Mining Management Plan 2018

Vista Gold Australia Pty Ltd

Mount Todd Gold Project

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ABBREVIATIONS

2013 MMP	Vista Gold 2013-2017 MMP/WMP
AAPA	Aboriginal Areas Protection Authority
AFANT	Amateur Fishermen's Association of the Northern Territory
AHD	Australian Height Datum
AMD	Acid Metalliferous Drainage
ANC	Acid Neutralising Capacity
BGL	Below Ground Level
CCNT	Conservation Commission of the Northern Territory
COC	Chain of Custody
CSE	Confluence of Stow Creek and Edith River
DLPE	Department of Lands, Planning and Environment
DME	Department of Mines and Energy
DO	Dissolved Oxygen
DTA	Direct Toxicity Assessment
EC	Electrical Conductivity
ELN	Exploration Lease Number
EPA	Environmental Protection Agency
HDPE	High Density Polyethylene
HLP	Heap Leach Pad
Ha	Hectares
Km	Kilometres
Km/h	Kilometres per hour
L	Litres
L/s	Litres per Second
LGO	Low Grade Ore
PAF	Potentially Acid Forming
PCG	Pine Creek Geosyncline
Mg/L	Microgram per Litre
MLN	Mineral Leases Number
MMP	Mining Management Plan
MSDS	Material Safety Data Sheet
MTPA	Million Tonnes Per Annum
NT	Northern Territory
ROM	Run of Mine
RP	Retention Pond
RWA	Restricted Works Areas

TSF	Tailing Storage Facility
Vista Gold	Vista Gold Australia Pty Ltd
VSD	Variable Speed Drive
WCER	Confluence of West Creek and Edith River
WDL	Waste Discharge Licence
WRD	Waste Rock Dump
WMP	Water Management Plan
WTP	Water Treatment Plant
°C	Degrees Celsius

1 Introduction

Vista Gold currently conducts the care and maintenance activities on the Mount Todd Gold mine site on behalf of the NT Government under agreement D92226 (Appendix A). The intention is to re-establish, operate and rehabilitate the site through the Mount Todd Gold Project.

The site remains a brownfield/disturbed site that was previously mined for gold in the 1990s until 2000. Mining infrastructure including tailings dams, waste rock dumps and remains of processing facilities remain on site (Figure 1).

Submission of a Mining Management Plan (MMP) is a regulatory requirement for issue of an authorisation and this document presents the relevant information for the Mt Todd Site.

Guidelines for the structure and content of an MMP is provided by the NT DME (https://minerals.nt.gov.au/mining/mining-management-plans) along with guidelines for extractive and exploration operations. There is not a specific template or set of requirements for operations in Care and Maintenance whom are not actively in production. Advice provided by the DME is to utilise the full MMP template applying only those sections relevant to the operation.

The previously submitted MMP for the Mt Todd Project was a 4-year term (as detailed in the guidelines) with Operation Performance Reports (OPR) being provided to the DME annually in previous years. However, Vista Gold have received written instruction from the DME to revert to the historical standard of annual MMP reporting and no requirement to submit an OPR.

This MMP outlines the operation activities undertaken in the 2016-17 year and those planned for the 2017-18 year for the Mt Todd Site.

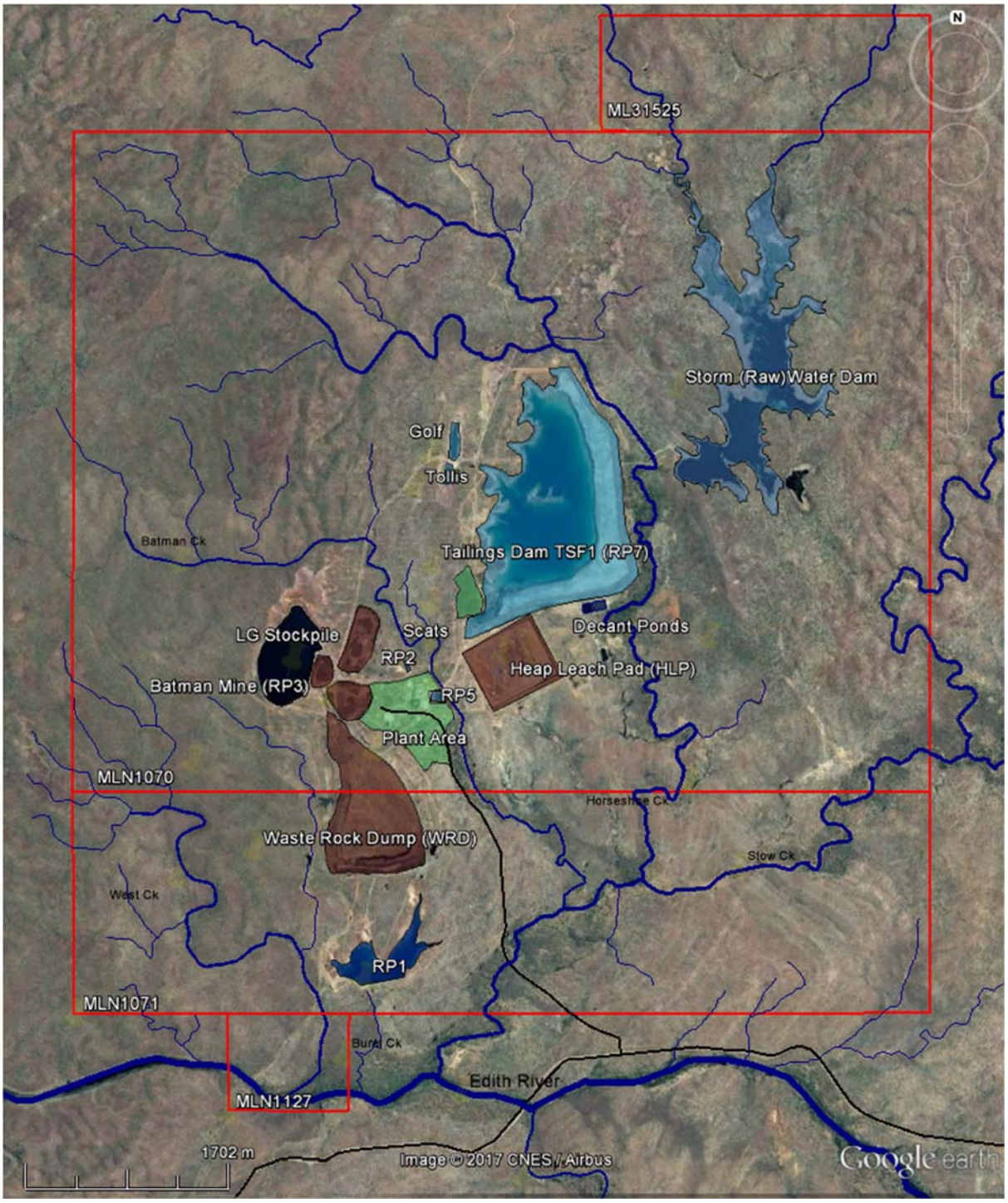

Figure 1. Existing Site Layout and Mineral Leases

Vista Gold Australia Pty Ltd operates the Mount Todd site. Key company details are as listed in Table 1 below.

Table 1. Operator Details

Operator Name	Vista Gold Australia Pty Ltd
Key Contact Person	Brent Murdoch, Director & General Manager
Postal Address	GPO Box 3449, Darwin NT 0801
Street Address	Level 3, 43 Cavanagh St Darwin NT 0800
Phone	Darwin Office (08) 8941 9105 Brent Murdoch 0488 100 314
Fax	(08) 8992 9011 Darwin Office
Email	bmurdoch@mttodd.com.au riacono@vistagoldaustralia.com.au

1.1.1 Organisational Structure / Chart

Vista Gold Australia Pty Ltd is a wholly owned subsidiary of Vista Gold Corporation. The organisational structure of Vista Gold Australia is represented in Figure 2 and shows the relevant connections to its parent company Vista Gold Corporation.

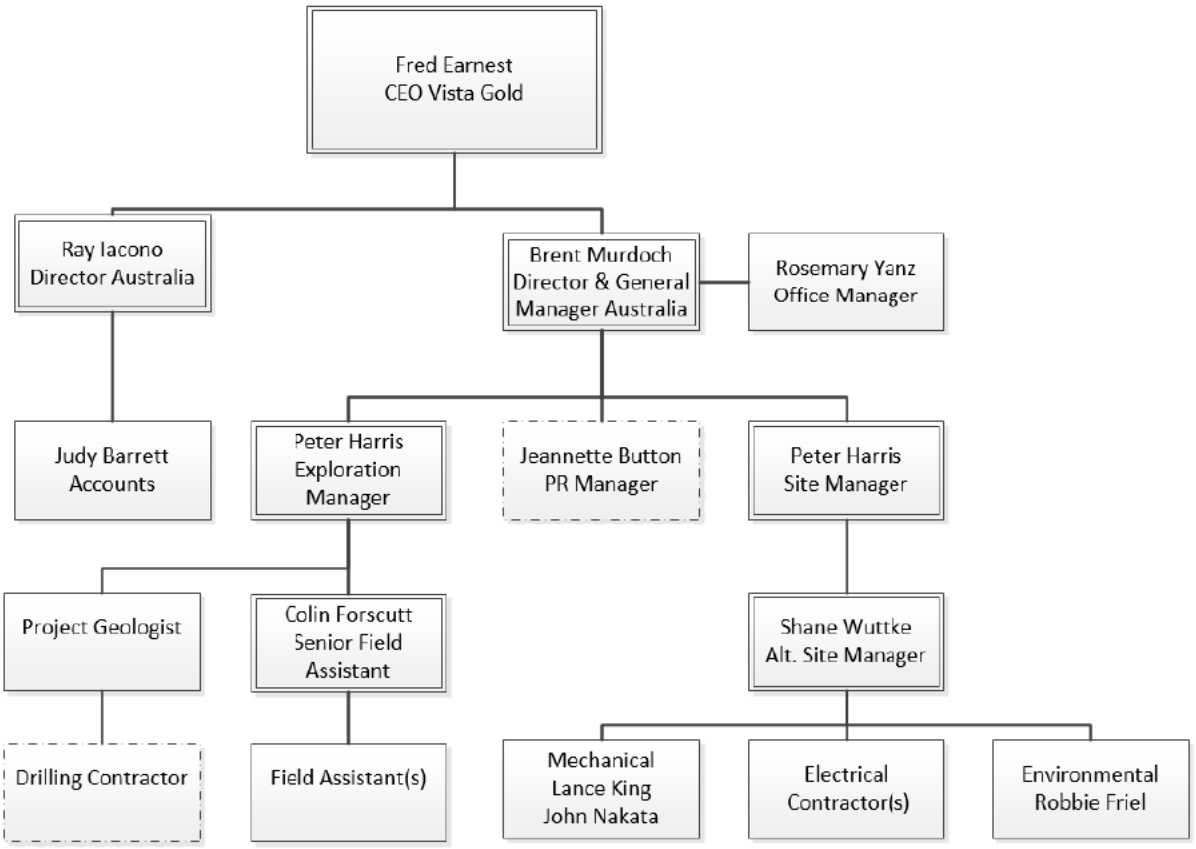

Figure 2. Vista Gold Mt Todd Gold Project Organisational Structure

1.1.2 Workforce

The current Vista Gold Mount Todd Gold Project team is outlined in Table 2.

Table 2. Vista Gold Mount Todd Gold Project Workforce

Type	Quantity	Descriptions
General Manager	1	Responsible for all operational activities.
Site Manager	2	Manage everyday care and maintenance activities across the site as well as statutory safety requirements.
Exploration Manager	1	Manage, report, plan and execute all exploration and geological activities within Vista Gold Australia as directed by VP Exploration, ensuring compliance with all relevant state and territory legislation.
Project Geologist	1	Day to day administration and participation in all geological activities required to complete Vista Gold Australia's work program.
Senior Field Assistant	1	Manage and participate in soil sampling, drill core mark-up and sampling, site preparation for drilling, rehabilitation and other duties as directed by Senior Geologist.

Type	Quantity	Descriptions
Exploration Field Assistants	1	Sampling of soils, cutting and sampling drill core, assist care and maintenance and environmental departments as workload permits.
Care and Maintenance Staff	3	Water management, plant maintenance, weed and feral animal management, water sampling, fire control, workshop equipment repairs and fabrication, other general site maintenance activities.
Administration	2	Data entry, accounts payable, human resource recordkeeping, general administrative duties.

1.2 Project Details

1.2.1 Introduction

Vista Gold Australia currently hold the titles for Mineral Leases (MLN) 1070,1071, 1127 and 31525 which encompass the brownfield workings from previous operations (Figure 1) and the proposed footprint of the storm (raw) water storage dam. Vista Gold continues to operate the site in a care and maintenance status in anticipation of favourable market conditions which would aim to return the site into production.

1.2.2 Site Location

The Mt Todd Gold Mine site is located approximately 40 km North West of Katherine, and 250 km south of Darwin, NT, Australia (Figure 3). The topographical feature named Mt Todd is within the mine lease. The mine site is accessed via the restricted mine access road (Jatbula Road), approximately 10 km along the Edith Falls Road east of the Stuart Highway.

Figure 3. Site Location

1.3 History of Development and Current Status

1.3.1 Historical Mining / Exploration

The area has been historically explored and small-scale mining conducted at various locations regionally since the early 1900's. Billiton Australia Gold Pty Ltd, in a joint venture with Zapopan NL, discovered the Batman deposit at Mount Todd in May 1988. Zapopan acquired Billiton's interest then Pegasus Gold Australia Pty Ltd subsequently acquired the property when it completed the acquisition of Zapopan in July 1995. Pegasus operated the Batman deposit as an open-pit heap-leach operation from 1993 to1996, then as a sulphide milling operation until November 1997.

In March 1999, a joint venture between Multiplex Resources Pty Ltd and General Gold Resources Ltd acquired the project from the deed administrators for Pegasus and operated the mine and processing facility from October 1999 until July 2000 when the project was closed and control returned to the deed administrators. Most of the buildings and equipment have since been sold and removed from the site.

From July 2000 to June 2006, the deed administrators for Pegasus, the NT government and the Jawoyn Association Aboriginal Corporation controlled the project. Vista Gold completed the acquisition of the property in June 2006, and has undertaken care and maintenance of the property on behalf of the NT Government since January 2007 in accordance with the conditions of NT Agreement D92226 (Appendix A).

Since 2007 Vista Gold has spent over 60 million dollars on care and maintenance activities, exploration and numerous other investigations around the resumption of mining. A Preliminary Feasibility Study report for the Mount Todd Gold Project was issued on 1 October 2010. This was updated for a 10.65Mtpa ore mining rate on 28 January 2011. A further Preliminary Feasibility Study was issued on 29 May 2013. This PFS evaluates two development scenarios including a 50,000 tonne per day project (the "Base Case") which develops more of the Mt Todd resource and generates a larger Net Present Value, and a smaller and higher-grade 33,000 tonnes per day project that focuses on maximizing return and operating margins (the "Alternate Case").

Exploration activities have been conducted since 2007 on MLN 1070, 1071,1127 and recently on ML31525. All exploration activities are covered under a separate Exploration MMP.

1.3.2 Current Care and Maintenance Activities

Current care and maintenance activities undertaken by Vista Gold cover the areas of site management, infrastructure maintenance and environmental management. Key activities and their frequency of occurrence are presented in Table 3, with responsibility for these lying with the Mine Site Manager. Further details on environmental activities are provided in Section 5.

Table 3. Summary of Care and Maintenance Activities

Section	Activities	Frequency
Site Management & Infrastructure Maintenance	Maintaining Site Security • Ensure assets on site remain safe and are not affect/interfered with by external parties.	Daily

Section	Activities	Frequency
	Assets Maintenance • Maintain assets so they are fit for purpose.	Monthly / As required
	Access Management • Maintain tracks and roads on site allowing other care and maintenance activities to take place.	Monthly / As required
	Clean up • Undertake housekeeping activities to ensure site and work areas are safe and accessible	As required
	Heap Leach Pad Dewatering • Undertake dewatering activities to maintain capacity.	As required during the year. Significant works during dry if required
	Ponds, Pipe and Valve inspection and or maintenance • Ensure all water management assets are fit for purpose and able to cope with flows required.	Monthly / As required
	Health and Safety • New staff and contractors undertake a site-specific health and safety induction. Additional health and safety issues related to the operation under care and maintenance.	As Required
Environmental Management	Soil and Land Management • Maintain the site soils from erosion. Maintain diversion drains and roads. Undertake assessments of erosion and sediment on site.	As required. Additional checks after significant rainfall
	Water Management • Actively monitor and manage the site water inventory to ensure protection of water holding structures and minimise discharge risks to the environment.	Daily monitoring at various sites as required. Monthly sampling during dry, and more frequently as required during wet season.
	Weed Management • Maintain a pest and weed management program to minimise spread and/or reproduction.	When conditions are suitable
	Feral Animal Management • Maintain a feral animal management program.	As Required
	Waste and Hazardous Substances Management • Maintain facilities and actively monitor waste production and disposal. Monitor hazardous substances storage and maintain inventory of hydrocarbon storage	As Required and during deliveries

Section	Activities	Frequency
	Fire Management • Identification of potential fire risks, conducting managed burns across the Mineral Lease to protect assets	When suitable weather conditions exist and under permit when required
	Cultural and Heritage Management • Ensure all Aboriginal Areas Protection Authority Certificates are current, education and marking of known heritage sites to avoid/minimise disturbance. Enforcing compliance of all on-site activities.	As works require

2 Site Conditions

2.1 Climate

The Mt Todd area has a sub-tropical climate with a distinct wet and dry season. The area receives the majority of rainfall between the months of December and early April.

During the dry season the temperature ranges from 24 to 36°C, occasionally reaching 39°C with night-time temperatures reaching 7°C. During the wet season daily temperatures can range from 27 to 42°C.

Rainfall statistics from the Katherine weather station approximately 40km south southeast of the site are shown in Table 4, and illustrate the general rainfall conditions of the surrounding area. Since 1943 the highest annual rainfall measured at the Aviation Museum was 1,772.5mm in 1998. The lowest annual average rainfall was 678.3mm in 1970. Further climate observations summaries of temperature and wind speed are displayed in Table 5 and Table 6 respectively. Average wind data for the site (from 2011 to 2016 inclusive) is also displayed in Figure 4. Reporting of tabulated monthly summary data on wind speed will be discontinued from 2016 onwards and replaced by an updated wind rose (Figure 5) displaying longer term averages and also an annual wind speed summary within the current meteorological data section (2.2).

Long term probabilities of rainfall over the Mt Todd area are presented in the Intensity Frequency Duration (IFD) probabilities included as Table 7 below. These IFD's have been obtained from the Bureau of Meteorology and are largely calculated from the rainfall data collected at the Edith Ridge telemetered rain gauge managed by the Bureau.

Site specific meteorological data are collected by three automatic weather stations installed at the Mt Todd site. The first was installed in March 2011 on the ridge to the west of the scats pile. The two additional weather stations were commissioned in December 2015. The first is situated SW of RP3 on the edge of the Yinberrie Hills escarpment and the second on the eastern edge of the main plant area in the accommodation compound. The weather stations record the following meteorological parameters –

- Rainfall
- Wind Speed
- Wind Direction
- Solar Radiation
- Net Radiation
- Relative Humidity
- Air Temperature
- Barometric Pressure (2011 commissioned station only)

Data from the weather stations are available at the site in real time via the on-site radio telemetry network, and over time will increasingly be utilised in place of Katherine meteorological data. Summary information from these stations is presented in section 2.2 below.

Table 4. Summary of Rainfall Data

Year	Katherine Monthly Rainfall (mm)												Total Annual Rainfall (mm)
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
2007 - 8	-	32	-	18	106	331	219	470	196	2	-	-	1,374
2008 - 9	-	-	1	4	58	399	436	308	10	-	-	-	1,216
2009 - 10	-	-	0	1	21	291	343	214	107	57	12	-	1,046
2010 - 11	-	4	19	77	65	419	268	360	236	228	-	-	1,675
2011 - 12	-	-	-	30	201	247	98	202	358	48	2	-	1,186
2012 - 13	-	-	14	-	120	173	188	165	389	103	-	0	1,152
2013 - 14	-	-	-	14	143	166	282	327	111	27	-	-	1,070
2014 - 15	-	-	-	2	93	291	209	107	134	-	8	-	845
2015 - 16	-	-	-	-	97	597	252	113	101	19	45	-	1,222
2016 - 17	1	0	68	26	32	241	451	316	215	21	-	-	1,371
1943-2017# Average	*1*	*2*	*6*	*32*	*89*	*224*	*259*	*236*	*198*	*44*	*5*	*0*	*1,096*
	Mt Todd Weather Station Monthly Rainfall (mm)												
2012 - 13	-	-	10	1	128	216	121	284	416	73	28	-	1,278
2013 - 14	-	-	2	28	272	145	368	301	71	12	7	-	1,207
2014 - 15	-	-	-	2	109	211	193	136	155	-	12	0	818
2015 - 16	-	-	-	55	91	507	290	103	127	6	65	-	1,243
2016 - 17	6	-	24	22	100	250	434	225	212	47	-	-	1,320
2012-2017# Average	*1*	*-*	*7*	*21*	*140*	*266*	*281*	*210*	*196*	*28*	*22*	*0*	*1,173*

Notes: *Average monthly rainfall value.

Table 5. Summary of Temperature Data

	Tindal Monthly Mean Temperature (°C)																							
	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
2007	24.5	34.7	24.0	35.4	23.8	32.9	19.9	33.7	19.6	34.0	14.2	26.8	10.6	29.3	14.6	31.2	18.3	35.8	23.3	37.8	24.4	37.7	24.0	35.7
2008	24.0	34.7	23.9	32.7	22.6	33.6	16.3	33.4	13.1	31.3	14.3	30.0	11.3	30.1	14.0	31.4	20.4	36.3	22.7	38.5	25.4	38.4	24.3	34.5
2009	23.8	33.6	23.8	32.6	21.1	35.3	20.6	35.3	17.0	31.8	13.8	31.2	12.2	30.3	14.8	33.5	21.5	36.8	22.6	37.8	25.4	38.9	24.8	36.4
2010	24.4	34.0	24.5	34.6	22.9	33.8	22.8	33.5	21.1	32.3	14.1	29.6	17.8	31.2	16.2	32.8	22.9	36.1	23.1	35.7	23.0	36.1	23.9	34.8
2011	24.0	33.2	23.7	32.2	23.8	31.8	20.1	31.4	14.0	29.7	9.2	27.6	13.5	29.8	13.2	31.5	17.4	34.8	23.9	37.3	24.2	35.6	24.6	35.3
2012	24.1	31.5	23.2	36.1	23.3	33.5	20.2	33.8	17.0	31.2	11.4	29.7	14.2	30.5	11.8	32.8	18.5	37.2	23.7	38.1	25.2	37.9	25.2	37.3
2013	24.8	37.0	24.0	36.0	-	-	-	-	-	-	-	-	-	-	-	-	15.2	39.4	18.9	41.5	23.1	41.0	22.7	38.8
2014	20.0	40.6	19.6	35.5	14.9	38.2	18.4	38.1	13.5	37.0	6.5	34.0	7.6	34.2	6.4	35.5	11.0	39.1	22.8	39.0	25.5	38.4	25.3	36.4
2015	24.4	33.8	23.7	36.4	23.5	36.1	20.1	34.6	14.7	32.9	15.2	31.5	13.4	30.9	14.8	33.2	17.4	36.0	23.2	38.2	25.1	39.4	24.5	34.8
2016	25.2	36.3	25.0	37.0	34.6	36.8	21.0	36.4	21.4	34.9	17.5	33.4	7.4	34.9	7.3	37.4	17.5	38.7	15.5	40.3	19.7	41.4	22.7	40.8
2017	21.9	36.0	20.1	36.5	22.4	37.2	15.0	36.0	12.5	34.7	8.6	32.4	10.5	34.7	9.5	37.1								
1946-2017 average	**24.3**	**34.1**	**24.1**	**33.9**	**23.1**	**34.3**	**20.6**	**34.0**	**17.5**	**32.3**	**14.2**	**30.0**	**13.7**	**30.3**	**15.0**	**32.3**	**20.0**	**35.8**	**23.9**	**37.6**	**25.0**	**37.4**	**24.8**	**35.6**
Mt Todd Weather Station Monthly Mean Temperature (°C)																								
2012	-	-	-	-	-	-	-	-	-	-	-	-	17.6	29.4	17.3	31.9	21.9	36.1	24.1	37.1	25.0	36.7	24.7	36.4
2013	25.1	35.5	24.2	34.4	24.2	33.7	22.2	34.4	22.7	32.6	20.2	31.0	11.3	32.9	13.0	36.5	19.7	38.1	23.0	40.6	22.3	40.1	22.5	38.3
2014	21.7	39.7	20.7	34.3	18.4	37.8	22.4	37.5	16.8	35.3	11.4	32.9	12.7	33.7	13.9	33.5	17.2	38.3	22.0	40.1	21.2	40.2	23.2	38.7
2015	21.6	35.2	19.5	37.6	21.2	38.8	17.2	36.6	14.4	35.8	13.9	33.1	11.5	34.8	14.7	35.8	16.7	36.6	21.3	40.0	21.9	40.3	22.2	36.9
2016	22.2	36.6	22.3	38.4	22.4	39.1	21.1	37.5	20.3	36.3	16.3	35.3	13.1	34.3	11.6	36.9	38.5	22.1	21.4	39.9	20.3	40.9	22.2	39.2
2017	22.1	36.0	21.8	37.4	22.6	37.0	18.6	36.2	16.3	35.1	14.1	32.0	16.8	34.6	16.1	36.6								
2012 – 2017 average	**22.5**	**36.6**	**21.7**	**36.4**	**21.8**	**37.3**	**20.3**	**36.4**	**18.1**	**35.0**	**15.2**	**32.9**	**13.8**	**33.3**	**14.4**	**35.2**	**22.8**	**34.2**	**22.4**	**39.5**	**22.1**	**39.6**	**23.0**	**37.9**

Table 6. Summary of Wind Speed Data

	Katherine Wind Speed Averages (km/h)																							
	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	9am	3pm	9am	3pm	9am	3pm	9am	3pm	9am	3pm	9am	3pm	9am	3pm	9am	3pm	9am	3pm	9am	3pm	9am	3pm	9am	3pm
1981-2010	4.2	6.3	3.8	6.2	3.4	7.2	4.8	10.3	6.5	10.8	6.5	10.8	6	11.2	5.5	10.7	5.4	9.4	5.5	8.4	4.6	7	4.2	6.6
2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	17	11	14	14	14	11	14	10	12
2013	12	15	9	10	12	12	16	18	16	18	16	18	14	19	10	16	-	-	-	-	-	-	-	-
2014	11	14	14	16	9	15	11	16	12	17	17	19	12	17	17	18	10	16	10	16	6	8	7	8
2015	14	14	9	14	10	14	13	15	12	16	14	17			12	15	13	17	11	16	12	15	11	16
2016	9	12	10	15	8	12	10	18	12	16	13	15	14	17	13	16	12	14	14	14	14	13	10	17
2017	12	13	9	16	8	13	12	18	12	18	13	19	13	19	12	18								
Mt Todd Weather Station Wind Speed Averages (km/h)																								
2012	-	-	-	-	-	-	-	-	-	-	-	-	11.9	13.6	7.3	14.9	8.5	13.9	10.5	11.1	7.4	11.0	5.8	7.6
2013	7.7	10.9	5.4	7.7	6.9	9.4	7.2	13.5	10.9	13.5	11.5	14.1	10.2	15.9	7.1	14.5	9.4	12.8	8.6	12.8	6.8	11.3	5.7	8.5
2014	7.3	10.1	8.2	11.0	5.7	11.3	6.5	12.7	7.9	13.3	12.6	15.9	6.9	13.4	13.5	16.1	6.6	12.6	8.1	14.9	8.0	9.8	7.3	8.6
2015	9.1	11.6	5.9	10.4	6.4	10.1	9.5	12.1	10.4	14.1	8.3	15.8	8.8	15.2	8.5	12.8	10.1	14.9	8.3	14.4	6.9	9.3	7.6	9.5
2016	5.7	8.3	4.9	9.0	4.8	6.8	5.4	14.5	7.0	12.6	10.2	12.2	8.6	13.7	7.8	12.5	8.2	10.8	10.1	12.3	10.0	11.0	8.2	10.2
2017	7.2	9.5	6.4	10.3	5.0	9.9	7.6	14.3	8.3	14.9	10.5	16.1	7.5	14.1	8.2	14.4								
Average	***7.4***	***10.1***	***6.2***	***9.7***	***5.8***	***9.5***	***7.2***	***13.4***	***8.9***	***13.7***	***10.6***	***14.8***	***9.0***	***14.3***	***8.7***	***14.2***	***8.6***	***13.0***	***9.1***	***13.1***	***7.8***	***10.5***	***6.9***	***8.9***

*Mt Todd site wind speed averages for 2016 have been replaced by Figure 4 below.

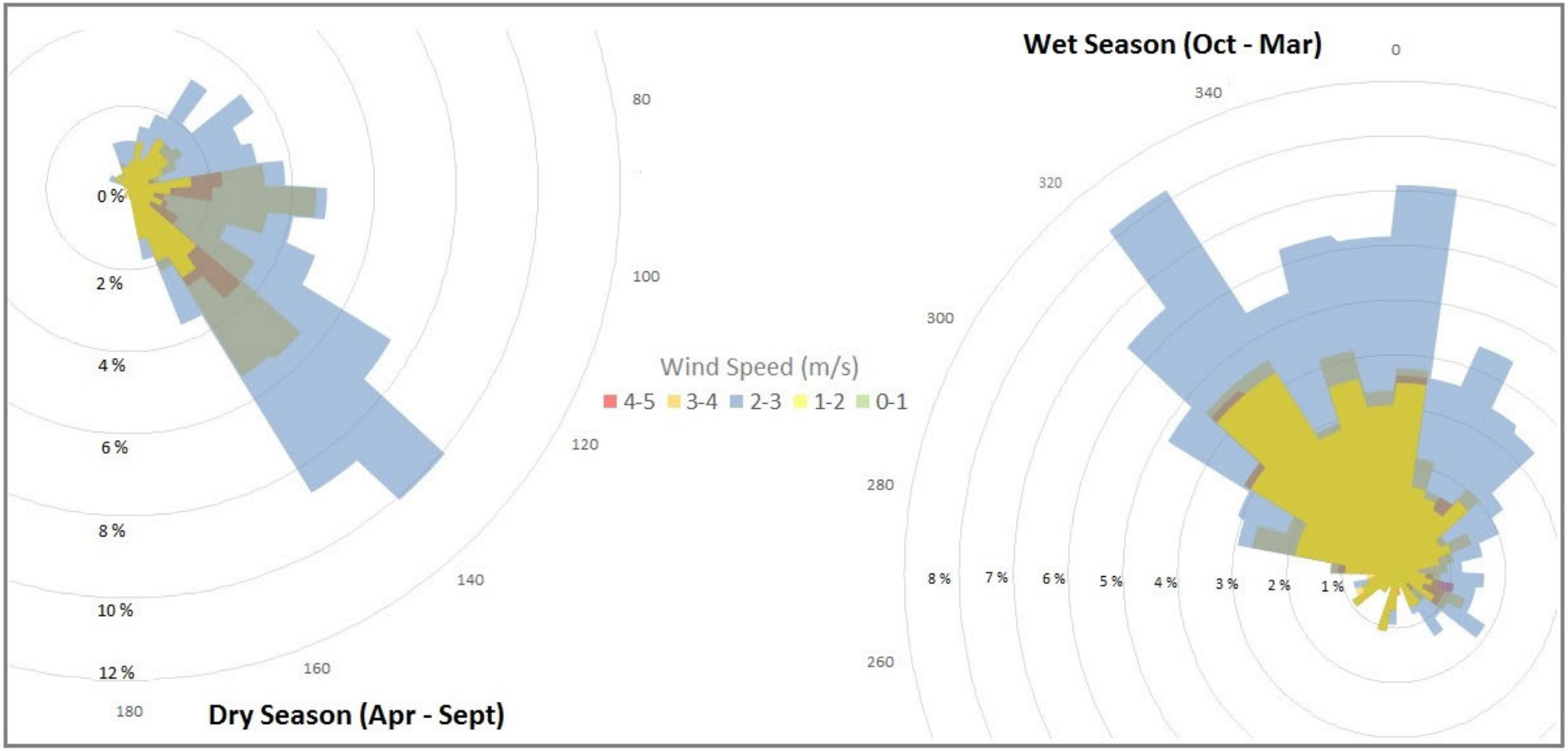

Figure 4. Average Wind Speed and Direction at Mt Todd from 2011 to 2015

Table 7. Intensity Frequency Duration probabilities for the Mt Todd area

IFD Design Rainfall Depth (mm)

Issued: 07 October 2015

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).

	EY	Annual Exceedance Probability (AEP)					
Duration	**1EY**	**50%**	**20%**	**10%**	**5%**	**2%**	**1%**
1 min	2.7	3.0	3.7	4.2	4.6	5.1	5.4
2 min	5.0	5.5	6.7	7.4	8.0	8.6	8.9
3 min	7.0	7.7	9.5	10.5	11.4	12.3	12.8
4 min	8.9	9.7	12.0	13.4	14.5	15.8	16.6
5 min	10.6	11.6	14.4	16.0	17.5	19.2	20.3
10 min	17.5	19.2	24.0	26.9	29.6	32.8	35.2
15 min	22.8	25.0	31.3	35.1	38.6	42.8	45.9
30 min	33.5	36.7	45.7	51.2	56.0	61.8	65.8
1 hour	44.9	49.2	61.0	68.1	74.3	81.5	86.2
2 hour	55.3	60.5	75.4	84.3	92.3	101.7	108.0
3 hour	60.5	66.2	83.1	93.6	103.1	114.7	122.9
6 hour	68.3	75.1	96.2	110.3	124.0	142.0	156.0
12 hour	76.9	85.1	112.2	131.9	152.2	180.8	204.9
24 hour	89.7	100.0	135.8	163.4	193.1	237.1	274.9
48 hour	111.4	125.0	172.7	210.0	250.7	311.6	362.3
72 hour	130.0	146.1	201.7	244.3	290.1	357.5	412.5
96 hour	146.0	164.0	224.9	270.1	317.5	385.6	441.4
120 hour	159.7	179.2	243.3	289.2	336.1	401.4	457.1
144 hour	171.3	191.9	257.6	303.0	348.1	408.7	464.0
168 hour	181.0	202.3	268.4	312.4	354.8	409.7	465.1

[‡]*EY = "Exceedance per year"*

Australian Government
Bureau of Meteorology

Location

Label: Mt Todd IFD Design Rainfall Depth (mm)

Latitude: 14.2910 [Nearest grid cell: 14.2875 (S)]

Longitude: 132.2990 [Nearest grid cell: 132.2875 (E)]

IFD Design Rainfall Depth (mm)

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).

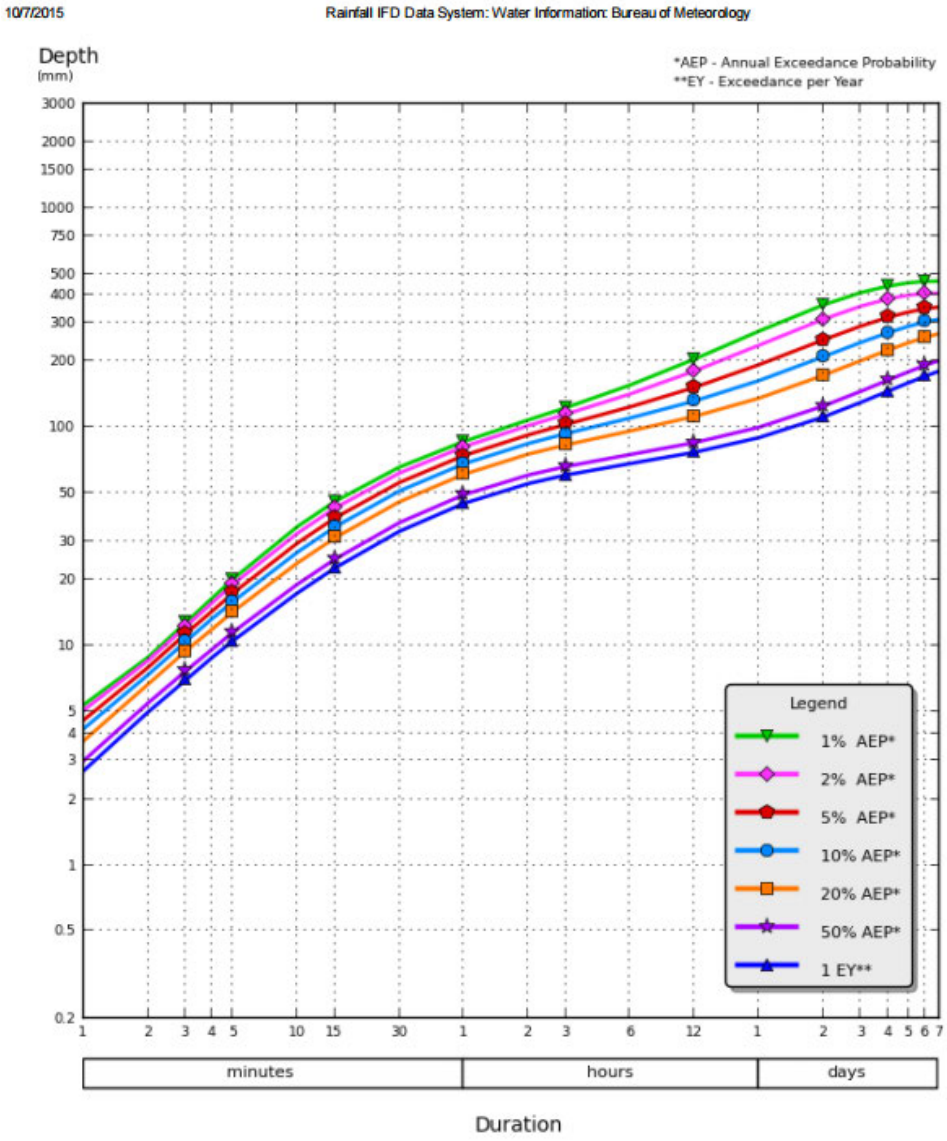

Figure 5. Intensity Frequency Duration curves for the Mt Todd a

2.2 Current Meteorological Conditions

Figure 6 displays data collected from the Mt Todd Weather Station for the current reporting period.

High maximum wind speeds are mostly associated with wet season storms but the higher minimum wind speeds - indicative of sustained winds overnight – are usually more evident during late dry season. The extent of daily fluctuations can be seen from comparison of maximum and minimum values across each figure.

Raw data is not provided in appendices due to the excessive quantity of data recorded by the loggers. However, this data is available on request.

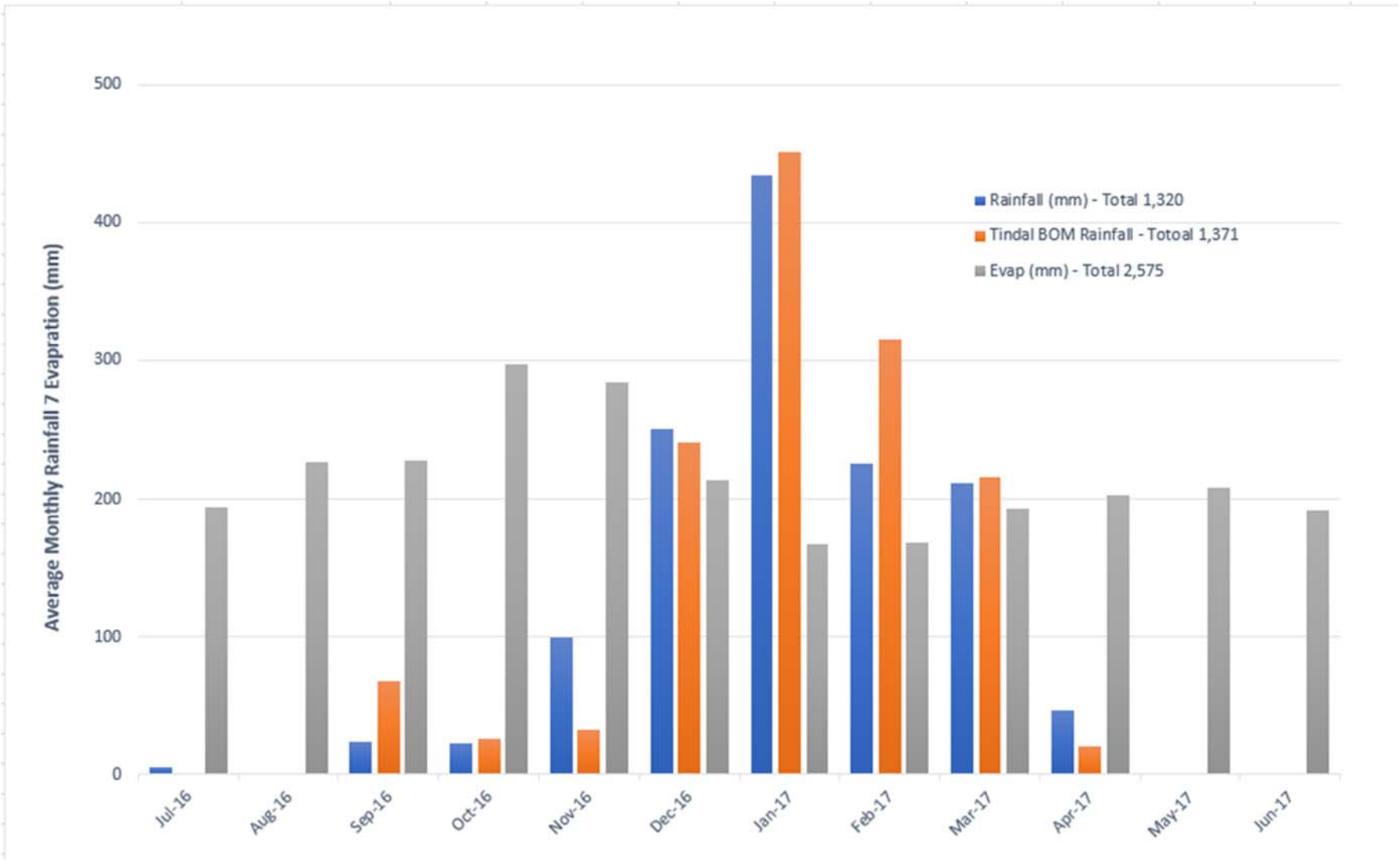

Figure 6. Daily Rainfall and Evaporation at Mt Todd and Tindal during the reporting period

2.3 Geology and Land Systems

2.3.1 Geology

The Mt Todd Gold Mine is located within the Early Proterozoic Pine Creek Geosyncline (PCG), comprising meta-sediments, granitoids, basic intrusives, acid and intermediate volcanic rocks. The geology of the site is generally greywackes (some areas have been locally metamorphosed to hornfels at depth), shales, felsic tuff and alluvium (Figure 7).

The deposits are similar to other gold deposits of the PCG classified as orogenic gold deposits in the subdivision of thermal aureole gold style. The Batman Deposit shares some characteristics with intrusion-related gold systems, especially in terms of the association of gold with bismuth and reduced ore mineralogy. This makes the deposit unique in the PCG. The mineralization within the Batman Deposit is directly related to the intensity of the north-south trending quartz sulfide veining. The lithological units impact on the orientation and intensity of mineralization. Sulfide minerals associated with the gold mineralization are pyrite, pyrrhotite, and lesser amounts of chalcopyrite, bismuthinite, and arsenopyrite. Galena and sphalerite are also present but appear to be post-gold mineralization and are related to calcite veining, bedding, and the east-west trending faults and joints.

2.3.2 Land Systems

The two main land systems identified in the Project area are:

1. Baker land system:
    - hills, and strike ridges on persistent Burrell Creek Greywacke, sandstone and siltstone in the west of the area enclosing the Batman Pit and extending north and south,
    - Mt Todd and similar rises in the east.
2. Bend land system:
    - undulating hills on lower Proterozoic sediments (Burrell Creek Formation) occupying the north-south central portion the area including the waste rock dump, tailings storage facility and heap leach pad, and the eastern portions of the lease.

The land systems are detailed in Figure 8.

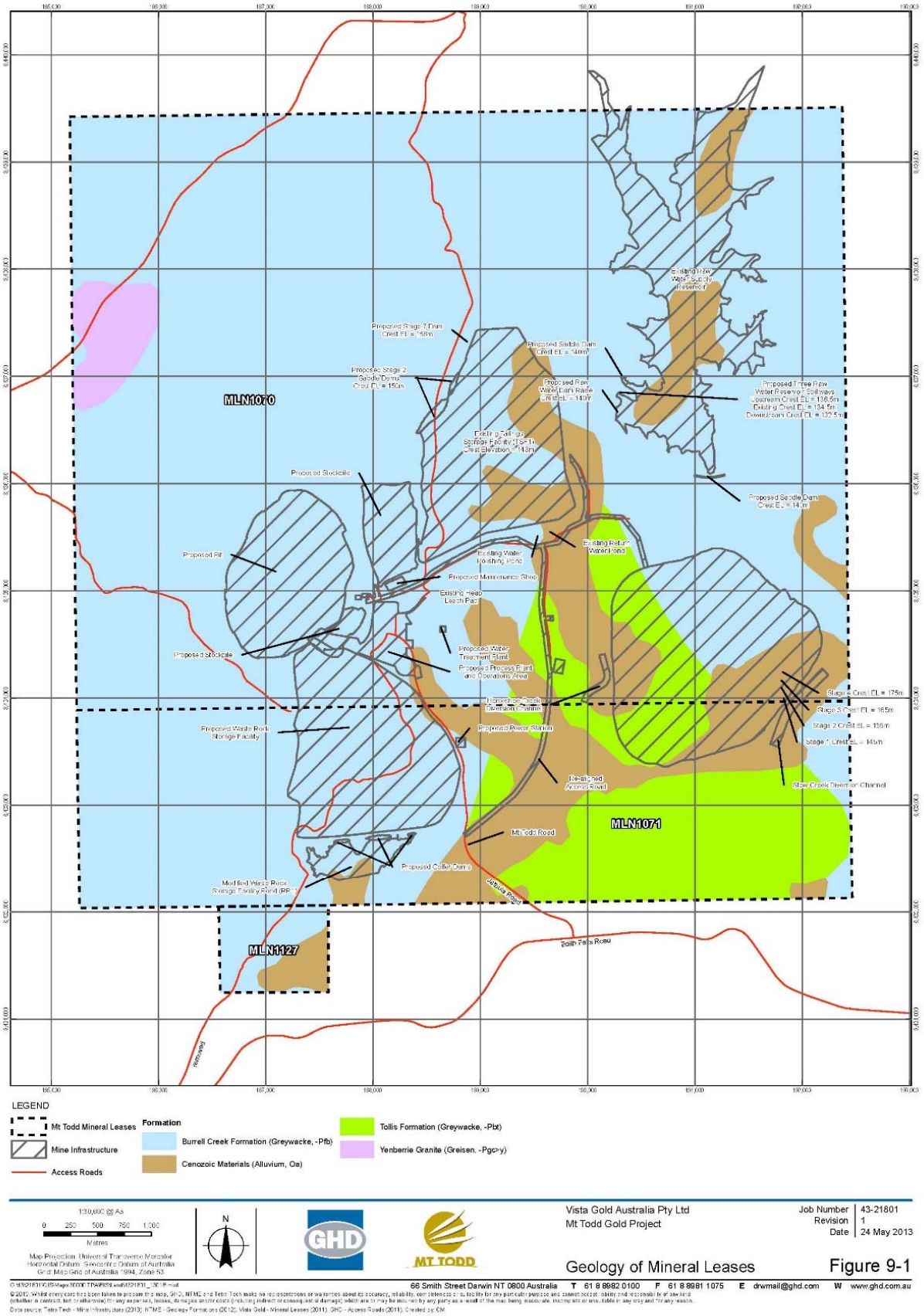

Figure 7. Geology of the Mineral Leases

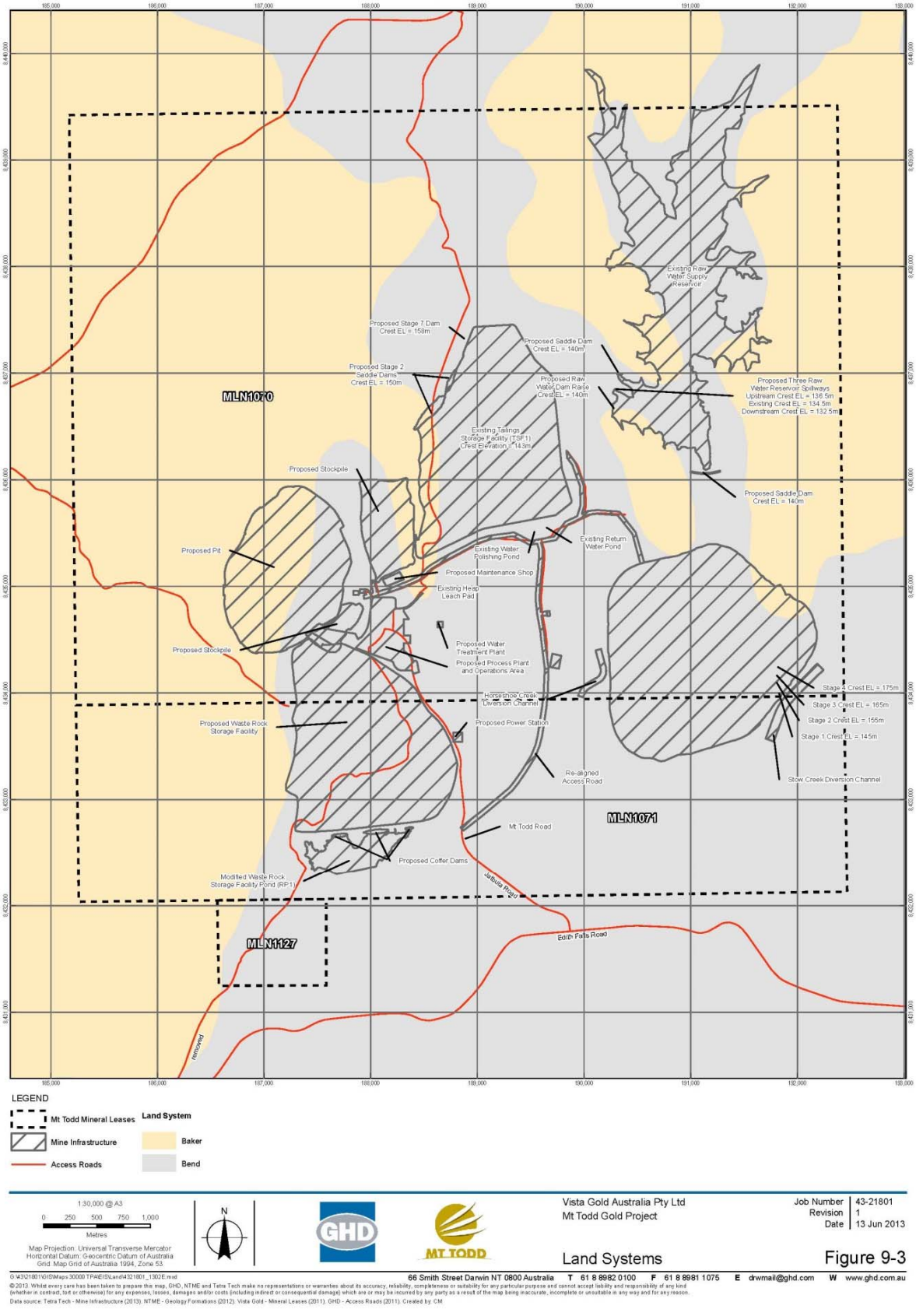

Figure 8. Land Systems across the Mineral Leases

2.3.3 Soils

Soils vary from sandy and loamy red and yellow earths to lateritic and yellow podsolic soils on the gently undulating land, often over compacted clay sub-soils. Heavier textured grey soils are found on the floodplains and levees of the Daly River system while stony and skeletal soils occur in the hills.

Analysis of soil pH levels ranged from 4 - 4.2, and salt levels were reportedly low with sodium and chloride concentrations averaging 10ppm.

Levels of nitrogen (N), phosphorous (P) and potassium (K) were reported as generally low. Nitrogen levels are generally low corresponding to the low levels of organic matter in the skeletal nature of soil. Phosphorus levels are very low as would be expected under the observed acidic conditions.

Potassium levels vary. Low levels were reported from soils tested from Bend and Baker land units. Medium levels were observed on alluvial soils types associated with rivers and creeks.

2.4 Hydrology

The mine is in the Daly River Catchment and north of the Edith River. Site drainage flows to the Edith River primarily via five ephemeral streams or channels, Batman creek, Horseshoe creek, Stow creek, West Creek and Burrell Creek (Figure 9).

2.5 Hydrogeology

The hydrogeology of the Pine Creek mining region includes the Burrell Creek Formation which can provide sustainable yields of 0.5 to 2 L/s in zones of intense alteration, faulting or shearing. Otherwise, rock classified as fractured and weathered with minor groundwater resources in the Mount Todd area is generally not a significant groundwater resource for substantial developments such as mines. This has been evidenced at the Mt Todd site through the previous construction of the raw water reservoir to make up the shortfall in local groundwater capacity for processing operations.

Regional aquifers include carbonate systems however no such systems are present locally at the Mount Todd mine. Most of the groundwater at the site is composed of isolated aquifers present in the faults and fractures of the local geology. Groundwater flow in general terms is across the Mineral Lease north to south towards the Edith River. Groundwater recharge and discharge zones are predominantly localised with recharge zones located in elevated areas of weathered material and sparse vegetation, and discharge zones expected to be along low-lying areas such as creek lines. Rates of hydraulic conductivity are variable across the site with bore airlift yields across the Burrell creek and Tollis formations varying from < 1 L/s to 14 L/s. The low and variables rates of groundwater flow are also seen in the varying chemical signatures from groundwater bores below legacy structures.

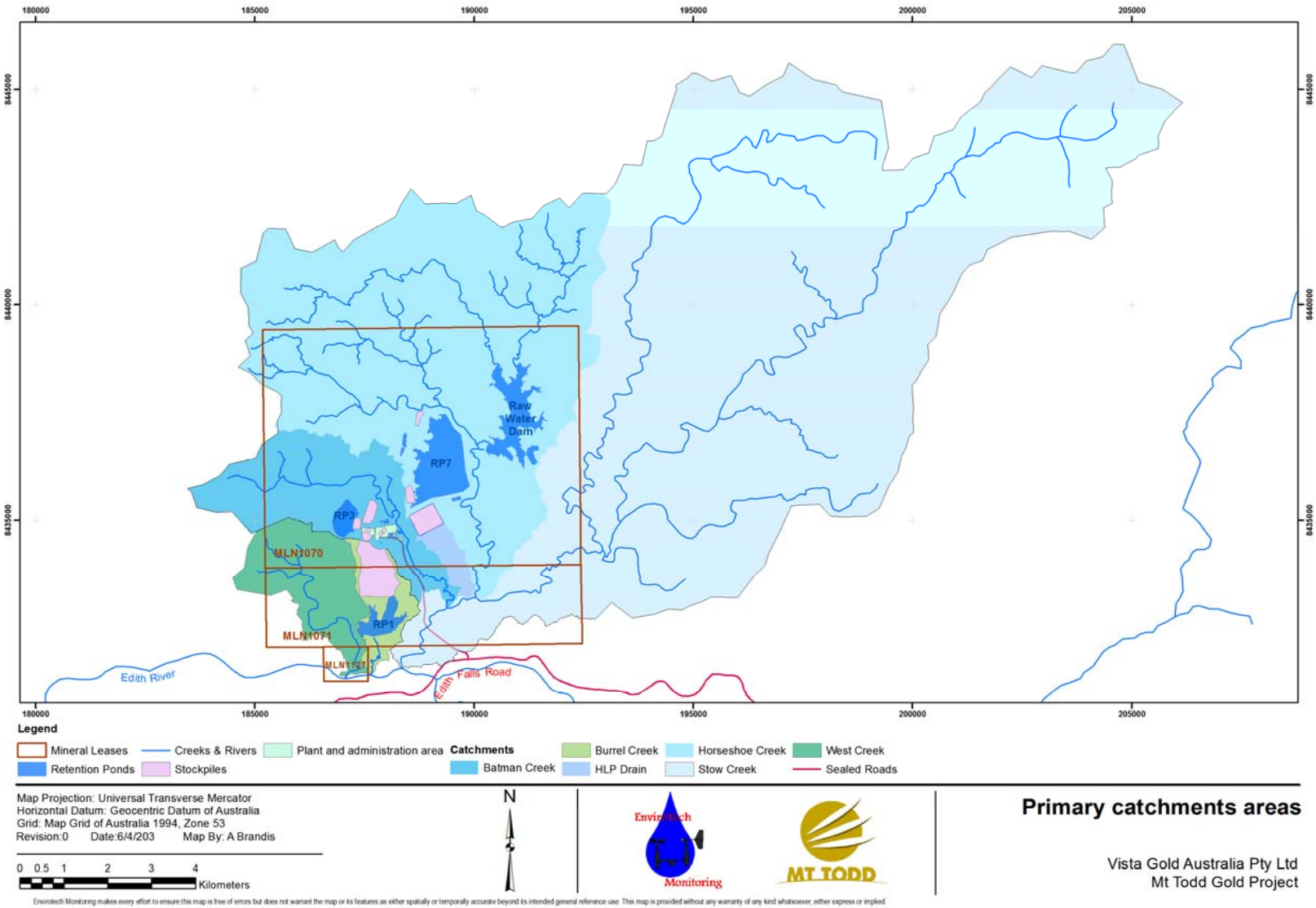

Figure 9. Hydrology of the primary catchment areas

2.6 Flora and Fauna

2.6.1 Flora

The tenements encompass a variety of habitats forming part of the northern savannah region which is characterised by Eucalypt woodland with tropical grass understoreys. The mineral lease contains approximately eight different vegetation types as identified during the 2013 EIS.

1. Melaleuca forest, with bare areas
2. *E. bigalerita* Eucalyptus spp. open-forest
3. *E. tintinnans Eucalyptus spp.Erythrophleum chlorostachys* woodland
4. *E. tintinnans Corymbia dichromophloia* woodland
5. *E. tectifica* woodland
6. *E. tectifica Corymbia confertiflora* woodland
7. *Corymbia latifolia E. bigalerita* open-woodland with areas of grassland
8. *E. tectifica* woodland \ *E. tintinnans Eucalyptus spp. Erythrophleum chlorostachys* woodland1

The spatial distribution of the vegetation types is illustrated in Figure 10.

The dominant communities in the area of the mine prior to its development were the *E. tintinnans* dominated woodlands in rocky hills and *E. tectifica* dominated woodlands in the surrounding plains. Previous development of the site resulted in reductions of the extent of the *E. tintinnans* woodlands and the *E. tectifica* woodlands within the mineral lease area.

The only known threatened species around the Mt Todd site is the bladderwort (*Utricularia singeriana*). While recorded in the Northern Territory Flora database records as approximately six kilometres west of the mineral lease, targeted searches within the mineral lease failed to identify any individuals during the recent EIS flora surveys.

Three species of declared weeds are known to exist on within the mineral lease. These species and others are managed as per Section 5.7.2.

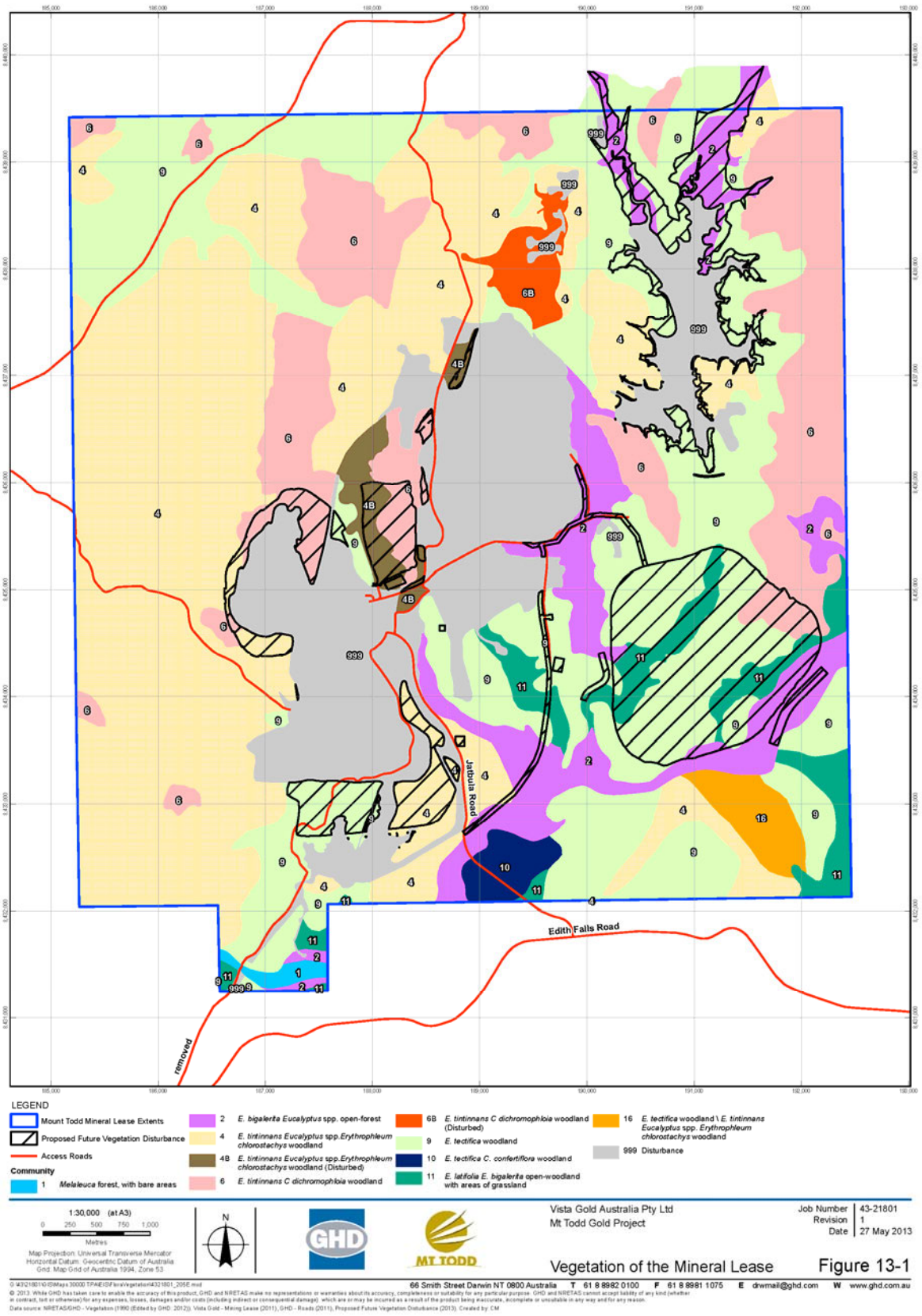

Figure 10. Vegetation types across the mineral lease

2.6.2 Fauna

The draft Environmental Impact Survey conducted during 2012 identified 226 species of fish, mammals, reptiles, frogs and birds. This is a slight increase on the 219 identified species in 1990.

Frequent sightings of the larger fauna include feral cattle (*Bos taurus*), water buffalo (*Bubalus bubalis*), donkeys (*Equus asinus*) and horses (*Equus caballus*) on the mineral lease. Feral pigs (*Sus scrofa*) roam the area as indicated by old wallows and 'rooting' evident in low lying areas. Additional exotic species included in the Northern Territory Fauna Atlas are the black rat (*Rattus rattus*), feral cat (*Felis catus*) and the cane toad (*Rhine/la marina*).

Threatened fauna species previously identified on-site are listed in Table 8. For one of these, the Mt Todd Mine Site also encompasses the Yinberrie Hills, a key site in northern Australia for the nationally endangered Gouldian Finch. Given the significant amount of suitable habitat for this species across the Mineral Leases (Figure 11), this population has undergone regular monitoring since 1993. Further details on the status and management of threatened species on the project site are discussed in Section 5.7.4.

Table 8 Threatened fauna identified across the Mineral Leases

Common Name	Sightings
Gouldian finch	• Yinberrie Hills is the location of the largest known breeding population • Individuals and nests across Mineral Leases
Crested shrike-tit (northern)	• one record from the Mineral Leases, immediately north of the Batman Pit. • one record of calling to the west of the Batman Pit. • three other records within five kms of the Mineral Leases.
Australian bustard	• six records from the Mineral Leases plus a 10km wide buffer.
Grey falcon	• one record at northern end of proposed mine site (October 1988). • two sightings near end of old Edith Falls Road (1990).
Mertens' water monitor	• three records from the mineral leases. • reported as 'most common' along the Edith River (1990).
Mitchell's water monitor	• reported as abundant along Horseshoe Creek and Yinberrie Creek (1990).
Yellow-spotted monitor	• one record from the Mineral Leases over 20 years ago.
Partridge pigeon	• eight records within approximately four kms of Mineral Leases. • one record adjacent to railway line on Edith Falls Road.
Painted honeyeater	• one record in the Mineral Leases.
Northern quoll	• one record approximately 4km northwest of the Mineral Leases (1990).
Pale field rat	• one record north-east of proposed mine site (1988). • six records during Dry and Wet season surveys.

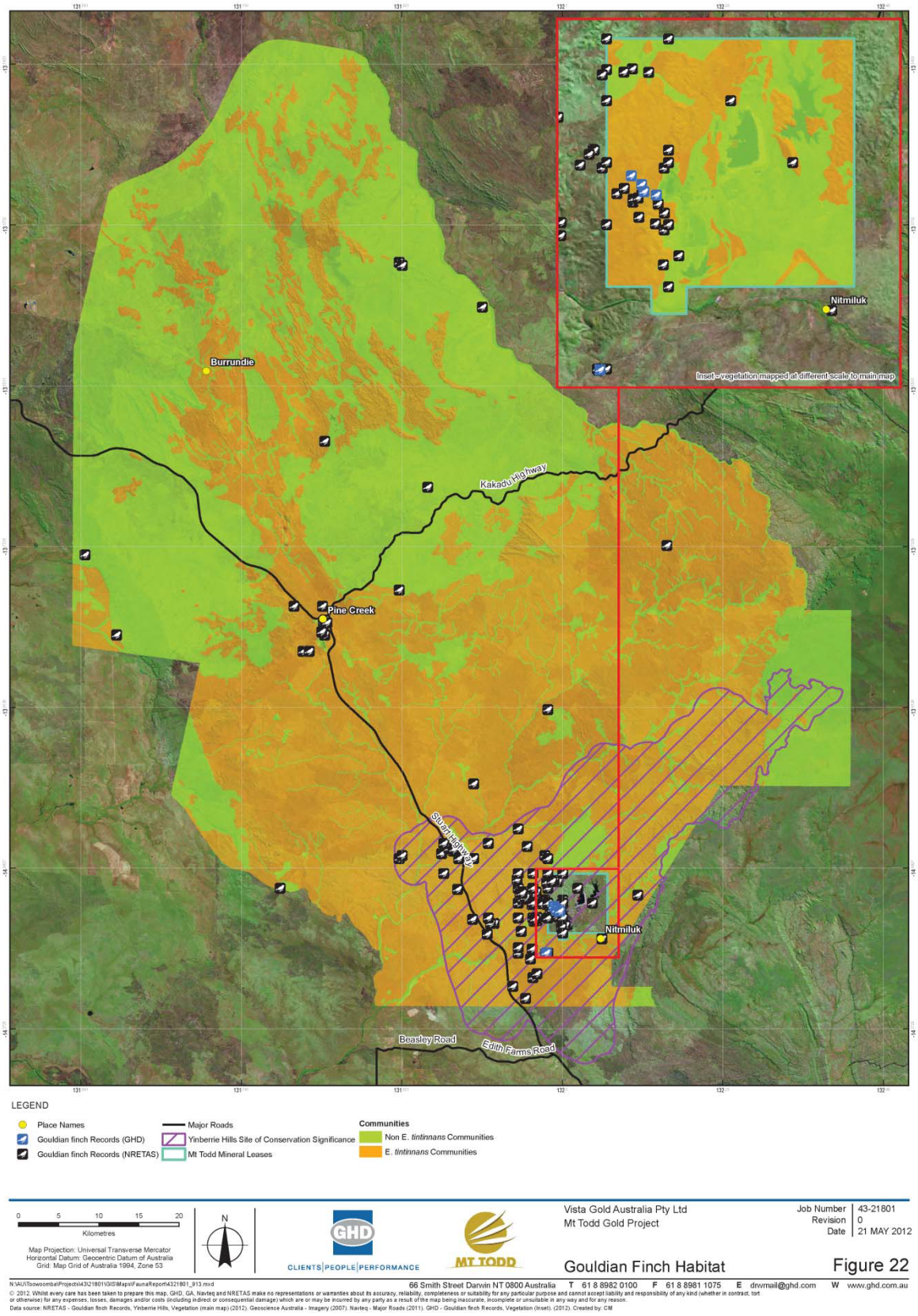

Figure 11. Gouldian Finch Habitat

2.7 Socio-Economic Environment

2.7.1 Current Land Use

The current land use of the area is mining (redundant facilities) / exploration, pastoral, hunting and fishing. Aboriginal freehold land is the predominant land use within the Yinberrie Hills. There are some small portions that are also privately owned freehold land and Crown leasehold land. In addition to mining, other land uses within the Yinberrie Hills area include tourism, with about 8% of the Yinberrie Hills also managed as conservation reserve (Nitmiluk National Park).

2.7.2 Identified Stakeholders

Stakeholders which have been identified as part of the EIS process include Northern Territory government departments, local government, potentially affected landowners, local business and residents, indigenous groups, traditional owners, community interest groups, industry representatives, environmental groups, media and surrounding communities. Key stakeholders in regard to the site when in production are detailed in Table 9.

A stakeholder database is maintained whereby any member of the public can register to obtain up to date information on the project. Information is also made available to the public through the project website www.mttodd.com.au. Only a sub selection of these stakeholders is relevant during care and maintenance operations.

Table 9. Key Stakeholders during production

Stakeholder(s)	Representatives
Federal Government	
Federal Government Departments	Department of Environment and Energy
Elected Representatives	Member of Goyder
	Member of Katherine
Northern Territory Government	
Government Agencies	Department of Primary Industry and Resources
	Department of Housing and Community Development
	Department of Environment and Natural Resources
	Department of Health
	Department of Lands Planning and the Environment (DLPE) and NT EPA
	Department of Chief Minister
	Department of Business
	Department of Treasury and Finance
	AAPA
Local Government	
Katherine Town Council	Mayor
	CEO
	Aldermen
	Key Council Officers
	Economic Development Manager
Roper-Gulf Shire Council	Mayor
	CEO
	Aldermen
	Key Council Officers
Victoria-Daly Shire	Mayor

	CEO
	Aldermen
	Key Council Officers
Local Communities	
Directly Affected Landholders	Landholders directly affected by Project
Local Residents	Katherine
	Pine Creek
	Indigenous communities (Werenbun, Rockhole, Binjari, Gorge Camp, Kalano, Eva Valley etc.)
Other Key Stakeholders	
Emergency and Health Services	Police Service
	Ambulance and Emergency Services
	Fire and Rescue Service
	Katherine Hospital & Health Service
	Private Health Providers
Utility Service Providers	Power and Water Corporation
	NT Gas
Indigenous Groups and Traditional Owners	Jawoyn Association
	Nitmiluk National Park Board of Management
	Aboriginal Areas Protection Authority
Community, Business and Industry Groups	Katherine Chamber of Commerce
	Northern Territory Minerals Council
	Amateur Fisherman's Association of the Northern Territory
	Mt Todd Mine Site Reference Group
	Katherine Land Care Group
Environmental Groups	Environment Centre Northern Territory
Media	
Print	Katherine Times
	Northern Territory News
TV/ Radio	ABC Radio, Katherine Community Radio

Various stakeholder consultations were carried out as part of the development of the 2013 EIS. Many of these consultations were undertaken by the EIS consultants or by Vista Gold directly. The results of these consultations will allow Vista Gold to address public and stakeholder concerns regarding the Mt Todd project.

Vista Gold holds scheduled meetings with the Jawoyn association approximately every six months to discuss any matters pertinent to the Mt Todd site. Many other informal discussions and visits are conducted throughout the year as required. During the current reporting period, on-site Vista staff also assisted the Jawoyn community through excavating two grave sites.

The MT Todd reference group meets as necessary. Members include Vista Gold; DME; Amateur Fisherman's association of the Northern Territory (AFANT); Environment Centre of the Northern Territory; Jawoyn Association; Katherine Town Council; Roper Shire, Supervising Scientist Division of the Department of Sustainability, Environment, Water, Population and Communities and the Minerals Council of Australia NT.

Regular communications are conducted with the Mining Compliance Division of DME on operational matters and with the NT EPA with matters pertaining to the Waste Discharge Licence. Meetings are also held on an as needs basis with relevant Ministers.

2.7.3 Community Interaction

Regular public information dissemination via our Mt Todd Booth in Katherine occurs when necessary to inform the general public and provide a forum for questions and feedback, as well as at the Katherine Show and periodically at the Saturday Markets. Vista Gold also proudly sponsors an event, the local Nixon's Crossing Camp Draft, held annually on the outskirts of Katherine.

Vista Gold currently commissions regular community updates in local newspapers to inform the wider community on projects, site progress and community engagement activities pertaining to the Mt Todd site. Vista Gold has contracted a local Darwin business to assist with all community consultation and communication activities.

3 Statutory and non-statutory requirements

3.1 Statutory Requirements

Legislation applicable to current project activities is listed below.

Commonwealth:

- Environmental Protection and Biodiversity Conservation Act 1999.
    - Vista Gold submitted referral in 2011 and approval granted. Project declared a 'controlled action' in 2011.
- Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984
- Native Title Act 1993
    - Cultural Heritage Management Plan developed for project 2012
- Work, Health and Safety (National Uniform Legislation) Act 2011 and Regulation.

Northern Territory:

- Mining Management Act 2001 and Mining Management Regulations 2001
    - MMP submitted and approved
    - Authorisation granted for proposed works
- Mineral Titles Act 2016
    - MLN 1070, MLN 1071, MLN 1127 and MLN31585
- Environmental Assessment Act 1982
    - Draft EIS completed in 2013
- Northern Territory Environmental Protection Authority Act 2012
- Northern Territory Aboriginal Sacred Sites Act 2004
    - Heritage Impact Assessment Report completed 2013
    - AAPA Certificate 2011/15538 granted in 2012 (Appendix B).
- Northern Territory Heritage Act 2011
    - Application for Work Approval granted under part 3.2 in 2013
- NT Aboriginal Land Rights Act
- National Environmental Protection Council (Northern Territory) Act 1994
- Water Act 1992
    - Waste Discharge License 178-5
- Waste Management and Pollution Control Act 2009
- Northern Territory Government Agreement D92226
- Bushfires Act 2009
- Weeds Management Act 2001
- Territory Parks and Wildlife Conservation Act 2006
- Fire and Emergency Act 1996

3.2 Non-Statutory Obligations

The following non-statutory obligations are currently in place:

- Official written agreement between Vista Gold and the Jawoyn Aboriginal Association Corporation that governs the use of the land on the mining site.
- Agreement between Vista Gold and the Northern Territory Government Agreement D9226

The following policies for Vista Gold's Mt Todd site:

- Environmental Policy
- Safety and Health Policy
- Corporate Social Responsibility Policy
- Community Relations Policy
- Quality Policy

3.3 Sacred, Archaeological and Heritage Sites

There are many Aboriginal and other Heritage sites that are present within and surrounding the mineral lease (Figure 12). A number of these sites have been identified; sign posted and fenced off during previous mining operations.

The NT Archaeological database and the NT heritage resister hold information on 58 archaeological places and objects near Mt Todd. Many of these are now salvaged or destroyed. Many previous archaeological and historical investigations specific to Mt Todd have been conducted as part of previous mining operations and more recent on heritage assessments performed as part of the EIS. Of most notable significance and importance to the local traditional owners is the extensive greywacke quarry site (MT26) west of the Batman pit. This site was extensively surveyed around 1993 and was estimated to contain over 45 million artefacts.

Additional heritage sites are also present in the surrounding exploration leases; however, these areas have not received similar levels of assessment to those on or nearby to the mineral lease. It is expected that future works in these areas will uncover many more heritage values that need to be considered and managed.

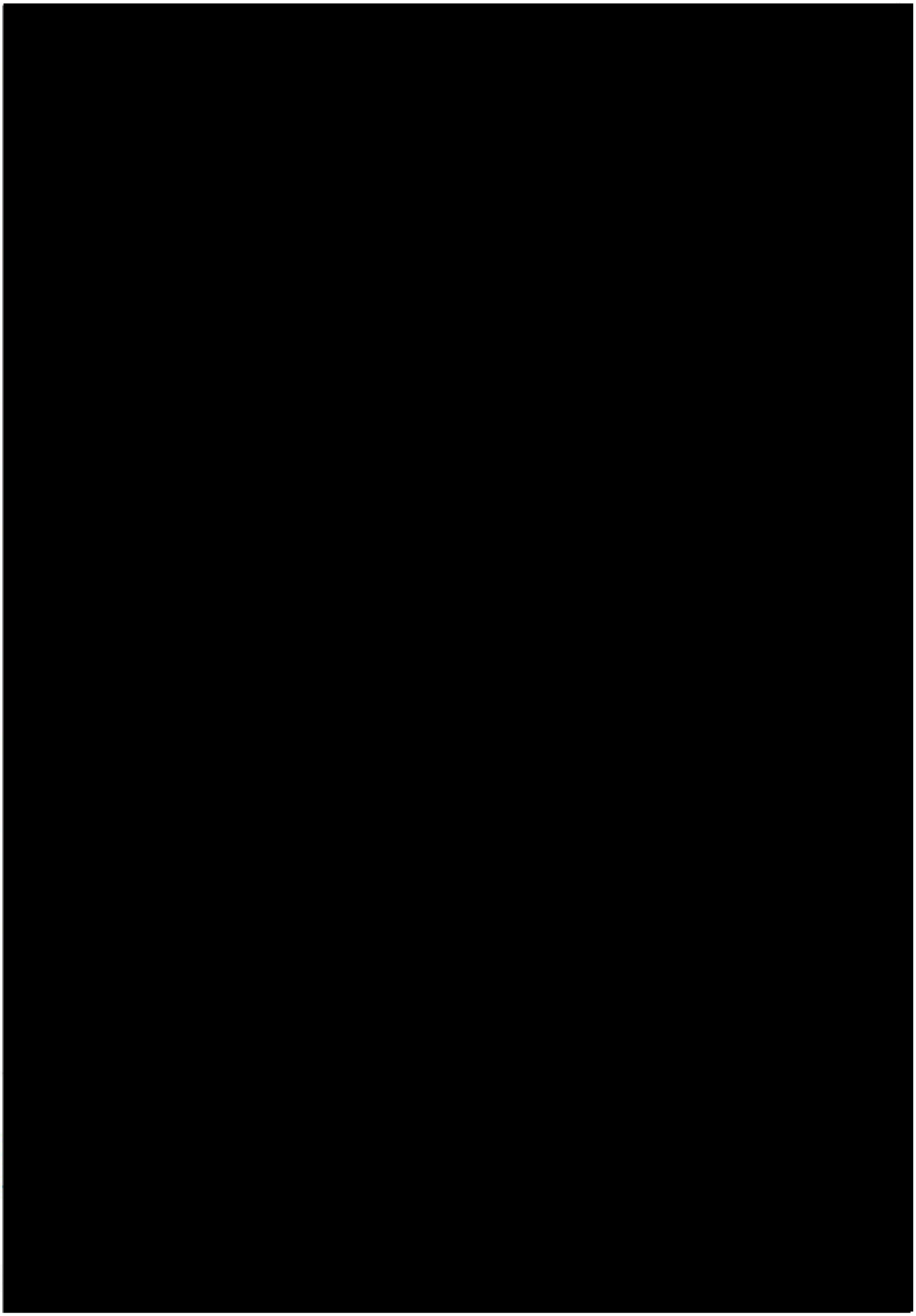

Figure 12. Distribution of heritage sites at Mt Todd

4 Operational Activities

4.1 Past Performance

For the current reporting period the successful implementation of care and maintenance projects, and environmental and water-related management activities, has been achieved a standard equal to or better than previous years. Specific tasks undertaken are listed below.

4.1.1 Care and Maintenance

Key areas of care and maintenance are management and maintenance of the site and its infrastructure. Tasks undertaken across a range of areas during the current reporting period include:

Maintenance of site security

- Site personnel register to record visitor and contractor movements on and off the site.

Maintenance of on-site assets

- RP1 and decant pumps refurbished
- Install 2 new (now 3 total) BAM dust monitoring gauges (Baseline Monitoring Data Collection)
- Install 10 Dust Deposition Gauges (Baseline Monitoring Data Collection)
- Clean-up of workshop area, inside and around hydrocarbon and chemical bunkers, and installation of shade cloth on gates to reduce debris
- Site vehicles and equipment regularly serviced and maintained including major repair of backhoe hydraulics; repairs and replacement to brakes; replacement of steering rack, drive shaft, radiator of site light vehicles
- Horseshoe creek and Stow Creek Gauge stations maintained
- Poly welder refurbished
- Air conditioner pipe drain repaired in site house
- Cleaned VSD air filters at Decant ponds
- Decommissioned SW3 telemetry

Maintain site access and access to relevant site facilities

- Maintained road train access for limestone dosing of RP3
- Clean up of access road to Bore 6
- IT28G roadwork graded at RP3 for road-train access
- Road re-instated into Yinberrie hills for weather station and BAM installations and access

Continued site clean up

- Periodic clean-ups of rubbish blown from on-site rubbish dump
- All leftover poly-pipe collected and stored for use in water management activities
- Drains around the site cleaned prior to wet season commencement
- Tracks around site cleaned up

Heap Leach Pad desilting

- Heap Leach Pad moat desilting carried out periodically
- Enhance the cells to facilitate additional storm water run-off

Pond/Pump/Pipe/Valve inspections and/or maintenance

- Pumps dispatched to service agents for repair and service as required
- On-site repair/replacement of parts on all site pumps as required

Maintain Health and safety of all personnel

- One LTI recorded for the period. Minor cuts and abrasions were recorded.
- Training courses carried out including Advanced Resuscitation

- Gate painted so easier to see
- Safety Standard Operating Procedures written and Job Hazard Analysis procedures implemented for all site activities
- Servicing of all fire extinguishers on site and in vehicles
- All Test and Tag dates checked for currency
- Safety sign audit completed around site, and safety signs erected.
- Fire alarms installed in offices, kitchen and core shed, and checked in accommodation.
- Medicals carried out on all site personnel
- First Aid courses held annually
- Defibrillator and Oxy-Viva II present in the workshop area

4.1.2 Environmental Management

Over the reporting period there was no visual evidence or environmental data that indicated operational activities over the 2016-17 period had a negative impact on the surrounding environment, or that operational activities exacerbated the legacy environmental threats of the Mt Todd site. In addition, there were no new significant environmental issues because of site activities during the reporting period. Specific activities undertaken within the different areas of environmental management of the site are listed below:

Soil and Land Management

- Road culverts cleaned
- Road pot holes maintained with the IT28
- Heap Leach Pond Moot cleaned as required

Weed Management

- Extensive poisoning of weeds to protect assets, focussing around transformers, pipe-lines, bores, telemetry stations, under power lines and around buildings
- Targeted spraying of Rubber bush to meet environmental objectives
- Backhoe, drilling truck and all vehicles cleaned thoroughly before entering Exploration leases to avoid spread of weeds

Feral Animal management

- Care and maintenance staff facilitated feral management programme

Waste and Hazardous substances management

- Internal reduction of flammable material carried out within the Mineral lease
- Limestone side tipper access protected against limestone spills by earthen bund.
- Empty chemical and hydrocarbon drums disposed of during annual ‘Drum Muster’.

Fire management

- Extensive Hazard reduction burning carried out, with a focus on protecting pipe infrastructure and buildings.
- Prescribed burning within mineral lease carried out in conjunction with Jawoyn Rangers

Cultural Heritage Management

- Archaeological work on MLNs and ELs facilitated by local care and maintenance personnel

4.1.3 Water Management

Water management activities were successfully implemented during the reporting period. Specific details are outlined in Section 6.

4.1.4 Community Activities and Support

After the great success 2015 of the inaugural Mt Todd Open Day, the activity is now on the annual calendar. This year's open day at Mt Todd was held on a Saturday the 1th April 2017. Vista Gold provided return transport from Katherine as well as food and drinks. The Open Day encompassed tours of the Mt Todd site demonstrating how the mine is currently being managed, the water treatment facility, and explanations of the gold deposit and Vista Gold's plans for the future. The invitation was also extended to schools to visit the site on Friday 31st March 2017.

Vista Gold also attended the Katherine Community Markets to provide all members of the community with the opportunity to ask questions about the Mt Todd project. From this, great feedback was received such that Vista Gold plans to make this a regular event in the future. Staff on-site also collecting disposable drinking water bottles so they can be cashed in under the NT container deposit scheme and the proceeds donated to local community groups and organisations

Vista Gold established a booth and both the Katherine Mining Forum and the Katherine Show.

Vista presented at the Katherine Mining Forum and Mining in the Territory conferences.

Vista Gold has also recently provided the following community support; details can be found on our website at http://www.mttodd.com.au/community-engagement.html Objectives and Targets

2017 Mt Todd Open Day

4.1.5 Company Objectives

The current goals for Vista Gold are to:

- Maintain and improve the occupational health and safety practices.
- Ensure activities comply with statutory requirements.
- Maintain the Mount Todd site in a condition equivalent to or better than that when we become responsible for the assets in 2006.
- Ensure care and maintenance activities do not result in an increased detriment to the surrounding environment.
- When necessary, discharge of treated water from the Batman pit in an ecologically sound manner.
- Continue endeavours to reduce the total net water inventory on-site.
- Continue to work to build and maintain strong relationships with stakeholders and the broader community regarding the Mt Todd gold project.
- Further progress the project towards a final definitive study to enable a decision to move from evaluation into construction/production.

4.1.6 Care and Maintenance

Care and maintenance objectives and targets for the upcoming reporting period include:

Objectives:

- Successfully implement the existing care and maintenance program and related activities to a standard equal to or better than previous years.
- Continue the operation of the site in a consistent manner to a standard reflective of previous years.

Targets:

- Zero injuries to personnel.
- Minimal downtime of plant equipment.

4.1.7 Environmental Management Plans

The broader environmental objectives and targets are listed below. Specific details for each of the key environmental areas are specified in the individual plans in section 5.7.

Objectives

- Continue working to ensure discharging activities and on-site management of AMD waters have no significant impact on the receiving Edith River aquatic ecosystem.
- To restrict, modify or substitute any activities that have an established known direct negative impact towards threatened species.
- Continue to educate contractors and employees in all aspects of OHS and environmental considerations related to site operations and maintenance.
- Continue the successful reduction of weeds and feral animals across the mineral lease.
- Ensure all activities and personnel continue to respect the cultural and heritage values that exist across the site.
- To successfully rehabilitate all exploration drill sites within the Mineral Lease area.

Targets:

- Zero detectable negative impacts of on-site activities on the receiving Edith River aquatic ecosystem.
- Achieve minimal footprint of legacy structures.
- Zero occurrences of new environmental issues resulting from care and maintenance or exploration activities.
- Zero occupational and environmental incidents on-site including uncontrolled fires, chemical spills, introduction of weeds to surrounding environments and harm to threatened species.
- Zero incidents of unapproved work within significant cultural and heritage areas.

4.1.8 Water Management Plan

The broader objectives and targets for water management are listed below. Specific details are provided in Section 6.

Objectives:

- Successful implementation of water management activities consistent with those undertaken in the past year.

Targets:

- Reduction in the net volume of surface water stored at the Mt Todd site.
- Zero uncontrolled discharges due to infrastructure failures.

4.1.9 Mining Resumption

Vista Gold's objective remains to finalise the planning and approval processes to permit the recommencement of mining at Mt Todd.

Vista is currently seeking an Approval for a Controlled Action under the EPBC Act to allow mining near the Gouldian Finch, which is listed as endangered.

Action on the NT EPA's recommendations included in the EIS assessment report has not progressed as the project is still in care and maintenance and yet to receive the required federal approvals to facilitate the next phase of the project.

5 Environmental Management

5.1 Environmental Policy and Responsibilities

In March 2006 the Government of the Northern Territory, Vista Gold Australia Pty Ltd and Vista Gold Corp. entered into an agreement through which Vista became the owner of the Mineral Leases 1070, 1071 and 1127 and the party responsible for the care and maintenance of the Mt Todd Mine Site effective January 1, 2007.

The agreement specifically states:

"11.5 Notwithstanding any provision to the contrary in any of the Mineral Leases, the Mining Act, the Mining Management Act, or any other legislation, the Territory acknowledges and agrees than Vista Gold has no obligations in respect of the rehabilitation of the Mt Todd site, insofar as the rehabilitation obligations relate to any pre-existing environmental condition as at the Commencement Date. Vista Gold agrees and acknowledges that it has full responsibility for any environmental conditions that occur subsequent to the Commencement Date, other than any environmental conditions caused by the Territory, and except as otherwise expressly provided in clause 11.6".

"11.6 The parties acknowledge that, in spite of the best endeavours by Vista Gold, the pre-existing environmental conditions at Mt Todd as at the Commencement Date could be exacerbated by factors outside of the control of the parties, or unknown to the parties at the commencement Date, such as extraordinary weather conditions. Consistent with the position that Vista Gold has no obligations in respect of the rehabilitation of the Mt Todd site, insofar as the rehabilitation obligations relate to any pre-existing environmental conditions as at the Commencement Date, the Territory agrees that, if there is a claim made against Vista Gold or the Guarantor as a result of the exacerbation of pre-existing environmental condition as at the Commencement Date, the Territory will bear the cost of such claim, provided that Vista Gold has used its best endeavours to prevent the exacerbation, and Vista Gold has complied with its obligations under clause 7.4"

For the information of the reader, clause 7.4 obligates Vista Gold to "operate and manage Mt Todd in an environmentally sound manner and in accordance with all laws and policies of the Territory and otherwise to the standard and using the skill and resources that would be applied by a prudent mine operator". It further states that the "obligation to operate and manage includes (but is not necessarily limited to): provision of adequate security on site; fire and water management; the conduct of all

repairs and maintenance of the NT Assets to the appropriate standards such that the mechanical equipment is kept in sound operating condition".

The administration and execution of Vista Gold's Environmental Management Plan is the responsibility of Vista's Mine Site Manager and Environmental Manager. Vista Gold is committed to ensuring that environmental responsibility is an integral part of its normal business practice. The policies, practices and procedures defined in this environmental management plan are to be understood and implemented by the Vista staff and all authorized visitors/contractors in the natural course of completing their assigned tasks.

Vista Gold places a high priority on safety and environmental protection. As a result, Vista Gold is dedicated to providing the appropriate training and equipment to meet all relevant standards and goals. Vista Gold is very clear in communicating that safety and environmental protection are personal as well as corporate responsibilities. A copy of the Vista Gold Environmental Policy is located in Appendix C.

The Mt Todd site is subject to various Acts and/or agreements in part or entirely, as previously listed in Section 3.

In 2017 Vista was granted MLN31585. This lease covers the are to be inundated by the Raw Water Dam when the walls are lifted by ~2m to facilitate the additional water requirements of the larger proposed gold processing plant.

5.2 Environmental Commitments

Vista Gold is committed to the care and maintenance of the Mount Todd site through active site management and maintenance of assets and the environment. It is Vista Gold's aim to have no injuries to personnel or contractors and no non-conformances with operating conditions.

Vista Gold is also committed to minimising any potential impacts to the receiving aquatic ecosystem of the Edith River as a result of controlled discharging activities and management of on-site AMD waters.

Vista Gold is well aware of the historical environmental issues at the Mt Todd site, and the community and stakeholder concerns in regard to those issues. It is the company's intention to maintain a transparent dialogue with the broader community on all environmental matters and ensure equal consideration with other project factors.

The investment of over nine million dollars towards the treatment of water and installation of pumping infrastructure at the Batman Pit demonstrates Vista Gold's commitment towards the improvement of and reduction in total AMD waters on-site.

5.3 Environmental Training and Education

Each new employee and contractor will receive a copy of the induction manual (Appendix D) and must attend an induction session with the safety officer or company official.

The induction manual covers the following topics:

- Health and Safety Policy including specific site safety rules
- Environmental Policy, Environmental values & Risks, including:
    - Environmental Policy
    - Water draining facilities and management
    - Chemicals and hazardous substances management
    - Fuel storage management

    - Flora and fauna awareness and habitat preservation
    - Environmental monitoring
    - Cultural heritage
    - Waste management
- Community Relations Policy
- Quality Policy & Quality assurance
- Radio communications & mobile phones
- Accident/Incident prevention
- Hazard recognition and risk assessment
- Permit to work procedures
- Incident reporting
- Emergency response procedures
- First Aid
- PPE
- Vehicles and Mobile Equipment
- Smoke free work environment
- Fire prevention and response
- Health issues & Fitness for work
- Workers compensation

Vista Gold is committed to regular review and training of site employees on site safety and environmental issues. The company utilizes an annual training schedule that incorporates environmental and cultural responsibility in addition to health, safety and operational topics. A summary of the annual training schedule is found in Table 10. Most training is conducted by the on-site personnel, with external resources used as appropriate.

Table 10. Annual training schedule

January	Proper Use of Personal Protection Equipment - Heat stress / working in hot climates
February	First aid action plan and site safety management
March	Cultural understanding and bush craft training
April	Fire Prevention and Controlled Burning Procedures - Gouldian Finch habitat protection
May	Wildlife Awareness (snakes, spiders, pigs, etc.)
June	Cultural understanding and bush craft training
July	First aid action plan and site safety management
August	Proper Use of Personal Protection Equipment and Heat stress / working in hot climates
September	Mobile Equipment Operation (including motorized vehicles)
October	Wet season operating practices, policies and procedures - solution management & monitoring procedures
November	Cultural understanding and bush craft training
December	First aid action plan and site safety management

5.4 Environmental Emergency Preparedness and Response

Information on the emergency preparedness regarding surface water management is included in Section 6.

A mobile firefighting trailer, backhoe and Integrated Tool Carrier reside at the site along with other firefighting equipment to combat unexpected wildfires that pose a threat to life or property. All staff involved in firefighting receives regular training and all equipment is thoroughly inspected and serviced prior to the commencement of the dry season.

Spill kits are located on the site and in areas where chemicals are stored.

Muster points are clearly marked and all personnel and contractors informed of their locality during inductions, as well as being provided with a locality plan.

The Integrated Tool Carrier and backhoe can also be utilised in emergency situations to remove spills and contaminations from soils or to repair washouts and erosions.

5.5 Environmental Risk Assessment

As stated in previous sections it is the intention of the company to manage the site in such a manner to ensure the extent and distribution of legacy or new environmental impacts do not grow and are not exacerbated by the day to day management activities on-site, as far as reasonably practicable.

The environmental impacts from not actively managing the site are considered more significant than any possible impacts brought about by care and maintenance activities. As highlighted in 5.5, surface

runoff of poor quality water is the single biggest risk to the health of the downstream receiving environment and if not properly managed will have numerous impacts other than the obvious deterioration of water quality.

Management of the site's surface waters during the wet season is considered to be the single biggest on-site activity with the greatest potential for environmental impact if improperly managed. With the exception to exploration drilling activities, all other site day to day activities, such as maintenance, weed control, security etc. generally occur on or adjacent to existing disturbed areas. The current care and maintenance activities do not involve any actions such as the clearing of significant vegetation, extraction of significant water or generation of significant airborne pollutants.

Much of Vista Gold's other recent activities have been conducted with the view of evaluating the technical and economic viability of renewed mining activities at the Mt Todd Mine Site. Potential project development activity has primarily been preceded by the collection and assessment of baseline environmental data and such activities have had no significant environmental impact.

A risk assessment was completed to isolate the key environmental, social and economic issues and potential impacts associated with the Mt Todd site and ongoing care and maintenance activities.

The risk assessment process did not consider any threats or benefits from the possible restart of mining operations. These scenarios are presented in the EIS and are not applicable within the context of this Mining Management Plan for care and maintenance.

5.5.1 Process and Methodology

Nine distinct environmental values were determined as being at risk of harm and therefore requiring risk assessment to ensure protection. The subsequent risk assessment considered the views of the company, stakeholders and the community. These environmental values and applicable context are:

- Downstream aquatic ecosystem
    - This includes all downstream river and streams such as the Edith River, and encompasses all of the ecological aspects such as water quality, sediments, riparian vegetation, aquatic fauna & flora.
- Ground waters
    - This includes the quality and quantity of ground waters on the Mineral Lease. Risks and potential impacts to neighbouring groundwater resources beyond the Mineral Lease were not considered due the established lack of interaction.
- Air Quality
    - This includes risks to the quality of air on and near the site.
- Terrestrial Flora Communities
    - Flora values generally include those associated with the vegetation communities present on site, their diversity, species composition and the ecosystem functions they fulfil including provision of habitat. In the assessment of consequence, legacy impacts within the Mineral Lease were considered, as well as management actions aimed at the protection of flora on adjacent land.
- Terrestrial Faunal Communities
    - Faunal values were similar in scope to that of Flora.
- Soil
    - Surrounding undisturbed land was used as the soils value benchmark. Assessments were limited to soils within the Mineral Lease and consequences also consider legacy impacts
- Aboriginal Sacred Sites and Heritage

- Knowledge on the variety of existing heritage and sacred sites across the MLNs provided the benchmark for this value. Assessment of risk was generally restricted to the MLNs.

- Community Reputation
  - This is a value of high importance to Vista Gold, ensuring that strong relationships with the local community will provide stable conditions for the ongoing development of the project. Scope of community was generally limited to the Katherine / Pine Creek region.
- Local Economic Value
  - This value has the same foundation and scope as communality reputation, but assesses the financial aspects independently.

While risk assessment processes typically identify impacts and consequences resulting from an organisation's activities, in the case of Mt Todd cessation of anthropogenic activities would also increase the environmental risks due to the legacy issues from previous operations. As a result, the risk assessment process in the context of care and maintenance operations includes any new impacts brought about by anthropogenic activities and those existing legacy issues which care and maintenance aims to combat.

During the assessment of consequences worst case scenarios were applied, reflecting the worst realistic effects on given values (in terms of spatial scale, temporal effect, nature of contaminants, etc.).

Assessment of risk has been conducted through consideration of the circumstances, consideration of the management plans which are in place to preserve those values, and assume effective implementation of such plans.

Levels (and definitions) of likelihood and the severity for types of consequences that make up the risk rating determination are defined in Table 11 and Table 12, respectively.

Table 11. Likelihood definitions

Rating	Likelihood	Definitions
5	Almost certain	The event is expected to occur in most circumstances (The event is likely to occur once per year).
4	Likely	The event will probably occur in most circumstances (The event is likely to occur once every 1 – 2 years).
3	Possible	The event might occur at some time (The event is likely to occur once every 2 – 5 years).
2	Unlikely	The event could occur at some time (The event is likely to occur once every 5 – 10 years).
1	Rare	The event may occur only in exceptional circumstances (The event is unlikely to occur in any 10-year period).

Table 12. Consequence definitions

Rating	Consequence	Environment and Heritage	Social & Economic
5	Catastrophic	Extensive long term environmental harm and / or harm that is extremely widespread. Impacts unlikely to be reversible within 10 years. Widespread / catastrophic detrimental long-term impacts on the environment, which could include extensive pollutant discharges. Unsalvageable and permanent damage to sensitive structures or sites of cultural significance or sacred value.	Community condemnation and irreconcilable community & stakeholder loss of confidence (including severe and detrimental long-term impacts on the community and / or public health). Public or media attention of national to international scale. Irreversible and extensive detriment to local economy. Including shutdown of local businesses and significant employment losses. Extensive emigration of people away from local area, or complete cessation of visitation.
4	Major	Major or widespread, unplanned environmental impact on or off the site. Major detrimental long-term impacts on the environment, which could include substantial pollutant discharges. Major damage or infringement to sensitive structures or sites of cultural significance or sacred value.	Prolonged community condemnation or annoyance and / or loss of confidence by stakeholders and local media attention. Prolonged and widespread detriment to local economy. Including shutdown of local businesses and major employment losses. Widespread emigration of people away from local area, or major cessation of visitation.
3	Significant	Significant, unplanned environmental impact contained within the site or minor impact that is off the site. Considerable damage or infringement to sensitive structures or sites of cultural significance or sacred value.	Limited and localised loss of confidence by the community & stakeholders. Limited and localised direct interruptions to local economy and businesses
2	Moderate	Moderate, unplanned localised environmental impact (maybe of a temporary nature) or discharge contained on-site or with negligible off-site impact. Moderate but repairable damage to important historic structures or sites of cultural importance.	Limited and localised community impacts and concerns. Economic concerns, and indirect financial effects on economy
1	Minor	Minor environmental impact. Any impacts are contained on-site and short term in nature. No detrimental effect on the environment. Minor repairable damage to more common structures or sites. No disturbance of historic and / or cultural heritage sites.	Isolated minor community or individual issue-based concern and complaints. Isolated financial issues primarily affecting unrelated individuals or businesses

Table 13 provides a summary of the qualitative risk matrix adopted and the levels of risk for the various consequence and likelihood combinations.

Table 13. Risk Matrix

		Severity of Consequence				
		5	4	3	2	1
Average of Likelihood of Triggers	5	10 Extreme	9 Extreme	8 Very High	7 High	6 Medium
	4	9 Extreme	8 Very High	7 High	6 Medium	5 Low
	3	8 Very High	7 High	6 High	5 Medium	4 Low
	2	7 High	6 Medium	5 Medium	4 Low	3 Very Low
	1	6 Medium	5 Low	4 Low	3 Very Low	2 Very Low

5.5.1.1 *Results*

The identified sources of impact were assessed for residual risk after consideration of the strategies and on ground actions outlined in the respective environmental management plans. The sources of impact, residual consequences, likelihoods and risks from this assessment are presented in Table 14.

Table 14. Risk assessment by value

Reference	Source of Impact	Consequence	Consequence	Likelihood	Residual Risk
Downstream aquatic environment					
AE01	uncontrolled discharge from RP1 spillway	Reduction in downstream water quality Alteration of breeding capacity of downstream biota Increase of metals within aquatic sediments Degradation of river system	2	3	5
AE02	uncontrolled discharge from RP2 spillway	per AE01	2	3	5
AE03	uncontrolled discharge from RP5 spillway	per AE01	1	4	5
AE04	uncontrolled discharge from HLP spillway	per AE01	3	1	4
AE05	uncontrolled discharge from RP7 spillway	per AE01	2	2	4

Reference	Source of Impact	Consequence	Consequence	Likelihood	Residual Risk
AE06	uncontrolled discharge from RP3 spillway	per AE01	2	1	3
AE07	Engineering failure of RP7	per AE01 deposition of tailings material along creek lines	2	2	4
AE08	Engineering failure of RP1	pee AE01	2	1	2
AE09	Engineering failure of HLP moat	per AE01	1	2	3
AE10	Engineering failure of RP5	per AE01	2	1	3
AE11	Rupture of pipeline	per AE01	2	1	3
AE12	Seepage from RP7	per AE01	1	4	4
AE13	Seepage from RP1	per AE01	4	0	4
AE14	seepage from RP2	per AE01	1	2	3
AE15	Seepage from RP5	per AE01	1	0	1
AE16	Seepage from HLP	per AE01	3	0	3
AE17	Seepage from RP3	per AE01	2	0	2
AE18	Anthropogenic/Active discharge from RP1	per AE01	2	3	5
AE19	Anthropogenic/Active discharge from RP7	per AE01	3	2	5
AE20	Anthropogenic/Active discharge from RP3	per AE01	1	5	6
AE21	Hydrocarbon and Pesticide contamination	per A01 Increased hydrocarbons and pesticides within sediments	1	3	4
AE22	Particulate & foreign matter contamination	Reduction in downstream water quality Visual reduction in aesthetics of aquatic environment Reduction in light availability to biota Degradation of River System	2	1	3
AE23	Change of flow regimes	Impact on breeding cycles of aquatic biota Impacts on vertebrate movement Death of flora either via immersion or lack of water	2	1	3
AE24	Change to streambed characteristics	Physical destruction of biota habitat alteration of hydraulic conditions	2	2	4
Groundwater					
GW01	Seepage from RP7	Reduction in groundwater quality Migration of contaminated waters off site Migration of contaminated waters into surface water bodies	5	4	9
GW02	Seepage from RP1	per GW01	5	0	5
GW03	Seepage from HLP	per GW01	4	2	6
GW04	Seepage from RP2	per GW01	3	3	6
GW05	Seepage from RP3	per GW01	3	1	4
GW06	Seepage from RP5	per GW01	2	2	4
GW07	seepage from WRD	per GW01	4	5	9
GW08	Seepage from LGO stocks	per GW01	4	3	7
GW09	Seepage from scats stocks	per GW01	4	3	7

Reference	Source of Impact	Consequence	Consequence	Likelihood	Residual Risk
GW10	Leakage from plant infrastructure	per GW01	2	5	7
GW11	Rusting / leaks from stocks of old mining equipment	per GW01	1	1	2
GW12	Contamination from poorly maintained vehicles / equipment	per GW01	1	1	2
GW13	Failure on-site storage containers / facilities	per GW01	2	3	5
GW14	Spillage while in transport	per GW01	1	3	4
GW15	Incorrect chemical handling and use	per GW01	1	2	3
GW16	Incorrect chemical disposal	per GW01	2	2	4
GW17	Direct introduction of contaminated water or chemicals	per GW01	2	3	5
GW18	Alteration of water table	per GW01	3	2	5
Air Quality					
AQ01	Dust generation	Reduction in air Quality Reduction in visibility Increased wear on combustion engines or other plant from deposition Health problems for on-site workers	3	1	4
AQ02	Particulate contamination	as per AQ01	3	2	5
AQ03	Gaseous contamination	Health and or life threats to on-site personnel	3	2	5
Terrestrial flora communities					
TFA01	Clearing	Death of flora Degradation of habitat	3	2	5
TFA02	Fire	Alteration of seeding cycles Stunting of growth Removal of vegetation Death of flora	3	5	8
TFA03	Equipment and vehicle interaction	as per TFA01	2	1	3
TFA04	Soil contamination	as per TFA01	3	3	6
TFA05	Introduced species	Resource competition	3	1	4
TFA06	Direct degradation	as per TFA01	3	1	4
TFA07	Groundwater contamination	as per TFA02	3	1	4
TFA08	Water table alteration	as per TFA02	3	1	4
TFA09	Alteration of surface water flow regimes	as per TFA02	4	1	5
TFA10	Poaching	removal of species from population	1	1	2
Terrestrial fauna communities					
TFL01	Habitat modification	Reduction in nesting and feeding sites Reduction of food availability	3	1	4
TFL02	Disease	Alteration of breeding capacity Alteration of mortality	1	2	3
TFL03	Introduced species	Competition for food resources	3	2	5
TFL04	Hunting/Poaching	removal of species from population	1	1	2
TFL05	Anthropogenic land use	Exclusion from use of land	3	1	4

Reference	Source of Impact	Consequence	Consequence	Likelihood	Residual Risk
Soil					
S01	Contamination	Reduction in quality Reduction in fitness for purpose	3	3	6
S02	Erosion	Removal of nutrients Removal of topsoil	2	1	3
S03	Compaction	Reduction in fitness for purpose	4	1	5
S04	Clearing	Increased exposure to elements and weathering	3	1	4
S05	Alteration of the soil structure	as per S01	3	1	4
Aboriginal sacred sites & Heritage					
AH01	Fire	Damage to artefacts and structures	3	1	4
AH02	Clearing	as per AH02	3	2	5
AH03	damage from vehicles	as per AH02	2	2	4
AH04	Vandalism / Theft	Damage to artefacts and structures Removal of artefacts	1	2	3
Community reputation					
CR01	Disrespect to aboriginal people and their heritage and cultural beliefs and ways	Elimination of trust Increase in negative opinions Removal of land use permissions	2	1	3
CR02	Disharmony	Reduction in employee wellbeing Increased likelihood of accidents Reduced efficiency Reduced community perceptions	2	1	3
CR03	Noise	Reduction in adjacent land use and values Increased risk to personnel wellbeing	3	1	4
CR04	Light Pollution	Disruption of adjacent land uses	2	1	3
CR05	Change in economy	Increased stress on local workforce Increased costs of doing business within the community	2	2	4
CR06	negative image of mining	Negative perceptions and opinions of the company	2	1	3
CR07	Increased road usage	Disruption to local residents and visitors to Edith Falls	2	2	4
CR08	Poor operational management & failing to meet community expectations	Loss of confidence in company Removal of support from stakeholders Loss of jobs Environmental degradation	3	2	5
CR09	Visual aesthetics	Reduction in Adjacent land values	2	2	4
Local economic value					
EV01	Site Closure	Loss of jobs Loss of economy for local businesses Loss of confidence in Mt Todd as a viable mining operation	3	2	5
EV02	Not buying / hiring locally	Loss of confidence in company Removal of support from stakeholders Stunting of local labour market.	2	1	3

Reference	Source of Impact	Consequence	Consequence	Likelihood	Residual Risk
EV03	environmental degradation	Reduction in adjacent or downstream land values Reduction in community confidence towards economic benefits of mining	3	1	4

5.6 Environmental Audits and Inspections

Environmental audits and inspections will be performed by the Site Manager and/or the Environmental Manager and reported internally as required.

Routine monitoring of surface water, groundwater, aquatic sediments and macroinvertebrates are conducted each year as outlined in the Water management plan.

Routine check monitoring sampling of surface and ground waters is undertaken by the Department of Mines and Energy.

No other routine formal environmental audits by external consultants have recently or routinely take place at Mt Todd.

Other non-routine environmental inspections and audits which have or are likely to take place at the site include

- surveys and monitoring of Gouldian Finches
- survey to determine if the Northern Quall and Crested Shriketit are at Mt Todd
- land quality survey of ~1,800ha as part of the assessment for Offsets under the EPBC Act.
- aboriginal archaeological surveys to ensure site activities do not have an impact on any previously undocumented sites

Non-environmental inspections and audits by external agencies and or regulatory authorities include

- audits of occupational health and safety management procedures
- on-site audits and inspection of occupational health and safety incidents
- inspections of on-site chemical and Hydrocarbon storage facilities

5.7 Environmental Management Plans

The following sections present the environmental management plans for those high and medium risk domains identified in the risk assessment of section 5.5.

5.7.1 Soil and Land Management

5.7.1.1 *Environmental Risks*

Due to the history of the site several areas provide a risk of contamination including the Heap Leach Pad, Low Grade Ore Stockpile, Waste Rock Dump, Waste Rock Dump Retention Pond (RP1) and the Tailings Storage Facility (RP7). Contaminants of concern include cyanide, heavy metals and the generation of acids from water washed sulphuric compounds.

Intense localised storms also have the potential to wash away significant quantities of soil. The historically affected areas have generally been diversion drains and road crossings where surface runoff consolidates into high velocity flows. No broad scale erosion is present on-site primarily due to

the lack of fine soils in areas of relief. The exception to this is the HLP which suffers from major erosion every wet season due to its composition being finely milled rock. The other stockpiles and dumps do not suffer from erosion of any significant form.

5.7.1.2 *Objectives and Targets*

- Minimise the spread of contaminants or potentially contaminated material across site.
- Minimise the footprint of legacy structures as far as reasonably practicable.

5.7.1.3 *Management and mitigation strategies*

Many surface water diversion drains exist across the site. Most of these drains divert natural uncontaminated surface runoff away from existing contaminated structures, and thereby reduce the total volumes of contaminated waters that require management. A diversion drain is present around the eastern side of the low-grade ore stockpile which captures contaminated runoff from the stockpile and diverts it to RP2. Diversion drains are regularly inspected after significant rainfall events to identify any failures and/or necessary repairs.

Annual excavation and reshaping works are conducted on the HLP in preparation for the following wet season to ensure eroded material remains constrained to the lined facility. These activities are undertaken on the legacy structure at great cost and include; removal of eroded material from the moat, reshaping of benches and the installation of pipelines to the top of the HLP to stop water naturally cascading to the moat.

Improvements such as rock armouring are made to road crossings and diversion drains where necessary to minimise erosion from flood. Material used for such improvements is carefully selected to ensure PAF type material is not used.

5.7.1.4 *Monitoring and Measurement*

No formal monitoring, measurement or recording of soil or land disturbance is conducted. The care and maintenance activities undertaken on-site are restricted to areas of existing disturbance. Activities outside those areas are only conducted after approval from the Site, Environment or Exploration manager and conducted to ensure there are no major soil and land impacts.

5.7.1.5 *Strategy effectiveness and review*

Since undertaking management of the site in 2007, no significant enlargements have occurred to the footprint of existing structures or previously disturbed areas, and there has been no detected or identified land contamination because of care and maintenance activities. Breaches of diversion drains have occurred on two occasions since 2007 and were also the result of significant heavy localised rainfall.

5.7.1.6 *Reporting and Corrective Action*

Previous breaches of diversion drains have been reported to necessary regulatory authorities. Such authorities will also be notified upon the detection of contamination in any areas previously known or assumed to be undisturbed.

All soil and land related issues are included in monthly internal reports where necessary for attention of management and ensure corrective actions are taken.

5.7.2 Weed Management

5.7.2.1 *Environmental Risks*

The surveys conducted during the EIS confirmed the presence of 12 weed species on the mineral lease, comprising four class B weeds, one species of concern to the integrity of the NT savannahs, one species of concern to the ecological integrity of the Yinberrie Hills, and six species without specific classification (Table 15).

If left unchecked the spread of weeds on the mineral lease has the potential to affect neighbouring areas. Weeds have the potential to compete with native vegetation and reduce the plant diversity necessary to support the surrounding ecosystem. For example, the Gouldian Finch relies on native grass seeding patterns which could be interrupted by the spread of weeds.

Weeds also have the potential to alter fire regimes, by increasing fire intensity and frequency. For example, Exotic grasses such as Gamba grass (*Andropogon gayanus*) and Mission grass (*Pennisetum polystachion)* increase fuel loads, leading to hotter fires which eventually change ecosystem structure and compositions.

5.7.2.2 *Objectives and Targets*

- Reduce the prevalence of weeds across the mineral lease
- Ensure weeds are not transported to surrounding areas (such as exploration leases) as a result of care and maintenance activities.
- Monitor vegetation post work programmes to ensure that if new weeds are accidentally introduced they are swiftly eliminated.

5.7.2.3 *Management and mitigation strategies*

Regular weed spraying activities are undertaken on-site by care and maintenance personnel, with weed species and location of eradication documented. Weeds along pipelines, around buildings and on the edges of road verges are regularly sprayed. Identified weeds at other locations on the mineral lease are sprayed in accordance with the following hierarchy.

Four class B weed species under the *Weeds Management Act 2001* have been identified on the mineral lease; Gamba grass (*Andropogon gayanus*), Hyptis (*Hyptis suaveolens*), Mission grass (Perennial – *Cenchrus polystachios,* Annual – *Cenchrus pedicellatus*) and Rubber bush (*Calotropis procera)* (Table 15). These species are actively managed as first priority to limit their growth and spread, according to obligations under the *Weeds Management Act 2001.*

One species is of concern to the ecological integrity of the NT savannah ecosystems namely the Stinking passionfruit (*Passiflora foetida*), and one species of concern to the ecological integrity of the Yinberrie Hills ecosystem is the Rosella (*Hibiscus sabdariffa*) These two species have been identified on the mineral lease and although there is no legislative requirement to control the above weeds, they are controlled as second priority to reduce any potential threat to ecosystems within and adjacent to the mineral lease.

Of lowest priority are the remaining weeds listed in Table 15 which do not pose a particular threat to ecosystems within or adjacent to the mineral lease. These weeds are monitored but not actively eradicated.

The company requires that all employees and contractors ensure that any equipment or machinery being brought to and from site is clean and free of potential weeds.

On-site vehicles and in particular quad bikes are regularly washed to limit any spread and driving off designated tracks is only conducted when absolutely necessary and avoided if weeds are known to be in seed.

All employees are instructed in the appropriate preventative measures during site induction and at regular intervals thereafter.

Table 15. Weeds Present Across the Mineral Lease

Species Name	Common Name	Schedule Class*	Priority for treatment**
*Andropogon gayanus***	Gamba grass	B	1
Calotropis procera	Rubber bush	B	1
Cenchrus ciliaris	Buffel grass		3
Chloris gayana	Rhodes grass		3
Crotalaria goreensis	Gambia pea		3
Hibiscus sabdariffa	Rosella		2
Hyptis suaveolens	Hyptis	B	1
Melinis repens	Red Natal grass		3
Passiflora foetida	Stinking passionfruit		2
Cenchrus pedicellatus	Mission grass (Annual)		3
Cenchrus polystachios	Mission grass (Perennial)	B	1
Stylosanthes hamata	Carribean stylo		3

Notes: * Schedule Class as determined under the Weeds Management Act. All Schedule Class A and B weeds in the Northern Territory are also scheduled as Class C weeds.

** 1 is highest priority weeds, and are sprayed preferentially, 2 is second priority weeds, being treated after A, and 3 are lowest priority weeds, and are not actively treated.

5.7.2.4 *Monitoring and Measurement*

It is of critically importance that no new class A or B weeds become established on the mineral lease. Examples of weeds of concern include Bellyache bush (*Jatropha gossypifolia*), Devil's claw (*Martynia annua*) and Neem (*Azadirachta indica)*. These first two species are identified by NT government records as occurring in the area and both are Class A weeds, with a legislative requirement for eradication. Neem is a recent declared weed and is already well established in the Katherine River system.

To reduce the chance of new introductions, staff members are vigilant as to the appearance of any new weeds on site, and all new staff members are taught about the above weeds in the site induction. Any unrecognised plant will be identified, and if found to be a weed of concern, will promptly be eradicated.

Key methods of weed management include:

- extensive poisoning of weeds to protect assets, focussing around transformers, pipe-lines, bores, telemetry stations, under power lines and around buildings;
- targeted spraying of Rubber bush to meet environmental objectives; and
- Thorough cleaning of backhoe, drilling truck and all vehicles before entering exploration leases to avoid spread of weeds.

A weed map of control activity is included in **Error! Reference source not found.** and identifies the areas of routine spraying.

5.7.2.5 *Strategy effectiveness and review*

No new class A, B or C weeds have been identified on site as a result of import by vehicles or machinery to the site.

The routine weed spraying activities have been successful in halting the spread and distribution of the primary weed threats on the mineral lease.

All new contractors and employees were educated in avoiding the spread of weeds.

5.7.2.6 *Reporting and Corrective Action*

All required reporting with respect to weed management has been undertaken. No new weeds have been identified that warrant additional contact with authorities.

5.7.3 Feral Animal Management

5.7.3.1 *Environmental Risks*

Feral animals are known to have a negative impact on native flora and fauna, through competition for resources, killing of native wildlife, or degradation and damage to landscapes. Feral animals likely on the mineral lease include buffalos, cane toads, cats, cattle, dogs, donkeys, and pigs. These animals are not isolated to the mineral lease and occur across the general area, with individual animals moving throughout the unfenced landscape. The animals do not pose any direct risks to operational activities at the site other than potential safety issues upon interaction with staff or contractors.

5.7.3.2 *Objectives and Targets*

To provide assistance where necessary towards any feral animal control or eradication programmes operated by surrounding land owners.

5.7.3.3 *Management and mitigation strategies*

Currently, the feral animal eradication program is executed by the Jawoyn Association under the direction of the Jawoyn Land Manager. This program is targeted towards all Jawoyn owned land and Vista Gold facilitates the Jawoyn Association with undertaking activities on the mineral lease.

5.7.3.4 *Monitoring and Measurement*

No formal process of monitoring or measurement of feral animals is conducted by Vista Gold.

5.7.3.5 *Strategy effectiveness and review*

The working arrangement between Vista Gold and the Jawoyn association regarding feral animal control has been successful.

5.7.3.6 *Reporting and Corrective Action*

Jawoyn rangers have conducted many visits to the mineral lease. No significant feral animal issues have been reported by the rangers or staff. No specific environmental issues pertaining to feral animals within mineral lease have been identified.

5.7.4 Threatened Species Management

5.7.4.1 *Environmental Risks*

The draft EIS released in 2013 identified 6 species of threatened Fauna confirmed within the mineral lease (Table 16). As the vast majority of care and maintenance activities occur within existing disturbed areas, and no unauthorised vegetation clearing is permitted, most site activities have no potential to affect threatened species. The main exception is fire management, which has the potential to affect significant areas of undisturbed or partially disturbed habitat.

5.7.4.2 *Objectives and Targets*

To restrict or substitute any care and maintenance activities that has an established known direct negative impact towards threatened species.

5.7.4.3 *Management and mitigation strategies*

As described in the Fire Management Plan (Section 5.7.7), controlled burning is carried out in a manner that protects the natural habitat of the Gouldian Finch in the Yinberrie Hills. Recent surveys for the 2013 EIS found that no significant change in either the grasses required to sustain the Gouldian Finch populations, or Finch numbers has occurred in the last 17 years. It is therefore apparent that previous and current fire management strategy is not significantly affecting Gouldian Finch populations.

The Australian Bustard is commonly encountered on site, as the cleared areas of the Brownfields site provide ideal habitat. The main risk posed by site activities is interference by on-site personnel or vehicles. This risk is mitigated by active avoidance of birds by site personnel.

Potential risks and mitigation measures to other threatened species on site is addressed in Table 16.

Table 16. Threatened species potentially found within mineral lease

Confirmed during 2011/12 EIS Fieldwork

Species Name	Common Name	Schedule Class	Risks posed by Care and maintenance	Mitigation strategy
Erythrura gouldiae	Gouldian finch	Endangered EPBC Act Vulnerable TPWC Act	Inappropriate fire regimes	Appropriate fire regimes designed to ensure the grass assemblages exist to support the Gouldian Finch.
Falcunculus frontatus whitei	Crested Shrike-tit	Vulnerable EPBC Act Near Threatened TPWC Act	Low risk of any harm, as species only occasionally resident to site	No active Mitigation strategies
Ardeotis australis	Australian Bustard	Near Threatened TPWC Act (formally Vulnerable)	Small risk of interference by vehicles and site personnel	Birds will be avoided by site personnel

Grantiella picta	Painted Honeyeater	Vulnerable TPWC Act	Very low risk, generally restricted to mature trees that host mistletoe, not disturbed by care and maintenance activities	No active Mitigation strategies
Varanus mertensi	Mertens' Water Monitor	Vulnerable TPWC Act	Population not affected by care and maintenance activities	No active Mitigation strategies
Rattus tunneyi	Pale Field-rat	Vulnerable TPWC Act	Frequent fire regimes Predation by feral cats	•Fire regime is not currently designed to consider this species •Support pest control including eradicating feral cats

	Species Name	Common Name	Schedule Class	Risks posed by Care and maintenance	Mitigation strategy
Previously confirmed on site	*Dasyurus hallucatus*	Northern Quoll	Endangered EPBC Act Critically endangered TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
	Falco hypoleucos	Grey Falcon	Vulnerable TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
	Varanus mitchelli	Mitchell's Water Monitor	Vulnerable TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
	Varanus panoptes	Yellow-Spotted Monitor	Vulnerable TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
	Geophaps smithii	Partridge pigeon	Vulnerable EPBC and TWPC Acts	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
Unlikely to occur on site*	*Saccolaimus saccolaimus*	Bare-rumped sheathtail bat	Critically endangered EPBC Act Near Threatened TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
	Phascogale pirata	Northern brush-tailed phascogale	Endangered TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies

	Conilurus penicillatus	Brush Tailed Rabbit-rat	Vulnerable EPBC Act Endangered TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
	Tyto novaehollandiae kimberli	Masked Owl	Vulnerable EPBC and TPWC Acts	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
	Erythrotriorchis radiatus	Red Goshawk	Vulnerable TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies
Likely to occur but unconfirmed	*Mesembriomys gouldii*	Black Footed Tree Rat	Vulnerable TPWC Act	Minimal Risk posed by care and maintenance activities	No active Mitigation strategies

Note: *As determined in 2013 Draft Environmental Impact Statement

5.7.4.4 *Monitoring and Measurement*

No formal monitoring and measurement of threatened species are conducted by Vista Gold while in a care and maintenance role. Faunal assessments have recently been undertaken across the site as part of the draft EIS. Vista will collaborate to the extent possible with other groups interested in studying and monitoring threatened species, particularly the Gouldian Finch populations of the Yinberrie Hills.

5.7.4.5 *Strategy effectiveness and review*

No incidents have been identified or reported whereby care and maintenance activities have resulted in threats towards threatened species within the Mineral Lease.

5.7.4.6 *Reporting and Corrective Action*

No internal or external reporting is currently conducted.

5.7.5 Hazardous Substances Management

5.7.5.1 *Environmental Risks*

The principal risk associated with most hazardous materials is possible harm to the health and safety of those who use or are exposed to the materials. There is also an environmental risk associated with spills and leaks with the potential for soil, water and air contamination.

Table 17 lists the most common and significant potentially hazardous substances on the site.

Table 17. Potentially hazardous materials stored and used on-site

Product Name	Description	Maximum Quantity Stored
Roundup PowerMAX	herbicide	60 litres
Amicide 625	herbicide	20 litres
Access	herbicide	20 litres

Velpar L	herbicide	20 litres
Chlorpyrifos 500 EC	insecticide	4 litres
BP Coolant	automotive coolant	40 litres
Diesel Fuel	fuel	600,000 litres
Unleaded Petrol	fuel	200 litres
waste oil	used motor oil	200 litres
Castrol GTX2	motor oil	20 litres
Mobil Delvac 1240	2-cycle motor oil	20 litres
Vanellus C6 Global	diesel motor oil	20 litres
Vanellus DD 40	Motor oil	20 litres
BP Energrease LC2	Grease	20 kg
BP Energear Limslip 90	Gear oil	20 litres
BP Visco 5000	Motor oil	20 litres
O-Tech Ultra-Cut Chain 'n Bar Lube	Chain and bar lubricant	5 litres
BP Degreaser	solvent	20 litres
Solver 4960 Acetone	solvent	20 litres
White Spirits	solvent	20 litres
Mineral Turpentine	solvent	20 litre
Limestone	Water Treatment	90 Tonne

5.7.5.2 *Objectives and Targets*

To ensure all contractors and employees are aware of the OHS and environmental considerations when using hazardous substances.

To ensure zero occupational and environmental incidents on-site involve hazardous substances.

Reduce the total inventory of possible hazardous substances either stored or needed to be brought to site

5.7.5.3 *Management and mitigation strategies*

Employees and contractors of Vista Gold are instructed in the proper use and storage of chemicals and materials deemed to be hazardous. No employee or contractor is permitted to use or handle such materials until deemed competent by the Site Manager. Conformance to handling and usage procedures is required always by the company. All necessary PPE such as gloves, masks and goggles are provided on-site.

All contractors bringing materials deemed hazardous onto site are responsible for the management of those materials.

Material Safety Data Sheets ("MSDS") are available on-site for all hazardous materials. Such MSDS's are typically stored nearby to the hazardous materials.

The following storage facilities are in place on the site;

- Diesel fuel can be stored in two separate tanks

    - A 4,400 litre, double-walled, self-bunded steel tank in the main site compound. This tank is primarily for local site management activities.
    - A 600,000 litre bunded tank 300m south of the site compound. The tank has a lined earthen bund of dimension 26.4m x 26.4m x 1m which provides in excess of 650 000 Litres of capacity should the primary tank fail. The tank is typically only filled with 100,000 litres of Diesel (equivalent volume of 1 tanker delivery to site)
- Unleaded petrol is stored in a shaded, well-ventilated area that is appropriately labelled. The maximum volume at any one time is 500 litres.
- Lubricants are stored in their original packaging in a shaded, appropriately labelled, bunded and well-ventilated area.
- Waste oil is stored in a 205-litre drum until it can be transported to an approved recycling facility for disposal.
- Herbicides and Pesticides are stored in their original packaging in a shaded, appropriately labelled, bunded and well-ventilated area.
- A maximum of 90 tonnes of Limestone is stored at the water treatment plant silo on the ROM pad.

Regular inspections are performed on all storage facilities to identify any potential issues.

The types and quantities of chemicals stored on-site are frequently reviewed to ensure only the minimum quantities necessary are kept. Chemicals no longer required are removed from site and disposed of by licensed companies.

In the event of a small spill, product will be contained and collected using on-site spill kits, and the contaminated soil will be collected and removed. Soils contaminated by hydrocarbon spills will be placed on the heap leach pad for subsequent volatilization. Soils contaminated by other hazardous or toxic materials will be collected and disposed of in accordance with applicable laws.

If the spill contaminates flowing surface waters, the size and nature of the spill will be immediately reported to the relevant authority. The report will include an estimate of the quantity of contamination, whether or not downstream waters are visually affected, the observance of any fish mortalities resulting from the spill and any other factors that may be relevant to the health of humans, fish or stock downstream from the site of the spill.

In the event of an unplanned volatilization of any hazardous materials, the downwind area will be immediately cleared of personnel and equipment.

5.7.5.4 *Monitoring and Measurement*

Records of all occupational and environmental incidents involving chemicals or hazardous materials are recorded by the Site Manager for further investigation and as per relevant legislation.

5.7.5.5 *Strategy effectiveness and review*

No environmental or occupational incidents have been recorded on-site because of hazardous substances. No major or minor spills were recorded in the same period.

5.7.5.6 *Reporting and Corrective Action*

Any serious occupational injury or illness must be reported to NT Work safe.

Any incidents deemed likely to cause material environmental harm or serious environmental harm will be reported to the relevant authority.

5.7.6 Waste Management

5.7.6.1 *Environmental Risks*

The Mt Todd Mine Site in its current care and maintenance status generates very little waste. Most waste generated on site is classified as domestic garbage, or sewage from on-site accommodation and amenities. There is a small quantity of industrial waste that is generated from time to time.

The environmental risk associated with domestic garbage (i.e. paper, plastic, wood scraps, food scraps, etc.) Is deemed to be low with the primary concerns being interaction of fauna with garbage (ingestion) and containment of waste (litter).

The industrial wastes generated on site include a small quantity of waste oil (on an infrequent basis), oil filters and containers (glass, plastic or metal) used for the transportation/storage of pesticides, herbicides, lubricants and other materials. Such drums and residue could pose a threat to aquatic or terrestrial fauna and flora.

This section addresses waste generated by site activities only. All issues pertaining to water management, including those reported under the *Waste Management and Pollution Control Act,* are addressed in the 2013-14 Water management plan.

5.7.6.2 *Objectives and Targets*

Minimise the volumes of wastes generated, and maximise the wastes which can be recycled.

Ensure hazardous and non-hazardous materials are safely used and disposed of correctly.

5.7.6.3 *Management and mitigation strategies*

Domestic garbage will be stored and disposed of separately from industrial waste. A domestic garbage pit is located on the eastern side of waste rock dump and receives general rubbish from the accommodation and site offices and workshops. The garbage is incinerated on an as needs basis to minimise the pit size. Incineration is only conducted when wind conditions will ensure fumes are carried away from the site. The garbage pit is also fenced off to exclude fauna from entering the area.

Upon final consumption of herbicides and pesticides, the containers are triple rinsed with clean water. The water used in the rinse process is dumped in the sprayer for subsequent consumption. Once triple rinsed, the containers are left to air dry and finally disposed of at an authorised recycle centre.

Waste oil is collected and stored on-site in appropriately labelled 205 litre steel drums and transported to an authorized recycle centre for final disposal on an as needed basis.

Used oil filters and lubricant containers are gravity drained and the drippings collected and placed in the waste oil drum prior to being disposed of in the garbage pit.

From time to time, clean-up or dismantling of existing facilities may result in the generation of other types of industrial wastes. In each case, the disposal of the waste will be carefully considered and the waste will be disposed of in accordance with acceptable standards and practices.

The site contains a “lay down” area where many items such as steel and pipe are taken to in the anticipation of them being re used at later stages.

All on-site septic tanks are pumped fortnightly (or as required) by a contracted waste management company who disposes of the effluent at the Katherine treatment facility.

5.7.6.4 *Monitoring and Measurement*

No formal monitoring and assessment of wastes on-site is conducted.

5.7.6.5 *Strategy effectiveness and review*

Due to the small number of personnel at the site, the current waste management strategies have been effective in handling the wastes generated.

5.7.6.6 *Reporting and Corrective Action*

No formal external or internal reporting is conducted in regard to waste management at the site.

5.7.7 Fire Management

5.7.7.1 *Environmental Risks*

Most normal site activities do not involve the use of open flames or other sources of ignition but activities such as welding, cutting or the use of motorized vehicles and equipment could present a fire initiation risk. Careless disposal of cigarettes by smokers, particularly when working in bush areas, presents another ignition potential.

The risk of a fire arising from any of the installations (buildings, sheds) at the Mt Todd site is deemed to be minimal and the fire management strategy largely focuses on potential impacts from wildfires. The extended dry periods and accompanying fuel loads from heavy wet season growth present optimal conditions for wild fires in the Northern Territory. Uncontrolled wildfires can do damage to infrastructure and have impacts on flora and fauna.

One of the major operational concerns is the potential damage to Polyethylene piping infrastructure from wildfires. Damage to such pipes, particularly in the late dry season would create significant issues towards the management of on-site waters during the wet season.

The status of the Gouldian Finch and proximity of the site to known habitat of significance and the surrounding area which may impact on the quality and quantities of food resources for the finches and other fauna requires careful fire management by the Jawoyn Rangers and our site personnel.

5.7.7.2 *Objectives and Targets*

Minimise potential for the uncontrolled spread of fire across the mineral lease and/or on to neighbouring properties.

Maintain all firebreaks across the site prior to the potential fire season.

Protect all on-site assets from fire.

Ensure any fires started because of on-site operations are contained to the immediate area.

Ensure all personnel working at the site are aware of fire risks and their responsibilities.

Adopt contemporary fire management practices i.e. patchwork mosaic burning.

5.7.7.3 *Management and mitigation strategies*

Vista Gold implements four methods towards fire management. Education, inspection, elimination and controlled burns.

1. Education

Fire management is included within the site induction manual (Appendix D) to educate and inform all site personnel as to the dangers and responsibilities associated with fire management. The induction highlights the caution required while handling potential ignition sources, and directs personnel to contact the Site Manger immediately if a fire is detected on or adjacent to the site.

2. Inspection

All assets are physically inspected at the beginning of the dry season to identify any build-up of vegetation nearby to an asset that may post a fire risk and requires removal. General housekeeping is also assessed in work areas to identify potential fire risks, such as improper storage of flammable liquids, removal of rubbish or flammable materials.

3. Elimination

Vegetation growth around assets is controlled during the wet season through the routine application of herbicides.

To the extent possible, all welding and cutting activities are conducted in workshops. When this is not possible, precautions are taken to ensure that the area is free of combustible material and that one person is designated as fire watchman during the welding activity. This person will have at the minimum a fire extinguisher and shovel immediately available for use in the event of an ignition event.

A trailer mounted fire tender is permanently kept and maintained at the site for fire control. A rubber-tyred backhoe and integrated tool carrier are also based at the site and are available to assist in fire control if necessary.

4. Controlled Burns

Controlled burns on-site are undertaken in accordance with two recommendations of the Conservation Commission of the Northern Territory (CCNT) in the “Mt Todd Gold Mine Environmental Management Plan” prepared by Zapopan N.L. in 1993 for Gouldian Finch breading areas.

These recommendations were to commence the first dry season burn when the Sorghum spp. seed has dropped (generally March to April); and undertake secondary burns three weeks later in areas too wet to be ignited during the initial burn.

Contrary to the plan recommended by the CCNT, fires will be started during the day. This is consistent with the controlled burning plans of the Nitmiluk Park Rangers, the Werenbun Community and Jawoyn Association.

Vista Gold’s fire management strategies and operations are reviewed each year in conjunction with the Jawoyn Association and burns are undertaken only once the Site Manager has coordinated the proposed controlled burning program with Nitmiluk National Park Rangers, Jawoyn Association and Werenbun community. No burning occurs without a NT bushfire permit to burn or when fire bans are active in the area.

5.7.7.4 *Monitoring and Measurement*

The Site Manager and Jawoyn Association will continuously monitor controlled burns and maintain control of the burn.

No formal recording or assessment is performed on areas of the mining or exploration lease which is burnt under controlled or uncontrolled conditions.

All occupational injuries because of fire are recorded.

5.7.7.5 *Strategy effectiveness and review*

No major assets have been damaged because of fire at the site since 2007. The weed management and spraying activities around pipelines and other infrastructure during the wet season significantly reduces the annual volume of dry vegetation that would otherwise require removal during the early dry.

No fires have been unexpectedly started by staff or contractors working in high fire risk areas.

Early dry controlled burning of key locations to form fire breaks has been successful in preventing external fires entering the lease, and any later on-site controlled burns from leaving the lease.

Strategic monitoring of Finch populations within the Mineral lease is conducted by the DLRM annually and it has been noted that inappropriate fire management practices are likely to have a negative impact on the Finches. However, no significant change to the Finch population was found between the previous EIS (1992) and the 2013 EIS. It can therefore be concluded that fire management practices over that period have not been detrimental to Gouldian finch populations.

5.7.7.6 *Reporting and Corrective Action*

All significant injuries because of fire are reported to NT Worksafe and internally.

Any damage to on-site property or infrastructure because of fire are included in monthly reporting so changes and corrective measures can be put in place.

5.7.8 Community and Stakeholder Management

5.7.8.1 *Environmental Risks*

Risks to community and stakeholder relationships include disrespect to Aboriginal culture and heritage, pollution, local economic changes, negative perceptions of mining, increased road usage, poor operational management leading to a failure to meet community expectations (including environmental harm), aesthetic changes to the site and depreciation of neighbouring and downstream land values.

5.7.8.2 *Objectives and Targets*

Vista Gold aims to create and maintain strong relationships with stakeholders and the wider community, to establish stable conditions and support for current and future operations within the Mt Todd site (**Error! Reference source not found.**).

5.7.8.3 *Management and mitigation strategies*

Vista Gold's community and stakeholder management strategy comprises the following;

- Communicate the positive social, economic and environmental aspects of Vista Gold's presence and the potential redevelopment of the Mt Todd site, through regular communication and consolation.
- Ensure that all staff and contractors are trained as to the importance of maintaining a strong working relationship with local Aboriginal stakeholders, including cultural awareness and sacred site training.
- Mt Todd reference group meetings are held at least annually, allowing for dialogue between Vista Gold and member stakeholders.
- A stakeholder database is maintained, to ensure stakeholders or interested parties are kept informed as to site matters or company plans.
- Meetings with the Jawoyn association are held approximately every 6 months, to allow for specific dialogue between Vista Gold and traditional owners.
- Communication plan enacted for waste discharge under WDL 178, which provides procedure for contacting affected or potentially affected stakeholders in the event of an unplanned discharge.
- Complaints register enacted under WDL 178, to allow for community concerns to be specifically addressed.

- Practical internal policies aimed toward maintaining community trust and confidence including preferentially sourcing local labour, goods and services.
- Workforce harmony is maintained, and any disharmony on site is resolved internally through mediation and conflict resolution.

5.7.8.4 *Strategy effectiveness and review*

Vista Gold has successfully enacted the above management and mitigation strategies. Strong working relationships exist between Vista Gold stakeholders including Jawoyn Association, AFANT, The NT Environment Centre and relevant local, Territory and State government authorities and agencies.

Vista Gold has continued to build confidence within the local community with education of the social, economic and environmental benefits associated with the current and future management of the site.

5.7.8.5 *Reporting and Corrective Action*

No official reporting or corrective action pertaining to community and stakeholder management is implemented. During the previous reporting period, no complaints were recorded regarding site operations.

5.7.9 Cultural and Heritage Management

5.7.9.1 *Environmental Risks*

The Mount Todd Gold Project mineral leases contain areas of past use including the Overland Telegraph Line (~1872) and historic and modern mining ventures. The site has been occupied by many different people including Jawoyn Aboriginal people, Chinese and European miners.

Aboriginal Areas Protection Authority (AAPA) have designated four Restricted Work Areas (RWA) (Figure 13) across the mineral leases, these include:

- RWA 1 (associated site 5369-50) – non-intrusive and non-ground disturbance works associated with environmental assessment and monitoring and repatriation of archaeological material to Proposed Repatriation Area.
- RW 2 (associated site 5369-50) – all proposed works permitted as long as heritage approvals are in place, archaeological materials are salvaged and other archaeological material salvage under relevant Aboriginal custodians. Salvaged materials are to be dealt with as detailed in the AAPA certificate. Both approvals are pursuant to *Northern Territory Heritage Conservation Act 1952*.
- RWA 3 (associated site 5369-57) – no work to take place.
- RWA 4 (associated site 5369-57) – no work to take place except for use and maintenance of existing access road and bridge.

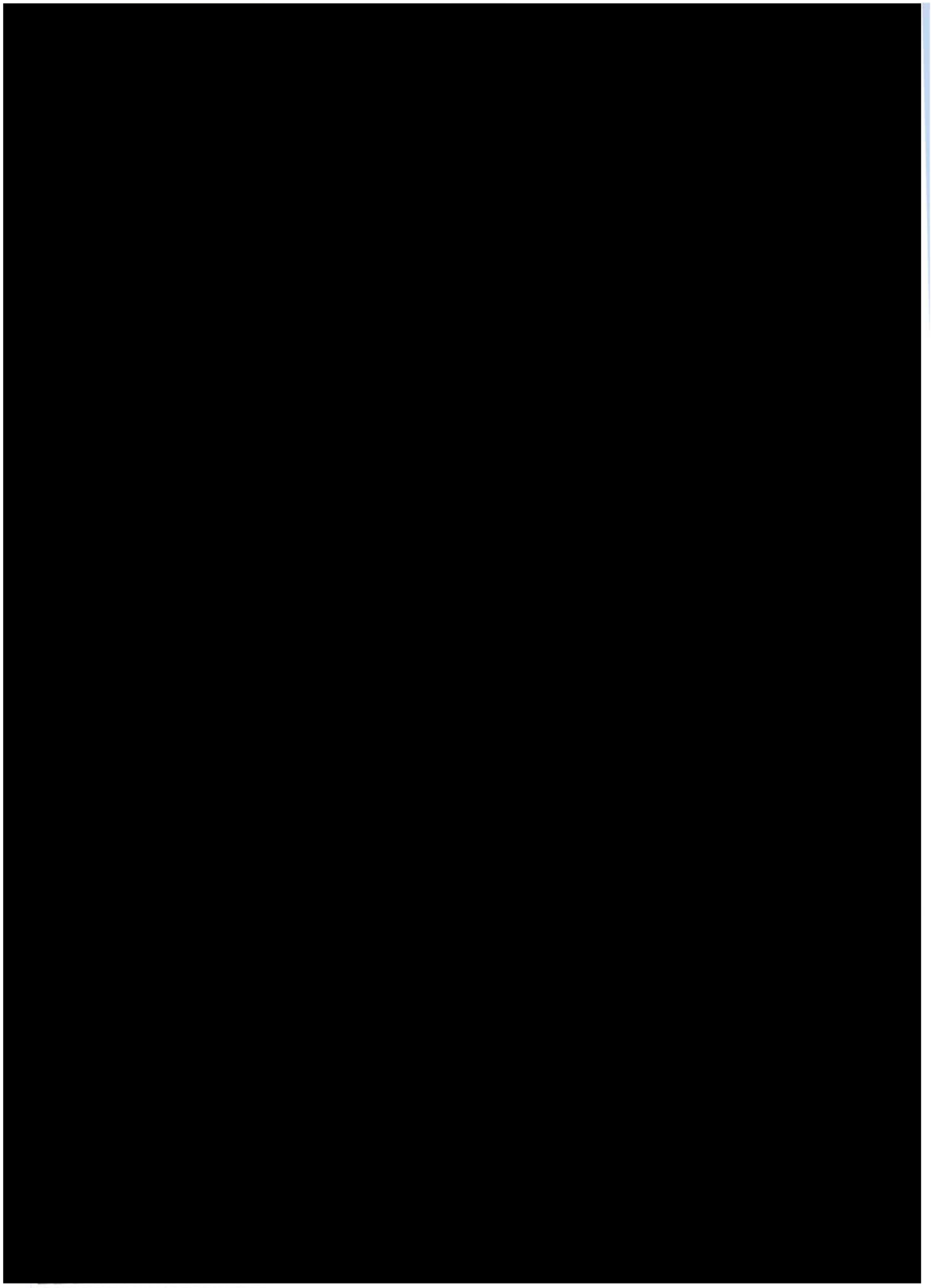

Figure 13. Aboriginal Areas Protection Authority Restricted Work Areas

5.7.9.2 *Objectives and Targets*

Minimise potential impact on significant cultural and heritage sites and work in accordance with Aboriginal Areas Protection Authority and Northern Territory Heritage Conservation Act 1952 approvals.

Zero instances of unapproved work within pre-designated areas.

5.7.9.3 *Management and mitigation strategies*

Vista Gold has continued to support a management programme to protect all archaeological sites. This programme includes:

- Marking site locations on all master drawings to ensure unaffected sites are avoided during detailed mine planning and activities.
- Briefing employees and contractors on the presence, significance and location of archaeological sites during induction.
- Marking archaeological sites on the ground by flagging and with signs, to minimise the risk of vehicle access, or inadvertent damage by members of the project workforce or the public.

Vista Gold have a solid working relationship with the Jawoyn association and relevant traditional owners of the area to ensure all current and future operations are conducted in a manner appropriate to the wishes of such land owners.

Vista Gold has obtained authority certificate 2011/15538 from the Aboriginal Areas Protection Authority (Appendix B) to cover anticipated activities within the mineral lease. The certificate covers exploration works, environmental impact assessment investigations, geotechnical investigations, routine environment monitoring and management activities, care and maintenance activities on behalf of the NT Government, civil construction maintenance activities, construction, mining, rehabilitation and closure activities associated with the MT Todd Gold Project. Vista Gold communicates regularly with the traditional owners of the area to ensure sacred areas are protected.

All employees and contractors are informed of the cultural and heritage sites that exist across the mineral lease and that access and disturbance is forbidden. No works by contractors are permitted on the site without the company's knowledge of the location and type of activity being conducted. If any disturbance is suspected or identified, staff and contractors must report the disturbance to the Mine Manager immediately.

A number of heritage sites have been signposted by previous operators. Vista Gold will continue to ensure these areas are easily identified.

If care and maintenance of the Mt Todd site require travel to/from or work in areas that have not previously been evaluated from a historical or aboriginal perspective, only non-disturbance activities will be initially permitted as per relevant authorisations. Upon discovery of any new potential heritage site, the Mine Site Manager will contact the Jawoyn Association and coordinate a formal site inspection. For activities with any significant measure of impact, a cultural heritage survey will be conducted prior to the commencement of the planned activities in consultation with the Jawoyn Association prior to any works taking place.

From time to time, aboriginal sites may be identified as part of the exploration activities. If potentially new sites are discovered, works in those areas will be temporarily suspended until the true significance is ascertained and appropriate actions formulated for management. Current approved exploration activities are not planned for known areas of heritage or significance.

5.7.9.4 *Monitoring and Measurement*

Heritage sites and known restricted works areas are frequently checked by staff to identify any possible damage or disturbance.

5.7.9.5 *Strategy effectiveness and review*

Since Vista Gold's operation of the site in 2007 no incidents regarding heritage sites have been reported. Further formal surveys in both the mineral and exploration leases have identified additional areas of significance. These areas have been mapped and marked and provide the company with additional certainty of heritage areas.

5.7.9.6 *Reporting and Corrective Action*

Identified disturbances will be immediately reported to the relevant authorities and external stakeholders as per the legislation. These disturbances will also be reported internally to senior management to determine the cause and necessary controls that needs to be adjusted or implemented.

6 Water Management Plan

6.1 Introduction

Water management has historically been a challenge for the site since operations ceased in 2000. The site contains several ponds with lower than ambient pH and contains dissolved metals which include the Batman Pit (RP3), the waste rock dump repository (RP1), the tailings dam (RP7), the heap leach facility (HLP), and the low-grade ore dump pump sump (RP2). AMD is generated each year during the wet season from precipitation on the Waste Rock Dump (exposed sulphide rock).

The challenge over the years has largely been to prevent uncontrolled release of mine affected water entering the receiving environment using the existing water management infrastructure. Since Vista Gold undertook to manage the site on behalf of the NT Government in 2007, the water management strategy has been a combined effort of licenced water release, on-site storage and treatment. All activities have and are the subject of DME approvals. This strategy has successfully minimised uncontrolled discharges but has resulted in the net accumulation of AMD waters on-site to a level nearing capacity in 2014.

In response to this, over the last couple years there has been significant effort dedicated towards the treatment of on-site water. The aim of this treatment is to increase the quantity of water than can be discharged off site, to levels above what is annually accumulated from rainfall, without any harm to receiving environments. These activities have shown to be successful and over the last two years the net inventory of water on site has been declining at a significant rate.

6.2 Surface Water

6.2.1 Surface water management infrastructure / features

6.2.1.1 *Surface water catchments and drainage channels*

The Mount Todd Mine Site is dissected by several ephemeral streams that are tributaries to the Edith River. Situated within the Daly River Catchment the site is part of one of the largest river systems in the Northern Territory with a catchment area of 52,577km^2. The site is situated to the north of the Edith River. Drainage across the site flows primarily to the south via five ephemeral creeks; Batman creek, Horseshoe creek, Stow creek, Burrell Creek and West Creek. Burrell, West and Stow creeks discharge directly into the Edith River, with Horseshoe and Batman creeks reporting to Stow Creek. Location the creeks and rivers are shown in Figure 14.

West Creek

West Creek receives clean water from the diversion channel on the western side of the site, from the spillway of RP1 and from natural runoff west of the site. West creek is dominated by freshwater flows, unless an uncontrolled release is occurring via the RP1 spillway.

Burrell Creek

The Burrell Creek catchment area is essentially covered by the Waste Rock Dump and RP1. The lower reaches of the creek receive small amounts of local freshwater runoff during rain events. However, most of any flows are typically due to licenced releases of water from RP1 via the siphon system.

Batman Creek

Batman Creek is fed by a natural catchment area up-stream and to the west of the site, but can also receive overflows from uncontaminated areas through the site and via RP2 and RP5 if they exceed capacity. Batman Creek is also capable of receiving pumped treated water from RP3. Most of flows into Batman creek are from freshwater runoff originating from the higher catchment.

Horseshoe Creek

Horseshoe Creek is primarily fed by natural catchment flows which originate from the raw water supply reservoir, the watershed to the north of the diversion channel around the Tailings Storage Facility (RP7). Any excess water within RP7 would report to Horseshoe creek via the RP7 spillway. Small amounts of water enter the creek year-round from seepage points around the southern and eastern walls of RP7. Water from the Heap Leach Pad (HLP) moat can enter the catchment if the northern or eastern moats become blocked by erosion of the HLP during rainfall.

Stow Creek

Stow Creek lies to the south of the site and is fed by Batman Creek, Horseshoe Creek and the dominant remainder of its natural catchment to the east of the mineral lease. No on-site infrastructure or activities result in direct discharge to Stow Creek. Such waters can only be received via one of the previous catchments.

Edith River

The Edith River flows from east to west across the south of the site. The river intersects MLN 1127 and receives the runoff from all the previous site related catchments. The volume of runoff from site related catchments typically contributes less than 50% of the total flow within the Edith River at any time. The river has a high ecological and recreational value, with the site located approximately nine kilometres downstream of Edith Falls, within Nitmiluk National Park.

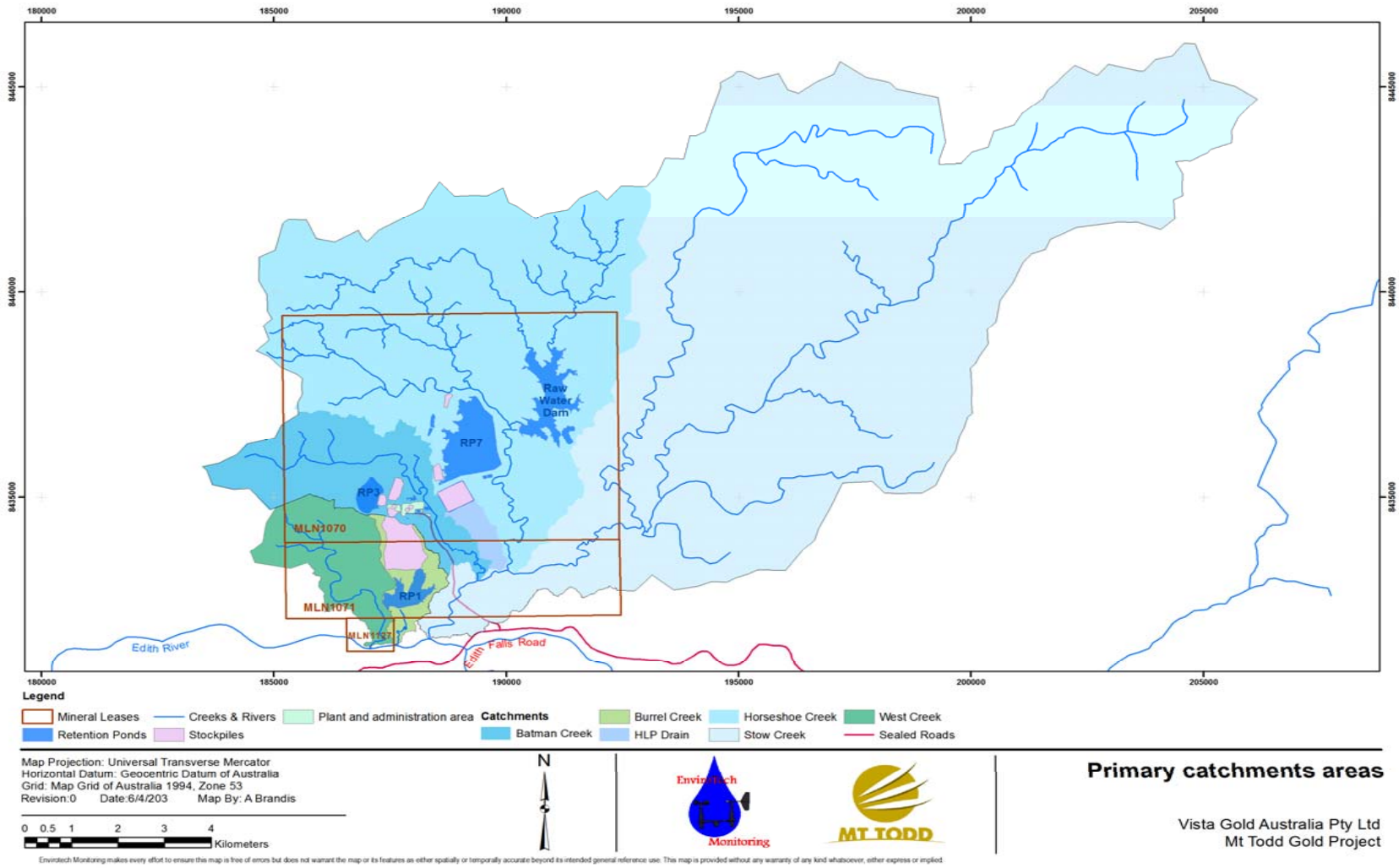

Figure 14. On-site catchments, creeks and rivers

6.2.1.2 *Diversion drains*

Four diversion drains currently exist at the site as shown in Figure 15. Three reduce the volumes of clean water entering on-site catchments and one prevents AMD from directly flowing into natural streams. Details of the diversion drains are as follows:

- Western Waste Rock Dump diversion drain – This drain was constructed during previous operations and is situated to the west of the Waste Rock Dump and RP1. The drain channels flow from the upper reaches of Burrell Creek away from the WRD and RP1 into West Creek
- RP1 Diversion Drain – This drain was commissioned by the NT DME and constructed in late 2011. The drain is situated to the west of RP1 and collects runoff from the natural surface that lies between the Western Waste Rock Dump diversion drain and RP1. This clean water is diverted away from RP1 and into West Creek.
- Low Grade Ore Stockpile Diversion Drain – This drain was constructed during previous operations and is situated adjacent to the eastern side of the Low-Grade Ore (LGO) Stockpile. The drain captures runoff from the stockpile and channels it into RP2.
- Also commissioned by the DME and constructed in 2011 is the Northwest TSF diversion drain which captures runoff from the western catchment as well as overflows from Golf and Tollis pits and diverts this water to Horseshoe Creek away from RP7.

6.2.1.3 *On-site catchments*

Internal drainage at the site comprises six primary catchments as listed in Table 18 and shown in Figure 15. Many smaller ponds without catchments are located on-site but these do not require active management and are therefore not considered in water management operations or planning.

Table 18. Key On-site Catchment areas

Catchment	Area (Km^2)
RP1	2.174
RP3	0.617
RP5	0.346
RP2	0.323
HLP	0.347
RP7	2.358
TOTAL	**6.16**

The catchments areas listed have been derived from the DME 2008 DEM and corrected where necessary based on local knowledge of surface water flow paths. Catchment areas listed include the respective surface areas of the ponds.

The RP1 catchment stretches to the north and encompasses the WRD. 42% of the RP1 catchment is overlain by the WRD with the remaining 58% contributing to freshwater inflows either via non WRD runoff or direct precipitation onto the pond. The construction of the RP1 diversion drain in 2011 resulted in a 7.7% reduction of the RP1 catchment area from 2.356 km^2 to 2.174 km^2. A second diversion drain had been proposed for the eastern side of the RP1 catchment by the DME, however 2011 works were abandoned due to the significant shelf rock present and the associated additional cost. The northern extent of the RP1 catchment does not contain the surface runoff from the WRD. This runoff generally flows north into the RP5 catchment during heavier falls.

Due to infrastructure between the Run of Mine (ROM) pad and RP3, surface water from the ROM reports to RP2 instead of RP3. The majority of other runoff into RP3 is considered freshwater with little additional AMD being generated by the pit walls due to their current submersion and lack of exposure to air for oxidation. This may change in the future as the pit level recedes from offsite discharging.

A small drain exists on the western face of the RP2 LGO stockpiles which collects runoff from the western face of the stockpile and transfers it into the main RP2 diversion drain. The RP2 catchment is technically limited to the extent as shown Figure 15. However, during heavy downpours, runoff from the opposite side of the road to the west can occasionally breach the road camber and enter this drain and subsequently RP2.

The HLP moat does not receive any inflows external to the lined facility. All moat inflows are restricted to direct incident rainfall or HLP runoff.

The RP5 catchment largely encompass the old mine processing and current operational facilities, as well as the southern faces of the ROM pad and runoff from the access ramps and roads on the WRD.

The TAILINGS STORAGE FACILITY catchment is dominated by the existing pond. 72.5% of incident rainfall falls directly within the storages maximum surface area. The 2011 constructed diversion drain resulted in a 13.5% reduction of the old catchment area from 2.727km^2 to 2.358km^2. Most of natural inflows are fresh water with a small amount of AMD generated by the scats stockpile to the west.

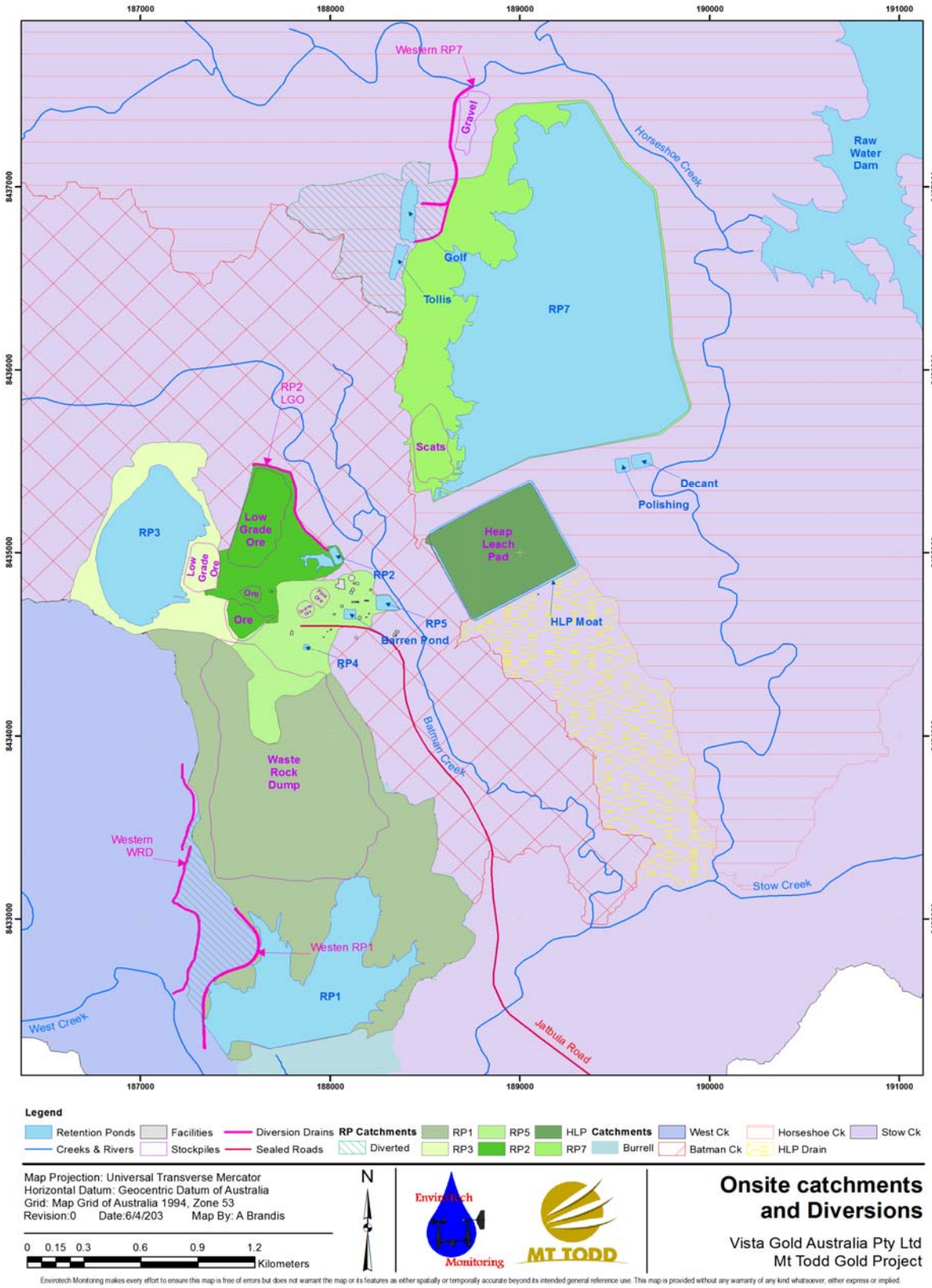

Figure 15. On-site catchments, ponds and diversion drains

6.2.1.4 *Retention ponds*

The five primary retention pond designations can be misleading, as only one (RP1) is a retention pond. To facilitate the planning of water management activities, they have been designated as detailed in Table 19. Many other ponds exist across the site; however, all contain fresh water and as a result do not currently require active management for environmental, safety or engineering purposes. The locations of the primary and secondary ponds across the site are show in Figure 15.

Table 19. Primary site retention ponds

Storage Structure	Retention Pond Number	Maximum Storage Capacity (ML)*	Surface area at capacity (m^2)	Spillway Height (AHD)	Spillway Coordinates (WGS84)
Waste Rock Dump Retention Pond	RP1	1,255	357,536	120.26	187440E 8432275S
Low Grade Ore Stockpile Sump	RP2	11	3,885	130.37	188016E 8435032S
Batman Pit	RP3	11,810	323,323	143.5*	187299E 8434769S
Plant Run-off Sediment Trap	RP5	Maximum: 18.7 Current: 12.5$^{\beta}$	7,175	129.13	188330E 8434739S
Tailings Storage Facility	RP7	5,070	1,544,829	137.48 (Plug Crest)	188519E 8435350S
Heap Leach Pad Moat	HLP	12^	22,966	135.15*	188981E 8434742S

*Notes: * These structures do not have engineered spillways and levels reported are elevations of equivalent breach points*
^Exact volumes are unknown due to varying yearly siltation quantities
$^{\beta}$Reduced volume due to silt

RP1

This storage was constructed during previous operations for water supply and WRD runoff containment and is situated in the Burrell Creek catchment. Currently the ponds only role is AMD containment. The pond is an unlined facility with a clay and earthen wall. Little information is available on its engineering specifics or the extent of any specific works to minimise seepage into local groundwater. The quality of water within the pond is and has been historically poor with high metal contents and low pH ranges. Seepage is evident on the downstream side of the wall all year as a result of the transmitted head pressure on the monitoring bores below the structure. The water quality of the seepage resembles a close signature to the retained waters and predominantly rises from the deeper bores.

The storage contains a 45m wide spillway on the south-western corner which permits excess water to flow into West Creek. Prior to 2011 the spillway had a height of 119.37m and was primarily of earthen design with a shallow 30cm wide concrete core at the control point. In late 2011 the DME commissioned a lift to the storage wall and spillway to increase the storage capacity and minimise the frequency of uncontrolled discharges from the pond. The engineering details with respect to this lift are currently held by DME.

The new spillway has a height of 120.26m and comprises a concrete core surrounded by earth and rock armouring with gravel capping. Modelling of the new storage height suggests the pond now has an additional storage of 377 ML, increasing the maximum pond storage level from 878 ML to 1255 ML. The modelled full capacity surface area is show in Figure 16.

At the same time the lift was commissioned, the western diversion drain at RP1 was constructed to capture freshwater running off the existing catchment and divert this water away from the pond. DME and Vista Gold have previously investigated the possibility of the construction of an equivalent diversion drain on the eastern side of RP1. However, the resultant estimated costs due to the nature of the topography and substrate on the eastern side of the pond, rendered this activity unfeasible.

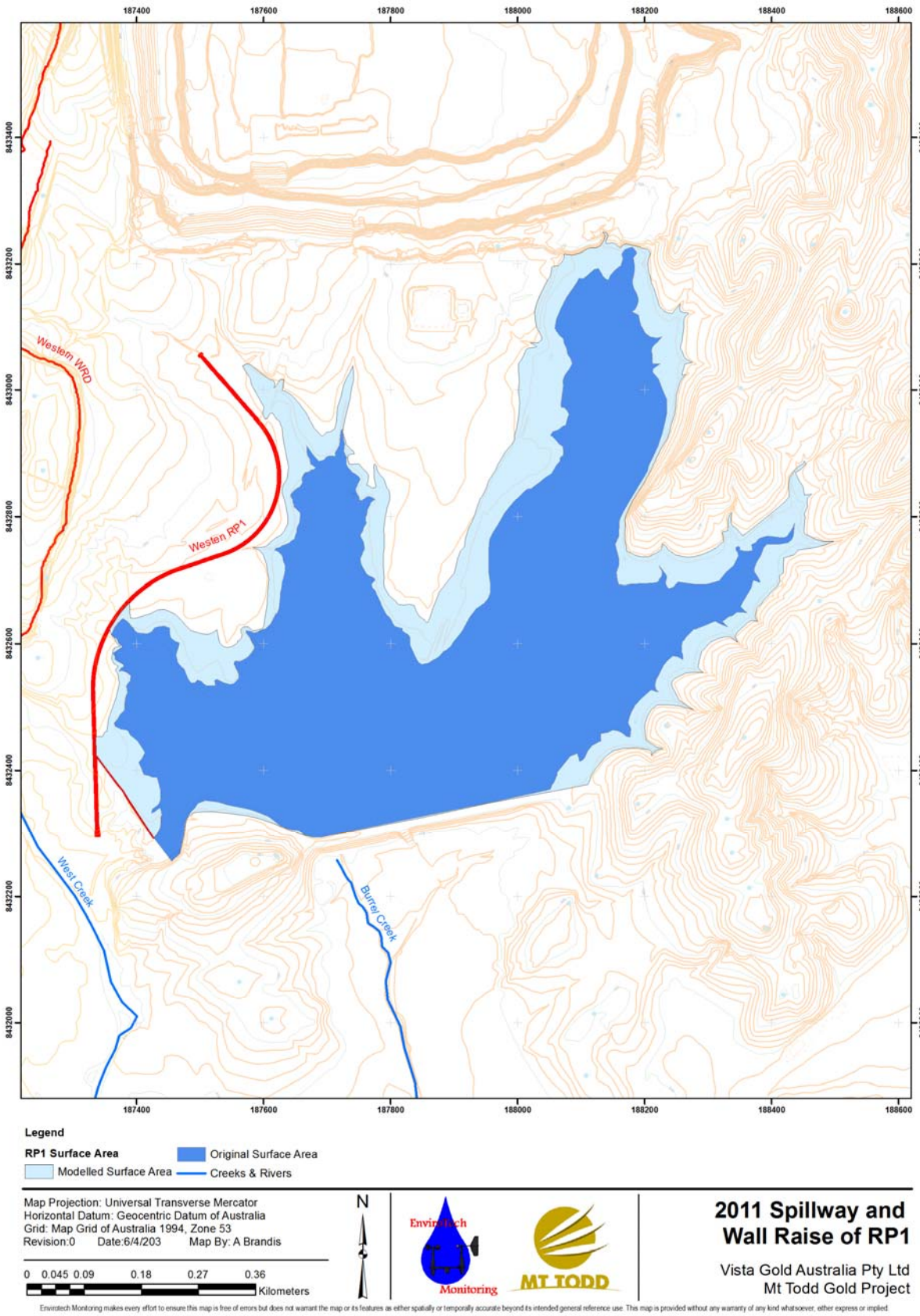

Figure 16. Maximum surface areas of RP1 before and after spillway modifications

A scour valve was also installed beneath the wall to permit controlled release to the Edith River during operations; however, the valve has since failed and has been permanently sealed. A 500mm poly siphon was subsequently installed over the dam wall during NT government operation of the site prior to 2007 and has since been used for all licenced control discharging activities. In 2010 an inline magnetic flow meter was installed by Vista Gold to the 500mm siphon system to permit accurate measurement of controlled releases. A further two 400mm siphons were installed in 2012 over the RP1 wall under direction from the NT government as a further countermeasure to uncontrolled releases. Allowable dilution rates within Waste Discharge Licence are such that only one siphon can ever be used at a time given the current pond water qualities. Discharge from the siphons has not occurred since 2013.

RP5

RP5 is not a retention pond, it is a sediment trap. RP5 is a lined facility and was constructed during operations to trap sediment and collect runoff from the plant and processing area before overflowing into the Batman Creek. It is located to the west of the processing area all of which is situated within in the Batman Creek catchment. Its current capacity is less than original design due to the significant quantity of sediment present. This volume of sediment was quantified in 2013 by on-site survey and is reflected in the numbers presented in Table 19. Attempts have been made by Vista Gold to remove the sediment and increase the storage capacity; however, such operations were abandoned due to logistical issues and risks to the lining integrity.

Water quality of the pond is generally poor likely due to the scattered ore stockpiles within the catchment. The pond lining integrity has not been verified by Vista. Visually it shows no direct or indirect signs of damage, and there is also no evidence of near surface seepage during the dry season. The pond has a spillway situated on the eastern face and any discharged water will report directly to Batman Creek. During normal operations water will be pumped to RP7 directly and only when there is heavy rainfall more than the pumps capacity diluted water traverses over the spillway into the Batmen Creek.

RP2

RP2 is not a retention pond, it is a pump sump. Situated immediately to the north of the old processing facilities, this pond's primary purpose is to capture AMD runoff from the LGO stockpiles to allow pumping to alternative storage (RP3 or RP7). The pond was constructed during operations primarily by excavation into the ground and only has a small retention wall on the south-eastern corner. The pond is unlined and no information is known as to the extent of groundwater seepage (other than visible seepage through the retention wall) or the specifics of its construction. The northern face contains the spillway which discharges excess water northward prior to entering Batman Creek. The lower end of the RP2 catchment terminates immediately to the west of RP2, this area pools with water from the catchment before flowing through a channel on the northwest corner of RP2 into RP2. The water can pool to a depth of approximately half a meter in certain locations and spread over an area more than 600m^2.

RP3

The former Batman pit is not a retention pond, but has historically been the destination of waters pumped from other retention ponds in an effort to mitigate uncontrolled discharges from site since operations ceased in 2000. If the pit was to ever completely fill to the point of overflow, water would begin to discharge around the area of the access ramps, and such water would report to RP1. The water quality within RP3 has historically been poor, with low pH and high metal concentrations; however, this has significantly changed since 2012 following significant treatment operations.

At the lower levels, there is some debate on whether seepage or ingress into the pit void occurs. Some modelling suggests 0-30L/sec while others suggest the there is no connectivity. Higher rates are possible in the upper levels due to the weathered nature of the near surface geology, however with the recent decline in water levels this is no longer a problem.

RP7

The former tailings impoundment facility is not a retention pond. It is in the Horseshoe Creek catchment. Significant engineering was undertaken during the construction of RP7 to effectively manage seepage. High permeability soils were removed from natural channels and replaced with low permeability soil blankets topped with a network of porous drains to form an effective seepage capture system. A network of decant towers was installed to facilitate the collection and reuse of supernatant as the tailings beaches grew along the retaining wall. Both piping networks transfer the water to the decant and polishing ponds below the southern wall, prior to the water being reused in the processing plant. Both the decant and underdrainage valves have largely remained closed (minor opening during servicing) since operations ceased. The net effect this has had on groundwater seepage rates is poor.

The emergency spillway is located at the south-western corner and is comprised of a canal formed into the siltstone which carries water around to the southern channel between RP7 and the HLP. Under direction from the DME in 2011 an earthen plug was installed in the spillway to stop uncontrolled overflow from the storage. The earthen plug has a current elevation of 137.48 which reduces the freeboard before overtopping the wall to approximately 300mm. A structural integrity inspection was commissioned by Vista Gold to assess the additional risks the plug would place on the wall. One of the recommendations of the report was to manually breach the plug if water levels within the structure reach the plug crest.

Water quality within RP7 is poor, primarily due to the storage acting as a receptacle for site AMD waters since operations ceased in 2000, and to a smaller extent, due to AMD runoff from the scats stockpile in the south-western corner of the catchment. The supernatant water has a low pH and the highest dissolved metal content of all ponds. The tailings pore water still largely exhibits a process water signature and despite the acid neutralising capacity (ANC) having been exhausted in the top 1.2m, sufficient ANC remains below the acidic wedge.

Because of its operation as a water storage, the high-water levels within RP7 have had the benefit of minimising acidity generation from oxygen exposed unsaturated tailings. However, the high-water levels have also resulted in increased infiltration of low pH waters along the western side and as a result now flow along the old drainage lines and express as seepage below the structure wall. By volume the largest seepage occurs from RP7 where the structure crosses over the pre-existing creek lines. These seeps and many others present visibly at the surface. Seepage is also present within the groundwater as measured via the existing monitoring bores and exhibits a process water signature.

HLP

The heap leach facility was a purpose built and lined basin where ground oxide ore was stockpiled and cyanide irrigated for mineral recovery. The structure contains an estimated 214,000 m^3 of various small grain sized material which suffers from significant erosion during the wet season. A moat surrounds the leach pad and sits within the lined basin which receives inflows either as direct runoff from, or seepage through, the leach heap. The moat has an estimated capacity of 12 ML, which fluctuates from year to year as eroded heap sediments fill and is subsequently excavated from the moat each year. The moat has three pumps along the southern wall, however two have been disconnected and only the third is used to adequately maintain moat levels below capacity.

Continual excavation of siltation builds up is necessary to ensure water can flow around to the pumps during the wet season. The structure has no engineered spillway, if the moat was to exceed capacity it would commence spilling approximately midway along the southern wall. Such water would then travel down the locally named HLP drain and into Stow Creek. However significant siltation can result in the blockage at any position along the moat which would see such overflow report to a different catchment depending on the location of the blockage. The Northern and eastern faces would report to Horseshoe Creek, the southern face to the HLP drain, and the western face to Batman Creek. Pipes and windrows atop the HLP have been installed to capture and transfer water to the moat to minimise the erosion. The water quality within the moat is poor but comparatively better than other retention ponds on-site. A small surface seep is evident on the north-eastern corner of the HLP but only when the moat is full. The complete integrity of the lining is unknown but likely to be compromised as evidenced by weathering in patches and poorer quality of chemical results from the adjacent monitoring bores.

6.2.1.5 *Pipeline and valve infrastructure*

The site is equipped with High-Density Polyethylene (HDPE) pipelines of various diameters that are used to transfer surface waters in efforts to minimise uncontrolled discharges from retention ponds (Figure 17). Variation in pipe diameters evident on many pipelines has resulted from the reuse and recycling of piping inherited when site management commenced.

The relative position and path of each pipeline are displayed in Figure 17 and the source, destination and size are presented in Table 20 below.

The following alterations have been made to on site pipe infrastructure during the 2016-2017 period:

- Extend the irrigation pipeline on the south-eastern beach of RP7.
- Installation of additional pipelines from the cells on top of HLP to the settling pond to the south of the HLP.

The pipelines installed for irrigation purposes are to facilitate “enhanced evaporation” which is operated during the dry season.

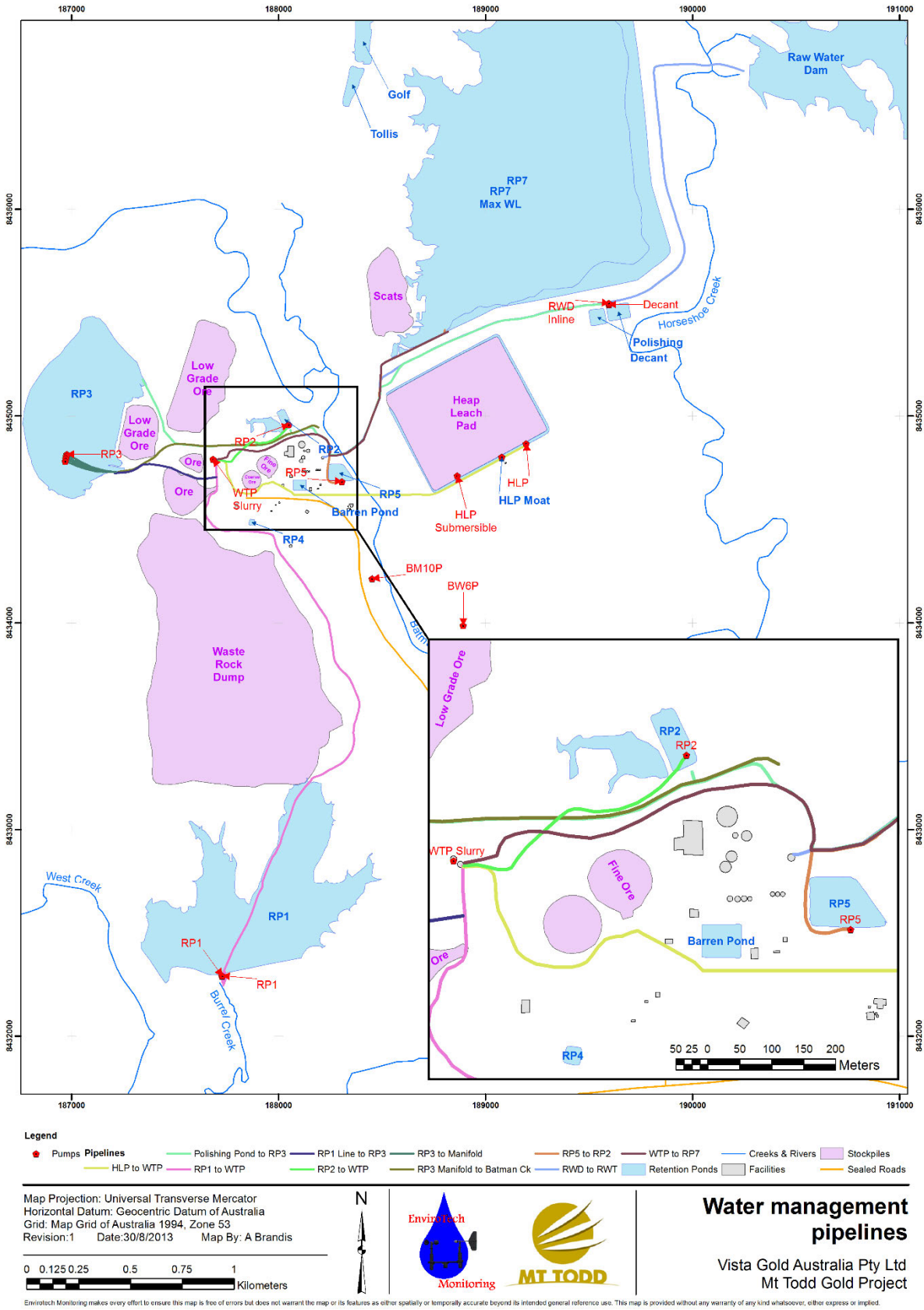

Figure 17. Existing pipe and pumping Infrastructure

Table 20. Key Pipeline Infrastructure

Start	End	Size (mm)	*Length (m)
RP1	WTP	315 – 355	3113
RWD	RWT	315 – 500	3512
RP5	RP7	200-500	1112
RP5	RP2	200	469
RP7 Decant Pond	RP3	315	2104
RP3	Batman Ck	500	999
RP2	WTP	280 – 355	439
RP2	RP7	200 – 500	1,120
WTP	RP7	315 – 355	1563
RP1 Line Junction	RP3	315 – 355	512
RP1	Burrell Ck	500	79
RP1	Burrell Ck	400	68
RP1	Burrell Ck	400	73

*Pipeline lengths recalculated in 2013

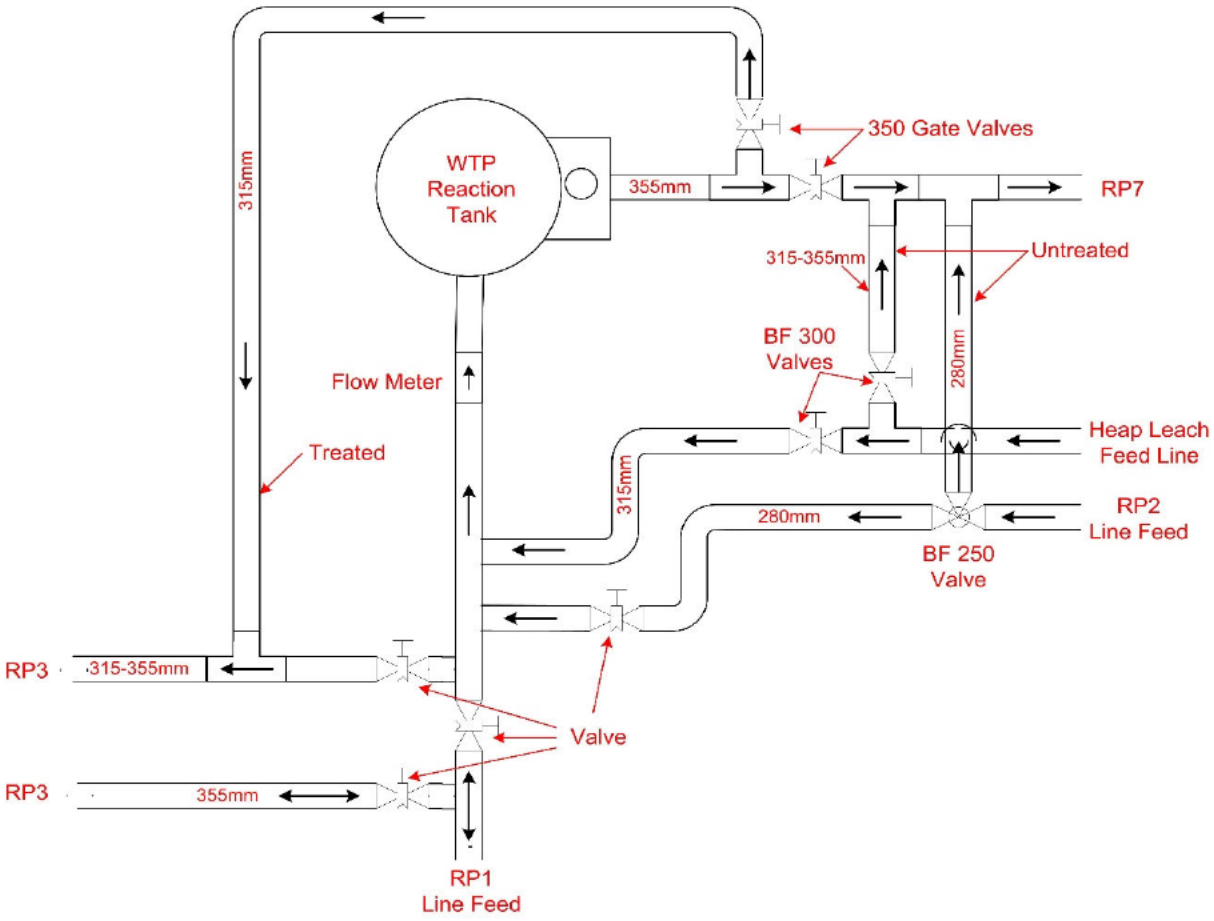

Figure 18. Pipe and valve arrangement around the WTP

6.2.1.6 *Pumps and siphons*

Table 21 lists the pumps and siphons on the Mt Todd Mine Site.

Table 21. Pump infrastructure

Location	Quantity	Type	Size	Flow rate (L/s)
RP-1	2	Centrifugal	110kw	110
RP-2	1	Centrifugal	54 kw	80
RP-5	1	Centrifugal	15 kw	18
Heap Leach Pad Moat (disconnected)	2	Centrifugal	15 kw	18
Heap Leach Pad Moat	1	Submersible	37 kw	95
Bore #6	1	Submersible	2.2 kw	4.5
Bore #10 (unused)	1	Submersible	2.2 kw	4.5
Standby Diesel Pump	1	Centrifugal	425 kw	120
WTP (slurry pump)	1	Centrifugal	1.5 kw	3
Decant Pond	2	Centrifugal	150 kw	125 ea.
RWD Line (Decant to Site Tank)	1	Centrifugal (Gravity from RWD to Decant)		100 (estimate)
RP3	4	Centrifugal	500 kw	100 to 1,000 (combined, variable output)
RP1	1	Siphon	500 mm	100-240

All of the above pumps are in good working condition and capable of coping with the average wet season demands of the site during non-exceptional rainfall conditions. An automated start/stop system has been installed which enables the remote control of RP3 from the site office via telemetry. Float switches have also been installed to the pumps at RP2, RP5 and the HLP to enable automatic pumping during overnight rainfall. Manual control of the pumping systems will always be necessary as a number of the pumps fail to maintain their prime and must be checked prior to starting in order to protect the equipment.

While there are two pumps located at RP1, only one can be operated at a time due to limitations of the electricity transformer at RP1 and the size of the HDPE pipeline. The two centrifugal pumps at the HLP have also been disconnected due to the limited capacity of the transfer pipeline to receive water from more than one pump and the historical lack of demand for their use.

The standby diesel pump is mounted on a twin axle trailer which enables it to be transported to various locations for additional pumping requirements as necessary or in the event of a primary pump

failure. Additional valves and connection tees have been installed at various locations to enable connection of the diesel pump to discharge lines.

The flow rates specified for the RP1 siphon is approximate only as the actual flow output flow rate is dependent on the amount of hydraulic head within the pond. The 500mm siphon contains three valves on the downstream side which permits the regulation of output flow volumes.

The four pumps listed at RP3 were installed during 2012-13 in preparation for dewatering of RP3. The pumping system consists of four 500 kW variable speed centrifugal pumps mounted on floating pontoons within RP3. Each pump is capable of outputting a range of flows from 100 to 300 L/s at a hydraulic head of up to 85m. Each pump line is connected to a manifold on the shore of RP3 which combines the individual lines prior to passing such water through a magnetic flow meter and then discharge into Batman Creek. Each pump is driven via a Variable Speed Drive (VSD) mounted on the shore. The variable speed and independent pump design permits the system to release water to Batman Creek at total flow rates from 100 L/s to 1,200 L/s. The actual flow rate permitted is calculated based on the available water in the Edith River and the permitted dilution rate as per the relevant criteria of the WDL.

While manual operation is possible, this RP3 pump operation and control process is designed to be entirely automated through telemetry, and only requires operator attention to input the dilution ratio and for routine servicing or correction of faults. The RP3 system requests the flow rate of the Edith River via telemetry from the SW4 gauge station at regular intervals. It then applies the operator set dilution ratio to calculate the volume of water which can be pumped. As soon as the calculated volume exceeds 100 L/s one of the four pumps starts and water at the correct flow rate is released to Batman Creek. As the Edith flow increases further, the RPM of the pump adjusts to match the volume increase, and additional pumps are spun to provide the additional flow input up the 1,200L/s maximum.

Pump status and flow rate information is logged continuously and presented as a live graphical dashboard on the company intranet. In the event the RP3 pumping system is not able to obtain the flow rates from the Edith River all pumping immediately ceases as a safety precaution.

6.2.1.7 *Water treatment plant*

The water treatment plant was a joint DME/Vista funded activity which was commissioned in 2009 and is located on top of the ROM pad. The plant consists primarily of a lime silo, slaking tank, reaction vessel and control system. The lime silo holds approximately 87 tonnes and provides finely ground limestone to the slaking tank where it is mixed with water to form a lime slurry. The slurry is then pumped into the reaction vessel where it mixes and reacts with incoming AMD water, to increase the pH up to approximately 8-9 pH units. The pH increase causes the dissolved metals in solution to form metal hydroxides and precipitate out of the solution. As per the piping schematic in Figure 18, AMD waters from a variety of sources can be pumped to the WTP for neutralisation. The resultant treated water and precipitates can be then discharged via gravity to either RP7 or RP3. An automated control system monitors the pH of the reaction vessel and regulates the quantity of slaked lime delivered. The control system is also connected to the site telemetry network which enables on-site staff to view and control the system at the office.

Due to the limited flow rates of the plant, it can only accept waters from retention ponds at any one time in the following arrangement –

- RP1 only
- RP2 only
- HLP only

- HLP with RP2
- RP3 only

The plant has been idle for the past 4 years due to the in-situ treatment of RP3 and reduced demands to treat ARD waters. The plant was modified by the DME contractors to add Quicklime into RP3 in 2015. The repairs to such modifications are still outstanding and require completion before the WTP can be again utilised.

No additional water treatment of RP3 is anticipated. There may be periodic “polishing” of the already treated water if dilution ratios are considered too high.

6.2.1.8 *Flow meters*

Three magnetic pipe flow meters are currently installed at the site. One is situated on the primary 500mm siphon at RP1 to measure water volumes released to the Edith River. The second is installed on the input line to the WTP to measure the volumes of water pumped through the WTP. A third flow meter has been installed with the RP3 dewatering pumps common manifold to monitor flow output to Batman Creek or other internal piped destinations.

Mechanical flow meters are installed on the RP2, RP5 and HLP discharge lines to record the volumes of water pumped from each of these ponds.

6.2.1.9 *Gauging stations*

Three stream gauging stations currently exist at the Mt Todd site. The Horseshoe Creek and Stow Creek (SW3) stations were commissioned by the DME in 2008 as part of environmental assessment activities, and a new SW4 gauging station installed by Vista Gold in late 2012. All three sites collect continuous stream water level, and water quality parameters of EC, pH and Temperature. Flow is calculated at all three stations through an empirically derived rating table.

The SW3 gauging station is no longer used as we have been unable to establish an application for the data.

The only other water related continuous monitoring station is the level monitoring station installed at RP1 in 2011.

All operational stations are connected to the site telemetry to provide real time information at the site office and over the company intranet. Figure 19 presents the locations of the water monitoring stations.

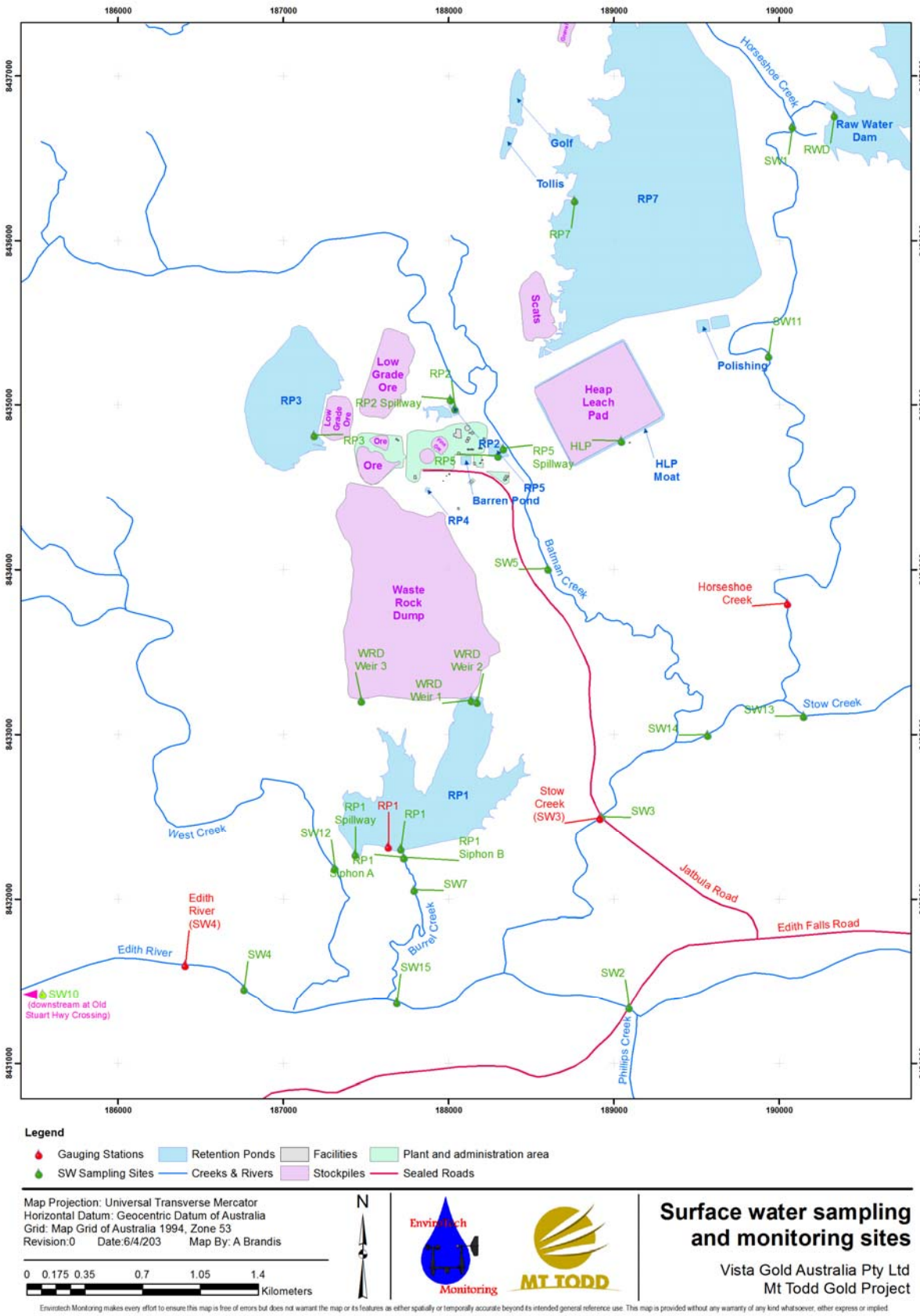

Figure 19. Surface water monitoring sites and sampling locations

6.2.1.10 *Surface water monitoring locations*

Surface water sampling locations across the site are detailed in Table 22 and their respective locations illustrated in Figure 19. All sites have varying sampling requirements and times, some locations such as SW2, SW4 and SW10 are requirements of the WDL, with other such as SW14 or SW12 monitored for internal purposes. Physical and chemical samples are taken monthly at most monitoring sites, with additional samples collected at SW2, SW4 and SW10 during periods of controlled release.

Table 22. Surface Water Monitoring Locations

Location	Description	Purpose	Latitude	Longitude
SW2	Edith River upstream of mine	WDL and Ops	-14.17194471	132.1198981
SW3	Stow Creek Downstream of Batman Creek	WDL and Ops	-14.16143741	132.1185117
SW4	Edith River downstream of West Creek	WDL and Ops	-14.1706686	132.098347
SW5	Batman Creek downstream of mine	Operational	-14.14783263	132.1156704
SW7	Burrell Creek downstream of mine	Operational	-14.16533368	132.1079651
SW10	Edith River downstream of mine	WDL and Ops	-14.18463718	132.0303688
SW11	Horseshoe Creek downstream of mine	Operational	-14.13632611	132.1281727
SW13	Stow Creek upstream of Horseshoe creek confluence	WDL and Ops	-14.15605208	132.129894
RP1	WRD Retention Pond 1	WDL and Ops	-14.16306406	132.1072276
RP1 Spillway	Water from RP1 when discharging via spillway	Operational	-14.16334286	132.1046916
WRD Weir 1	Weir 1 on southern Toe of WRD	Operational	-14.15497097	132.1112862
WRD Weir 2	Weir 1 on southern Toe of WRD	Operational	-14.15506615	132.111596
WRD Weir 3	Weir 1 on southern Toe of WRD	Operational	-14.15492912	132.1051241
RP1 Siphon A	Discharge point 1 from primary siphons	WDL and Ops	-14.16355	132.1073844
RP1 Siphon B	Discharge point 2 from primary siphons	WDL and Ops	-14.16355215	132.1074238
RP2	LG Stockpile Pump Sump	Operational	-14.13900123	132.1105751
RP2 Spillway	Water from RP2 when discharging via spillway	Operational	-14.13848504	132.1103263
RP3	Batman Pit	WDL and Ops	-14.14032773	132.1026623
RP5	Plant Run-off Sediment trap	Operational	-14.14157675	132.1129599
RP5 Spillway	Water from RP5 when discharging via spillway	Operational	-14.14118347	132.1132553
RP7	Tailings Storage Facility #1	WDL and Ops	-14.12763543	132.1174275
HLP	Heap Leach Pad	Operational	-14.14085911	132.1198629
RWD	Raw Water Dam	Operational	-14.12312228	132.1320079
SW14	Stow Creek below HLP drain confluence	Operational	-14.15702332	132.1244979
SW12	West Creek upstream RP1 Spillway confluence	Operational	-14.16406393	132.1035284
SW15	Edith River upstream Burrell Creek confluence	Operational	-14.17148983	132.1069033

6.2.2 Management challenges

6.2.2.1 *Potential contaminants*

The Mt Todd mine is a brownfield site, with various sources of potential contaminant generation. The geologic host is a hard, competent greywacke (silicified shale) containing small quantities of various sulphide minerals which, in addition to hosting gold and silver, also host a variety of other metals including iron, copper, lead, zinc, aluminium and cadmium. Surface water flows on the Mt Todd Mine site are a direct result of the seasonal rains during the wet season and are the prime mechanism in the rapid mobilization and transport of potential contaminants.

As the sulphide minerals are exposed to the atmosphere, a decomposition (or oxidation) of the mineral can occur. The result of this oxidation is the liberation of metal ions and combination of sulphur with oxygen to form sulphate. Generally, this reaction is superficial, the speed of which is driven by the surface area available in combination with environmental conditions such as temperature and available oxygen. Water provides the transport mechanism to wash the oxidized material away and provide a clean surface for the reaction to restart. Water itself may be an additional source of oxygen for the reaction resulting in an excess of free hydrogen ions, which can react with the liberated sulphate ions to form sulphuric acid. The lower pH contributes and often accelerates the speed of the reaction. The sulphide minerals present in the Mt Todd deposit include iron sulphides (pyrite and pyrrhotite), copper sulphides (bornite, covellite, chalcocite and chalcopyrite), zinc sulphide (sphalerite) and lead sulphide (galena).

In addition to the liberation of metal ions and the generation of acid through the oxidation of sulphide minerals, mined rock may also have various nitrogen/oxygen (NO_x) compounds present as residues from extractive blasting operations or from the degradation of cyanide used in the heap leaching or milling processes. Such contaminants are generally present in specific areas and are remnants from past mining operations.

Other contaminants are theoretically possible such as from fuel or oil spills, refuse or sewage, however due to the site being in a care and maintenance status, the used and generated quantities of such items are very low. The on-site management practices detailed in Section 5 to date have been adequate management of these smaller potential contaminants.

6.2.2.2 *Potential impacts*

The potential impact of unrestricted combining of site-contaminated surface water flows with regional surface water flows is the obvious deterioration of water quality; the magnitude of impact being in direct relation to the duration of exposure and levels of contaminants present. The Mt Todd Mine site is not the only source of the metals and compounds discussed in the previous section. There are background metals and compounds that can be identified in water quality analysis results upstream of the Mt Todd Mine arising either from historical sporadic mining activities or naturally from the area's mineralized geology. The distinction lies in the higher concentration of these contaminants in the mine site surface flows.

Naturally occurring changes in almost any elements have potential for any environmental harm to downstream ecosystems. An example of this would be the also annual "fish kills" around the NT due to very low oxygen levels and lower than normal pH.

Undiluted and untreated, contaminated flows from mine contact water have the potential to impact aquatic life and downstream users in the Edith River ecosystem, local soil and groundwater, and the various flora and fauna which reside within the local area. Heavy metals can enter the food chain through a variety of pathways such as direct ingestion by benthic filter feeders, adsorption into tissue through cell walls, uptake by plants and the subsequent consumption of contaminated prey and plants

by higher order feeders. Stock and domestic drinking water may no longer meet the necessary health limits, recreational uses of the river such as fishing may cease, and other non-direct impacts to downstream human activities may arise.

A detailed identification and assessment of the risks from contaminated surface waters at the Mt Todd sites is presented in the Risk Section of this MMP (Section 6.6).

6.2.2.3 *Legislative requirements*

Whilst there are many environmental legislations applicable to the site, the predominant instrument of importance both from a water and operational point of view is the Waste Discharge Licence (WDL) for water that leaves the MLN's. Without the ability to routinely discharge controlled waters off site, the site would quickly transform into a significant environmental risk, due to the volume of received rainfall and the volume of annually generated ARD. Over the years since Vista Gold's management of the site there have been numerous WDL's licencing the release of water into the Edith River. Licences are issued by the NT EPA and have been valid for a period of 2 years. WDL 178-5 is the current licence.

The licence is available publicly on the Mt Todd website http://www.mttodd.com.au/waste-discharge-licence.html and forms Appendix E of the MMP.

6.2.3 Management during current period (2016 to 2017)

Water management activities for the 2016-17 period largely remained consistent with those of previous years. This includes the main goal of minimising uncontrolled discharges through a combination of controlled (licenced) release, on-site storage of contaminated waters during the wet season and enhanced evaporation during the dry season.

All monitoring activities pursuant to WDL 178-5 and the MMP have been successfully completed. Surface water monitoring was undertaken on a monthly program across the site and daily during the discharge period. Biological and sediment monitoring was conducted in early April 2017.

Results of discharge water quality monitoring demonstrate compliance with site specific trigger values and dilution rates, established by applying an algorithm derived by direct eco toxicological testing. Monitoring results for the current reporting period are presented and discussed in subsequent sections.

Macroinvertebrate and sediment sampling revealed no statistical differences in macroinvertebrate populations related to the discharge point. Sediment chemistry was relatively consistent across all sites and is reflective of non-mining related catchment mineralisation. No values exceeded ISQG low concentrations.

Water levels in RP3 have reduced by a further 5 meters, and the net site water inventory has also reduced from 2016 accounts.

No uncontrolled overflows occurred in 2016/17.

Enhanced evaporation by irrigation commenced in 2016 on both the WRD SW crest and RP7 exposed beaches.

6.2.3.1 *Water Movement*

Due to the lower intensity (but on average) rainfall over the 2016-17 period, the quantity of water requiring transfer and retention across the site remained low compared to previous years, due to enhanced infiltration and evaporation. Water levels in RP1 were sustained well below the spillway throughout the wet season, with water transferred directly to RP7 when required.

Management of water levels in RP2, RP5, RP7 and HLP was as planned over the reporting period

Controlled releases of treated water from RP3 totalled 1.94 GL. Discharge commenced on the 17th January and ran continuously for 36 days 21st February when pumping was actively ceased. From 10th Mar-17 to 26th Mar-17 two more pumping incidences occurred. Pumping was ceased due to both meeting the desired target of 1.94 GL of discharge and due to there being insufficient diluting waters in the Edith River for the remainder of the season.

6.2.3.2 *Infrastructure*

Throughout the previous reporting period the following general water management infrastructure activities were undertaken:

- construction and installation of new height boards for RP3, RP7 Weir 2, Raw water dam, & decant ponds
- repairs to various leaks in pipes
- relocated HLP to WTP 315mm pipeline to WRD Enhanced Evaporation system
- replacement of failed pressure reducing valves
- servicing and maintenance of diesel and electric pumps
- deployment of new anchor and tie down cables for RP3 pumps
- inspection of diversion drains for erosion
- general inspection of retention pond structures
- preparation of area for application of lime to RP3
- improvements to mechanical valves at decant ponds
- minor earthworks and repairs to surface water sampling access roads
- poisoning and removal of weeds and vegetation growth from around pipelines and electrical transformers
- installation of pipework for enhanced evaporation
- installation of moisture monitoring tubes in RP7 beaches
- RP3 real-time monitoring telemetry
- second real-time weather station in the accommodation compound

6.2.3.3 *Projects*

Enhanced evaporation by irrigation

A trial of evaporation by irrigation has been occurring over the southern and eastern crests of the Waste Rock Dump in the 2015 dry season. Approximately 1.5 km of additional piping was installed. Treated RP3 water has been used during the trial and is delivered to the irrigation lines from the pumping infrastructure at RP3. Flow rates are generally under 200L/s when irrigating and cycled on and off to minimise the volume of water reporting back to RP1. Whilst an exact figure is difficult to determine, it is estimated that approximately 35% of the irrigated water is effectively evaporated.

Leveraging from the success of the trial the previous year at the WRD, an irrigation system was established at RP7 utilising the exposed beach area during the 2016 dry season. Treated water from RP3 and recirculated water from RP7 (via the Decant Ponds) was used in the system.

Additional Water treatment of RP3

Prior to the 2015-16 wet season additional lime treatment was applied to RP3 to further treat the upper zone of the water body and to reduce the required dilution ratio for offsite discharges. Routine monitoring of the chemical profile throughout the year indicates that the water body will stratify over the warmer months resulting in “cleaner” waters in upper layers.

No water treatment is planned for 2017 as the dilution ratio is acceptable. The projected dilution ratio is 40:1

An assessment will be made mid-year if water treatment is required in 2018.

Monitoring and Assessment

Routine surface water monitoring of key retention ponds and stream sites was successfully conducted across the site. Results of these monitoring activities for the past reportable period are presented in Section 6.7.

In accordance with the WDL, daily surface water sampling was undertaken for the 42 days of discharge as well as monthly monitoring of all sites identified in the Licence.

6.2.4 Management for the upcoming period

The potential impacts over the forthcoming period continue to be those identified in Section 6.2.2 and in general the operational water management activities will remain the same over the foreseeable future. There are no planned on-site activities or special projects planned for the 2018-19 period that would negatively impact on water quality or which would make significant change to the existing water management operations.

6.2.4.1 *Water pumping and release strategy*

Table 23 lists the ongoing activities related to water pumping and monitoring that will largely be adopted over the forthcoming reporting period until external conditions change. Pumping and water transfer paths are presented in Figure 20.

Table 23. Annual water transfers and monitoring procedure

Water Transfers	Monitoring
RP1	
Maintain freeboard by pumping untreated waters to RP7. Treat waters via WTP and redirect to RP3 when risks from further reduction of RP7 freeboard are considered too high. December to February – pump if freeboard is less than 2.5m. March to April – pump if freeboard is less than 0.75m. Dry season – pump if major rainfall is expected and freeboard is less than 0.5m. Discharge to Edith River through siphon when license conditions can be met and if required in emergency situations. April to November – maximise evaporation opportunities.	RP1 level (daily during wet season) Flow to RP-7 (cumulative and instantaneous. Daily recording of WTP flow meter and pump operating times) Discharge to Edith River through siphon (cumulative and instantaneous. Daily recording of flow meter and siphon operating times) Pump infrastructure (weekly during the wet season)
RP2	
Maintain freeboard by pumping untreated waters to RP7. Treat waters via WTP and redirect to RP3 when risks from further reduction of RP7 freeboard are considered too high. Pump to RP7 when WTP in use by another exclusive source. Commence pumping upon inflow of water and continue until maximum possible freeboard has been reached.	RP-2 level (daily during wet) Flow (cumulative and based on pump running times or WTP flow meter) Pump infrastructure (weekly)

Discharge to Batman Creek during heavy rainfall via overflow.	
RP3	
October – December – Retreat waters as appropriate with lime to achieve desired dilution ratios. December – April - Pump to Batman Creek when licence conditions can be met. Target volume for 2017-18 is 2.0 GL. April – December – Pump to irrigation. Pump to RP7 or RP1 to maximise evaporative losses of pond surface area. Can receive excess water from RP1, RP2, and RP5 via the WTP as treated water.	RP-3 level (daily during wet) Flow (cumulative and instantaneous. Daily flow meter recording and siphon or pump operating times) Pump infrastructure (weekly)
RP-5	
Maintain freeboard by pumping to RP7. Pump if freeboard is less than 1m or on prediction of extensive rainfall. Pump to RP2 if RP7 is approaching capacity. Discharge to Batman Creek during heavy rainfall via the spillway.	RP-5 level (daily during wet) Flow (cumulative and based on daily pump running times) pump infrastructure (weekly)
Heap Leach Facility	
Surface water collected in the cells on the top of the HLP can be diverted into the sediment settling pond before discharging into the Batman Creek via the spillway. Maintain freeboard by pumping untreated waters to RP7. October to April – pump if moat freeboard is less than 0.75m. Dry season – pump if moat freeboard is less than 0.5m and heavy rain is expected. November to April – pump if moat freeboard is less than 0.5m. Dry season – pump if moat freeboard is less than 0.5m and heavy rain is expected.	Heap leach moat level (daily during wet) pH of sediment settling pond Flow (cumulative and based on daily pump operating times) Pump infrastructure (weekly)
RP-7	
October to March - Discharge to Horseshoe Creek via decant ponds & only in an emergency situation. Breach spillway plug if water levels exceed engineered design and risk to structure is imminent. October to March – Pump untreated to RP3 when water level is at base of spillway. Redirect all pumped inputs to RP3.	RP7 level (weekly) Flow to RP3 (cumulative and based on pimp operating times) Pump infrastructure (weekly)

April to November – maximise evaporation opportunities by pumping to irrigation. Receives water from RP1, RP2. RP3 and HLP.	
RWD	
Supplies water as required for fire control, exploration programs, and the WTP. Maintain level in Decant Ponds to protect liner (300mm of freeboard should be maintained to allow for rainfall runoff).	RWD level (weekly)
WTP	
Receive, treat and discharge to RP3 pumped water from RP1 and RP2 when risks from further reduction of RP7 freeboard are considered too high.	Lime in silo (daily when in use) Plant operation (daily and over 24-hour period if required)

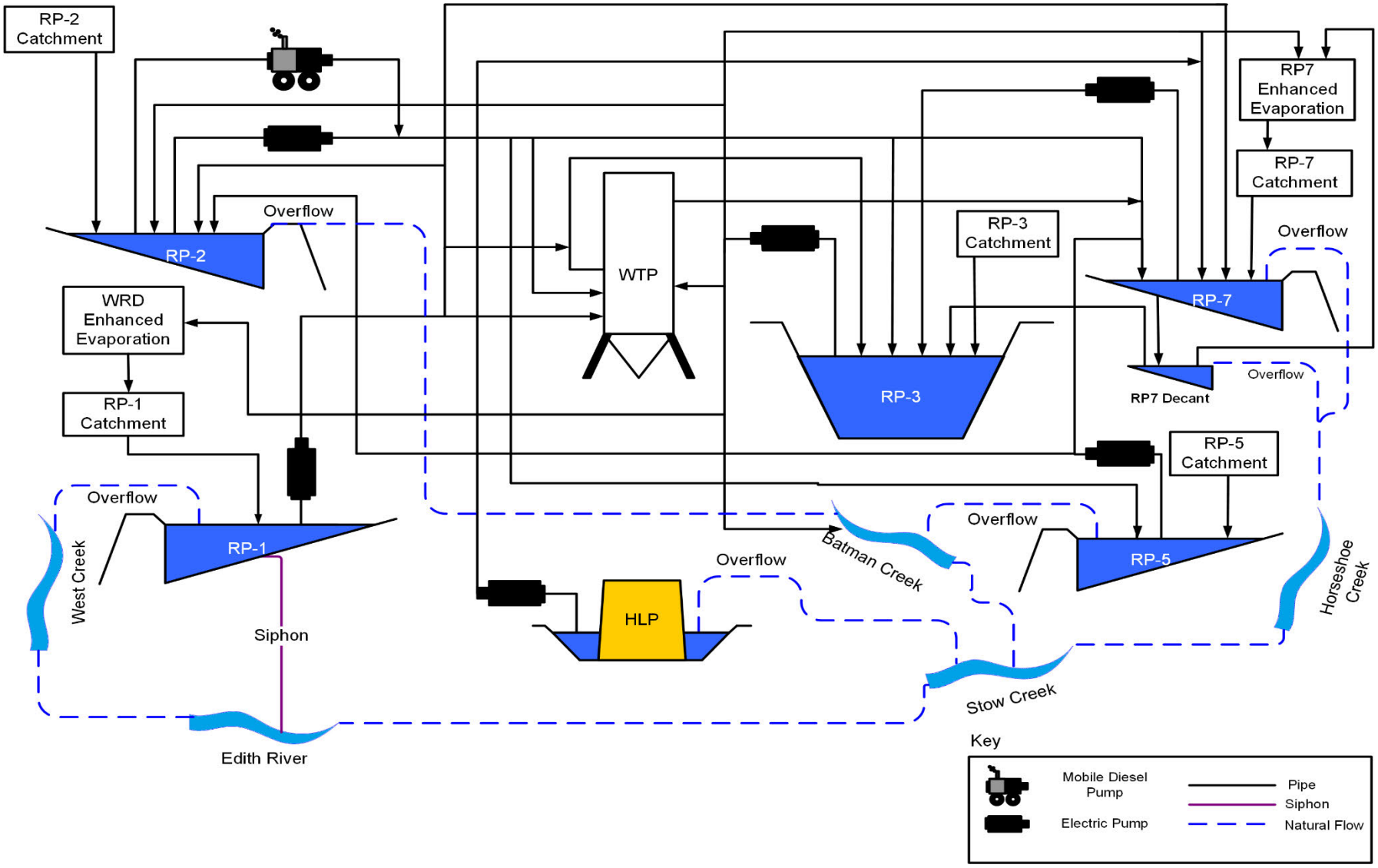

Figure 20. Pumping and water transfer paths

6.2.4.2 *WDL Licence Renewal*

WDL178 was renewed in 2016 and is valid for 2 years

Further detailed information regarding discharge actions from RP3 are contained within the Discharge Plan (Appendix F).

6.3 Groundwater

6.3.1 Groundwater management infrastructure / features

6.3.1.1 *Groundwater bores and monitoring piezometers*

A number of groundwater bores were installed in the early 1990's during the early stages of the initial MT Todd project development with an aim to develop a reliable water supply for milling operations. The BW prefix named bores focussed on the exploration and testing of groundwater as a resource for the mine in the Burrell Creek Formation and a number were subsequently fitted with pumps. However, the aquifers of the local area are primarily of the fractured rock type, and as a result only low flow rates from individual bores were achieved. At one stage of the project and prior to the construction of the RWD, many groundwater bores were connected onto a ring main in efforts to bolster supply quantity and consistency.

Many monitoring bores/piezometers were also installed during operations, primarily nearby to surface water structures to facilitate monitoring programs. Construction and documentation standards of adequate head works, casing packing or machine slotted screens for most of these monitoring bores are generally poor, with most being absent as evidenced by on-site camera inspections.

Since operations ceased most of any groundwater pumping infrastructure has been removed, abandoned or in the case of pipelines, claimed by fire. Little or no maintenance has been conducted to the existing groundwater bores since. Many bores still contain old pumps that have become silted in place, have damaged casings from fire, exhibit artesian flow or permit surface waters to directly enter the groundwater due to an absence of adequate standpipe height or capping.

Construction of many additional monitoring piezometers was undertaken in 2011 in conjunction with EIS baseline studies and TSF investigations. An audit of the groundwater bores across the site was also conducted in 2010-11 to physically identify bores listed in various literatures, the results of which are presented in Table 24 and Figure 21.

A small amount (approximately 3 ML) of groundwater is extracted from BW6P bore using existing pumping infrastructure for use in care and maintenance activities. Working pumping infrastructure is also present at BW10P but not actively used. There are no other groundwater extractive activities conducted at the site.

6.3.1.2 *Other groundwater management infrastructure*

All bores and piezometers on site that could be identified from historical records and those that have been ground truthed are listed in Table 24. To the company's knowledge no bores or other infrastructure were used for groundwater injection or groundwater contaminant recovery. No other specifically engineered structures, other than the TSF underdrainage system or lined retention ponds, have been identified on the site for the purposes of seepage limitation, interception and mitigation.

Groundwater bore logs are available in Appendix K of the EIS (http://www.ntepa.nt.gov.au/environmental-assessments/assessment/register/mount_todd_gold/mount-todd-draft-eis)

Table 24. Groundwater Bores and Piezometers

Bore ID	Physically Located*	Bore Number as marked on casing	RN Number	Northing	Easting	Elevation
1	Yes	MB4		189468.862	8434893.873	129.57
2	Yes	MB3		189158.000	8434624.000	
3	Yes	MB5		189426.530	8435302.350	
4	Yes	TDMB1S		189383.157	8435346.942	124.77
5	Yes	TDMB1D		189381.372	8435351.568	124.56
6	Yes	TDMB2D		189887.907	8435549.062	123.87
7	Yes	TDMB2S		189882.008	8435544.065	124.07
8	Yes	MB1		188099.519	8434470.273	131.06
9	Yes	BW1P	RN026130	188331.699	8434907.204	127.56
10	Yes	MB6S		187714.200	8432246.700	
11	Yes	MB7S		187855.290	8432280.520	113.48
12	Yes	BW29	RN029361	188306.790	8431781.467	112.80
13	Yes	BW29P	RN029363	188306.845	8431788.955	112.90
14	Yes	BW5		187506.717	8435612.504	142.88
15	Yes	TDMBD1		188670.070	8437099.535	143.16
16	Yes	TDMBS1		188665.099	8437099.165	143.21
17	Yes	TDMB4D		189497.626	8437339.708	132.44
18	Yes	TDMB4S		189499.168	8437336.876	132.03
19	Yes	TDMB3D		189937.183	8436307.725	125.32
20	Yes	TDMB3S		189941.531	8436310.490	125.24
21	Yes	BW10P	RN026132	188452.606	8434213.144	123.30
22	Yes	BW6P	RN026131	188893.019	8433988.369	121.54
23	Yes	BW19P	RN026149	188997.127	8438108.581	138.45
24	Yes	BW19		189008.513	8438106.611	138.33
25	Yes	BW23P	RN028927	189484.649	8438548.430	141.36
26	Yes	BW23	RN028922	189485.511	8438551.786	141.49
27	Yes	BW18		189859.603	8439226.397	140.69
28	Yes	BW18P	RN026350	189861.874	8439232.408	140.64
29	Yes			189978.976	8438586.333	145.16
30	Yes			189975.405	8438588.014	145.13
31	Yes		RN028926	189992.456	8438278.191	145.52
32	Yes		RN028923	189991.450	8438281.571	145.36
33	Yes			188680.384	8438755.031	139.35
34	Yes	BW17P	RN026354	188326.269	8439214.794	141.85
35	Yes	BW17		188334.493	8439215.977	142.33
36	Yes	BW8P	RN026134	188788.000	8434591.000	
37	Yes	MB7D		187846.510	8432275.370	
37	Yes	TSF2MB01		191239.441	8436060.050	138.77
38	Yes	TSF2MB02		191608.559	8435084.255	141.36
39	Yes	BPMB02		187012.310	8434374.822	145.67
40	Yes	BPMB01		186675.178	8435148.078	171.64
41	Yes	WDMB01		187284.957	8432583.777	124.15
45	Yes	1D		189841.626	8436628.220	165.49

Bore ID	Physically Located*	Bore Number as marked on casing	RN Number	Northing	Easting	Elevation
49	Yes	2D		189320.141	8435537.659	
50	Yes	2E		189349.770	8435444.039	
51	Yes	3A		189509.339	8435553.436	
52	Yes	4A		189780.333	8436857.245	
53	Yes	MB6D		187709.730	8432246.020	
54	Yes	WDMB02		188162.236	8433274.432	125.74
55	Yes	SW04MB01		186767.924	8431559.732	111.64
56	Yes	BW6		188895.028	8433966.356	121.27
57	Yes			188314.030	8436915.960	
58	Yes	5A		188686.581	8435794.500	
59	Yes	6A		188614.787	8436037.641	
60	Yes	7A		188978.006	8436707.673	
61	Yes					
62	Yes	1A		189607.130	8436467.740	
63	Yes	1B		189673.262	8436470.282	
64	Yes	1C		189740.323	8436473.113	
65	Yes	2A		189241.080	8435674.092	
66	Yes	2B		189259.607	8435632.574	
67	Yes	2C		189277.823	8435591.473	
68	No		RN024355	189500.000	8439500.000	
69	No		RN025088	190100.000	8439000.000	
70	No		RN026133	190500.000	8439500.000	
71	No	bw16p	RN026351	189300.000	8437720.000	
72	No	bw15p	RN026352	189040.000	8437280.000	
73	No		RN026353	188660.000	8436200.000	
74	No	bw25	RN028924	190100.000	8437650.000	
75	No	bw25p	RN028925	190100.000	8437550.000	
76	No	bw26	RN028928	188900.000	8433400.000	
77	No	bw27p	RN028929	188700.000	8432100.000	
78	No		RN028950	729490.000	8611060.000	
79	No	bw28	RN029360	188550.000	8431800.000	
80	No	bw28p	RN029362	188550.000	8431950.000	
81	No	bw30p	RN029364	187250.000	8434400.000	
82	No	bw31p	RN029365	187900.000	8435400.000	
83	No	WBNo1	RN006190	194128.000	8449164.600	
84	No	WBNo6	RN006675	192978.000	8449264.600	
85	No	WBNo2	RN006191	194578.000	8449714.600	
86	No	WBNo4	RN006676	192728.000	8449714.600	
87	No	WBNo3	RN006192	193628.000	8449744.600	
88	No	X Bore	RN025152	204427.900	8469564.400	
89	No	Y Bore	RN025153	204057.900	8469164.400	
90	No	W Bore	RN025151	203677.900	8469564.400	
91	No	Wandie	RN021538	198827.900	8471764.400	
92	No	AOM Wandie No4	RN025007	197807.900	8470714.400	
93	No	AOM Wandie No2	RN025005	197807.900	8470714.400	
94	No	AOM Wandie No1	RN024858	197807.900	8470714.400	

Bore ID	Physically Located*	Bore Number as marked on casing	RN Number	Northing	Easting	Elevation
95	No	AOM Wandie No3	RN025006	197807.900	8470714.400	
96	No	WM Bore No6	RN006674	197527.900	8470164.400	
97	No	Z Bore	RN025145	197527.900	8472164.400	
98	No	T Bore	RN026226	196807.900	8470304.400	
99	No	V Bore	RN026228	197167.900	8471814.400	
100	No	U Bore	RN026227	196777.900	8471149.400	
101	No	S Bore	RN026225	196807.900	8471954.400	
102	No	Wandie 1/85	RN024106	196627.900	8472164.400	

** A field marked 'No' indicates efforts have been made to locate the bore/piezometer but it could not be found.*

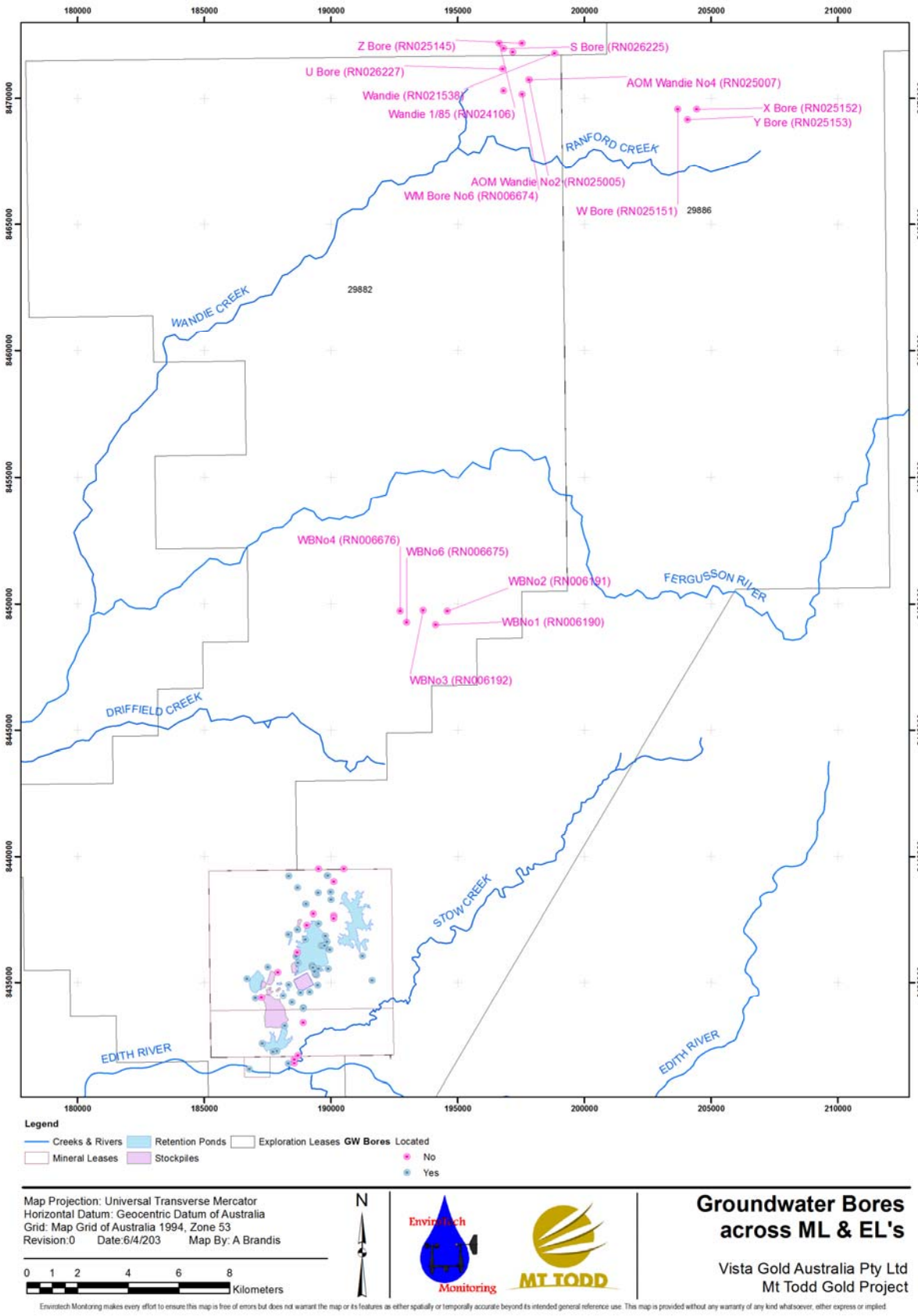

Figure 21. Groundwater Bores and Piezometers across mineral and exploration leases

6.3.2 Management challenges

6.3.2.1 *Potential contaminants*

The various potential contaminants as discussed for surface waters in section 6.2.2.1 also have the potential to enter ground waters. The extent to which this is occurring at the Mt Todd site is largely driven by:

- The measures taken during construction of retention ponds, waste rock and ore stockpiles to minimise groundwater seepage.
    - Such measures are known to exist for the HLP and RP5 where impermeable HDPE linings were installed as part of their construction and for RP7 in the form of the underdrainage network and soil improvements.
    - For other structures such as RP2, RP1 or the stockpiles no specific measures are known.
- The effectiveness of the seepage barriers / control systems
    - The groundwater monitoring results infer a possible compromise in the lining of the HLP, and the closure of the underdrainage system over the past 10 years is likely to have increased seepage rates below RP7.
- The porosity and transmissivity of the geologic host
    - Work to date suggests that groundwater aquifers below the site are generally composed of water within the cracks and fractures of the rock with the weathered upper geological layer playing a greater role in localised recharge and discharge. Hydraulic conductivities are generally low but notable in specific locations such as the surface seeps below RP1 and RP7.

Other minor contaminants could include the various hydrocarbons or chemicals such as herbicides if managed inappropriately. The likelihood of these contaminants entering the ground waters at Mt Todd is very low due to the small volumes maintained and utilised on site and the presence of appropriate storage and handling procedures.

6.3.2.2 *Potential impacts*

The primary impact of contaminated ground water is the reduction in water quality for other surrounding groundwater users and the contamination of surface water streams, rivers and lagoons as ground waters are released to the surface via springs and other groundwater sinks.

While the potential contaminants are significant, for the Mt Todd site the general opinion from investigations to date suggest that there exists limited ability for such contaminants to travel significant distances. This attenuation of transport exists throughout most of the site, particularly in higher areas where porous material is absent, and therefore restricts any potential impacts to the immediate area.

The Horseshoe Creek catchment below RP7 is expected to be the area of most significant impact as a result from the cessation of correct Tailings Storage Facility management facilitating increased seepage. Many bores below the TSF exhibit high concentrations of elements unequalled across the site and surface waters within the creek exhibit characteristics consistent with the contamination and subsequent transport through the surrounding alluvium.

The neighbouring and regional land uses do not share substantial groundwater resources with the mine site, with the nearest neighbouring bores being over six kilometres away (upstream) at the Werenbun community and Edith Falls recreational area. Results from monitoring of down gradient bores approximately 500m from RP1 has failed to identify any chemical signatures like that of the pond water. Results from dry season sampling of the Edith River also do not report elevated contaminants or evidence any information of direct groundwater contamination.

6.3.3 Management during the previous period

No specific direct management or mitigation activities were undertaken on site regarding ground waters. No abstraction of ground waters was conducted other than that the small amount used for site facilities and care and maintenance activities from Bore 6. The recharge rates around this bore exceed demand and in the absence of any large-scale extraction or injection no drawdown monitoring, or assessments are currently conducted.

Routine groundwater monitoring is the only reportable groundwater related activities for the period.

6.3.4 Management during the upcoming period

No specific activities in relation to groundwater management are proposed for the forthcoming life of mine plan other than the routine annual monitoring program.

In anticipation of future site developments, extension of the monitoring program is currently being considered to collect additional baseline information from a range of additional existing bores across the site. These areas of consideration include:

- The historical “Quigley’s” area to the north of the TSF.
- The inclusion of monitoring bores installed during RP7 acidity generation and migration study.
- The resurrection and inclusion of other legacy bores currently abandoned and inoperable for various reasons.

An investigation will also be undertaken to determine the availability and suitability of any regional neighbouring bores for inclusion to the longer-term groundwater monitoring program.

An ongoing review of groundwater results will be conducted to assess the spatial temporal variations in quality and to inform a greater strategic approach to future groundwater sampling activities.

Until a final investment decision is made, no additional groundwater monitoring bores will be installed at the site.

6.4 Information/Knowledge Gaps

No extensive knowledge gaps in relation to water management have been identified over the reporting period which would directly contribute to the improvement of environmental management outcomes because of care and maintenance operations.

The extensive monitoring and chemical profiling of RP3 has provided a valuable insight into the behaviour of the water body throughout the year and following the application of water treatments. Derivation of dilution ratios via toxicity unit calculations from previous eco toxicological data has also been working as expected. These two significant bodies of work now mean it should be “business as usual” discharging over the 2016-18 seasons.

Whilst not a direct knowledge gap, the GoldSim water management model continues to be utilised effectively. Further improvements to the model are likely to be made from time to time improving the use of this tool for effective on-site water management decisions.

6.5 Water Account

The water accounting maintains the format as presented in prior years. Vista Gold will commence water accounting as per the Minerals Council of Australia framework upon commencement of mining operations. Reporting against the framework while in care and maintenance mode is of little benefit when there are no operations which involve the consumption of water or impacts on external parties as a result of such non- consumption.

6.5.1 Water account for the current reporting period

As at 1 September 2017 the current total site inventory has been determined to be 10.66 ML, with 63% contained in RP3, 28% in RP7 and the remaining 9% distributed amongst the other ponds with the majority in RP1. Table 25 presents the historic and current volume distributions. The table indicates that the net site inventory fell again in the 2016-17 year; however, the reader is cautioned about the relative amount of reduction. The table indicates that net site reduction this year was 5% compared to 12% last year.

The high volume of water still contained by RP3 is showing a dramatic reduction with current water management activities. The improvement in water quality of this pond by continuing annual in-situ water treatment, is allowing rapid and sustained removal of water by annual licenced discharge. There is also an opportunity for enhanced evaporation by irrigation to other contained catchments without leading to deterioration of existing water quality.

As consistent with past years, groundwater is not included in water accounting or balances, as there are no abstractions or injections involving site care and maintenance operations. The only groundwater interaction is via the routine monitoring programme.

Table 25. Historic and current retention pond volumes

Storage Structure	Historic and Current Volumes (ML)									
	Oct-08	Oct-09	Jun-10	Oct-11	Oct-12	Oct-13	Sep-14	Aug-15	Sep-16	Sep-17
RP-1	234.5	392.9	568	396	396	525	452	271	437	990
RP-2	2.1	2.1	3.6	4	5.5	3.6	3.4	4.4	4.0	4.0
RP-3	6,754	8,300	8,171	8,805	10,350	10,756	11,604	10,150	8,607	6,720
RP-5	5.67	5.96	5.2	5.4	7.4	0.0	8.4	7.5	4.6	4.6
RP-7	2,130	2,230	2,200	4,145	3,439	4,003	3,382	2,287	2,722	2,950
Total (ML)	***9,126***	***10,931***	***10,948***	***13,355***	***14,198***	***15,288***	***15,450***	***12,720***	***11,774***	***10,669***
Total (%)	***51%***	***61%***	***61%***	***75%***	***78%***	***83%***	***85%***	***71%***	***66%***	***59%***

A summary of on-site water transfers during the 2016-17 period is presented in Table 26. Because of both the limited data available and their resolution quality, the numbers presented should be used as a guide only. Many have had to be estimated or deduced by indirect methods.

Table 26. Water balance summary for 2016-17

LOCATION	INFLOWS	ML/yr	OUTFLOWS	ML/yr
RP1 Catchment	Rainfall	2,103	Adsorption/Evaporation	1,008
			RP1 Catchment Runoff	1,095
	TOTAL	*2,103*	TOTAL	*2,103*
RP1	Rainfall	414	Siphons to Edith River	-
	RP1 Catchment Runoff	1,141	Pump to RP7	1,079
	Pumping from RP3	-	Pump to RP3	-
			Evaporation	753
			Δ Storage	- 277
	TOTAL	*1,555*	TOTAL	*1,555*
RP2 Catchment	Rainfall	369	Adsorption/Evaporation	213
			RP2 catchment runoff	156
	TOTAL	*369*	TOTAL	*369*
RP2	Rainfall	4	Pump to RP3	-
	RP2 Catchment Runoff	156	Pump to RP7	152
			Spillway	-
			Evaporation	9
			Δ Storage	- 1
	TOTAL	*160*	TOTAL	*160*
RP3 Catchment	Rainfall	340	Adsorption/Evaporation	31
			RP3 catchment runoff	311
	TOTAL	*320*	TOTAL	*320*
RP3	Rainfall	374	Evaporation	557
	RP3 Catchment Runoff	311	Pump to Edith	1,936
			Pump to RP7 sprinkler	136
			Pump to RP1 sprinkler	-
			Pump to WRD sprinkler	42
			Pump to RP5	-
			Δ Storage	- 1,986
	TOTAL	*685*	TOTAL	*685*
RP5 Catchment	Rainfall	392	Adsorption/Evaporation	366
			RP5 catchment runoff	27
	TOTAL	*392*	TOTAL	*392*
RP5	Rainfall	8	Pump to RP2	-
	RP5 Catchment Runoff	41	Pump to RP7	53
	RP3 for liner protection	4	Evaporation	16
			Δ Storage	- 16
	TOTAL	*53*	TOTAL	*53*

LOCATION	INFLOWS	ML/yr	OUTFLOWS	ML/yr
RP7 Catchment	Rainfall	941	Adsorption/Evaporation	571
			RP7 catchment runoff	315
	TOTAL	*886*	TOTAL	*886*
RP7	Rainfall	1,788	Evaporation	3,304
	RP7 Catchment Runoff	397		
	Pump from HLP	182	Δ Storage	470
	Pump from RP1	1,079		
	Pump from RP2	156		
	Pump from RP5	53		
	Pump from RP3	112		
	Pump from Decant	7		
	TOTAL	*3,774*	TOTAL	*3,774*
HL POND	Rainfall	27	Evaporation	49
	Runoff/Seepage from HL Pad	318	Evaporation Off Pad	125
			Pump to RP7	182
			Δ Storage	- 11.92
	TOTAL	*344*	TOTAL	*344*

Current pond levels are displayed in Section **Error! Reference source not found.** and through Figure 27 Figure 26. These figures display pond water levels over time for the current reporting period.

6.6 Risk Management

6.6.1 Identify Hazards and Rank Risks

An extensive risk assessment of the care and maintenance operations is provided in Section 5.5. As future water management activities are likely to be consistent with those historically undertaken last year, the impacts and consequences identified are largely unchanged.

6.6.2 Actions and Strategies in Response to Identified Risks

Whilst the volumes of water to be released continue to be high, minimum quantity and quality of diluent will still be required to meet thresholds and criteria of the applicable WDL. Such targets can largely be controlled through the adjustment of dilution rates to ensure environmental protection, as evidenced during discharges over the previous year.

With the significant reduction in pond levels this year, the available storage capacity of both RP1 and RP7 will be at their highest values heading into the forthcoming wet season. Whilst the quantity and frequency of rainfall events remains the primary threat to capacity exhaustion of these ponds, the additional storage capacity lowers this risk.

Pumping infrastructure capacity at RP1, RP2 and RP5 continues to be a risk during periods of high intensity rainfall. The current bottleneck for RP1 is the capacity of the pipeline from RP1 to RP7. Whilst the storage capacity increase and management of water levels in RP1 has proven effective against a reliance on the pumping capacity, piping capacity may need to be improved in the future if the risk of an uncontrolled event is to be lowered.

The capacity exceedances at RP2 and RP5 are only short lived and of undetectable effect to the receiving environment.

6.7 Monitoring

6.7.1 Monitoring permits and agreements

The majority of current surface or groundwater monitoring activities takes place within the existing mineral or exploration leases. The majority of surrounding lands are owned by the Jawoyn Aboriginal Corporation with whom Vista Gold have established working agreements, which permit access and operational activities such as the necessary environmental sampling programs.

In addition to the direct agreements with the Jawoyn association, certificate C2012/137 has been obtained from the AAPA to undertake a number of activities including “routine environmental monitoring and management activities” (Appendix B).

Where other specific permits for aquatic related sampling are necessary (e.g. non recreational sampling of fish), licenced external consultants are engaged.

6.7.2 Monitoring Program

Annual, routine water related monitoring programs at the site implemented by Vista Gold for the purpose of providing information for operating decisions, WDL compliance, investigations and information gathering.

A number of specific monitoring activities were conducted to enable the completion of the EIS, but are not anticipated to be continued on a regular basis unless business needs indicate otherwise.

Prior to returning the site to any active mining, the monitoring programs will be reviewed to ensure adequate baseline data is available in order to qualify and quantify the effects from such activities.

In accordance with the WDL, daily surface water sampling is undertaken on controlled discharge days as well as monthly monitoring of all sites identified in the Licence.

Annual Macroinvertebrate and Sediment sampling is conducted during recessional flow following the wet season.

Other water monitoring programs undertaken across the site include monthly surface water (ponds, dams and streams); monthly pit profiling and bi-annual groundwater sampling.

All monitoring programs are undertaken with appropriate Quality Assurance and Quality Control procedures and these are comprehensively detailed in (Appendix G)

Trigger values which have been derived for the purpose of WDL compliance are the only triggers defined and utilised by existing monitoring programmes. The WDL trigger levels are detailed in full in the WDL.

6.7.2.1 *Surface Water Monitoring*

Vista Gold routinely undertakes monthly surface water sampling from retention ponds and dams as well as river and stream sites across the lease (Figure 19). The sites sampled each month will vary throughout the year as water levels change and as operational (or legislative) requirements dictate. The sites monitored and parameters measured for each of the surface water programs are detailed below. Results and interpretation are presented in Section 6.7.2.

Vista Gold also undertakes routine profiling of the RP3 pit for physical water readings and chemistry at discreet depths.

To meet the requirements of the WDL sampling encompasses the following sites-

- RP1 - Waste rock wastewater source
- RP3 – Batman Pit
- SW2 – Edith River at Bridge on Edith Falls road
- SW4 – Edith River downstream of RP1 siphon and spillway discharge
- SW10 – Edith River at old Stuart highway causeway
- SW13 – Stow Creek upstream of Horseshoe Creek Confluence

Samples must be collected on the following schedule -

- Monthly
- Daily when discharging
- One week after the cessation of discharge
- Once during the period of first flush

Physical parameters measured include-

- Discharge flow rate
- River flow rate
- River height
- Temperature

- Electrical Conductivity
- pH
- Dissolved Oxygen

General Chemistry parameters measured include –

- Aluminium (Total & dissolved)
- Antimony
- Arsenic
- Bicarbonate
- Cadmium
- Calcium
- Chloride
- Chromium
- Cobalt
- Copper
- Hardness $CaCO_3$
- Iron (Total & dissolved)
- Lead
- Magnesium
- Manganese
- Mercury
- Nickel
- Potassium
- Silver
- Sodium
- Sulphate
- Total (WAD*) Cyanide
- Total Dissolved Solids
- Total Nitrogen
- Total Organic Carbon
- Total Suspended Solids
- Total Phosphorous
- Unfiltered Alkalinity $CaCO_3$
- Zinc

*WAD Cyanide is required if the result of monthly Total CN analysis is greater than 0.004 mg/L

The specific matrix of sampling sites, parameters and frequencies are specified in the WDL. Surface water sampling is conducted by on-site staff following the procedures listed in the Vista Gold Surface water sampling standard operating procedure (Appendix G).

6.7.2.1.1 Retention Ponds and Dams

Monthly physical water readings and chemistry samples were collected throughout the year at retention ponds RP1, RP2, RP3, RP5, RP7 and the Heap Leach Pad moat.

Physical parameters measured are:

- Electrical Conductivity
- pH
- Dissolved Oxygen
- Temperature
-

All water samples are dispatched to the laboratory for the following analysis –

Total Recoverable Hydrocarbons:

- *C15 - C28, C29 - C36, C10 - C14, >C10 - C16, >C16 - C34 and >C34 - C40*

General Chemistry:

- Bicarbonate Alkalinity as $CaCO_3$
- Calcium - (0.45µm filtered)
- Carbonate Alkalinity as $CaCO_3$
- Chloride, Cl
- Dissolved Organic Carbon
- Hardness
- Hydroxide Alkalinity (OH^-) as $CaCO_3$
- Ionic Balance
- Magnesium - Total
- Magnesium - (0.45µm filtered)
- Nitrate as N in water
- Phosphate as P in water
- Potassium – Dissolved
- Sodium - Dissolved
- Sulphate, SO_4
- Total Alkalinity as $CaCO_3$
- Total Cyanide
- Total Organic Carbon
- Total Solids
- Weak Acid Dissociable Cyanide

Trace Metals:

- Aluminium#
- Cadmium#
- Chromium#
- Cobalt#
- Copper#
- Iron#
- Lead#
- Manganese#
- Mercury#
- Nickel#
- Zinc#

For each of these metals, both Total and Filtered samples are analysed.

6.7.2.1.2 Rivers, Streams and Raw Water Dam

Monthly physical water readings and chemistry samples are collected throughout the year at the surface water sites identified in section 6.2.1.10. The physical parameters and laboratory analyses are the same as for the above retention ponds and dams. Sample collection will also be dictated by the presence of water at these sites. As such data from some sites will not be collected monthly.

Summary gauge station data are included in section 6.7.3.2.

6.7.2.2 *RP3 Treatment and Profiling*

The RP3 pit is profiled at the same centre location monthly during the dry season and at a higher weekly frequency during the period of discharge. Dry season samples inform the decision to provide in-situ treatment each year based on the remobilisation of metals into solution and the discharge targets for the upcoming wet season. The ultimate aim of the annual treatment is to maintain the RP3 water chemistry at a high quality (compared to other retention ponds on site) and thus maximise opportunities for discharge and other water management activities such as enhanced evaporation through irrigation.

Regular RP3 profiles record continuous physical parameters from the pit surface to the bottom (approximately 90 metres). Water samples are also collected for analysis from the surface and at multiple depths (15m, 30m, 45m, 60m, 75m and 90m).

Pit treatment details and results from periodic profiling are presented in section 6.7.3.3 below.

6.7.2.3 *Groundwater monitoring*

Groundwater monitoring is currently conducted across approximately 18 bores twice yearly. The full list of bores and co-ordinates can be found in Table 24.

The bores currently monitored are –

- TDMB4D
- BW18P
- BW29P
- MB3
- MB6S
- RN028926
- BW6P*
- TDMB2S
- TDMB2D
- WDMB02
- MB6D
- SW04MB01
- TDMB3D
- MB1
- MB5
- TDMB1D
- TSF2MB02
- TDMBD1

*BW6P is occasionally monitored for bacteriological and trace metal analyses to evaluate suitability for potable water

The following physical parameters are measured –

- SWL
- pH
- Electrical Conductivity
- Turbidity
- Dissolved Oxygen
- Oxidation / Reduction
- Temperature

All samples are dispatched to the laboratory for the following analysis:

General Chemistry:

- Ionic Balance
- Nitrate as N in water
- Total Nitrogen in water
- Total Cyanide
- Cyanide amendable
- Carbonate Alkalinity as $CaCO_3$
- Sulphate, SO_4
- Calcium – Total
- Potassium – Dissolved
- Nitrite as N in water
- Total Dissolved Solids
- Ammonia as N in water
- Phosphorus – Total
- Weak Acid Dissociable Cyanide
- Hydroxide Alkalinity (OH^-) as $CaCO_3$
- Total Alkalinity as $CaCO_3$
- Chloride, Cl
- Magnesium – Dissolved
- Potassium – Total
- TKN in water
- Thiocyanate
- Free Cyanide in Water
- Bicarbonate Alkalinity as $CaCO_3$
- Hardness
- Calcium – Dissolved
- Magnesium – Total
- Sodium - Dissolved
- Sodium - Total

Trace Metals:

- Aluminium#
- Antimony - Dissolved
- Arsenic#
- Barium – Dissolved
- Beryllium – Dissolved
- Bismuth – Dissolved
- Boron – Dissolved
- Cadmium#
- Chromium - Dissolved
- Cobalt#
- Copper#
- Iron#
- Lead#
- Lithium- Dissolved
- Manganese#
- Mercury – Total
- Molybdenum – Dissolved
- Nickel#
- Selenium – Dissolved
- Silver – Dissolved
- Strontium - Dissolved
- Thallium- Dissolved
- Thorium - Dissolved
- Tin – Dissolved
- Titanium – Dissolved
- Uranium- Dissolved
- Vanadium - Dissolved
- Zinc#

 # For each of these metals, both Total and Filtered samples were analysed.

Groundwater sampling and analysis is currently provided externally. Pumping and sampling of ground waters is conducted via a semi-automatic sampling system comparable in standard to that of the DME. While continuously monitoring the standing water level of the bore to minimise drawdown, groundwater is continuously pumped to the surface and passed through a flow cell where the physical parameters listed above are continuously measured and graphed in real-time.

Flow rates typically are less than 1L/min and regulated to achieve sufficient flow without disturbing the build-up of settled sediments around the screened zone. Pumping rate is matched to the bore re-charge rate by continuously monitoring the standing water level by a logged pressure sensor. When all of the physical parameters have stabilised, the water is determined to be adequately representative of the surrounding “aquifer”. Water is diverted to the pre- preserved sample containers (via inline filtration if necessary) and immediately cooled prior to dispatch to the laboratory.

Parameter concentrations are generally assessed against seasonal variations and historic values to provide an indication of potential changes in ground water quality. The specifics of the program may change over time to better address the groundwater monitoring needs of the site and company.

6.7.2.4 *Biological Monitoring*

Macroinvertebrates represent the only routine biological monitoring undertaken by Vista Gold and are undertaken by external contractor. Macroinvertebrates are monitored as a requirement of the WDL and undertaken in conjunction with annual sediment monitoring.

Samples are collected from eight sites along the Edith River and Stow Creek. All samples are from edge habitat where the bank below water-line is as vertical as possible, containing abundant trailing root material and minimal adjacent water velocity. Details of the program are included in Appendix H.

6.7.2.5 *Sediment monitoring*

Sediments are annually monitored as a requirement of the WDL and undertaken in conjunction with macroinvertebrate sampling. Sediment samples are collected from the same sites as biological samples for comparative assessment. Details of the program are included in Appendix H.

6.7.3 Data Review and Interpretation

The following sections provide review and interpretation of current monitoring programs undertaken by Vista Gold, for the current reporting period (2017-18) as well as other specifically requested analyses such as that presented for groundwaters. Monitoring programs undertaken as a component of Waste Discharge Licence are not included. Such information is presented in the annual monitoring report for the EPA. The 2016-17 report is provided in Appendix I.

6.7.3.1 *Retention Ponds and Dams*

Retention ponds are monitored monthly for pond level (adjusted to AHD), physical and chemical water quality characteristics.

All physical measurements and chemistry samples are collected from the surface of the retention ponds and as such should be representative of the water body when the ponds are shallow and well mixed. In the case of RP3, data should be viewed with caution as this water body is approximately 90m in depth. RP3 displays vertical variation in water quality for some period of the year and periods of full mixing. As such the surface results discussed below may not be typical of the water column but are typical of that discharged. Further discussion of the RP3 profile is presented in section 6.7.3.3 below.

6.7.3.1.1 Pond levels

The following figures (Figure 22 to Figure 26) show pond level for the period of reporting against spillway or crest level.

Water levels showed typical seasonal reductions. This level will be maintained to maximise evaporative losses prior to reducing the level in preparation for the 2018/2019 wet season.

The Heap Leach pond displayed maintenance pumping during the whole reporting period. Dry season top-ups to protect the pond liner and wet season pumping to prevent overflow were conducted.

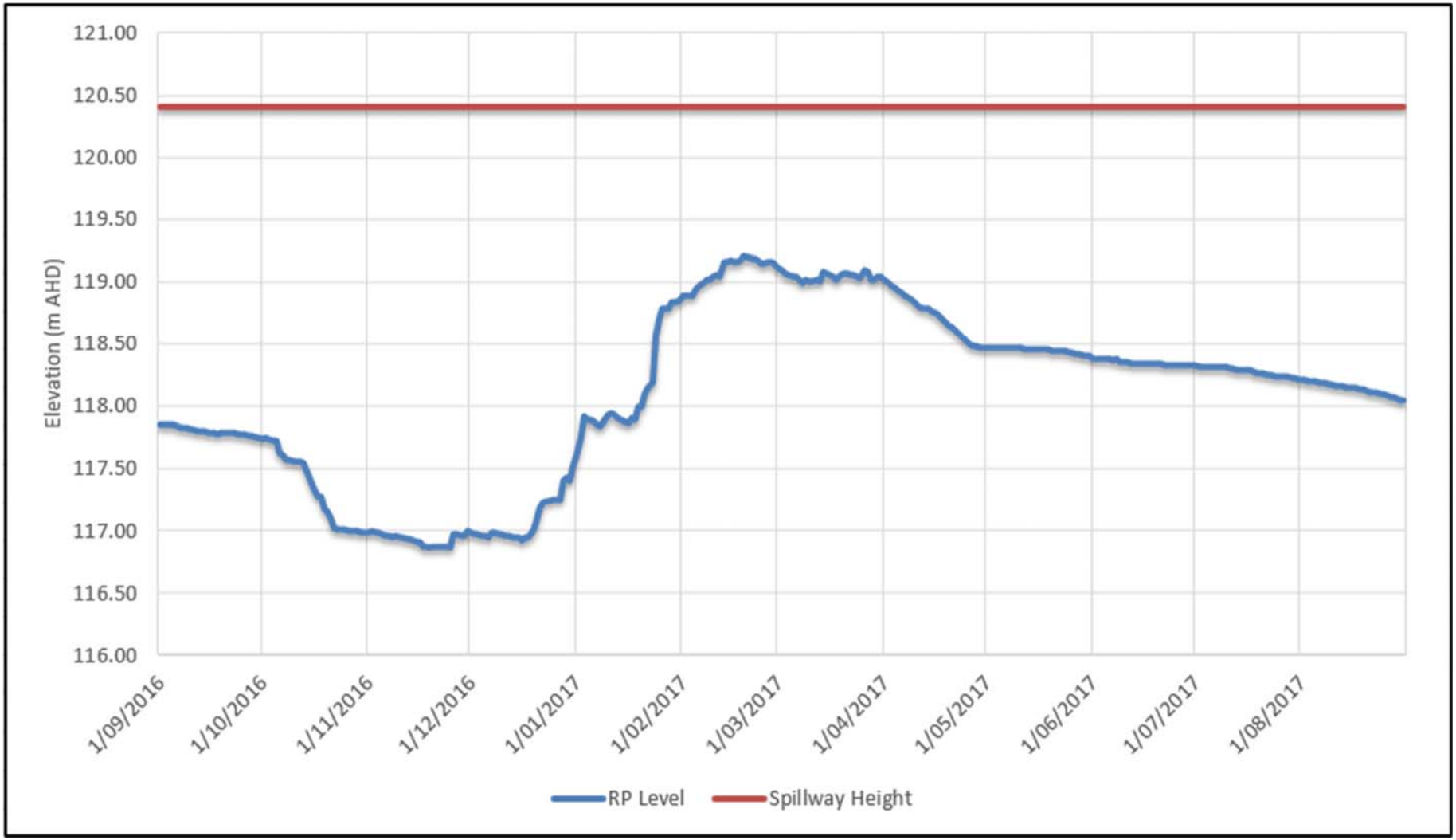

Figure 22. RP1 level against spillway height

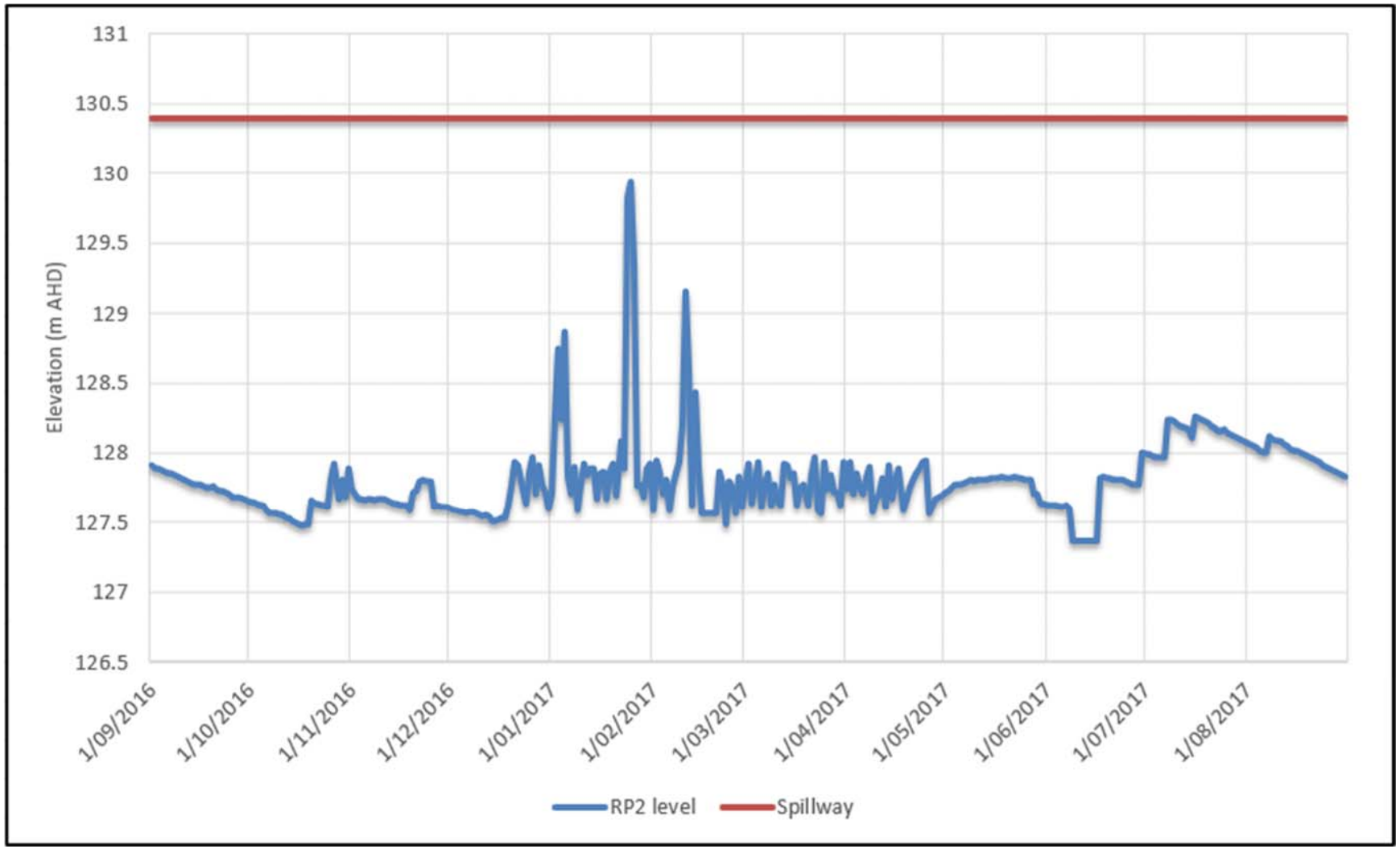

Figure 23. RP2 level against spillway height

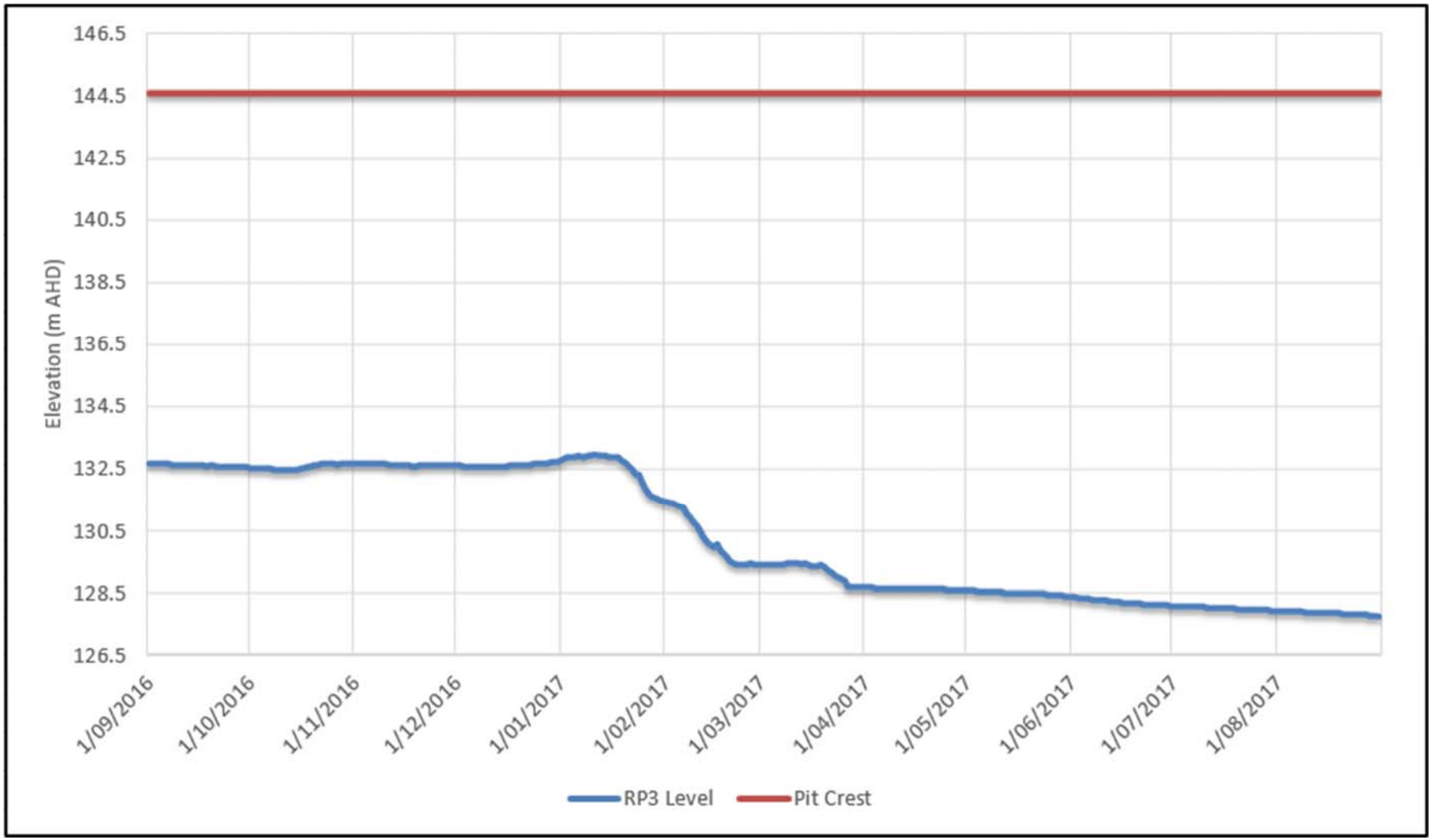

Figure 24. RP3 level against pit crest

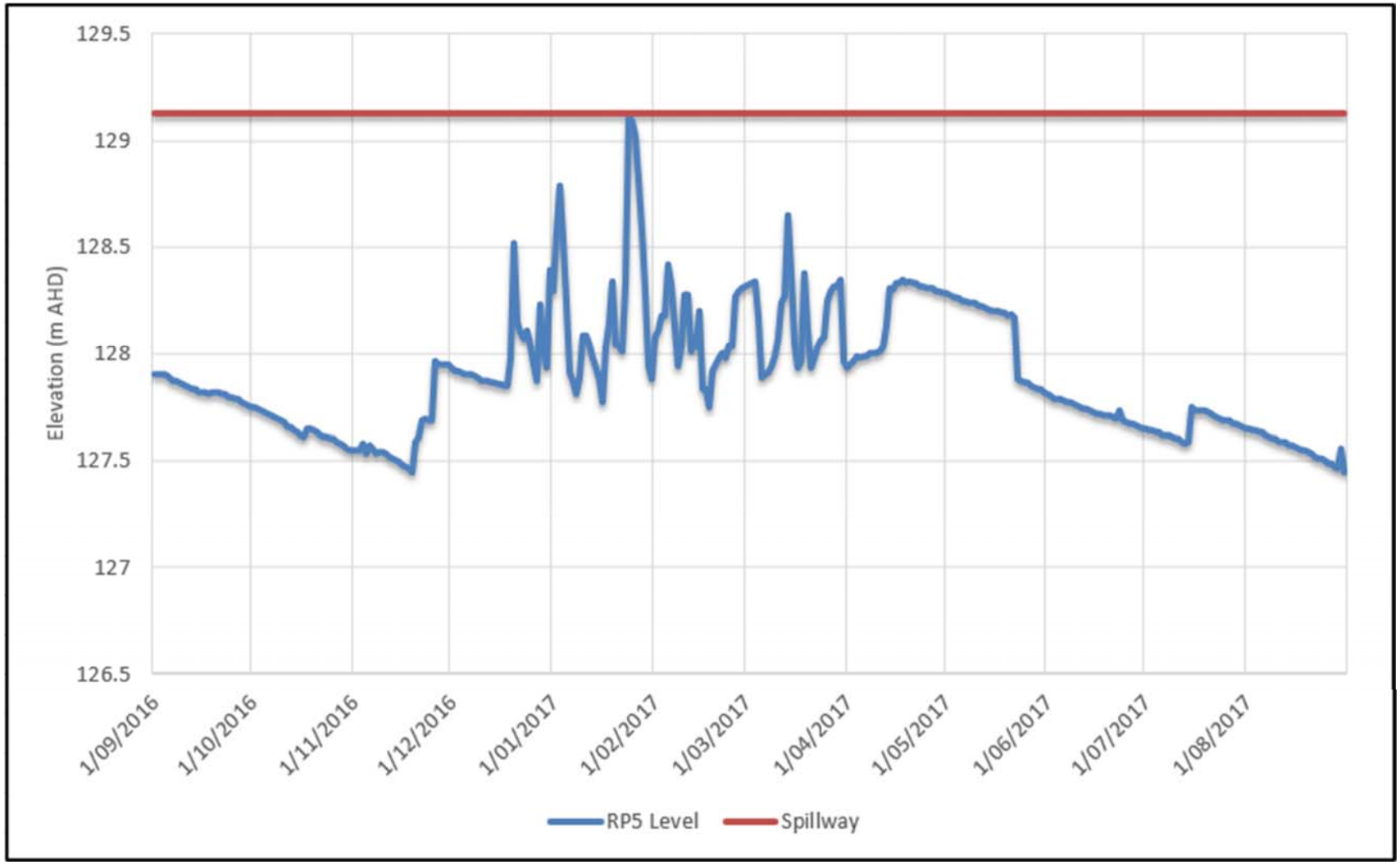

Figure 25. RP5 level against spillway height

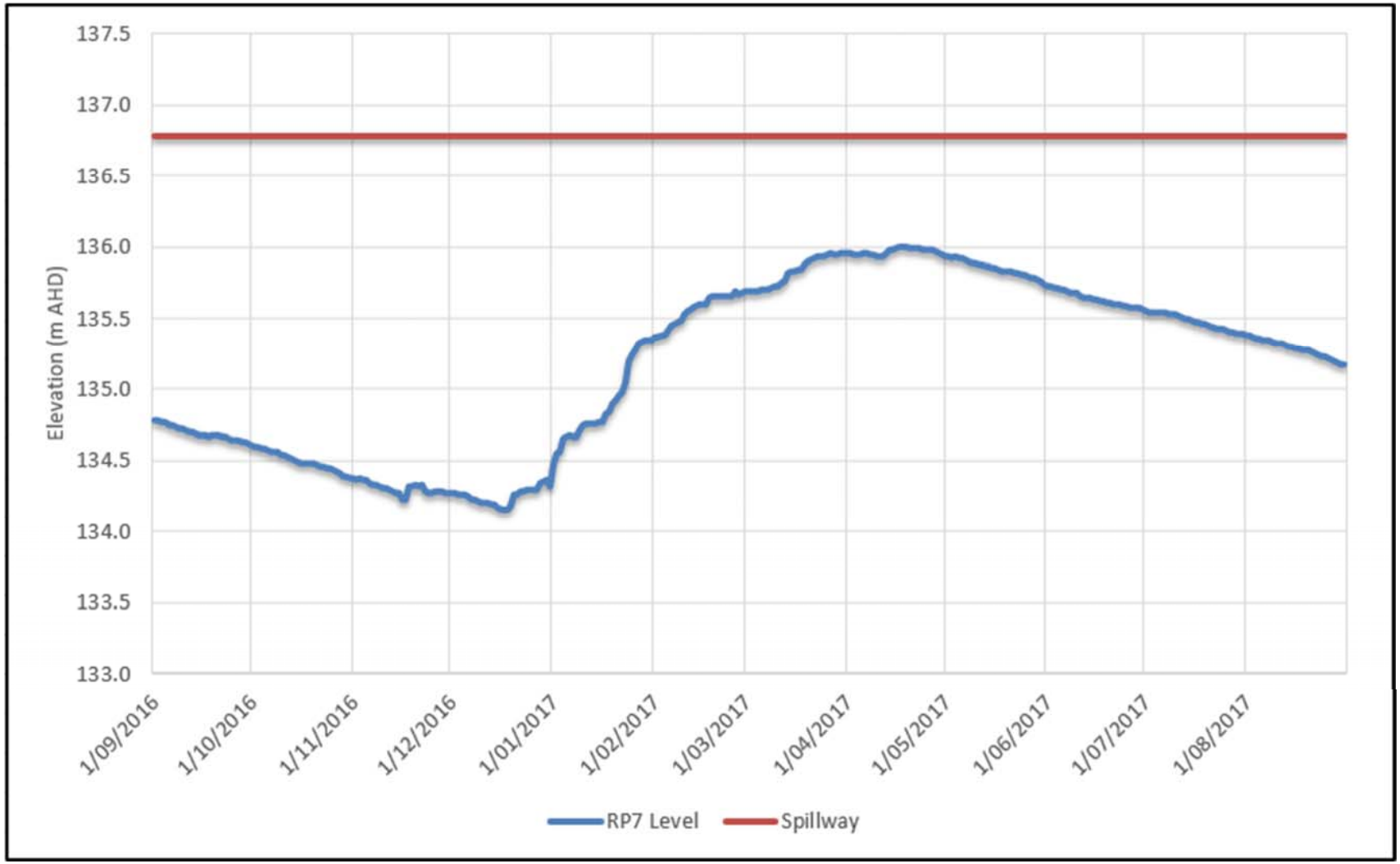

Figure 26. RP7 level against spillway height

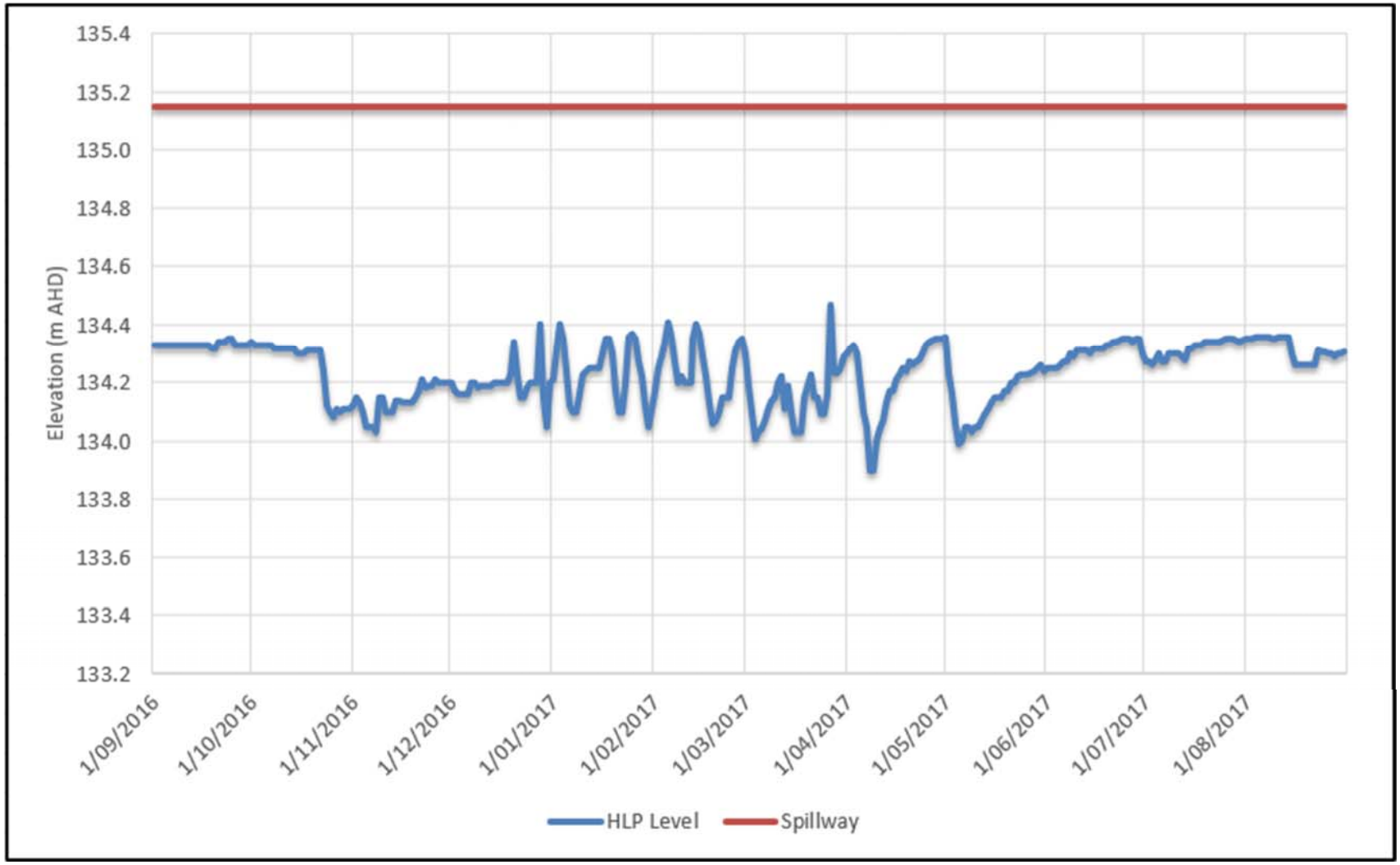

Figure 27. Heap Leach Moat level against spillway height

6.7.3.1.2 Pond Physical Quality

Electrical Conductivity (EC) remained relatively constant across the reporting period, particularly in those ponds with larger volume and surface area such as RP1, RP3 and RP7 (Figure 28). These larger water bodies exhibit a typical wet season dilution and dry season concentration curve. The smaller water bodies (HLP, RP2 and RP5) display more erratic EC values in line with greater fluctuations from rainfall input and pumping outputs. RP2 displays similar EC values to RP3 after water from this location was pumped into these ponds for maintenance purposes such as liner protection.

Retention ponds 1, 2, 5 and 7 display consistently low pH values (below 4.5) for the entire reporting period. Like last year, wet season rainfall failed to elevate the pH from dry season levels (Figure 29). The HLP displayed strong seasonal changes within the reporting period, with elevated pH approaching neutral during the wet season and lower pH during the dry season. RP3 displayed pH levels at or above neutral during the entire reporting period.

All retention ponds display surface temperatures that varied in response to fluctuating seasonal temperatures (Figure 30). Higher temperatures occur during the late dry season and throughout the wet season, with lower temperatures during cooler dry season months. Figure 30 shows a dip in surface water temperature during the middle of the wet season; consistent with cloudy days and high rainfall at this time of year.

Dissolved Oxygen levels follow a similar trend across most of the retention ponds with levels above 85% saturation for the whole year other than during high wet season flows in January and February 2017 (Figure 31). All ponds display divergent behaviour during the peak wet season with a site wide range between 60 and 110 percent saturation.

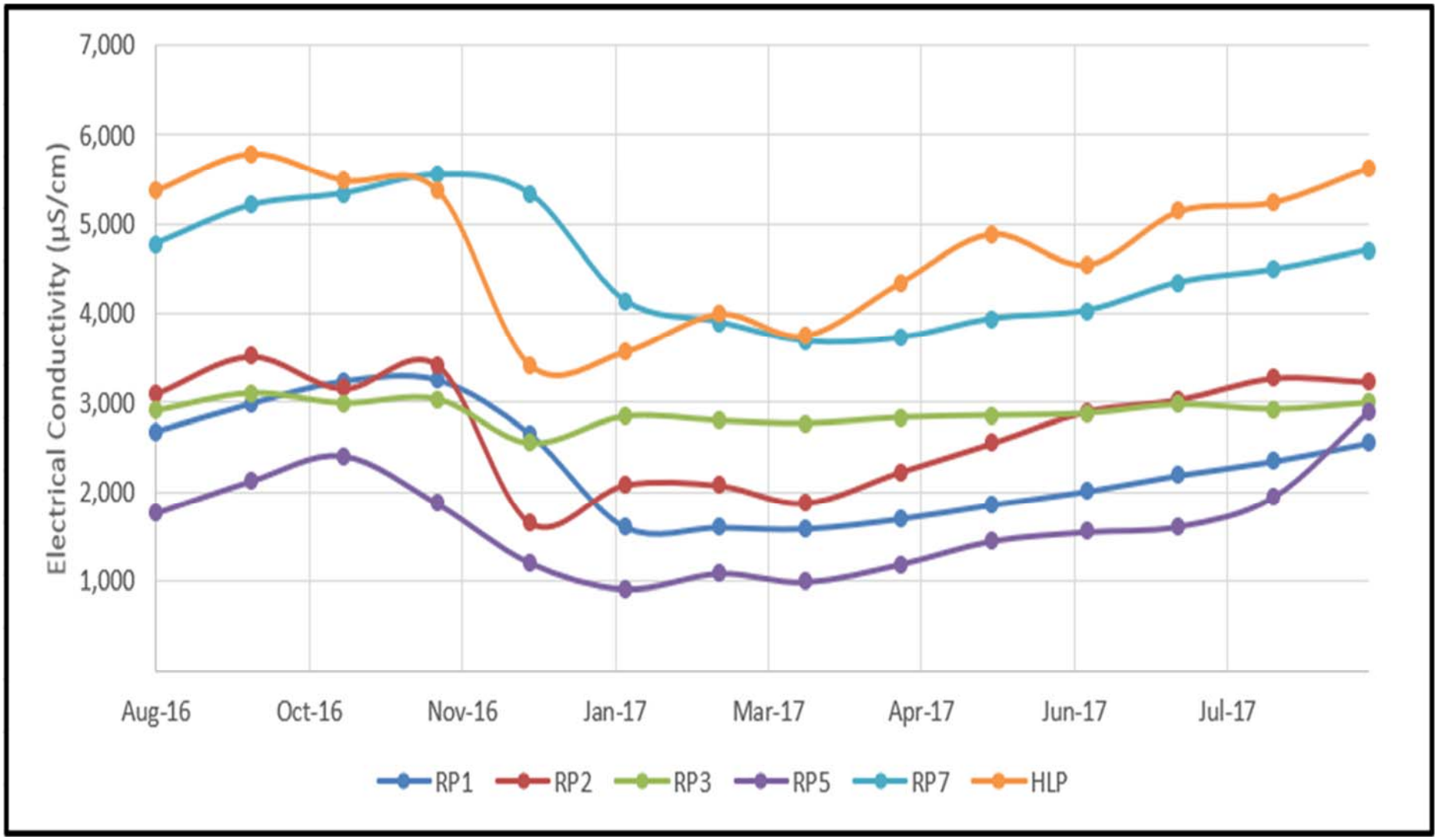

Figure 28. EC of Retention Ponds

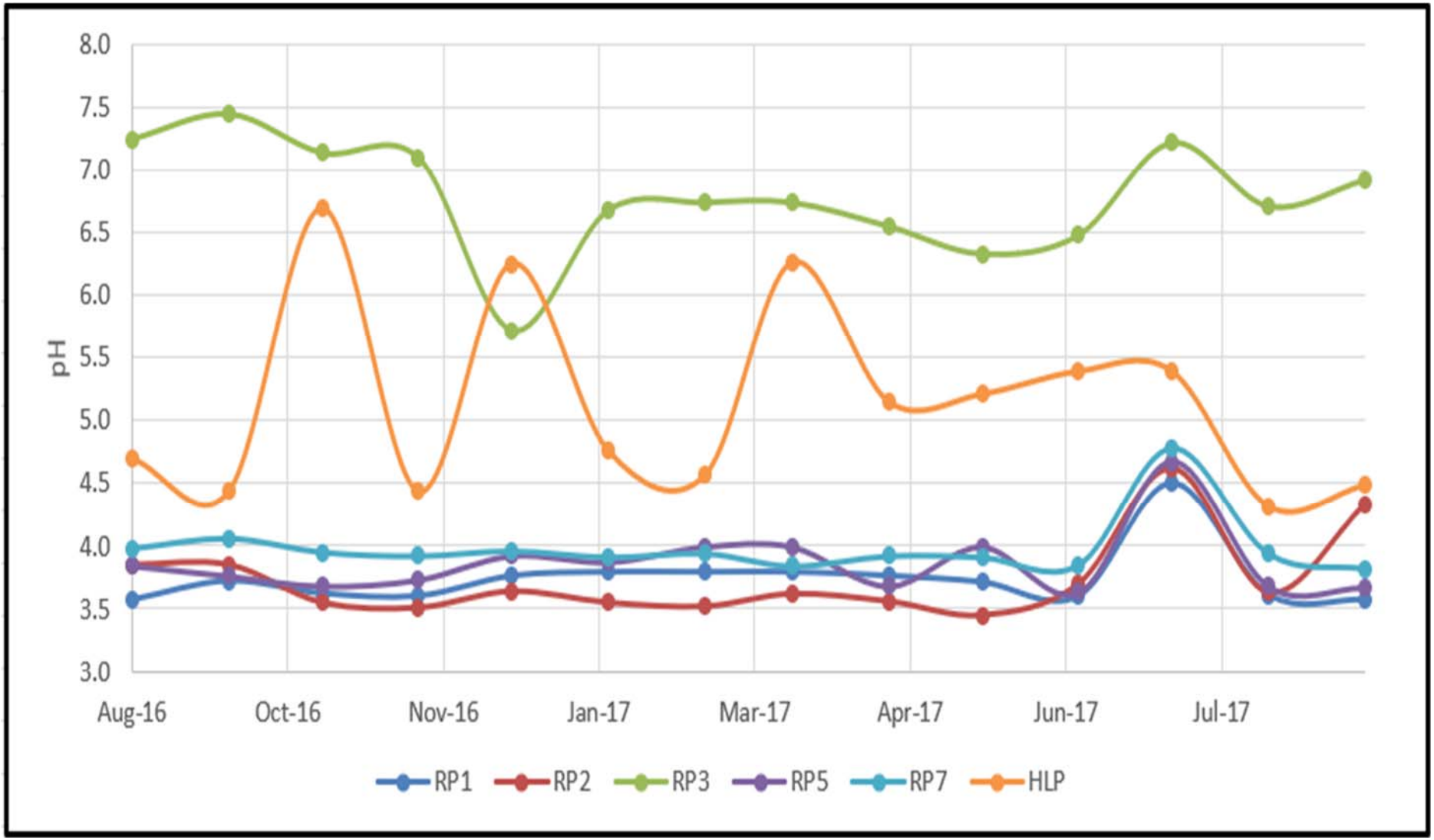

Figure 29. pH of Retention Ponds

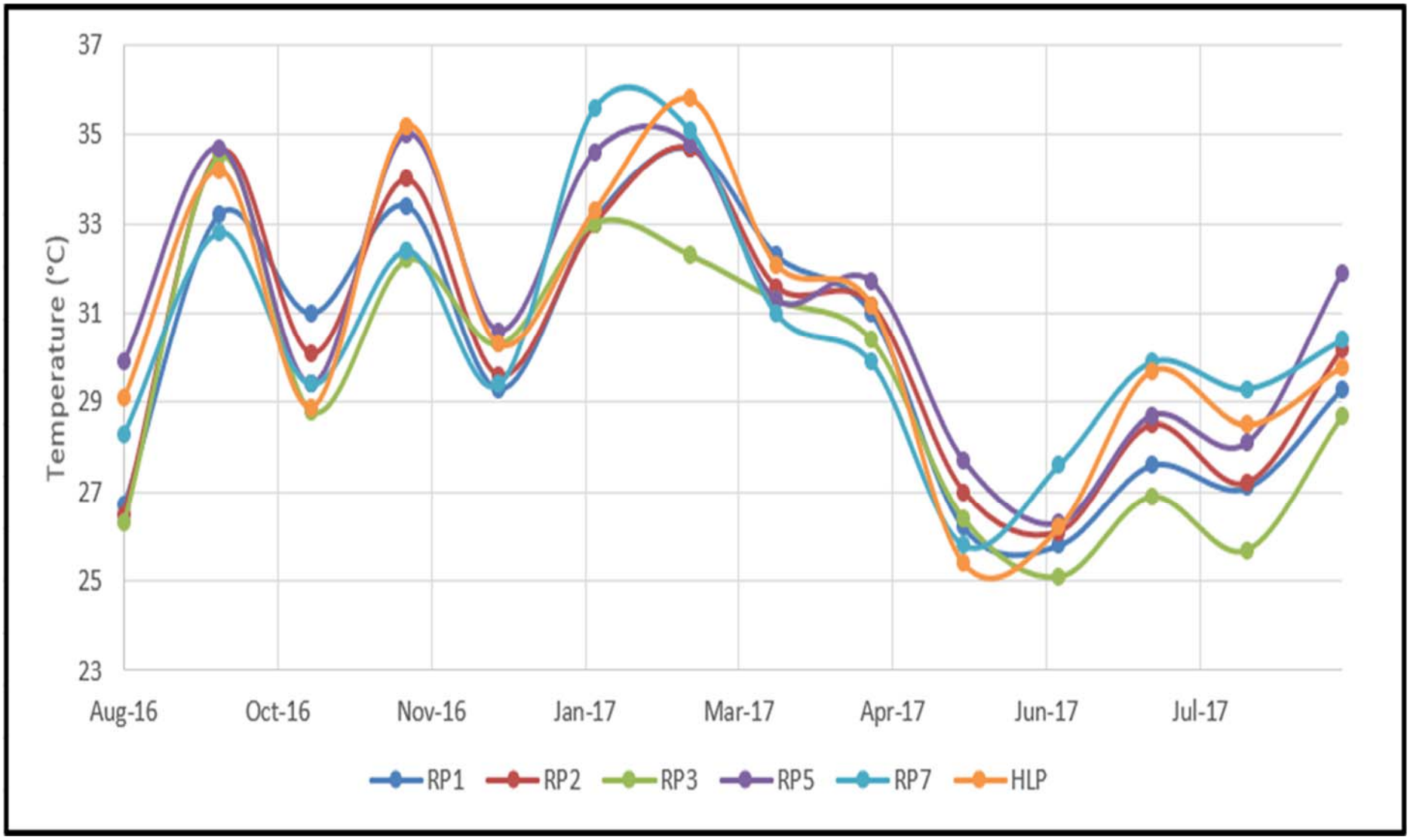

Figure 30. Temperature of Retention Ponds

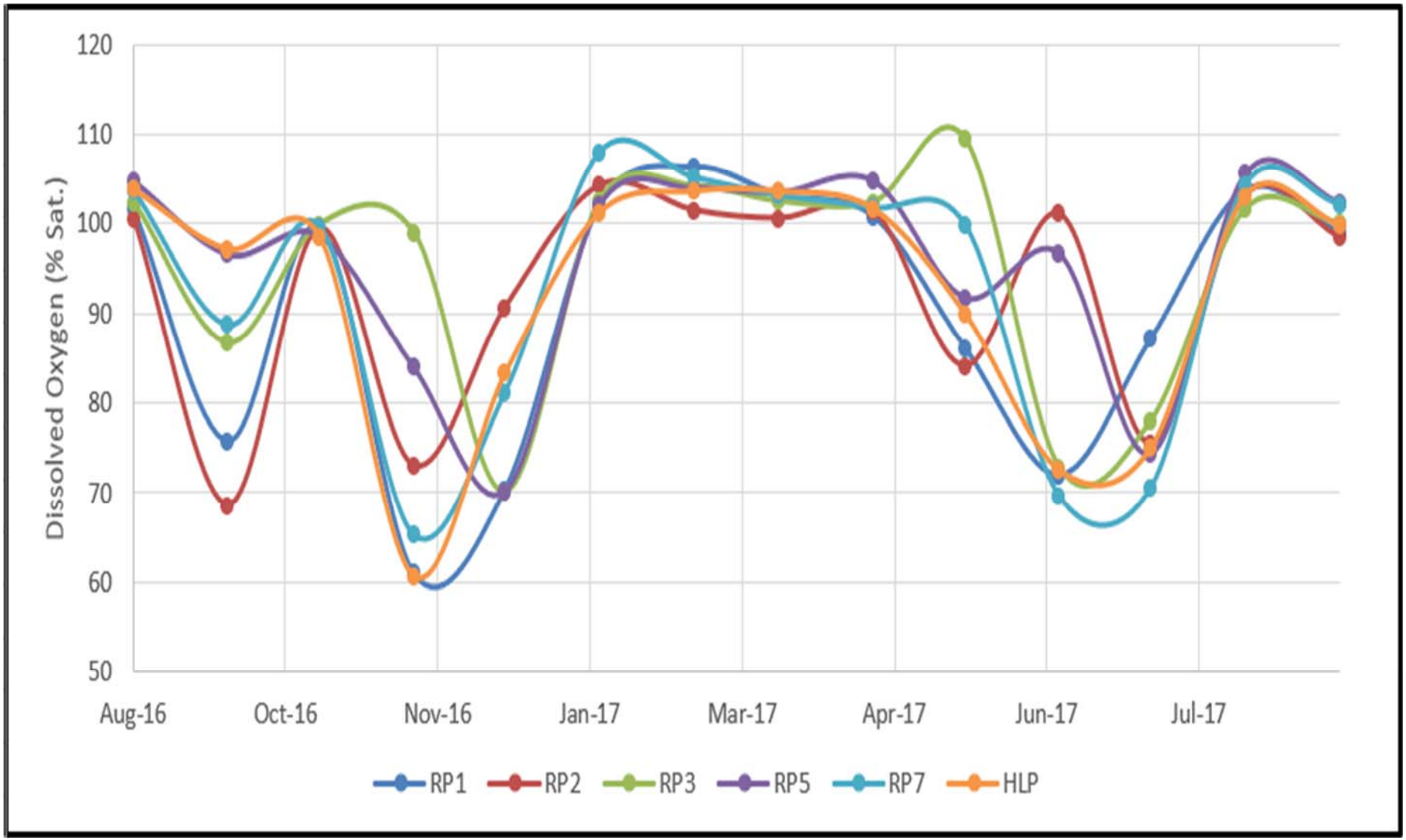

Figure 31. Dissolved Oxygen of Retention Ponds

6.7.3.1.3 Pond Chemical Quality

Figure 32 through Figure 43 present filterable general ions and trace metals from monthly water samples collected from retention ponds across the Mt Todd site. The selection of figures illustrates the variability in chemical composition of these waters over the reporting period.

General ions (particularly SO_4 and Ca) are in high concentrations in RP3, RP7 and the HLP and in lower concentrations in RP1, RP2 and RP5. Figure 32 through Figure 34 compare these concentrations over the reporting period from all retention ponds.

Trace metal concentrations are displayed in Figure 35 through Figure 43. RP3 filterable concentrations are much lower than the other retention ponds due to the annual in-situ water treatment. All other ponds display elevated levels of most trace metals and are strongly influenced by water movement activities on site. Understandably RP1 and RP7 display the most similar chemical composition as RP7 receives all the untreated RP1 water removed during the dry season and also during wet season level maintenance pumping. Larger ponds display major annual fluctuations (wet and dry season), while smaller ponds (RP2, RP5 and the HLP) are much more responsive to fresh water inputs during wet season rainfall events.

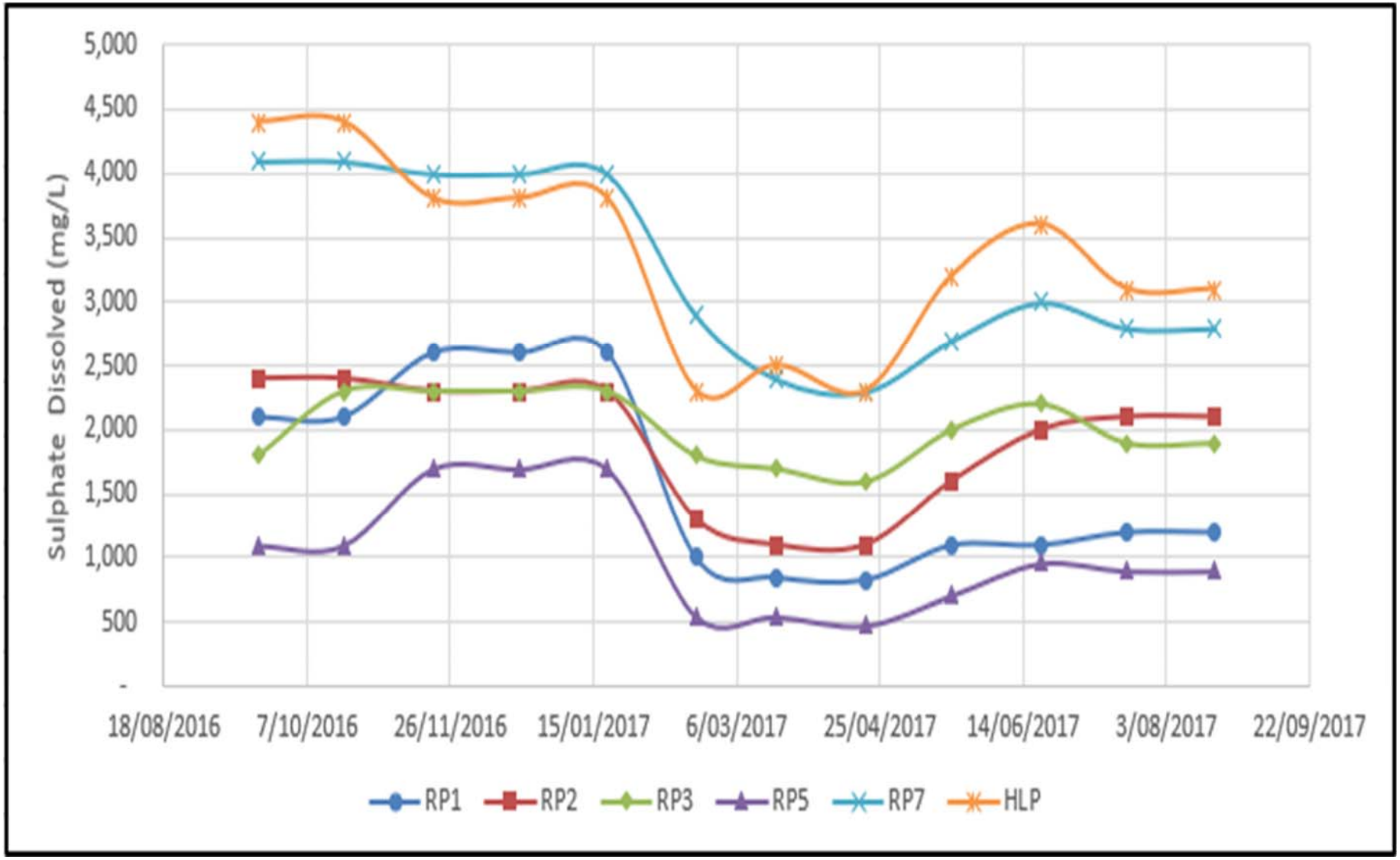

Figure 32. Sulphate in Primary Retention Ponds

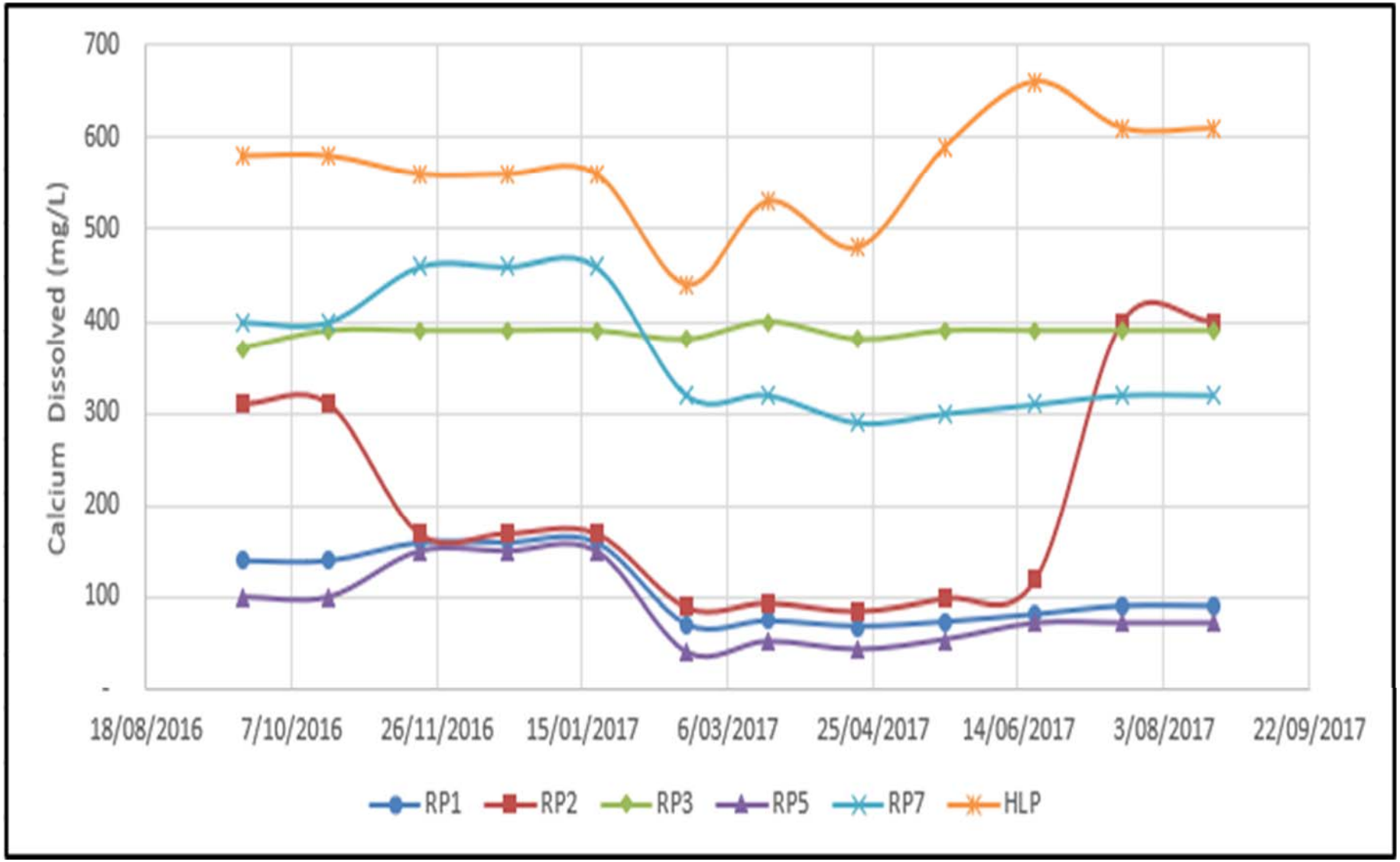

Figure 33. Calcium (0.45 µm filtered) in Primary Retention Ponds

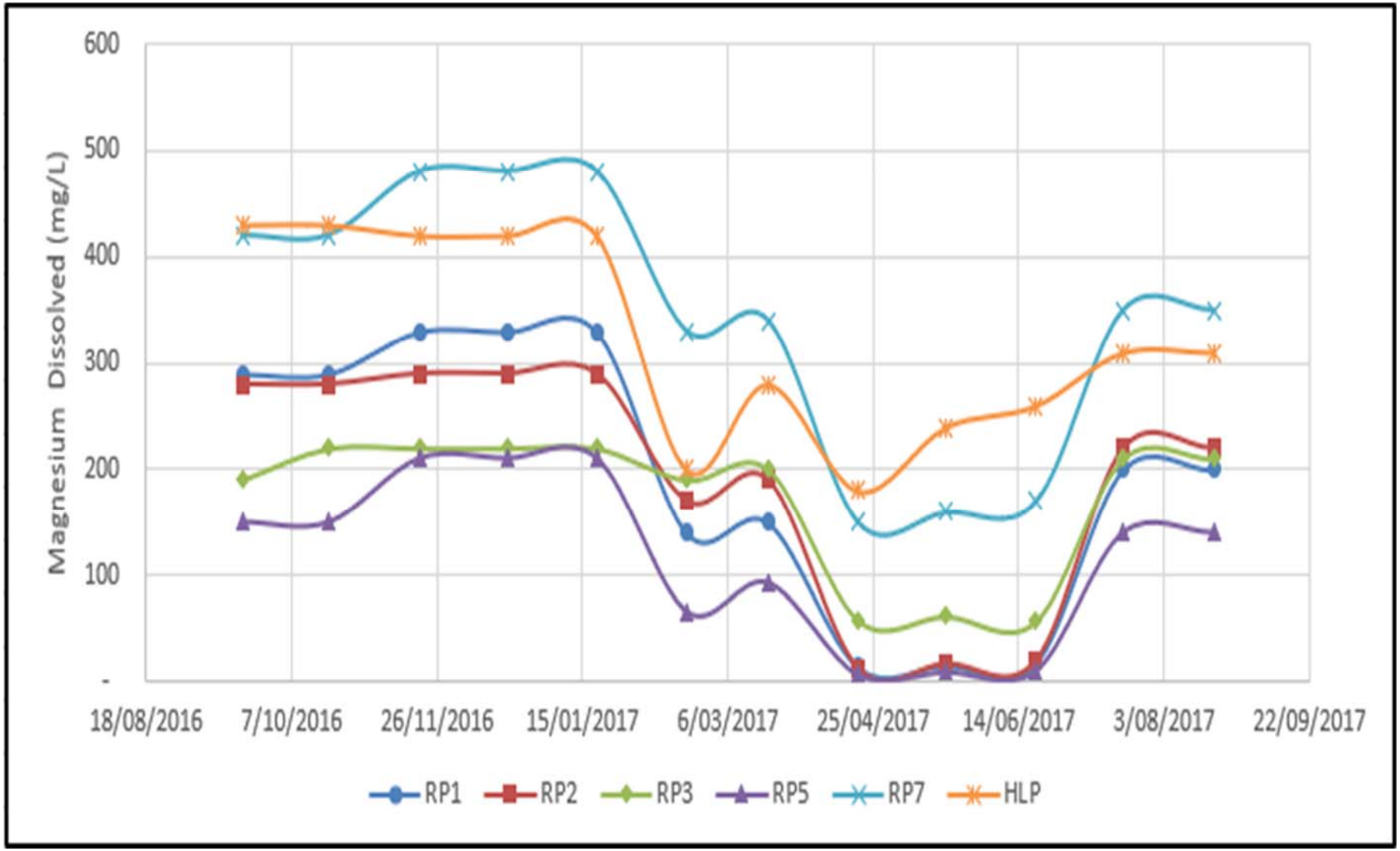

Figure 34. Magnesium (0.45 µm filtered) in Primary Retention Ponds

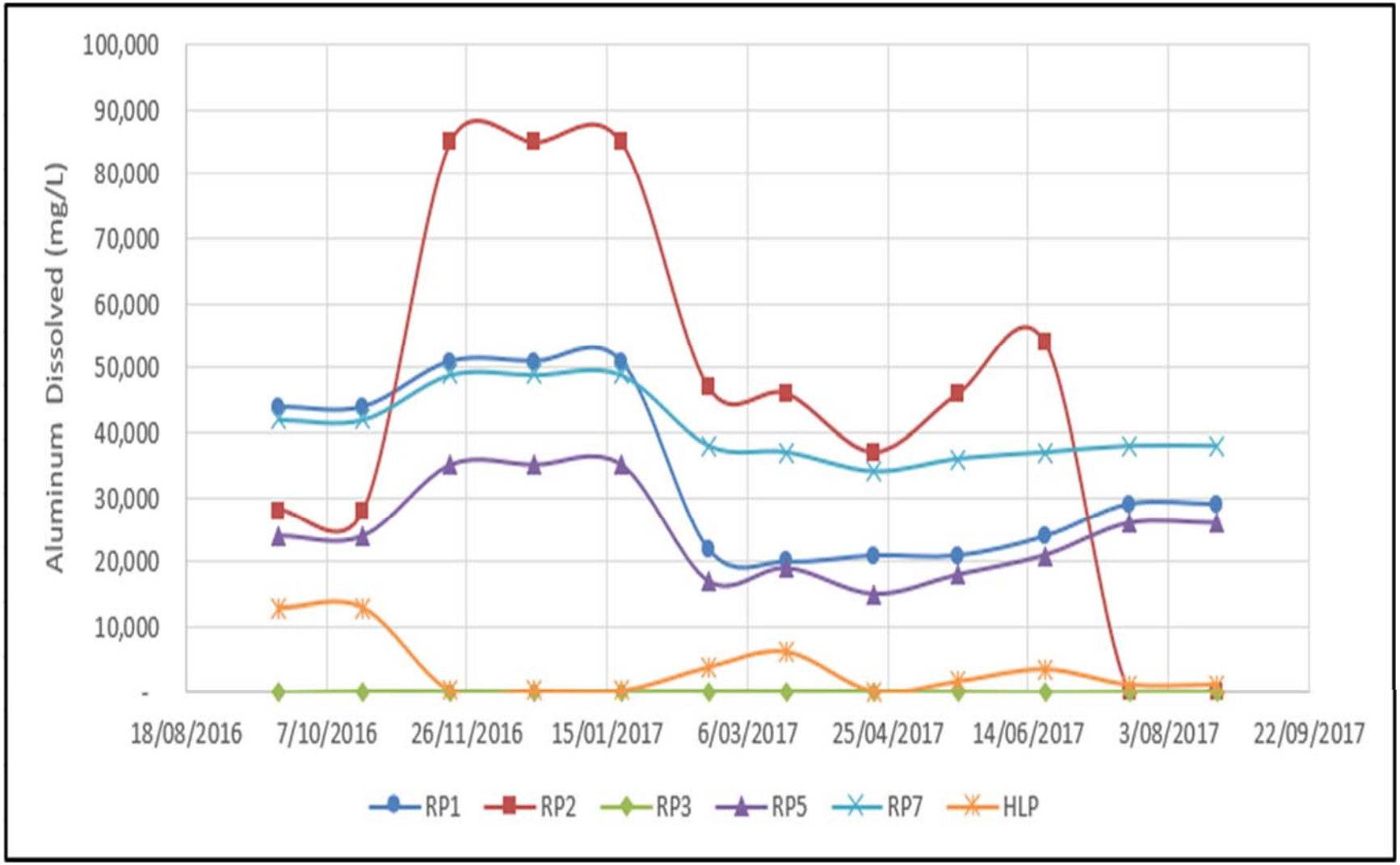

Figure 35. Aluminium (0.45 µm filtered) in Primary Retention Ponds

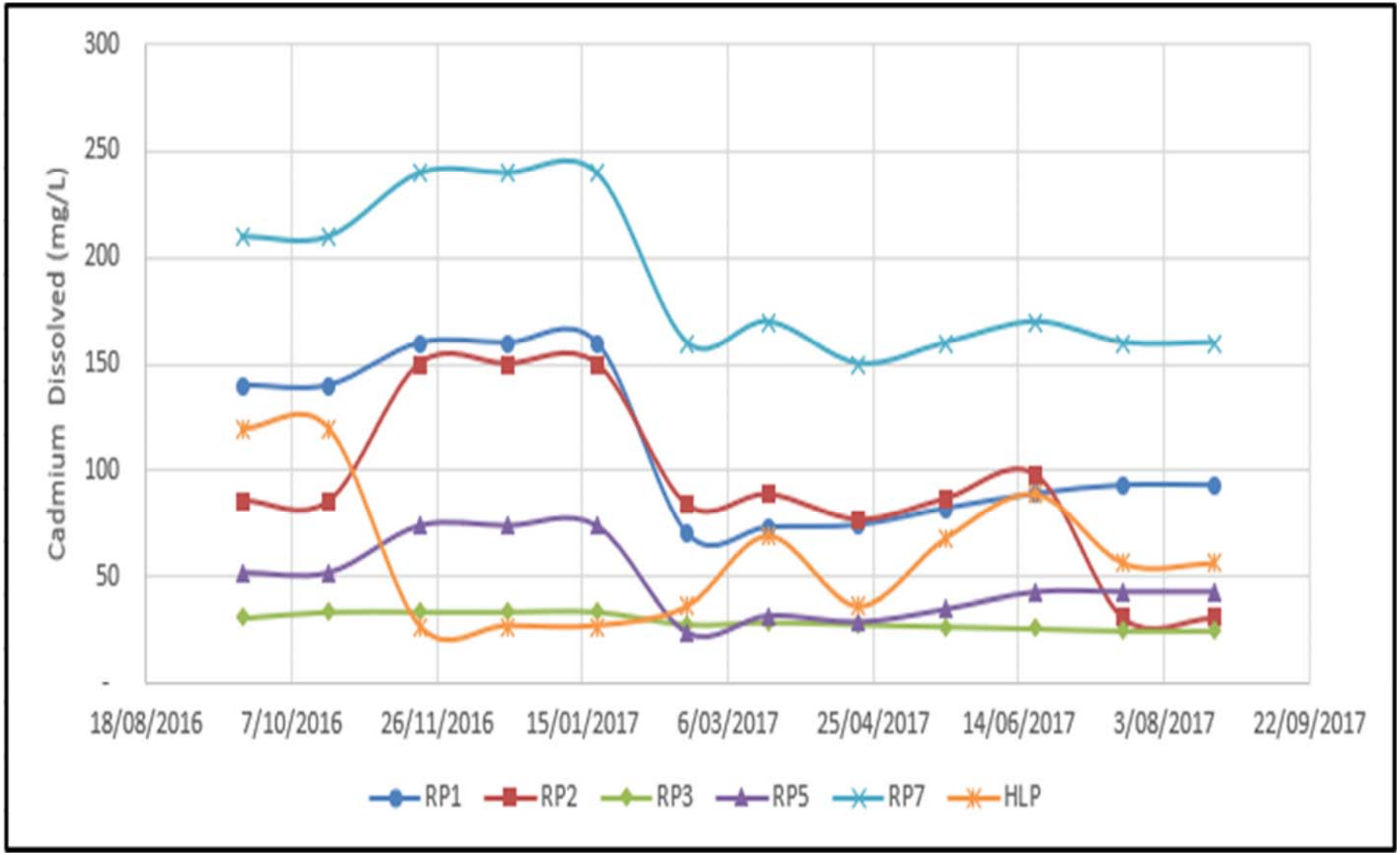

Figure 36. Cadmium (0.45 µm filtered) in Primary Retention Ponds

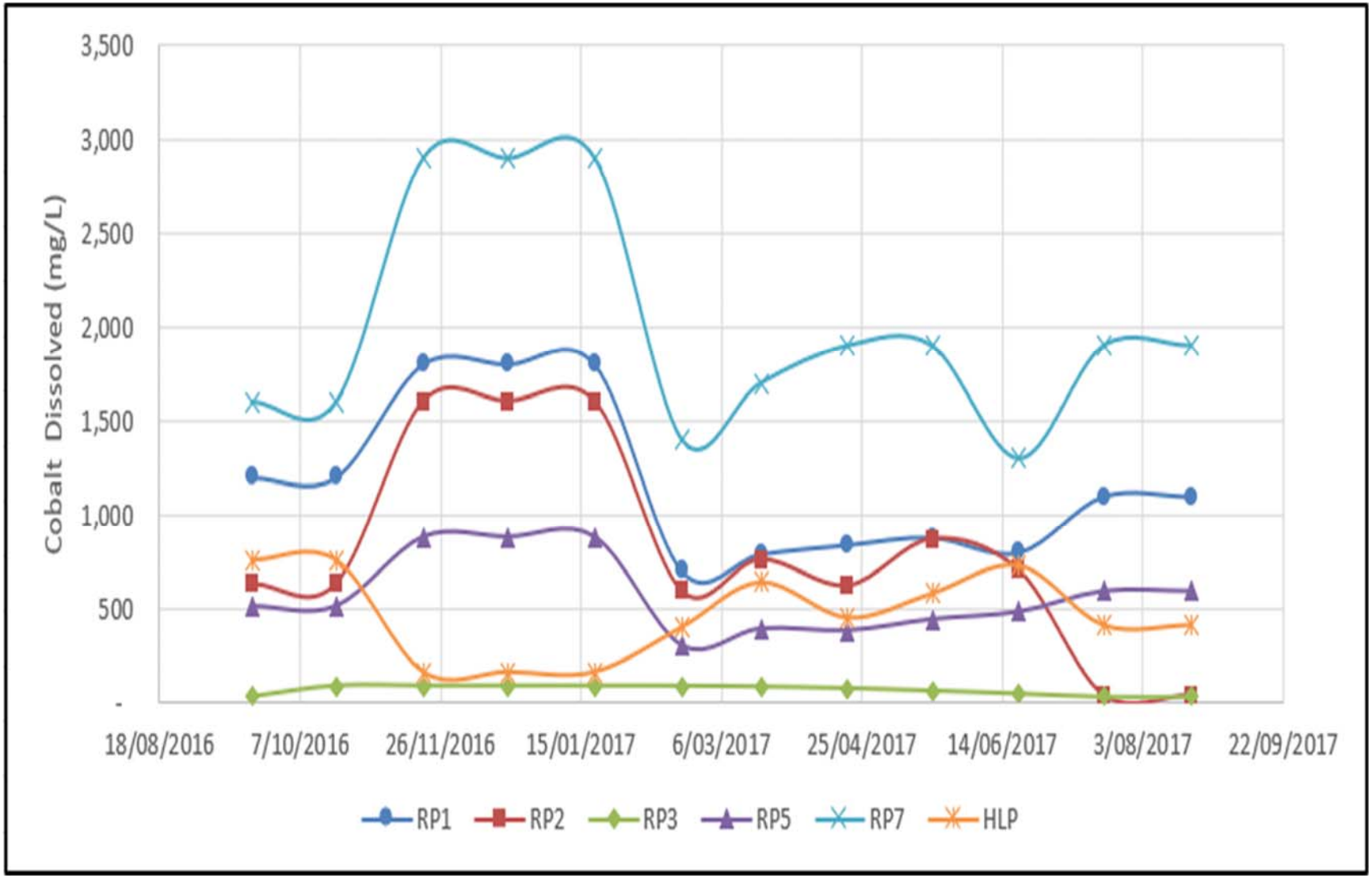

Figure 37. Cobalt (0.45 µm filtered) in Primary Retention Ponds

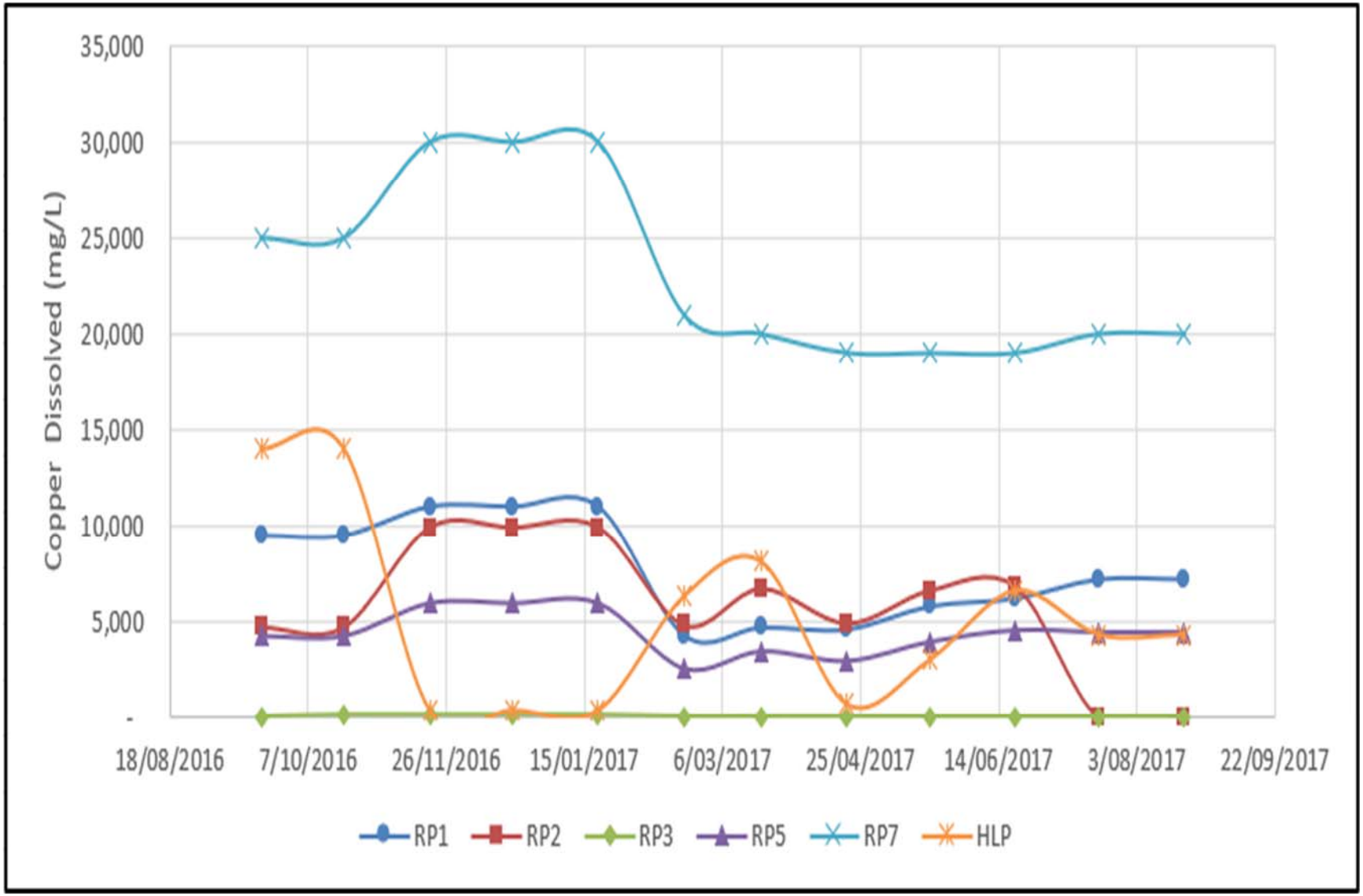

Figure 38. Copper (0.45 µm filtered) in Primary Retention Ponds

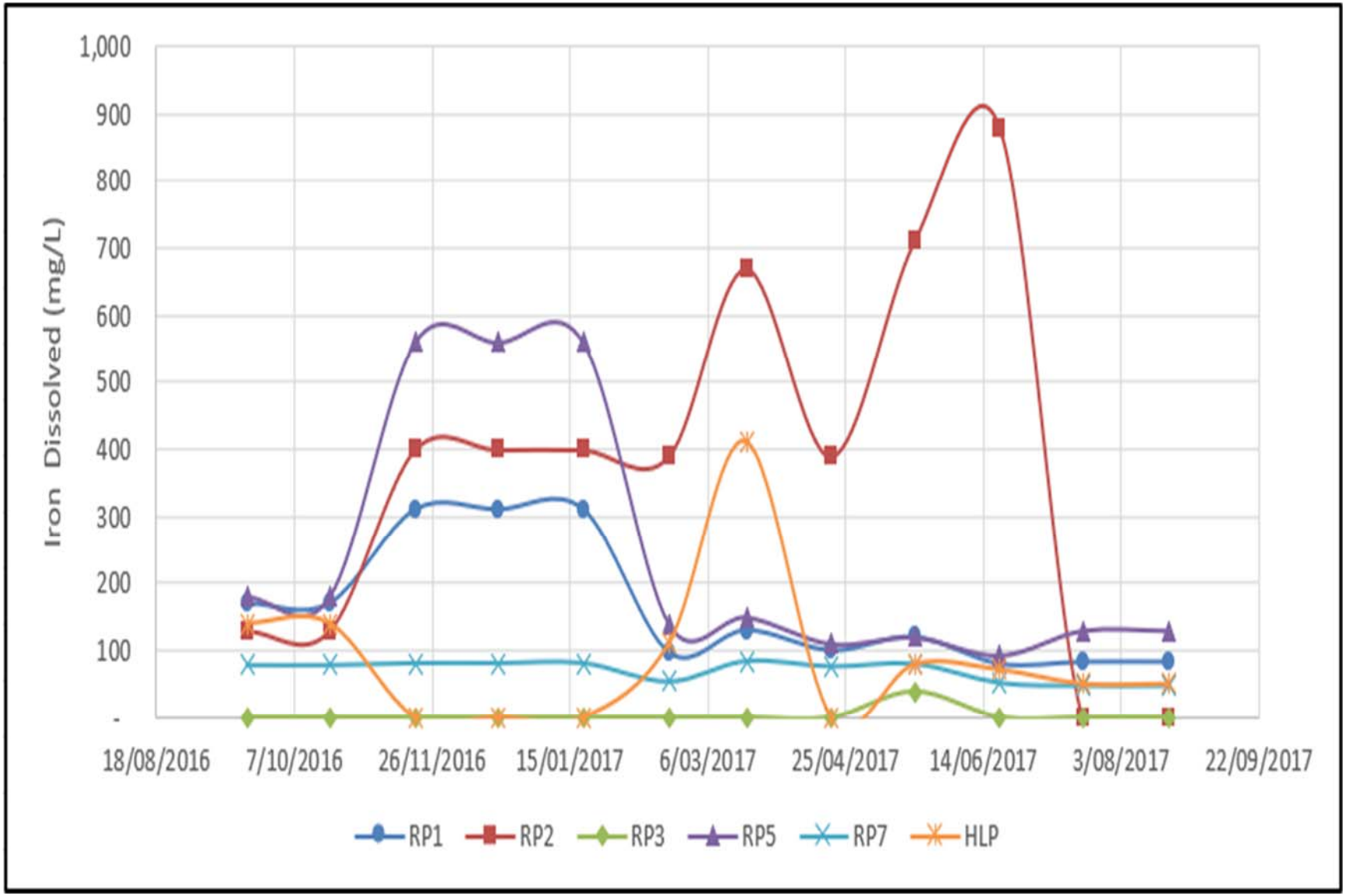

Figure 39. Iron (0.45 µm filtered) in Primary Retention Ponds

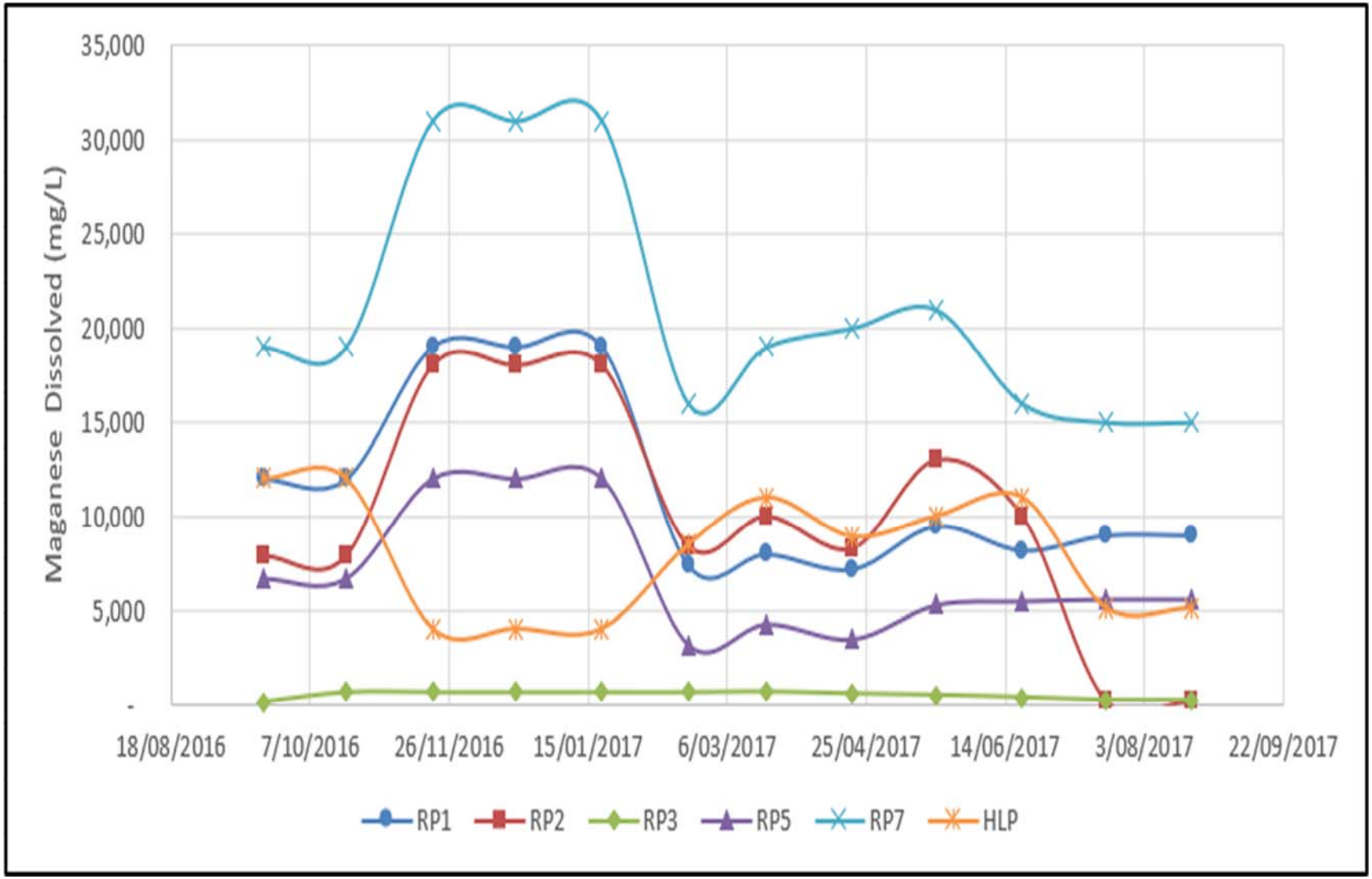

Figure 40. Manganese (0.45 µm filtered) in Primary Retention Ponds

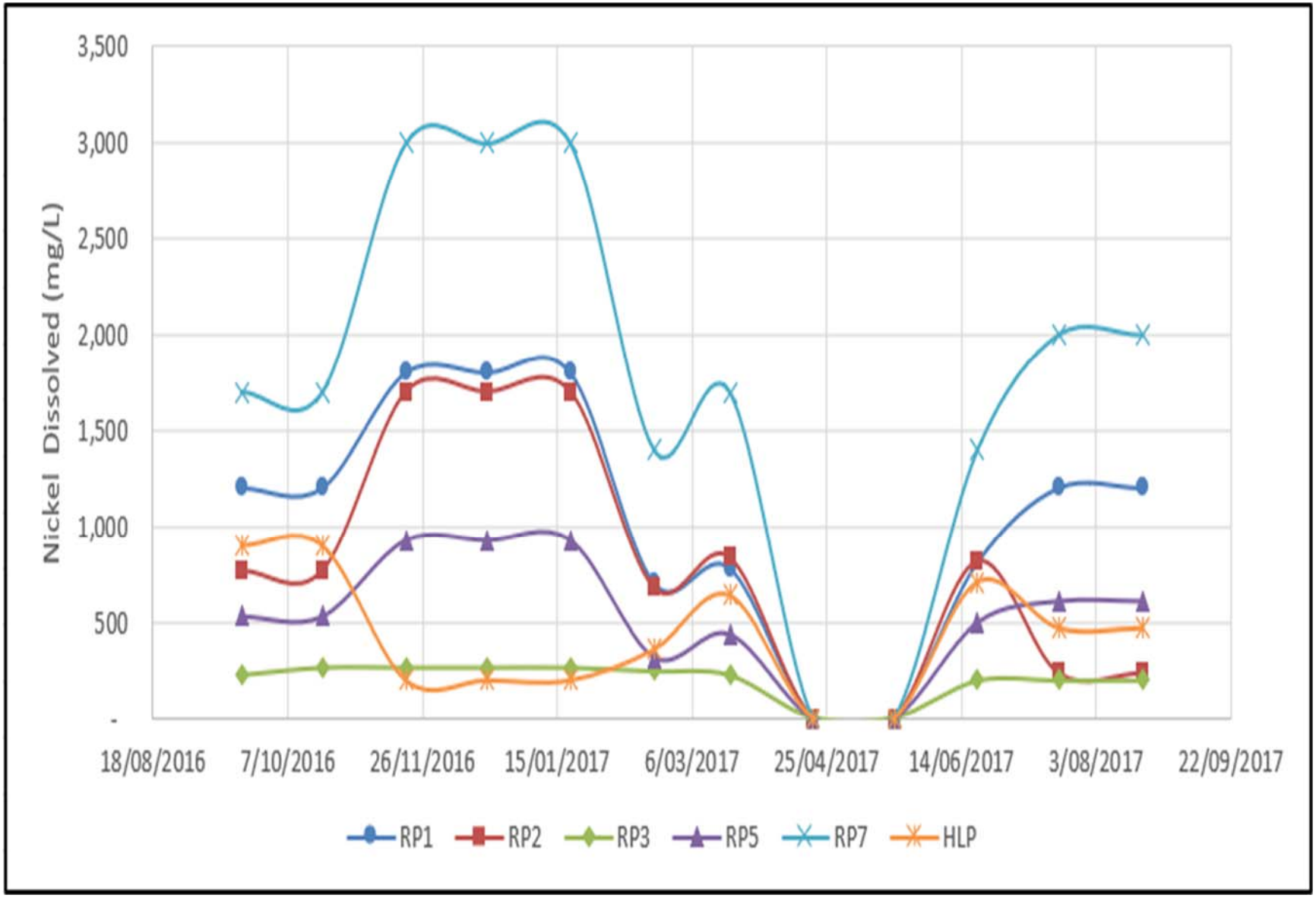

Figure 41. Nickel (0.45 µm filtered) in Primary Retention Ponds

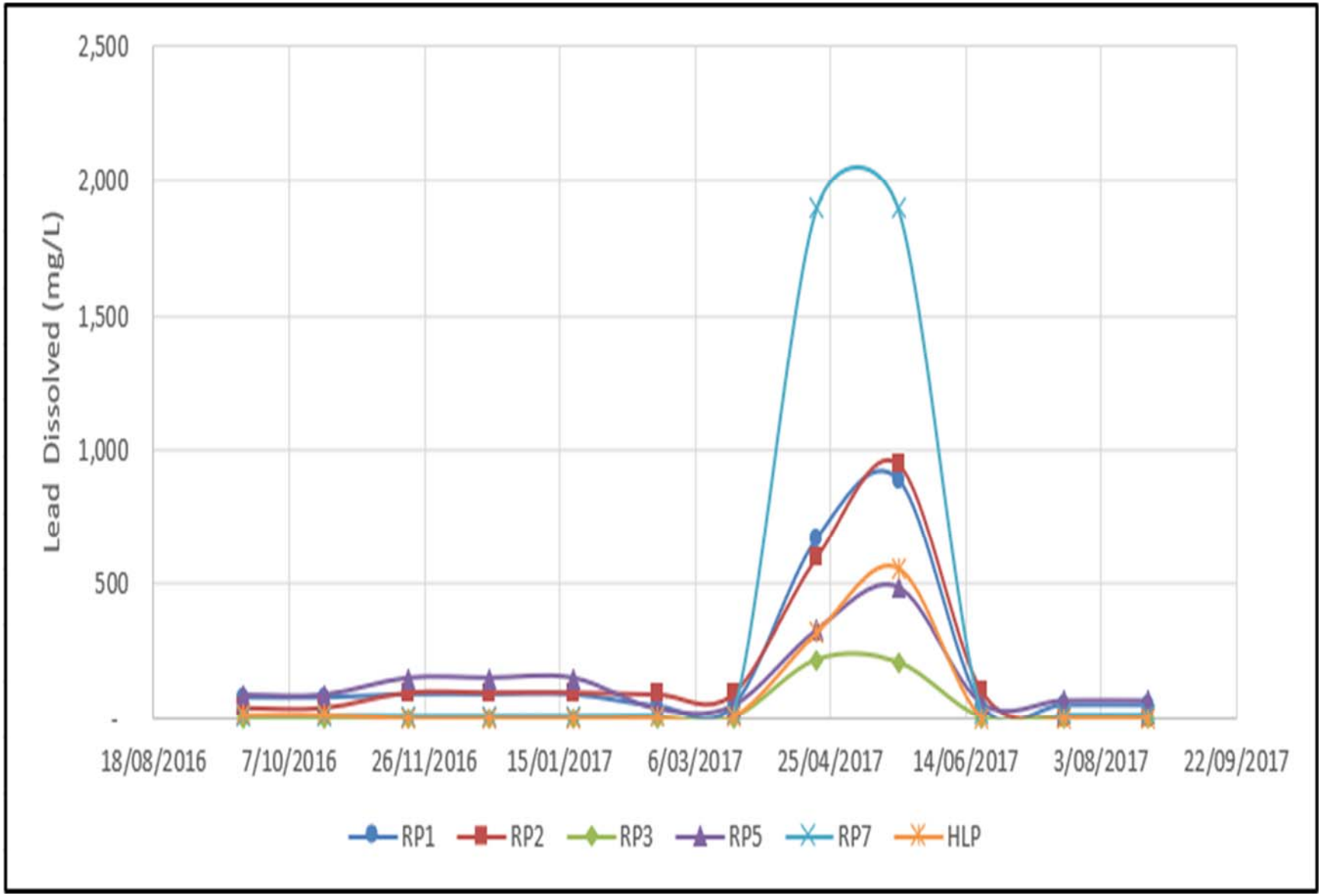

Figure 42. Lead (0.45 µm filtered) in Primary Retention Ponds

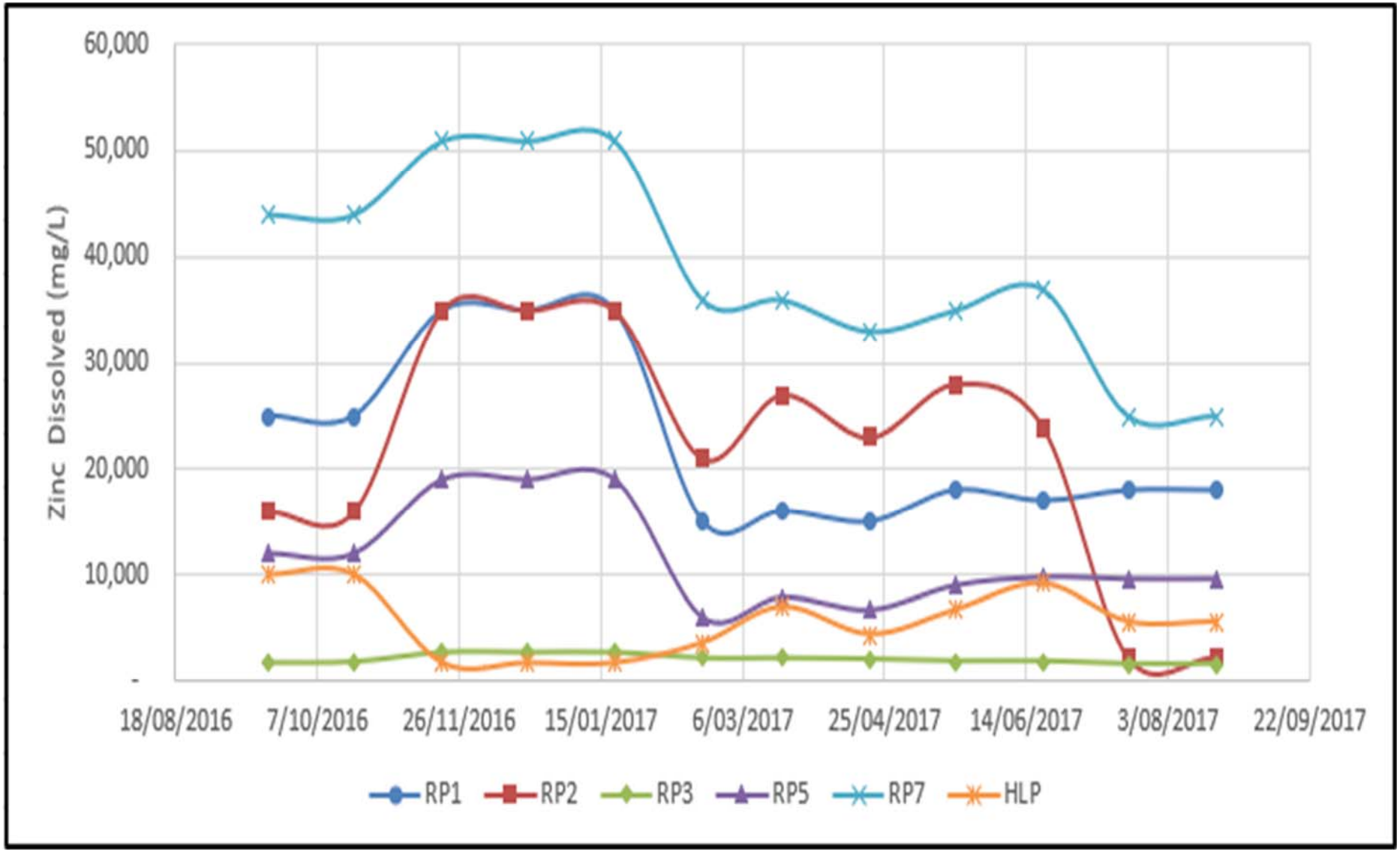

Figure 43. Zinc (0.45 µm filtered) in Primary Retention Ponds

6.7.3.2 *Rivers, Streams and Raw Water Dam*

The following section groups the Raw Water Dam and upstream reference sites (SW2, SW12 & SW13), with the downstream Edith River sites (SW15, SW4 and SW10) due to their low chemistry concentrations when compared with on-site receiving waters. All other receiving water sites (SW1, SW11, SW14, SW3, SW5) are presented together to provide a comparison of the range of chemistry concentrations experienced across the site. Site locations are displayed in Figure 19 section 6.2.1.9.

6.7.3.2.1 Physical Quality

Reference (upstream) and Edith River sites are characterised by low electrical conductivity and pH levels slightly acidic with an average of 6.2. Figure 44 and Figure 45 display variability in EC and pH respectively, across these sites. Dissolved oxygen levels fluctuate between 74 and 115 % saturation but do not appear to follow any spatial or seasonal trends. Water temperature is highly correlated to seasonal fluctuations in ambient temperature, ranging from 21 to 36°C.

Figure 48 and Figure 49 display variability in EC and pH respectively, across receiving waters. Receiving waters across the site are characterised by higher electrical conductivity and pH levels acidic of neutral with an average of 6.3. Temperature and dissolved oxygen show typical fluctuations similar to the reference sites and are driven by seasonal factors.

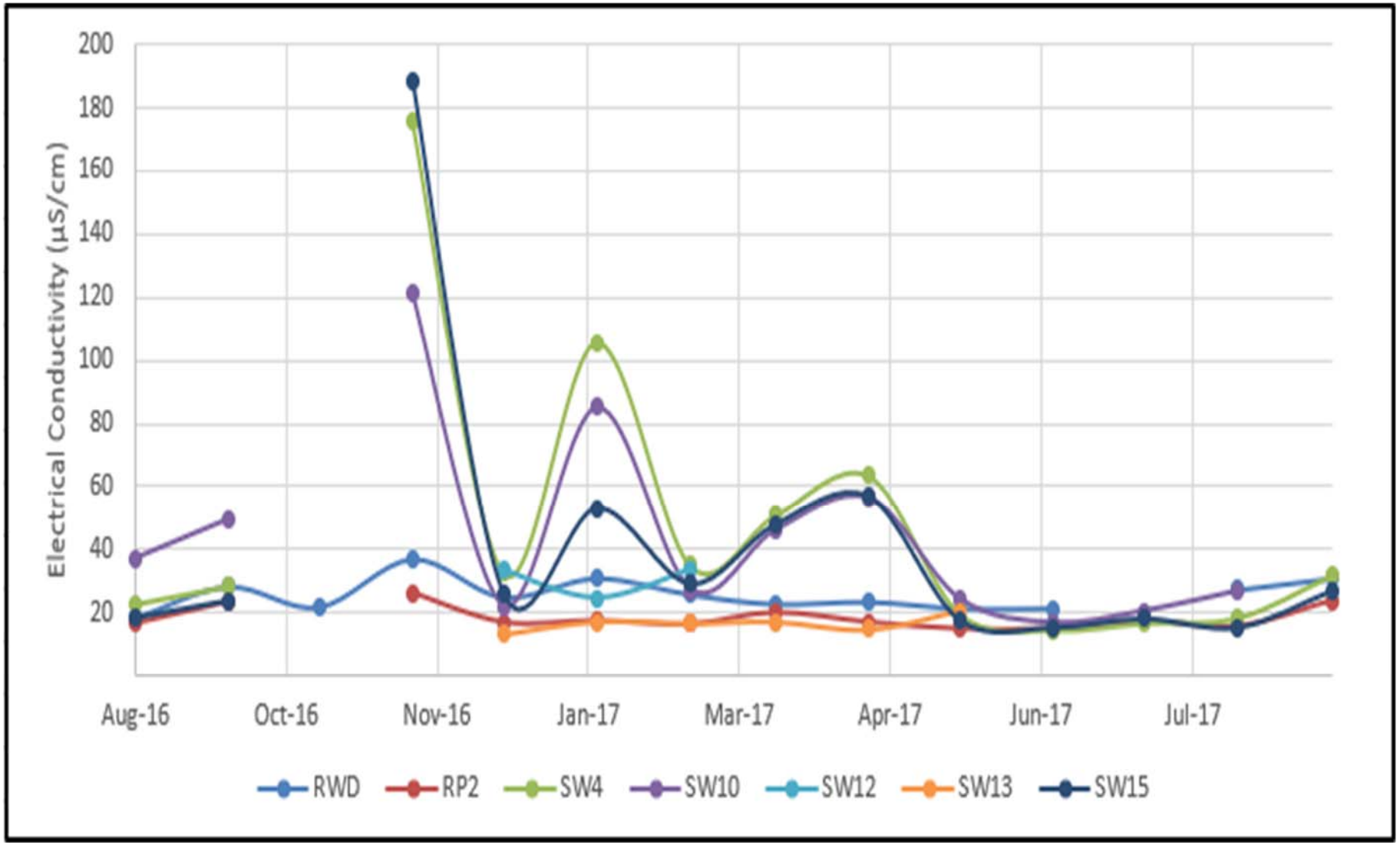

Figure 44. EC of Reference Sites and Edith River Sites

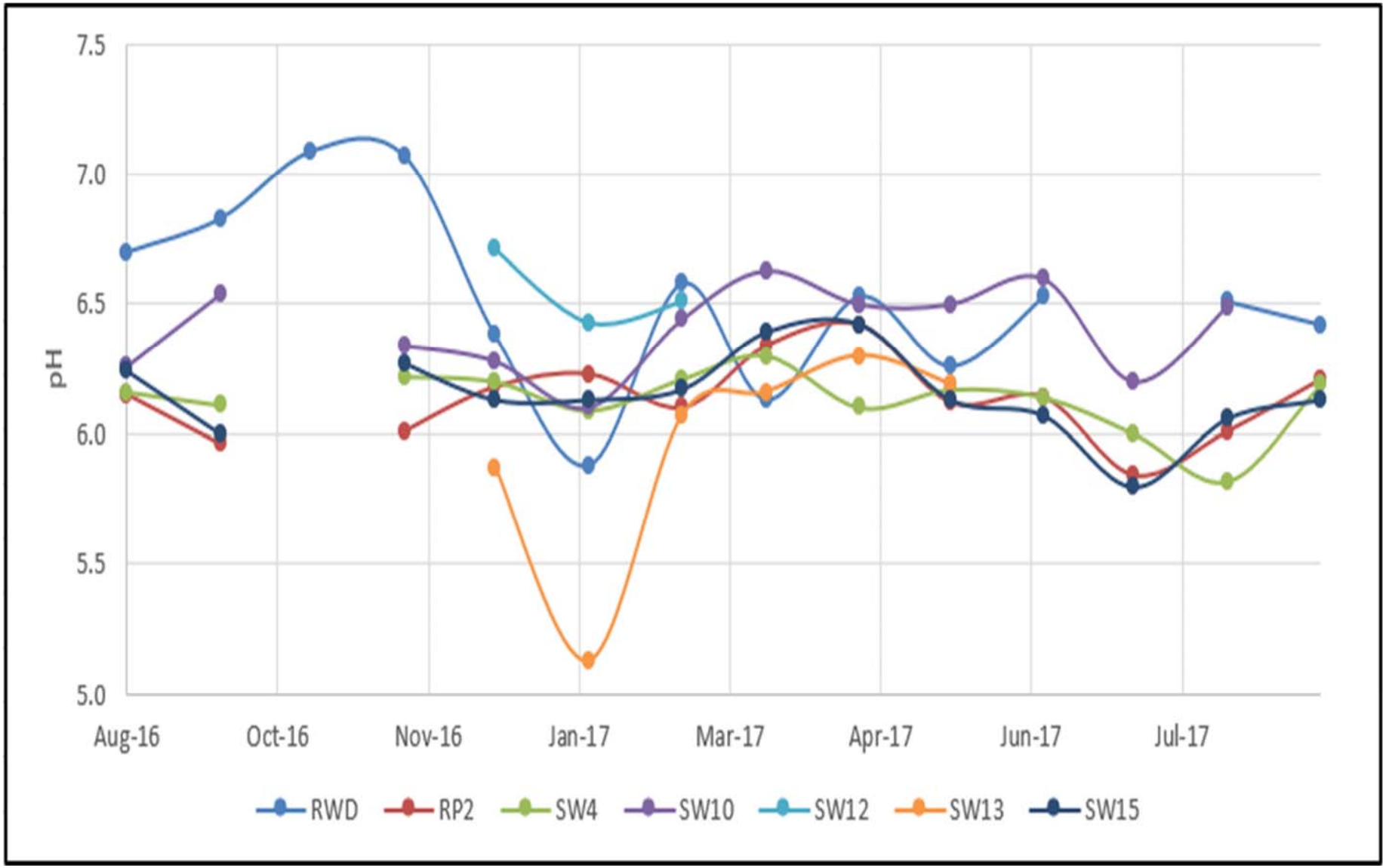

Figure 45. pH of Reference Sites and Edith River Sites

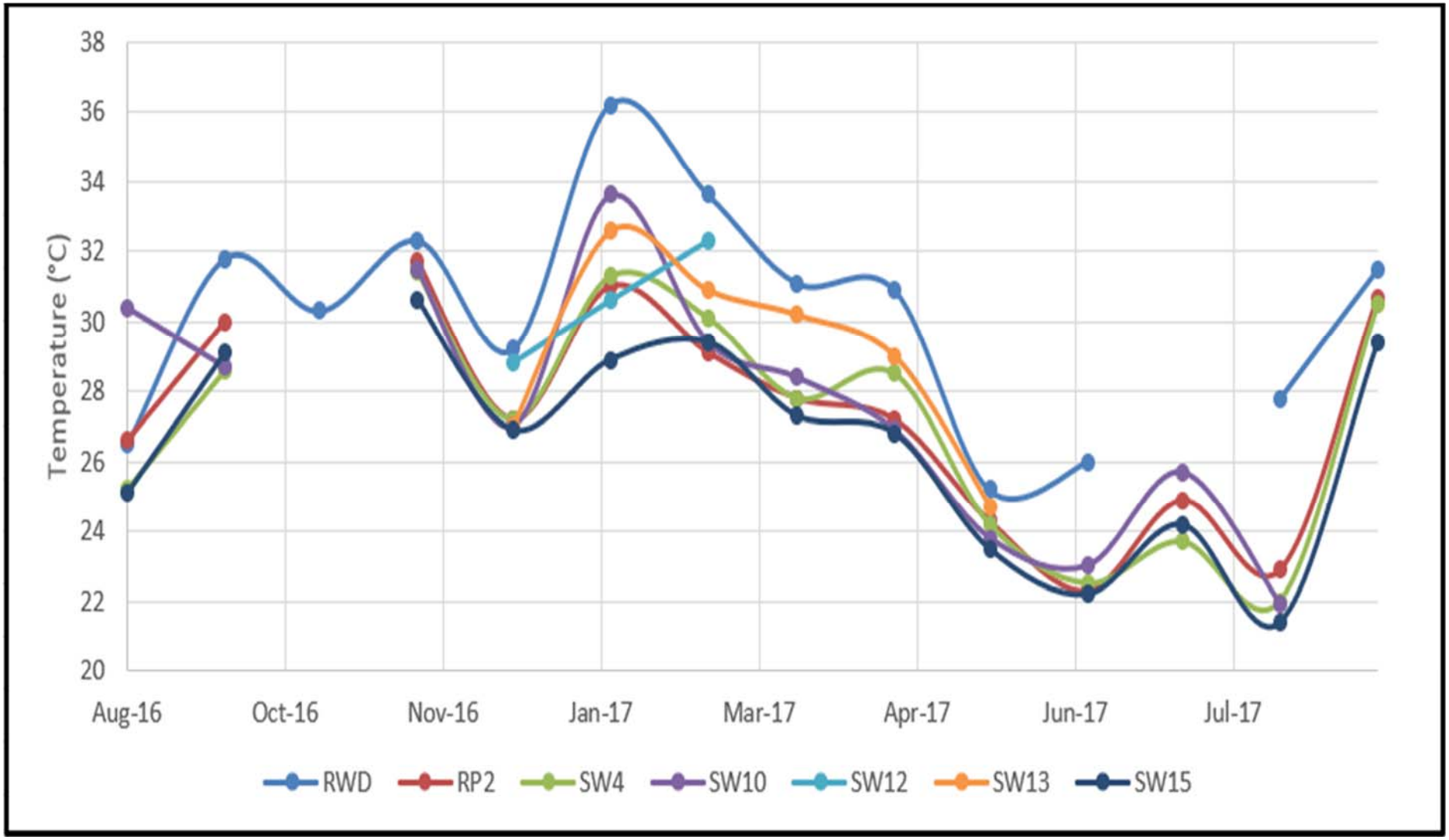

Figure 46. Temperature of Reference Sites and Edith River Sites

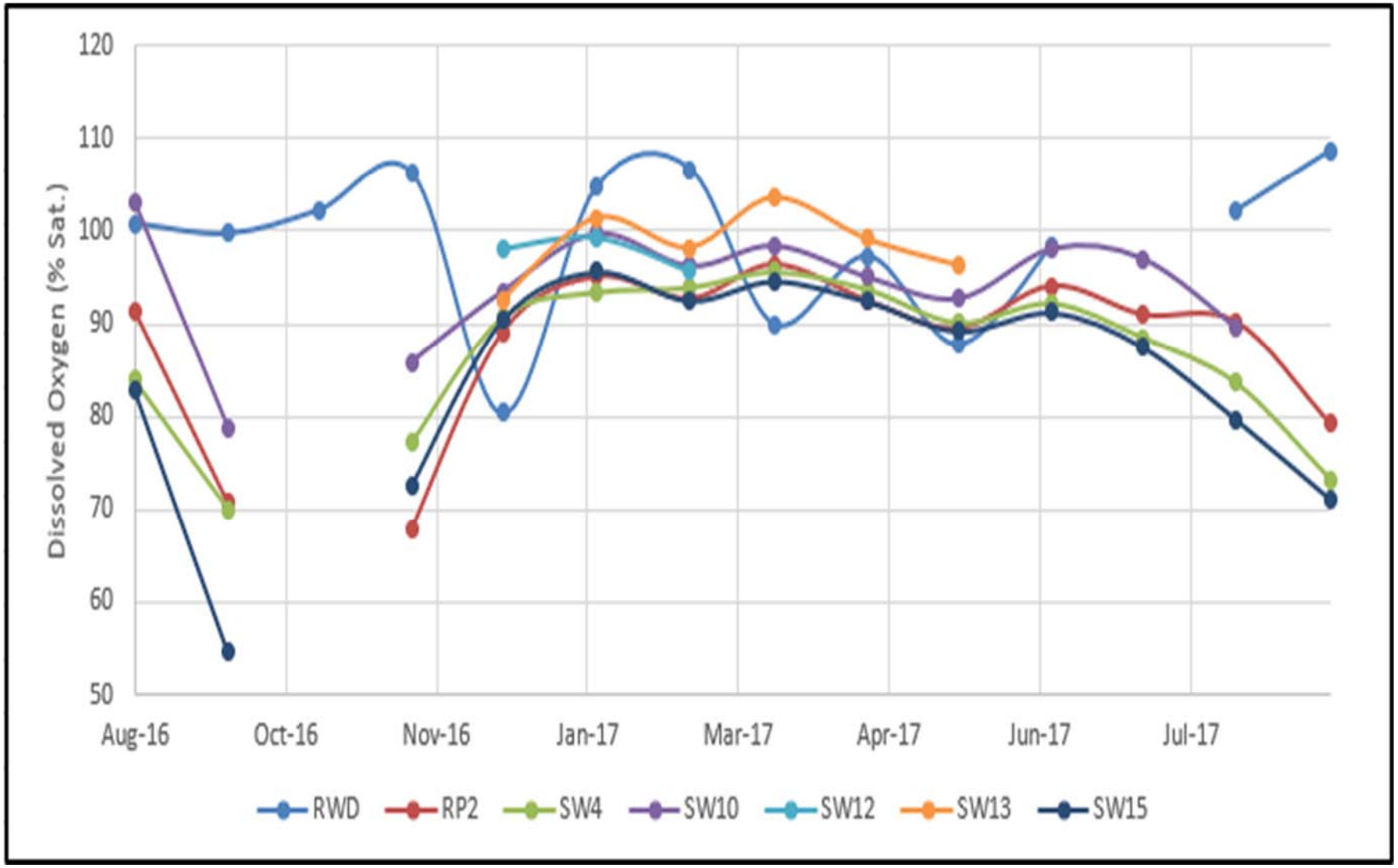

Figure 47. Dissolved Oxygen of Reference Sites and Edith River Sites

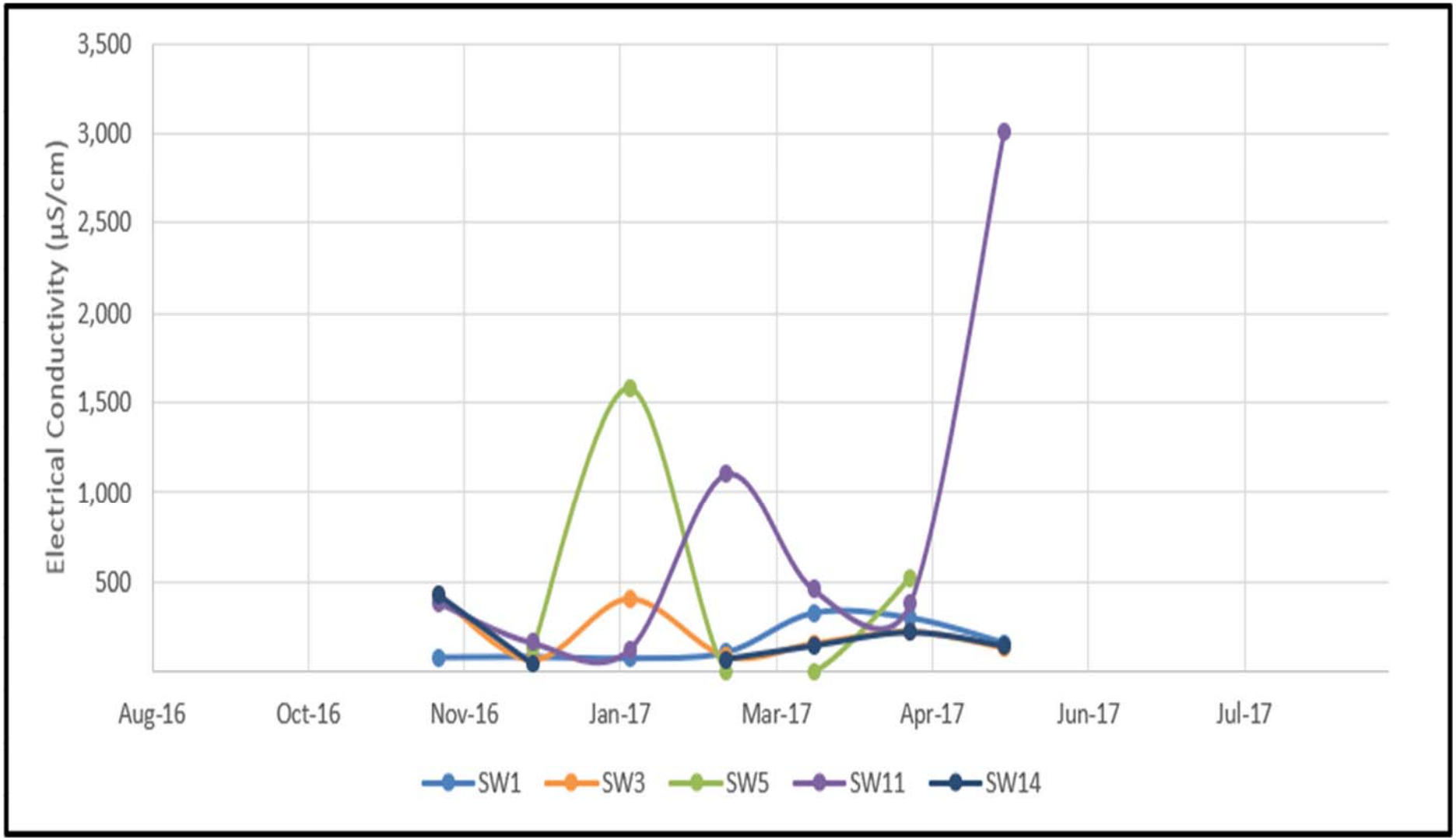

Figure 48. EC of Receiving Waters

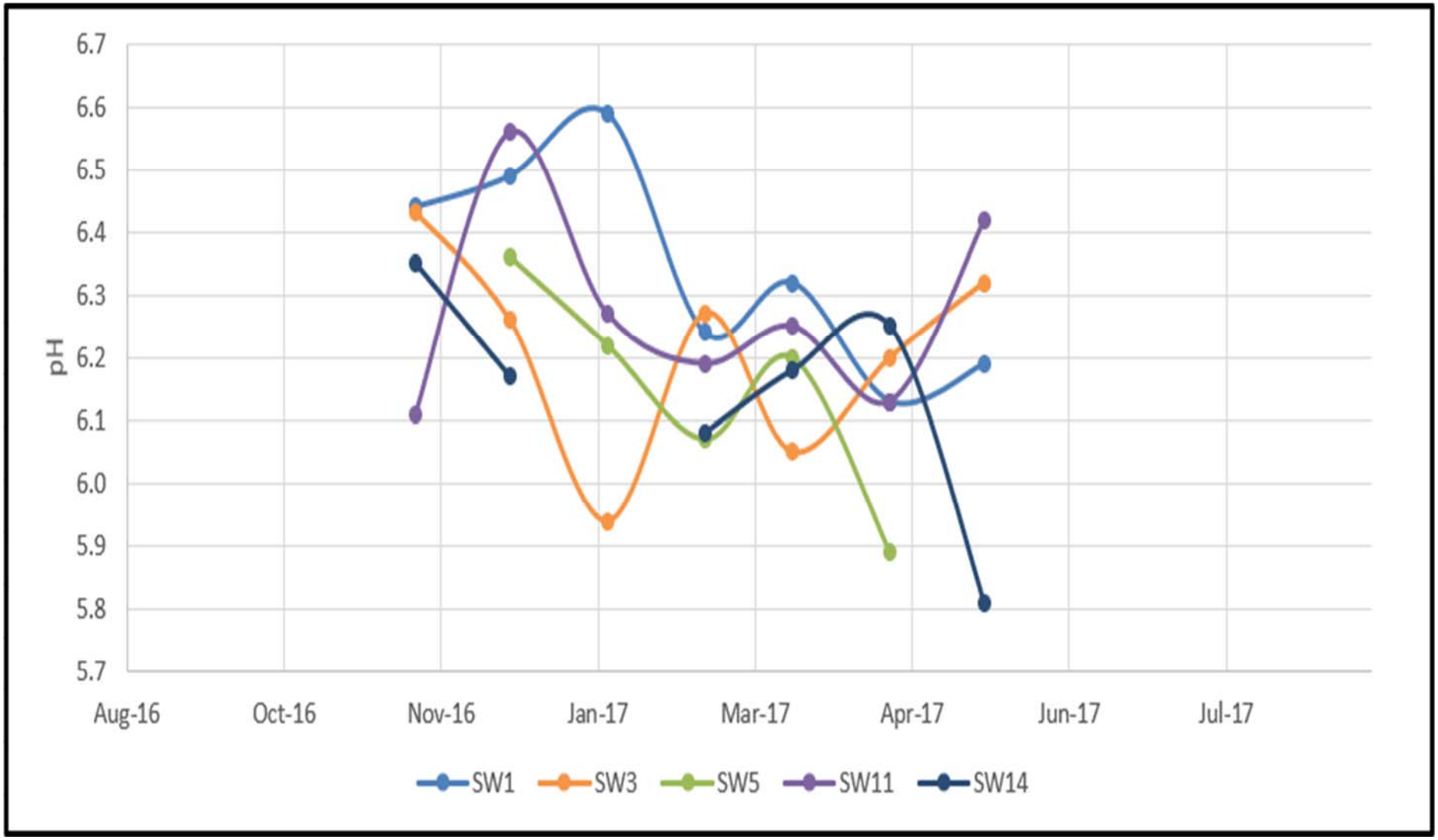

Figure 49. pH of Receiving Waters

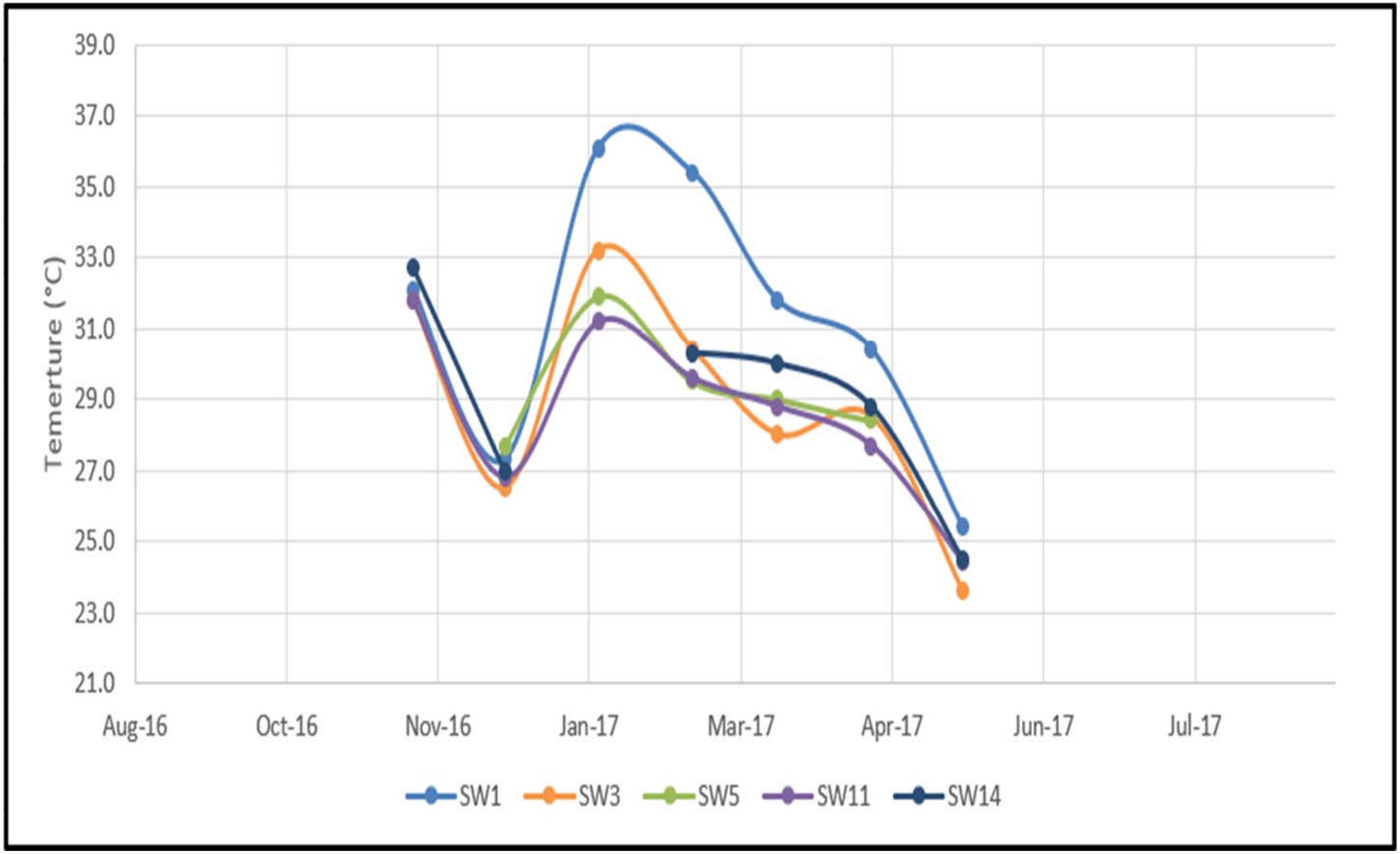

Figure 50. Temperature of Receiving Waters

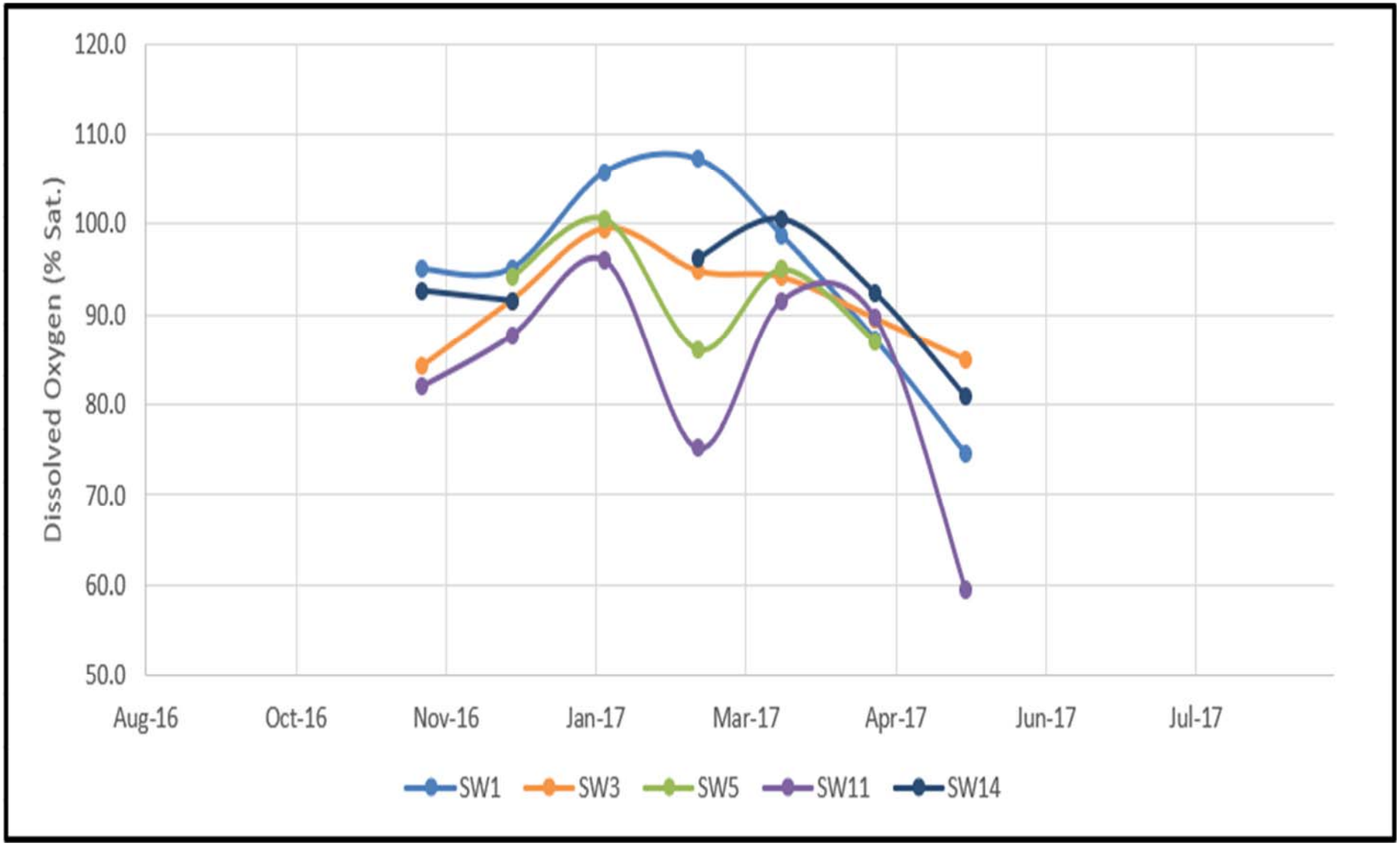

Figure 51. Dissolved Oxygen of Receiving Waters

6.7.3.2.2 Chemical Quality

Reference and Edith River Sites (RWD, SW2, SW4, SW10, SW12, SW13, SW15)

These sites are characterised by low concentrations of the major ions SO_4, Ca and Mg and also the trace metals Cu, Co, Ni and Zn. Higher concentrations of major ions are evident in the Edith River sites downstream of Stow Creek confluence from authorised wet season discharge. Highly variable concentrations of the trace metals Fe and Mn were observed across these sites, and Al displayed typical elevations associated with wet season flows but were mostly at or around the detection limit.

Sulphate concentrations were generally less than 20 mg/L for all sites across. Calcium and magnesium averaged only 1 mg/L but remained under 6 mg/L for the year for all sites. Copper and zinc averaged 1.4 µg/L and 3.5 µg/L respectively and showed slight increases during the wet season, likely from non-point source drainage across the site. Detailed analysis of water chemistry associated with the 2017 discharge period is discussed in the WDL Annual Report (Appendix I).

Figure 52 through Figure 59 present the water chemistry from these sites for the full reporting period.

Receiving Waters (SW1, SW3, SW5, SW11, SW14)

Receiving water sites are characterised by higher concentrations of major ions and trace metals, particularly during dry season sampling and originating primarily from non-point source drainage and also discharge drainage via Batman Creek (SW5) and Stow Creek (SW3).

Site SW5 exhibited the highest concentrations of the major ions, as well as Co, Cu, Ni and Zn. Horseshoe Creek catchment (SW11) exhibited the highest concentrations of Manganese and the upstream site (SW1) adjacent to RP7 also demonstrated moderately high Copper concentrations. Given the low concentration of dissolved copper in the RP3 discharge water (Section 6.7.3.3) the elevated levels across site are most likely associated with seepage from RP7 and legacy sediment contaminants present within the waterway at the respective locations.

Figure 60 through Figure 69 present the water chemistry for these sites for the full reporting period.

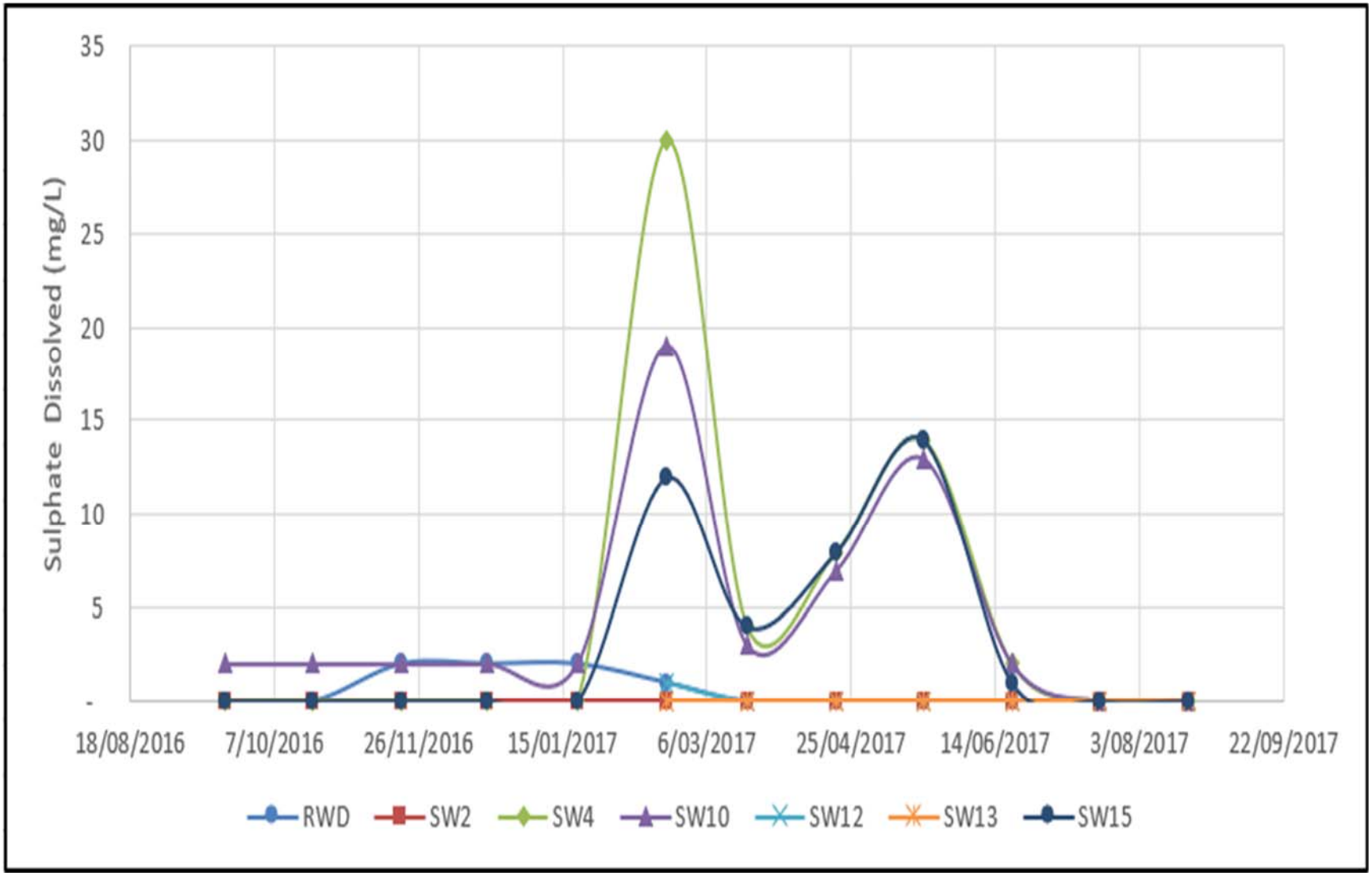

Figure 52. Sulphate of Reference sites and Edith River sites

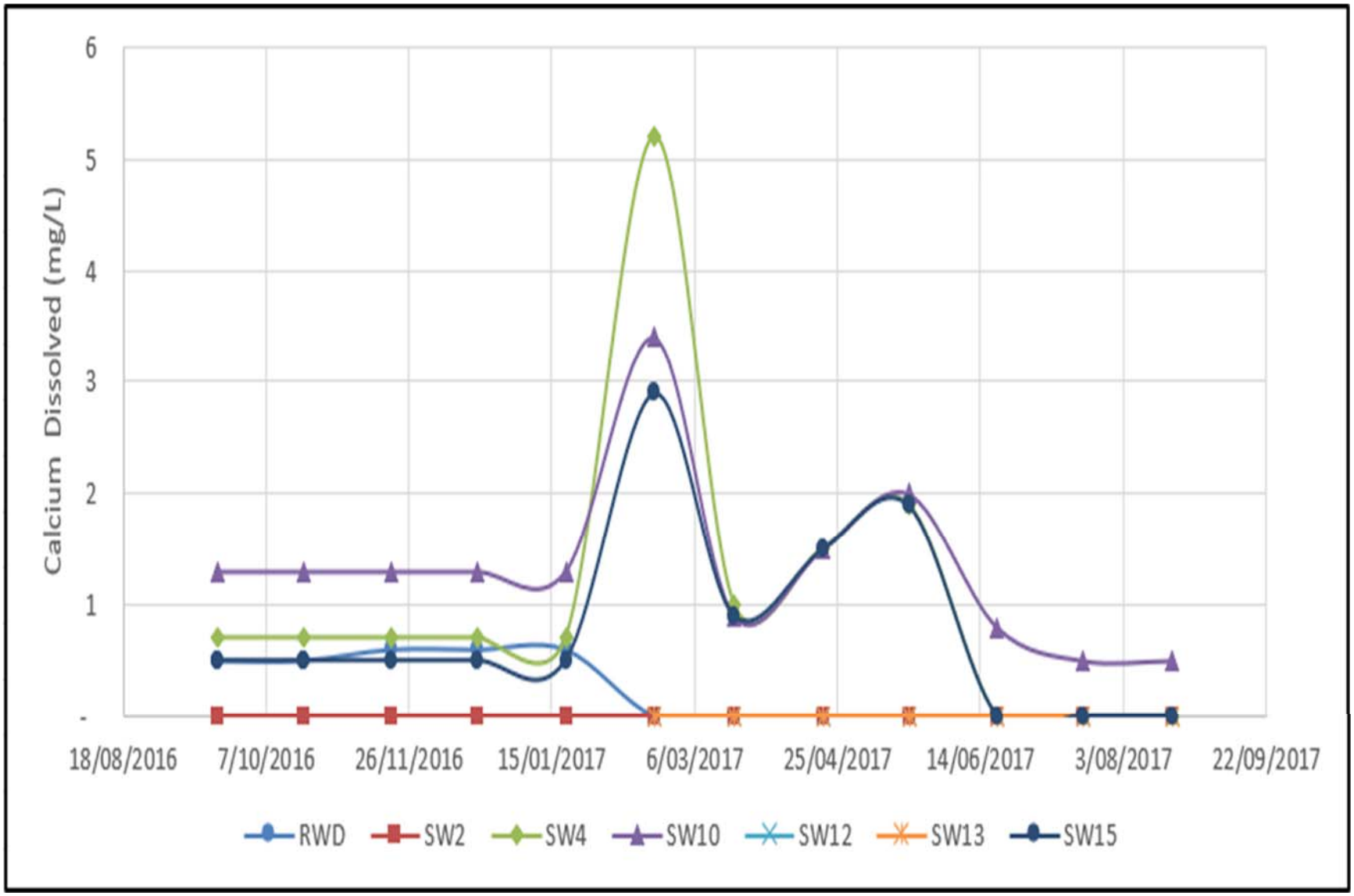

Figure 53. Calcium (0.45 µm filtered) of Reference sites and Edith River sites

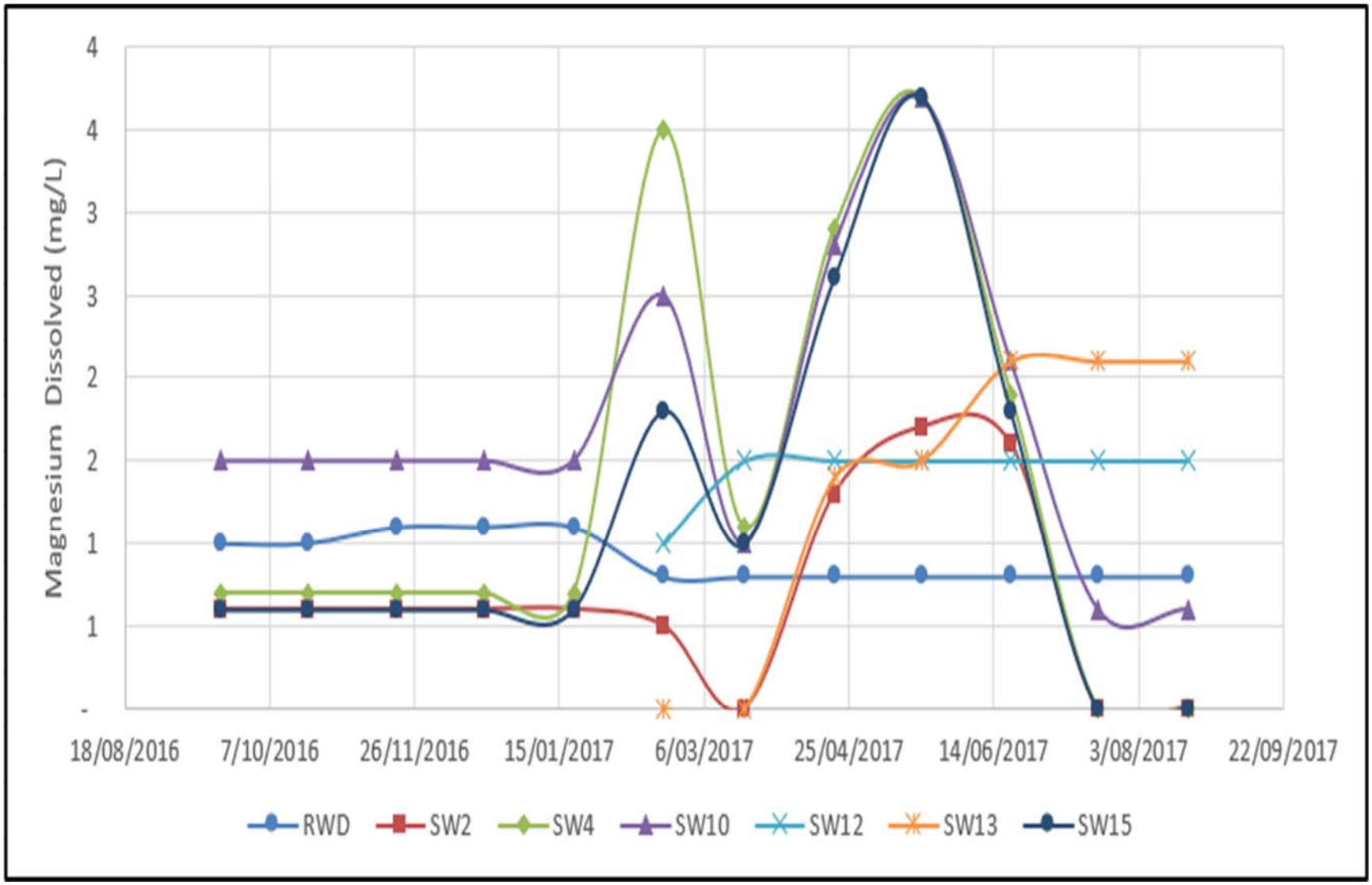

Figure 54. Magnesium (0.45 µm filtered) of Reference sites and Edith River sites

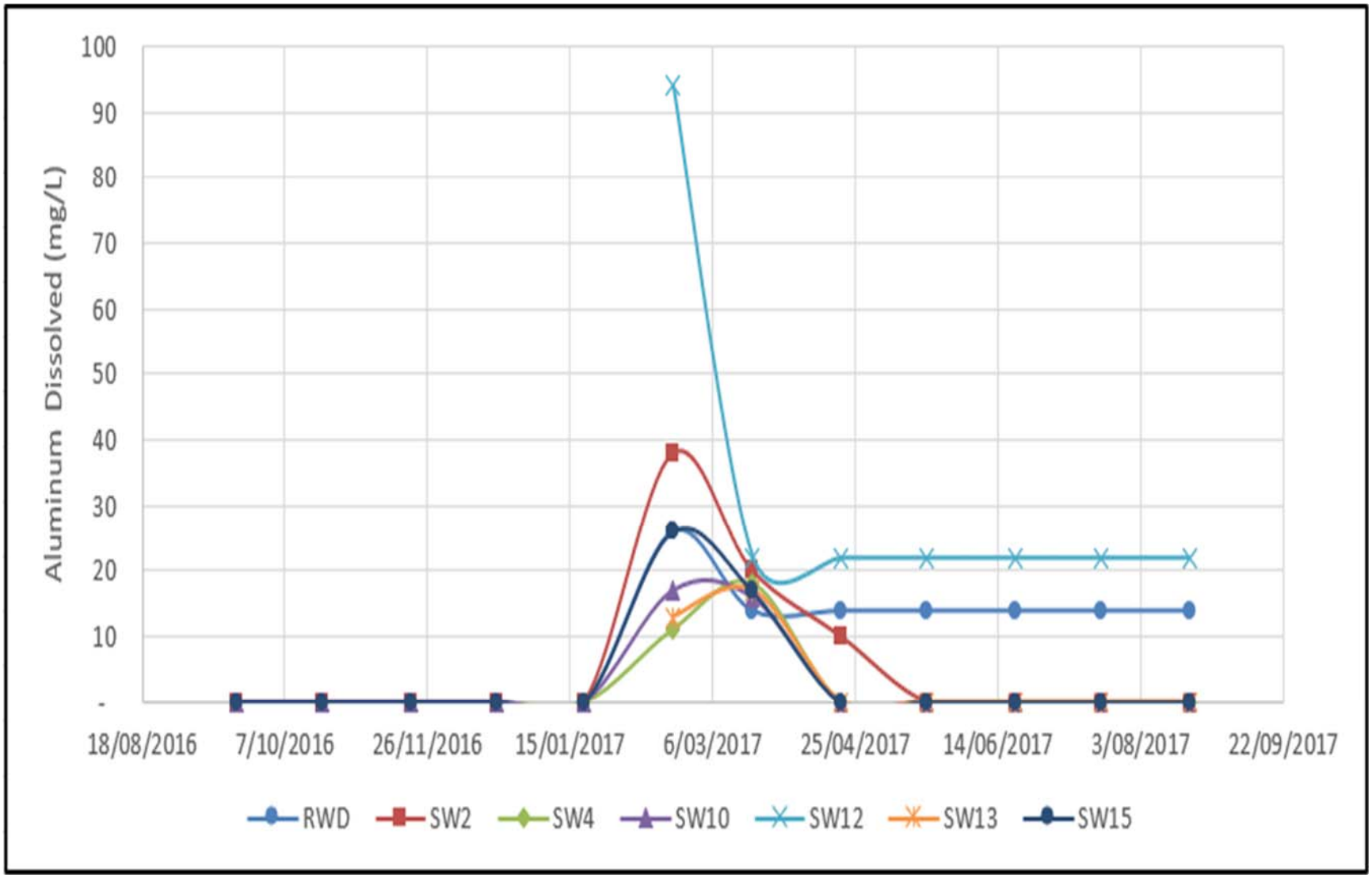

Figure 55. Aluminium (0.45 µm filtered) of Reference sites and Edith River sites

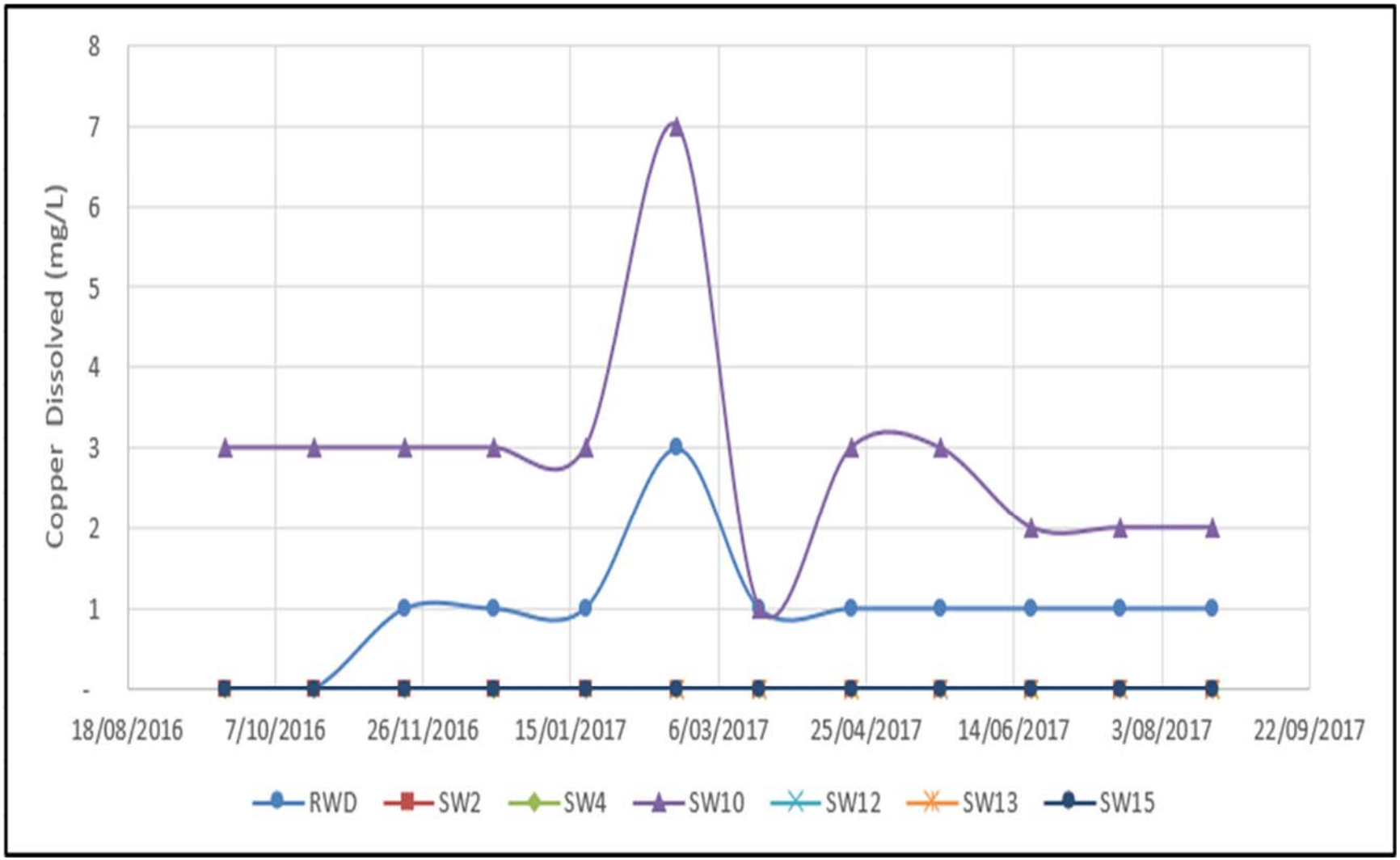

Figure 56. Copper (0.45 µm filtered) of Reference sites and Edith River sites

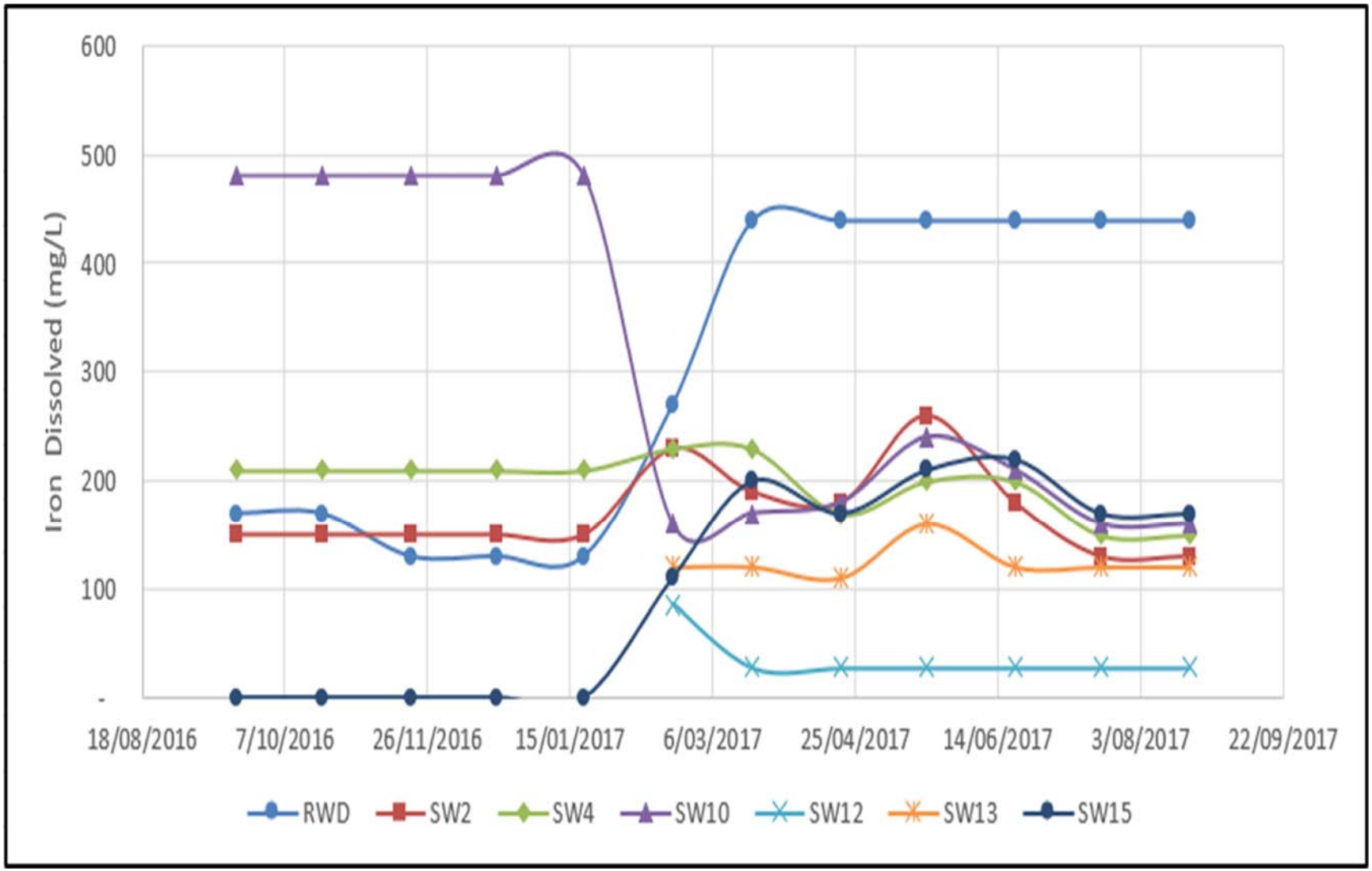

Figure 57. Iron (0.45 µm filtered) of Reference sites and Edith River sites

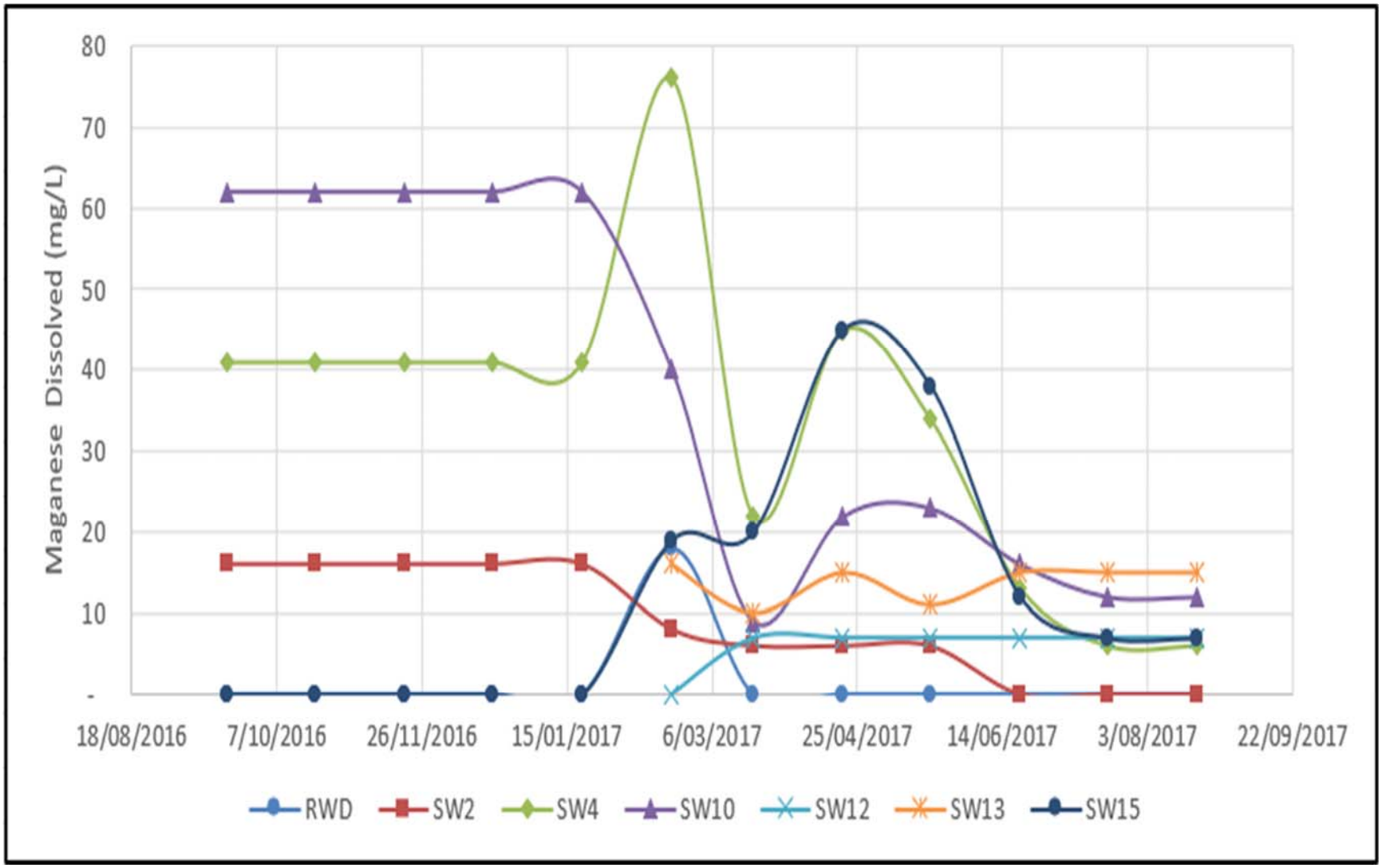

Figure 58. Manganese (0.45 µm filtered) of Reference sites and Edith River sites

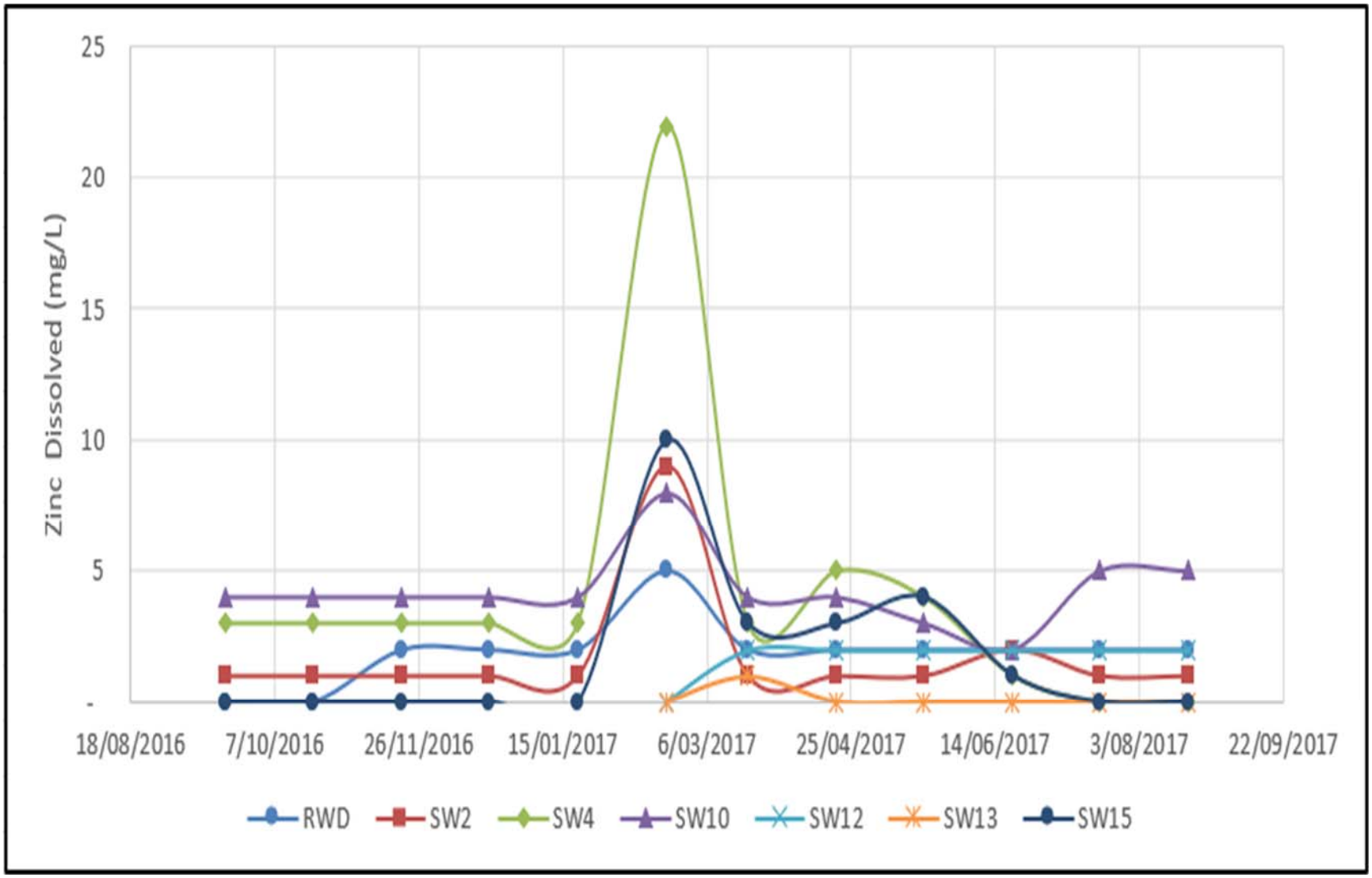

Figure 59. Zinc (0.45 µm filtered) of Reference sites and Edith River sites

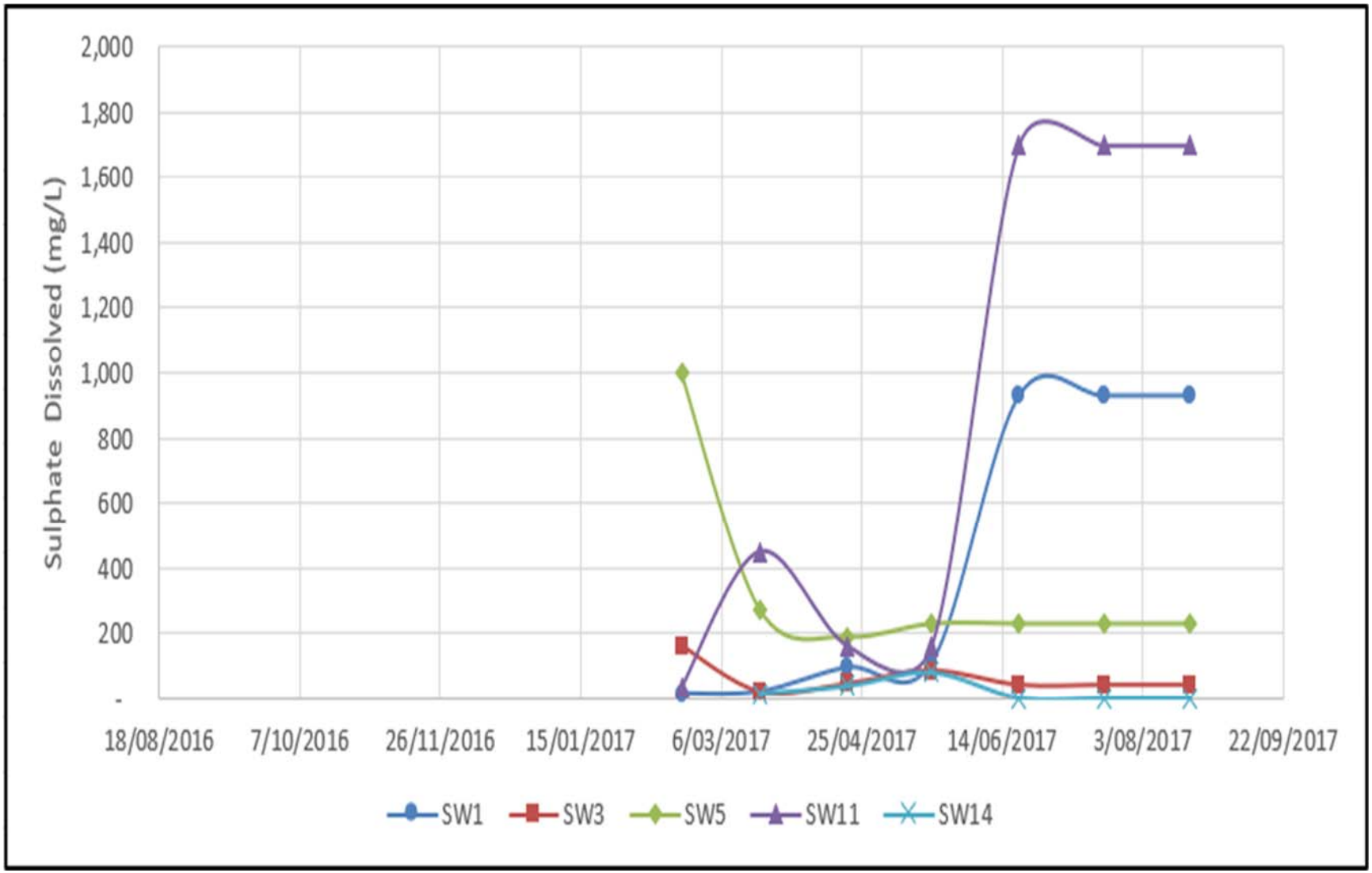

Figure 60. Sulphate of receiving waters

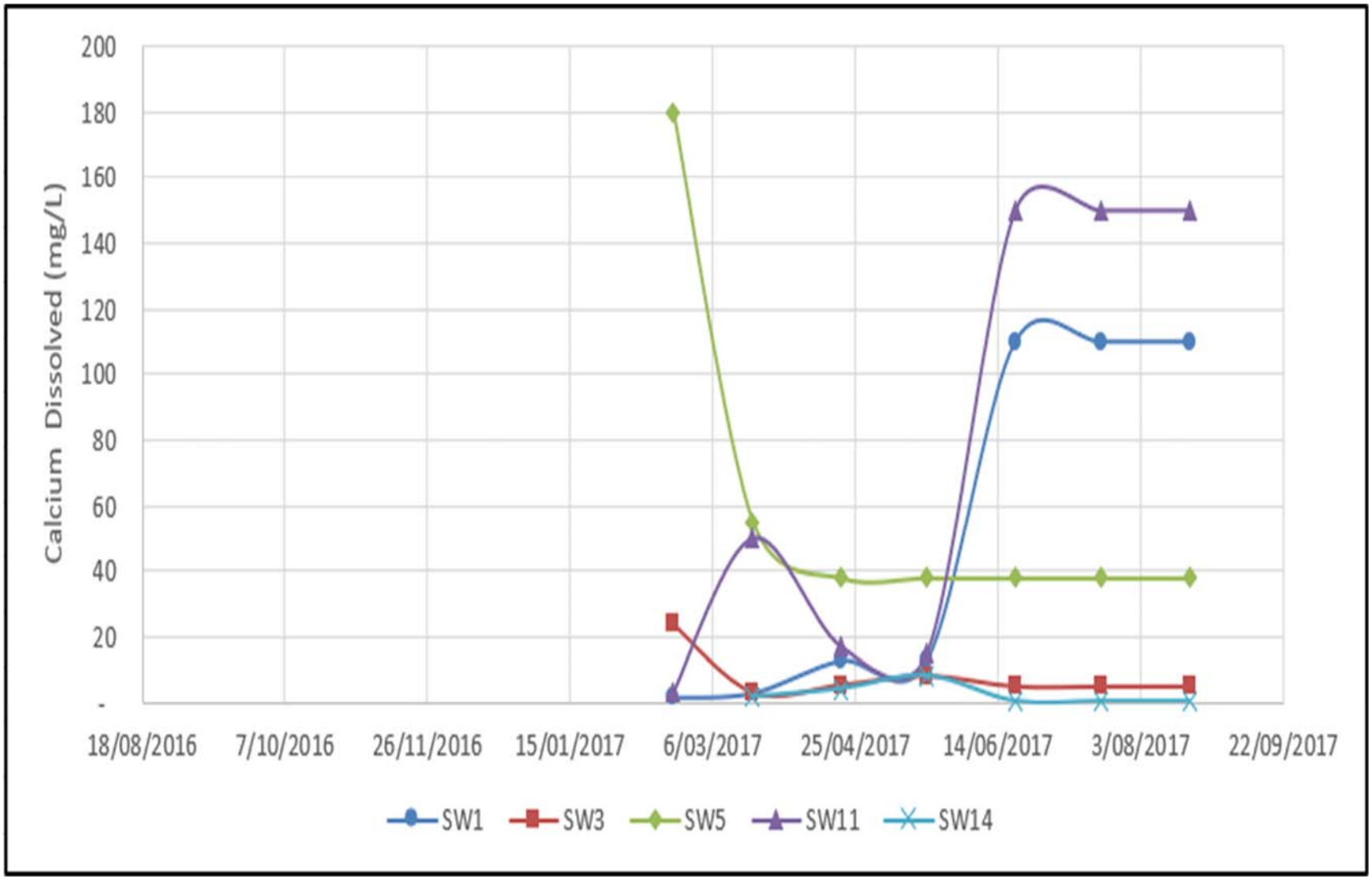

Figure 61. Calcium (0.45 µm filtered) of receiving waters

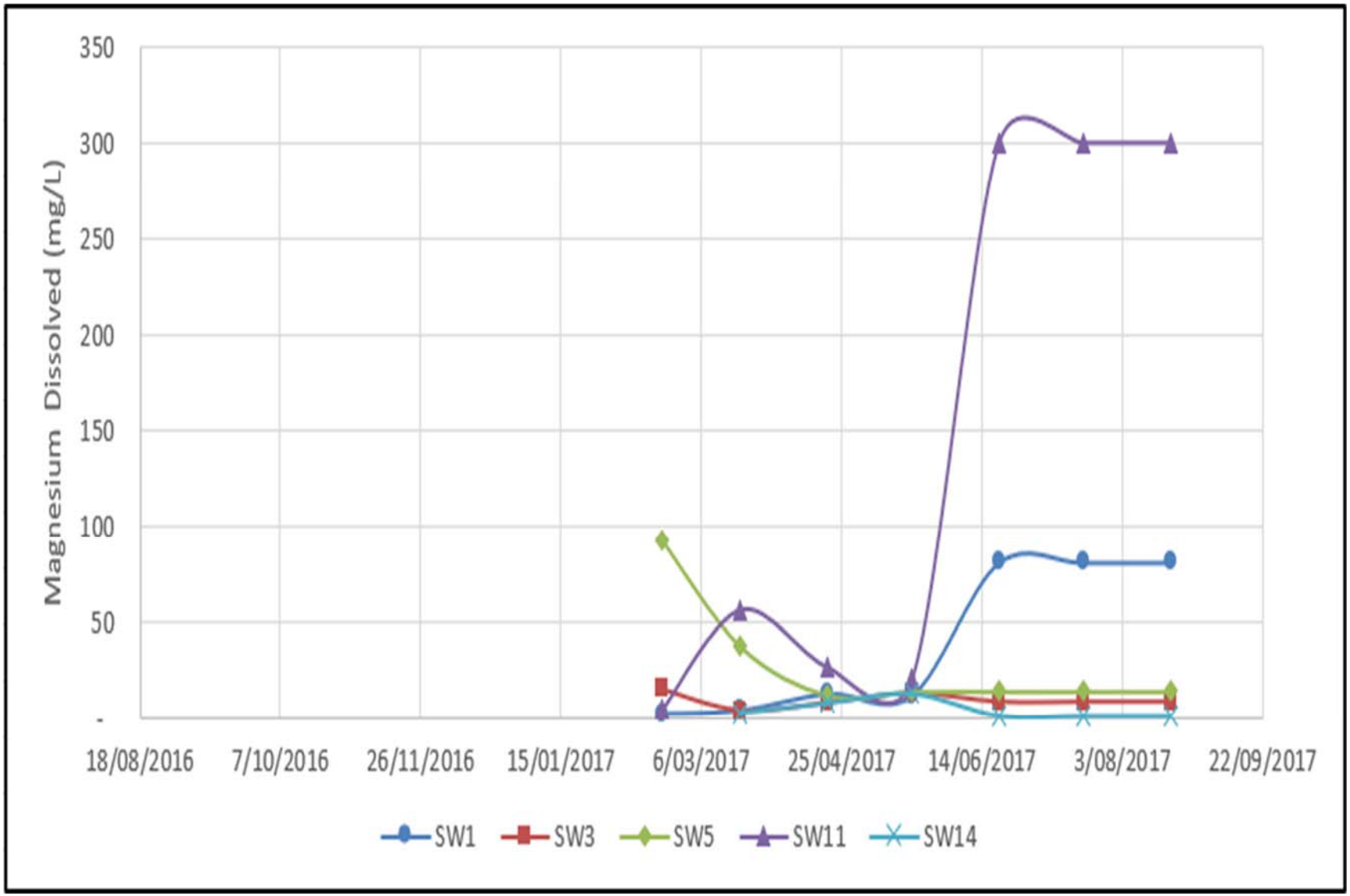

Figure 62. Magnesium (0.45 µm filtered) of receiving waters

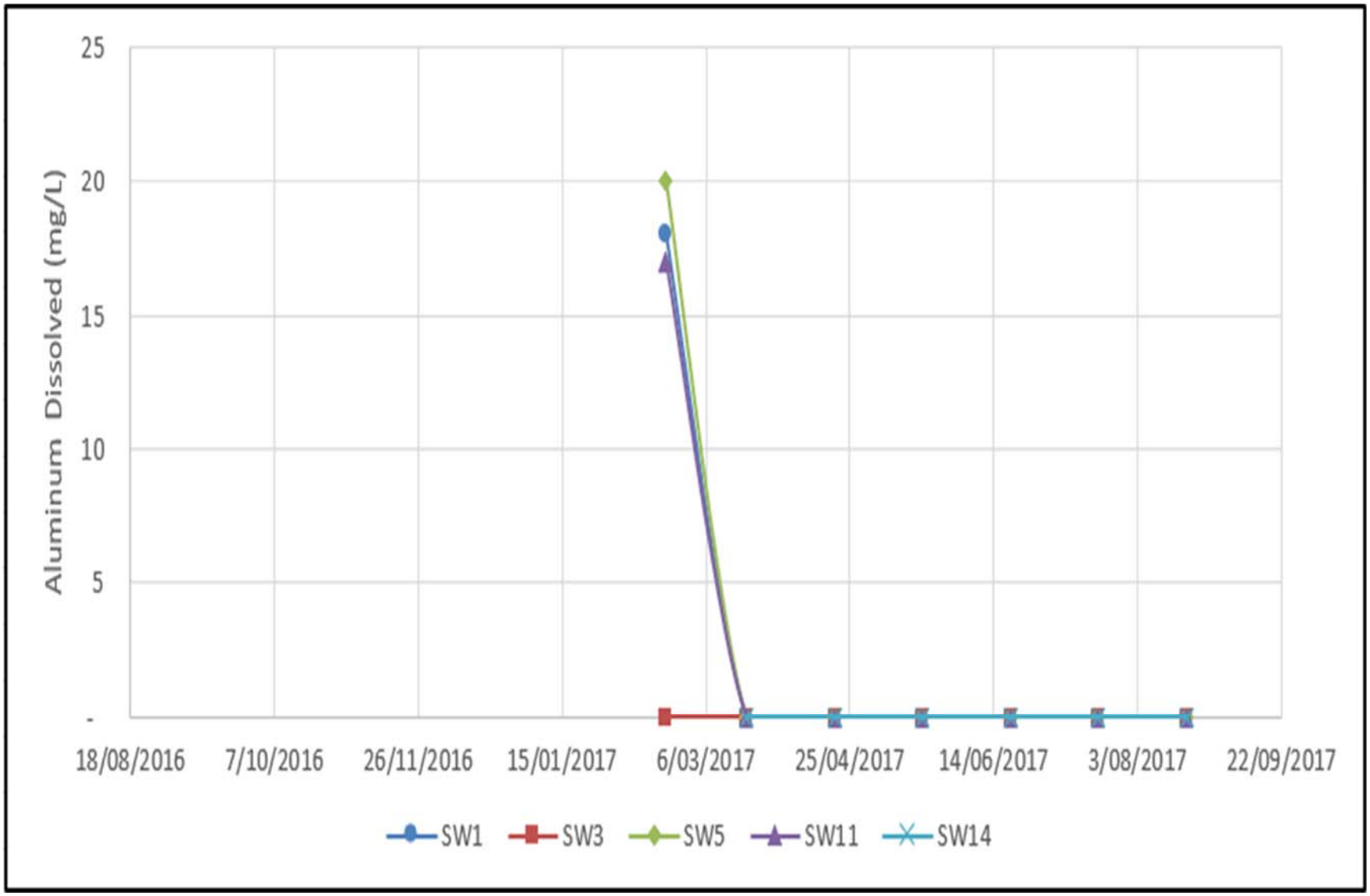

Figure 63. Aluminium (0.45 µm filtered) of receiving waters

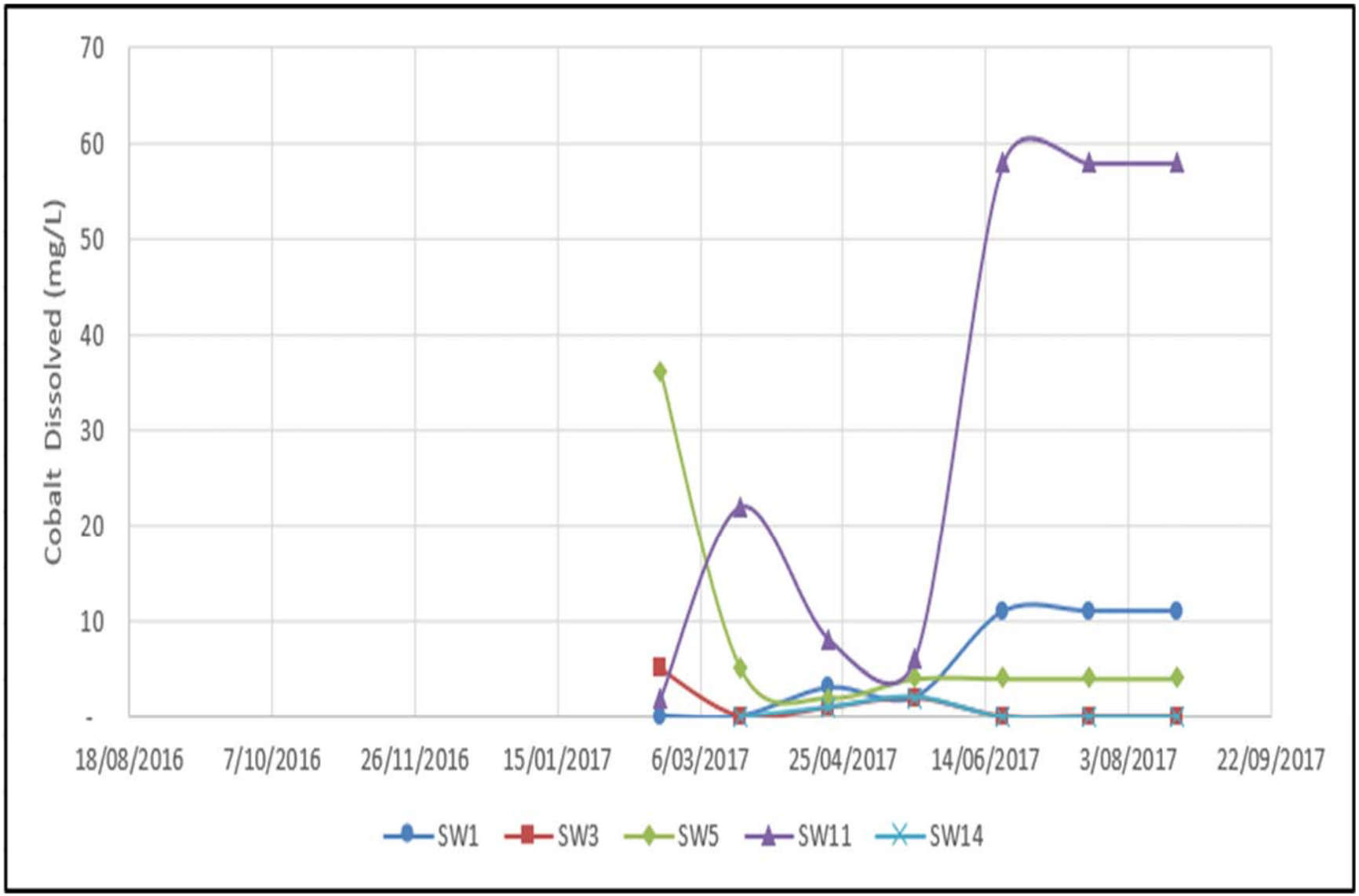

Figure 64. Cobalt (0.45 µm filtered) of receiving waters

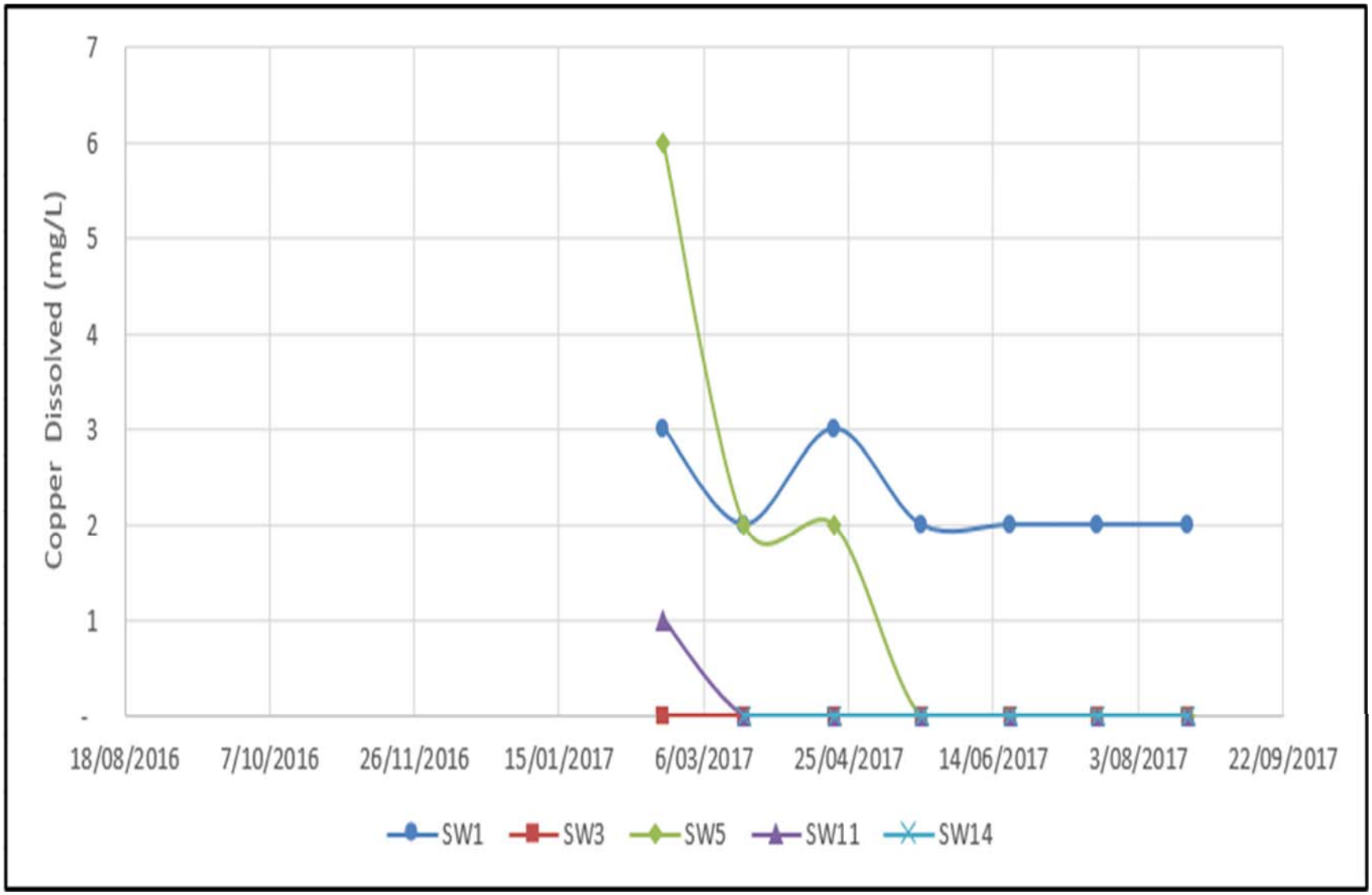

Figure 65. Copper (0.45 µm filtered) of receiving waters

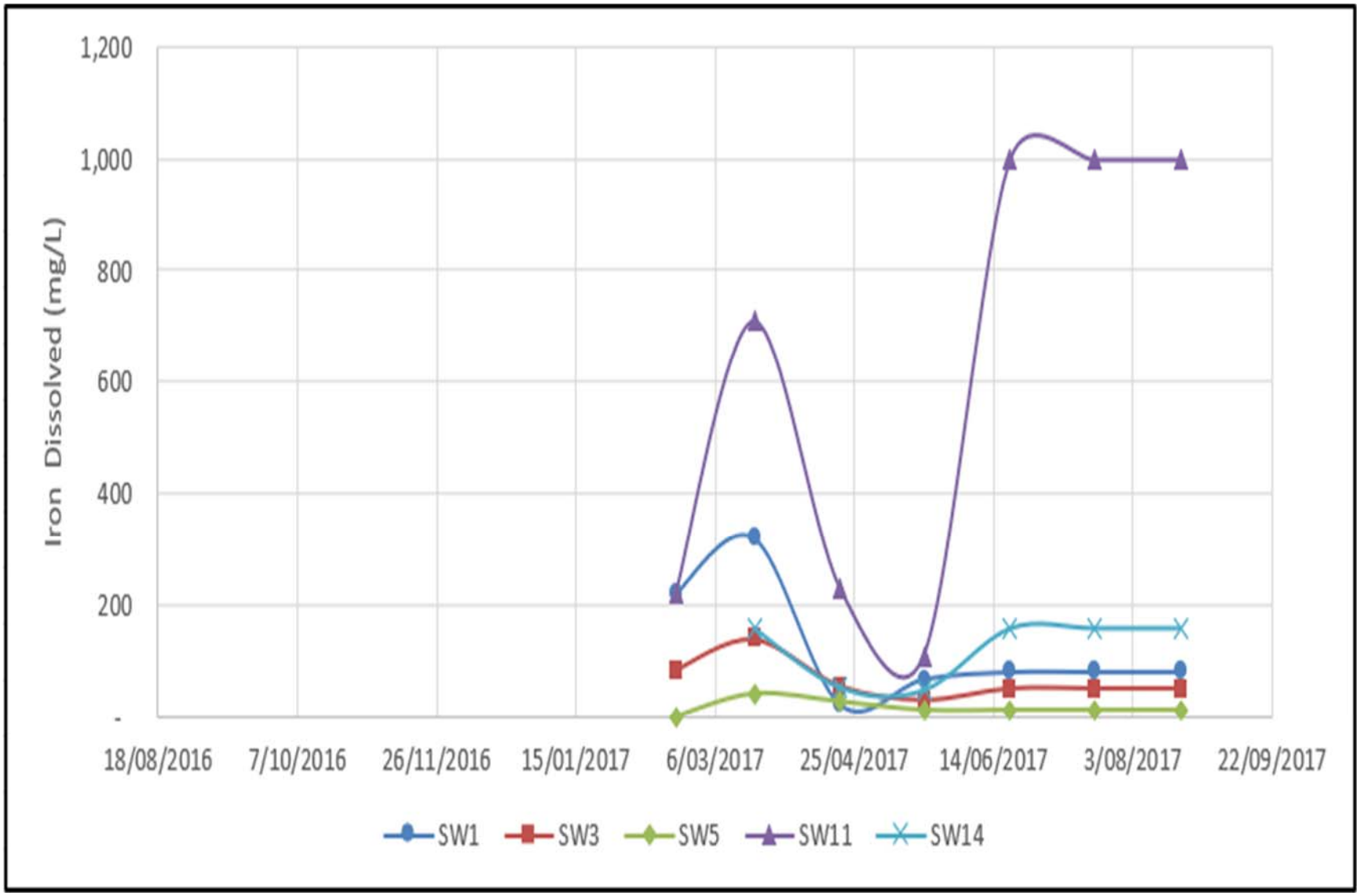

Figure 66. Iron (0.45 µm filtered) of receiving waters

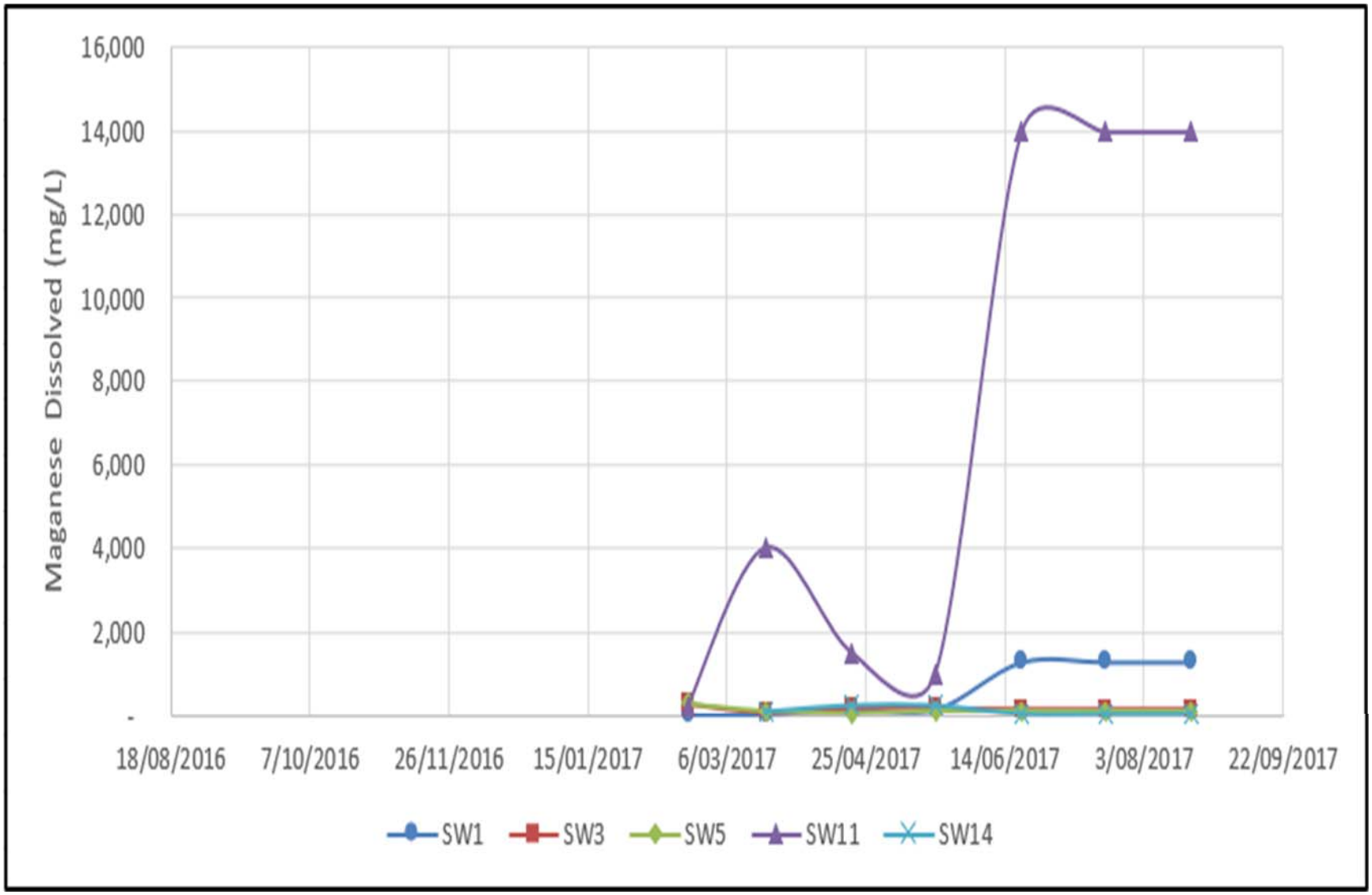

Figure 67. Manganese (0.45 µm filtered) of receiving waters

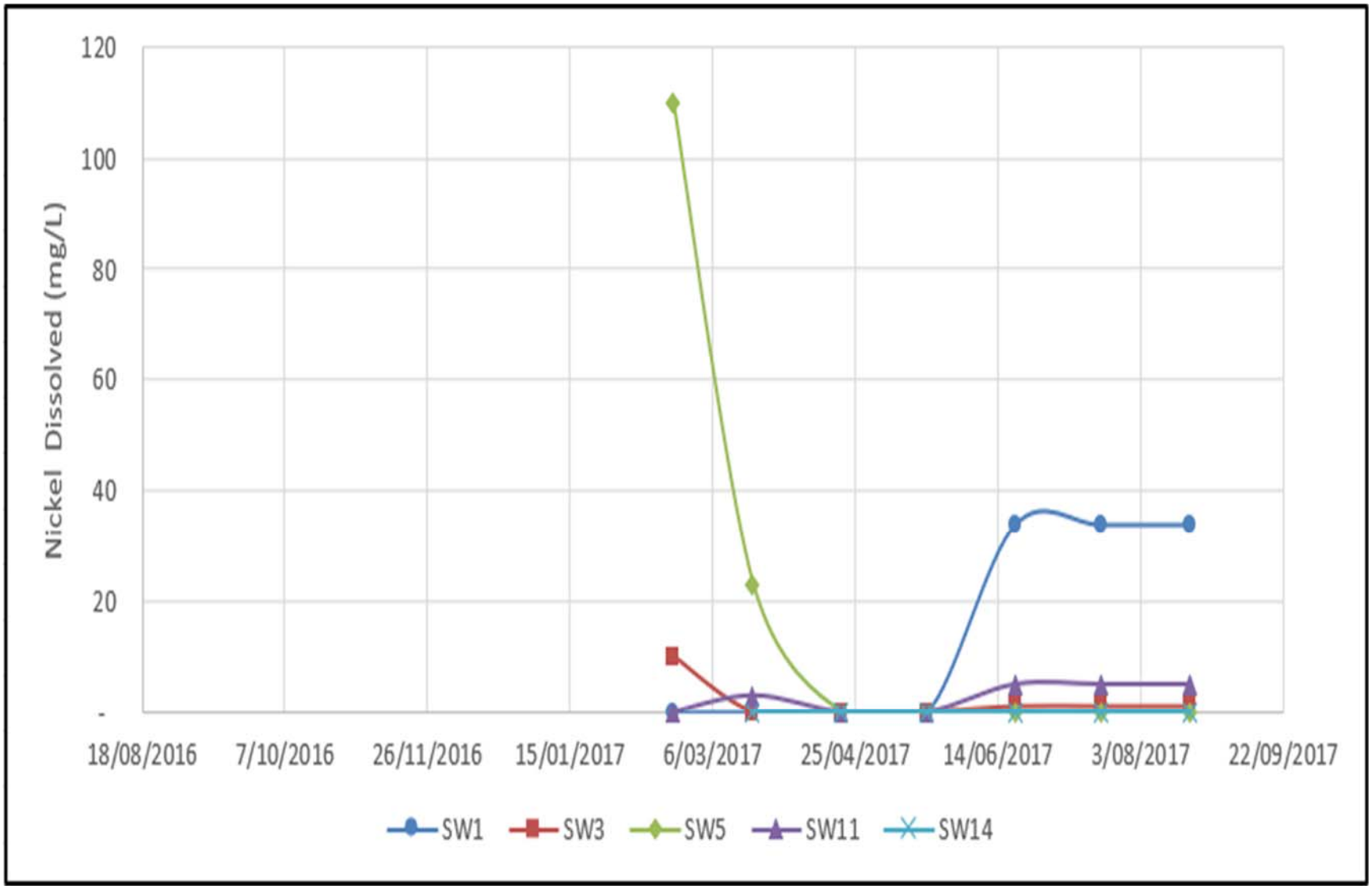

Figure 68. Nickel (0.45 µm filtered) of receiving waters

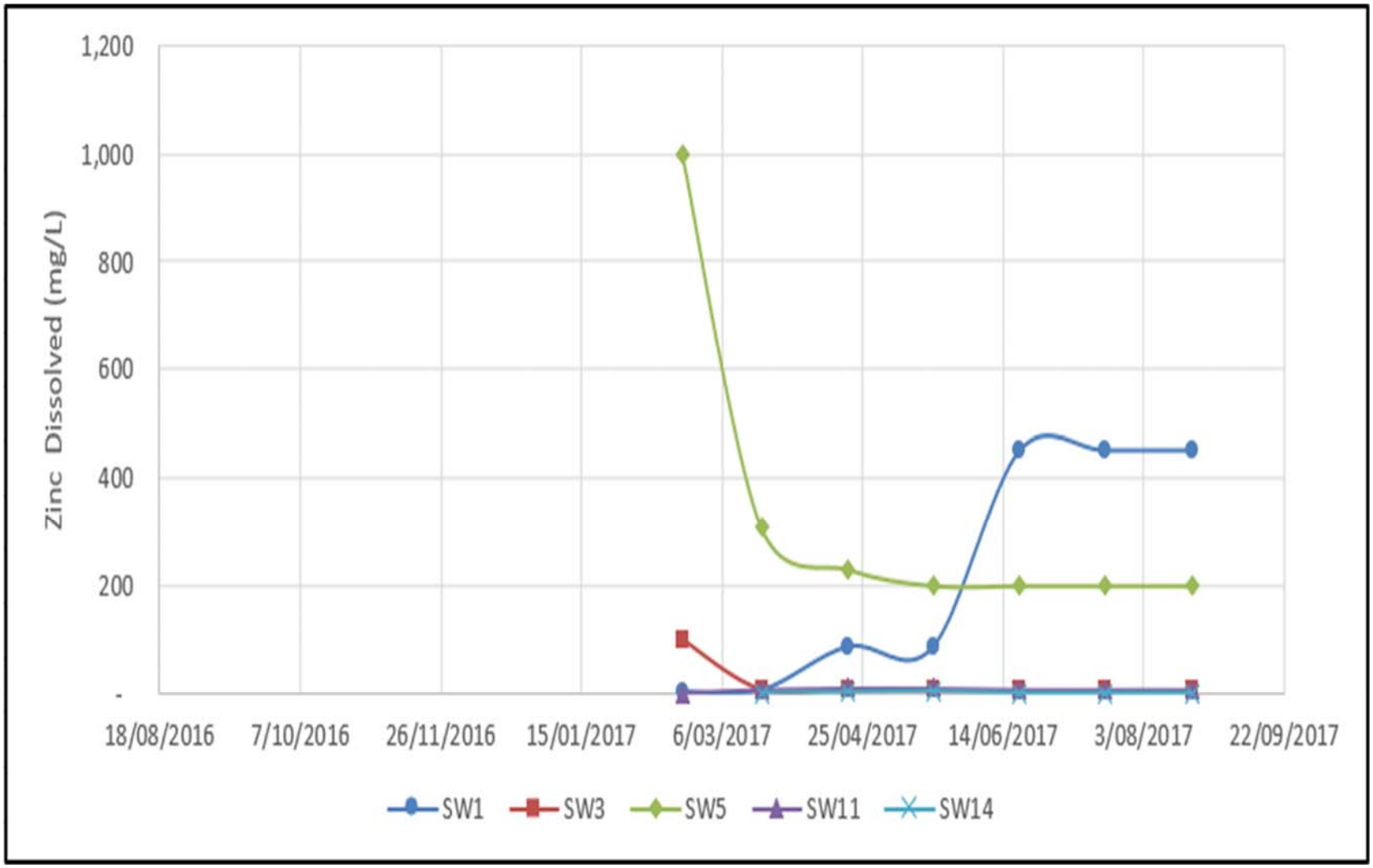

Figure 69. Zinc (0.45 µm filtered) of receiving waters

6.7.3.2.3 Gauge Station Data

Stream flow and electrical conductivity (EC) data for all Mt Todd gauge stations demonstrate the seasonal relationship between electrical conductivity and flow level. High wet season flows at each gauge station lead to low EC, with a reduction in flow (particularly during recessional flow periods) conversely reflected by increasing EC.

Hydrographs from all stations confirm wet season flows commenced in December 2014 and clearly identifies the high rainfall and flows experienced in late December 2016 and January 2017 at all site gauge stations.

6.7.3.3 *RP3 Treatment and Profiling*

Water profiling occurred monthly until December 2016. Weekly profiling commenced December until the February 2017 and covered the full period of discharge to the Edith River. Monthly sampling resumed once again March 2017 for the remainder of the reporting period.

The quality of the water within RP3 continues to improve, largely driven by the treatment works undertaken since 2012-13, November 2014, December 2015 and again in November 2016. The years of treatment have resulted in significant improvement to the chemical composition of the stored waters. Approximately 73% of the site inventory as at August 2016 now contains a chemical composition as presented in Table 27 and Table 28. The water chemistry for 2014 is provided in the following tables to demonstrate further improvements have also been achieved by additional treatment in late 2014 and late 2015. Treatment of RP3 in late 2015 resulted in further concentration reductions particularly in cadmium, cobalt, manganese, nickel and zinc.

As expected from lime treatment, some element concentrations have increased in the water body since primary treatment in 2014 (Table 28). Water hardness indicators such as bicarbonate alkalinity have increased dramatically over the treatment period and this is consistent with a rise in pH to neutral or above throughout the entire water column.

Table 27. Ranked RP3 Element concentration decreases since treatment

Sampled Element	Average Concentration at October 2012	Average Concentration at October 2014	Average Concentration at August 2016	Percentage Reduction (from 2012)
Copper-Dissolved (µg/L)	12000	108.30	1	99.99%
Copper-Total (µg/L)	12000	122.12	1.71	99.99%
Aluminium-Dissolved (µg/L)	63000	10.35	10.00	99.98%
Aluminium-Total (µg/L)	62000	16.15	14.29	99.98%
Lanthanum-Total (µg/L)	420	26.85	1.43	99.66%
Lanthanum-Dissolved (µg/L)	400	25.80	1.43	99.64%
Lead-Dissolved (µg/L)	190	1	1	99.47%
Lead-Total (µg/L)	180	1	1	99.44%
Manganese-Dissolved (µg/L)	21000	7293.05	207.86	99.01%
Manganese-Total (µg/L)	20000	7240.25	201.29	98.99%
Cobalt-Total (µg/L)	1600	523.41	38	97.63%
Ammonia as N in water (mg/L)	0.21	0.08	0.01	97.62%
Cobalt-Dissolved (µg/L)	1600	525.27	39.43	97.54%
Uranium-Dissolved (µg/L)	19	0.73	0.50	97.37%
Uranium-Total (µg/L)	18	0.75	0.52	97.13%
Beryllium-Dissolved (µg/L)	13	0.51	0.50	96.15%
Beryllium-Total (µg/L)	10	0.55	0.50	95.00%
Zinc-Total (µg/L)	39000	16251.50	2185.71	94.40%
Zinc-Dissolved (µg/L)	40000	16194.50	2285.71	94.29%
Arsenic-Dissolved (µg/L)	8	1	1	87.50%
Arsenic-Total (µg/L)	8	1	1	87.50%
Nickel-Total (µg/L)	1600	668.96	244.29	84.73%
Nickel-Dissolved (µg/L)	1600	658.59	255.71	84.02%
Cadmium-Total (µg/L)	130	80.95	32.14	75.27%
Cadmium-Dissolved (µg/L)	130	81.63	33.14	74.51%
Total Cyanide (mg/L)	0.010	0.004	0.004	60.00%
Chromium-Dissolved (µg/L)	2	1	1	50.00%
Chromium-Total (µg/L)	2	1	1	50.00%
Sulphate, SO_4 (mg/L)	1900	1534.58	1771.43	6.77%
Magnesium - Dissolved (mg/L)	230	209.50	215.71	6.21%
Magnesium - Total (mg/L)	220	216.50	218.57	0.65%

Table 28. Ranked RP3 Element concentration increases since treatment

Sampled Element	Average Concentration at October 2012	Average Concentration at October 2014	Average Concentration at August 2016	Percentage Increase (from 2012)
Bicarbonate Alkalinity as CaCO3(mg/L)	5	53.4	36.1	623%
Total Alkalinity as $CaCO_3$(mg/L)	5	53.4	36.1	623%
Nitrate as N in water (mg/L)	0.63	3.1	2.7	324%
Boron-Dissolved (µg/L)	16	29.1	54.1	238%
Calcium - Total (mg/L)	160	372.5	397.1	148%
Boron-Total (µg/L)	22	34.4	54.4	147%
Calcium - Dissolved (mg/L)	180	344.5	395.7	120%
Sodium - Total (mg/L)	47	66.1	67.3	43%
Sodium - Dissolved (mg/L)	49	56.5	67.7	38%
Hardness (mg$CaCO_3$/L)	1400	1723.0	1885.7	35%
Chloride, Cl (mg/L)	6	6.0	7.3	21%
Potassium - Dissolved (mg/L)	8.2	8.5	9.1	10%
Potassium - Total (mg/L)	8.1	8.7	8.9	10%

Physical characteristics are displayed in Figure 70 through Figure 73 and key chemical elements are displayed in Figure 74 through Figure 77. In all figures, profile data is presented for the surface (0 m), 45 m and 90 m depths. Data from 2013/2014 and 2014/2015 has been included in the figures to provide contextual information with respect to treatment periods and annual mixing events.

After the 2014/2015 wet season, a period of stratification and subsequent re-mixing resulted in remobilisation of some of the key trace metals required to meet 80% SSTVs. As a result, additional treatment was required to reduce these metals to an acceptable level that would allow a low dilution factor and thus a maximum allowable discharge volume.

Physical Quality

Electrical conductivity is consistent at depth throughout the year with little variation between 45 and 90m. The surface EC displays evaporative concentration during the late dry of 2016 and then rainfall dilution during the wet season. The 2017 dry season displays a rise in EC consistent with the previous year and then it mirrors the changes occurring at depth albeit at approximately 40 µS/cm higher.

The pH values are consistent at all depths but converge to around neutral after the 2016/2017 wet season. Some evidence of wet season acidification of the surface is consistent with acidic rainfall and surface runoff inputs during this period. Post wet season the whole pit appears to be very consistent throughout its profile with only minor temporal fluctuations around a neutral pH.

Surface temperature followed a strongly seasonal pattern and mirrored the last two years. Surface temperature displays a rise during the wet season and a fall during the dry season with almost an eight-degree fluctuation over the year. Deep water temperature below 45 m remained very constant at or below 24 ºC and varied by less than 0.4 ºC for the full period of reporting.

All depths are well oxygenated throughout the current reporting period.

Chemical Quality

There is a seasonal divergence in water chemistry of surface water compared to chemistry at depth. Cadmium and zinc display reductions in surface concentrations particularly during the wet season (ideal for discharge) but at depth remain reasonably constant and higher. Surface levels increase during the latter part of the reporting period and are at present the same concentration or marginally higher than deeper concentrations. Aluminium and copper displayed the inverse of this with high surface concentrations during the wet season albeit the concentrations are very low when compared with site wide un-impacted surface waters.

Cadmium concentrations during the current reporting period were lowest at surface and display a declining trend in concentration at depth over the last three years. This is also apparent in Zinc concentration with a steady three-year decline from 32,000 µg/L in 2013 to 1,700 µg/L in 2017. Surface zinc concentrations are influenced by wet season rainfall and show marked reductions during each wet season when compared with concentrations at depth.

Copper concentration in RP3 has been reduced to a level close to detection level throughout the whole profile and is no longer a water quality issue. Copper concentration is unlikely to change unless water was added to RP3 from emergency pumping of RP1 or RP7, or chemical remobilisation occurred from accumulated precipitates on the pit floor.

Zinc concentration remains relatively high in the water profile and additional maintenance treatment may be required if the surface water chemistry displays similar rises to previous years. Currently the surface concentration is over 1,700 µg/L and very similar to the same time last year as displayed in Figure 77. As seen in the previous years the addition of treatment prior to the wet season can reduce the surface level enough to achieve an acceptable dilution ratio for maximum discharge.

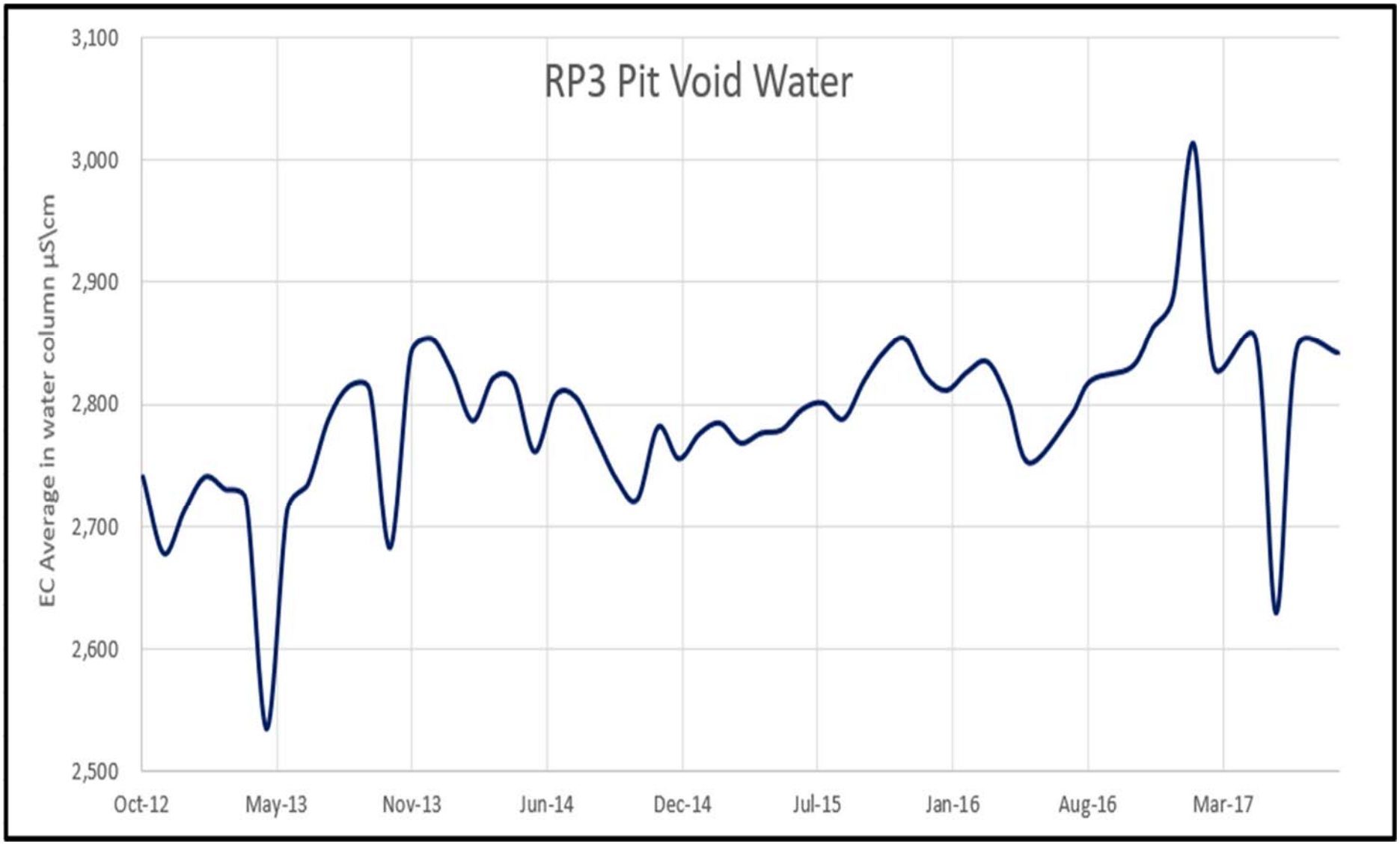

Figure 70. Electrical Conductivity in RP3 void

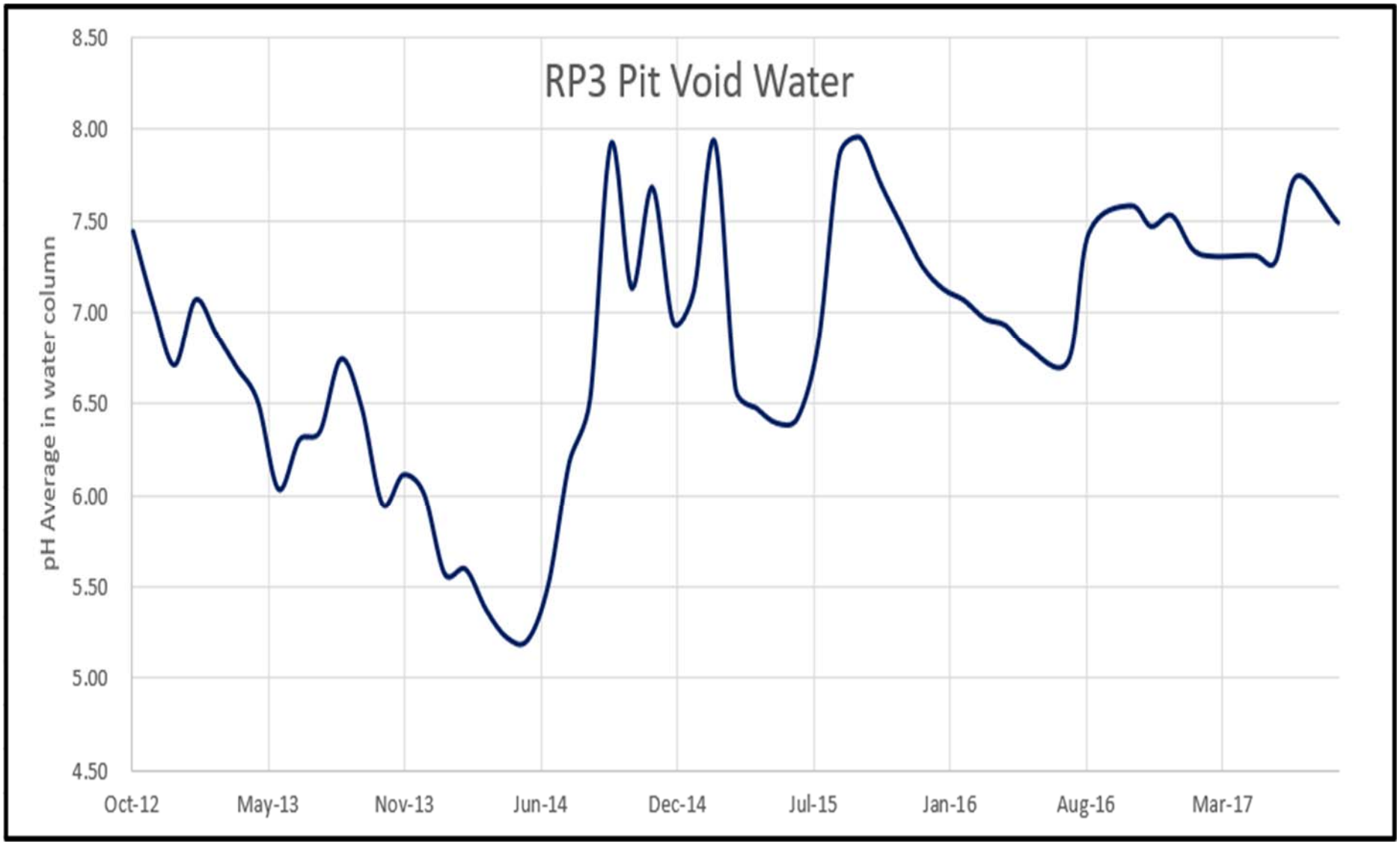

Figure 71. pH in RP3 pit void

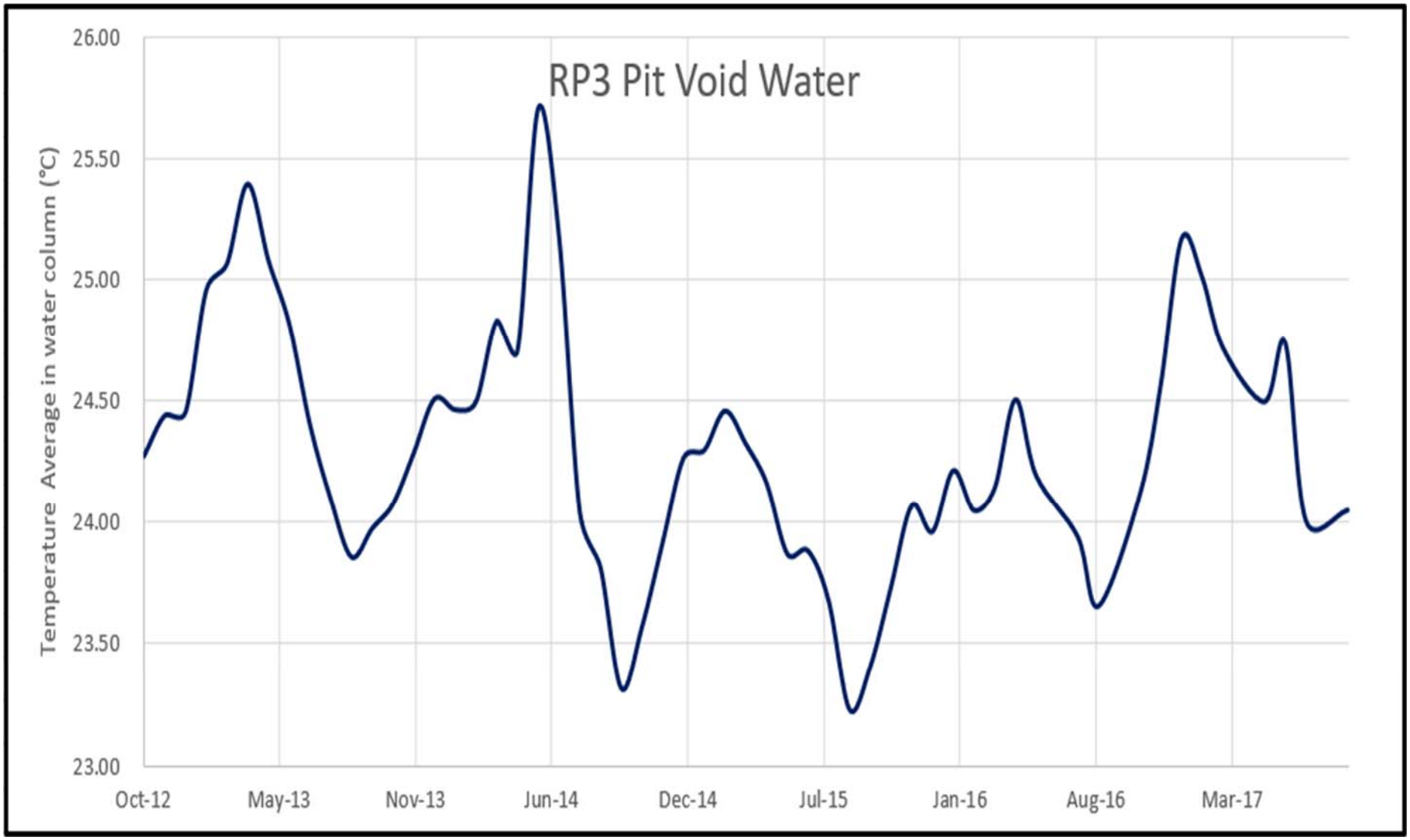

Figure 72. Temperature in RP3 pit void

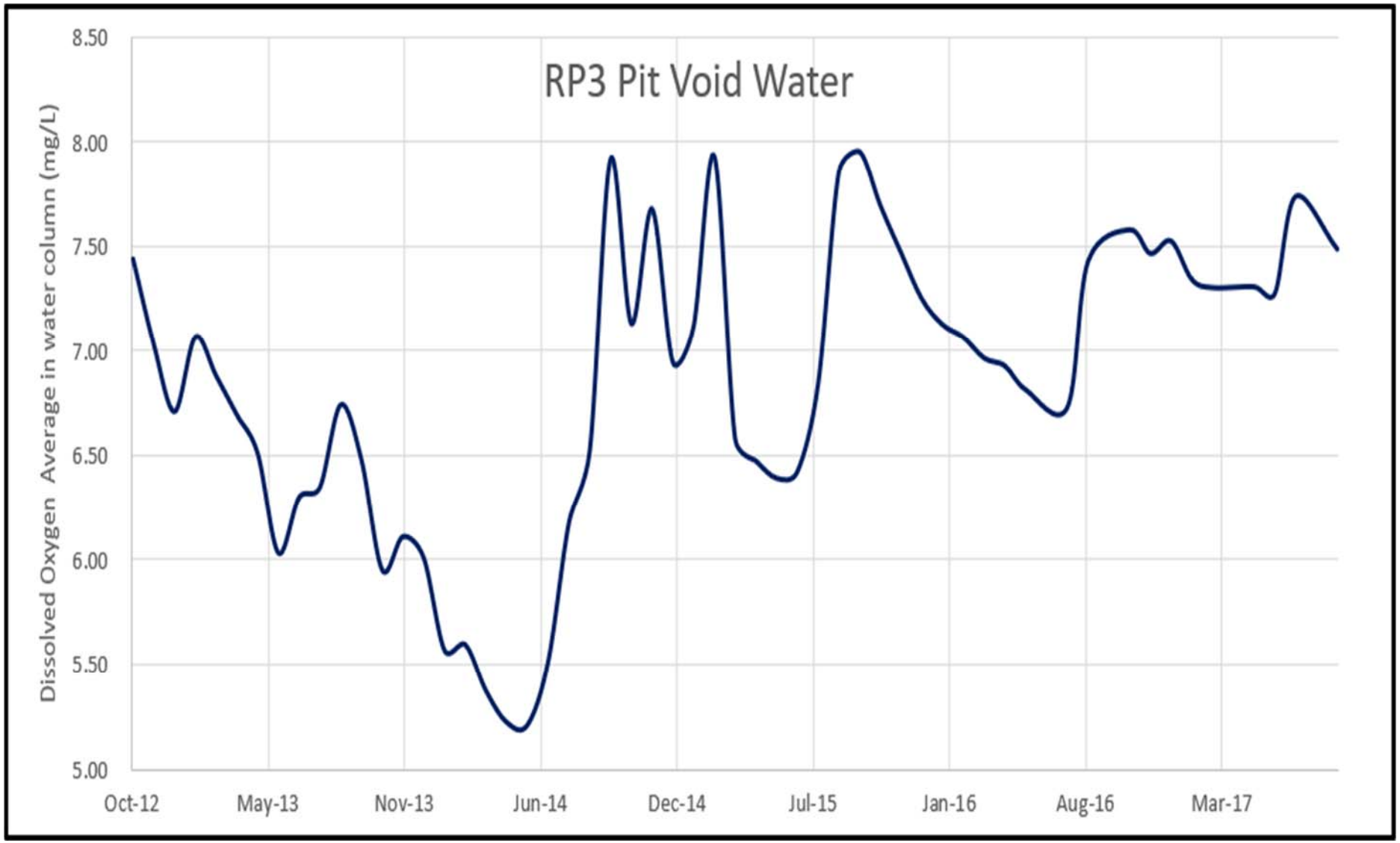

Figure 73. Dissolved Oxygen in RP3 pit void

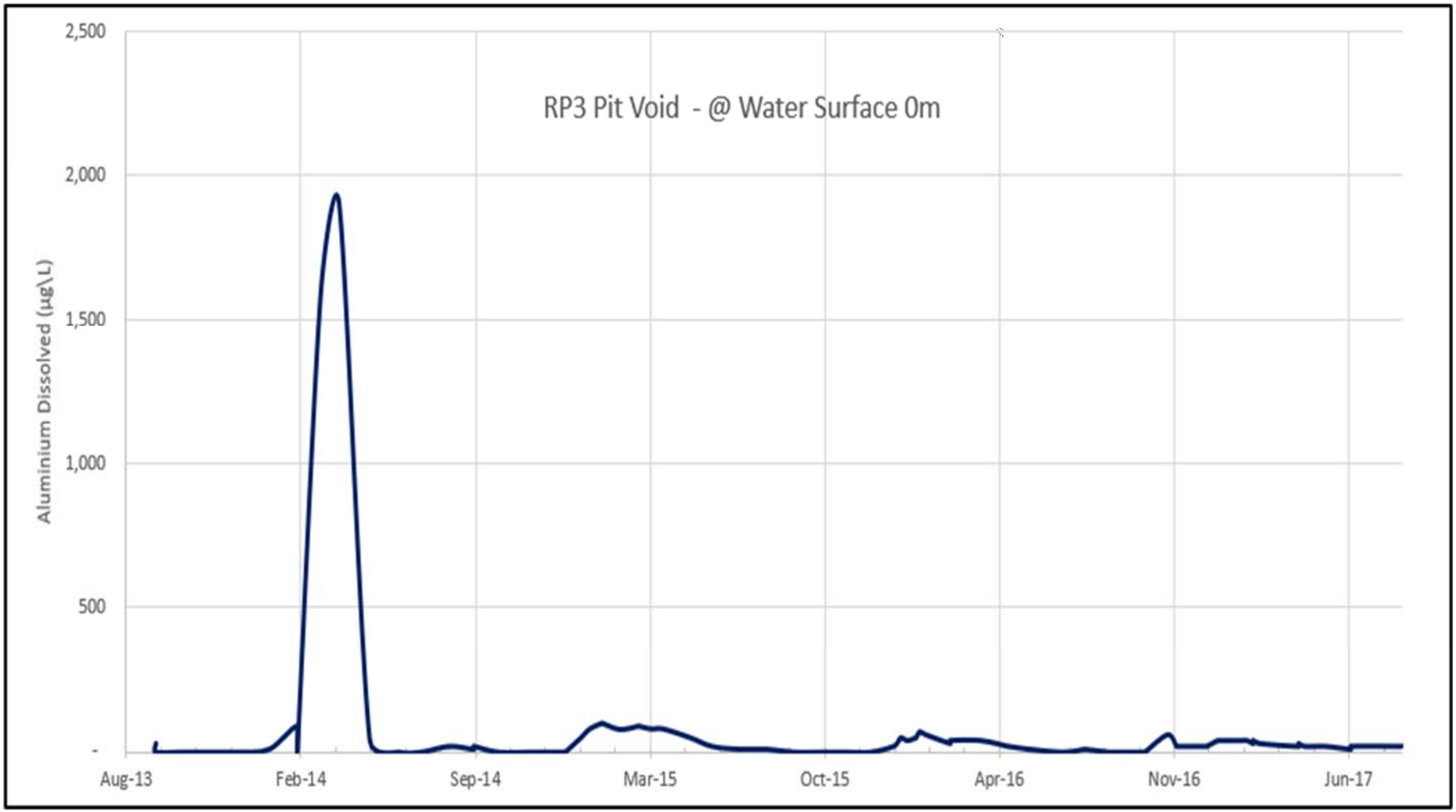

Figure 74. Aluminium (0.45 µm filtered) in RP3 pit profiles

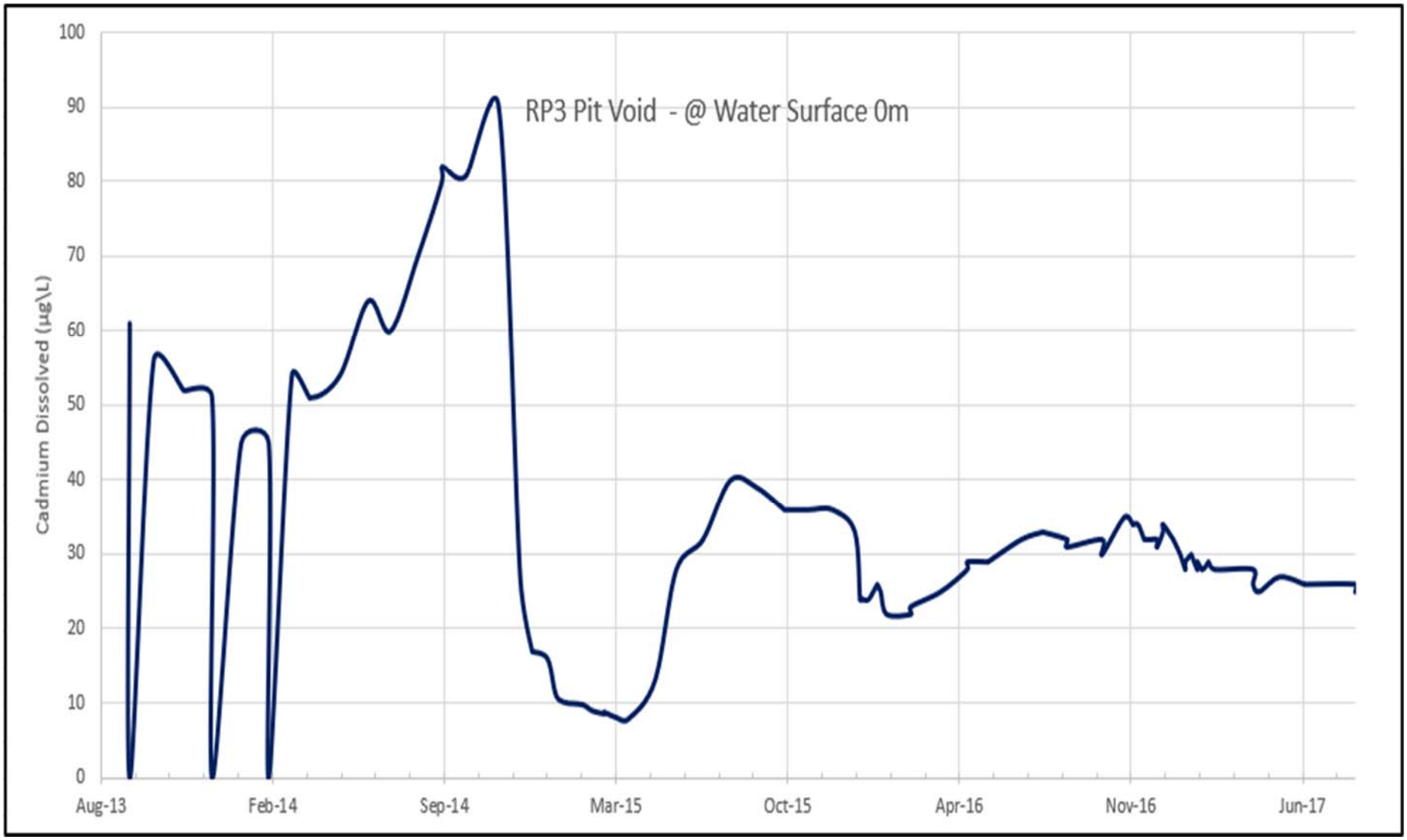

Figure 75. Cadmium (0.45 µm filtered) in RP3 pit profiles

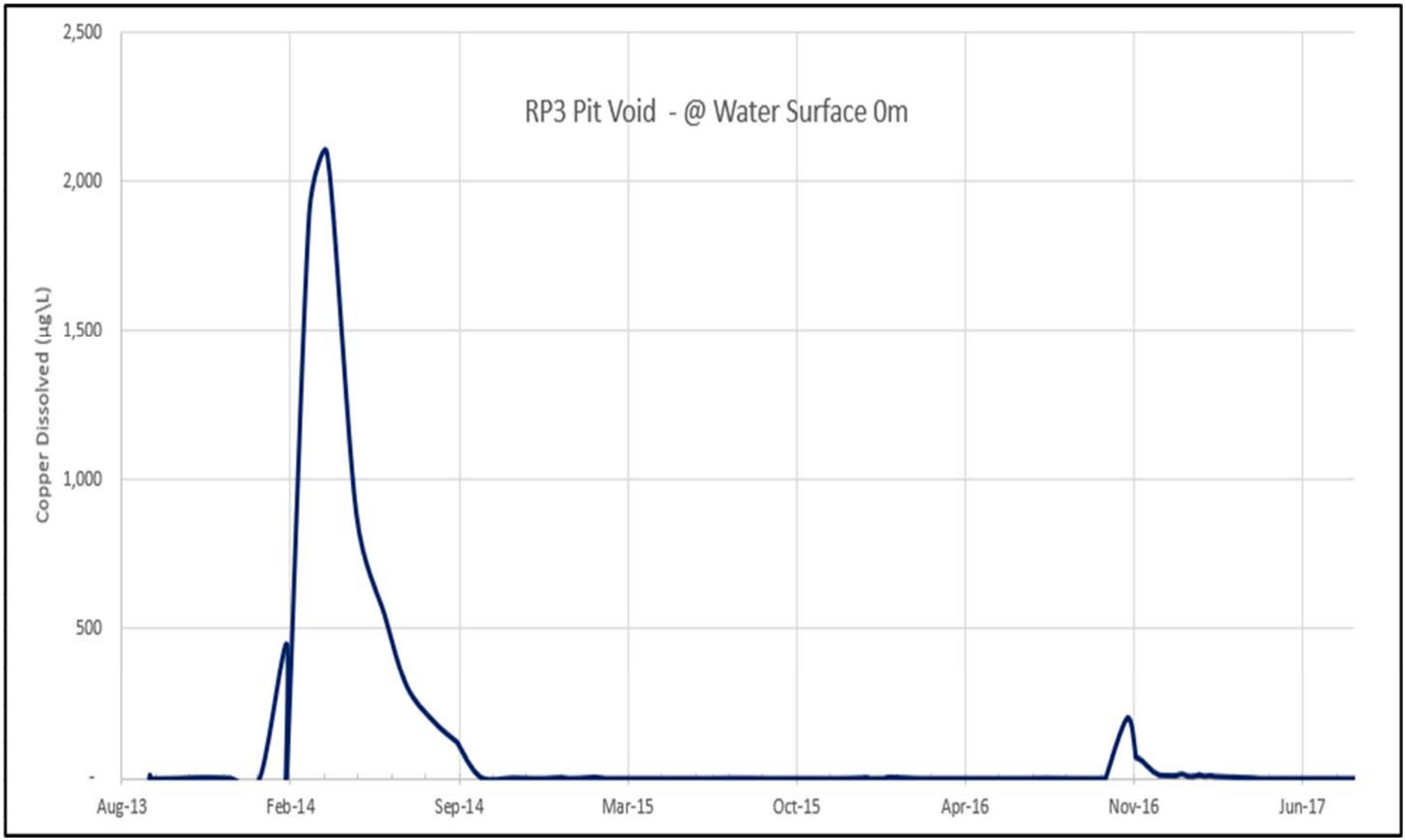

Figure 76. Copper (0.45 µm filtered) in RP3 pit profiles

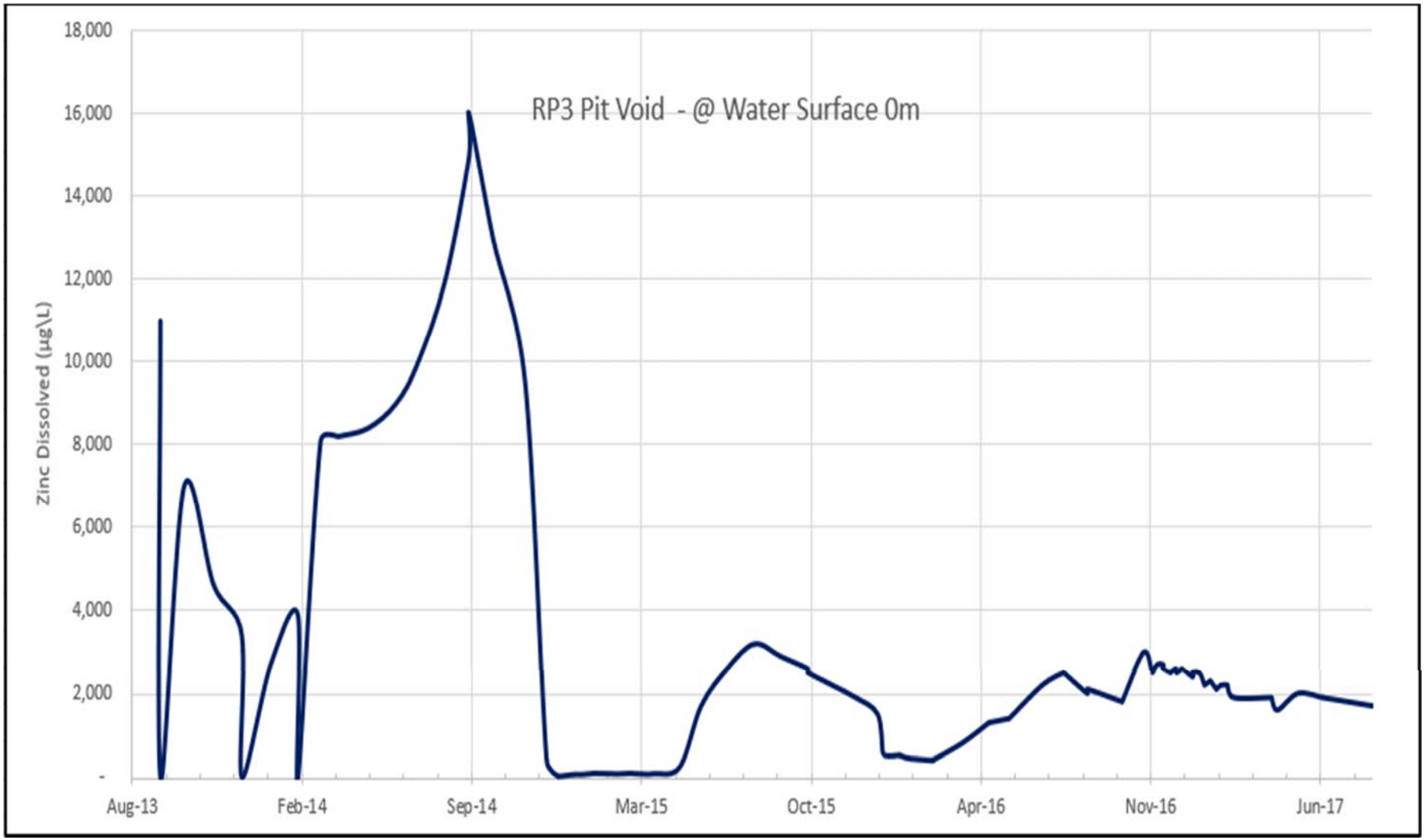

Figure 77. Zinc (0.45 µm filtered) in RP3 pit profiles

6.7.3.4 *Ground Water Monitoring*

Ground waters are monitored as outlined in this section. Two sampling events occurred in the reporting period. A total of 16 bores were sampled in January 2015 and 17 bores in August 2015, in line with the MMP amended program submitted to the DME in April 2014. The bore site locations are presented in Figure 78.

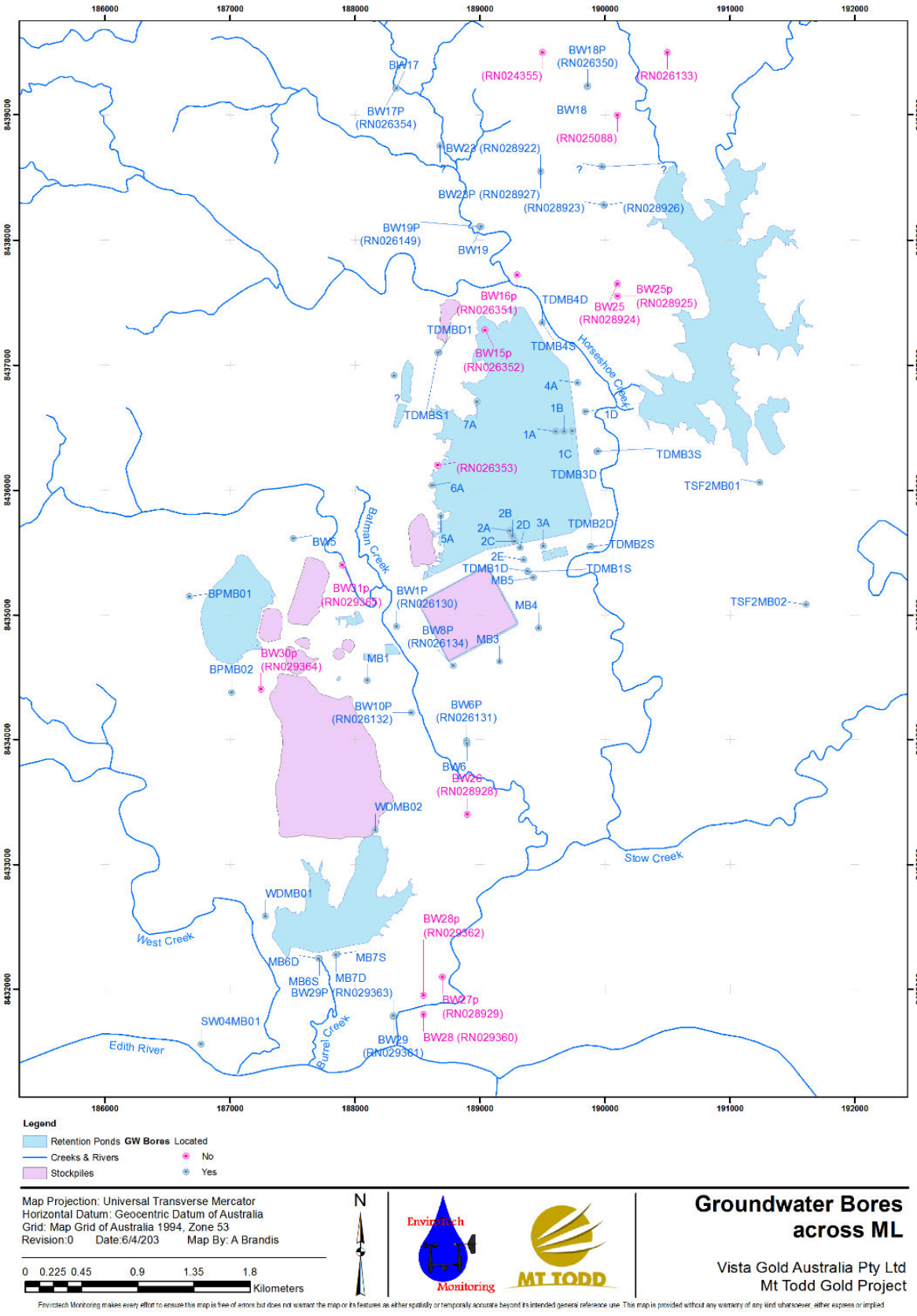

Figure 78. Groundwater Bores and Piezometers across the Mineral Lease

6.7.3.4.1 Physical Quality

All physical data presented below are from final stabilised water chemistry at the time of sample collection.

pH

Sample results from four sampling runs over two years displayed a pH range from 6.05 to 7.41. Groundwater pH is very stable at each bore and only exhibited a maximum of 0.45 pH units difference at any single bore over the two-year period. There is a marginal increase in pH seasonally, with slight elevation in wet season sampling runs compared to dry season runs.

Electrical Conductivity

There is substantial variation of EC across all bores, ranging from 130 µS/cm up to 5034 µS/cm. Individual bores exhibit only minor variability across the two years except for the two Tailings Dam bores TDMB2D and TDMB2S. These two bores display a larger range of values that appear seasonally related with lower EC recorded during the wet season dilution. Background bores are clearly identified to the left of the chart in

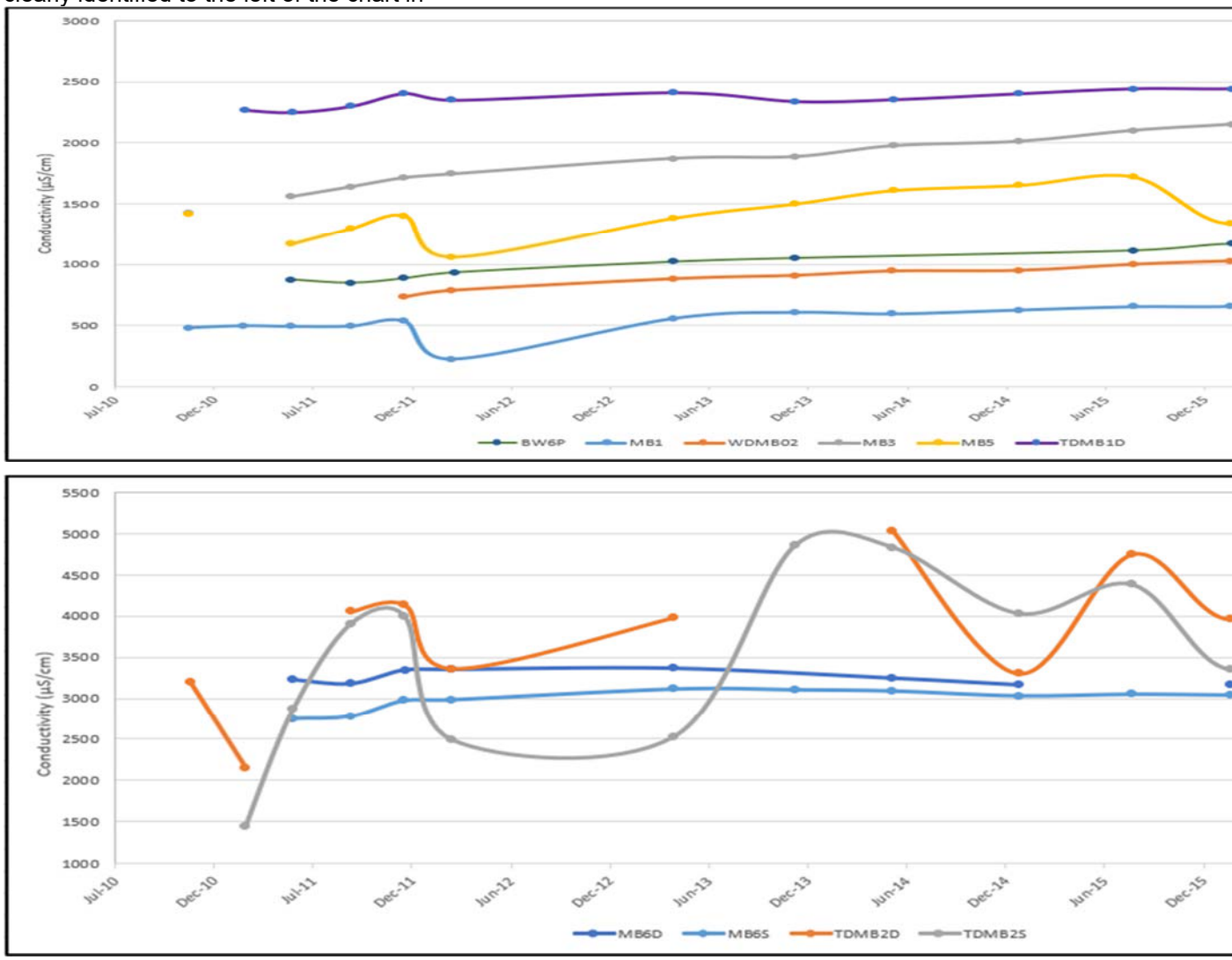

Figure 80; and include those bores at greater distance from mine structures and deep bores on the north, north eastern and western sides of the Tailings Dam. Central mine bores such as MB1, WDMB02 and BW6P display slightly higher EC whereas bores associated with RP1 or the southern end of the Tailings Dam show moderate to high EC signatures.

Temperature, Dissolved Oxygen, Turbidity and Redox

Temperature across the bores over two years of sampling remained stable with an average temperature of 33.7°C and a range from 28.5 - 33.7°C. Some minor seasonality is apparent from the data.

Dissolved oxygen and turbidity were recorded in only three of the four sampling runs due to instrument malfunction. Both parameters display typically low values as expected for groundwater. Averages below seven for both parameters show good bore sampling methodology, with aquifer recharge being sampled rather than remnant water from the bore casing.

The Redox value is a measure of the oxidation state of the groundwater aquifer. Chemical composition of water will vary considerably depending on this oxidation state. Both sampling years exhibited approximately 75% of waters were in a reducing state with negative redox values.

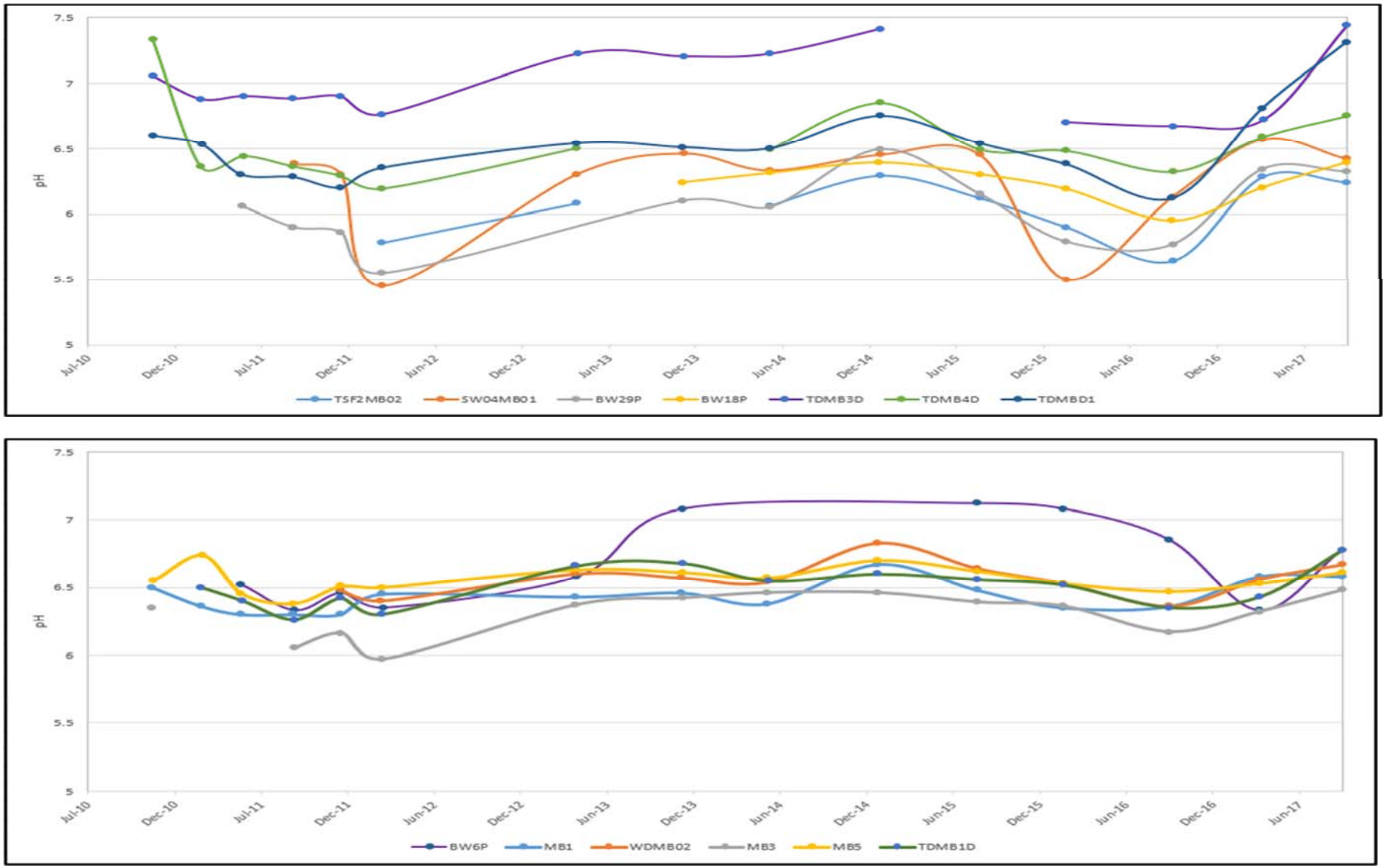

Figure 79. pH from bores sampled 2010 to 2017

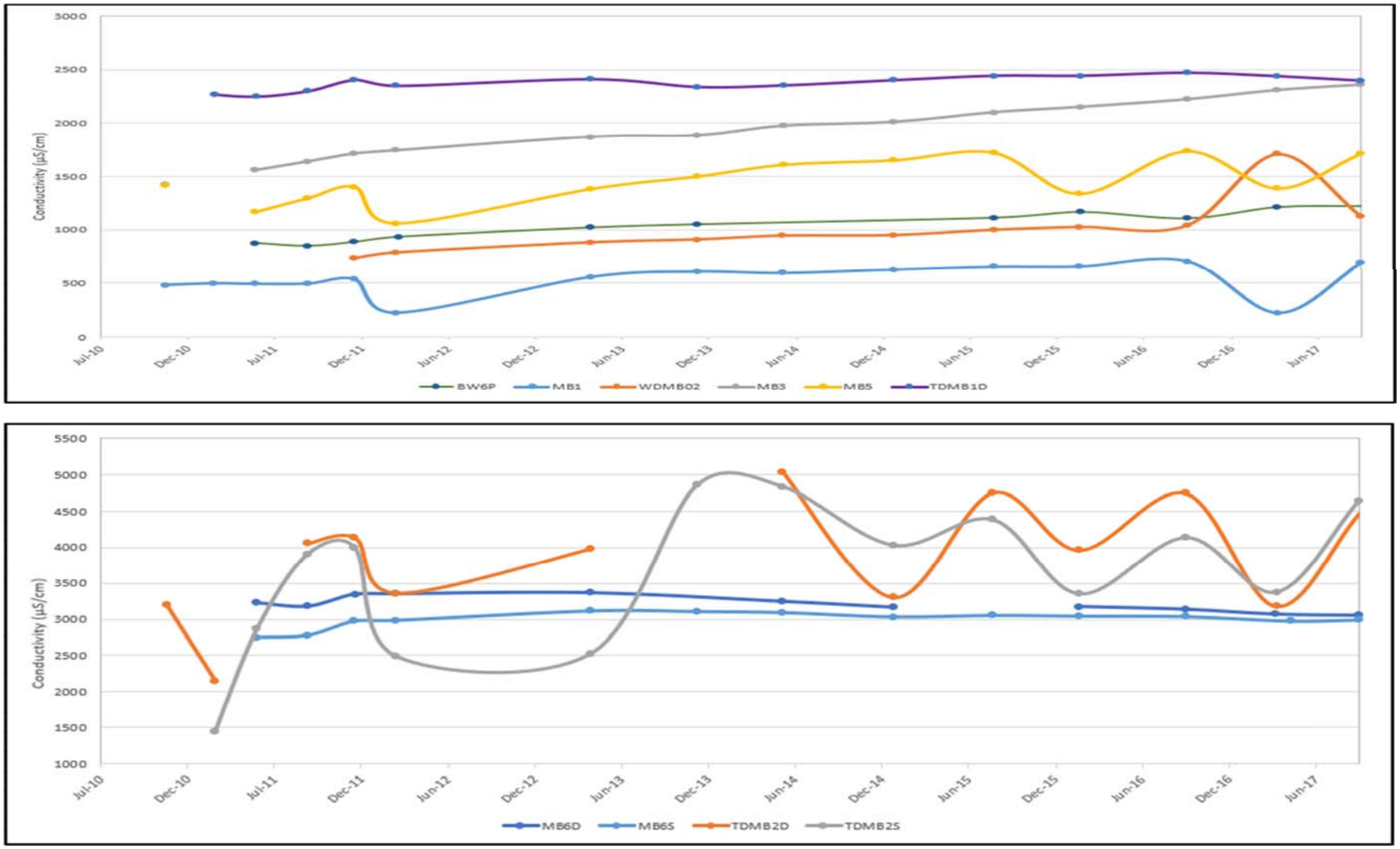

Figure 80. Electrical Conductivity from bores sampled December 2013 to August 2015

6.7.3.4.2 Chemical Quality

Ground water chemistry continued to show similar trends to those reported in the 2013 MMP and 2014 OPR, with a small subset of bores south of the TSF (TDMB1D, TDMB2D, TDMB2S and MB5) showing high concentrations of multiple chemical parameters. This is consistent through all sampling runs and shows a clear signature of contamination consistent with the chemistry of the TSF during operation. These sites are characterised by elevated concentrations of Cobalt, Manganese and a suite of other trace metals but lower concentrations of naturally occurring elements such as arsenic, which appears prevalent in background bores.

Other bores across the site exhibited a wide range of chemistry consistent with both mining related practices and naturally occurring mineralisation. High concentrations of sulphate are present in most bores near mining infrastructure, and as such are likely indicative of mining related impact. Arsenic concentrations are high across many bores at the site, with these elevated concentrations appearing to be independent of mining related activity and highly varied both seasonally and inter-annually.

The two most highly impacted bores (TDMB2D and TDMB2S) have the highest concentrations of trace metals and display the highest seasonal variation. Iron and manganese concentrations in the 2017 season are dramatically different from the previous season and may be indicative of a slightly different pumping procedure. The deep bore exhibits greater seasonal variation with wet season concentrations lower than dry season concentrations. The shallow bore has very low transmissivity and pumping has been problematic in the past. A new technique employed during 2015 ensures the bore casing is evacuated and aquifer recharge water is sampled during slow casing recharge. This may have resulted in the lower concentrations exhibited in the 2015 round of sampling.

6.7.3.4.3 Groundwater trigger values

No trigger values are currently defined for groundwater sampling results.

6.8 Remedial or Corrective Management Actions

No adverse trends have been identified in the bore monitoring data.

7 Incident Reporting

Only one incidents occurred on site within the current reporting period. A employee had a back strain as a product of using the fire bug while passenger in a ATV.

For the specified incident types below, the following reporting actions will take place in the event of such an incident occurring:

- Water management performance reporting will comply with the requirements of waste discharge licence 178. However, any breaches of the Waste Discharge Licence or uncontrolled discharges will be immediately reported to the NT Environment Protection Agency and DME.
- Hydrocarbon spills, unauthorised removal of vegetation and known changes to groundwater contamination will be immediately reported to the Northern Territory Department of Mines and Energy.

- Damage to aboriginal sites is immediately reported to the Northern Territory Aboriginal Areas Protection Authority.
- Damage to heritage sites are immediately reported to the Northern Territory Department of Lands Planning and Environment.

8 Closure Planning

Vista Gold completed the acquisition of the Mt Todd Site in June 2006, and has undertaken care and maintenance of the property on behalf of the NT Government since January 2007. Currently the environmental liability of the Mt Todd site resides with the Northern Territory Government. This liability will only transfer to the incumbent operator once all relevant approvals have been granted and mining operations have recommenced.

Due to the ownership arrangements, current site status and potential for renewed mining at Mt Todd, a discussion on closure planning activities and costs can be framed in either of the following scenarios:

1. Maintenance of the site assuming status quo until mining and construction operations recommence.
2. Complete rehabilitation of the site post the completion of successful mining and processing operations.

Scenario 1 above are the only possibilities now as there is yet to be a final investment decision made by Vista Gold towards restarting mining operations. Draft life of mine closure planning information is presented in the EIS and PFS and such information is not relevant for inclusion in this care and maintenance MMP. If mining operations were to recommence, such closure costs and activities would be provided to obtain the necessary approvals.

Ongoing management of the site in a care and maintenance status is the default scenario whilst under Vista Gold's management prior to a final investment decision. However, in the event of the unexpected departure of Vista Gold from site, activities necessary to completely rehabilitate all legacy facilities remain with the current liability holder, the Northern Territory government.

8.1 Care and maintenance operations

The following table summarises the annual core care and maintenance activities to be undertaken to reduce the risk of significant environmental harm occurring.

Table 29. Essential care and maintenance activities

Activity	Details	Costs areas
Heap Leach Pad de-silting & management	Wet season rainfall routinely washes fine material into the HLP moat which blocks and reduces the moat capacity. Small excavation during the wet season is needed along with significant remedial excavation during the dry season. Works are also conducted on the top of the HLP to install pipes	Contractors, plant & equipment for major dry season excavation works On-site personnel hours and excavation equipment for wet season management
Soil and land management	Routine inspections for erosion, particularly after significant rainfall events. Earthworks to repair erosion or damage to infrastructure such as roads.	Contractors, plant & equipment for major repairs (such as repairs to the main access road, or creek and diversion repairs) On-site personnel hours and earthmoving equipment for smaller repairs Plant and equipment operating costs
Ponds, Pipe and Valve inspection and maintenance	Ensure all water management infrastructure is fit for the purpose of managing wet season rainfall	On-site personnel hours to routinely inspect pond liners/structures, pipelines and pumps for issues. Personnel hours to undertake repairs to pipelines or pumps. On-site personnel to remove pumps and transport to external service agent. Service and repair costs. On-site contractors for electrical repairs
Security	Ensure all assets are protected and site egress is restricted to authorised personnel	Personnel hours to maintain access register, escort contractors, open gates. Supply of security hardware such as locks, keys etc. Vehicles and running costs
Health and safety	Ensure all contractors, visitors and staff attend inductions. Routine inspections, identification and address of safety related issues with plant, equipment or other site facilities. Regulatory reporting of health and safety information and incidents	On-site personnel hours to inspect plant, equipment. Personnel hours to isolate and or repair issues. External costs with repair or replacement of equipment On-site contractors to undertake repairs specifically where licenced operators are required. On-site personnel to record compile health and safety information and to generate necessary reports

Activity	Details	Costs areas
Water Management	Actively manage the site water inventory to ensure protection of water holding structures and minimise discharge risks to the environment in accordance with the WDL and MMP conditions.	On-site personnel to monitor daily pond levels, starting and stopping of pumps, monitoring pumping activities, adjusting valves. Monitoring of weather conditions and planning for rainfall events. External contractors to repair faults and equipment related to telemetry and automated systems Power to run pumps On-site personnel to repair & move pipelines, pumps or other equipment necessary for emergency situations On-site external contractors to undertake repairs as necessary to failed equipment Personnel to operate water treatment plant. External contractors to repair faults or plant equipment. Lime supply by external parties On-site personnel hours for water quality sampling and water management recordkeeping. Sampling consumables, supply of instrument, freight and external analysis of water samples. Supply of hire equipment if required Vehicles and operating costs
Environmental Monitoring	Actively monitor the site environment to measure effectiveness of operational controls	Groundwater Surface water Macroinvertebrates and sediments RP3 Pit Profiling WDL discharge monitoring Site water inventory
Weed Management	Maintain a pest and weed management program to minimise spread and/or reproduction.	On-site personnel to monitor and conduct spaying Removal of build-up of weeds or other vegetation for the protection of assets Supply of herbicide Vehicles and operating costs
Waste and Hazardous Substances Management	Maintain facilities and actively monitor waste production and disposal. Monitor hazardous substances storage and maintain inventory of hydrocarbon storage	On-site personnel to perform routine inspections, undertake repairs, recordkeeping & reporting Disposal of containers and unused chemicals or waste by external contractors
Fire Management	Identify fire risks and conduct controlled burns across the Mineral Lease to protect assets	On-site personnel to identify fuel loads and risks. Conduct prescribed burns to remove fuel and provide fire breaks. Supply of firefighting equipment. Vehicles and operating costs

While the table does not list the multitude of other indirect costs such as administration, human resource management, accommodation etc. which would also be borne by any subsequent manager of the site, such costs cannot be excluded and will vary depending on business structure, corporate expertise and knowledge etc.

8.2 Post mining rehabilitation

The rehabilitation requirements post mining would be dependent on the operational facilities that are constructed during the project life. Closure plans of such infrastructure and facilities for the proposed Mt Todd Project are detailed within the EIS

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9 Appendices

Appendix A. Northern Territory Government Agreement D92226

Appendix B. AAPA Authority Certificate 2011/15538

Appendix C. Vista Gold Environmental Policy

Appendix D. Vista Gold Induction Manual

Appendix E. Waste Discharge Licence 178-5

Appendix F. Discharge Plan V4

Appendix G. Surface Water Monitoring Standard Operating Procedures

Appendix H. WDL 178-5 Aquatic Monitoring 2016 2017

Appendix I. WDL 178-5 Monitoring Report 2017