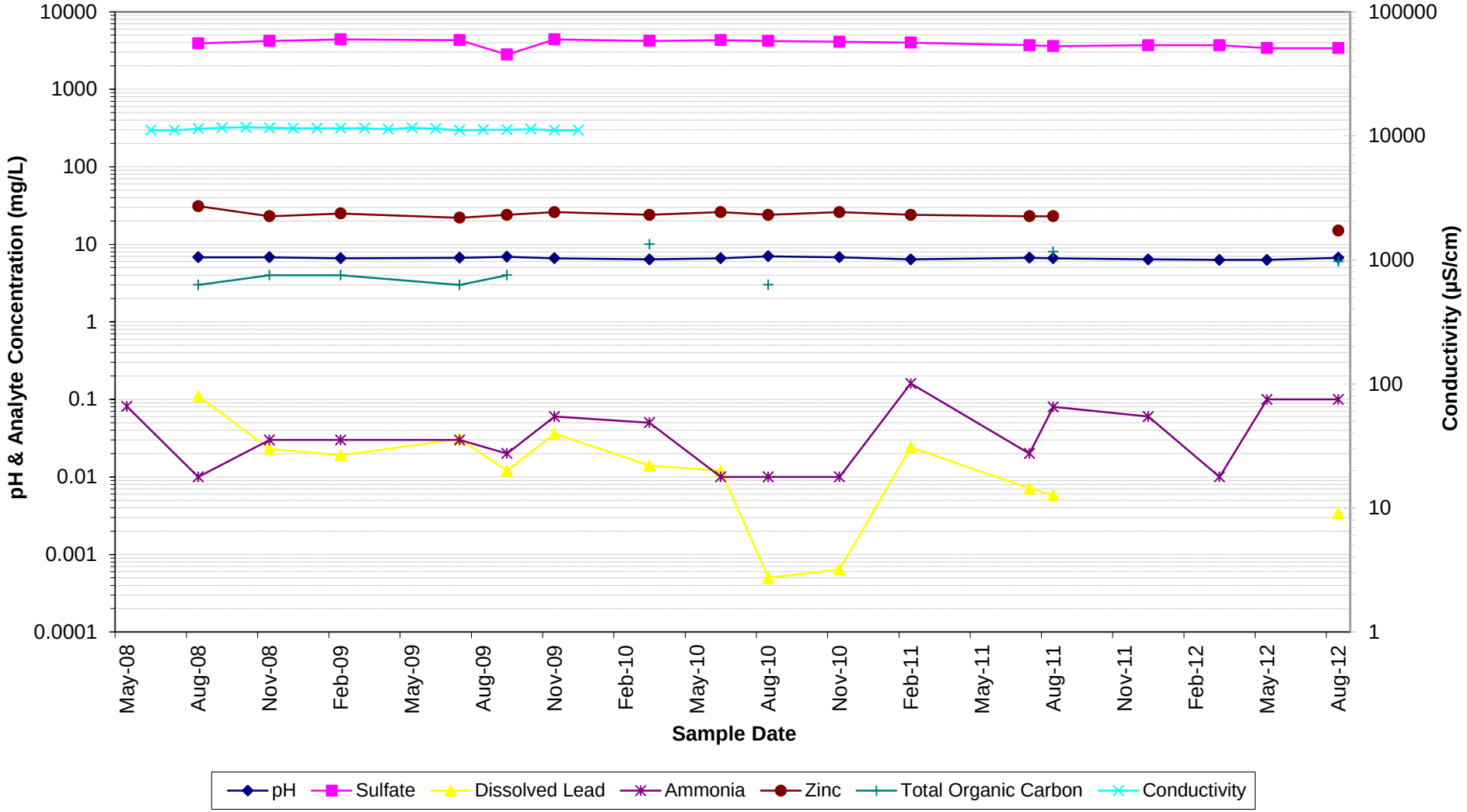


Figure 41 - Groundwater Trends - MW9S

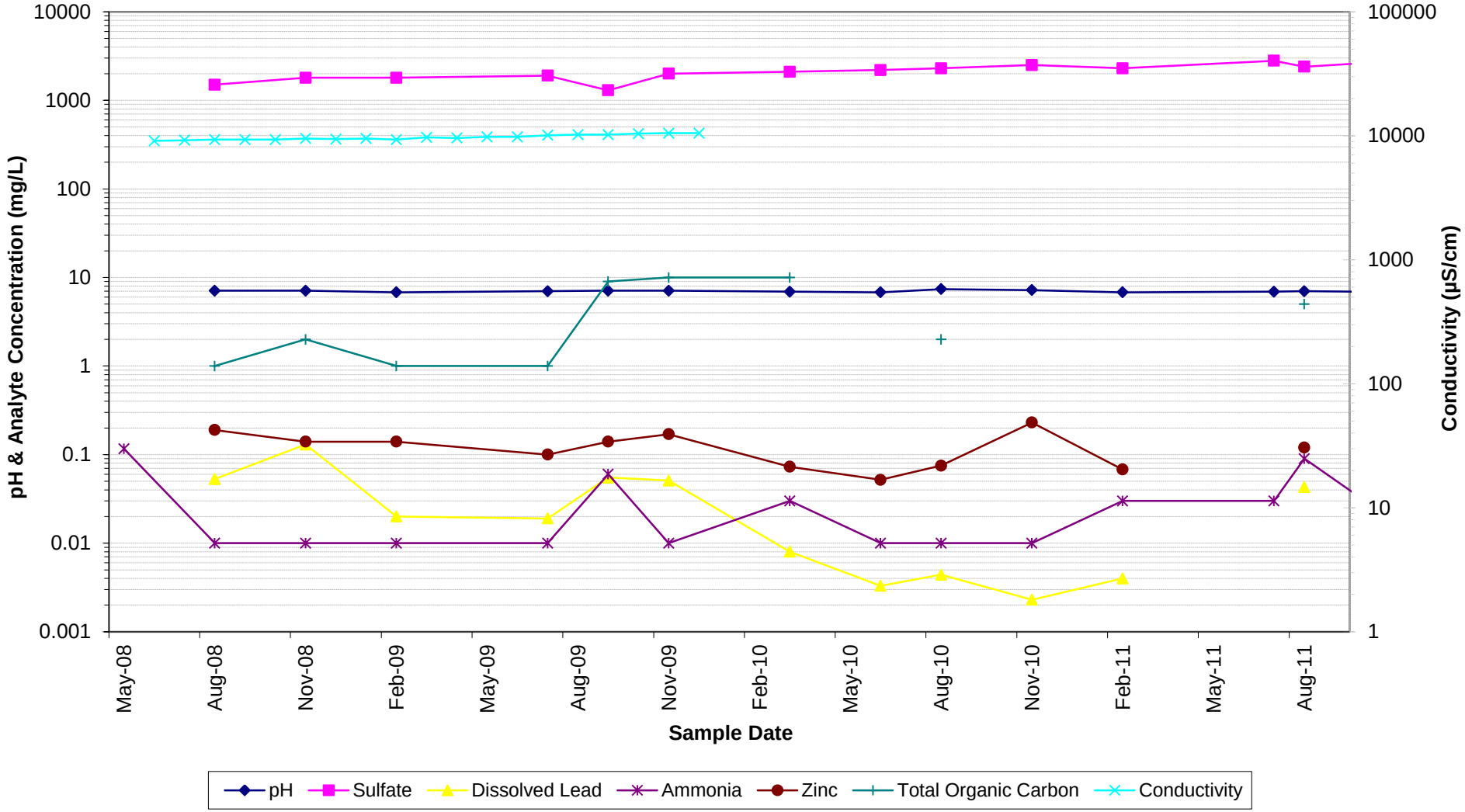


Figure 42 - Piezometer Levels - P44 - P100

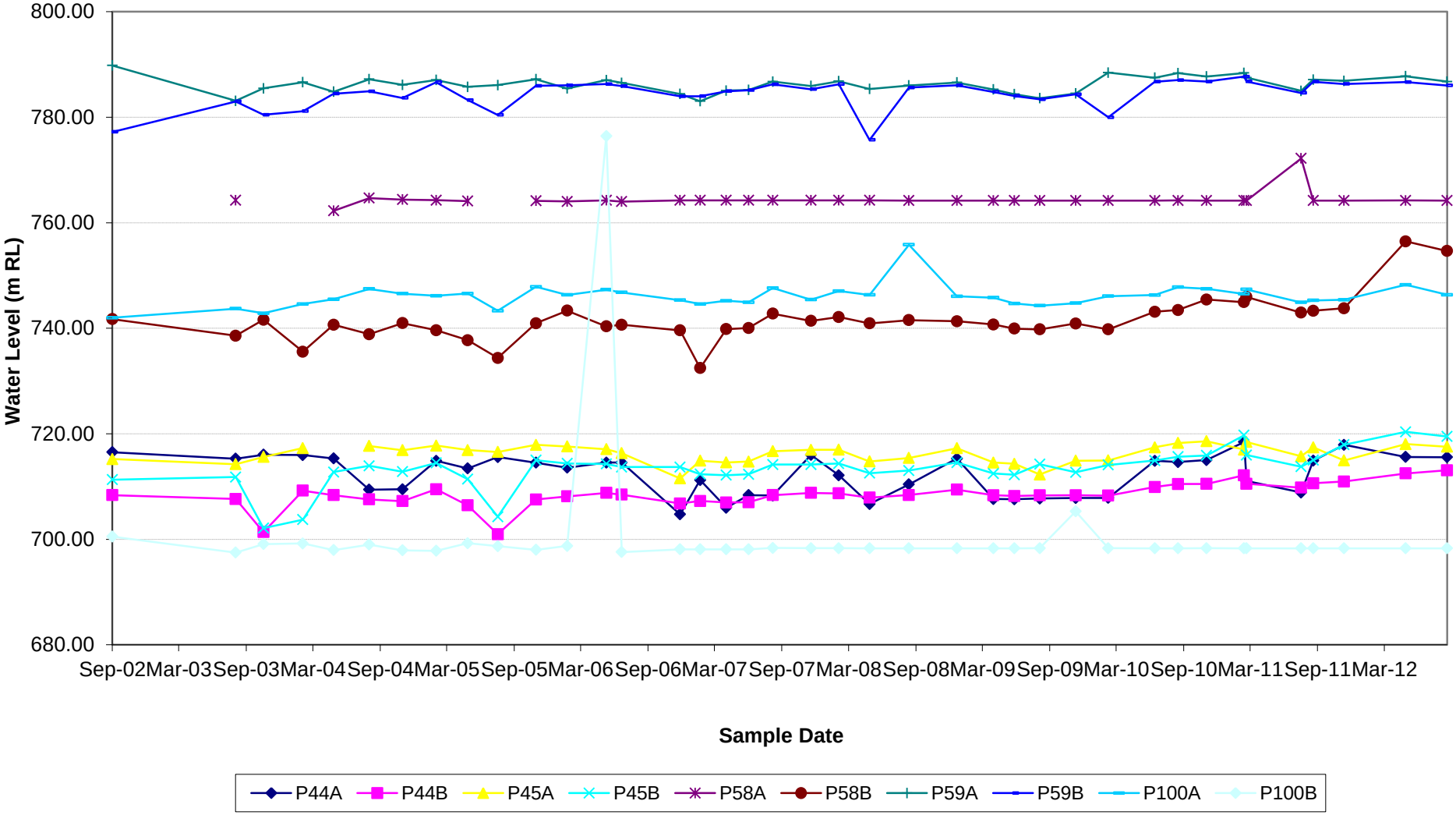


Figure 43 - Evaporation Dam 3 Volume

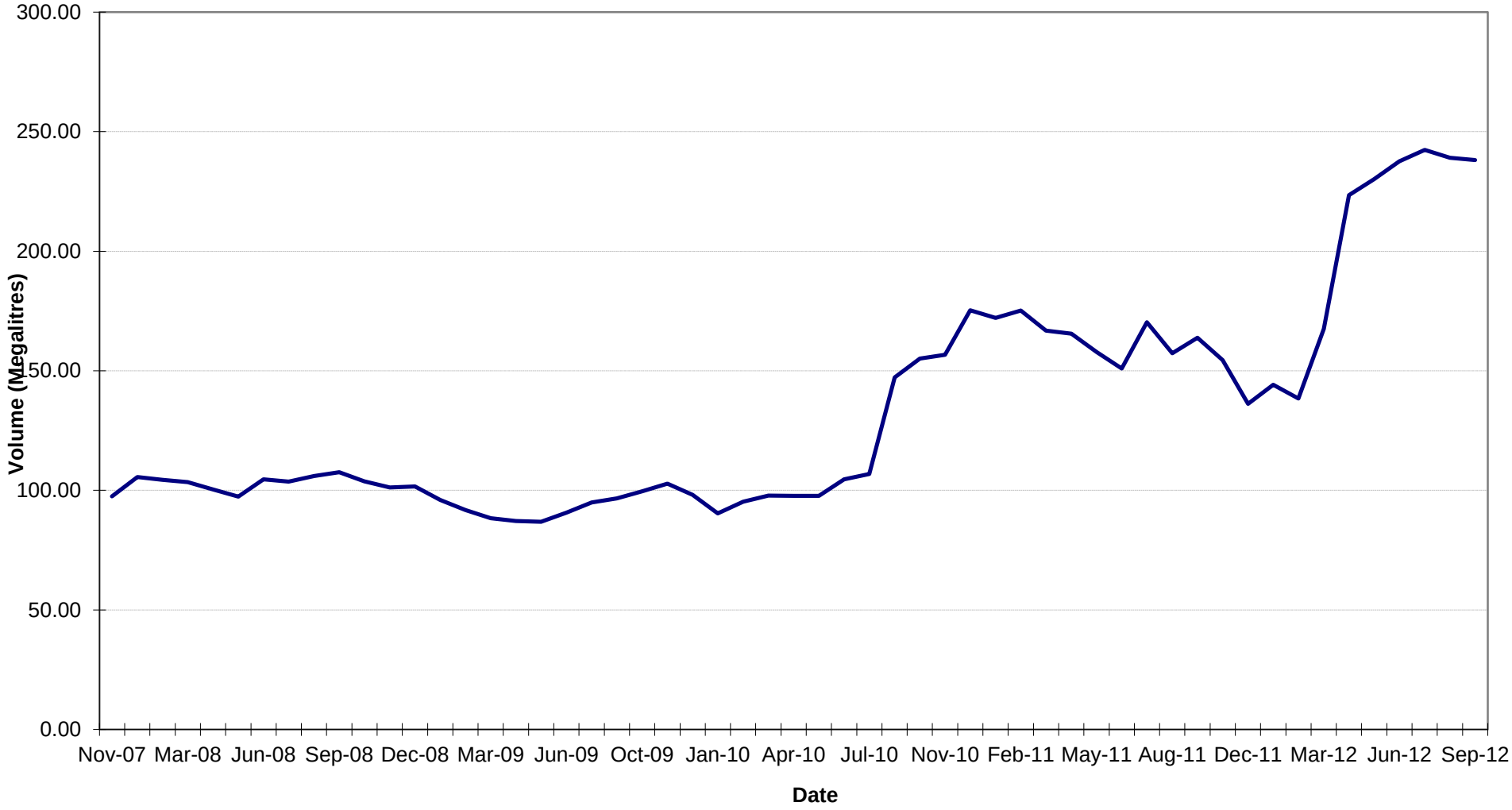


Figure 44 - IMF Surface Water Trends - Site 110

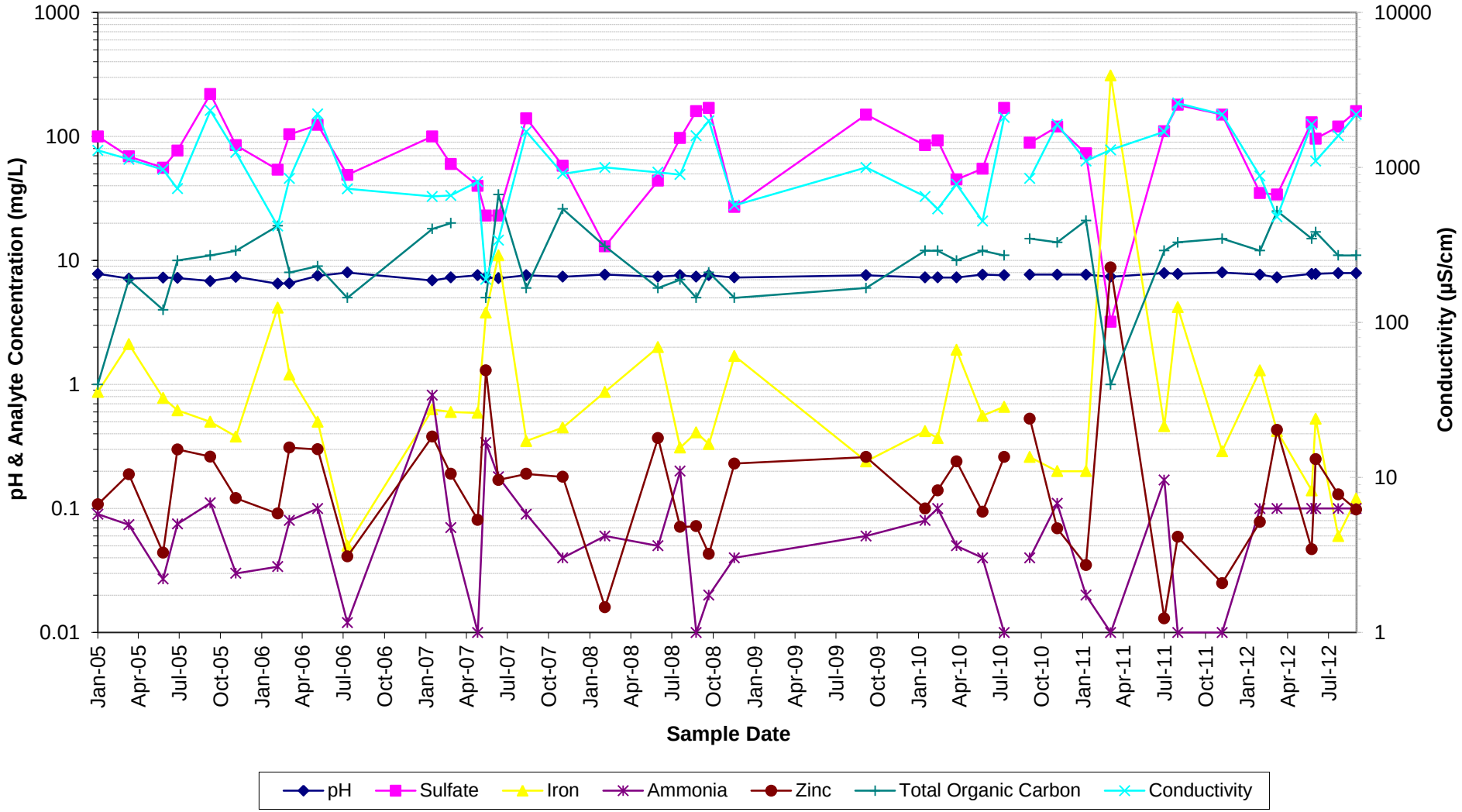


Figure 45 - IMF Surface Water Trends - Site 130

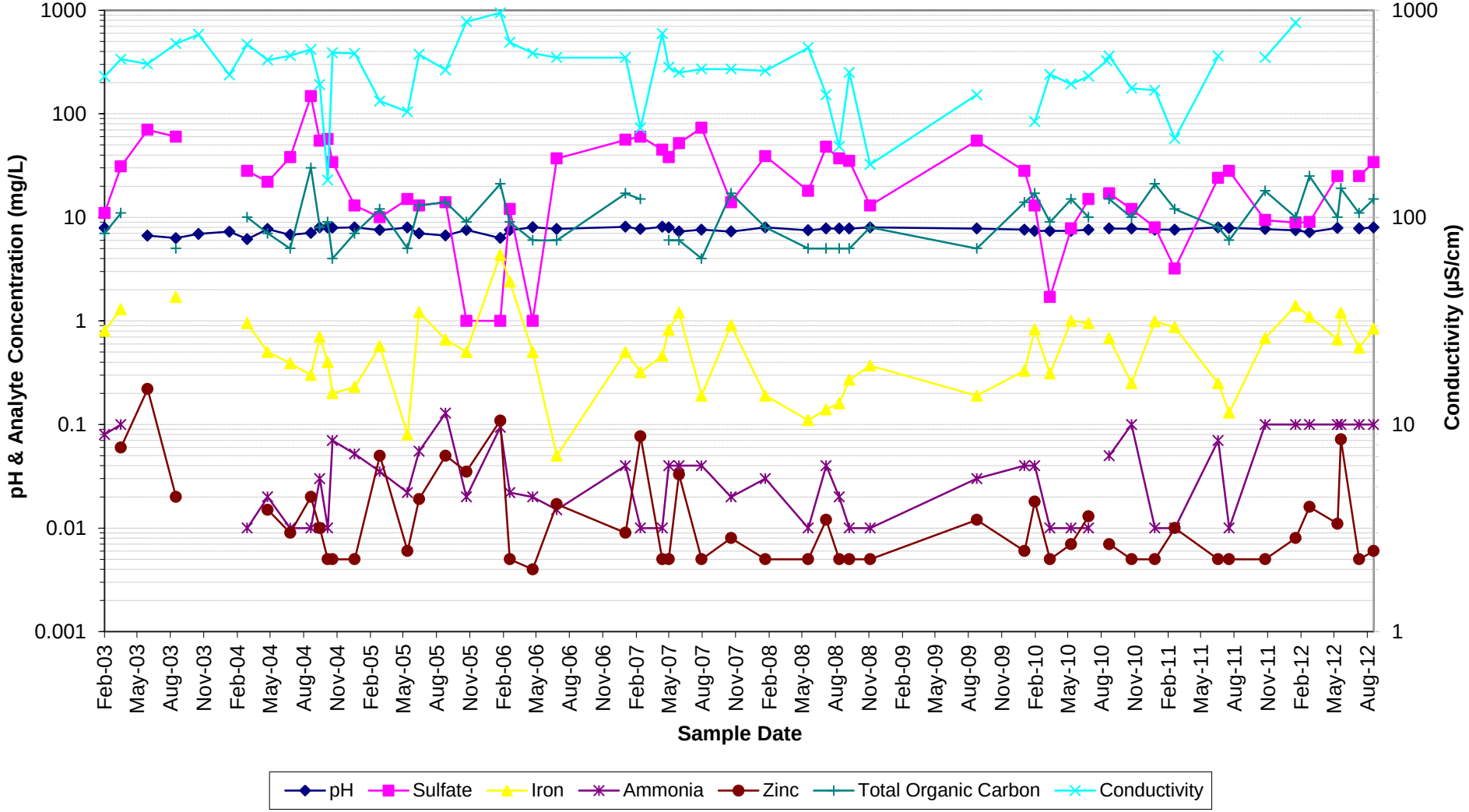


Figure 46 - IMF Surface Water Trends - Site 150

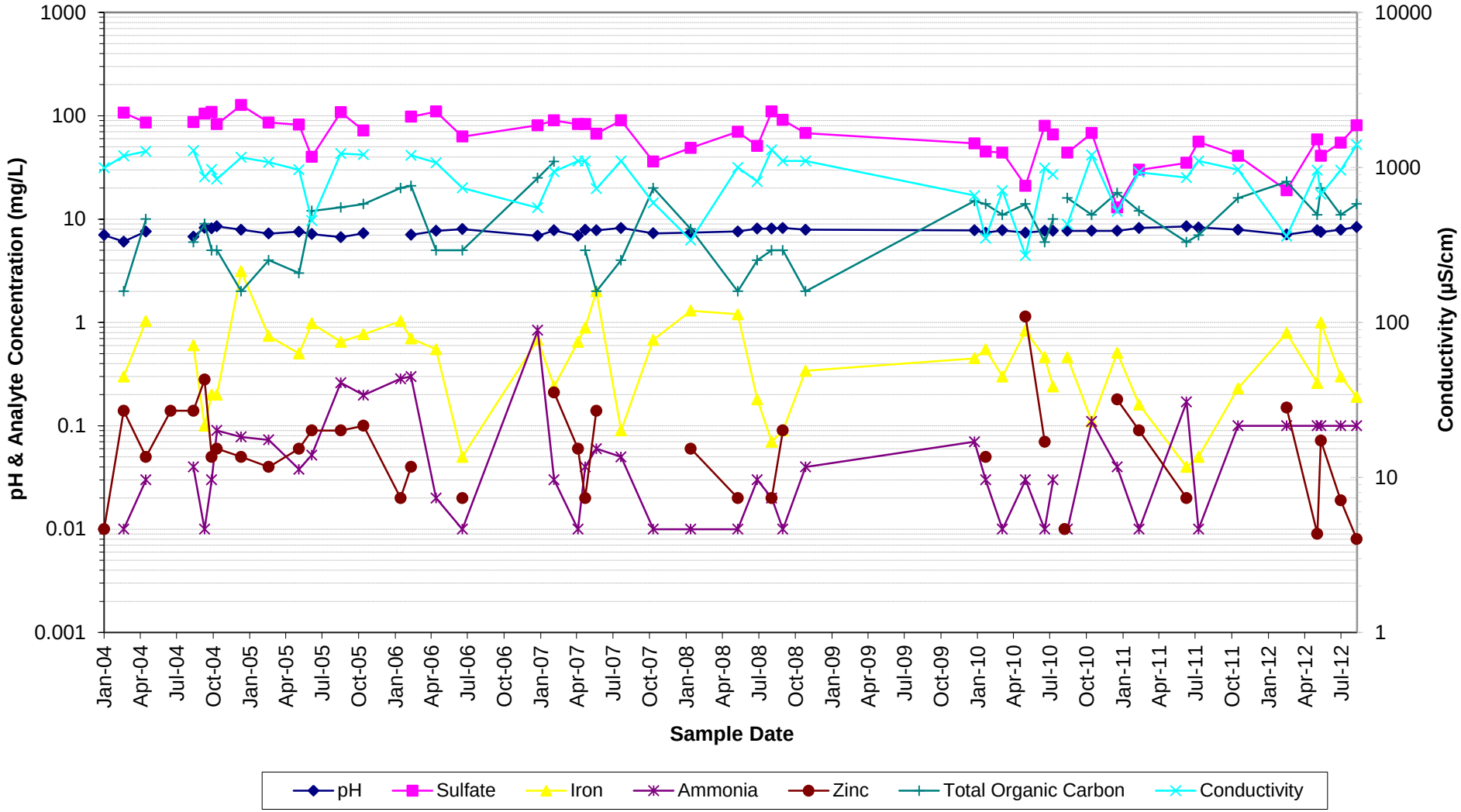


Figure 47 - IMF Surface Water Trends - First Flush

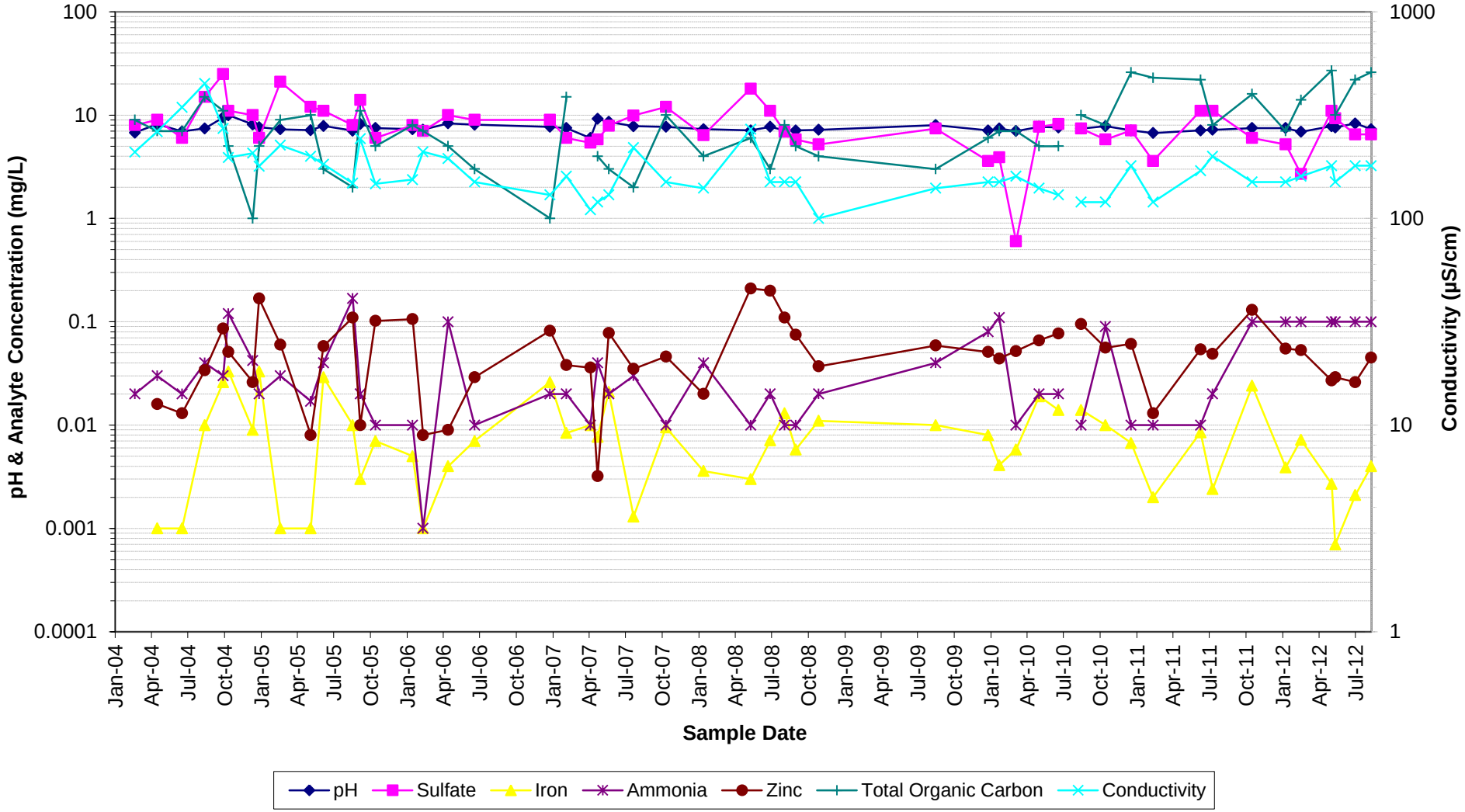
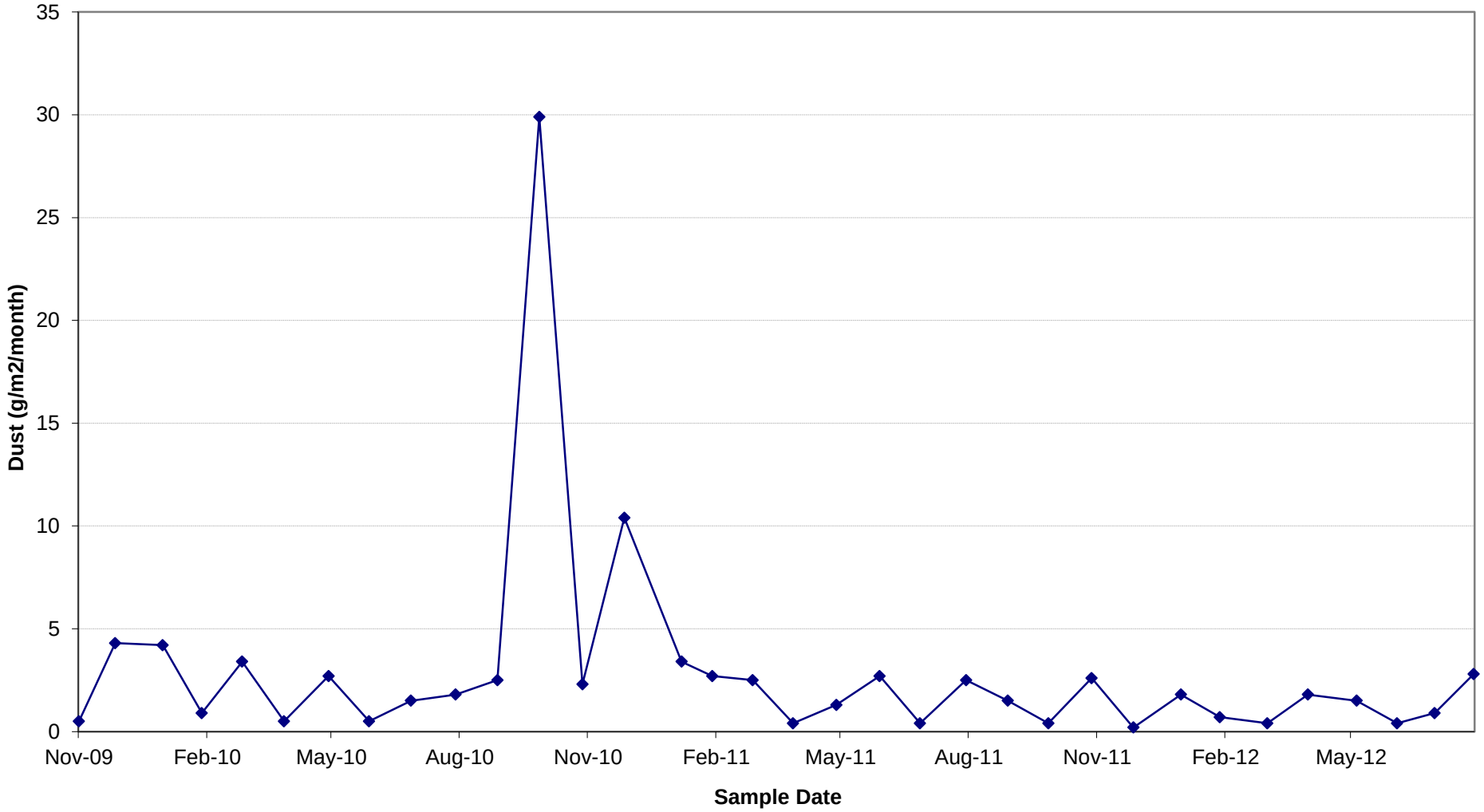


Figure 48 - IMF Depositional Dust Trends - DG18



TABLES

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T-1 - Complaints Register

No.	Date	Time	Complaint	Name of Complainant	Location	VES Response
1	20/10/2011	9.15am	Odour			Spoke to complainant
2	22/11/2011	10.50am	Odour			Spoke to complainant
3	22/11/2011	8.45am	Odour			Spoke to complainant
4	9/12/2011	9.10am	Odour			Spoke to complainant
5	14/12/2011	8:00am	Odour			Spoke to complainant
6	15/01/2012	11.15am	Odour			Spoke to complainant
7	20/01/2012	9.05am	Odour			Spoke to complainant
8	25/01/2012	12.35 pm	Odour			Phoned complainant
9	2/02/2012	11.15 am	Odour			Phoned complainant
10	3/02/2012	7.30 pm	Odour			Phoned complainant
11	13/02/2012	10.30 am	Odour			Phoned complainant
12	17/02/2012	9.30 am	Odour			Phoned complainant
13	20/02/2012	11.25 am	Odour			Phoned complainant
14	23/02/2012	9.10 am	Odour			Phoned complainant
15	27/02/2012	11.15 am	Odour			Phoned complainant
16	27/02/2012	12.00 pm	Odour			Phoned complainant
17	5/03/2012	7.45 am	Odour			Phoned complainant
18	17/03/2012	11.30 am	Odour			Spoke to complainant
19	22/03/2012	4.30 pm	Odour			Meeting arranged 10/4
20	23/03/2012	9:00 AM	Odour			Phoned complainant
21	27/03/2012	9:00 AM	Odour			Reported personally
22	27/03/2012	2.05 pm	Odour			Phoned complainant
23	29/03/2012	8.30 am	Odour			Phoned complainant
24	29/03/2012	9.00 am	Odour			Phoned complainant
25	29/03/2012	AM *	Odour			Phoned complainant
26	31/03/2012	8.00am	Odour			Phoned complainant
27	31/03/2012	9.00am	Odour			Phoned complainant
28	31/03/2012	AM *	Odour			Phoned complainant
29	1/04/2012	7.30am	Odour			Phoned complainant
30	3/04/2012	4.00 pm	Odour			Phoned complainant
31	3/04/2012	7.30pm	Odour			Phoned complainant
32	3/04/2012	9.00 pm *	Odour			Phoned complainant
33	3/04/2012	9.00am	Odour			Email
34	7/04/2012		Odour			Phoned complainant
35	12/04/2012	1.30 pm	Odour			Phoned complainant
36	13/04/2012	10.30 am	Odour			Phoned complainant
37	13/04/2012	9.15 am	Odour			Spoke to complainant
38	16/04/2012	8:00 AM	Odour			Phoned complainant
39	16/04/2012	11:00 AM	Odour			Phoned complainant
40	17/04/2012	7.50 am	Odour			Phoned complainant
41	20/04/2012	7.30 am	Odour			Phoned complainant
42	30/04/2012	9.15 am	Odour			Phoned complainant
43	2/05/2012	9.50 am	Odour			Phoned complainant
44	2/05/2012	9.50 am	Odour			Phoned complainant
45	16/05/2012	9.00am	Odour			Spoke to complainant
46	17/05/2012	8.45 am	Odour			Phoned complainant
47	30/05/2012	7.30am	Odour			Phoned complainant
48	30/05/2012	8.40 am	Odour			Phoned complainant
49	4/06/2012	11.10 am	Odour			Phoned complainant
50	4/06/2012	11.50 am	Odour			Phoned complainant
51	5/06/2012	8.40 am	Odour			Spoke to complainant
52	5/06/2012	9.00am	Odour			Phoned complainant
53	7/06/2012	9.30am	Odour			Phoned complainant
54	12/06/2012	2.45 pm	Odour			Spoke to complainant
55	14/06/2012	10.00 am	Odour			Phoned complainant
56	26/06/2012	9.15 am	Odour			Phoned complainant
57	6/07/2012	8.20 am	Odour			Phoned complainant
58	9/07/2012	10.00 am	Odour			Phoned complainant
59	24/07/2012		Odour			Phoned complainant
60	13/08/2012	7.50 am	Odour			Phoned complainant
61	13/08/2012		Odour			Phoned complainant
62	21/08/2012	7.30 am	Odour			Phoned complainant
63	21/08/2012	10.30 am	Odour			Phoned complainant
64	21/08/2012	2.00 pm	Odour			Phoned complainant

T10.1 - Groundwater Results - MB 1

| Statistics | Field Information | | | | | | | | | | | Analytical Information | | | | | | | | | | |

T10.11 - Groundwater Results - MB 12

| | Statistics | Field Information | | | | | | | | | | | Analytical Information | | | | | | | | | | |

T10.21 - Groundwater Results - WM5

| | Statistics | Field Information | | | | | | | | | | Analytical Information | | | | | | | | | |

T-11.1 - Piezometer Water Level Results - P44A & P44B

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P44A	13.15	717.90	TH
		28/02/2011	P44A	12.59	718.46	TH
		14/05/2012	P44A	15.43	715.62	TH
		4/09/2012	P44A	15.48	715.57	TH
2011/12	Minimum			12.59	715.57	
	Maximum			15.48	718.46	
	Average			14.16	716.89	
	StdDev			1.509997	1.509997	
	Count			4	4	

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P44B	20.10	710.95	TH
		28/02/2012	P44B	18.92	712.13	TH
		14/05/2012	P44B	18.57	712.48	TH
		4/09/2012	P44B	17.97	713.08	TH
2011/12	Minimum			17.97	710.95	
	Maximum			20.10	713.08	
	Average			18.89	712.16	
	StdDev			0.896995	0.896995	
	Count			4	4	

T-11.2 - Piezometer Water Level Results - P45A & P45B

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P45A	16.21	714.95	TH
		28/02/2012	P45A	14.16	717	TH
		14/05/2012	P45A	13.11	718.05	TH
		4/09/2012	P45A	13.60	717.56	TH
2011/12	Minimum			13.11	714.95	
	Maximum			16.21	718.05	
	Average			14.27	716.89	
	StdDev			1.36262	1.36262	
	Count			4	4	

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P45B	13.17	717.94	TH
		28/02/2012	P45B	11.39	719.72	TH
		14/05/2012	P45B	10.74	720.37	TH
		4/09/2012	P45B	11.61	719.50	TH
2011/12	Minimum			10.74	717.94	
	Maximum			13.17	720.37	
	Average			11.73	719.38	
	StdDev			1.030158	1.030158	
	Count			4	4	

T-11.3 - Piezometer Water Level Results - P58A & P58B

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler	Comments
		28/11/2011	P58A	42.05	764.20	TH	DRY
		28/02/2012	P58A	42.04	764.21	TH	DRY
		14/05/2012	P58A	42.03	764.22	TH	DRY
		4/09/2012	P58A	42.04	764.21	TH	Moist
2011/12	Minimum			42.03	764.2		
	Maximum			42.05	764.22		
	Average			42.04	764.21		
	StdDev			0.008165	0.008165		
	Count			4	4		

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P58B	62.47	743.78	TH
		28/02/2012	P58B	61.31	744.94	TH
		14/05/2012	P58B	49.79	756.46	TH
		4/09/2012	P58B	51.60	754.65	TH
2011/12	Minimum			49.79	743.78	
	Maximum			62.47	756.46	
	Average			56.29	749.96	
	StdDev			6.52	6.52	
	Count			4	4	

T-11.4 - Piezometer Water Level Results - P59A & P59B

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P59A	17.8	786.90	TH
		28/02/2012	P59A	16.32	788.38	TH
		14/05/2012	P59A	16.94	787.76	TH
		4/09/2012	P59A	17.94	786.76	TH
2011/12	Minimum			16.32	786.76	
	Maximum			17.94	788.38	
	Average			17.25	787.45	
	StdDev			0.76149	0.76149	
	Count			4	4	

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P59B	18.39	786.31	TH
		28/02/2012	P59B	17.01	787.69	TH
		14/05/2012	P59B	18.04	786.66	TH
		4/09/2012	P59B	18.67	786.03	TH
2011/12	Minimum			17.01	786.03	
	Maximum			18.67	787.69	
	Average			18.0275	786.6725	
	StdDev			0.725643	0.725643	
	Count			4	4	

T-11.5 - Piezometer Water Level Results - P100A & P100B

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P100A	31.02	745.41	TH
		28/02/2012	P100A	29.93	746.50	TH
		14/05/2012	P100A	28.20	748.23	TH
		4/09/2012	P100A	30.08	746.35	TH
2011/12	Minimum			28.2	745.41	
	Maximum			31.02	748.23	
	Average			29.8075	746.6225	
	StdDev			1.175227	1.175227	
	Count			4	4	

EPL 11436	Statistics	Date	Site Code	Depth to Water m	RL water level	Sampler
		28/11/2011	P100B	78.14	698.29	TH
		28/02/2012	P100B	78.14	698.29	TH
		14/05/2012	P100B	78.14	698.29	TH
		4/09/2012	P100B	78.14	698.29	TH
2011/12	Minimum			78.14	698.29	
	Maximum			78.14	698.29	
	Average			78.14	698.29	
	StdDev			0.00	0.00	
	Count			4	4	

T-12 - Water Volume Results - Evaporation Dam 3

Date	ED3S	ED3N	ED3N Lagoon 1	ED3N Lagoon 2	ED3N Lagoon 3	Total Volume ED3 System
	Volume ML	Volume ML	Volume ML	Volume ML	Volume ML	
Oct-11	88	41.95	7.26	11.28	13.37	161.87
Nov-11	75	40.13	5.70	10.85	12.82	144.50
Dec-11	92	39.83	0.00	7.59	12.76	152.19
Jan-12	90	35.16	0.00	5.87	11.18	142.20
Feb-12	83	34.87	0.00	2.44	11.12	131.43
Mar-12	135	59.35	0.00	12.87	12.35	219.56
Apr-12	130	60.75	1.47	14.24	12.05	218.50
May-12	130	60.05	14.29	13.97	11.87	230.19
Jun-12	135	61.90	19.40	14.24	12.05	242.59
Jul-12	130	69.35	19.40	14.24	4.44	237.42
Aug-12	128	68.98	21.67	14.04	4.39	237.08
Sep-12	127	67.89	21.17	13.91	7.21	237.18
Minimum	75	34.87	0.00	2.44	4.39	131.43
Mean	111.92	53.35	9.20	11.30	10.47	196.23
Maximum	135	69.35	21.67	14.24	13.37	242.59

T-13.1 - IMF Surface Water Results - Site 110

	Statistics	Field Information										Analytical Information														
EPL 11455		Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissolved Oxygen	Oxidation-Reduction	Flow	Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Sulphate	Total Suspended Solids	Total Dissolved Solids	Total Kjeldahl Nitrogen	Total Organic Carbon	Oil & Grease	Phosphorous	Total Copper	Total Iron	Total Lead	Total Zinc
				AM/PM	Initials	pH	µS/cm	°C	mg/L	mV			mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		11/11/2011	110	10.23	TH	7.23	2172	16.4	6.04	-106.1	low flow, 36m	861893	0.01	2	2200	8	150	5	1400	0.9	15	1	0.03	0.002	0.29	0.0002	0.025
		3/02/2012	110	10.25	TH	7.87	2370	14.9	5.8	0	Low flow, 38m	873716	0.1	3	880	7.7	35	12	610	0.7	12	1	0.08	0.002	1.3	0.0003	0.078
		12/03/2012	110	11.16	TH	6.83	490	17.5	6.37	0	High flow	879544	0.1	2	480	7.3	34	2	380	1.4	25	1	0.06	0.019	0.42	0.0006	0.43
		28/05/2012	110	12.12	TH	7.75	1813	8	10.56	-25.7	Medium flow	890602	0.1	2	1900	7.8	130	5	1200	0.7	15	1	0.02	0.001	0.14	0.0002	0.047
		6/06/2012	110	14.23	TH	6.08	1096	8	11.31	54.6	High flow	892106	0.1	2	1100	7.8	96	10	800	1.1	17	1	0.06	0.014	0.53	0.0014	0.25
		26/07/2012	110	9.43	TH	7.35	1597	7.6	10.15	15.9	High flow, 1.5	898780	0.1	2	1600	7.9	120	2	1000	0.7	11	1	0.01	0.009	0.06	0.0002	0.13
		4/09/2012	110	12.52	TH	7.29	2260	10.4	9.63	-15.6	Low flow	903961	0.1	2	2200	7.9	160	3	1500	0.5	11	1	0.1	0.002	0.12	0.0002	0.098
2011/12	Minimum					6.08	490	7.6	5.8	-106.1			0.01	2	480	7.3	34	2	380	0.5	11	1	0.01	0.001	0.06	0.0002	0.025
	Maximum					7.87	2370	17.5	11.31	54.6			0.1	3	2200	8	160	12	1500	1.4	25	1	0.1	0.019	1.3	0.0014	0.43
	Average					7.2	1685.42857	11.8285714	8.55143	-10.99			0.087	2.142857	1480	7.771429	103.5714	5.57	984	0.857143	15.1	1	0.051	0.007	0.408571	0.000443	0.151143
	StdDev					0.60197	687.518692	4.31536568	2.38044	49.24			0.034	0.377964	674.783916	0.228869	51.49064	3.95	413	0.304725	4.91	0	0.033	0.0071647	0.428269	0.000447	0.143127
	Count					7	7	7	7	7			7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

T-13.2 - IMF Surface Water Results - Site 130

	Statistics	Field Information										Analytical Information														
EPL 11455		Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissolved Oxygen	Oxidation-Reduction	Flow	Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Sulphate	Total Suspended Solids	Total Dissolved Solids	Total Kjeldahl Nitrogen	Total Organic Carbon	Oil & Grease	Phosphorous	Total Copper	Total Iron	Total Lead	Total Zinc
				AM/PM	Initials	pH	µS/cm	°C	mg/L	mV			mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		11/11/2011	130	10.08	TH	7.29	420	17.3	5.94	-158.9	low flow, 36m	861895	0.1	2	420	7.7	9.4	2	270	1.2	18	1	0.04	0.001	0.68	0.0002	0.005
		3/02/2012	130	10.52	TH	7.85	396	16.8	8.26	0	Low flow, 38m	873717	0.1	4	410	7.5	8.9	11	230	0.7	10	1	0.04	0.002	1.4	0.0003	0.008
		12/03/2012	130	11.46	TH	7.11	239	17.9	8.36	0	High flow	879545	0.1	2	240	7.2	9	4	190	1.4	25	1	0.05	0.004	1.1	0.0007	0.016
		28/05/2012	130	12.35	TH	7.75	598	8.7	11.29	-14.9	Medium flow	890603	0.1	2	600	7.9	25	6	400	0.6	10	1	0.07	0.001	0.66	0.0002	0.011
		6/06/2012	130	14.14	TH	5.93	383	8.5	11.51	62.4	High flow	892107	0.1	2	400	7.3	12	14	280	1.2	19	1	0.06	0.003	1.2	0.0009	0.072
		26/07/2012	130	10.34	TH	7.31	598	9.2	10.36	-43.1	High flow, 1.5	898781	0.1	2	590	7.8	25	2	340	0.6	11	1	0.01	0.002	0.55	0.0002	0.005
		4/09/2012	130	13.19	TH	7.27	880	14.3	11.18	-25	Low flow	903962	0.1	3	870	8	34	21	530	0.6	15	1	0.03	0.001	0.84	0.0004	0.006
2011/12	Minimum					5.93	239	8.5	5.94	-158.9			0.1	2	240	7.2	8.9	2	190	0.6	10	1	0.01	0.001	0.55	0.0002	0.005
	Maximum					7.85	880	17.9	11.51	62.4			0.1	4	870	8	34	21	530	1.4	25	1	0.07	0.004	1.4	0.0009	0.072
	Average					7.21571	502	13.2428571	9.55714	-25.64			0.1	2.428571	504.2857143	7.628571	17.61429	8.57	320	0.9	15.4	1	0.043	0.002	0.918571	0.000414	0.017571
	StdDev					0.62841	209.207234	4.30885025	2.09341	67.39			1E-17	0.786796	202.8839687	0.303942	10.22031	7.11	115	0.351188	5.62	0	0.02	0.0011547	0.31877	0.000279	0.024323
	Count					7	7	7	7	7			7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

T-13.3 - IMF Surface Water Results - Site 150

	Statistics	Field Information										Analytical Information														
EPL 11455		Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissolved Oxygen	Oxidation-Reduction	Flow	Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Sulphate	Total Suspended Solids	Total Dissolved Solids	Total Kjeldahl Nitrogen	Total Organic Carbon	Oil & Grease	Phosphorous	Total Copper	Total Iron	Total Lead	Total Zinc
				AM/PM	Initials	pH	µS/cm	°C	mg/L	mV			mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		11/11/2011	150	9.35	TH	7.05	976	19.3	4.29	-30.3	medium flow,	861894	0.1	2	970	7.9	41	3	580	0.9	16	1	0.03	0.002	0.23	0.0002	
		12/03/2012	150	12.03	TH	7.05	363	18.1	6.29	0	No flow, stagn	879546	0.1	2	360	7.1	19	4	280	1.6	23	2	0.05	0.013	0.79	0.0014	0.15
		28/05/2012	150	12.54	TH	7.6	952	8.8	10.89	-5.7	Medium flow	890604	0.1	2	960	7.8	59	2	580	0.5	11	1	0.01	0.002	0.26	0.0002	0.009
		6/06/2012	150	13.47	TH	5.69	654	8.2	10.55	65.2	High flow	892108	0.1	3	670	7.5	41	12	420	1.2	20	1	0.08	0.007	1	0.0011	0.072
		26/07/2012	150	10	TH	7.41	969	8.6	10.5	-10.2	Medium flow,	898782	0.1	2	960	7.9	55	2	560	0.6	11	1	0.01	0.002	0.3	0.0002	0.019
		4/09/2012	150	13.36	TH	7.64	1402	13.1	13.09	-5	Low flow	903963	0.1	2	1400	8.4	81	3	920	0.4	14	1	0.01	0.001	0.19	0.0002	0.008
2011/12	Minimum					5.69	363	8.2	4.29	-30.3			0.1	2	360	7.1	19	2	280	0.4	11	1	0.01	0.001	0.19	0.0002	0.008
	Maximum					7.64	1402	19.3	13.09	65.2			0.1	3	1400	8.4	81	12	920	1.6	23	2	0.08	0.013	1	0.0014	0.15
	Average					7.07333	886	12.6833333	9.26833	2.333			0.1	2.166667	886.6666667	7.766667	49.33333	4.33	557	0.866667	15.8	1.16666667	0.032	0.0045	0.461667	0.00055	0.0516
	StdDev					0.72478	350.12969	5.00296579	3.28782	32.55			2E-17	0.408248	348.0038314	0.436654	20.9157	3.83	214	0.463321	4.88	0.40824829	0.029	0.0046797	0.344059	0.00055	0.060986
	Count					6	6	6	6	6			6	6	6	6	6	6	6	6	6	6	6	6	6	6	5

T-13.4 - IMF Surface Water Results - First Flush System

	Statistics	Field Information										Analytical Information														
EPL 11455		Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissolved Oxygen	Oxidation-Reduction	Flow	Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Sulphate	Total Suspended Solids	Total Dissolved Solids	Total Kjeldahl Nitrogen	Total Organic Carbon	Oil & Grease	Phosphorous	Total Copper	Total Iron	Total Lead	Total Zinc
				AM/PM	Initials	pH	µS/cm	°C	mg/L	mV			mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		11/11/2011 : First Flush		9.53	TH	7.3	144.3	17	3.93	-21.2	6mm in 48hrs	861896	0.1	17	150	7.5	6	66	92	1.6	16	1	0.24	0.014	3.6	0.024	0.13
		3/02/2012 : First Flush		10.37	TH	8.12	166.2	16.4	5.37	0	8mm in 24hrs	873719	0.1	4	150	7.5	5.2	10	100	0.7	7	1	0.06	0.007	0.72	0.0039	0.055
		12/03/2012 : First Flush		11.29	TH	6.97	163.5	16.7	2.78	0	No flow	879547	0.1	9	160	6.9	2.7	34	110	2	14	1	0.23	0.007	4.6	0.0072	0.053
		28/05/2012 : First Flush		12.23	TH	7.95	187.7	8.2	13.16	-52.8	No flow	890605	0.1	54	180	7.8	11	140	180	3.4	27	1	0.4	0.004	1.7	0.0027	0.027
		6/06/2012 : First Flush		14.02	TH	6.04	147.3	8.7	12.12	51.5	No flow	892109	0.1	11	150	7.6	9.3	140	98	1.2	10	1	0.14	0.006	0.86	0.0007	0.029
		26/07/2012 : First Flush		10.21	TH	7.35	190.3	8.2	7.74	-28.1	in last 24hrs.	898790	0.1	36	180	8.3	6.5	36	120	2	22	1	0.22	0.003	2.3	0.0021	0.026
		4/09/2012 : First Flush		13.04	TH	7.34	192.3	11.7	7.59	-48	No flow	903965	0.1	16	180	7.3	6.5	89	110	1.6	26	1	0.13	0.004	1.7	0.004	0.045
2011/12	Minimum					6.04	144.3	8.2	2.78	-52.8			0.1	4	150	6.9	2.7	10	92	0.7	7	1	0.06	0.003	0.72	0.0007	0.026
	Maximum					8.12	192.3	17	13.16	51.5			0.1	54	180	8.3	11	140	180	3.4	27	1	0.4	0.014	4.6	0.024	0.13
	Average					7.29571	170.228571	12.4142857	7.52714	-14.09			0.1	21	164.2857143	7.557143	6.742857	73.6	116	1.785714	17.4	1	0.203	0.0064286	2.211429	0.006371	0.052143
	StdDev					0.68257	20.229387	4.18546237	3.93702	35.58			1E-17	17.73885	15.11857892	0.431498	2.709771	51.9	29.8	0.845436	7.79	0	0.109	0.0036904	1.426831	0.008032	0.036453
	Count					7	7	7	7	7			7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

T-14 - Dust Deposition Results - DG18

Site Name	Date	ALS Batch Code	Ash Residue	Combustibles	Calculated Rainfall	Soluble Matter	Insoluble Solids	Total Solids
			g/m2/mth	g/m2/mth	mm	g/m2/mth	g/m2/mth	g/m2/mth
DG18	Sep-11	EN1103106	0.7	0.4	36	0.4	1.1	1.5
DG18	Oct-11	EN1103462	0.2	0.1	22	0.2	0.2	0.4
DG18	Nov-11	EN1104234	0.6	0.5	114	1.5	1.1	2.6
DG18	Dec-11	EN1200155	0.1	0.1	61	0.1	0.2	0.2
DG18	Jan-12	EN1200964	0.5	0.1	43	1.3	0.5	1.8
DG18	Feb-12	EN1200963	0.4	0.3	48	0.1	0.7	0.7
DG18	Mar-12	EN1201560	0.1	0.1	89	0.2	0.2	0.4
DG18	Apr-12	EN1201922	1.3	0.4	59	0.1	1.7	1.8
DG18	May-12	EN1202394	0.3	0.2	90	1	0.5	1.5
DG18	Jun-12	EN1202687	0.1	0.1	19	0.3	0.1	0.4
DG18	Jul-12	EN1202991	0.1	0.1	35	0.7	0.2	0.9
DG18	Aug-12	EN1203485	0.4	0.3	25	2.1	0.7	2.8
2011/2012	Min		0.1	0.1	19	0.1	0.1	0.2
	Avg		0.40	0.23	53.42	0.67	0.60	1.25
	Max		1.3	0.5	114	2.1	1.7	2.8
	stDev		0.35	0.15	30.34	0.67	0.49	0.89

T-2 - Subsurface Gas Results

	30/10/2009	23/02/2010	15/05/2010	30/07/2010	29/10/2010	2/02/2011	5/05/2011	4/08/2011	19/10/2011	18/01/2012	11/05/2012	31/07/2012
GMBH1*	0	0	0	0	0	0	0	0	0	0	0	0
GMBH2*	0	0	0	0	0	0	0	0	0	0	0	0
GMBH4*	0	0	0	0	0	0	0	0	0	0	0	0

	GMBH1	GMBH2	GMBH4
Min	0	0	0
Average	0	0	0
Max	0	0	0

* Note: Purged readings only

T-3 - Landfill Gas Extraction Booster Results

EPL 11436

Date	Carbon Dioxide	Dry Gas Density	Moisture Content	Molecular weight of stack gases	Oxygen	Temperature	Volatile Organic Compounds	Volumetric Flow rate	Volumetric Flow rate	Methane
	%	*%*	*%*	*mg/m3*	*%*	*Deg C*	*mg/m3*	*m3/hour*	*m3/sec*	*%*
22/09/2009	42.05	99	25.44	N/A	0.01	24.83	9.25	928.25	0.26	47.23
1/06/2011	37.04			N/A	1.09	22.2		771.83	0.21	
14/10/2011	34.8	11617	8.5	30.17	1.6	447	0.09	5380	1.49	48.6

OVERALL	Minimum		34.8	99	8.5	30.17	0.01	22.2	0.09	771.83	0.21	47.23
	Maximum		42.05	11617	25.44	30.17	1.6	447	9.25	5380	1.49	48.6
	Average		37.96333	5858	16.97	30.17	0.9	164.6766667	4.67	2360.026667	0.66	47.915
	StdDev		3.712147	8144.45591	11.97838887	#DIV/0!	0.81184974	244.502715	6.47709812	2616.542758	0.73	0.96873629
	Count		3	2	2	1	3	3	2	3	3.00	2

T-4 - Surface Gas Results

			25/02/2011		
Transect	Time	No of measurements	Min Methane (%)	Max Methane (%)	Average Methane (%)
1	10:00:00 AM	13	0.0003	0.08	0.021
2		15	0.0005	0.03	0.031
3		18	0.0001	0.12	0.015
4		10	0.0012	0.06	0.026
5		7	0.0026	0.07	0.034
6		7	0.0022	0.08	0.056
7		9	0.0013	0.16	0.065
8		17	0.0014	0.31	0.022
9		15	0.0023	0.08	0.018
10		11	0.0017	0.03	0.011
11	↓	9	0.0012	0.08	0.023
12	12:05:00 PM	9	0.0012	0.01	0.019
Total Measurements		**140**		**Site Averag**	**0.028**

			30/12/2011		
Transect	Time	No of measurements	Min Methane (%)	Max Methane (%)	Average Methane (%)
1	10:40:00 AM	14	0.0003	0.08	0.017
2		13	0.0005	0.03	0.008
3		16	0.0001	0.12	0.012
4		8	0.0012	0.06	0.023
5		7	0.0026	0.07	0.021
6		11	0.0022	0.08	0.019
7		15	0.0013	0.16	0.031
8		15	0.0014	0.31	0.062
9		11	0.0023	0.08	0.028
10		9	0.0017	0.03	0.006
11	↓	7	0.0012	0.08	0.025
12	1:05:00 PM	8	0.0012	0.01	0.006
Total Measurements		**134**		**Site Averag**	**0.022**

			17/02/2012		
Transect	Time	No of measurements	Min Methane (%)	Max Methane (%)	Average Methane (%)
1	11:20:00 AM	7	0.0006	0.012	0.008
2		9	0.0024	0.22	0.062
3		14	0.0041	0.15	0.031
4		10	0.0047	0.12	0.029
5		6	0.0019	0.014	0.009
6		13	0.0011	0.13	0.025
7		11	0.0023	0.40	0.053
8		11	0.0044	0.08	0.024
9		16	0.0021	0.18	0.031
10		8	0.0026	0.029	0.009
11	↓	13	0.0028	0.046	0.008
12	1:05:00 PM	11	0.0016	0.41	0.096
Total Measurements		**129**		**Site Averag**	**0.032**

			8/06/2012			
Transect	Time	No of measurements	Min Methane (%)	Max Methane (%)	Average Methane (%)	Total Methane (%)
1	14:10:00 PM	8	0.0008	0.0102	0.0045	0.0360
2		9	0.0003	0.0240	0.0064	0.0579
3		10	0.0022	0.0394	0.0127	0.1269
4		8	0.0014	0.0102	0.0050	0.0402
5		8	0.0022	0.0173	0.0097	0.0772
6		8	0.0038	0.2980	0.0701	0.5608
7		10	0.0021	0.0396	0.0256	0.2558
8		14	0.0045	0.1340	0.0381	0.5338
9		15	0.0039	0.6475	0.0712	1.0677
10		13	0.0008	0.0429	0.0134	0.1743
11		13	0.0035	0.0457	0.0230	0.2988
12	↓	17	0.0051	0.8000	0.0810	1.3768
13	16:00:00 PM	17	0.0158	0.4700	0.1234	2.0980
Total Measurements		**150**		**Site Averag**	**0.030**	Total

2011/2012

Min	0.0001
Average	0.0299608
Max	0.8

T-5 - Landfill Gas Flare Results

Measurement	Units	Reading
Temperature	°C	1108.4
Residence Time	Seconds	0.3

T-6.1 - Landfill Gas Engine Results - Generator 1

EPL 11436

Note: A TAN coloured cell indicates that the indicated value is LESS THAN (<) indicated

							EPL Limit		**EPL Limit**						**EPL Limit**
							450		**100**						**5**
	Date	Carbon Dioxide	Carbon Monoxide	Dry Gas Density	Moisture Content	Molcular Weight Of Stack Gases	Nitrogen Oxides	Oxygen	Sulfuric Acid Mist & Sulfur Trioxides S03	Sulphur Dioxide	Temperature	Velocity	Volatile Organic Compounds	Volumetric Flowrate	Hydrogen Sulphide
		%	*mg/m3*	*kg/m3*	*%*	*gr/gr mole*	*mg/m3*	*%*	*mg/m3*	*mg/m3*	*Deg C*	*m/sec*	*mg/m3*	*m3/sec*	*mg/m3*
Generator 1	3/04/2009	11.6	962	1.35	5.6	30.2	318	8.2	6.58	21	455	50.5	3.62	1.71	0.31
	10/02/2010	13.3	1073	1.36	5.3	30.472	400	8.2	10.4	3	475	46.4	1.74	1.59	0.37
	30/06/2011	10.4	1011	1.34	3.3	30.032	382	9.2	8.13	56	418	42.9	4.14	1.6	0.34
	20/06/2012	11.6	997	1.35	8.3	30.172	385	8.2	11.3	214	447	45	0.09	1.49	0.326
OVERALL	Minimum	10.4	962	1.34	3.3	30.032	318	8.2	6.58	3	418	42.9	0.09	1.49	0.31
	Maximum	13.3	1073	1.36	8.3	30.472	400	9.2	11.3	214	475	50.5	4.14	1.71	0.37
	Average	11.73	1010.75	1.35	5.63	30.22	371.25	8.45	9.10	73.50	448.75	46.20	2.40	1.60	0.34
	StdDev	1.19	46.33	0.01	2.05	0.18	36.36	0.50	2.15	96.22	23.64	3.21	1.85	0.09	0.03
	Count	4	4	4	4	4	4	4	4	4	4	4	4	4	4

T-6.2 - Landfill Gas Engine Results - Generator 2

								EPL Limit		EPL Limit						EPL Limit
								450		100						5
EPL 11436		Date	Carbon Dioxide	Carbon Monoxide	Dry Gas Density	Moisture Content	Molcular Weight Of Stack Gases	Nitrogen Oxides	Oxygen	Sulfuric Acid Mist & Sulfur Trioxides S03	Sulphur Dioxide	Temperature	Velocity	Volatile Organic Compounds	Volumetric Flowrate	Hydrogen Sulphide
			%	*mg/m3*	*kg/m3*	%	*gr/gr mole*	*mg/m3*	%	*mg/m3*	*mg/m3*	*Deg C*	*m/sec*	*mg/m3*	*m3/sec*	*mg/m3*
	Generator 2	8/12/2008	9.3	674	1.31	6.2	29.4	449	10	7.88	10	437	44.7	4.17	1.55	
		23/06/2010	13.4	799	1.36	5.4	30.48	411	8.4	4.23	3	368	41.7	0.086	1.61	0.36
		30/06/2011	11.4	750	1.35	4.8	30.152	402	8.2	8.89	109	415	43.6	4.1	1.59	0.33
		20/06/2012	9.8	1011	1.34	8.1	29.944	384	9	7.9	255	432	44.7	0.18	1.52	3.354
	Note: A TAN coloured cell indicates that the indicated value is LESS THAN (<) indicated															
OVERALL	Minimum		9.30	674.00	1.31	4.80	29.40	384.00	8.20	4.23	3.00	368.00	41.70	0.09	1.52	0.33
	Maximum		13.40	1011.00	1.36	8.10	30.48	449.00	10.00	8.89	255.00	437.00	44.70	4.17	1.61	3.35
	Average		10.98	808.50	1.34	6.13	29.99	411.50	8.90	7.23	94.25	413.00	43.68	2.13	1.57	1.35
	StdDev		1.85	144.46	0.02	1.44	0.45	27.40	0.81	2.05	117.59	31.44	1.42	2.31	0.04	1.74
	Count		4	4	4	4	4	4	4	4	4	4	4	4	4	3

T-6.3 - Landfill Gas Engine Results - Generator 3

EPL 11436

Note: A TAN coloured cell indicates that the indicated value is LESS THAN (<) indicated

								EPL Limit 450		EPL Limit 100					EPL Limit 5
	Date	Carbon Dioxide	Carbon Monoxide	Dry Gas Density	Moisture Content	Molcular Weight Of Stack Gases	Nitrogen Oxides	Oxygen	Sulfuric Acid Mist & Sulfur Trioxides S03	Sulphur Dioxide	Temperature	Velocity	Volatile Organic Compounds	Volumetric Flowrate	Hydrogen Sulphide
		%	mg/m3	kg/m3	%	gr/gr mole	mg/m3	%	mg/m3	mg/m3	Deg C	m/sec	mg/m3	m3/sec	mg/m3
	8/04/2010	7.5	304	1.35	6	30.138	322	14.7	6.25	3	345	46.2	0.09	1.89	0.288
	30/06/2011	10.5	869	1.34	3.8	30.04	317	9	11.1	120	438	48.7	25	1.75	0.33
	20/06/2012	10.6	926	1.34	3.8	30.032	359	8.3	5.65	266	421	45.8	3.87	1.65	0.34
OVERALL	Minimum	7.50	304.00	1.34	3.80	30.03	317.00	8.30	5.65	3.00	345.00	45.80	0.09	1.65	0.29
	Maximum	10.60	926.00	1.35	6.00	30.14	359.00	14.70	11.10	266.00	438.00	48.70	25.00	1.89	0.34
	Average	9.53	699.67	1.34	4.53	30.07	332.67	10.67	7.67	129.67	401.33	46.90	9.65	1.76	0.32
	StdDev	1.76	343.84	0.01	1.27	0.06	22.94	3.51	2.99	131.77	49.52	1.57	13.42	0.12	0.03
	Count	3	3	3	3	3	3	3	3	3	3	3	3	3	3

T-6.4 - Landfill Gas Engine Results - Generator 4

							EPL Limit		EPL Limit						EPL Limit
							450		100						5
EPL 11436	Date	Carbon Dioxide	Carbon Monoxide	Dry Gas Density	Moisture Content	Molcular Weight Of Stack Gases	Nitrogen Oxides	Oxygen	Sulfuric Acid Mist & Sulfur Trioxides S03	Sulphur Dioxide	Temperature	Velocity	Volatile Organic Compounds	Volumetric Flowrate	Hydrogen Sulphide
		%	*mg/m3*	*kg/m3*	*%*	*gr/gr mole*	*mg/m3*	*%*	*mg/m3*	*mg/m3*	*Deg C*	*m/sec*	*mg/m3*	*m3/sec*	*mg/m3*
	20/06/2012	10.3	686	1.34	5.7	29.964	391	8.3	9.64	278	425	45.3	3.77	1.6	0.327

Note: A TAN coloured cell indicates that the indicated value is LESS THAN (<) indicated

OVERALL	Minimum	10.30	686.00	1.34	5.70	29.96	391.00	8.30	9.64	278.00	425.00	45.30	3.77	1.60	0.33
	Maximum	10.30	686.00	1.34	5.70	29.96	391.00	8.30	9.64	278.00	425.00	45.30	3.77	1.60	0.33
	Average	10.30	686.00	1.34	5.70	29.96	391.00	8.30	9.64	278.00	425.00	45.30	3.77	1.60	0.33
	StdDev	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count	1	1	1	1	1	1	1	1	1	1	1	1	1	1

T-7.1 - Dust Deposition Results - DG22

Site Name	ALS Batch Code	Date	Ash Residue	Combustibles	Calculated Rainfall	Soluble Matter	Insoluble Solids	Total Solids
			g/m2/mth	g/m2/mth	mm	g/m2/mth	g/m2/mth	g/m2/mth
DG22	EN1103106	Sep-11	2	0.3	45	1.6	2.3	3.9
DG22	EN1103462	Oct-11	1.5	0.1	33	0.2	1.6	1.8
DG22	EN1104234	Nov-11	4.5	0.7	114	4.2	5.2	9.4
DG22	EN1200155	Dec-11	0.6	0.1	55	0.1	0.6	0.6
DG22	EN1200964	Jan-12	4.9	0.3	51	1.5	5.2	6.7
DG22	EN1200963	Feb-12	0.9	0.1	48	1.3	0.9	2.2
DG22	EN1201560	Mar-12	1.1	0.7	73	1.1	1.8	2.9
DG22	EN1201922	Apr-12	1.6	0.3	55	2.6	1.9	4.5
DG22	EN1202394	May-12	2.1	0.1	81	2	2.1	4.1
DG22	EN1202687	Jun-12	0.8	0.1	21	0.8	0.9	1.7
DG22	EN1202991	Jul-12	0.8	0.1	33	0.1	0.8	0.9
DG22	EN1203485	Aug-12	24.6	3.7	40	2.8	28.3	31.1
		Min	0.6	0.1	21	0.1	0.6	0.6
		Avg	3.78	0.55	54.08	1.53	4.30	5.82
		Max	24.6	3.7	114	4.2	28.3	31.1
		stDev	6.71	1.02	25.20	1.23	7.72	8.35

T-7.2 - Dust Deposition Results - DG24

Site Name	ALS Batch Code	Date	Ash Residue	Combustibles	Calculated Rainfall	Soluble Matter	Insoluble Solids	Total Solids
			g/m2/mth	g/m2/mth	mm	g/m2/mth	g/m2/mth	g/m2/mth
DG24	EN1103106	Sep-11	1.1	0.3	42	2.6	1.4	4
DG24	EN1103462	Oct-11	0.8	0.3	12	0.7	1.1	1.8
DG24	EN1104234	Nov-11	3.6	1.4	114	6.5	5	11.5
DG24	EN1200155	Dec-11	0.9	0.2	55	1.1	1.1	2.2
DG24	EN1200964	Jan-12	1.6	0.1	49	4	1.7	5.7
DG24	EN1200963	Feb-12	1.6	0.6	48	3.7	2.2	5.9
DG24	EN1201560	Mar-12	1	0.3	91	2.7	1.3	4
DG24	EN1201922	Apr-12	1	0.6	62	0.5	1.6	2.1
DG24	EN1202394	May-12	1.8	0.5	84	3	2.3	5.3
DG24	EN1202687	Jun-12	2.5	2.7	24	2	5.2	7.2
DG24	EN1202991	Jul-12	0.5	0.3	30	0.1	0.8	0.8
DG24	EN1203485	Aug-12	0.8	0.3	38	0.5	1.1	1.6
2010/2011		Min	0.5	0.1	12	0.1	0.8	0.8
		Avg	1.43	0.63	54.08	2.28	2.07	4.34
		Max	3.6	2.7	114	6.5	5.2	11.5
		stDev	0.88	0.73	29.60	1.87	1.49	3.03

T-7.3 - Dust Deposition Results - DG28 Pylara

Site Name	ALS Batch Code	Date	Ash Residue	Combustibles	Calculated Rainfall	Soluble Matter	Insoluble Solids	Total Solids
			g/m2/mth	g/m2/mth	mm	g/m2/mth	g/m2/mth	g/m2/mth
DG28	EN1103106	Sep-11	0.4	0.6	38	0.6	1	1.6
DG28	EN1103462	Oct-11	0.2	0.1	13	0.6	0.2	0.8
DG28	EN1104234	Nov-11	1.5	1	114	2.7	2.5	5.2
DG28	EN1200155	Dec-11	0.4	0.3	55	0.1	0.7	0.7
DG28	EN1200964	Jan-12	0.5	0.1	42	0.2	0.6	0.8
DG28	EN1200963	Feb-12	1.8	1.1	48	0.8	2.9	3.7
DG28	EN1201560	Mar-12	0.4	0.1	69	1	0.5	1.5
DG28	EN1201922	Apr-12	0.3	0.3	55	0.7	0.6	1.3
DG28	EN1202394	May-12	0.2	0.2	71	1	0.4	1.4
DG28	EN1202687	Jun-12	0.1	0.1	20	0.5	0.1	0.6
DG28	EN1202991	Jul-12	0.2	0.1	35	0.3	0.3	0.6
DG28	EN1203485	Aug-12	0.3	0.3	28	2.1	0.6	2.7
2010/2011		Min	0.1	0.1	13	0.1	0.1	0.6
		Avg	0.53	0.36	49.00	0.88	0.87	1.74
		Max	1.8	1.1	114	2.7	2.9	5.2
		stDev	0.54	0.36	27.18	0.77	0.89	1.43

T-8.1 - Surface Water Results - Site 115

	Statistics	Field Information											Analytical Information							
EPL 11436		Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissovled Oxygen	Redox	Flow		Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Total Dissolved Solids	Total Organic Carbon	Total Potassium
				AM/PM	Initials	pH	µS/cm	°C	mg/L	mV				mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L
		11/11/2011	115	8.21	TH	7.39	2430	14.8	5.68	178.8	No flow, 36mr		861891	0.1	2	2400	8.2	1600	18	3.7
		20/12/2011	115	9.03	TH	7.12	1293	18	7.89	38.4	Low flow, 40m		867621	0.1	3	1300	7.9	900	18	2.1
		12/03/2012	115	14.06	TH	7.28	1104	21.2	7.86	0	Medium flow		879522	0.1	2	1100	7.8	760	25	2.1
		6/06/2012	115	10.51	TH	6.14	1718	7.8	11.51	41.2	Medium flow		892100	0.1	2	1700	8.1	1200	17	2.5
2011/12	Minimum					6.14	1104	7.8	5.68	0				0.1	2	1100	7.8	760	17	2.1
	Maximum					7.39	2430	21.2	11.51	178.8	0		892100	0.1	3	2400	8.2	1600	25	3.7
	Average					6.9825	1636.25	15.45	8.235	64.6				0.1	2.25	1625	8	1115	19.5	2.6
	StdDev					0.5725	588.170256	5.73032867	2.416147	78.419				0	0.5	573.7304826	0.182574	371.79744	3.6968	0.757187779
	Count					4	4	4	4	4				4	4	4	4	4	4	4

T-8.2 - Surface Water Results - Spring 2

	Statistics	Field Information											Analytical Information							
EPL 11436		Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissovled Oxygen	Redox	Flow		Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Total Dissolved Solids	Total Organic Carbon	Total Potassium
				AM/PM	Initials	pH	µS/cm	°C	mg/L	mV				mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L
		11/11/2011	Spring 2	9.04	TH	5.69	801	18.2	8.6	503	No flow, 36mr		861892	2	2	790	6.1	530	10	24
		20/12/2011	Spring 2	10.07	TH	4.76	447	18	9.54	0	Low flow, 40m		867624	0.1	3	440	5.8	340	12	9.8
		12/03/2012	Spring 2	13.27	TH	6.94	354	18.2	9.85	0	Low flow		879520	0.1	5	360	6.6	320	37	2.3
		6/06/2012	Spring 2	9.06	TH	6.19	434	5.7	9.5	-41	Medium flow		892098	0.1	4	440	6.2	400	17	3.4
2011/12	Minimum					4.76	354	5.7	8.6	-41				0.1	2	360	5.8	320	10	2.3
	Maximum					6.94	801	18.2	9.85	503				2	5	790	6.6	530	37	24
	Average					5.895	509	15.025	9.3725	115.5				0.575	3.5	507.5	6.175	397.5	19	9.875
	StdDev					0.91457	198.962308	6.21738155	0.53823	259.06				0.95	1.290994449	192.0720351	0.330404	94.648472	12.356	9.980439202
	Count					4	4	4	4	4				4	4	4	4	4	4	4

T-8.3 - Surface Water Results - Site 105

	Statistics	Field Information											Analytical Information							
EPL 11436		Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissovled Oxygen	Redox	Flow		Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Total Dissolved Solids	Total Organic Carbon	Total Potassium
				AM/PM	Initials	pH	µS/cm	°C	mg/L	mV				mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L
		5/10/2011	105	10.15	TH	6.56	3890	10.7	9.01	10.1	Medium flow		856583	0.2	2	4000	7.9	2600	14	1.4
		20/12/2011	105	10.28	TH	6.66	1560	17.1	7.18	0	High flow, 40r		867620	0.1	4	1500	7.6	1200	22	2.3
		12/03/2012	105	13.41	TH	7.08	812	18.1	7.36	0	High flow		879521	0.1	2	800	7.4	580	29	1.2
		6/06/2012	105	9.2	TH	6.42	1345	6	10.6	-78.2	High flow		892099	0.1	2	1400	7.8	1000	19	2.8
2011/12	Minimum					6.42	812	6	7.18	-78.2				0.1	2	800	7.4	580	14	1.2
	Maximum					7.08	3890	18.1	10.6	10.1				0.2	4	4000	7.9	2600	29	2.8
	Average					6.68	1901.75	12.975	8.5375	-17.03				0.125	2.5	1925	7.675	1345	21	1.925
	StdDev					0.28425	1362.28445	5.68939071	1.602755	41.06				0.05	1	1417.450763	0.221736	875.65214	6.2716	0.754431353
	Count					4	4	4	4	4				4	4	4	4	4	4	4

T-8.4 - Surface Water Results - Raw Water Dam (WM200)

	Statistics	Field Information											Analytical Information							
SML20 EPL 11436		Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissovled Oxygen	Redox	Flow		Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Total Dissolved Solids	Total Organic Carbon	Total Potassium
				AM/PM	Initials	pH	µS/cm	°C	mg/L	mV				mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L
		5/10/2011	WM200	9.42	TH	5.51	1511	12.3	10.83	5.3	No flow		856579	0.1	2	1500	7.2	1000	6	4.3
		20/12/2011	WM200	9.2	TH	6.04	1462	18.1	9.41	34.6	Low flow, 40m		867617	0.1	2	1400	6	1100	9	4.1
		12/03/2012	WM200	14.23	TH	6.72	1090	18.9	9.5	0	Low flow		879518	0.1	2	1100	5.7	810	13	3.6
		6/06/2012	WM200	10.15	TH	4.82	1100	8.4	11.23	122.1	Low flow		892094	0.1	2	1100	6.3	830	13	3.9
2011/12	Minimum					4.82	1090	8.4	9.41	0	0			0.1	2	1100	5.7	810	6	3.6
	Maximum					6.72	1511	18.9	11.23	122.1	0			0.1	2	1500	7.2	1100	13	4.3
	Average					5.7725	1290.75	14.425	10.2425	40.5	#DIV/0!			0.1	2	1275	6.3	935	10.25	3.975
	StdDev					0.80529	226.952822	4.97820249	0.924604	56.488	#DIV/0!			0	0	206.1552813	0.648074	139.16417	3.4034	0.298607881
	Count					4	4	4	4	4	0			4	4	4	4	4	4	4

T-8.5 - Surface Water Results - Entrance Road Culvert (WM201)

Statistics	Field Information										Analytical Information							
EPL 11436	Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissovled Oxygen	Redox	Flow	Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Total Dissolved Solids	Total Organic Carbon	Total Potassium
			AM/PM	Initials	pH	µS/cm	°C	mg/L	mV			mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L
	20/12/2011	WM201	9.56	TH	4.6	301	16.7	6.46	0	Low flow, 40m	867618	0.1	3	290	5.7	240	15	3.2
	3/02/2012	WM201	10.56	TH	5.85	396	15.8	8.26	0	High flow 38m	873750	0.1	2	230	5.6	150	9	3
	6/06/2012	WM201	8.27	TH	6	1620	6.4	8.27	-47.2	Medium flow	892095	0.1	2	230	6.1	190	13	2.3
2011/12	Minimum				4.6	301	6.4	6.46	-47.2			0.1	2	230	5.6	150	9	2.3
	Maximum				6	1620	16.7	8.27	0			0.1	3	290	6.1	240	15	3.2
	Average				5.48333	772.333333	12.9666667	7.663333	-15.73			0.1	2.333333333	250	5.8	193.33333	12.333	2.833333333
	StdDev				0.76866	735.636006	5.70467644	1.042129	27.251			1.6997E-17	0.577350269	34.64101615	0.264575	45.092498	3.0551	0.472581563
	Count				3	3	3	3	3			3	3	3	3	3	3	3

T-8.6 - Surface Water Results - Evaporation Dam 3 South (WM202)

Statistics	Field Information										Analytical Information							
EPL 11436	Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissovled Oxygen	Redox	Flow	Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Total Dissolved Solids	Total Organic Carbon	Total Potassium
			AM/PM	Initials	pH	µS/cm	°C	mg/L	mV			mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L
	5/10/2011	WM202	9.14	TH	2.71	8670	11.4	11.09	-22.1	no flow	856580	82	3	8700	2.8	11000	8	10
	20/12/2011	WM202	9.35	TH	2.74	8110	18.1	9.8	0	Low flow, 40m	867627	52	4	8000	2.8	10000	7	6.8
	12/03/2012	WM202	14.33	TH	3.14	6730	18.8	9.72	0	Low flow	879519	54	3	6800	2.8	8500	12	7.6
	6/06/2012	WM202	11.17	TH	3.19	6200	7.6	11.38	224.7	Medium flow	892096	56	2	6300	2.9	7900	6	9.7
2011/12	Minimum				2.71	6200	7.6	9.72	-22.1			52	2	6300	2.8	7900	6	6.8
	Maximum				3.19	8670	18.8	11.38	224.7			82	4	8700	2.9	11000	12	10
	Average				2.945	7427.5	13.975	10.4975	50.65			61	3	7450	2.825	9350	8.25	8.525
	StdDev				0.25515	1155.11543	5.40269994	0.860402	116.5			14.0949163	0.816496581	1096.965511	0.05	1410.6736	2.63	1.569235483
	Count				4	4	4	4	4			4	4	4	4	4	4	4

T-8.7 - Surface Water Results - Evaporation Dam 3 North (WM203)

Statistics	Field Information										Analytical Information							
EPL 11436	Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissovled Oxygen	Redox	Flow	Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Total Dissolved Solids	Total Organic Carbon	Total Potassium
			AM/PM	Initials	pH	µS/cm	°C	mg/L	mV			mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L
	05/10/2011	WM203	9.27	TH	4.72	21040	11.6	8	-6.1	no flow	856582	940	290	21000	5.1	21000	410	730
	20/12/2011	WM203	9.27	TH	4.94	20590	17.6	8.52	0	Low flow, 40m	867619	870	280	21000	4.9	20000	290	750
	12/03/2012	WM203	10.2	TH	4.18	15670	17.6	1.2	0	No flow	882681	590	140	16000	4.2	16000	200	
	6/06/2012	WM203	11.08	TH	4.67	14920	8.2	10.63	140.8	Low flow	892097	590	110	16000	4.3	16000	190	460
2011/12	Minimum				4.18	14920	8.2	1.2	-6.1			590	110	16000	4.2	16000	190	460
	Maximum				4.94	21040	17.6	10.63	140.8			940	290	21000	5.1	21000	410	750
	Average				4.6275	18055	13.75	7.0875	33.675			747.5	205	18500	4.625	18250	272.5	646.6666667
	StdDev				0.32056	3206.9144	4.65725241	4.086428	71.475			184.096895	93.27379053	2886.751346	0.442531	2629.9556	102.1	161.9670748
	Count				4	4	4	4	4			4	4	4	4	4	4	3

T-8.8 - Surface Water Results - Pond 3

Statistics	Field Information										Analytical Information							
EPL 11436	Date	Site Code	Time	Sampler	pH	Conductivity	Temperature	Dissovled Oxygen	Redox	Flow	Laboratory Sample Code	Nitrogen (ammonia)	Biochemical Oxygen Demand	Conductivity	pH	Total Dissolved Solids	Total Organic Carbon	Total Potassium
			AM/PM	Initials	pH	µS/cm	°C	mg/L	mV			mg/L	mg/L	µS/cm	pH	mg/L	mg/L	mg/L
	5/10/2011	Pond 3	10.01	TH	3.77	6920	12.5	1.75	7.6	no flow	856584	23	58	6800	3.5	10000	88	16
	20/12/2011	Pond 3	10.45	TH	3.07	2157	17.8	5.6	0	Low flow, 40m	867623	3.1	4	2100	3	2100	15	0.7
	6/06/2012	Pond 3	10.01	TH	2.85	8720	10.4	11.07	248.6	Low flow	892101	6	7	8100	2.6	13000	10	0.6
	26/07/2012	Pond 3	10.56	TH	3.62	3550	10.6	6.95	209.1	Low flow, 1.5m	898779	23	7	3600	3.2	4200	11	14
2011/12	Minimum				2.85	2157	10.4	1.75	0			3.1	4	2100	2.6	2100	10	0.6
	Maximum				3.77	8720	17.8	11.07	248.6			23	58	8100	3.5	13000	88	16
	Average				3.3275	5336.75	12.825	6.3425	116.33			13.775	19	5150	3.075	7325	31	7.825
	StdDev				0.43805	3014.20784	3.44903368	3.845373	130.97			10.7177034	26.03843313	2776.688675	0.377492	5047.359	38.061	8.32521271
	Count				4	4	4	4	4			4	4	4	4	4	4	4

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T-9.1 - Leachate Results - Leachate Pond

| | Statistics | Field Information | | | | | | | | | Analytical Information | | | | | | | | |

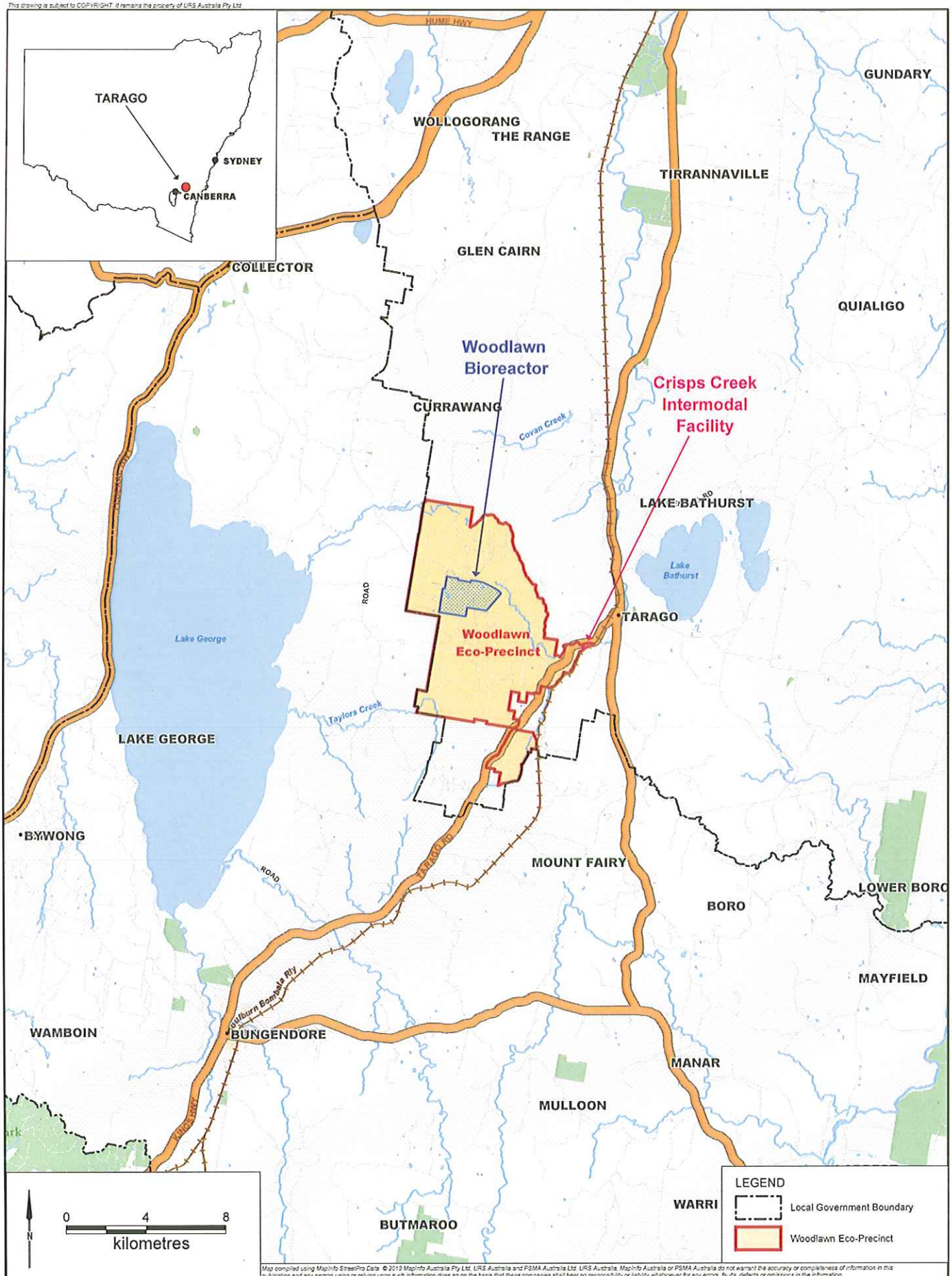
APPENDICES

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APPENDIX 1 – SITE LOCATION PLAN

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Map compiled using MapInfo StreetPro Data. © 2010 MapInfo Australia Pty Ltd, URS Australia and PSMA Australia Ltd. URS Australia, MapInfo Australia or PSMA Australia do not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that these companies shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.

Client	Project	Title
VEOLIA ENVIRONMENTAL SERVICES PTY LTD	WOODLAWN EXPANSION PROJECT	WOODLAWN ECO-PRECINCT LOCATION

URS

Drawn: SB	Approved: LO	Date: 06/08/2010
Job No: 43177703	File No: 43177703.018.wor	

Figure: 1.1

APPENDIX 2 – EPL BOUNDARY

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North

EVAPORATION DAM 2

EVAPORATION DAM 1

Lot 30 DP 754919

Lot 25 DP 754919

EVAPORATION DAM 3

EVAPORATION DAM 3

WEST RIDGE

OFFICE AREA

4

3

5

2

1

DISUSED PLANT AREA

PLANT COLLECTION DAM

HICKORY'S PADDOCK

RAW WATER DAM

DOLORITE STOCKPILE

Lot 91 DP 754919

Lot 88 DP 754919

MINE VOID

Lot 19 DP 827588

LAKE GEORGE CATCHMENT

WASTE ROCK DAM

REHABILITATED WASTE DUMP

WOLLONDILLY CATCHMENT

NORTH TAILINGS DAM

WEST TAILINGS DAM

SOUTH TAILINGS DAM

LAKE GEORGE CATCHMENT

AREA SOURCE - WOODWARD-CLYDE DRAWING A8602362/0600

PROJECT AREAS

1 - ACCESS ROAD
2 - MINE VOID
3 - EVAPORATION DAM
4 - OFFICES, WORKSHOP, POWER GENERATING INFRASTRUCTURE
5 - PIPELINE

Cad ref: J:\MMPL\10407001\Cad\LEMP\LEMP-10407001-560.dwg

Last modified: 23 Jun 04 - 15:00

REVISIONS				
No.	BY	DATE	DESCRIPTION	APPD
A	SGG	23.6.04		

Before commencing work, all controlling dimensions on the drawings must be verified on the site, particularly those relative to property allgnments, other structures, and services.

Figured dimensions take preference over scaled. If in doubt, ask.

SCALES

0 100 200 300 400m

1 : 1500 at A3

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THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE MAUNSELL AUSTRALIA QUALITY ASSURANCE SYSTEM CERTIFIED TO AS/NZS ISO 9001-1994

	PREPARED	CHECKED	
DESIGN			PASSED
DRAFTING	PM		DATE

maunsell

Maunsell Australia Pty Ltd A.B.N. 20 093 846 925
An AECOM company

WOODLAWN BIOREACTOR

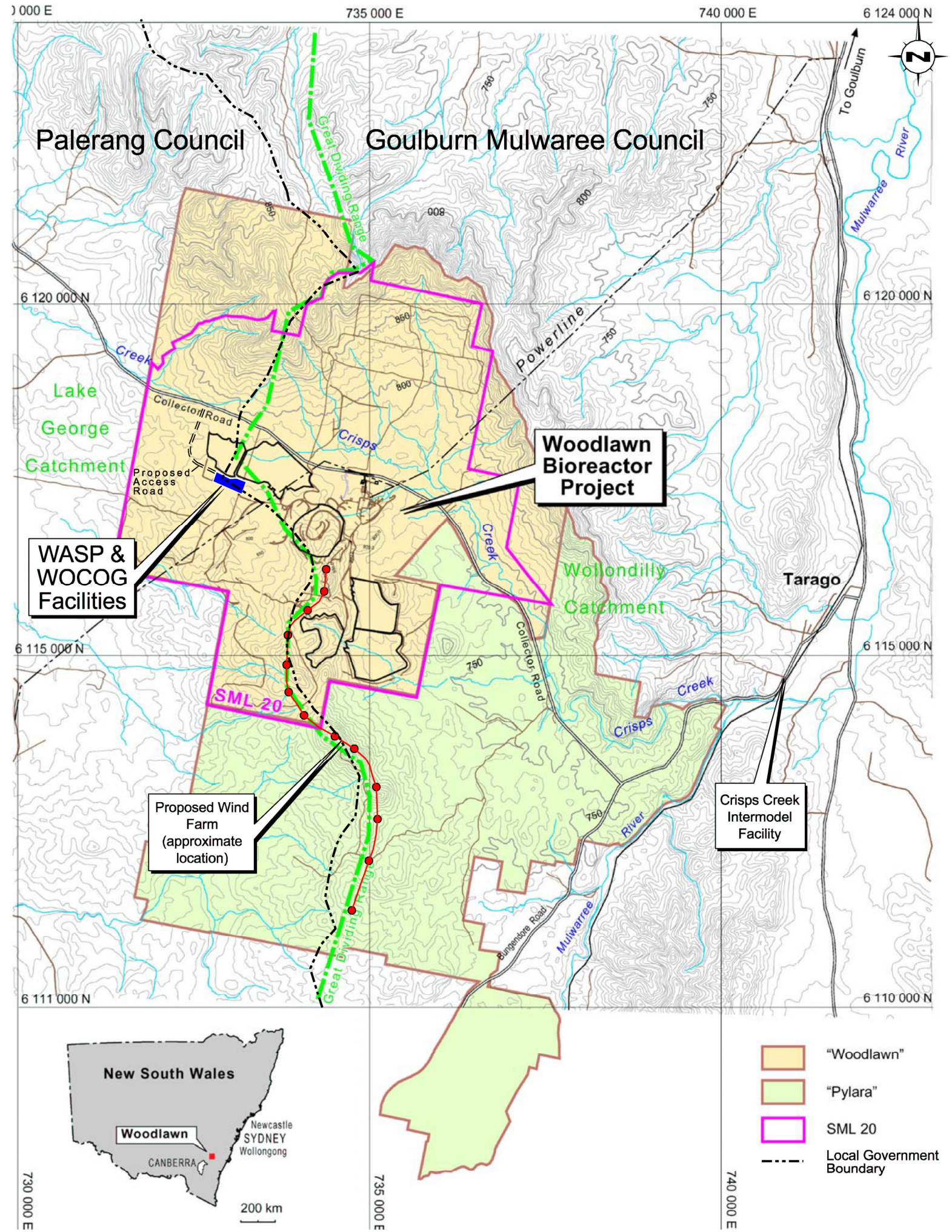
WOODLAWN MINE SITE

LICENCED PREMISES

10407001-560 | A

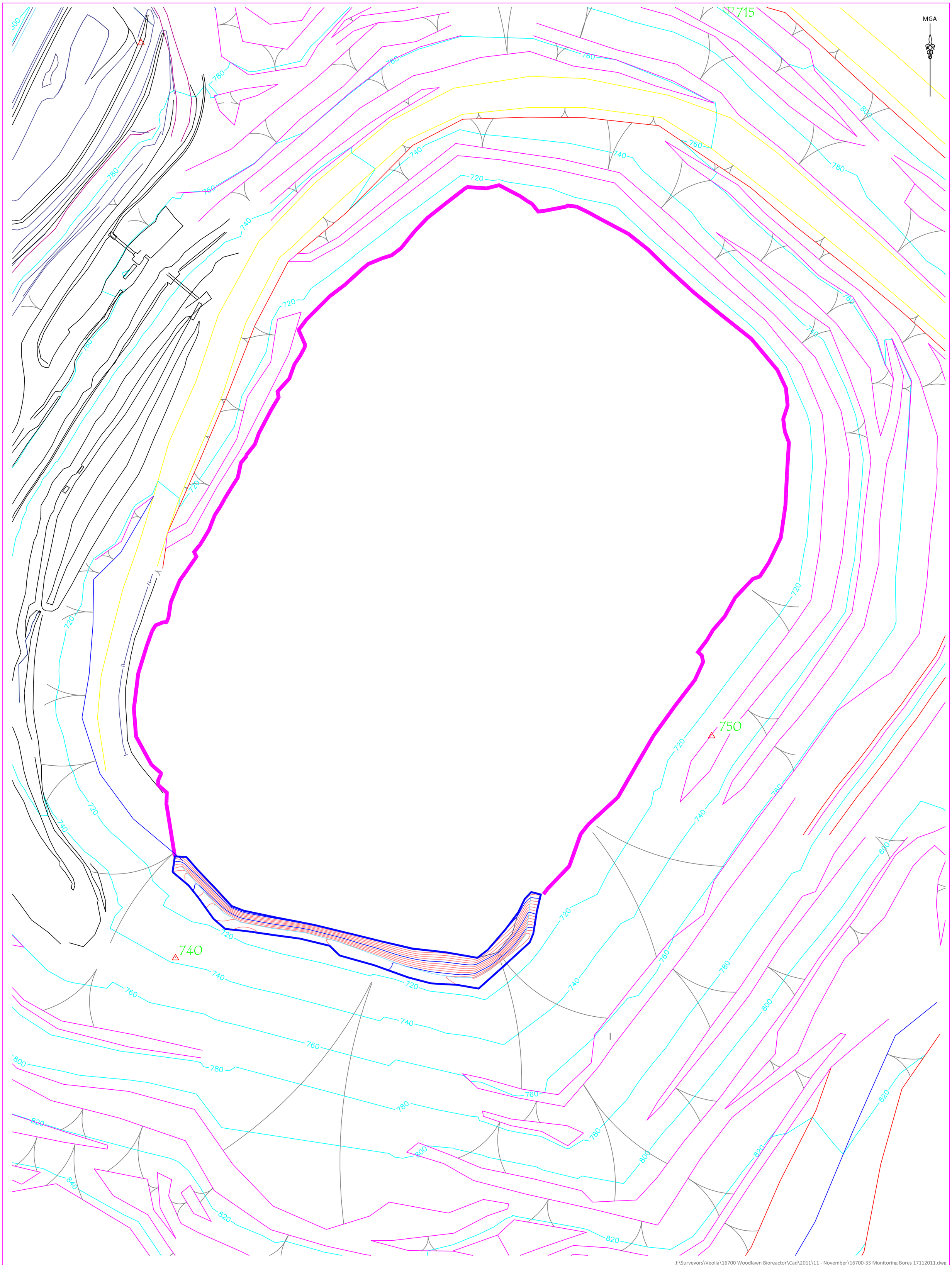
APPENDIX 3 – SML20 BOUNDARY

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000 E
735 000 E
740 000 E
6 124 000 N
Palerang Council
Goulburn Mulwaree Council
Great Dividing Range
To Goulburn
Mulwarree River
6 120 000 N
Powerline
Creek
Lake George Catchment
Collector Road
Crisps
Proposed Access Road
Woodlawn Bioreactor Project
WASP & WOCOG Facilities
Wollondilly Catchment
Tarago
6 115 000 N
SML 20
Proposed Wind Farm (approximate location)
Crisps Creek Intermodel Facility
Bungendore Road
6 111 000 N
6 110 000 N
New South Wales
Woodlawn
Newcastle
SYDNEY
Wollongong
CANBERRA
200 km
"Woodlawn"
"Pylara"
SML 20
Local Government Boundary
730 000 E
735 000 E
740 000 E

APPENDIX 4 – CLAY LINING PLAN

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ISSUE	AMENDMENT	DATE
A	INITIAL ISSUE	29/10/2012

SCALE 1:1250

0 15 30 45 60 75

Metres

Liability limited by a scheme approved under Professional Standards Legislation.

A2 SHEET

VEOLIA ENVIRONMENTAL SERVICES

LandTeam Australia Pty Ltd
ABN 35 300 283 502
Goulburn Office
36 Montague Street
Postal: PO Box 1040
GOULBURN NSW 2580
p: (02) 4821 1033
f: (02) 4821 7238
e: goulburn@landteam.com.au

VEOLIA ENVIRONMENTAL SERVICES

WOODLAWN BIOREACTOR
CLAY LINING LOCATION
OCTOBER 2012

DATUM: AHD | ORIGIN: PILLAR 713 | CONTOUR INTERVAL: 20m

DATE: 29/10/2012
SURVEYED: S McD
DRAWN: S McD
CHECKED: MK
ISSUE A

DRAWING No.

16700-60

J:\Surveyors\Veolia\16700 Woodlawn Bioreactor\Cad\2011\11 - November\16700-33 Monitoring Bores 17112011.dwg

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APPENDIX 5 – CLYDE WASTE SCREENING PROCEDURE

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NSW Resource Recovery Screening & Recording of Waste Procedure

Aim and Scope

This procedure covers the waste screening and recording requirements at the NSW Resource Recovery Facilities. These facilities each have Environment Protection Licenses which need to be complied with when receiving waste at the facilities. Whilst the types of waste accepted at each of these facilities can vary, the process for screening and recording waste are substantially the same.

Acts, Regulations, Codes of Practice and Australian Standards

Protection of the Environment Operations Act 1997

Accountabilities and Responsibilities

The Operations Manager is accountable for ensuring that this procedure is implemented onsite.

All workers onsite are responsible with following this procedure. All customers are also responsible in following these procedures where they apply to the transport and tipping of their waste.

Procedure

Site inductions and Customer Contracts

There are three types of customers that will tip waste at NSW Resource Recovery facilities:

1. Internal Customers (VES NSW)
2. External Account Customers
3. one-off COD customers (where applicable)

All account customer's waste taken directly to site needs to be preapproved by the NSW Resource Recovery Sales Team or Site Management to ensure that it meets the site Environment Protection License requirements. Sites have induction materials available for all drivers coming onsite, including pamphlets and videos. Inductions include the site safety requirements as well as the environmental requirements, including waste types permitted by the Environment Protection License.

Waste Screening and Inspection

There are two main screening points when waste is delivered to the site:

- At the Weighbridge, site staff confirm the source of the waste material and provide access to the site, before allowing vehicle to proceed to the tipping facility. All details of the waste accepted onto site are recorded.
- At the Tipping area, Site staff inspection of waste as it is discharged from vehicle at the tipping area, to check for non-conforming waste. Site operators are trained to recognise wastes that are not to be accepted at the site. If the site operator sees a non-conforming waste, the truck driver will be informed and asked to wait. The site manager will be immediately informed who will arrange for the customer to be notified.

Where a non-conforming waste is identified, if appropriate, the site operator will isolate the load, either by leaving it or by moving it to a separate place so as not to cause hazard or disruption to others. The operator should follow the Procedure for Waste Rejection.

Should there be any reason to not permit the load onto the site, the customer will be informed and a record of waste rejected will be kept. The Procedure for Waste Rejection will be followed.

Inspection at Unloading Point

If the operator is in any doubt as to the contents of the load, the load will be left in place and the Site Manager consulted. If possible, the driver will be asked to provide any further information on the contents. In the event that part or the entire load is to be rejected, Procedure for Waste Rejection will be followed.

Recording of Waste

The customer details are verified on PWS. If there are any concerns or queries, the site manager will be contacted and the driver's office may be contacted.

Once VES staff are satisfied that the waste is acceptable, the following details are recorded on PWS:

- Date
- Time
- Vehicle Registration
- Customer
- Gross weight
- Waste type

Once the load has been tipped the vehicle will proceed to the weighbridge and a tare weight will be recorded. A transaction docket will be produced confirming the key details above, and the weighbridge operator will obtain the driver's signature (where applicable) to confirm the details. A copy will be given to the driver.

Procedure for Waste Rejection

If a load of waste is rejected at the facility, one of the following processes will take place:

1. If it can be loaded easily and safely, the load will be reloaded into the same vehicle to allow the driver to dispose of the waste material at another facility.
2. If it cannot be reloaded into the same vehicle, the waste will be segregated and reloaded into a suitable vehicle.

Any costs associated with Waste rejection will be borne by the customer.

End of Procedure

APPENDIX 6 – MONITORING LOCATIONS PLAN

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MINE GRID

Rev.	Description	By	Date
A	Site monitoring locations	B.R.	12/10/07

Kells Land Development Solutions
GOULBURN
88 Montague Street
PO Box 2060
GOULBURN NSW 2580
Ph: (02) 4821 2288
Fax (02) 4821 2288
BRAIDWOOD
5 Village Terrace
Jellicoe Street
BRAIDWOOD NSW 2622
Ph: (02) 4842 2288
Fax (02) 4842 2994
Email: office@kellsurveyors.com.au

SCALE 1:12,500 (AT A1)

0 250 500 750 1000 1250
Metres

SURVEY	B.R
DESIGN	VEOLIA
DRAWN	B.R.
CHECKED	VEOLIA
APPROVED	VEOLIA

VEOLIA ENVIRONMENTAL SERVICES

WOODLAWN BIOREACTOR SITE MONITORING LOCATIONS

DATUM: AHD
ORIGIN OF LEVELS:
DRAWING No. 16800 - 220/1
REV. A

APPENDIX 7 – WEATHER STATION CALIBRATION RECORDS

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HCS Hydrometric Consulting Services

Specialists in water measurement and instrumentation

24th July 2012

Henry Gundry
Veolia/Collex
Woodlawn Bioreactor

Re – weather station

Henry

The quarterly routine service and maintenance visit was undertaken on Monday 23rd July.

All sensors were checked by using a Kestral 3000 Portable Weather Sensor, Monitor Solar Radiation sensor and a compass – details as follows

Sensor	Actual reading	Logger reading
Wind Direction	75 deg	75 deg - fluctuating
Wind Speed	2.6 m/s @ 2m	3.2 m/s @ 10m - fluctuating
Temperature	6.5 deg	6.8 deg @ 10m 7.6 deg @ 2m
TBRG	tested	tested
Solar Radiation	330 w/cu.m	332
Relative Humidity	87.7%	83.5%
Barometric Pressure	938	938
Battery	13.2v	

The sensors were cleaned and the TBRG dismantled and thoroughly cleaned. Guy-wires were tightened and one of the turn buckles replaced due to breakage Immediate area around was cleared.

Additionally the weather station at the evaporation pond was also checked and cleaned – details as follows

Sensor	Actual Reading	Logger Reading
Wind Direction	110 deg	110 deg
Wind Speed	4.7 m/s (fluctuating)	4.7 m/sec
Battery	13.7v	

Please find attached our invoice which includes an amount for the service and maintenance of the additional weather station.

S.Swanbury

Hydrometric Consulting Services Pty Ltd
ABN 16 091 437 071

17 Caley St
Bowral NSW 2576
Tele 48617389 Fax 48617197 Mob 0410564196
Email steves@mitmania.net.au

2 Autumn Place
Guildford NSW 2161
Tele 98924588 Fax 98924599 Mob 0402134092
Email glenmurf@ozemail.com.au

www.hydrometric.com.au

HCS Hydrometric Consulting Services

Specialists in water measurement and instrumentation

24th April 2012

Henry Gundry
Veolia/Collex
Woodlawn Bioreactor

Re – weather station

Henry

The quarterly routine service and maintenance visit was undertaken on Tuesday 24th April

All sensors were checked by using a Kestral 3000 Portable Weather Sensor, Monitor Solar Radiation sensor and a compass – details as follows

NOTE – a calibration of the raingauge was not undertaken as there was rainfall occurring and the calibration could compromise the data set

Sensor	**Actual reading**	**Logger reading**
Wind Direction	270 deg	270 deg - fluctuating
Wind Speed	1.0 m/s @ 2m	1.0 m/s @ 10m - fluctuating
Temperature	10.0 deg	9.8 deg @ 10m 10.4 deg @ 2m
TBRG	n/a	n/a
Solar Radiation	160 w/cu.m	160
Relative Humidity	75%	76%
Barometric Pressure	n/a	n/a
Battery	13.1v	

The sensors were cleaned and the TBRG dismantled and thoroughly cleaned.
Guy-wires were tightened.
Immediate area around was cleared.

Additionally the weather station at the evaporation pond was also checked and cleaned – details as follows

Sensor	Actual Reading	Logger Reading
Wind Direction	270 deg	270 deg
Wind Speed	3.6 m/s (fluctuating)	4 m/sec
Battery	13.9v	

Please find attached our invoice which includes an amount for the service and maintenance of the additional weather station.

S.Swanbury

Hydrometric Consulting Services Pty Ltd
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17 Caley St
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2 Autumn Place
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Tele 98924588 Fax 98924599 Mob 0402134092
Email glenmurf@ozemail.com.au

www.hydrometric.com.au

HCS Hydrometric Consulting Services

Specialists in water measurement and instrumentation

30th January 2012

Henry Gundry
Veoila/Collex
Woodlawn Bioreactor

Re – weather station

Henry

The quarterly routine service and maintenance visit was undertaken on Monday 30th January.

All sensors were checked by using a Kestral 3000 Portable Weather Sensor, Monitor Solar Radiation sensor and a compass – details as follows

NOTE – a calibration of the raingauge was not undertaken as there was rainfall occurring and the calibration could compromise the data set

Sensor	Actual reading	Logger reading
Wind Direction	300 deg	300 deg
Wind Speed	5.0 m/s @ 2m	8.0 m/s @ 10m
Temperature	20.9 deg	21.2 deg @ 10m 20.9 deg @ 2m
TBRG	n/a	n/a
Solar Radiation	340 w/cu.m	340
Relative Humidity	85%	86%
Barometric Pressure	912hPa	912
Battery	13.2v	

The sensors were cleaned and the TBRG dismantled and thoroughly cleaned.

Additionally the weather station at the evaporation pond was also checked and cleaned – details as follows

Sensor	Actual Reading	Logger Reading
Wind Direction	290 deg	290 deg
Wind Speed	10 m/s (fluctuating)	10 m/sec
Battery	13.6v	

Please find attached our invoice which includes an amount for the service and maintenance of the additional weather station.

S.Swanbury

Hydrometric Consulting Services Pty Ltd
ABN 16 091 437 071

17 Caley St
Bowral NSW 2576
Tele 48617389 Fax 48617197 Mob 0410564196
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2 Autumn Place
Guildford NSW 2161
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www.hydrometric.com.au

HCS Hydrometric Consulting Services

Specialists in water measurement and instrumentation

1st November 2011

Henry Gundry
Veoila/Collex
Woodlawn Bioreactor

Re – weather station

Henry

The quarterly routine service and maintenance visit was undertaken on Monday 31st October.

All sensors were checked by using a Hydrological Services Raingauge calibrator, Kestral 3000 Portable Weather Sensor, Monitor Solar Radiation sensor and a compass – details as follows

Sensor	Actual reading	Logger reading
Wind Direction	320 deg	317 deg
Wind Speed	2.6 m/s @ 2m	3.2 m/s @ 10m
Temperature	15 deg	16.2 deg @ 10m 14.2 deg @ 2m
TBRG	20 tips	20 tips
Solar Radiation	900 w/cu.m	900
Relative Humidity	54%	53.6%
Barometric Pressure	931hPa	931
Battery	13.2v	

The sensors were cleaned and the TBRG dismantled and thoroughly cleaned.

Additionally the weather station at the evaporation pond was also checked and cleaned – details as follows

Sensor	Actual Reading	Logger Reading
Wind Direction	90 deg	90 deg
Wind Speed	0.9 m/s (fluctuating)	0.9 m/sec
Battery	13.7v	

Please find attached our invoice which includes an amount for the service and maintenance of the additional weather station.

S.Swanbury

Hydrometric Consulting Services Pty Ltd
ABN 16 091 437 071

17 Caley St
Bowral NSW 2576
Tele 48617389 Fax 48617197 Mob 0410564196
Email steves@mitmania.net.au

2 Autumn Place
Guildford NSW 2161
Tele 98924588 Fax 98924599 Mob 0402134092
Email glenmurf@ozemail.com.au

www.hydrometric.com.au

APPENDIX 8 – MB19 AND MB20 RESULTS

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Appendix 8 - MB19 & MB20

| Statistics | | Field Information | | | | | | | | | | Analytical Information | | | | | | | | | |