BHP

Annual Environmental Protection and Management Program Report

Olympic Dam

1 July 2016 – 30 June 2017

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Distribution

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Introduction

Purpose and Scope

This annual Environmental Protection and Management Program report (annual EPMP report) presents data relating to the environmental management of the BHP Billiton Olympic Dam operations for the period 1 July 2016 to 30 June 2017 (FY17).

The objectives are to:

- Meet the requirements of clause 11 of the Olympic Dam and Stuart Shelf Indenture (the Indenture) and condition 18 of the major development approval (10th October 2011).
- Report performance against environmental outcomes, compliance criteria and leading indicators presented in the 2016 Environmental Protection and Management Program (EPMP).
- Report performance against targets and continuous improvement actions also contained in the 2016 EPMP.
- Document the results of the deliverables presented in the monitoring programs (MPs) of the 2016 EPMP.

The 2016 EPMP was submitted to the Indenture Minister in May 2016 and subsequently approved.

Report Structure

A description of the EPMP structure against which reporting is based is given below (Table 1).

The reporting against outcomes is achieved through a hierarchy of data reporting (deliverables) and statements of compliance leading to an assessment of whether or not the environmental outcome has been met. The main chapters in the report are aligned to the key environmental aspect IDs contained within the EPMP.

The reporting hierarchy then takes the following form:

- Deliverables from the various MPs are included in the most relevant chapter, and a presentation of data and discussion of results is provided.
- The results of the deliverables contribute to the compliance statement for the compliance criteria under which they are reported (and in some cases to other compliance criteria, in which case appropriate cross-referencing is provided).
- These compliance criteria then provide a statement of achievement of the environmental outcome.

Performance against targets and continuous improvement actions is reported separately but still within the relevant ID chapter.

Table 2 contains a summary of each Environmental Management Program (EM Program) ID. This provides an overview of the outcomes and has the following elements:

- the environmental outcome to be achieved
- a ‘traffic light’ style indicator to indicate whether the outcome has been achieved.
- a statement that summarises whether or not the environmental outcome was achieved, and why.

EPMP Structure

Background

The structure of the EPMP report is closely aligned with the structure of the BHP Billiton Olympic Dam Corporation Pty Ltd (ODC) 2016 EPMP, and in particular the EM Program contained within that document. The EPMP consists of a number of documents which form a portion of the Environmental Management System (EMS) requirements. A brief summary of each document within the EPMP is shown in Table 1.

Table 1: EPMP Structure

Document	Content summary
EMM	General overview of the EPMP. Purpose and scope. Regulatory framework. Background information about Olympic Dam and the expansion. Overview of the structure and requirements of the Environmental Management System. Glossary of defined terms. Cross-referencing of EPMP content to approval conditions and the requirements of the Mining Code.
EM Program	Addresses potentially significant environmental aspects and impacts, identified through analysis and prioritisation of environmental risks, legal obligations and community concerns. Documents the processes, systems and actions used to manage the prioritised aspects and impacts.
MP(s)	Address assessment and performance of the EM Program's outcomes, compliance criteria and targets, control mechanisms and legal and other requirements.
Actions, Targets and Major Changes	Captures continuous improvement opportunities and development opportunities identified that can assist in meeting compliance criteria and environmental outcomes and improving ODC's environmental performance, environmental improvement targets and the action plan to achieve such targets.
Mine Closure and Rehabilitation Plan	A plan for closure and rehabilitation of the mine, including the environmental outcomes expected to be achieved indefinitely, and options for progressive rehabilitation.

The EM Program documents the processes, systems and actions used to manage prioritised aspects and impacts, including the incorporation of:

- the environmental values that may be impacted, and the key risks to those values;
- the environmental outcomes that BHP Billiton aims to achieve;
- clear, specific and measurable compliance criteria that demonstrate achievement of the outcome(s);
- leading indicator(s) criteria, providing early warning of trends that indicate a compliance criteria may not be met;
- the management and operational controls in place to deal with the environmental risk (aspects and impacts), including any regulatory conditions;
- contingency options to be used in the event that identified risks are realised;
- continuous improvement opportunities and development opportunities identified that can assist in meeting compliance criteria and environmental outcomes and improving ODC's environmental performance;
- environmental improvement targets and the action plan to achieve such targets.

Executive Summary

Overview

The FY17 Annual EPMP Report demonstrates compliance and environmental improvements against the 2016 EPMP.

Data from monitoring programs is presented as evidence against compliance criteria under the Environmental Management Program (EM Program) IDs.

Considerable progress against environmental outcomes, compliance criteria, actions and targets in the 2016 EMP was made during the reporting period.

Changes to the 2016 are listed in Appendix A of the FY17 Annual EPMP Report.

Major Achievements

Following is a list of major achievements for the reporting period:

- The construction of the first cell of the approved permanent contaminated waste disposal facility (CWDF) was completed. Following the approval of the permanent CWDF a project was initiated to decommission the temporary contaminated waste facilities and clean, prepare, test and dispose of the waste as per the approved CWDF Waste Management Plan. The project ensured implementation of cleaning and recycling strategies in order to minimise contaminated waste. The project commenced in May 2017 and has successfully processed approximately 3846 tonnes of contaminated waste. Of the 3846 tonnes processed approximately 1127 tonnes has been removed off site as recycling with ~ 1600 tonnes cleaned and ready to be removed offsite for recycling subject to transport. Only 1118.1 tonnes of waste was determined to be contaminated and has been disposed of to the new CWDF. The project has successfully recycled 70% of contaminated waste to date with only 30% being disposed to the CWDF.
- A works program of GAB well decommissioning and repair was completed. Olympic Dam owned artesian wells underwent a physical condition and monitoring program relevance assessment. Eleven wells were identified in need of repair and ten wells were determined to be surplus to monitoring program requirements. A works program was developed in conjunction with Dept. Environment, Water and Natural Resources (DEWNR) and received GABSI funding. Main valves, manifolds and distribution systems were replaced where leaks had been identified. Decommissioning of wells was undertaken by a qualified third party contractor. The successful execution of this project reduced the risk of unplanned well failure and ensure BHP Olympic Dam is managing GAB wells to the appropriate standard.

Leading Indicators, Actions and Targets

The approved 2016 EPMP contained 15 leading indicators, 15 targets and 23 actions, which are best practice and do not form a part of our compliance.

All environmental targets and actions were achieved or were within limits.

Fourteen of the 15 leading indicators were achieved. The leading indicator not achieved was in relation to pore pressures within or adjacent to the TSF embankment, which are greater than the pore pressures used in the slope stability assessment demonstrating compliance with ANCOLD guidelines. Piezometers located around the Cell 1, 2/3 and 5 remained relatively constant and below hydrostatic levels while the piezometers on Cell 4 (north, west and south walls) are generally above the trigger values. Stability analysis results of studies undertaken in FY17 (Golder Associates, 2016) show the Factors of Safety for the critical sections of the embankments comply with ANCOLD Guidelines except for Cell 4. Buttresses are being constructed along the downstream side of these walls of Cell 4 to improve the factor of safety against slope instability of the embankments to the typically recognised minimum value of 1.5. The Cell 4 Factors of Safety will be above the guidelines upon completion of the buttress, expected to be the first quarter of FY18.

Compliance Summary

Table 2 lists the environmental outcomes for each EM Program ID. Next to each outcome 'traffic light' style indicators have been used to allow for overview assessment of achievement of the outcome, as follows:

- Environmental outcome achieved
- Significant progress towards achieving the Environmental outcome
- Environmental outcome not achieved.

The approved 2016 EMP contained 22 environmental outcomes and 28 compliance criteria.

All environmental outcomes and compliance criteria were achieved or were within prescribed limits.

Table 2 provides a summary of the environmental outcomes assessed during FY17.

Table 2: FY17 Compliance summary.

Environmental outcome	Outcome Statement
ID 1 USE OF NATURAL RESOURCES	
ID 1.1 Land Disturbance and Rehabilitation	
No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of the construction, operation and closure of Olympic Dam.	No significant adverse impacts to populations of listed species as a result of the construction, operation and closure of Olympic Dam occurred. Low numbers of four species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and two species listed under the *National Parks and Wildlife Act 1972* (NPW Act), were observed interacting with the TRS during FY17. Two wide spread regionally significant flora species (not listed species) were disturbed.
ID 1.2 Aquifer Level Drawdown	
Environmental outcome	Outcome Statement
No significant adverse impacts to existing third-party users' right to access water from within the GAB wellfield Designated Areas for the proper development or management of the existing use of the lands as a result of ODC activities.	Drawdown and percentage wellhead pressure loss at pastoral bores remains less than the predicted long-term impact as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2017), and significantly less than the maximum drawdown area defined within the 10 m contour. Environmental flow rates at GAB springs remained above predicted long term impacts as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2017).
No significant adverse impacts to the availability and quality of groundwater to existing Stuart Shelf third-party users as a result of groundwater drawdown associated with ODC activities.	No significant impact to groundwater for existing Stuart Shelf third-party users has occurred. Regional groundwater levels are stable.
No significant adverse impact on groundwater-dependent listed species or ecological communities as a result of groundwater drawdown associated with ODC activities.	Drawdown remains less than the predicted long-term impact and was within compliance criteria limits for FY17. Environmental flow rates at GAB springs remained above predicted long term impacts as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2016). Monitoring showed no indication of a significant adverse impact on groundwater-dependent listed species or ecological communities.
ID 2 STORAGE, TRANSPORT AND HANDLING OF HAZARDOUS MATERIALS	
ID 2.1 Chemical and Hydrocarbon Spills	
Environmental outcome	Outcome Statement

No significant site contamination of soils, surface water or groundwater, as a result of the transport, storage or handling of hazardous substances associated with ODC's activities.	No significant site contamination of soils, surface water or groundwater occurred in FY17. All spills were appropriately contained and cleaned up as soon as practicable. Active monitoring and management of legacy hydrocarbon sites was continued during FY17.

ID 2.2 Process Material Spills

Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of radioactive process material spills from ODC's activities.	BHP Billiton Olympic Dam Corporation Pty Ltd (ODC) has consistently operated in a manner that limits radiation dose to members of the public, from operational activities and radioactive emissions, to less than a small fraction of the International Commission on Radiological Protection (ICRP) 1mSv/y limit. During FY17 there were no radioactive process material spills outside operational areas. As a result, there are no adverse radiation exposure impacts to the public from activities undertaken at ODC.
No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive process material spills from ODC's activities.	No significant impacts to populations of listed species or ecological communities were recorded due to operational activities, including the effects of any radioactive process material spills. Impacts to listed species and ecological communities are avoided by ensuring that there is no uncontrolled loss of radioactive material to the natural environment. As there was no loss of radioactive material to undisturbed environment in FY17, no impact to populations of listed species or ecological communities occurred.

ID 3 OPERATION OF INDUSTRIAL SYSTEMS

ID 3.1 Particulate Emissions

Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of particulate emissions from ODC's activities.	No adverse impacts to public health as a result of particulate emissions from operations conducted at ODC occurred during FY17. ODC considers the compliance limits as listed in Condition 49(a) of the Major Development Approval to be the threshold at which adverse impacts to public health may occur. Measured ground level dust concentrations derived from operations at Olympic Dam and recorded at sensitive receptor sites were below compliance criteria for PM_{10} dust at all times during FY17.

ID 3.2 Sulphur dioxide emissions

Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of sulphur dioxide emissions from ODC's activities.	There were no adverse impacts to public health as a result of sulphur dioxide (SO_2) emissions from ODC's activities during FY17. National Environmental Protection Measure (NEPM) levels for ambient air quality are based on protection of human health. Roxby Downs and Olympic Village ambient SO_2 analyser results for the reporting period showed no exceedance of the NEPM for ambient air quality SO_2 at either Olympic Village or Roxby Downs Township.

ID 3.3 Saline aerosol emissions

Environmental outcome	Outcome Statement
No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of ODC's activities.	No significant adverse impact to populations of listed species from saline aerosol emissions was observed during FY17.Observations made during environmental inspections and supported by data collected during various flora and fauna monitoring programs, did not find any significant adverse impacts to listed species.

ID 3.4 Radioactive emissions

Environmental outcome	Outcome Statement

No adverse impacts to public health as a result of radioactive emissions from ODC's activities.	No adverse impacts to public health as a result of radioactive emissions from ODC's activities occurred. ODC has consistently operated in a manner that limits radiation dose to members of the public, from operational activities and radioactive emissions, to less than a small fraction of the ICRP 1 mSv/y limit. As a result, there are no adverse radiation exposure impacts to the public from activities undertaken at ODC.
No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive emissions from ODC's activities.	No significant adverse impacts to populations of listed species or ecological communities occurred as a result of ODC's activities. Monitoring of radiation doses to the public and the deposition of Uranium-238 (^{238}U) at non-human biota assessment sites is used as an indicator of the potential exposure of listed species to radioactive emissions. Deposition of ^{238}U at non-human biota assessment sites was at a level which poses no significant adverse impacts to non-human biota.

ID 3.5 Greenhouse gas emissions

Environmental outcome	Outcome Statement
Contribute to stabilising global atmospheric greenhouse gas concentrations to minimise environmental impacts associated with climate change.	ODC has a road-map to achieve a reduction in greenhouse gas (GHG) emissions to an amount equivalent to at least a 60% reduction of 1990 emissions by 2050. Abatement of carbon emissions was achieved during FY17 through improvement projects.

ID 4 GENERATION OF INDUSTRIAL WASTES

ID 4.1 Embankment stability of TSF

Environmental outcome	Outcome Statement
No significant TSF embankment failure.	During FY17 the Tailings Storage Facilities (TSFs) were managed in accordance with the TRS Operations, Maintenance and Surveillance Manual (BHP Billiton Olympic Dam 2017d) and the Tailings Management Plan (BHP Billiton Olympic Dam 2017e) and no embankment failures of any magnitude occurred.

ID 4.2 Tailings seepage

Environmental outcome	Outcome Statement
No significant adverse impact on vegetation as a result of seepage from the TSF.	No significant adverse impact to vegetation as a result of seepage from the TSF has occurred. Eighty metres AHD (20 m below ground level) is considered as the level below which groundwater cannot interact with the root zone of plants in the Olympic Dam region. Groundwater levels in the vicinity of the TSF remain below 80 mAHD.
No compromise of current and future land uses on the SML or adjoining areas as a result of seepage from the TSF.	No compromise of current and future land uses on the SML or adjoining areas has occurred. Groundwater levels in the vicinity of the TSF remain below 80 mAHD and sampling indicates that seepage is being attenuated.
No compromise of the environmental values of groundwater outside the SML as a result of seepage from the TSF.	No compromise of the environmental values of groundwater outside the SML has occurred. Sampling indicates that seepage is being attenuated within the SML, and groundwater levels of bores along the SML are consistent with other regional bores. Seepage modelling has been updated to demonstrate that there are no expected future offsite impacts.

ID 4.3 Fauna interaction with Tailings Retention System

Environmental outcome	Outcome Statement
No significant adverse impacts to listed species (South Australian, Commonwealth) as a result of interactions with the Olympic Dam TRS.	No significant adverse impacts to listed species as a result of interactions with the Olympic Dam Tailings Retention System (TRS) have occurred. Low numbers of four species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and two species listed under the *National Parks and Wildlife Act 1972* (NPW Act), were observed interacting with the TRS during FY17.

ID 4.4 Solid waste disposal	
Environmental outcome	Outcome Statement
No significant adverse impacts as a result of management of solid waste.	The Resource Recovery Centre (RRC) effectively manages solid waste as per the EPA approved Landfill Environmental Management Plan 2016. No evidence of material environmental harm was identified based on the results or routine auditing and reporting conducted. No significant adverse impacts resulted from the management of solid waste at Olympic Dam during FY17.

ID 4.5 Radioactive waste	
Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of radioactive waste from ODC's activities.	No adverse impacts to public health as a result of radioactive waste from ODC's activities. ODC has consistently operated in a manner that limits radiation dose to members of the public, from radioactive waste, to less than a small fraction of the ICRP 1 mSv/y limit. As a result, there are no adverse radiation exposure impacts to the public from activities undertaken at Olympic Dam.
No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive waste from ODC's activities.	No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive waste from ODC's activities. Monitoring of radiation doses to the public and the deposition of ^{238}U at non-human biota assessment sites is used as an indicator of the potential exposure of listed species to radioactive waste. Deposition of ^{238}U at non-human biota assessment sites was at a level which poses no significant adverse impacts to non-human biota.

ID 5 INTERACTION WITH COMMUNITIES ID 5.1 Community interaction	
Environmental outcome	Outcome Statement
Residents in Roxby Downs, Andamooka and Woomera trust ODC to act in their best interests.	Responses to the most recent Olympic Dam Community Perception Survey indicate that ODC is a trusted organisation within our local communities. In addition to this, ODC provides employment to local and regional communities.

1. Use of Natural Resources

1.1 Land Disturbance and Rehabilitation

1.1.1 Environmental outcome

No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of the construction, operation and closure of Olympic Dam.

No significant adverse impacts to populations of listed species as a result of the construction, operation and closure of Olympic Dam occurred.

Low numbers of four species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and two species listed under the *National Parks and Wildlife Act 1972* (NPW Act), were observed interacting with the TRS during FY17. Two wide spread regionally significant flora species (not listed species) were disturbed.

1.1.2 Compliance Criteria

No significant impact to the size of an important population of Category 1a species. *NOTE: Significant impact is as defined in the Significant Impact Guidelines and greater than predicted in the EIS.*

All Category 1a species potentially impacted by operations at Olympic Dam are associated with the Great Artesian Basin (GAB) threatened ecological community, a discussion of which is provided in Chapter 1.2 on Aquifer Level Drawdown. Of the springs included in revised GAB flora monitoring program, *Eriocaulon carsonii* has been recorded at 60 springs at some stage since monitoring began (1983/4). *E. carsonii* was recorded on eighteen springs in 2015 and eighteen springs in 2016. In 2016, the species was absent from four mound springs where it had previously been recorded in 2015. New records of the species since 2015 were also found at four mound springs. This may be due to the proximity of springs. For example, the vents of HHS075 and HHS077 are very close together, which may have facilitated the movement of *E. carsonii* from one spring to the other. This may suggest that the species is a fast coloniser and may establish colonies quickly in areas with a suitable microclimate (i.e. such as areas with adequate surface flows). Therefore, it is concluded that no significant impact to the size of an important population of Category 1a flora species has occurred in FY17.

No loss of an important population of Category 1b species.

No loss of an important population of Category 1b fauna or flora species occurred as a result of land disturbed by ODC activities. No known preferred habitats of Category 1b fauna species were cleared during FY17. Vegetation clearance was primarily restricted to the SML with small amounts of disturbance occurring in the near vicinity. No avian Category 1b species of fauna were significantly impacted upon by the TRS during FY17. This is discussed in further detail in Section 4.3 *Fauna interaction with Tailings Retention System.*

Clearing of vegetation not to exceed the total area of 17,269 hectares as indicated in the EIS (DEIS and SEIS).

Clearing of vegetation as indicated in the 2009 EIS did not exceed the total area of 17,269 ha (BHP Billiton Olympic Dam 2009). As at 30 June 2017 a total of 816 ha of land was cleared subject to an offset. The offset provisions indicated in the EIS do not apply to land approved for clearing under previous EIS approvals prior to 2003. This is discussed in further detail in Section 1.1.8.

1.1.3 Leading Indicators

- None applicable

1.1.4 Deliverables (FA 2.1)

An annual report of monitoring and control actions undertaken within the SML and surrounding areas.

During FY17, a total of 146 traps were set with an average of 12 traps set per month. Over this period, a total of 25 cats were caught. Therefore, the overall trap success rate was 17%. The overall trap success rate was down on last financial year. ODC will review cat trapping methods in an effort to increase the success rate to previous levels. Areas of focus included Roxby Downs Village, Olympic Dam Village, the Resource Recovery Centre and office buildings on the SML. ODC remains committed to control efforts for cats and monitors the presence of other feral animals.

Throughout FY17, three wild dogs were observed opportunistically south of the dog fence in the vicinity of Olympic Dam and Roxby Downs. ODC remains committed to work in conjunction with the South Australian Arid Lands Natural Resource Management Board (NRM SAAL) to opportunistically control wild dog numbers (see SA Arid Lands Wild Dog Management Plan 2015).

In FY16, ODC together with Arid Recovery re-established an historical spotlight transect program that monitors the density of rabbits, cats, foxes and kangaroos in the Olympic Dam region. ODC worked with the Department of Primary Industries and Regions, South Australia (PIRSA) to facilitate the release of a Korean strain of Rabbit Haemorrhagic Disease Virus (RHDV) known as K5 in the Roxby region in March FY17 (Figure 1.1-1). The release of the virus saw no dramatic decline in rabbit numbers (Figure 1.1-1). Monitoring to-date suggests that the K5 virus has not been effective in the Roxby region. This may be due to the amount of native vegetation available after high summer rains, which would provide alternative (and potentially preferred) feed over the bait. The abundance of feral and abundant native species will continued to be monitored on a quarterly basis in FY18.

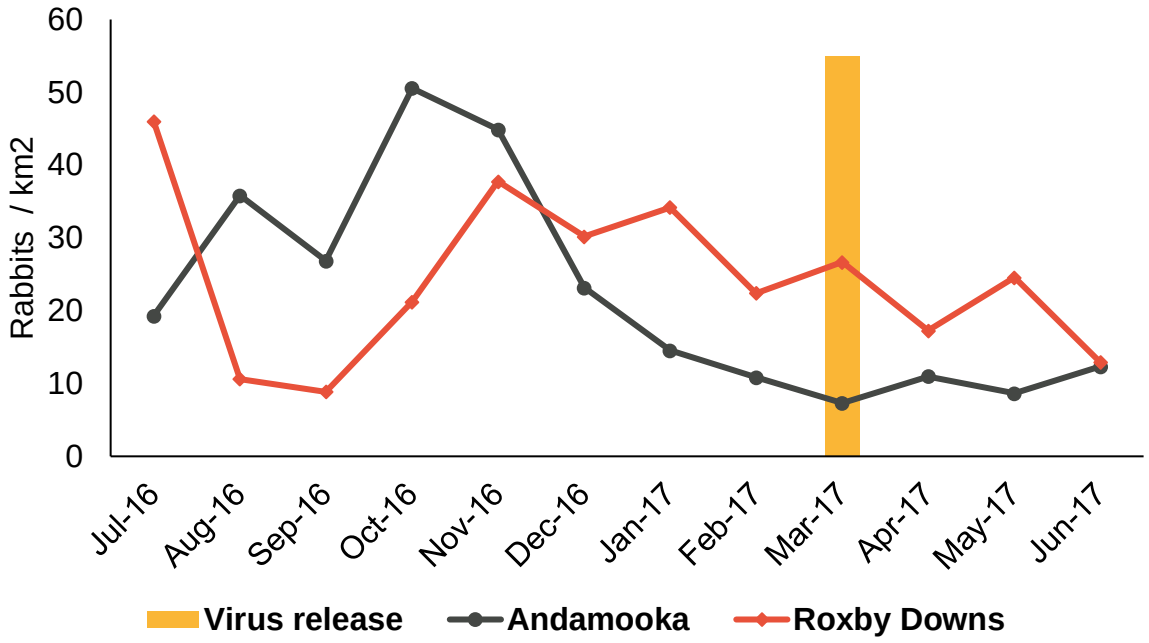


Figure 1.1-1: The density of rabbits observed pre- and post- K5 virus release.

A triennial quantitative assessment of the abundance of specific feral and abundant species within the region.

Monthly spotlight counts of two transects within the Olympic Dam region showed that rabbits exist in the highest density compared to other introduced species (i.e., foxes, cats and wild dogs) and abundant natives species (i.e., kangaroos) during FY17 (Figure 1.1-2). However, rabbit numbers remain below pre-RHDV1 release in 1995 (Pedler et al. 2016). Kangaroos were the next most abundant species, followed by cats, foxes and wild dogs

(Figure 1.1-2). Due to the cautious nature of wild dogs, it is recognised that the spotlight transect method may not be the best for capturing wild dog abundance data.

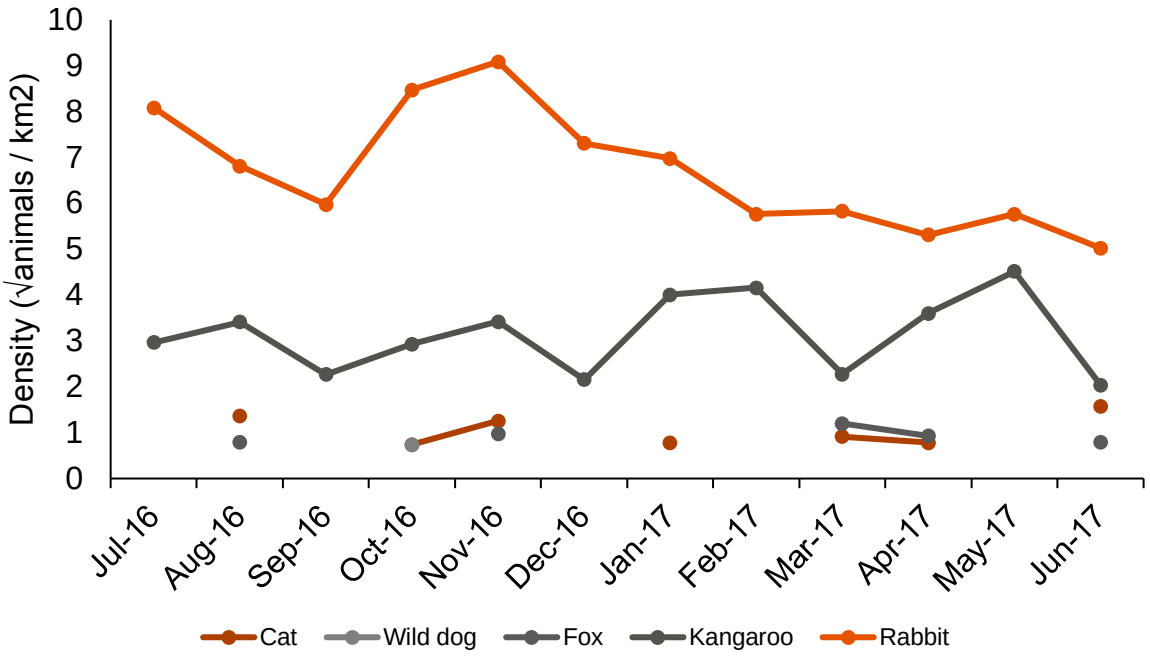


Figure 1.1-2: Density of rabbits, cats, foxes, wild dogs and kangaroos observed in the Olympic Dam region in FY17.

1.1.5 Deliverables (FL 2.3)

Define and map the current distribution of extreme and high risk weed species within the Olympic Dam region, Roxby Downs Municipality, the expanded SML and Gosse Springs SEB areas.

Identification of whether measures are required to control declared weeds and plant pathogens in the operations area.

Routine and opportunistic observations were undertaken throughout the reporting period. A total of 20 pest plant species were recorded during FY17, comprising of four declared species (Table 1.1-1). Moreover, an additional 25 pest plant species are known to persist in the SML/Municipal lease region (i.e., infestations recorded prior to FY17 that are known to still be active). Control efforts for a number of these species were undertaken throughout FY17. No self-sustaining population of previously un-recorded species of declared pest plants were observed. Despite this, it was determined that control measures were still required for the continued management of pest plants.

A baseline weed assessment undertaken within the Gosse Springs SEB area during FY16 recorded no declared species and two species, Common sowthistle and Ruby dock, listed as ‘significant’ by the South Australian Arid Lands Natural Resources Management Region. Follow-up weed monitoring of the SEB area was undertaken by the Stuart’s Creek pastoral holder and trained ODC personnel in May 2017. No pest plant species were recorded. The FY17 distribution of declared and other high risk pest plant species is shown in Figure 1.1-3-Figure 1.1-5. In many cases a single GPS location may reference a large infestation area, and as such distribution of weeds such as Ruby Dock, Salvation Jane, Caltrop and Blackberry nightshade may be more extensive than appears on the map below.

Table 1.1-1: A list of declared and other high risk weed species observed in the SML and Municipal Lease region during FY17.

Declared weed species	High risk weed species
African Boxthorn	Blackberry nightshade
Athel pine	Couch grass
Buffel grass	Onion weed
Caltrop	Paddy melon
Fountain grass	Potato weed
Gazania	Prickly lettuce
Innocent weed	Ruby dock
Prickly pear	Saffron thistle
Salvation Jane	Stemless thistle
	White cedar
	Wild oats

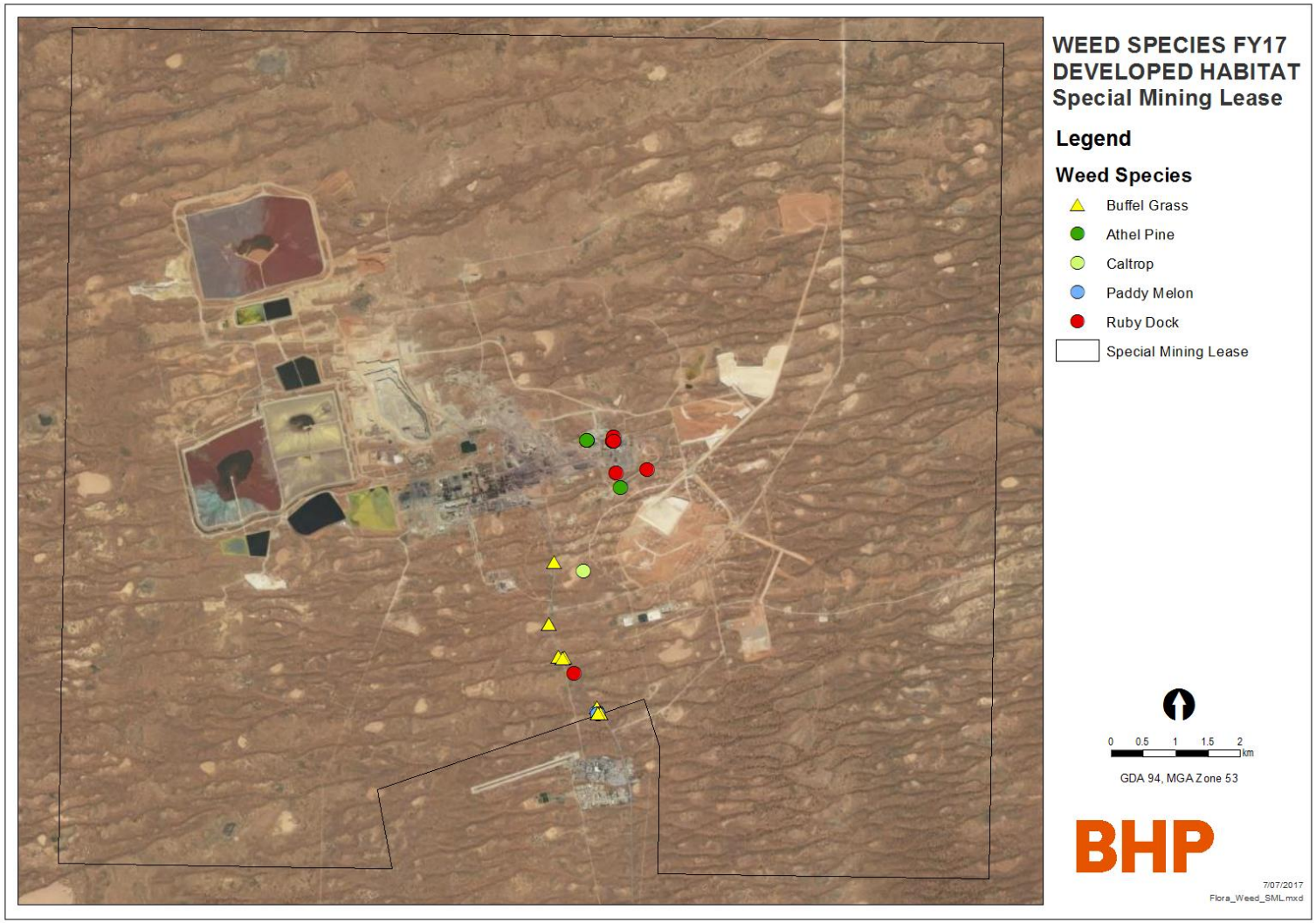


Figure 1.1-3: Locations of Declared and high risk weed species on the SML in FY17.

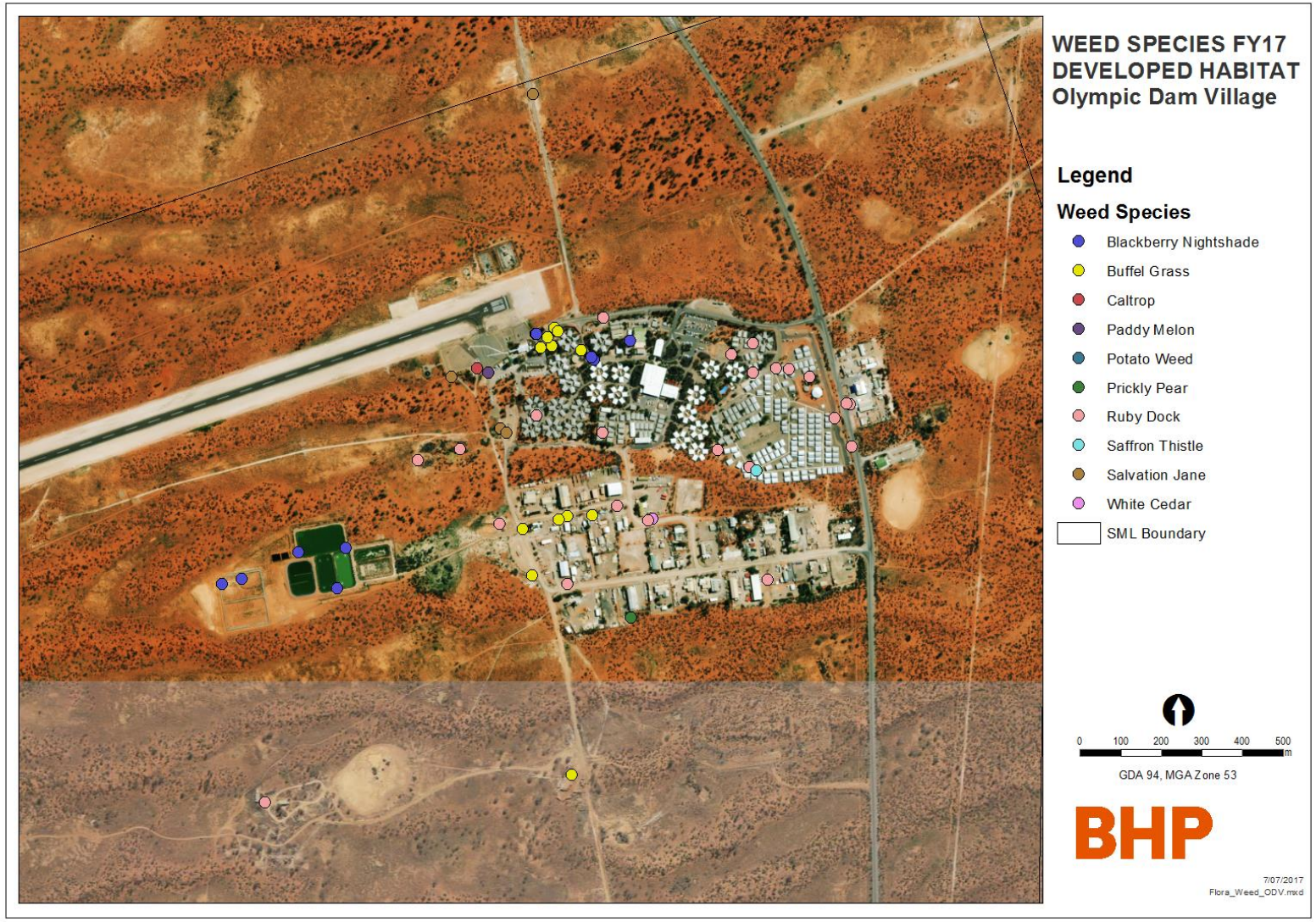


Figure 1.1-4: Locations of Declared and high risk weed species at Olympic dam Village (within the Municipal Lease) in FY17.

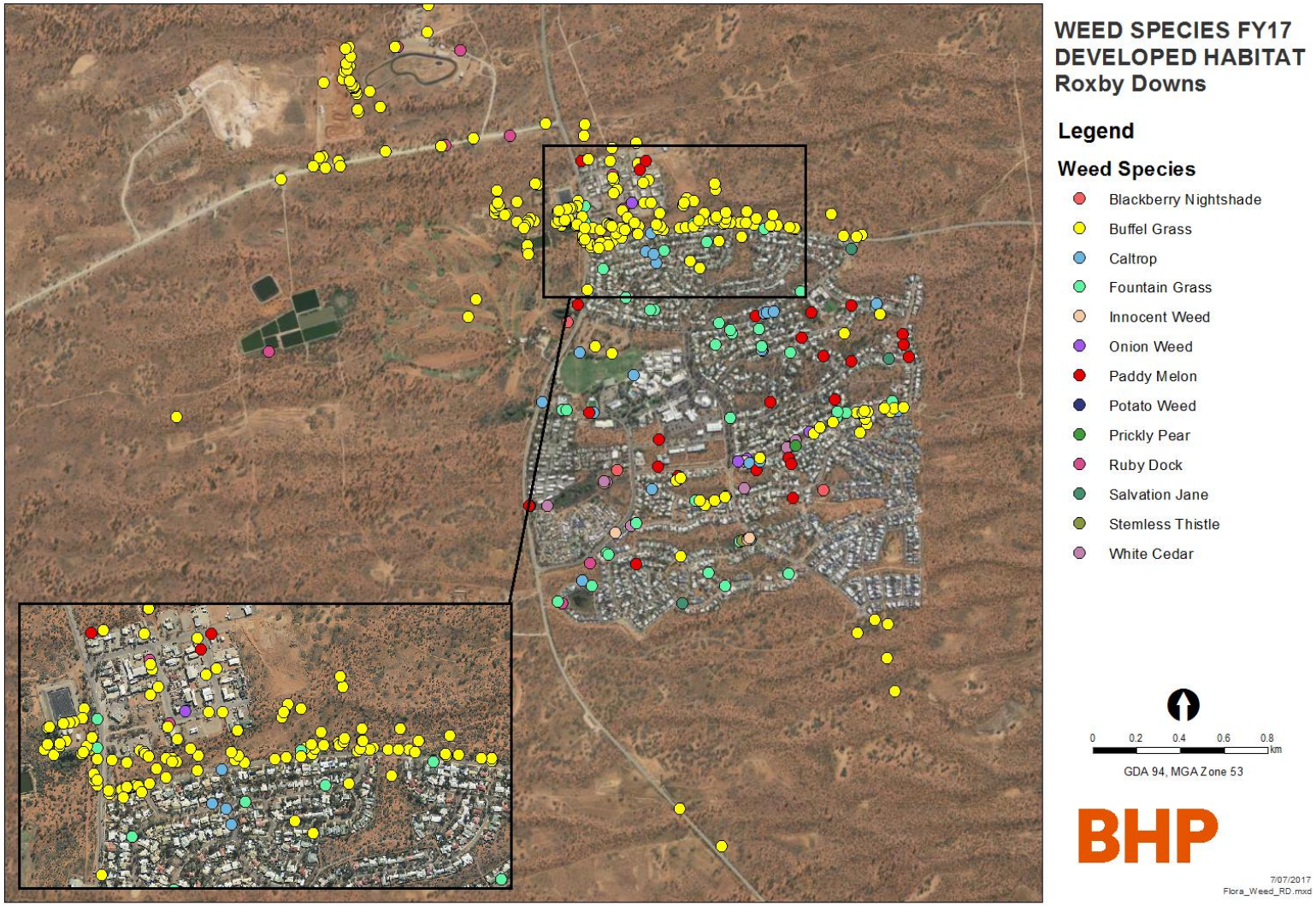


Figure 1.1-5: Locations of Declared and high risk weed species in the Roxby Downs urban area (within the Municipal Lease) in FY17.

1.1.6 Deliverables (FL 2.6)

A map of the known locations of Category 1b and 2 species (flora) within the impact area of the Olympic Dam operation.

A statement of impacts to, and measures undertaken to avoid, Category 1b at-risk species.

There are currently no Category 1b flora species within the impact area of the Olympic Dam operation.

Category 2 species include all other species known to occur in the region that are either listed as threatened under state, national and/or international legislation or considered regionally or locally significant and have the potential to be adversely impacted by operations. This includes species that have a wider distribution within the state, interstate or overseas and are therefore not considered to be critically dependent on existing populations within the potential impact area (Figure 1.1-6).

A small number of Category 2 flora species were impacted by disturbance activities during FY17. Species impacted were Mulga *(Acacia aneura)* and Western Myall *(Acacia papyrocarpa).* These locally common tree species are prevalent on the SML, Municipal lease and Pastoral leases and have been included as Category 2 species because they are long-lived and slow growing species with limited recruitment opportunities. During FY17 these species were impacted upon where ground disturbance requirements did not allow for the preservation of individual plants or trimming was required for maintenance activities. Efforts are made wherever possible to avoid these species during the Environmental Disturbance Permit (EDP) process.

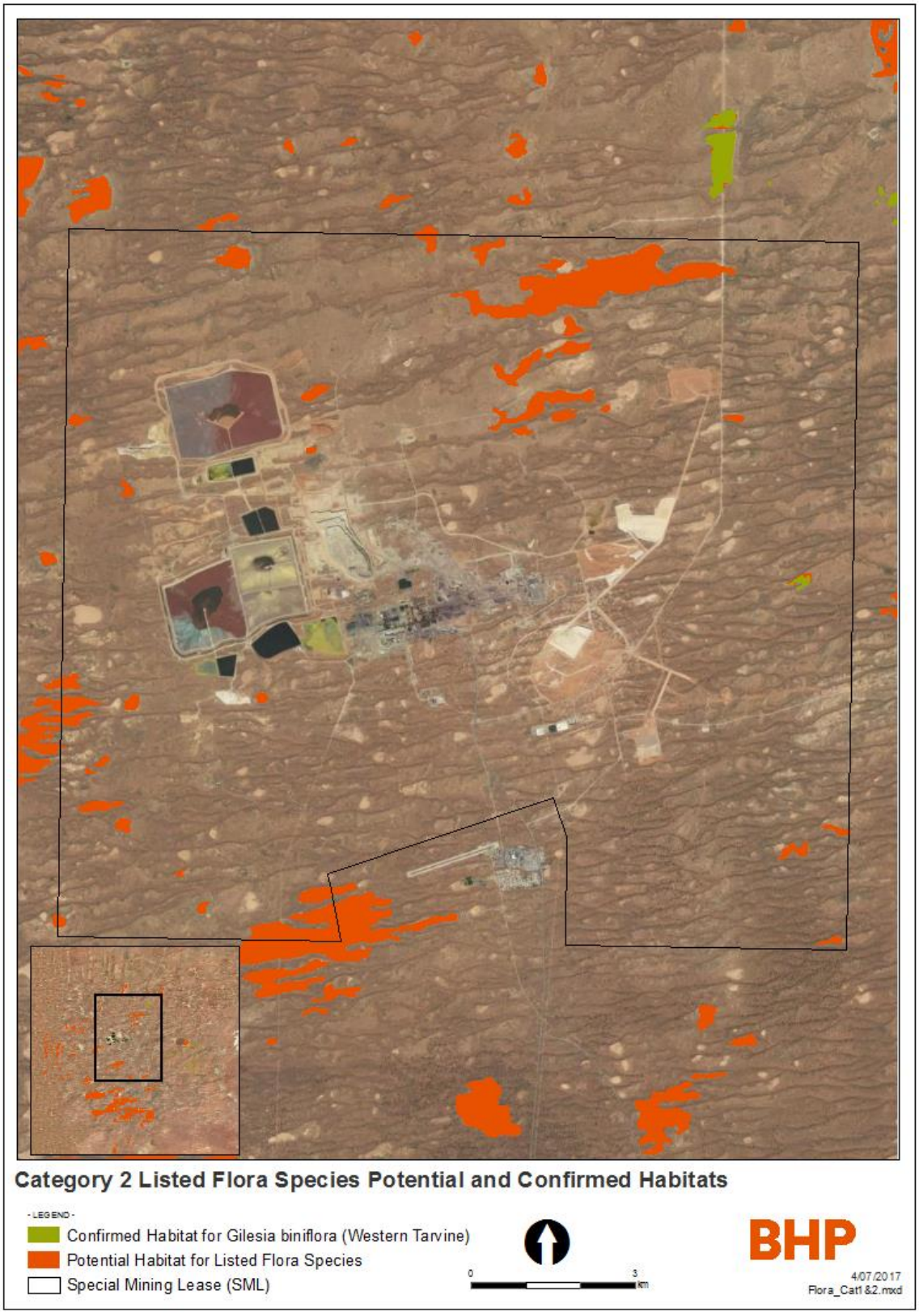


Figure 1.1-6: Potential and confirmed habitats of Category 2 flora species.

1.1.7 Deliverables (FA 2.3)

A quantitative assessment of the presence of Category 1b and Category 2 at-risk species (fauna) in the expanded SML, surrounding areas and wellfields region for internal records and EPMP reporting.

A maintained and updated (where required) map of the known locations and important habitats for at-risk species (fauna), to assist the EDP process.

A statement of impacts to, and measures undertaken to avoid, Category 1b at-risk species (fauna).

Thirty species of Category 1b and 2 birds and one species of mammal were recorded in the SML, wider region and the wellfields during the reporting period (Table 1.1-2).

Specifically at the TRS, four species listed under the EPBC Act were observed within the TRS during FY17. In total, two dead Common Sandpipers (*Actitis hypoleucos*), 14 dead Red-necked Stints (*Calidiris ruficollis*), nine dead Sharp-tailed Sandpipers (*Calidiris acuminata*) and one Plains Rat (*Pseudomys australis*) were observed during routine weekly monitoring conducted by trained Environment personnel. Management of deaths associated with the TRS is discussed in chapter 4.3 *Fauna interaction with Tailings Retention System*.

A map of known locations and important habitats for at-risk species is shown in Figure 1.1-7. This data is maintained and updated as required, to assist in the EDP process.

No additional management activities were required for Category 1b and 2 species during FY17.

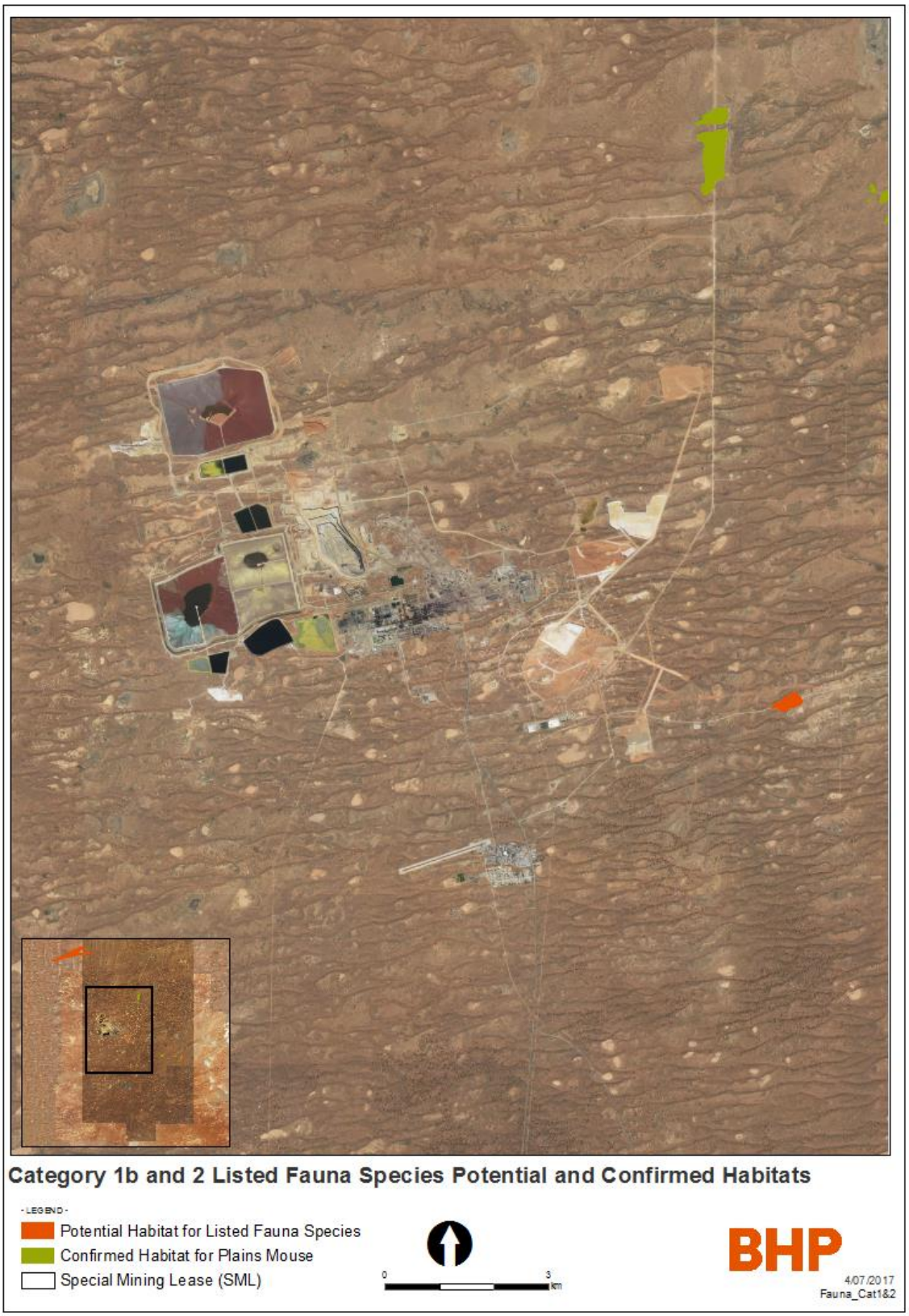


Figure 1.1-7: Category 1b and 2 fauna species potential and confirmed habitats

Table 1.1-2: FY17 Category 1b and 2 species in the Olympic Dam and wellfields region.

Species	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Birds												
Australian Bustard					✓			✓	✓		✓	✓
Australian Spotted Crake									✓	✓		
Banded Stilt							✓	✓				
Black Swan		✓		✓	✓	✓		✓			✓	✓
Black-winged Stilt				✓	✓		✓	✓	✓		✓	✓
Blue-winged Parrot						✓		✓				
Brolga												✓
Caspian Tern							✓					
Cinnamon Quailthrush	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
Common Sandpiper							✓	✓				
Darter									✓	✓		
Eurasian Coot		✓				✓	✓	✓	✓	✓	✓	
Flock Bronzewing						✓		✓	✓			
Freckled Duck							✓					
Great Crested Grebe							✓					
Gull-billed Tern					✓							
Little Black Cormorant					✓		✓	✓				
Little Eagle				✓								
Little Pied Cormorant			✓	✓	✓	✓						
Musk Duck		✓	✓									
Nankeen Night Heron				✓		✓	✓	✓	✓			
Red-capped Plover											✓	✓
Red-necked Avocet	✓		✓		✓	✓	✓	✓	✓	✓	✓	
Red-necked Stint							✓	✓	✓	✓	✓	
Sharp-tailed Sandpiper									✓	✓		
Splendid Fairy Wren		✓		✓								
Thick-billed Grasswren						✓	✓	✓			✓	
Whiskered Tern			✓	✓			✓	✓		✓	✓	✓
White-necked Heron								✓	✓			
Wood Sandpiper									✓			

1.1.8 Deliverables (FL 2.2)

A map of the direct disturbance impact footprint of ODC's Olympic Dam activities.

A statement of comparison between the impact footprint of ODC's Olympic Dam activities (i.e. within and outside the SML) and the offset areas under SEB processes, to track progress towards a life of mine ratio of 8 ha set aside for each hectare disturbed.

In 2010 the Gosse Springs Native Vegetation Management Plan was approved to establish a Significant Environmental Benefit (SEB) offset area of 10,963 ha. All land disturbance that is subject to an environmental offset under legislation is tracked though the EDP procedure and allocated an appropriate SEB offset ratio.

Total offset areas are then subtracted from the total SEB offset area that have been approved by the Native Vegetation Council, and a remaining SEB offset is reported in Table 1.1-3.

Spatial analysis techniques were utilised on geo-referenced orthoimagery for FY17. During this reporting period, satellite imagery of the vast majority of the SML was captured on a quarterly basis (captured in September 2016, December 2016, March 2017 and June 2017), offering an accurate account of the timing of land disturbance. Disturbances identified as occurring between these dates were digitised and are represented in Figure 1.1-8. The total area of disturbance that occurred during FY17 is 19.4 ha (Table 1.1-3).

The majority of disturbance for FY17 is attributed to works associated with the Southern Mining Area project.

As at 30 June 2017 a total area of 816 Ha of land requiring offset had been cleared resulting in an SEB offset of 6,618ha, with an average offset ratio greater than 8:1. A balance of 4,344 ha remained in the Gosse Springs SEB offset area.

The total area of disturbance related to Olympic Dam activities is currently 4,537.3 ha. This figure is inclusive of rehabilitation areas and Roxby Downs town facilities, water pipelines and other associated infrastructure.

Table 1.1-3: Areas of Disturbance and SEB Offset Areas as at June 2017.

	FY17 (ha)	Total Area (ha)	SEB offset (ha)	Average SEB Ratio
Gosse Springs Offset Area Available	-	-	10,963	-
Maximum Area Permitted to be Cleared as Indicated in the EIS	-	17,269	-	-
Land disturbed subject to an SEB offset*	-	816.4	6618.5	8.1
Land disturbed not subject to an SEB offset	19.4	3,720.9	-	-
Total Land Cleared**	19.4	4537.3	-	-
SEB Balance Remaining in Reserve ***	-	-	4344.4	-

* This figure includes areas where permission was granted to clear under the SEB offset policy prior to the approval of the EIS in 2011. It is based on a conservative calculation where the higher offset value of any permit issued over the area is used, which can result in small co-mission errors.
** This figure includes all land cleared to date as a part of ODC activities under previous EIS approvals.
***Slight variations will occur from year to year due to continuous improvement of the mapping layer.

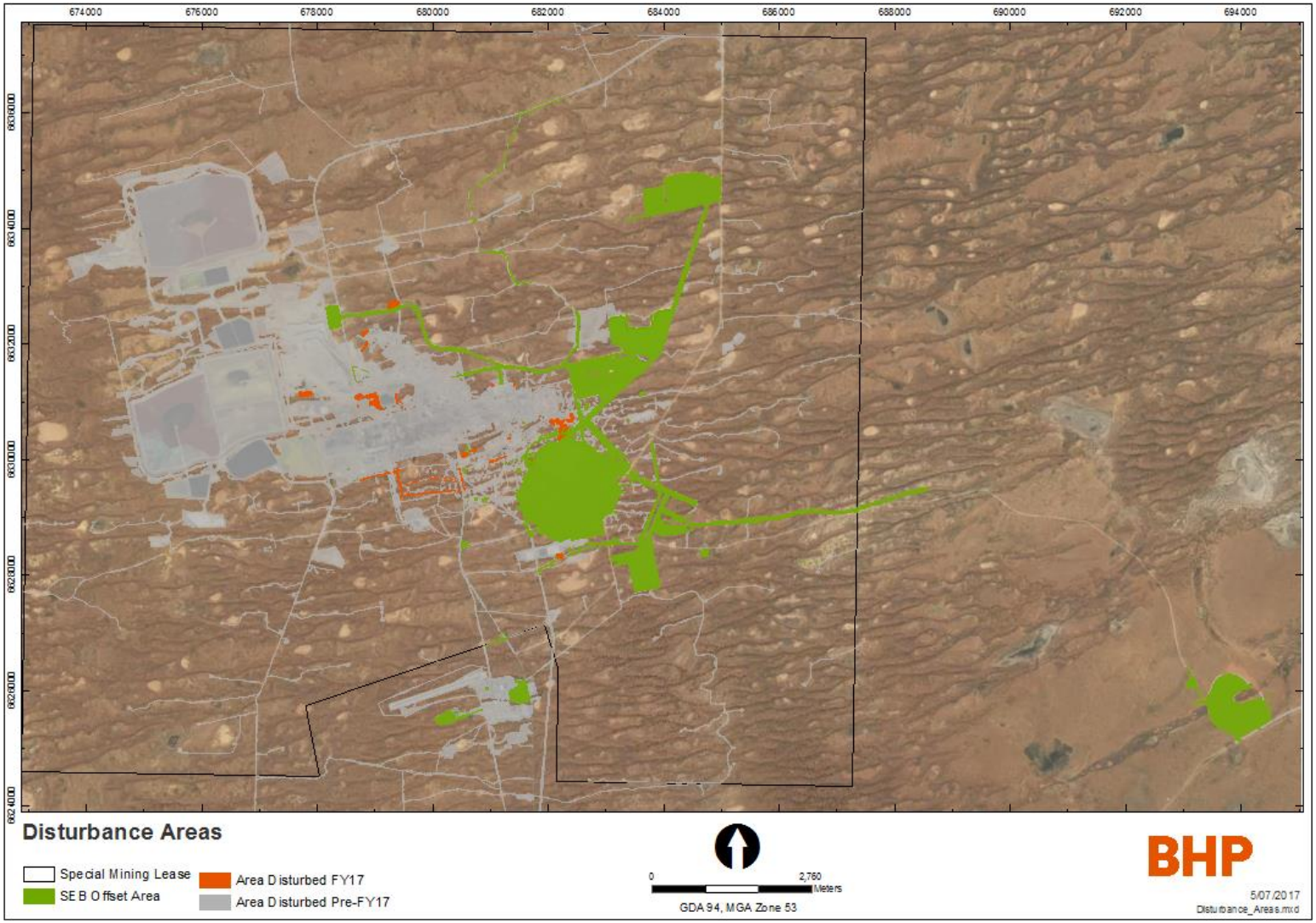


Figure 1.1-8: Areas of disturbance as at June 2017 (SML).

1.1.9 Deliverables (FL 2.7)

A summary of actions achieved from the SEB implementation plans within the fiscal year through the Annual EPMP Report.

An annual report to the government on SEB management outcomes through the Annual EPMP Report.

(Shapefiles of the SEB areas for inclusion in relevant departmental databases).

Prior to FY17, a number of actions were undertaken by ODC within the Gosse Springs SEB area. The Heritage Agreement was ratified by the Lands Titles Office, formalising this tenure aspect over the Gosse Springs SEB area. A new fence was also installed along the eastern boundary of the Gosse Springs SEB area and three dedicated parking areas have been constructed within the SEB area encouraging visitors to park prior to approaching the spring vent.

ODC commissioned a baseline vegetation survey of the Gosse Springs SEB area to record species cover and abundance using landscape representative quadrats. The baseline survey also targeted known threatened species locations and land systems to aid in the identification of priority management areas. The baseline survey also recorded the location of introduced species to guide weed management processes. The weed species locations have been added to ODC's weed management database and the Gosse SEB area has been included into the latest ODC Weed Management Work Instruction. A targeted survey for pest plant species within the SEB area was undertaken in September 2015. This data improves upon the broader assessment undertaken in an earlier vegetation survey and will be used to prioritise pest plant management within the SEB area.

During FY17:

- Monitoring of the cover and abundance of vegetation on the mound springs within the SEB area continued in FY17 and now forms part of the vegetation monitoring programme for Olympic Dam.
- Routine inspections were undertaken of car parks at Gosse, McLachlan and Fred Springs and SEB tracks.
- The SEB area was monitored for pest plants and animals. Rabbits were observed at Fred Springs.

A shapefile of the Gosse Springs SEB area has been provided to the Geographical Information System (GIS) Administrator – Native Vegetation and Biodiversity Management Unit of the South Australian Government. No further SEB areas have been implemented. The shapefiles of existing and proposed SEB offset areas are available in a standard GIS format that can be made available for other departmental databases as required.

1.1.10 Targets

- None applicable.

1.1.11 Action Plan FY17

Align pest plant and animal control with SAAL NRM objectives.

During FY17, ODC worked with the SAAL NRM to align our pest plant and animal control efforts with SAAL NRM regional objectives. As a result, ODC is working towards expanding its influence to pastoral lease holders in regards to pest plant and animal management (BHP Billiton Olympic Dam 2017a).

Develop and execute a control strategy for cat management on the SML and Olympic Dam Village.

In FY17, ODC implemented a Pest Animal Management Work Instruction (BHP Billiton Olympic Dam 2017b). The Work Instruction encompasses an effort-based approach for feral cat management and targets problematic areas such as Roxby Downs Village, Olympic Village and the Resource Recovery Centre. Adherence to the strategy is measured through 1SAP to ensure that management targets are met.

Implement FY15 actions identified in the site Rehabilitation Strategy.

Several actions associated with the cessation of Olympic Dam expansion pre-commitment works continued throughout FY17. The Rehabilitation Strategy actions associated with these works are described in Table 1.1-4. Regular photo point monitoring has shown that in some areas where specific stabilisation measures were adopted, an increase in vegetation coverage has occurred. See Figure 1.1-9 - Figure 1.1-12 as examples. Areas where compaction and saline water was used to minimise passive dust generation have showed signs of natural re-vegetation.

Regular inspections of the open pit area continued throughout FY17 and found that natural re-vegetation is occurring in some areas. Access to the pit itself and the immediate surrounding areas remains restricted. No further rehabilitation plans are in place for areas associated with pre-commitment works.

Due to the underground mining method used at Olympic Dam, large scale rehabilitation works were not required during FY17. The EDP process requires temporary disturbances (i.e. excavation for pipe maintenance and cable installations) to be remediated through topsoil replacement and scarification to promote natural re-vegetation.

Table 1.1-4: Rehabilitation Strategy actions undertaken in FY17.

Rehabilitation Strategy Action	Comment
Set up photo monitoring points for the area cleared for the proposed contractor's village on Andamooka Station to visually monitor soil stability.	Six monitoring sites were established in May 2012 and continue to be monitored on a biannual basis through photo points. The area continues to show progressive re-establishment of local plant species (Figure 1.1-9 to Figure 1.1-12).
Regular inspection of proposed contractor's village area for erosion.	The site of the proposed contractor's village is inspected during biannual photo point monitoring and other time-in-field excursions. Minor erosion from high rainfall events is visible within the Hiltaba area but does not warrant corrective action.

Review closure risks and assumptions through annual workshop.

The FY17 Annual Closure and Rehabilitation Plan review included a Closure Planning Workshop in March 2017. This workshop was held with the relevant internal stakeholders.

The following were implemented to update the Closure Estimates for the Current and Life of Asset Disturbances and associated Closure Risk Register:

- The mine closure date was increased to FY2086 from FY2085;
- The Life of Asset 2019 (LoA19) Optimised Base Plan will update any changes.

Figure 1.1-9: Photo Point ENV 492 at Hiltaba taken May 2013

Figure 1.1-10: Photo Point ENV 492 at Hiltaba taken March 2017 showing natural re-vegetation is occurring.

Figure 1.1-11: Photo Point ENV 490 at Hiltaba taken in May 2013

Figure 1.1-12: Photo Point ENV 490 at Hiltaba taken in March 2017

1.2 Aquifer Level Drawdown

1.2.1 Environmental Outcome

No significant adverse impacts to existing third-party users' right to access water from within the GAB wellfield Designated Areas for the proper development or management of the existing use of the lands as a result of ODC activities.

Drawdown and percentage wellhead pressure loss at pastoral bores remains less than the predicted long-term impact as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2016), and significantly less than the maximum drawdown area defined within the 10 m contour. Environmental flow rates at GAB springs remained above predicted long term impacts as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2016).

No significant adverse impacts to the availability and quality of groundwater to existing Stuart Shelf third-party users as a result of groundwater drawdown associated with ODC activities.

No significant impact to groundwater for existing Stuart Shelf third-party users has occurred. Activity associated with the open pit and RSF have ceased, and the Motherwell wellfield has not been constructed, substantially reducing any potential for groundwater impact. Regional groundwater levels are stable.

No significant adverse impact on groundwater-dependent listed species or ecological communities as a result of groundwater drawdown associated with ODC activities.

Drawdown remains less than the predicted long-term impact and was within compliance criteria limits for FY17. Environmental flow rates at GAB springs remained above predicted long term impacts as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2016). Monitoring showed no indication of a significant adverse impact on groundwater-dependent listed species or ecological communities.

1.2.2 Compliance Criteria

A 4 m drawdown limit at the point on the designated area for Wellfield A that is mid-way between GAB8 and HH2 based on the 12-month moving average (GA 2.5).

At the end of FY17 average drawdown between GAB8 and HH2 was 1.2 m (BHP Billiton Olympic Dam 2017c).

A 4 m drawdown limit for Wellfield B at the point between monitoring bores S1 and S2 (measured as the average drawdown of the two bores) and based on the 12-month moving average (GA 2.5).

At the end of FY17, the average drawdown between S1 and S2 was 0.0 m (BHP Billiton Olympic Dam 2017c).

A drawdown footprint for Wellfield B, measured as the area contained within the 10 m drawdown contour, that is less than or equal to 4,450 km^2 (GA 2.5).

At the end of FY17, the area contained within the 10 m drawdown contour line was 2,611 km^2 (BHP Billiton Olympic Dam 2017c).

No material change in the availability and quality of groundwater at existing bores in the Stuart Shelf area operated by third-party users.

Water quality sampling indicates occasionally elevated uranium and manganese concentrations above drinking water limit within the SML area. However the groundwater in the Stuart Shelf area is hyper-saline, which precludes it from any environmental benefit categories such as human and livestock consumption under ANZECC guidelines (see sections 1.2.9 and 1.2.10). Monitored water levels in the Stuart Shelf area are consistent with historical levels, and do not indicate any change in the availability of groundwater at existing bores.

1.2.3 Leading Indicators

No leading indicator trigger values were reached. Drawdown trends at monitoring bore S1 (for Wellfield A) remain well below threshold values, as does the drawdown footprint area for Wellfield B. Flow and water quality parameters at GAB springs, and drawdown trends at GAB pastoral bores, are stable and remain within the predictions of the 1997 EIS. Water quality in the Stuart Shelf area remains unaffected.

1.2.4 Deliverables (FL 2.5)

A comparison of the abundance and distribution of *E. carsonii*, per impact zone, with previously reported values, to determine impacts to the GAB springs.

Flora species included under category 1a are those at-risk species whose population distribution as a whole is largely restricted to the impact area of the operation and are therefore at a higher risk of being impacted by the operations. *Eriocaulon carsonii* is restricted to the Great Artesian Basin (GAB) springs of the Lake Eyre South region in the vicinity of the wellfields and is the only plant to fall into this category.

Within the region studied, populations of *E. carsonii* were restricted to 18 spring vents in the Hermit Hill and Lake Eyre springs complexes in 2016 (GHD 2017). *E. carsonii* occurred on the Hermit (14 springs), Gosse (2), West Finniss (1), and Sulphuric (1) spring groups (Table 1.2-1). *E. carsonii* was uncommon and limited in abundance where it did occur. It ranged in percentage abundance on any one spring vent on which it occurred from 2.7 – 30.5 %. *E. carsonii* occurred on spring mounds/springs and spring tails (GHD 2017)

Of the springs included in this revised GAB monitoring program, *E. carsonii* has been recorded at 60 springs at some stage since monitoring began (1983/4).). *E. carsonii* was recorded on eighteen springs in 2015 and eighteen springs in 2016. In 2016, the species was absent from four mound springs where it had previously been recorded in 2015. New records of the species since 2015 were also found at four mound springs. This may be due to the proximity of springs. For example, the vents of HHS075 and HHS077 are very close together, which may have facilitated the movement of *E. carsonii* from one spring to the other. This may suggest that the species is a fast coloniser and may establish colonies quickly in areas with a suitable microclimate (i.e. such as areas with adequate surface flows). Therefore, it is concluded that no significant impact to the size of an important population of Category 1a flora species has occurred in FY17.

Table 1.2-1: Comparison of *E. carsonii* results in 2014 - 2016.

Spring group	Spring vent	Units monitored in 2014[2]	2014 (cover class)	2015 (percent abundance)	2016 (percent abundance)
Hermit Hill	HHS028	-	-	8.7	13.5
	HHS033	-	-	1.6	2.7
	HHS035	-	-	0.0	2.8
	HHS072	M	1	1.4	0.0
	HHS074	M	1	2.7	5.1
	HHS075	M	0	1.4	0.0
	HHS077	-	-	0.0	7.7
	HHS078	-	-	5.5	20.5
	HHS114	S	1	1.7	0.0
	HHS116	M	2	1.4	8.3
	HHS119	S	2	0.0	0.0
	HHS121	-	-	0.0	2.9
	HHS122	M	2	0.0	2.8
	HHS123	-	-	6.3	30.5
	HHS131	M	1	1.8	4.7
	HHS144	S	1	0.0	0.0
	HHS150A	M/S/T	1	2.6	5.4
	HHS154	T	1	0.0	0.0
	HHS155	-	-	3.9	15.0
	HHSfenl	T	6	13.0	10.5
North West	HNWlawn	T	1	1.7	0.0
Old Finniss	HOF058	S	1	0.0	0.0
Sulfuric	HSS012	M	2	3.2	2.7
West Finniss	HWF043	S/T	3	9.8	11.5
Gosse	LGS002	M/T	2	12.3	18.0
	LGS004	S/T	3	18.9	26.7

Notes:

1. Because of the change in monitoring program, the results are not directly comparable.
2. Up until (and including) 2014, springs units were monitored separately: A spring unit is a morphological component of a spring: the vent, mound, or tail. The vent is the source of most of the water. The vent is usually set in the top or side of the mound ('m') (if the spring has a mound). The tail ('t') is an area with an outflow of water away from the vent. A spring ('s') may possess some or all of these components. For monitoring *E. carsonii* and grazing impacts, the mound and tail have generally been treated separately (no monitoring occurs on the vent). Over 2005-2014, we followed the procedure established by Kinhill Stearns (1984) and Fatchen and Fatchen (1993). However, past monitoring has been inconsistent: PPK (2002) and Badman (2004; 2005) treat an "undifferentiated spring plus any tail" as a single unit (Badman, 2005:16).
3. Up until (and including) 2014, the monitoring was targeted at finding and recording *E. carsonii*. While the 2015 monitoring included all identifiable springs where *E. carsonii* has ever been recorded, the method quantifies species abundance for all species present on the site, rather than focussing on searching for the generally very small *E. carsonii* populations.

4. Up until (and including) 2014, cover was estimated using the Domin-Krajina rank score (see Griffin and Dunlop 2014). In 2015 and 2016, abundance was calculated directly from the percentage of quadrats on which a species occurred.

1.2.5 Deliverables (GA 2.5)

Collated domestic and industrial water use efficiency data, to assess performance against improvement targets.

The GAB industrial water efficiency of the operation in FY17 was 0.96 kL/t, which was favourable compared to the target of 1.18 kL/t. The FY17 performance was better than that of FY16 (1.08 kL/t). Historical GAB industrial water efficiency is given in Figure 1.2-1.

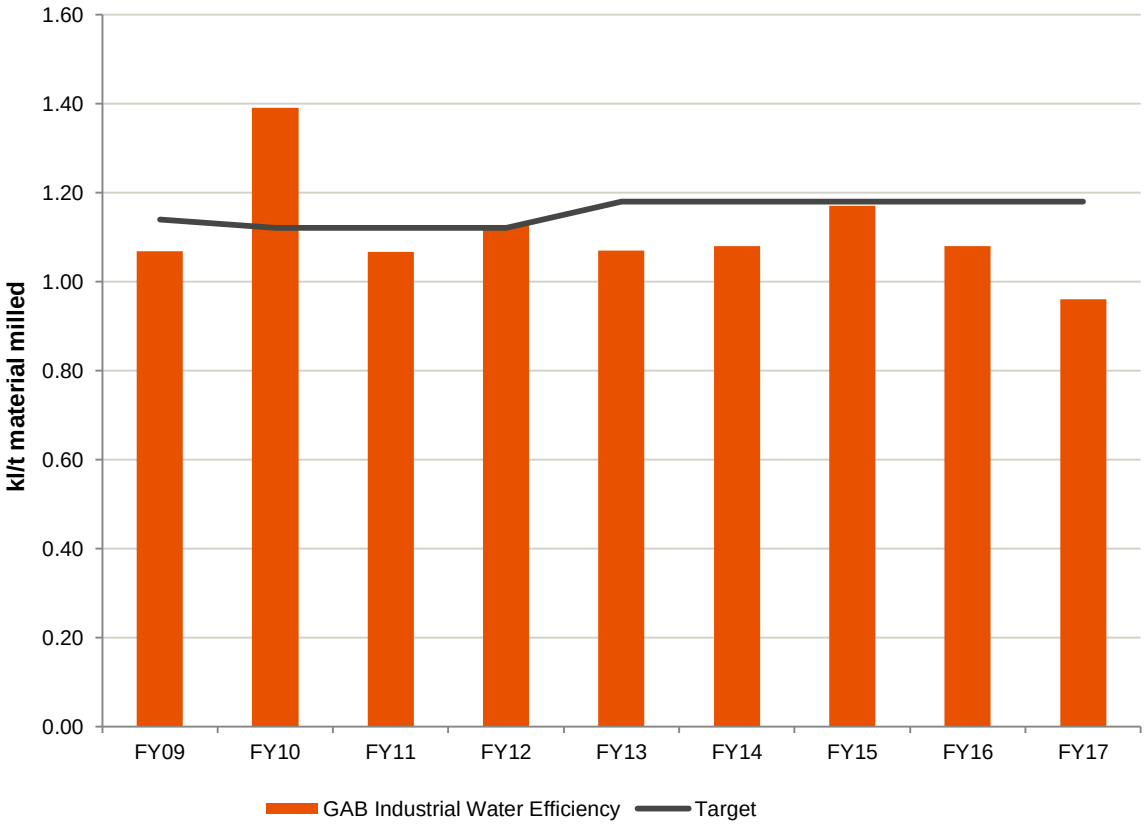


Figure 1.2-1: Historical industrial GAB water efficiency.

Water efficiency was maintained under the target in FY17. This was due to sustained operating discipline to minimise the use of GAB water across the operation.

Domestic water use during FY17 averaged 2.2 ML/d compared to 2.3 ML/d in FY16, which was below the target of 3.2 ML/d. Historical domestic water use is given in Figure 1.2-2.

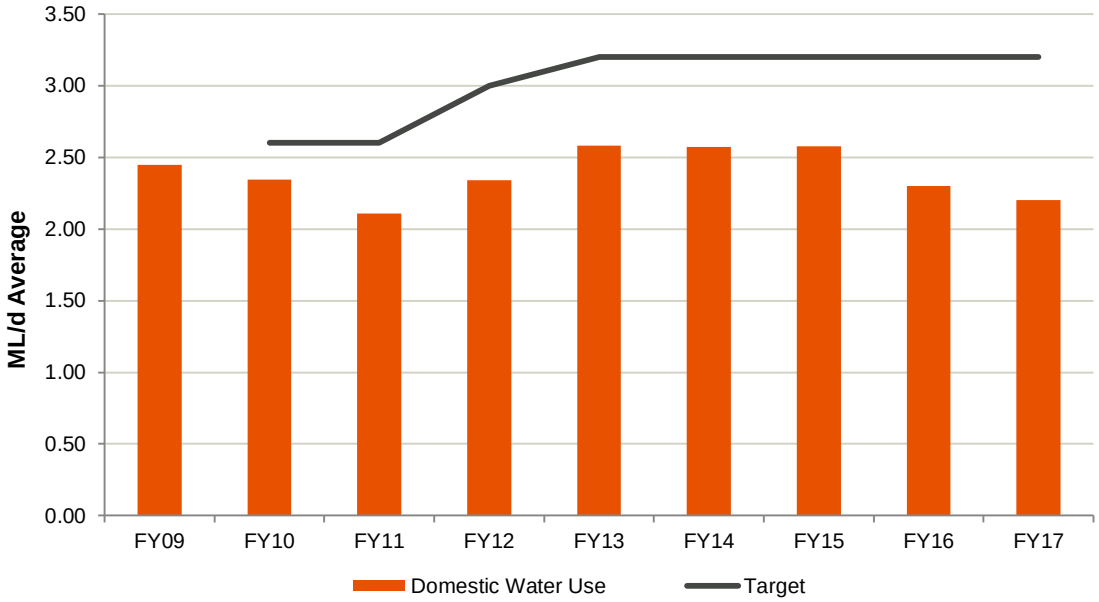


Figure 1.2-2: Historical domestic water use (note there was no target in FY09).

1.2.6 Deliverables (GW 2.5)

Ten-year water use schedule to be submitted to the Indenture Minister by 1 January annually.

The current 10-year water use schedule, as provided to the Minister for Mineral Resources Development in December 2016, is presented in Appendix 9 of the FY17 Annual Wellfields Report (BHP Billiton Olympic Dam 2017c). An updated schedule will be provided by 1 January 2018.

The current forecast shows an increase in the non-potable water requirement in the Mine and Process Plant from 2017. Water use is predicted to increase over the next decade, which is predominantly driven by the increase of production physicals. A detailed water forecast beyond 2021 is not available, however production and therefore water demand is forecast to increase.

1.2.7 Deliverables (GW 2.1)

A review of abstraction and injection rates and trends and an assessment with respect to groundwater levels.

Saline water was abstracted from the Arcoona Quartzite throughout FY17 from the Saline Wellfield located south of the Whenan Shaft.

Some of this water from the Saline Wellfield was used in construction projects throughout the operations, whilst the remainder was discharged to the mine water disposal pond for evaporation. An average of 3.6 ML/d (Figure 1.2-3) was abstracted over the period, compared to 2.3 ML/d during the previous reporting period.

A definition and map of the underground mine water balance.

The mine water balance is a summary of the volume of water going into and out of the underground mine. It includes saline water abstracted from local bores that is added to surface storages and used around site. The balance (presented in Figure 1.2-3) is generated from a combination of measured, derived and estimated data.

An estimate of the volume of groundwater discharge to underground.

Groundwater inflow to the mine occurs at several intersections with the underground operations (Figure 1.2-3). Total natural inflow is estimated to be approximately 1.0 ML/d, the majority entering via upcast raise bores. Additional natural inflow comes into the mine via other entry points, including downcast raise bores, exploration drill holes and shafts. Much of the total inflow to the mine is transported to the surface as ore content or exhausted to the atmosphere as saline aerosols or moisture-laden air via upcast raise bores, estimated at around 0.9 ML/d.

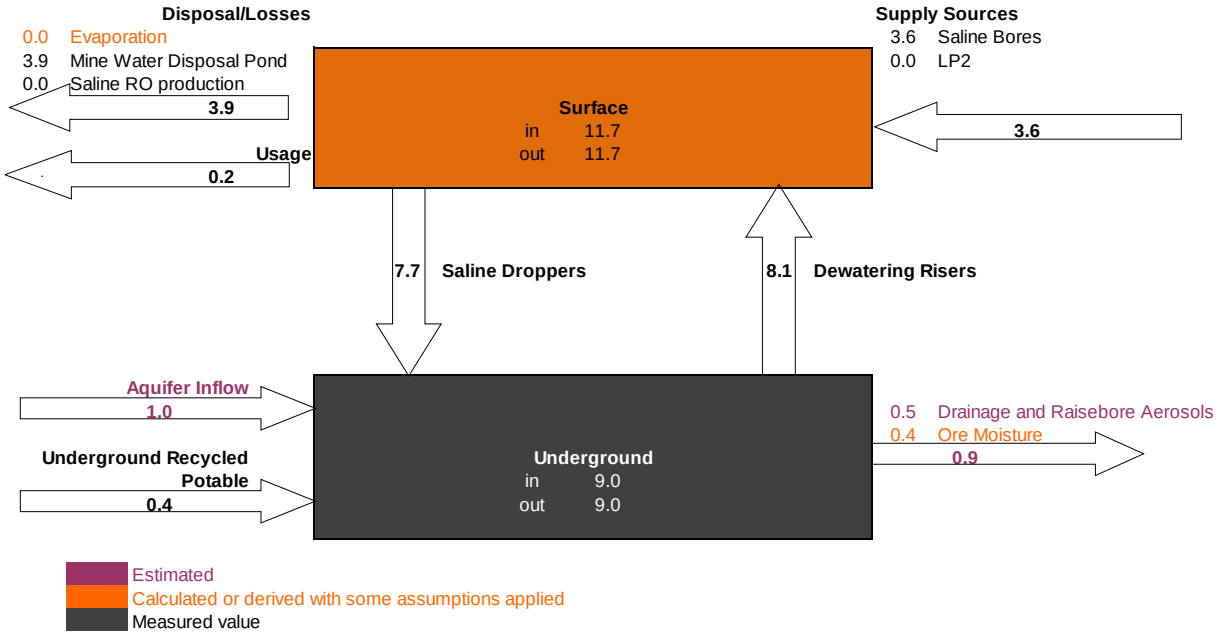


Figure 1.2-3: FY17 Saline (Mine) water balance summary (ML/d).

1.2.8 Deliverables (GW 2.2)

A review of the trends in local and regional groundwater levels and a comparison with historical groundwater levels.

A slight downward trend in local and regional groundwater levels is evident over the last three years at the monitored bores (Figure 1.2-4). The groundwater cross section (Figure 1.2-5) and hydrograph (Figure 1.2-6) confirm the limited changes in groundwater levels beneath the TSF between June 2016 and June 2017.

The maximum groundwater level recorded below the TSF for the current reporting period was 62.62 mAHD at LT67. The general downward trend has been maintained since late 2010 and groundwater levels are not expected to exceed the agreed limit of 20 m below the ground surface (80 mAHD) within the next 12 months.

Groundwater level contours in the Andamooka limestone aquifer beneath the perimeter of the TSF have generally remained stable during FY17 (Figure 1.2-7). A continued contraction of the area above 60 mAHD and no groundwater level above 65 mAHD has been maintained. There is a gradual rise in groundwater levels beneath TSF 5 (Figure 1.2-8) which can be attributed to the ongoing use of this facility. Levels are well below compliance limits of 80 mAHD, however, well LT67 is rising at a rate greater than expected and in isolation of other monitored wells. The reasons behind this rate of rise are the subject of a detailed study to be carried out in FY18.

Groundwater levels for bores in the vicinity of the underground mine (Figure 1.2-9) continue to show depressurisation of the geological units, consistent with ongoing mine depressurisation activities.

Limestone aquifer bores in the vicinity of Roxby Downs (Figure 1.2-10) demonstrate stable groundwater levels during FY17.

Historical level monitoring indicates steady groundwater levels over time with no overarching trends that would indicate material change in the availability at existing bores in the Stuart Shelf area operated by third-party users (section 1.2.3).

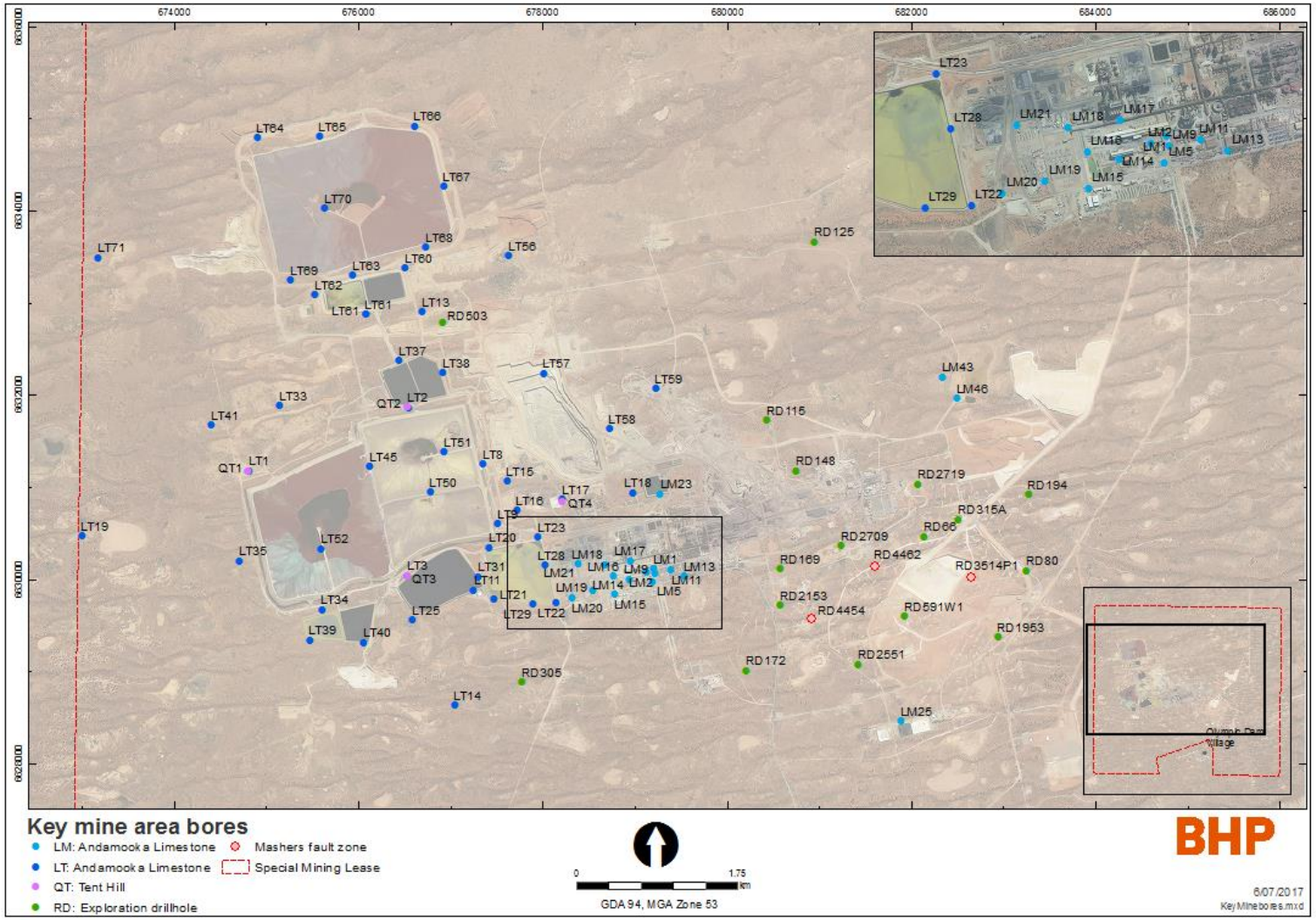


Figure 1.2-4: Location of key mine area bores.

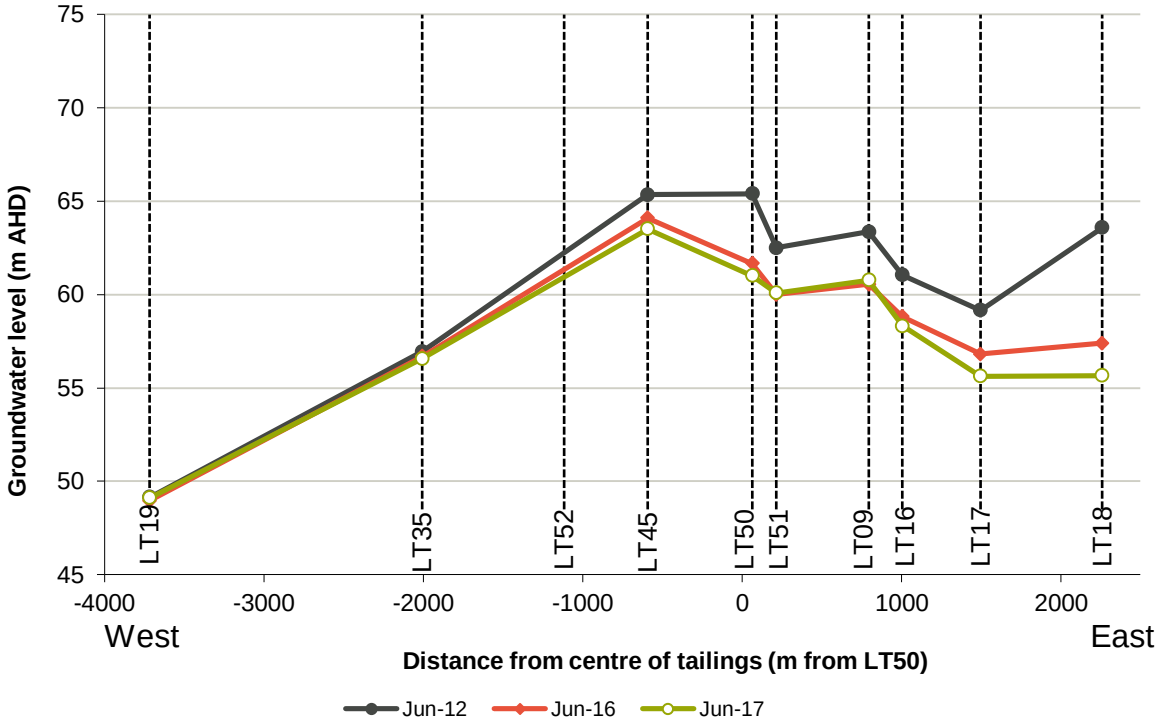


Figure 1.2-5: Change in groundwater elevation along an east-west cross-section from LT19 to LT18, through the centre of the TSF.

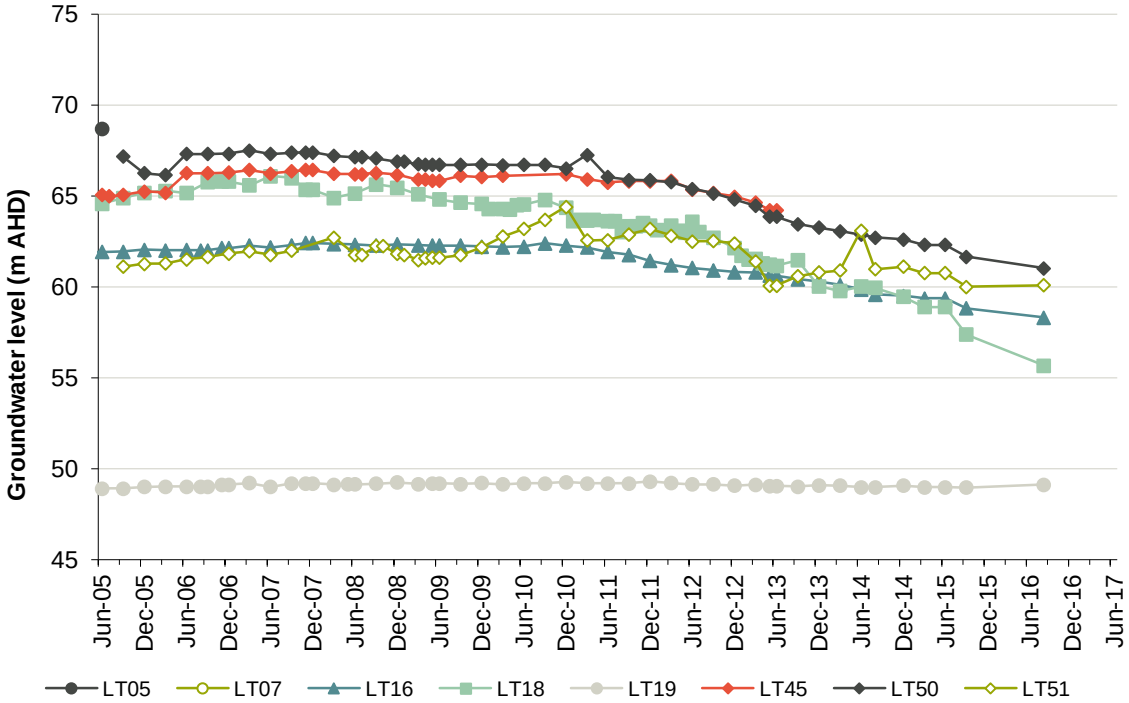
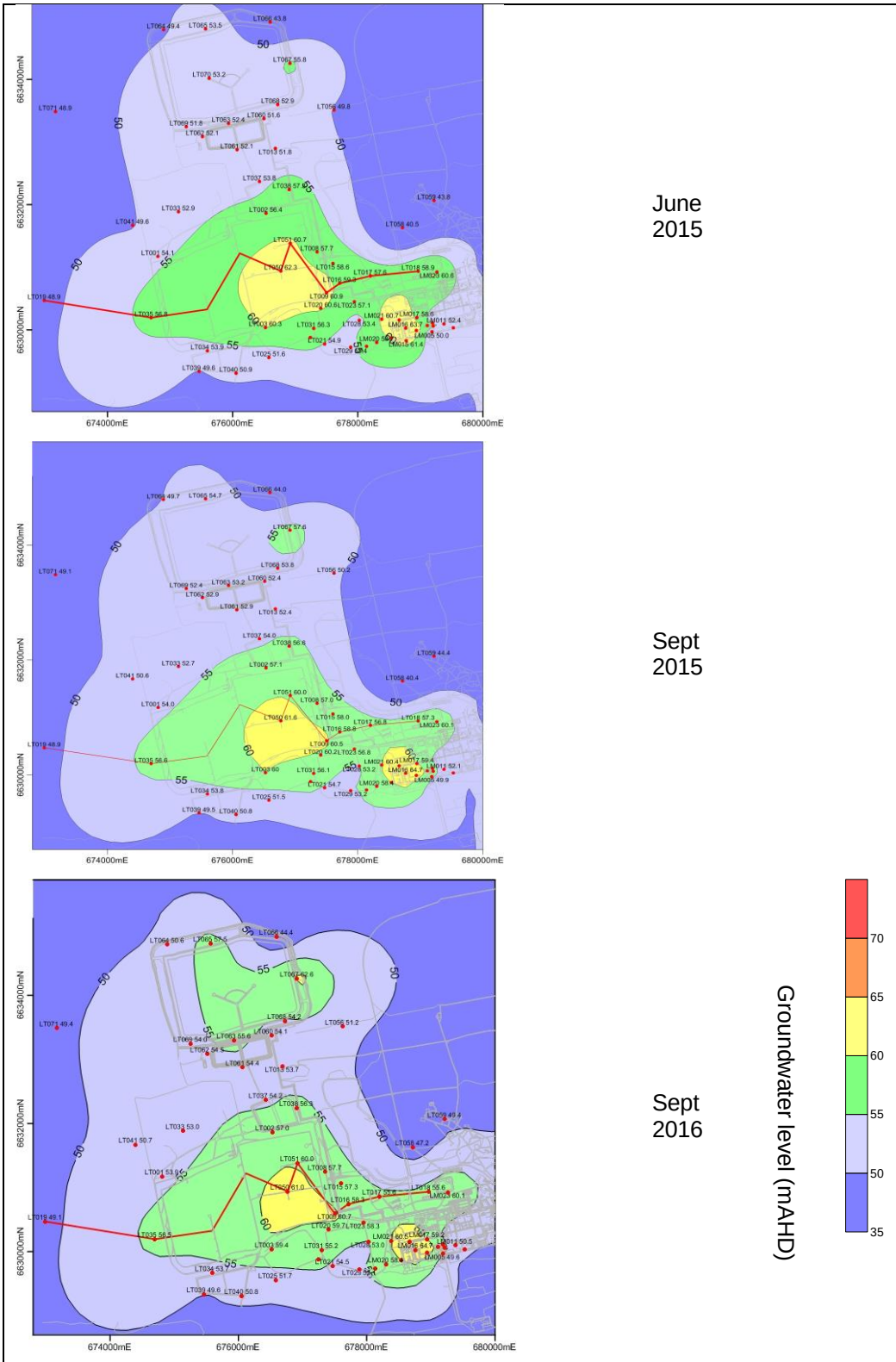


Figure 1.2-6: Groundwater levels for Andamooka Limestone bores in the vicinity of the TSF.



Datum: GDA94

Projection: MGA94

Zone: 53

Figure 1.2-7: TRS area groundwater levels (mAHD) Andamooka Limestone Aquifer.

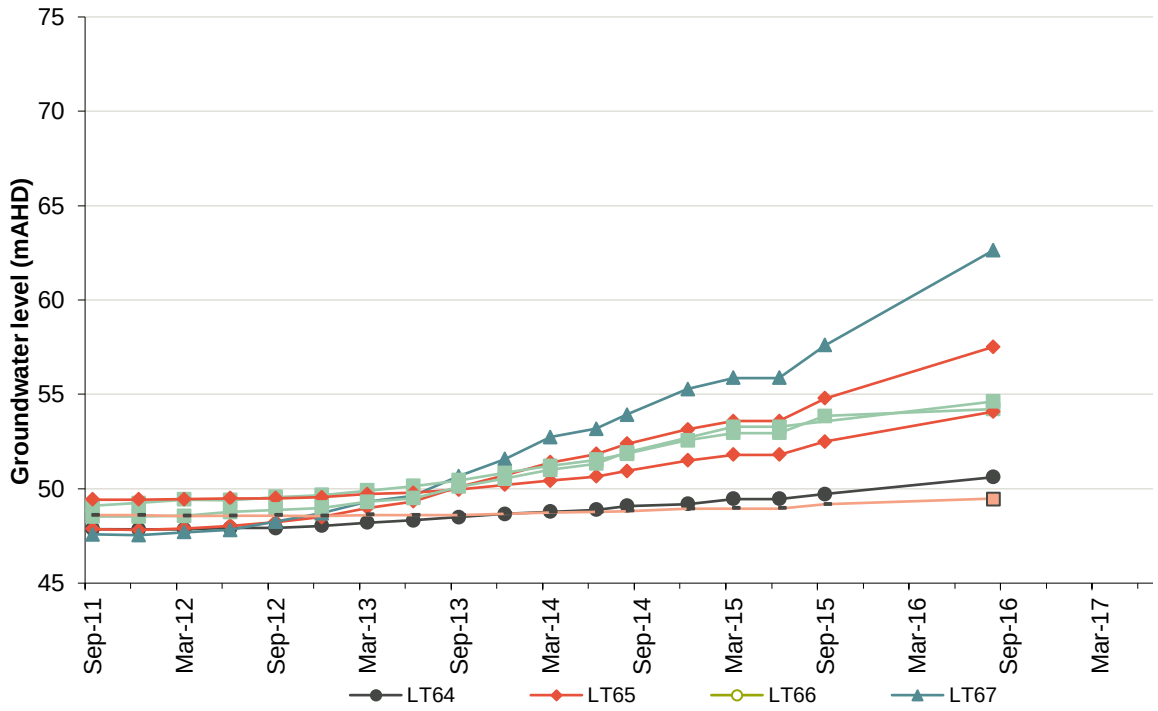


Figure 1.2-8: Groundwater levels for bores in the vicinity of TSF 5.

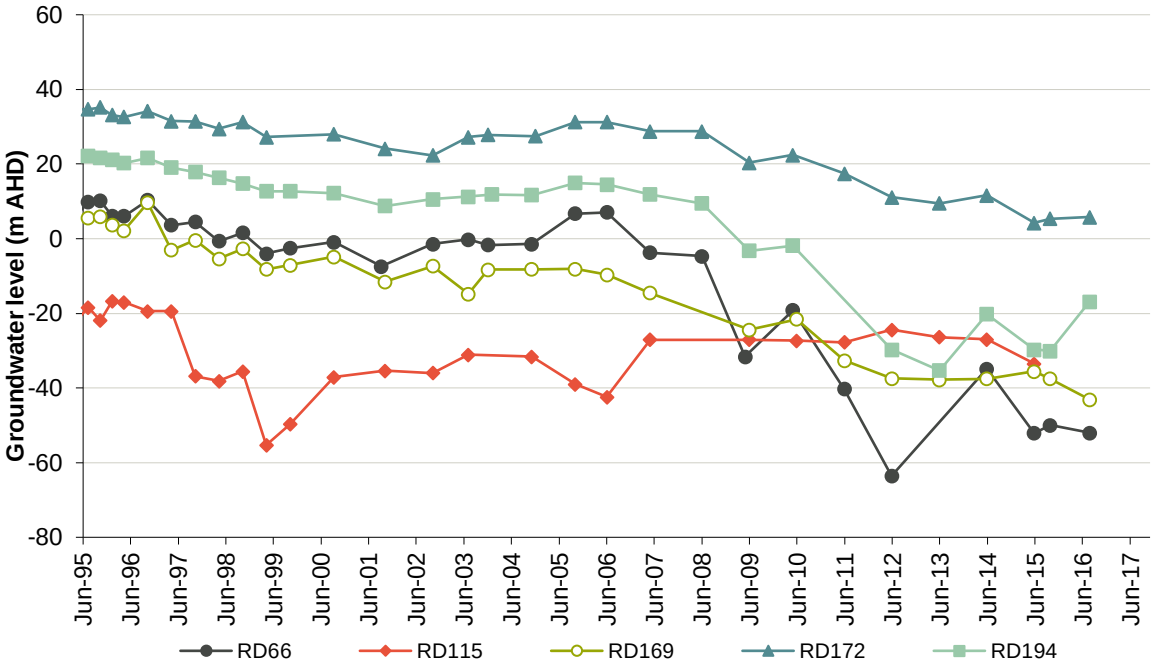


Figure 1.2-9: Groundwater levels for exploration drill holes in the vicinity of the underground mine.

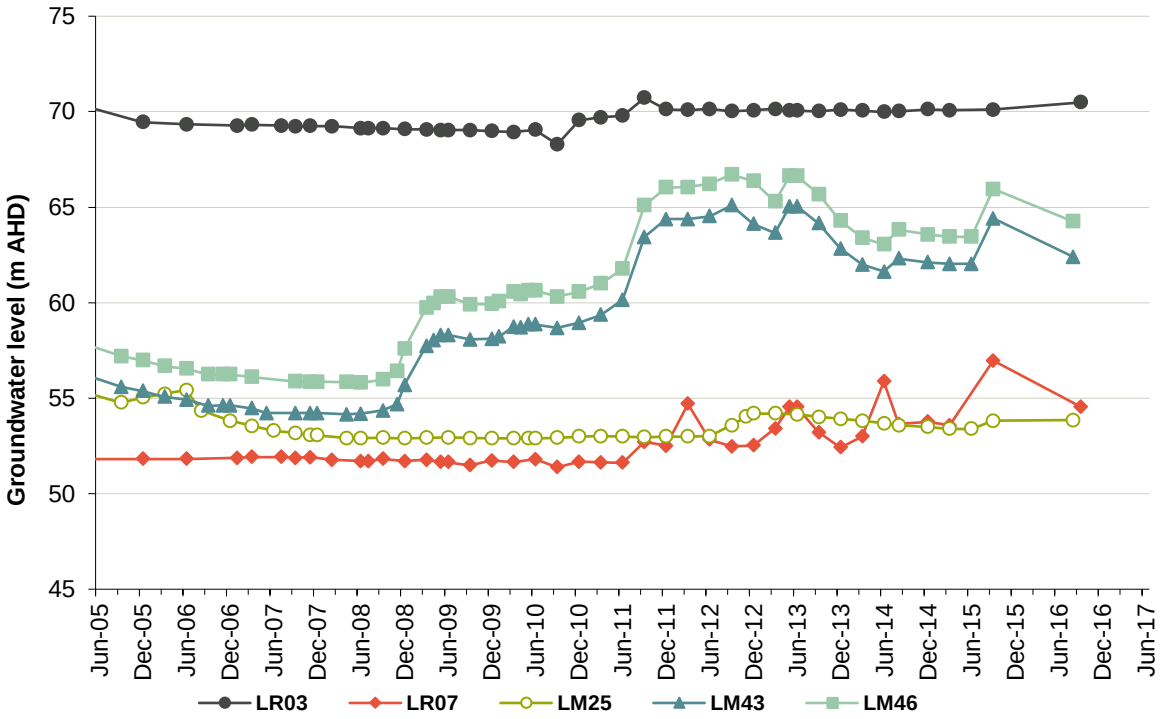


Figure 1.2-10: Groundwater levels for Andamooka Limestone bores in the vicinity of Roxby Downs (LR) and the Mine Water Pond (LM).

Data showing the tracking of trends towards leading indicators for groundwater impacts, and an alert to management when levels approach the leading indicators.

Data for groundwater level was collected, with a discussion of results in section 1.2.8. Leading indicator trigger levels were not reached (see section 1.2.12).

1.2.9 Deliverables (GW 2.3)

A review of trends in groundwater quality and a comparison to ANZECC criteria.

Groundwater in the vicinity of the Olympic Dam Operation occurs at depth and is highly saline making it unsuitable for human or livestock consumption and largely inaccessible. The local groundwater does not meet any of the beneficial use categories listed under ANZECC guidelines.

Groundwater salinity has generally remained stable and within the range that could be reasonably expected for natural variation within the aquifer. Salinity levels across site vary slightly due to input sources from various areas of the mine.

Groundwater pH ranges from 6.73 in LT25 to 7.63 in LT22, in line with previous years monitoring.

Concentrations of copper in all groundwater monitoring bores sampled during the FY17 monitoring program were reported below ANZECC (2000) guidelines for livestock consumption of 0.4 mg/L (Figure 1.2-11).

While slightly elevated concentrations of uranium continue to be detected in the groundwater in the vicinity of evaporation pond two, uranium concentrations remain steady in the majority of bores. Uranium concentrations are lower than the adopted ANZECC (2000) guidelines for livestock consumption of 0.2 mg/L. (Figure 1.2-12).

A uranium concentration in excess of the ANZECC livestock guidelines has been detected at bores LT15 (0.235 mg/L) and LT25 (0.433 mg/L). LT15 and LT25 are located at the base of the tailings facility and are highly susceptible to changes in tailings pond use rates. Bore LT22, which is located nearby shows uranium levels below ANZECC livestock guidelines.

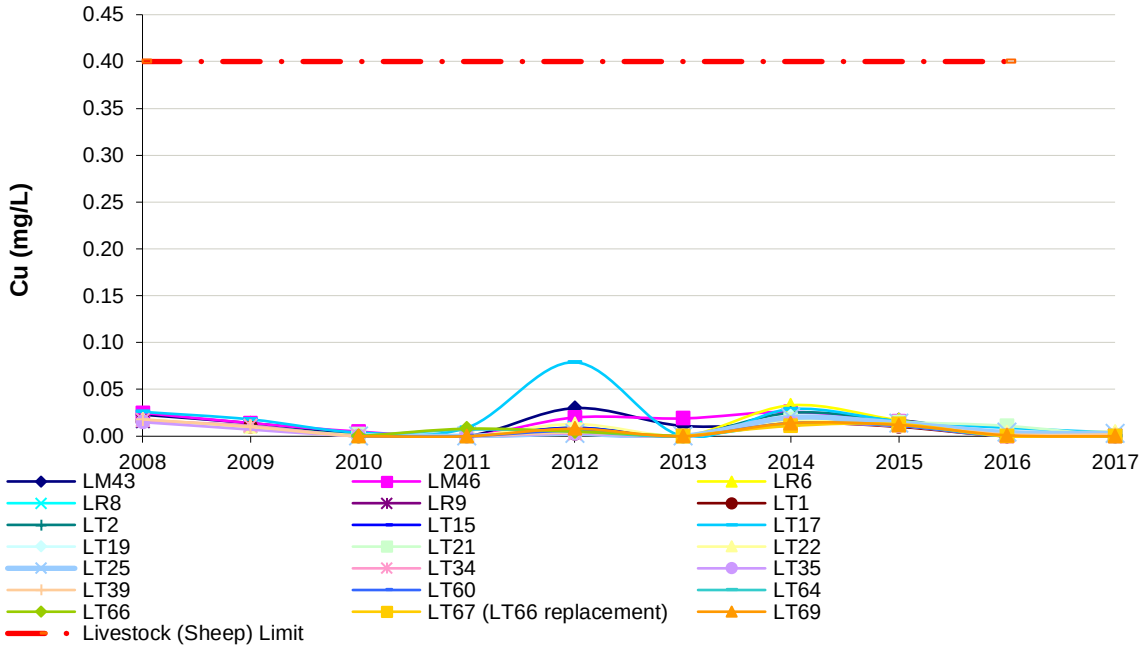


Figure 1.2-11: Olympic Dam on-site and regional groundwater monitoring bores: copper concentration.

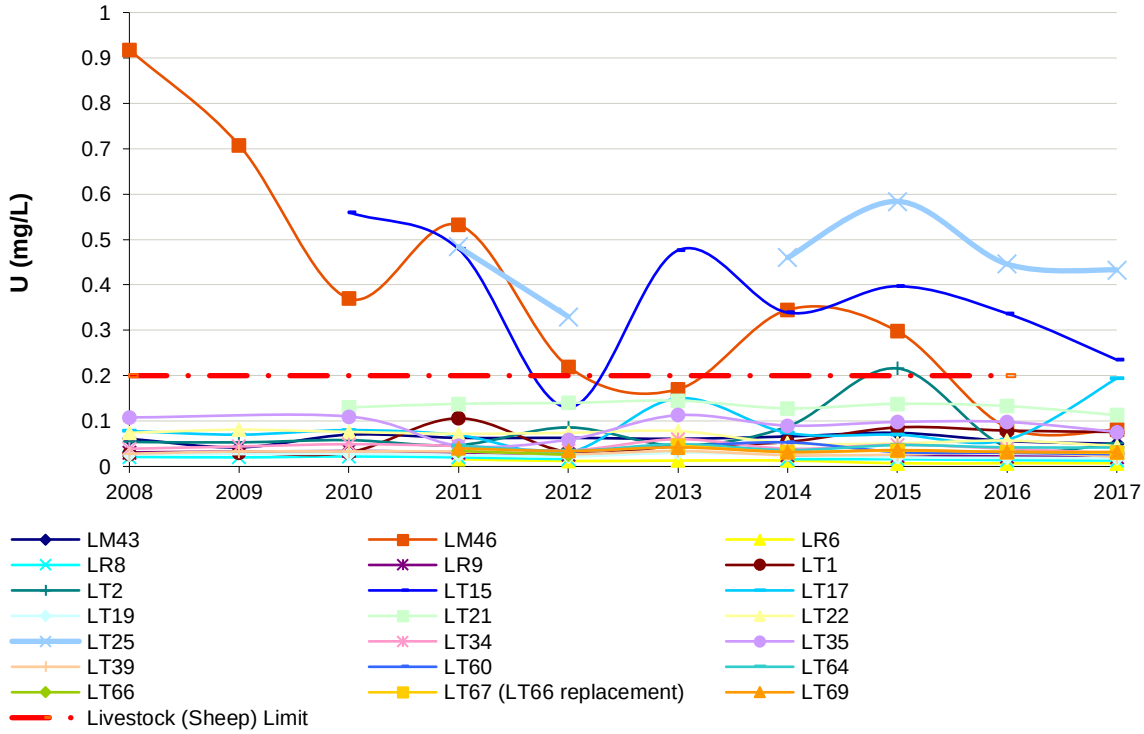


Figure 1.2-12: Olympic Dam on-site and regional groundwater monitoring bores: uranium concentration.

1.2.10 Deliverables (WA 2.3)

Records of the water levels in the MWDP.

To determine any potential environmental impacts of the Mine Water Disposal Pond (MWDP), water levels were monitored via local groundwater bores. An increase in groundwater level at LM43 and LM46 was observed consistent with higher water discharge rates into the pond during early FY16 (Figure 1.2-10).The groundwater level remains below the leading indicator level of 70 mAHD.

Records of quantities of water disposed of into the MWDP.

Quantities of water disposed of into the MWDP were measured and recorded each day, and reconciled monthly as part of the Saline Water balance (see Figure 1.2-3). An average of 3.9 ML per day was disposed into the MWDP during FY17.

1.2.11 Deliverables (WA 2.4)

Records of pond levels and pond wall condition (sewer ponds).

Sewage waste generated by Olympic Village (OV) is gravity fed to three on site chambers and pumped to the OV treatment facility west of the camp. The treatment facility consists of primary, secondary and storage ponds and a permanent evaporation pan with a combined volume of 32 ML. The secondary ponds are mechanically aerated.

The OV treatment facility is inspected daily for security, inflow, wall integrity and available freeboard in storage ponds. Freeboard is reported daily and recorded. Inflow was recorded daily and averaged at 132 kl/day for FY17.

Sewage waste generated by the Mine and Process plant is treated onsite. The onsite facility consists of a lined primary lagoon and lined evaporation pond. Currently inflow is averaging 272 kl /day.

A chemical and biological testing regime is undertaken quarterly for both the onsite and OV facilities. All results are analysed and logged. All results were in expected parameters for FY17.

1.2.12 Deliverables (GW 2.5)

Data demonstrating that radionuclide concentrations are below upper limits.

Surface ponds which hold groundwater used for road watering were monitored and analysed during FY17 for specific radionuclides. Results from samples collected in September 2016 were below the upper limit for radionuclide ^{238}U and ^{226}Ra of 50 Bq/L and 5Bq/L respectively (Table 1.2-2; Figure 1.2-13; Figure 1.2-14).

Table 1.2-2: Radionuclide analysis for dust suppression water.

	Analyte	^{238}U (Bq/L)	^{230Th} (Bq/L)	^{226}Ra (Bq/L)	^{210}Pb (Bq/L)	^{210}Po (Bq/L)
Upper Limits		50		5		
Sample site	Date					
A Block	Sept 2016	1.02		1.4		0.3
TCAF	Sept 2016	3.3		1.5		0.5
Turkey Nest	Sept 2016	0.025		2.3		0.4

Note – analysis of Th230 and Pb210 was unable to be completed at the time of report submission.

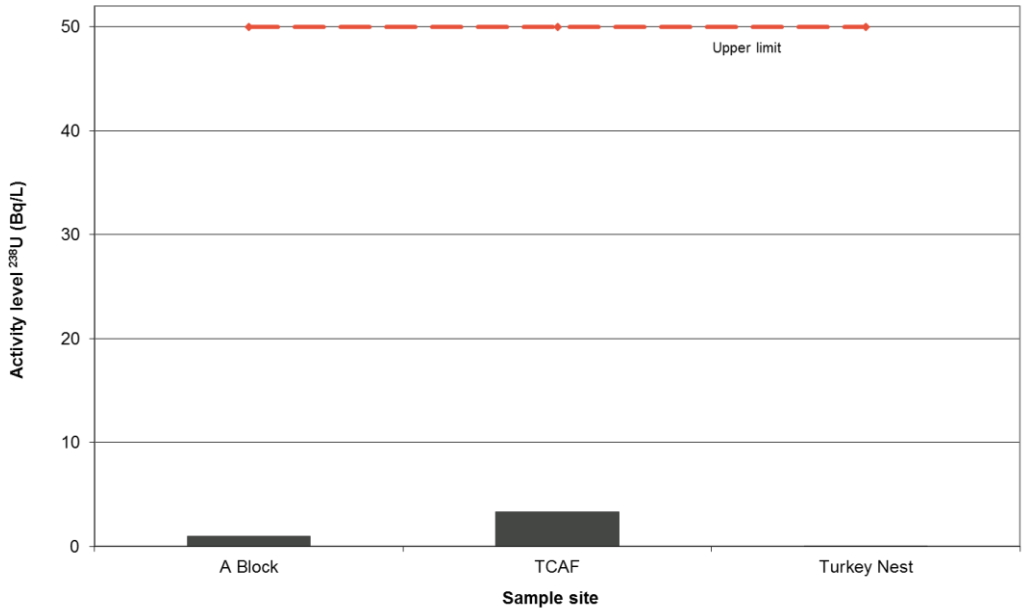


Figure 1.2-13: Mine water sample ^{238}U levels and upper limit FY17.

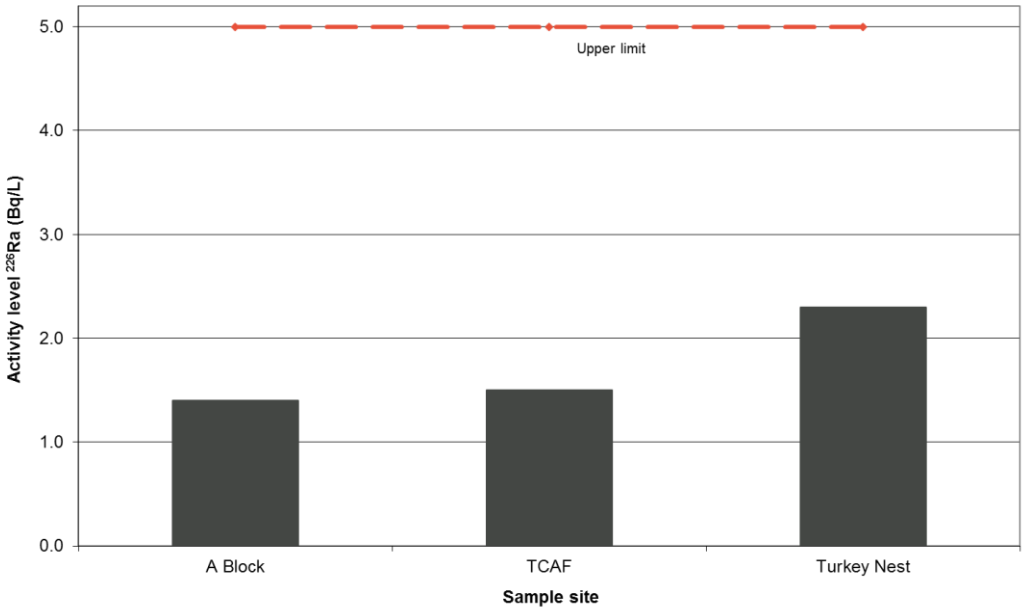


Figure 1.2-14: Mine water sample ^{226}R levels and upper limit FY17.

A review of results and provision for increased monitoring frequency where concentrations are trending towards upper limits.

No samples collected during FY17 showed levels approaching upper limits.

1.2.13 Targets FY17

Maintain an industrial water efficiency of 1.18kL/t at the budgeted production rate.

The GAB industrial water efficiency of the operation in FY17 was 0.96 kL/t, which was favourable compared to the target of 1.18 kL/t. The FY17 performance was lower than that of FY16 (1.08 kL/t). Historical GAB industrial water efficiency is given in Figure 1.2-1.

Maintain a domestic water use target of 3.2 ML/d average

Domestic water use during FY17 averaged 2.2 ML/d, below the target of 3.2 ML/d, as outlined in the Great Artesian Basin Wellfields Report (BHP Billiton Olympic Dam 2016c).

1.2.14 Action Plan FY17

Continue work on establishing Practical Reference Heads (PRHs).

Temperature inclusive drawdown is reported where appropriate in FY17 (BHP Billiton Olympic Dam 2016c).

Continue implementation of water use conservation and recycling initiatives.

Tanks and troughs were supplied to two Wellfield neighbouring properties with the ability to shut-in free flowing bores. The equipment has been partly installed however concerns regarding well integrity are cited as reason not to fully close the wells.

BHP cannot compel the third parties to complete installation.

Continue substitution of saline water for high quality water where possible.

Saline water continues to be used in lieu of high quality water where feasible, including use in CAF, road watering, construction and underground drilling activities.

Saline water is not being used to augment the process water stream as this would result in an unacceptable increase in chloride in the system, which affects plant performance.

2. Storage, Transport and Handling of Hazardous Materials

2.1 Chemical / Hydrocarbon Spills

2.1.1 Environmental Outcome

No significant site contamination of soils, surface water or groundwater, as a result of the transport, storage or handling of hazardous substances associated with ODC's activities.

No significant site contamination of soils, surface water or groundwater occurred in undisturbed areas in FY17. All spills were appropriately contained and cleaned up as soon as practicable. Active monitoring and management of legacy hydrocarbon sites was continued during FY17. This is explained further in section 2.1.4.

2.1.2 Compliance Criteria

No site contamination leading to material environmental harm arising from hydrocarbon/chemicals spills within the SML and wellfields designated areas.

During the reporting period, 25 chemical and hydrocarbon spills occurred across ODC operations. All spills were contained and cleaned up as soon as practicable. Three legacy hydrocarbon spill sites exist (one on the SML and two in the wellfields area), all being actively monitored and managed. For example, the hydrocarbon plume at the 3ML tank shows minor migration in a south easterly direction, and limited natural attenuation of the plume is occurring. Management options including a Detailed Risk Assessment (DRA) are being progressed FY17. In addition, PS1 remediation has successfully treated a groundwater volume of 3.1 ML since commencing operation in late 2014. Finally, PS6A remediation has treated groundwater in excess of 9.7 ML since commencing operation in mid-2014 and recovered approximately 33,100 L of light non-aqueous phase liquid (LNAPL).

Therefore, it is concluded that no new material environmental harm has arisen from hydrocarbon/chemical spills within the SML and wellfields designated areas.

2.1.3 Leading Indicators

- None applicable.

2.1.4 Targets FY17

Corrective actions for all reportable spills of chemicals and hydrocarbons are implemented in a timely manner and do not result in material environmental harm (as defined in the EMM). (Note: Spills are reportable if they result in potential or actual material environmental harm in accordance with the EP Act 1993)

One reportable spill of hydrocarbon occurred in FY17 (see below description of the spill which occurred on the 15th February). The reportable spill incident was defined as material harm under Section 5 of the EP Act as the cost of remediation was in excess of $5000. The reportable spill did not result in material environmental harm which is defined as a major impact (<5 years) to land, biodiversity, ecosystem services, water resources or air in the EMM.

A diesel spill of approximately 450 litres occurred at the western generator bank area installed for backup power supply on the 15th February 2017. The area is located at the smelter which is within the SML. The area has no environmental receptors and as such the event was considered as not having or causing environmental harm as per section 5 of the EP Act.

A solenoid valve on the day tank of a generator as well as a foot valve from the supply tank failed, resulting in the diesel spill. All soil was excavated and removed from site for remediation which cost in excess of $12 000 triggering the material harm clause in section 83 of the EP Act. Since the incident, a Long Term Standby Management plan has been implemented. This plan includes weekly inspections and functional testing. As part of this, the fuel system

is tested weekly which includes inspection of the fuel pipe lines, return lines, filters and fittings for cracks or abrasions. Any leaks are repaired immediately and if required line routing is altered immediately to eliminate wear

2.1.5 Action Plan FY17

Maintain a register of recordable chemical and hydrocarbon spills and corrective actions. (Note: An internally recordable spill of chemicals and/or hydrocarbons is defined as a spill of 10 litres or greater, outside of a bund, in a single event.)

During FY17 there were 25 internally recordable chemical and hydrocarbon spills across site. Majority of the spills occurred above ground in the plant smelter area and processing area with four at the mine end underground. The underground spills did not impact or interact with groundwater. No spills occurred outside the plant area or off the SML or impacted environmental receptors such as flora, fauna or water bodies.

Of the 25 spills; 10 were hydrocarbon spills with majority of the spills resulting from loss of containment on plant equipment across site. The remaining 15 chemical spills consisted of mainly weak acid, electrolyte and feed concentrate spills from leaking pipe racks and instrumentation failures resulting in bund and tank overflows.

Internally reportable chemical and hydrocarbon spills are consistent with previous years as shown in Figure 2.1-1. Furthermore substantial work has been made towards developing a good reporting culture for spills and other environmental events to ensure all events are reported in a timely and accurate manner.

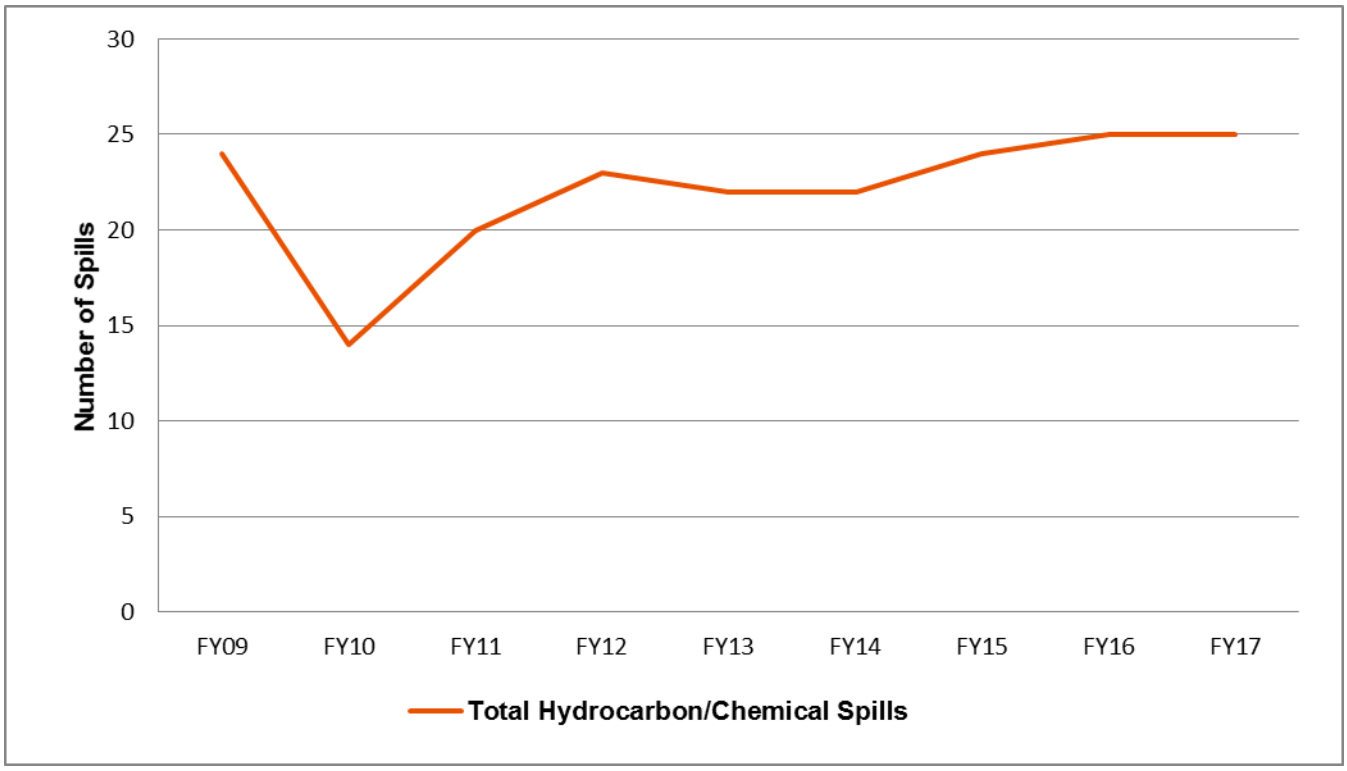


Figure 2.1-1: Historical hydrocarbon / chemical spills.

Continue to implement environment improvement plans for areas of concern, as identified through the annual Aspect and Impact risk register review.

All maintenance and inspections carried out for all tanks and bunds have been recorded in 1SAP as a work item. This ensures that tanks and bunds are regularly maintained and recorded for tracking and auditing purposes. Bunds that do not meet the recent EPA guidelines have undergone a risk assessment with additional controls put in place if required to reduce the risk of spills. The controls include safe fill levels; regular inspections and maintenance and online monitoring via Citect. This is all captured in our Aspects and Impacts register as well as 1SAP for tracking purposes.

An environmental improvement plan was identified as part of the aspect and impact review process for the mine end fuel bay. Improvements and upgrades include the installation of tank overfill protection; an automated fuel shut off system and a local overfill alarm and gauge at the fill point. Bund crack repairs, increase in bund capacity and replacement of valves are currently in progress with the remainder of the works to be completed over the course of the next few months (Figure 2.1-2).

Figure 2.1-2: Upgrade and repairs to the mine end fuel bay.

2.2 Radioactive Process Material Spills

2.2.1 Environmental Outcome

No adverse impacts to public health as a result of radioactive process material spills from ODC's activities).

ODC has consistently operated in a manner that limits radiation dose to members of the public, from operational activities and radioactive emissions, to less than a small fraction of the International Commission on Radiological Protection (ICRP) 1mSv/y limit. During FY17 there were no radioactive process material spills outside operational areas. As a result, there are no adverse radiation exposure impacts to the public from activities undertaken by ODC.

No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive process material spills from ODC's activities.

No significant impacts to populations of listed species or ecological communities were recorded as a result of operational activities, including the effects from any radioactive process material spills. Impacts to listed species and ecological communities are avoided by ensuring that there is no uncontrolled loss of radioactive material to the natural environment. As there was no loss of radioactive material to undisturbed environment in FY17, no impact to populations of listed species or ecological communities occurred.

2.2.2 Compliance Criteria

A dose limit for radiation doses to members of the public of 1 mSv/y above natural background).

The total dose to members of the public at Roxby Downs Monitoring Site (RDMS) and Olympic Village Monitoring Site (OVMS) due to contribution from ODC operations in FY17 was 0.033 mSv and 0.022 mSv, respectively. For more detail refer to Chapter 3.4 - Radioactive Emissions.

No significant radioactive contamination arising from uncontrolled loss of radioactive material to the natural environment. *NOTE: Significant is defined as requiring assessment and remedial action in accordance with the NEPM 1999 or EPP 2015 and the Mining Code. Measurement and monitoring is carried out in response to a specific event.*

In FY17 there were 13 radioactive material spills within the surface operational area. The majority of these spills were in the SX and Hydromet areas and were a result of failed pipes and feed spools. Of the spills in FY17 none required assessment and remedial action in accordance with the NEPM 1999, EPP 2015 or the Mining Code. . As stated in section 2.1.1 above, there was no uncontrolled loss of radioactive material to the natural environment in FY17.

2.2.3 Leading Indicators

- None applicable

2.2.4 Targets FY17

No spill of Radioactive Process Material into an undisturbed environment.

There was no uncontrolled loss of radioactive material to the undisturbed environment in FY17.

Corrective actions resulting from a reportable spill of radioactive process material are executed in a timely manner to ensure no adverse impacts to human health.

During FY17, 13 recordable radioactive material spills within the surface operational area. The majority of these spills were in the SX and Hydromet areas. These spills were contained and remediated resulting in no adverse impact to human health. No reportable spills occurred in FY17.

2.2.5 Action Plan FY17

Maintain a register of recordable spills of radioactive process material resulting from operations at Olympic Dam. (Note: Reportable and recordable spills of radioactive process material as defined by the Criteria and Procedures for Recording and Reporting Incidents as SA Uranium Mines (DSD), known as 'Bachman Criteria'.

A register of recordable spills was maintained. During FY17, there were 13 radioactive process material spills across site, which occurred at the SX, hydromet and concentrate areas. The number of radioactive process material spills shows a decreasing trend since FY11 as shown in Figure 2.2-1. This is attributed to planned maintenance and work management through 1SAP.

Continue to implement environment improvement plans for areas of concern as identified in the annual Aspects and Impacts risk register review.

All areas continued with planned maintenance tasks for tanks, pipes and bunds. These plans are captured and monitored through 1SAP. The adherence to planned maintenance ensures less radioactive process material spills as demonstrated in Figure 2.2-1.

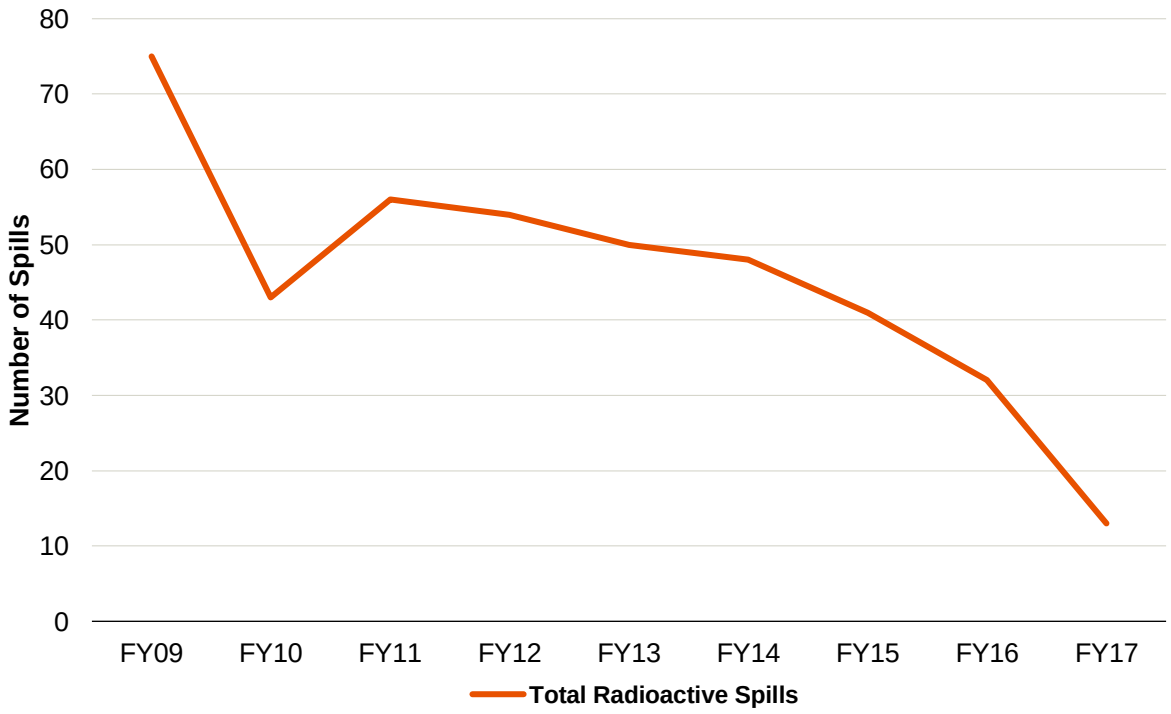


Figure 2.2-1: Historical radioactive process material spills.

3. Operation of Industrial Systems

3.1 Particulate Emissions

3.1.1 Environmental Outcome

No adverse impacts to public health as a result of particulate emissions from ODC's activities.

No adverse impacts to public health as a result of particulate emissions from operations conducted by ODC occurred during FY17. Condition 49(a) of the Major Development Approval prescribes ground level criteria for dust concentrations. Measured ground level dust concentrations derived from operations at Olympic Dam and recorded at sensitive receptor sites were below compliance criteria for PM_{10} dust at all times during FY17.

3.1.2 Compliance Criteria

Ground level PM_{10} dust concentrations at Roxby Downs derived from construction and operational sources at Olympic Dam must not exceed the PM_{10} 24-hour average of 50 µg/m^3.

It is noted that Olympic Village is not referenced under Condition 49 of the Major Development Approval and is therefore not considered a compliance station. However, Olympic Village is the primary workers village at Olympic Dam and is considered a sensitive receptor site. For this reason data pertaining to ground level dust concentration at Olympic Village has also been included into this report.

The highest 24-hour average recorded for operational contributed PM_{10} dust was 9.29 µg/m^3 and 48.91 µg/m^3 at Roxby Downs and Olympic Village respectively. This is below the limit of 50 µg/m^3 and is discussed further in section 3.1.4.

3.1.3 Leading Indicators

- None applicable.

3.1.4 Deliverables

Records of particulate emissions from Smelter 2 to assess compliance with the emission limits of EPA Licence 1301 and the Environmental Protection (Air Quality) Policy 1994 (AE 2.1).

The Environment Protection (Air Quality) Policy 1994 prescribes a level for emissions of particulates from any process using plant for the heating of metals or metal ores. This level is referenced in EPA Licence 1301 Authorisation Reference 7 (37-43). It is noted that this EPMP Report is reporting against the 2016 EPMP. Reference will be made to the updated Environment Protection (Air Quality) Policy 2016 and Schedule 2 Ground Level concentrations compliance to particulate PM10 is demonstrated in Figure 3.1-1and Figure 3.1-2 below.

Sampling of smelter stack emissions and analysis for particulate concentrations are undertaken periodically to assess the performance of gas cleaning systems against the requirements of the EPP 1994 reporting levels and EPA Licence 1301 Authorisation Reference 7 (37-43). Particulate emissions from the Acid Plant Tails Stack (APTS), Concentrate Dryer Stack and Main Smelter Stack were tested during FY17. The results of this testing program are summarised in Table 3.1-1 and Table 3.1-2.

Emissions of particulates from the Main Smelter Stack and the Acid Plant Stack met requirements of the Environment Protection (Air Quality) Policy 1994 during the reporting period for isokinetic testing Table 3.1-3. No exceedances of ground level concentrations (GLC) of PM10 as per schedule 2 of the EP Air quality Policy 2016 occurred in FY17.

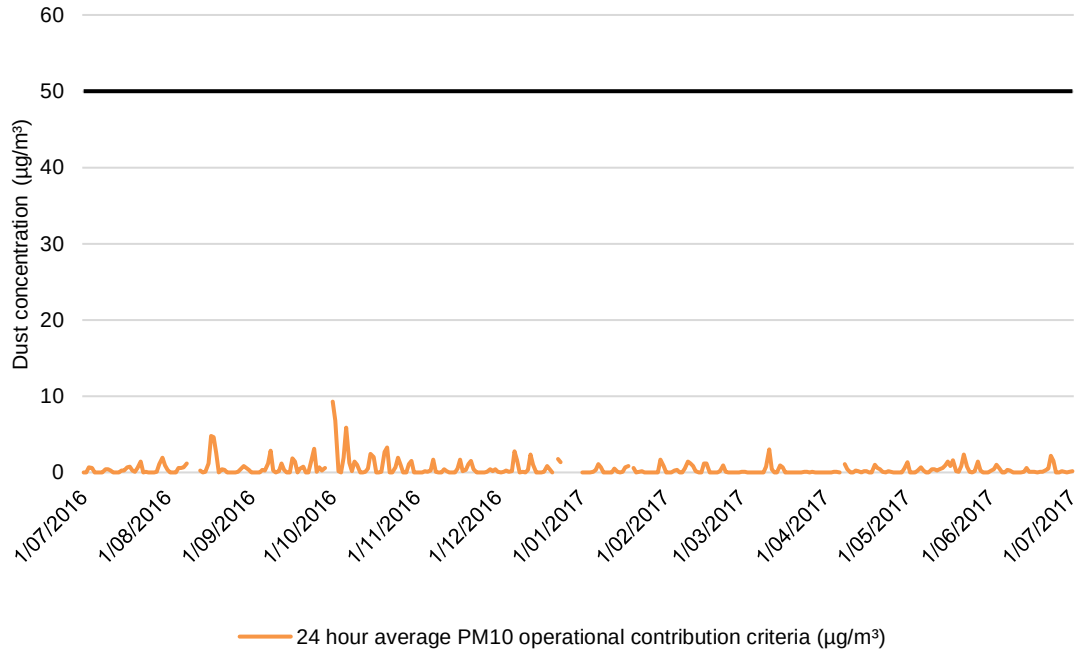


Figure 3.1-1: Real-time PM_{10} 24-hour 'operational contribution' dust concentrations at Roxby Downs (FY17).

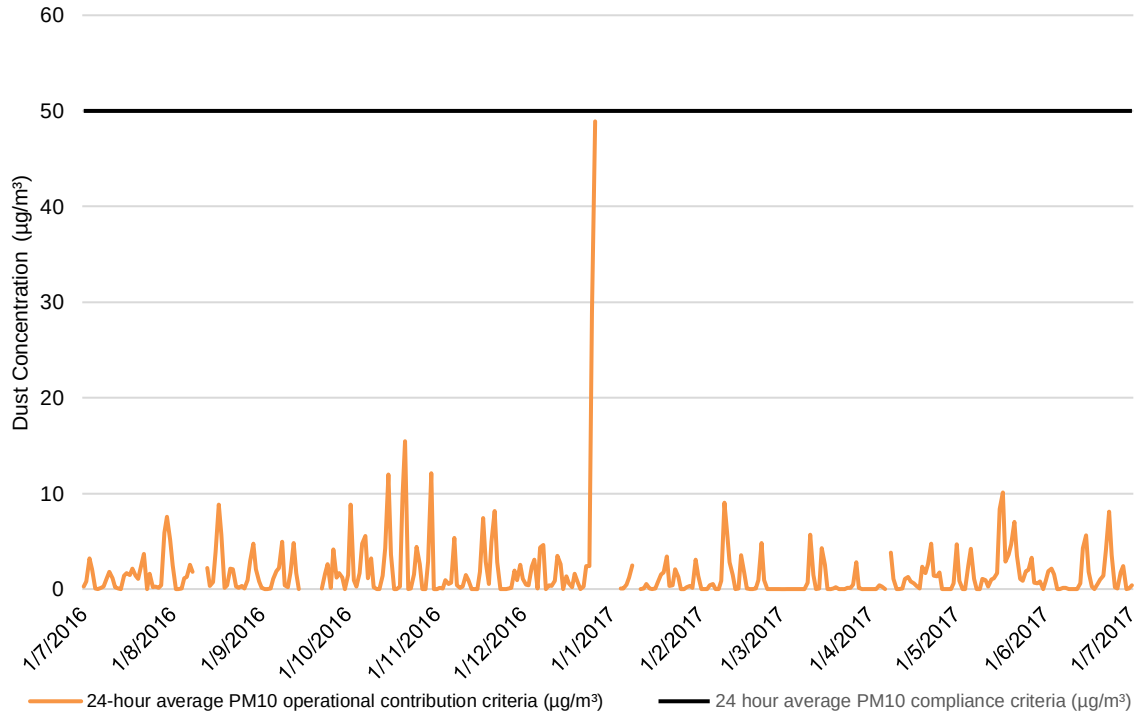


Figure 3.1-2: Real-time PM_{10} 24-hour 'operational contribution' dust concentrations at Olympic Village (FY17).

Table 3.1-1: Measured particulate concentrations at the Main Smelter Stack and Acid Plant Stack (mg/Nm^3).

	Main Smelter Stack (mg/Nm^3)	Acid Plant Stack (mg/Nm^3)
August 2016	32	1.5
February 2017	8	N/A

Note: Environment Protection (Air Quality) Policy Limit is 100 mg/Nm^3. The Environment Protection (Air Quality) Policy 2016 Schedule 4 is 100mg/Nm^3 and Schedule 2 GLC for PM_{10} is 0.05 mg/m^3. The GLC was not exceeded at sensitive receivers.

Table 3.1-2: Measured particulate concentrations at the Concentrate Dryer Stack (mg/Nm^3)

	Concentrate Dryer Stack (mg/Nm^3)
January 2017	369*
January 2017	259*
February 2017	36

Note: Environment Protection (Air Quality) Policy Limit is 250 mg/Nm^3. The Environment Protection (Air Quality) Policy 2016 Schedule 4 is 100mg/Nm^3 and Schedule 2 GLC for PM_{10} is 0.05 mg/m^3. The GLC was not exceeded at sensitive receivers (figure 2 and 3).* see below event description.

On the 23rd of January 2017 isokinetic testing on the Concentrate Dryer Stack revealed that particulates exceeded the relevant levels contained in Schedule 4 of the EPA Air Quality Policy (2016) at 369mg/Nm^3. Following inspections it was demonstrated that Dryer 1 bag house was the cause of the high particulates.

An internal and external inspection was undertaken which indicated no damage to the bags however excess concentrate build up was removed which could have interfered with the bag house seal. A follow up test was undertaken with results still exceeding the stack point source limit. A full bag replacement was scheduled and the bags were replaced. The final sampling conducted 21st of February 2017 indicated compliance with the Air Quality Policy for the Concentrate Dryer Stack.

Records of particulate emissions from Calciners A and B to assess compliance with the relevant particulate emission limit specified in Environment Protection (Air Quality) Policy 1994 (AE 2.2)

It is noted that this EPMP Report is reporting against the 2016 EPMP. Reference will be made to the updated Environment Protection (Air Quality) Policy 2016 and Schedule 2 Ground Level concentrations compliance to particulate PM10 is demonstrated in Figure 3.1-1and Figure 3.1-2.

Particulate emissions from Calciner A and B are measured on a quarterly basis by isokinetic sampling, where possible, depending upon process reliability and plant availability (Table 3.1-3). Any measurement above 250mg/Nm3 is investigated and reported to EPA Regulation and Compliance. The isokinetic stack-sampling filters used to capture particulates are also analysed for 238U activity. Results from the uranium analysis, together with data obtained from the process control system, are used to estimate total uranium discharged from the stacks, and subsequently reported in the LM1 Radiation Annual Report.

Scheduled sampling of the Calciner gas cleaning systems occurred in August 2016, November 2016; January 2017; April 2017 and May 2017. Emission of particulates from Calciner A and B met the requirements of the Environment Protection (Air Quality) Policy 2016 during the reporting period and did not result in GLC exceedance of particulates at sensitive receivers (Table 3.1-3). The particulate emission trend for the Calciner is presented in Figure 3.1-3.

Table 3.1-3: Measured particulate concentrations in Calciner emissions (mg/Nm^3)

	Calciner A (mg/Nm^3)	Calciner B (mg/Nm^3)
August 2016	58	45
November 2016	167	146
January 2017	159	28
April 2017	Not running	43
May 2017	107	N/A

Note: Environment Protection (Air Quality) Policy Limit is 250 mg/Nm^3. The Environment Protection (Air Quality) Policy 2016 Schedule 4 is 100mg/Nm^3 and Schedule 2 GLC for PM_{10} is 0.05 mg/m^3. The GLC was not exceeded at sensitive receivers.

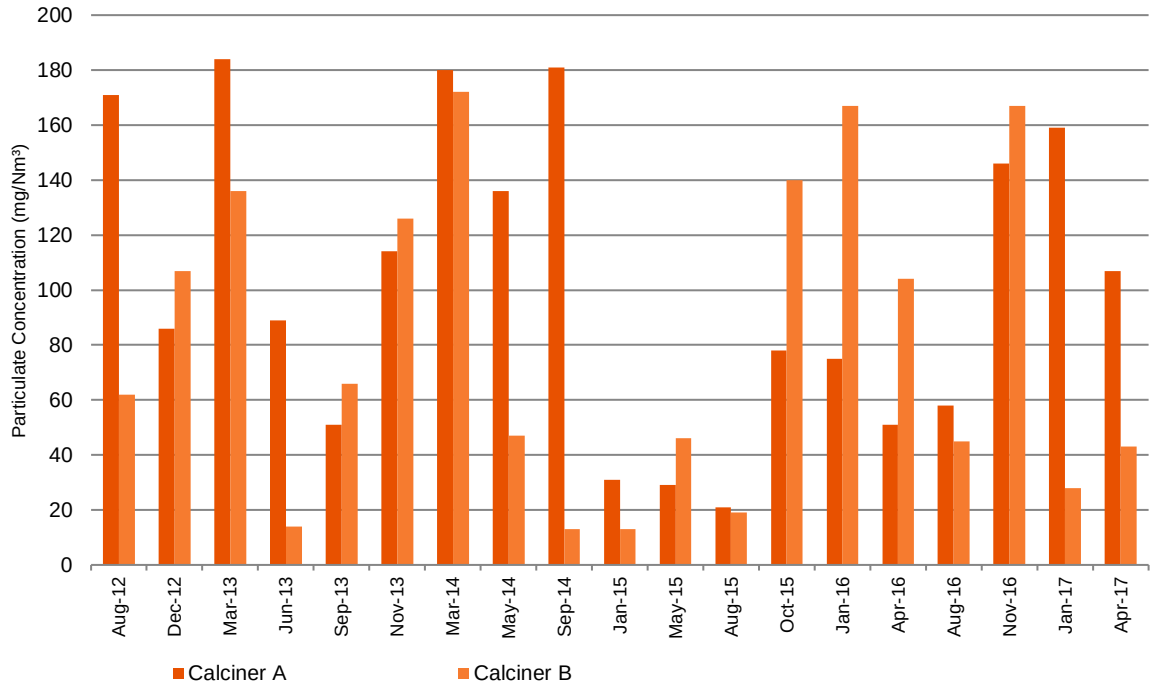


Figure 3.1-3: Historical Calciner quarterly isokinetic particulate emissions.

Records of particulate and hydrogen sulphide emissions from the Slimes Treatment Plant to assess compliance with the emission limits specified in the Environment Protection (Air Quality) Policy 1994 (AE 2.3).

It is noted that this EPMP Report is reporting against the 2016 EPMP. Reference will be made to the updated Environment Protection (Air Quality) Policy 2016 and Schedule 2 Ground Level concentrations compliance to particulate PM10 is demonstrated in Figure 3.1-1and Figure 3.1-2.

Particulate and hydrogen sulphide emissions from the Slimes Treatment Plant are measured on a biannual and annual basis respectively by isokinetic sampling (Table 3.1-4). Any measurement above 100 mg/Nm^3 for particulates from the roaster scrubber or above 5 mg/Nm^3 of hydrogen sulphide from the NO_X Scrubber is reported to EPA Regulation and Compliance and then investigated.

Table 3.1-4: Measured particulates and Hydrogen Sulphide concentrations (mg/Nm³)

	Saunders Furnace Particulates (mg/Nm³)	NO_X Scrubber Hydrogen Sulphide (mg/Nm³)
November 2016	58	<0.05
April 2017	70	

Note: Environment Protection (Air Quality) Policy 1994 Limit for Particulates and Hydrogen Sulphide was 100 mg/Nm^3 and 5mg/Nm^3 respectively. The Environment Protection (Air Quality) Policy 2016 Schedule 4 for Particulates and Hydrogen Sulphide is 100mg/Nm^3 and Schedule 2 GLC for PM_{10} and Hydrogen Sulphide is 0.05 mg/m^3 0.51mg/m^3 over a three minute averaging time. The GLC was not exceeded at sensitive receivers. Due to the measured <0.05mg/Nm3 Hydrogen Sulphide level at the stack no GLC measurement is necessary.

Records of real-time monitoring of particulates to ensure that concentrations at receptor sites remain within the compliance criteria (AE 2.6).

The real-time dust monitoring system records data at 10 minute intervals of ground level dust concentrations at sensitive receptor sites. The calculation of the operational component of these levels is determined by subtracting dust concentrations measured at the Northern background site from measurements recorded at sensitive receptors during attributable wind direction periods. The real time operational dust concentration results for Roxby Downs and Olympic Village are shown in Figure 3.1-1 and Figure 3.1-2. During FY17 all receptor sites remained within compliance limits. The high operational contribution dust level at Olympic Village on the 26th of December 2016 depicted in Figure 3.1-4 was investigated on the day and attributed to an isolated whirly wind that blew through the monitoring station. The real-time dust concentration from the Olympic Village station on the day reflects the same spike in data and due to the direction it was attributed as operational. Figure 3.1-4 represents real time 24-hour average background PM_{10} dust concentrations.

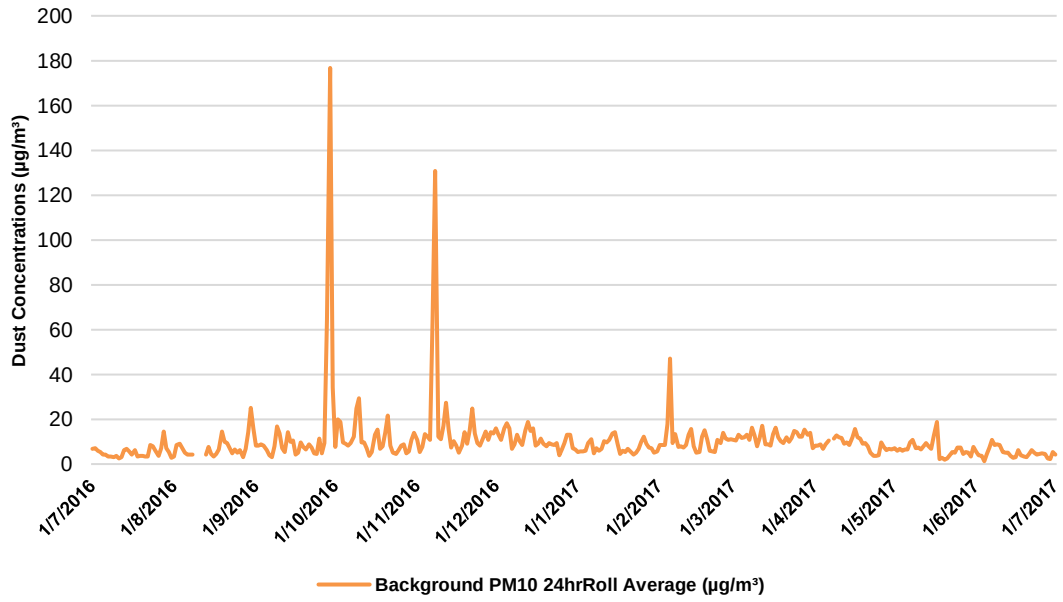


Figure 3.1-4: Real-time dust concentrations at Northern Background Station (FY17).

Provision of real-time particulate information to inform the management of dust producing activities at the operation (AE 2.6).

The real-time dust monitoring stations are recording information at 10 minute intervals with all information stored and managed on the Airodis air management data base (for real-time dust monitoring station locations, see Figure 3.1-5). A daily report is distributed to stakeholders which shows background and operationally contributed PM_{10} dust levels. If high winds and storms are anticipated a site wide weather warning is circulated to all operational areas, with site ceasing outdoor operations during storm events.

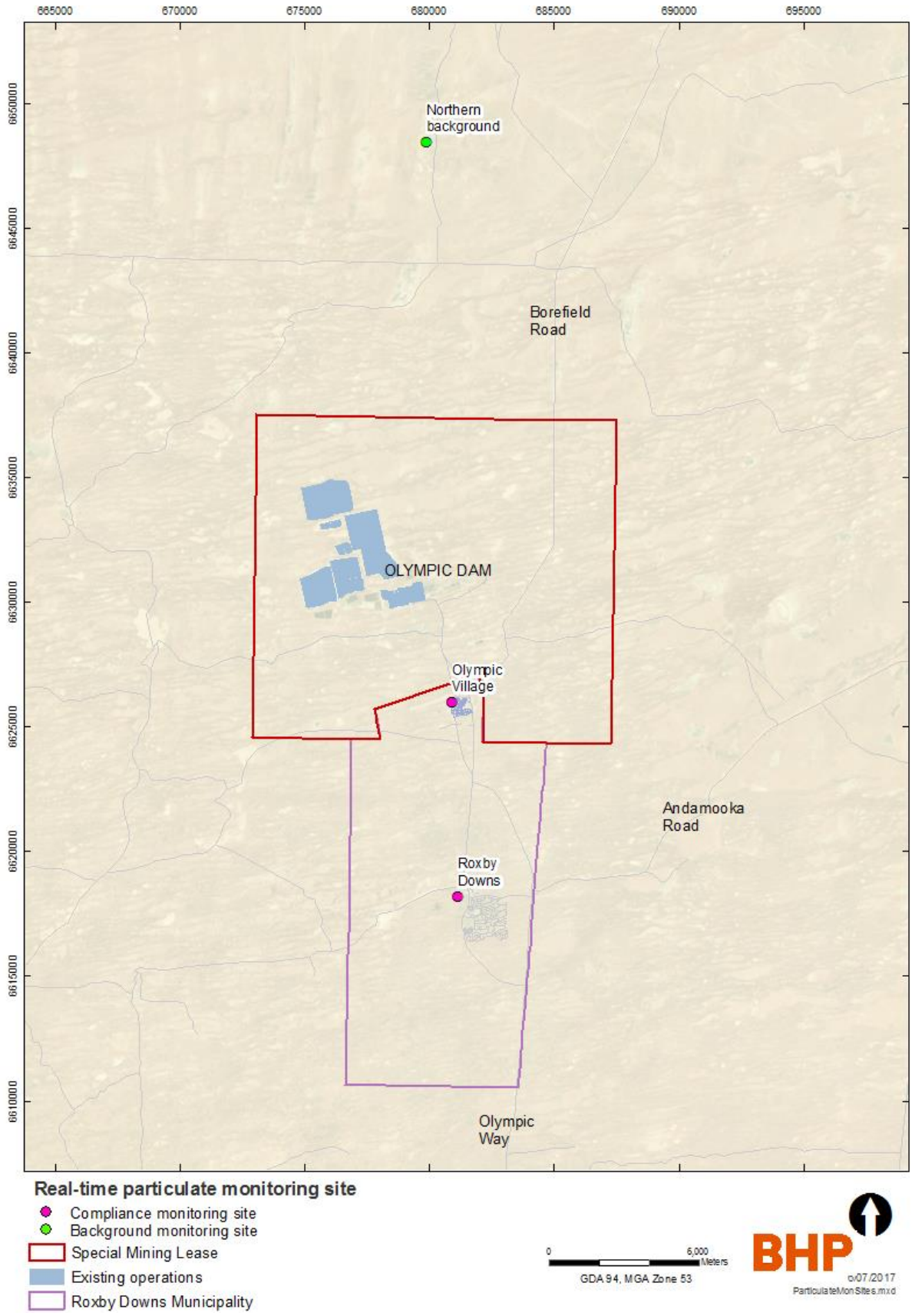


Figure 3.1-5: Location of real time dust monitoring sites.

3.1.5 Deliverables (FL 2.1)

A report on the annual changes in perennial communities within and surrounding the SML.

Sites sampled in FY17 are shown in Figure 3.1-6. The mean percentage relative abundance of most plant species at control sites in FY17 was similar to previous years. A slight increase in abundance in FY17 was observed for *Acacia aneura*, *Acacia ramulosa*, *Alectyron oleifolius*, *Dodonaea viscosa* and *Senna artemisioides spp. petiolaris*. A slight decrease in abundance was observed for *Acacia ligulata* and *Callitris glaucophylla*.

The mean percentage relative abundance of most plant species at treatment sites in FY17 was similar to previous years. The greatest increase in abundance in FY17 was observed for *Dodonaea viscosa* and *Pittosporum angustifolium*. A slight decrease in abundance was observed for *Acacia ligulata*, *Acacia oswaldii*, *Acacia ramulosa* and *Pimelea microcephala*.

Simpson's Index is a measure of the extent to which sites are dominated by one or more species. A Simpson's value of one indicates a single species exclusively dominates a site, whereas a value closer to zero suggests that numerous species are equally abundant. The univariate analysis of variance indicated that there was no significant difference ($p>0.05$) in Simpson's values between the control and treatment sites in the Acacia Woodland ($p = 0.423$) or the Callitris Woodland ($p = 0.288$).

Provide a comparative assessment on perennial species existing at different distances from the Main Smelter Stack.

Correlation analysis indicated that there was no significant relationship between Simpson's Index and distance from the main smelter stack in both the Acacia Woodland ($r = -0.1328$, $p = 0.3246$) and the Callitris Woodland ($r = 0.4455$, $p = 0.1970$). Simpson's Index values were comparable between control and treatment sites, and correlation analysis revealed weak relationships between floristic diversity/structure and distance from the main smelter stack. In summary, no evidence of adverse impacts due to emissions were detected.

In addition, a continuous improvement project was completed on a subset of 26 of the total 67 monitored flora sites. The study compared perennial communities with heavy metal analysis in the soil. Of the potential contaminants tested, copper, thorium, uranium and zinc were all detected at significantly higher levels on the SML compared to outside the SML, whereas acidity was significantly higher off the SML (Table 3.1-5). However, relatively low levels of these contaminants could not be linked to low plant species diversity. Sites on the SML that maintained high levels of species diversity were those directly north of the operation, behind the backfill area. These sites may potentially be exposed to less disturbance than other sites with high levels of copper, uranium and zinc and therefore are able to maintain higher levels of plant species diversity as the cumulative impacts may not be as great. These results will be further investigated in FY18.

Table 3.1-5: Mean ± SEM of contaminants that were significantly different to the level detected outside the SML.

Contaminant	SML Mean ± SEM (mg/kg)	Outside the SML Mean ± SEM (mg/kg)
Copper	37.8 ± 15.6	5.0 ± 0*
Thorium	0.8 ± 0.1	0.6 ± 0.03
Uranium	0.2 ± 0.1	0.1 ± 0*
Zinc	5.7 ± 0.3	5 ± 0*
Acidity	7.6 ± 1.4	12.1 ± 1.3

*Below detectable limits.

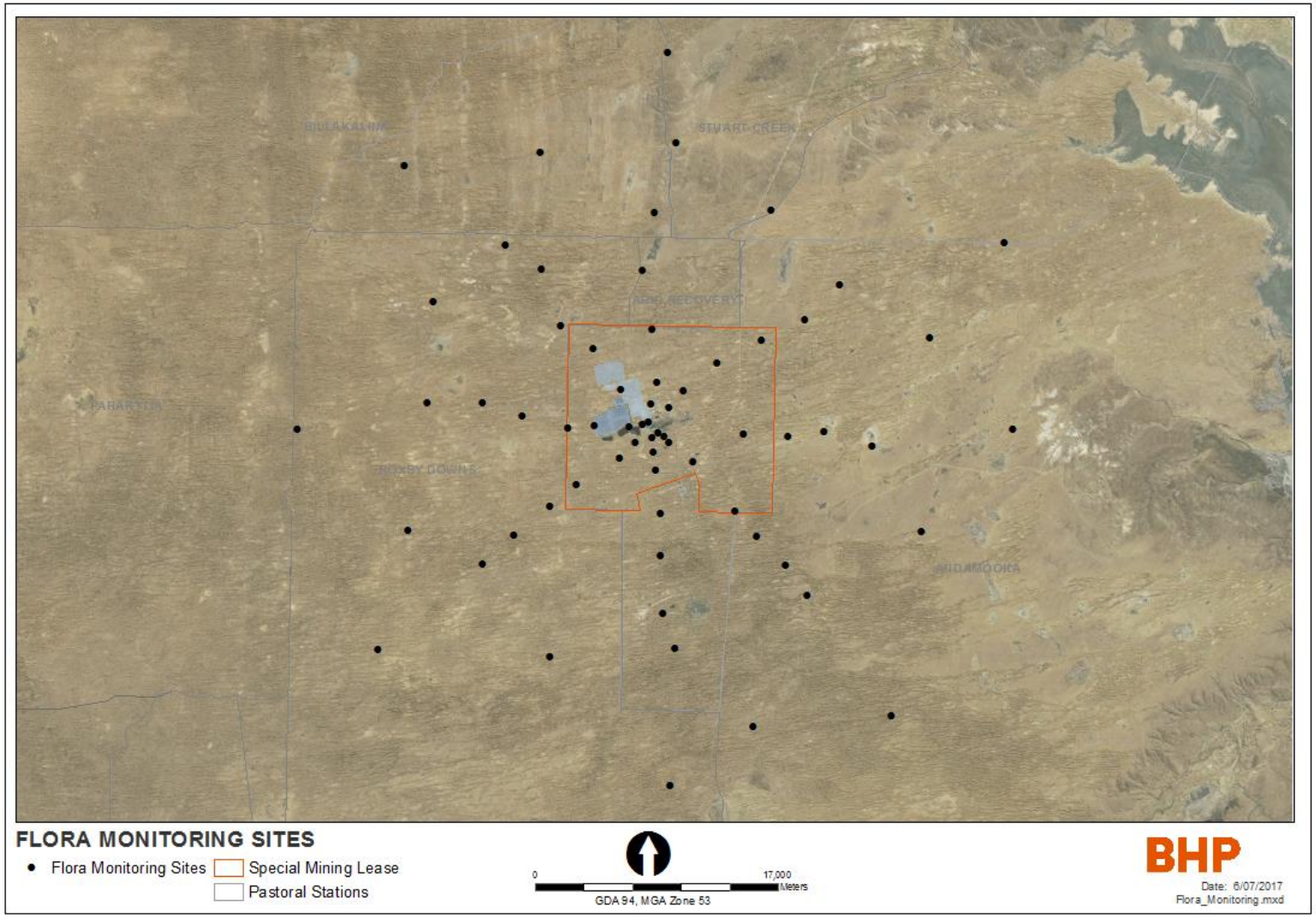


Figure 3.1-6: Location of radial sample sites monitored in FY17.

3.1.6 Targets FY17

- None applicable.

3.1.7 Action Plan FY17

Implement an Environmental Improvement Plan should any significant increase of operationally contributed PM_{10} 24 hour average of $50_{ug}/m^3$ occur over the year.

No increase of operationally contributed PM_{10} 24 hour average of $50_{ug}/m^3$ occurred over the year. All current operational dust limits are within compliance and no improvement plan is required at this present time.

3.2 Sulphur Dioxide Emissions

3.2.1 Environmental Outcome

No adverse impacts to public health as a result of sulphur dioxide emissions from ODC's activities.

There were no adverse impacts to public health as a result of sulphur dioxide (SO_2) emissions from ODC's activities during FY17.

National Environmental Protection Measure (NEPM) levels for ambient air quality are based on protection of human health. Roxby Downs and Olympic Village ambient SO_2 analyser results for the reporting period showed no exceedance of the NEPM for ambient air quality SO_2 at either Olympic Village or Roxby Downs Township.

3.2.2 Compliance Criteria

Annual average SO_2 concentration of less than 0.02 ppm at sensitive receivers, Olympic Village and Roxby Downs.

The measured annual average SO_2 concentrations for the reporting period was 0.0000 and 0.0001 at Roxby Downs and Olympic Village respectively, which is less than the 0.02 ppm NEPM limit.

24-hour average SO_2 concentration of less than 0.08 ppm at sensitive receptors, Olympic Village and Roxby Downs

The measured maximum 24-hour average SO_2 concentrations for the reporting period was 0.0010 ppm and 0.0016 ppm for Roxby Downs and Olympic Village respectively. This is below the 0.08 ppm NEPM limit.

One-hour average SO_2 concentration of less than 0.2 ppm at sensitive receptors, Olympic Village and Roxby Downs

The measured maximum hourly average SO_2 concentration for the reporting period was 0.0010 ppm and 0.0020 ppm for Roxby Downs and Olympic Village respectively, which is less than the 0.2 ppm NEPM limit.

3.2.3 Leading Indicators

- None applicable.

3.2.4 Deliverables

Calibration records for SO_2 analysers on the Main Smelter Stack and Acid Plant Tails Gas Stack (AE 2.1).

The Acid Plant Tail Gas Stack (APTS) and Main Smelter Stack (MSS) SO_2 analysers were maintained in accordance with site procedures and manufacturer's recommendations throughout the reporting period. Calibration maintenance plans (MPs) are scheduled through SAP and are automatically generated. These MPs are part of Olympic Dams' pollution control register and monitored for completion frequently. Currently, the in stack real time SO2 and particulate analysers on the MSS and the APTS are calibrated on a weekly and quarterly basis. All calibration maintenance plans were completed for FY17 and the calibration records are kept electronically.

Records of SO_2 emissions to assess compliance with the monitoring and reporting requirements of EPA Licence 1301 and the Environment Protection (Air Quality) Policy 1994 (AE 2.1).

It is noted that this EPMP Report is reporting against the 2016 EPMP. Reference will be made to the updated Environment Protection (Air Quality) Policy 2016 and Schedule 2 Ground Level Concentrations (GLC) compliance to SO2 is demonstrated in Table 3.2-1 below.

Table 3.2-1: Measured maximum average (mean) ambient SO2 concentrations at Roxby Downs and Olympic Village.

	Annual average concentration (ppm)	Maximum 24-hour average concentration (ppm)	Maximum hourly average concentration (ppm)
Roxby Downs			
Measured concentration	0.0000	0.0010	0.0010
NEPM	0.02	0.08	0.2
Olympic Village			
Measured Concentration	0.0001	0.0016	0.0020
NEPM	0.02	0.08	0.2

Isokinetic sampling of the Main Smelter Stack and Acid Plant Tail Gas Stack was undertaken in August 2016 for sulphur trioxide, with sulphur dioxide testing in August 2016 and February 2017. The results indicate continued compliance with the requirements of EPA Licence 1301 and the Environment Protection (Air Quality) Policy 2016. Table 3.2-2 and Table 3.2-3 display the results for FY17.

Table 3.2-2: Smelter 2 Main Smelter Stack sampling results FY17

Sampling Point Main Smelter Stack	Total acid gas emissions (mg/Nm^3)	Sulphur trioxide and acid mist emissions* (mg/Nm^3)	Sulphur dioxide emissions ** (mg/Nm^3)
Reporting Level	**3000**	**100**	**2400**
August 2016	262	3	259
February 2017	-	-	<15

* Expressed as sulphur trioxide equivalent
** EPA Licence 1301 Licence requirement level without sulphur trioxide

Table 3.2-3: Smelter 2 Acid Plant Tails Stack sampling results FY17

Sampling Point Acid Plant Tails Gas Stack	Total acid gas emissions (mg/Nm^3)	Sulphur trioxide and acid mist emissions* (mg/Nm^3)	Sulphur dioxide emissions ** (mg/Nm^3)
Reporting Level	**3000**	**100**	**2400**
August 2016	912	<1	911
February 2017	-	-	255

* Expressed as sulphur trioxide equivalent
** EPA Licence 1301 Licence requirement level without sulphur trioxide

Data to confirm that greater than 99 per cent of all SO_2 generated during the smelting process is captured (AE 2.1).

The percentage of SO_2 recovery for the reporting period FY17 was 99.00 %. This recovery result has increased from 98.96 % last reporting year and is compliant to the required 99 % capture deliverable.

Records of ground level SO_2 concentrations at Olympic Village and Roxby Downs Township to assess compliance with the ground level SO_2 concentration requirements of the Ambient Air Quality NEPM (AE 2.4).

Ambient SO_2 1 hour, 24 hour, and 1 year average (mean) concentrations for FY17 at Olympic Dam Village and Roxby Downs were measured by real time continuous ambient SO_2 monitors in accordance with EPA Licence 1301 Condition (305-138). Measured maximum average 1 hour, 24 hour, and 1 year concentrations for Roxby Downs and Olympic Village along with the applicable NEPM values, are presented in table 3 below. The results of the measured concentration for the reporting period show that no exceedance of the NEPM for ambient air quality for SO_2 occurred at Olympic Village or Roxby Downs Township (Figure 3.2-1 to Figure 3.2-6).

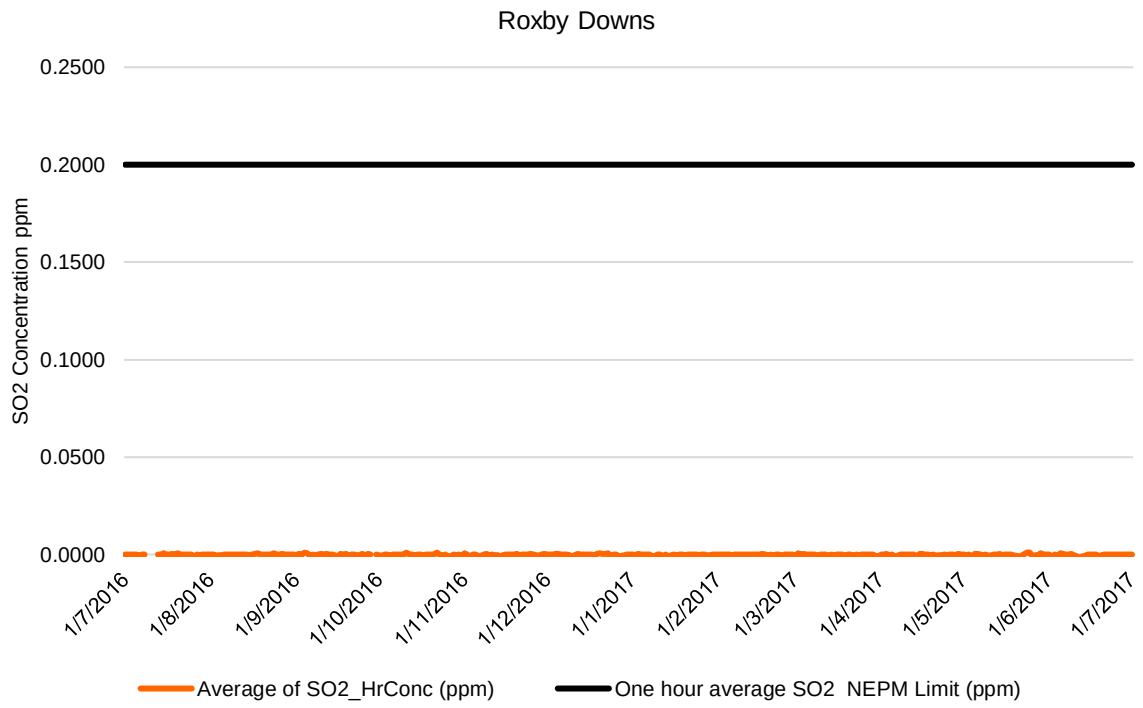


Figure 3.2-1: Measured hourly mean SO_2 concentration at sensitive receptor, Roxby Downs.

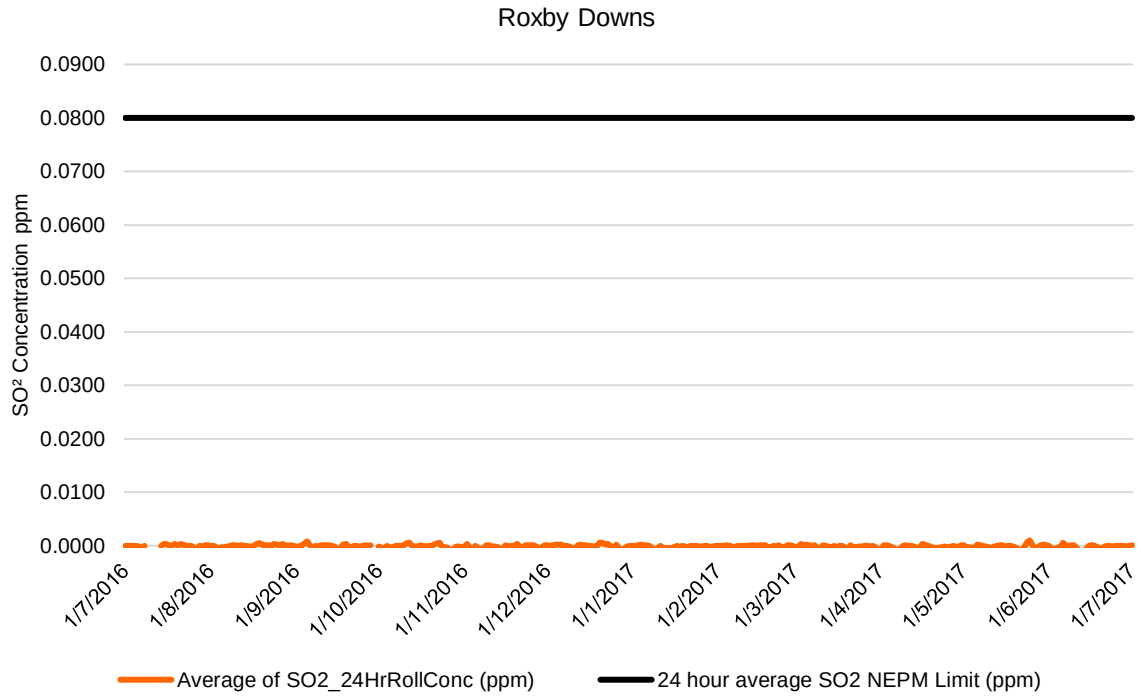


Figure 3.2-2: Measured 24-hour mean SO_2 concentration at sensitive receptor, Roxby Downs.

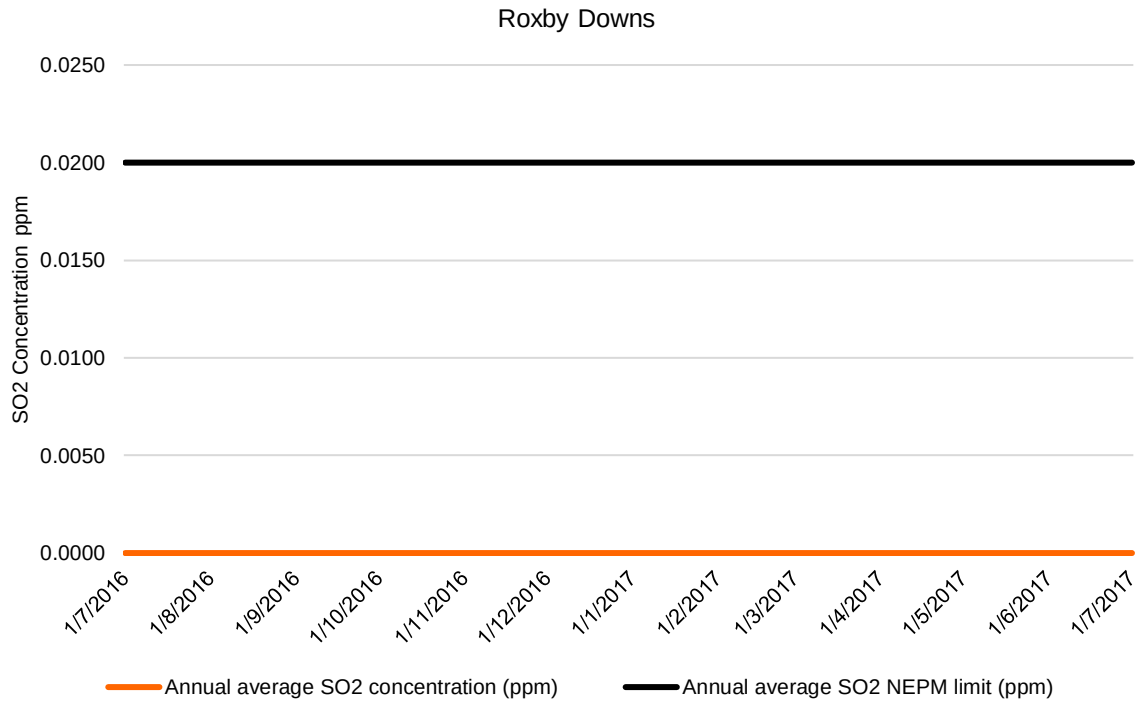


Figure 3.2-3: Measured annual mean SO_2 concentration at sensitive receptor, Roxby Downs.

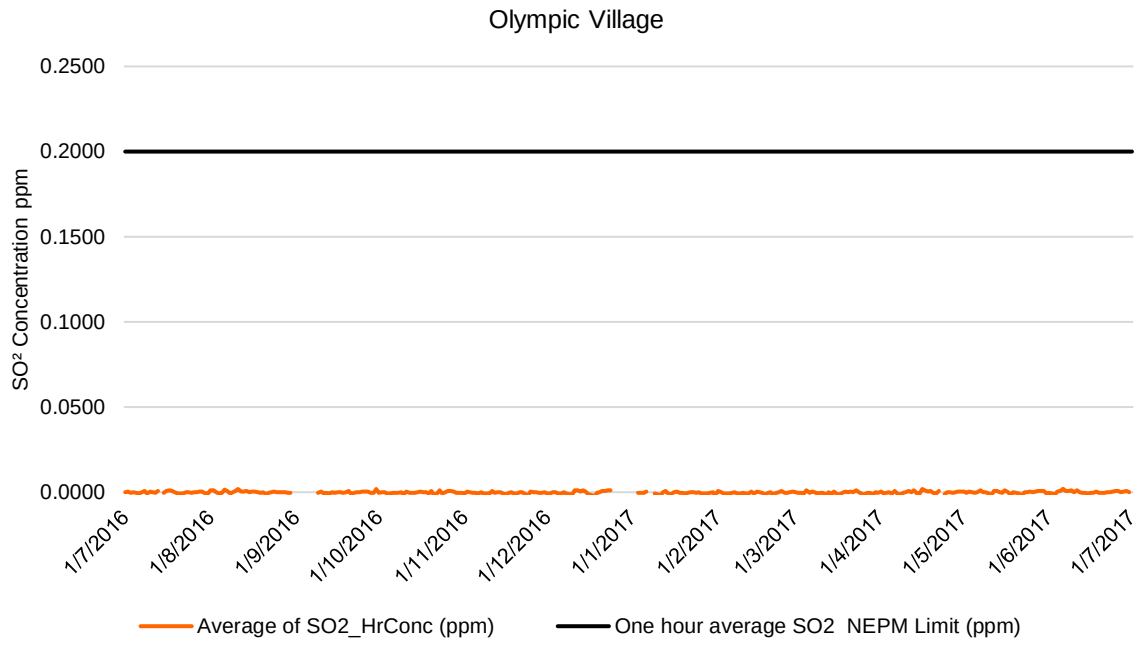


Figure 3.2-4: Measured hourly mean SO_2 concentration at sensitive receptor, Olympic Dam.

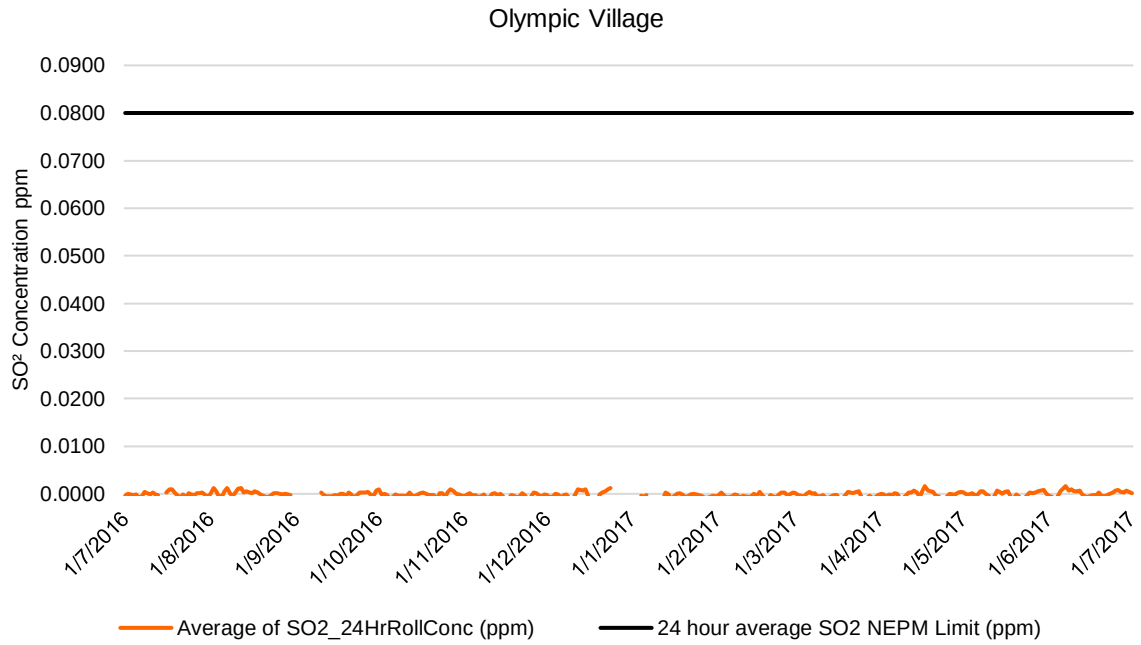


Figure 3.2-5: Measured 24-hour mean SO_2 concentration at sensitive receptor, Olympic Dam.

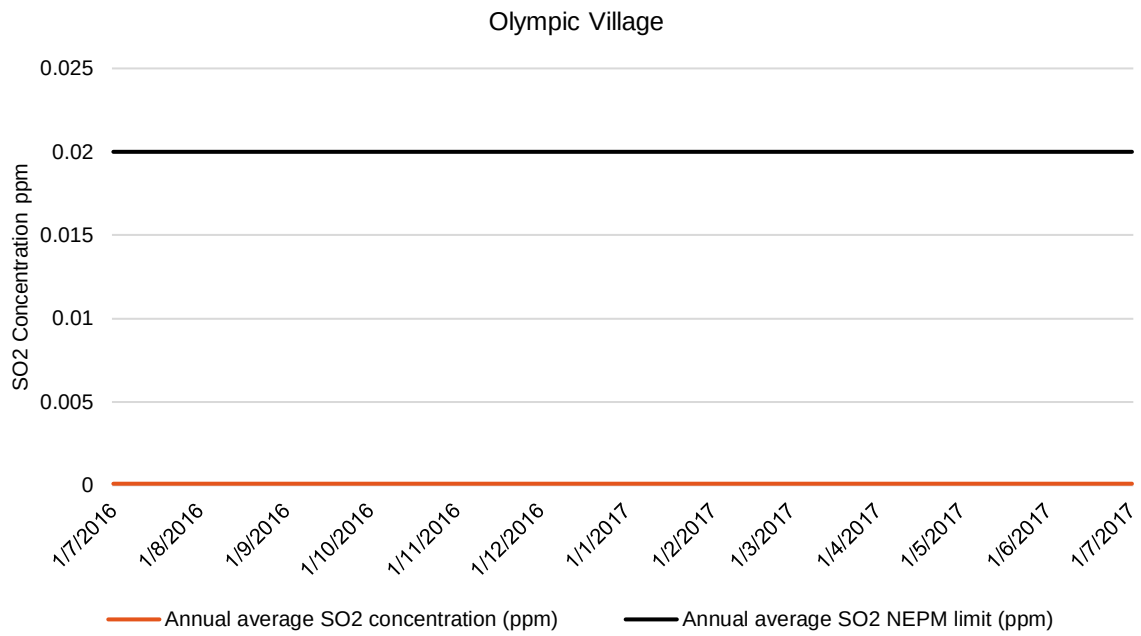


Figure 3.2-6: Measured annual mean SO_2 concentration at sensitive receptor, Olympic Dam.

3.2.5 Targets FY17

99 percent of all SO_2 generated during the smelting process is captured.

This has been achieved please see section 3.2.4 deliverables where this has been reported.

3.2.6 Action Plan FY17

- None applicable.

3.3 Saline Aerosol Emissions

3.3.1 Environmental Outcome

No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of ODC's activities.

No significant adverse impact to populations of listed species from saline aerosol emissions was observed during FY17. Observations made during environmental inspections and supported by data collected during various flora and fauna monitoring programs, did not find any significant adverse impacts to listed species.

3.3.2 Compliance Criteria

No loss of an important population of Category 1b species.

There was no loss of an important population of Category 1b species during FY17 as a result of saline aerosol emissions. No loss of an important population of Category 1b species was observed during the annual monitoring of emission impacts to vegetation, which are used to assess impacts to flora within the potential impact area. One Category 1b species (Plains Rat) is known to occur within the vicinity of raise bores during good seasons. Standards for raise bore design ensure pollution controls are applied consistently to all new raise bores which ensures that the majority of the salt deposited is reduced to a smaller radius surrounding the raise bore. Saline emissions have not changed in FY17 and therefore it is expected that the overall impact to the species has not changed.

3.3.3 Leading Indicators

- None applicable.

3.3.4 Deliverables (AE 2.6)

Records from salt deposition monitoring jars which characterise the dispersion and deposition of saline aerosol emissions around the raise bores (AE 2.6).

Raise bores are monitored if saline emissions are evident during operation and have the potential to impact surrounding vegetation. At Olympic Dam, ten exhaust raise bores are currently monitored (Figure 3.3-1). Salt deposition monitoring results from the FY17 monitoring period are presented Figure 3.3-2. Recorded salt deposition levels were consistent with historical levels for majority of the year, with the exception of raise bore (RB) 44 which had a high deposition result in September 2016.

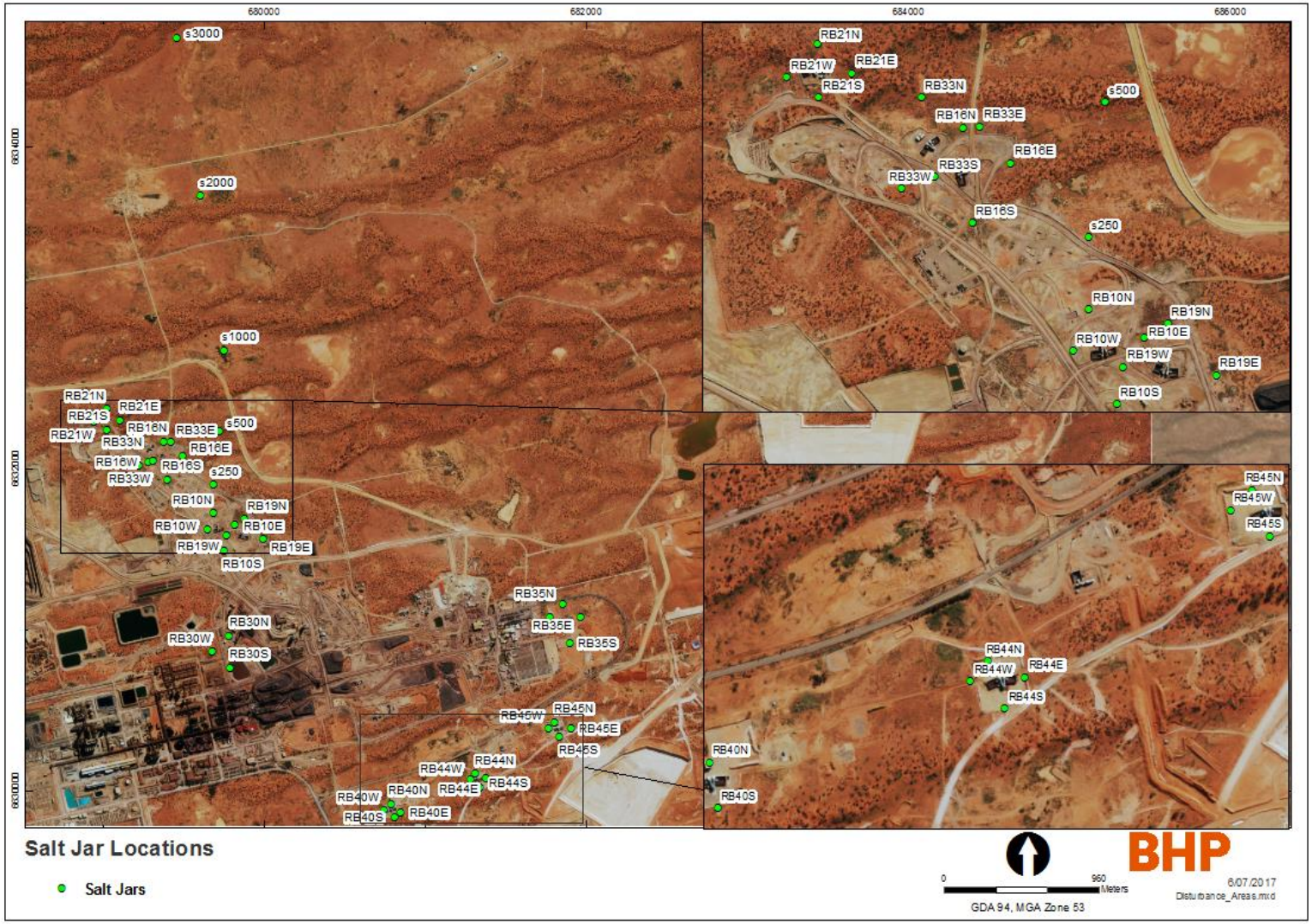


Figure 3.3-1: Salt Jar deposition monitoring locations FY17.

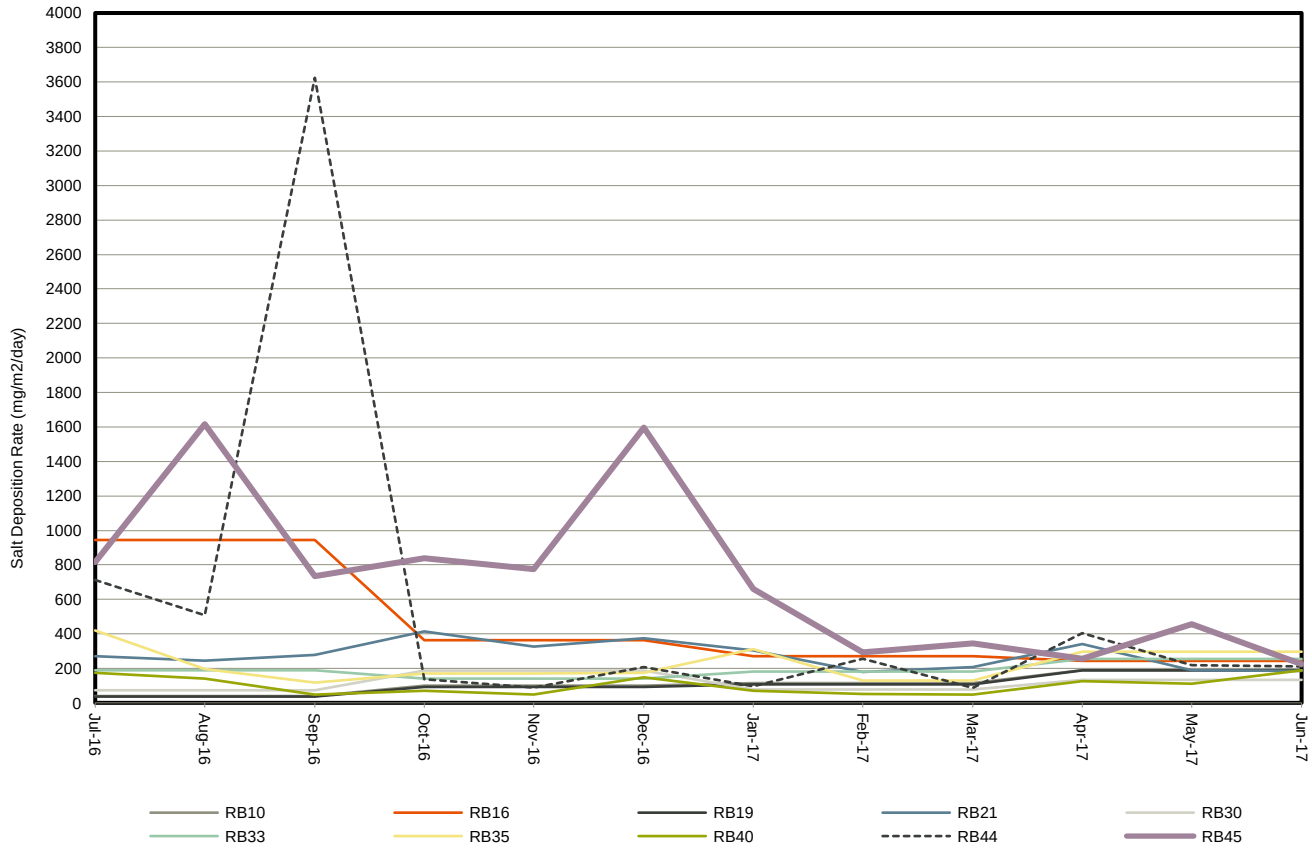


Figure 3.3-2: Salt deposition at all monitored raise bores for FY17.

A statement of impacts to Category 1b at-risk species (AE 2.6).

Impacts to flora within the impact zone of the operation are modelled through monitoring of long term changes to perennial vegetation (see Chapter 3.1 Particulate Emissions). Results of these programs and historical fauna programs have demonstrated that the impact to flora and fauna is largely restricted to the vicinity of the operation and is rainfall dependent. No Category 1b species were observed to be impacted directly by saline emissions in FY17.

3.3.5 Targets FY17

Reduce the deposition of salt from saline aerosol emissions at RB21 salt jars to < 800 mg/m^2/day.

RB 21 has salt interception devices installed and remained below the salt deposition target of 800 mg/m^2/day for all of FY17 (Figure 3.3-3).

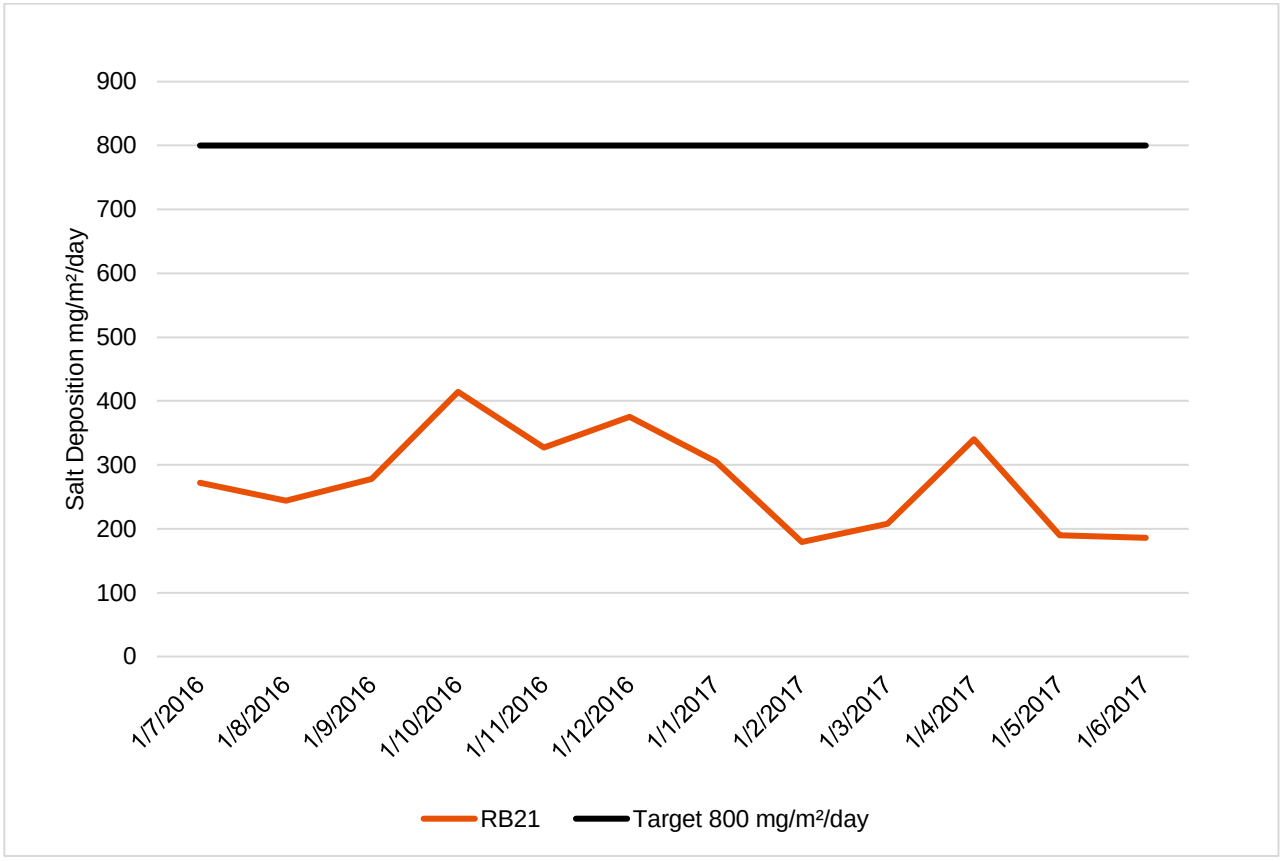


Figure 3.3-3: Saline deposition from RB21 FY17.

3.3.6 Action Plan FY17

Install and maintain controls as per the design standard around raise bores.

Standards for raise bore design ensure controls are applied consistently to all new raise bores. Raise bores are designed and constructed with 20 m splash ponds with surrounding barricades/walls. The exhaust outlet is inverted over the splash pond. This ensures that the majority of the salt deposited is reduced to a smaller radius surrounding the raise bore.

3.4 Radioactive Emissions

3.4.1 Environmental Outcome

No adverse impacts to public health as a result of radioactive emissions from ODC's activities.

ODC has consistently operated in a manner that limits radiation dose to members of the public, from operational activities to less than a small fraction of the ICRP 1 mSv/yr limit. As a result, there are no adverse radiation exposure impacts to the public from activities undertaken at Olympic Dam operation.

No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive emissions from ODC's activities.

There were no significant adverse impacts to populations of listed species or ecological communities as a result of ODC's activities. Monitoring of radiation doses to the public and the deposition of ^{238}U at non-human biota assessment sites is used as an indicator of the potential exposure of listed species to radioactive emissions. Deposition of ^{238}U at non-human biota assessment sites was at a level which poses no significant adverse impacts to non-human biota.

3.4.2 Compliance Criteria

Radiation doses to members of the public of 1 mSv/y above natural background.

The total estimated dose to critical groups of members of the public at Roxby Downs Monitoring Site (RDMS) and Olympic Village Monitoring Site (OVMS) contributed by ODC operations was 0.033 mSv/yr and 0.022 mSv/yr, respectively. These values are not statistically significant as they fall below the limit of detection for effective dose to members of the public, and are less than 2.7 % of the legislative limit of 1 mSv/yr and less than 2 % of the operation's internal working constraint of 0.3 mSv/yr.

Deposition of project originated ^{238}U less than 25 Bq/m^2/y at non-human biota assessment sites.

The average deposition of Uranium-238, calculated as an average of the four monitoring sites was determined to be 1.40 Bq/m^2/y. This is well below the 25 Bq/m^2/y compliance criteria.

3.4.3 Leading Indicators

Indications that a dose constraint of 0.3 mSv/y to members of the public above natural background will be exceeded.

Indications that a reference level of 10 µGy/h for impacts on non-human biota above natural background will be exceeded.

NOTE: The reference level for non-human biota is set as an interim criteria until such as an agreed national approach is determined.

No leading indicators were triggered. Doses to members of the public are below Olympic Dam's internal dose constraint of 0.3 mSv/yr. Similarly the reference level of 10 uGy/h for impacts on non-human biota has not been triggered.

3.4.4 Deliverables (ER 2.2)

Data leading to calculated estimates of annual radiation doses to members of the public in the critical groups identified.

The effective dose attributable to radon decay products (ED_{Rn}) and radionuclides in dust (ED_D) are calculated and summed to produce the total effective dose (i.e. the annual radiation dose to members of the public).

Monthly radon decay product (RDP) averages and the five year rolling average for RDMS and OVMS during the reporting period are shown in Figure 3.4-1.

The dose results provided in section 3.4.2 demonstrate that the dose to members of the public (as measured at RDMS and OVMS), due to RDP resulting from ODC operations is a small fraction of the applicable dose limit and indistinguishable from the limit of detection of the instrumentation used.

Analysis of historical monitoring data suggests that there is little operation-related RDP concentration at these monitoring sites and the main source of RDP exposure at both OVMS and RDMS is from natural radiation background which shows significant seasonal variations as seen in Figure 3.4-1.

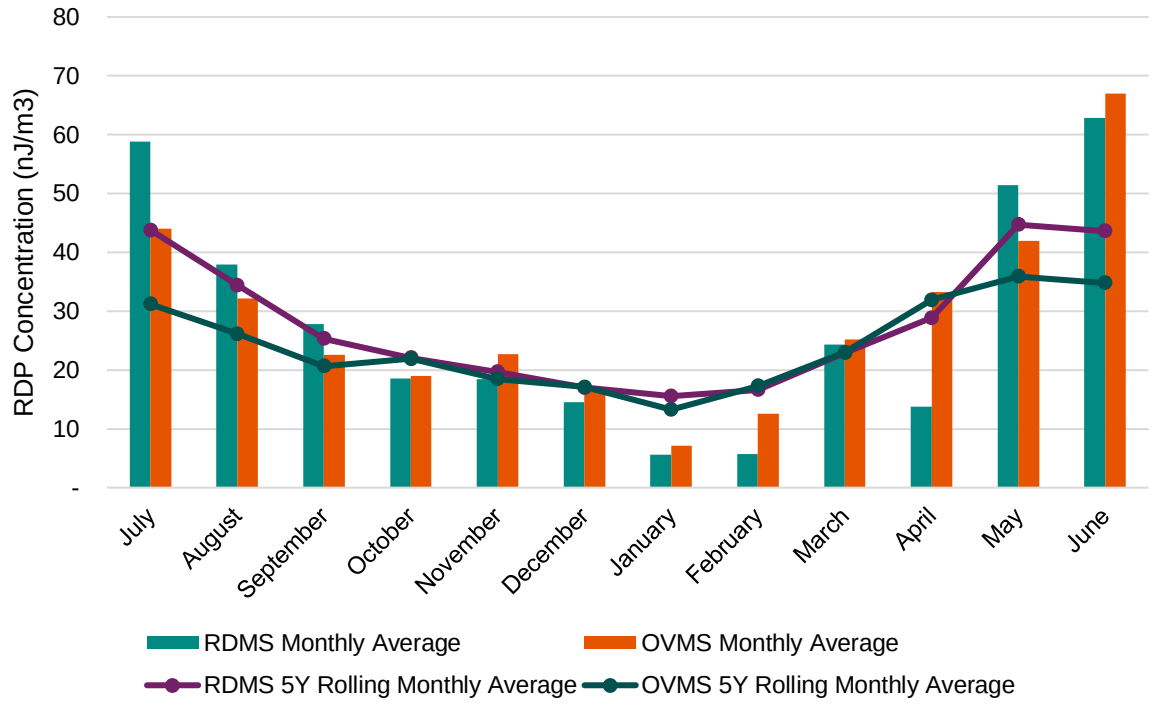


Figure 3.4-1: FY17 radon decay product monthly averages, including five-year trends.

Radionuclides in Dust Dose Assessment.

Monthly concentrations of the long-lived radionuclides (including background concentration), ^{238}U, ^{230}Th, ^{226}Ra, ^{210}Pb and ^{210}Po for the five year period FY13-17 are shown in Figure 3.4-2 to Figure 3.4-6 (includes environmental background).

The estimated FY17 radiation doses to members of the public at RDMS and OVMS due to long lived radionuclides in dust were 0.0061 mSv and 0.0028 mSv (adjusted for background) respectively. These correspond to 0.6 % and 0.28% of the public dose limit of 1 mSv respectively. These results indicate that the variation in radionuclide concentrations shown in Figure 3.4-2 to Figure 3.4-6 do not have a significant impact on the overall public radiation dose. It is to be noted that the dust sampling and the radionuclide analysis processes have inherent uncertainties which contribute to the fluctuations seen in the radionuclide trends in Figure 3.4-2 to Figure 3.4-6.

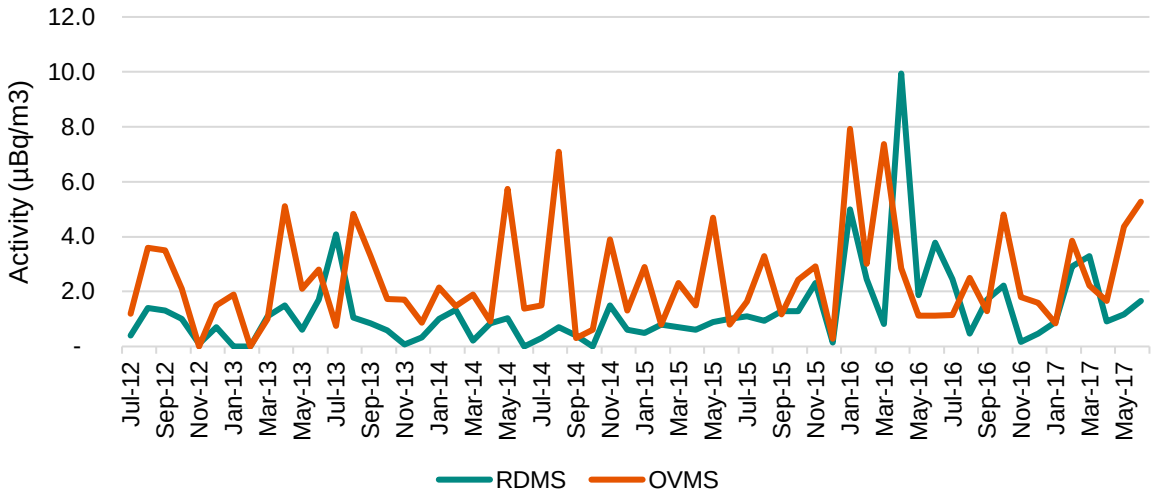


Figure 3.4-2: ^{238}U concentration for the 5 year period FY13-17 (PM10).

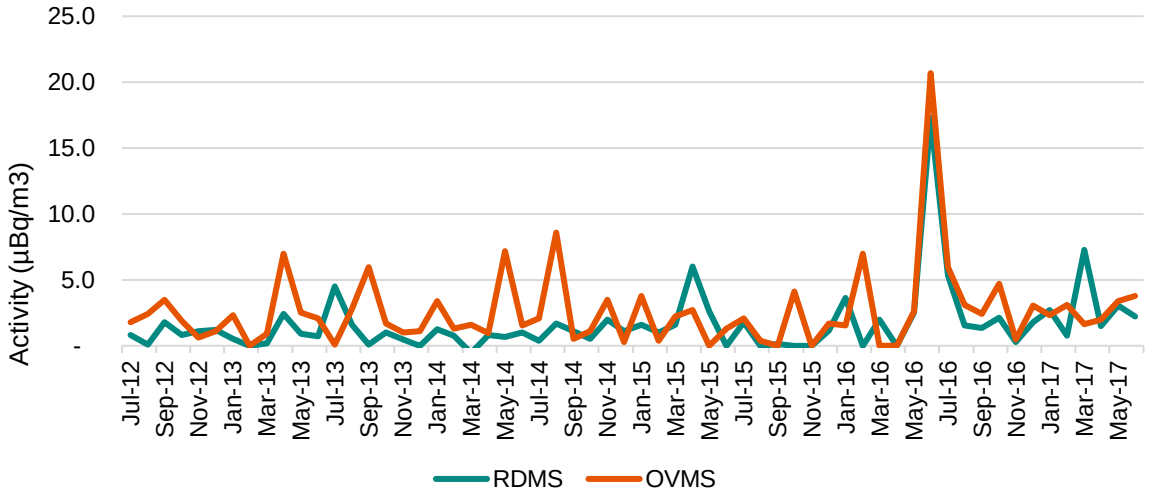


Figure 3.4-3: ^{230}Th concentration for the 5 year period FY13-17 (PM10).

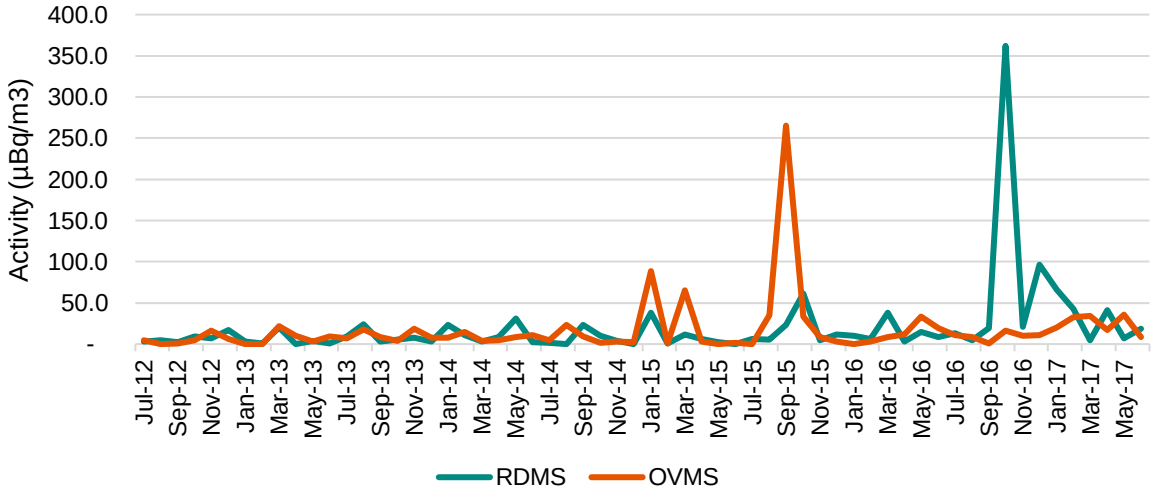


Figure 3.4-4: ^{226}Ra concentration for the 5 year period FY13-17 (PM10).

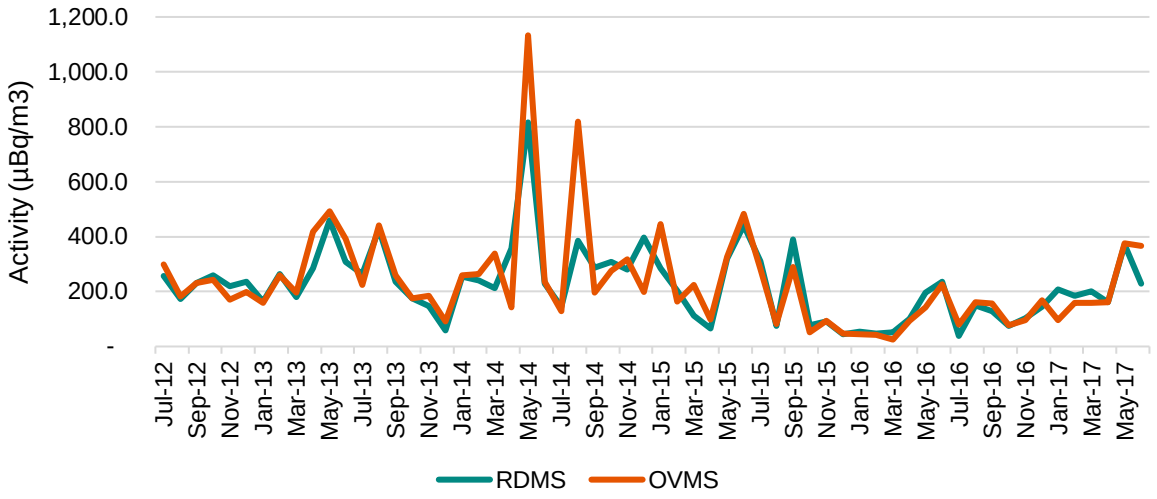


Figure 3.4-5: ^{210}Pb concentration for the 5 year period FY13-17 (PM10).

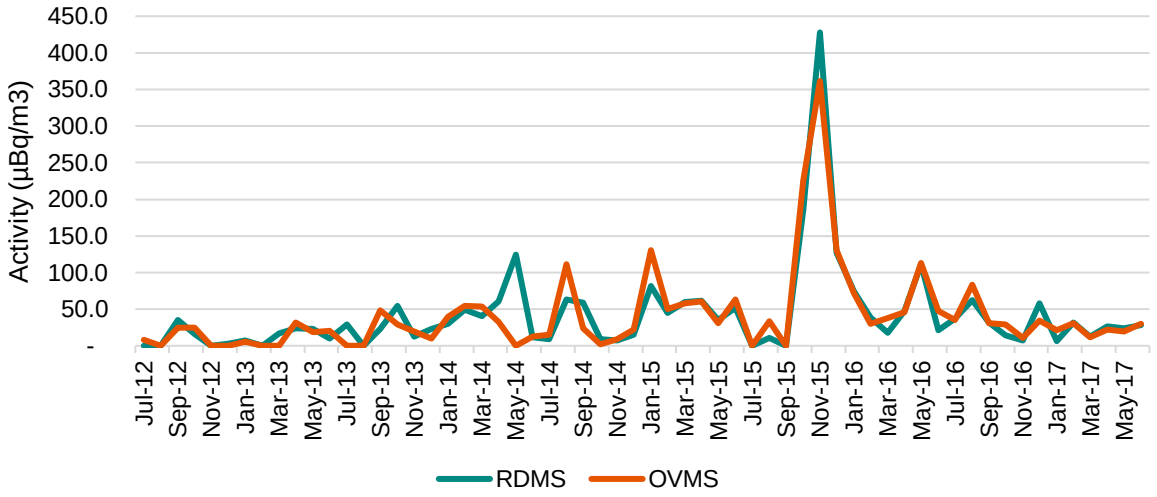


Figure 3.4-6: ^{210}P0 concentration for the 5 year period FY13-17 (PM10).

Total Dose to Members of the Public.

The total estimated dose (FY17) to members of the public at RDMS and OVMS contributed by ODC operations was 0.033 mSv/yr and 0.022 mSv, respectively, well below the 1 mSv/yr public dose limit and Olympic Dam's internal dose constraint of 0.3mSv/yr. Figure 3.4-7 shows the annual trend of public doses at RDMS and OVMS.

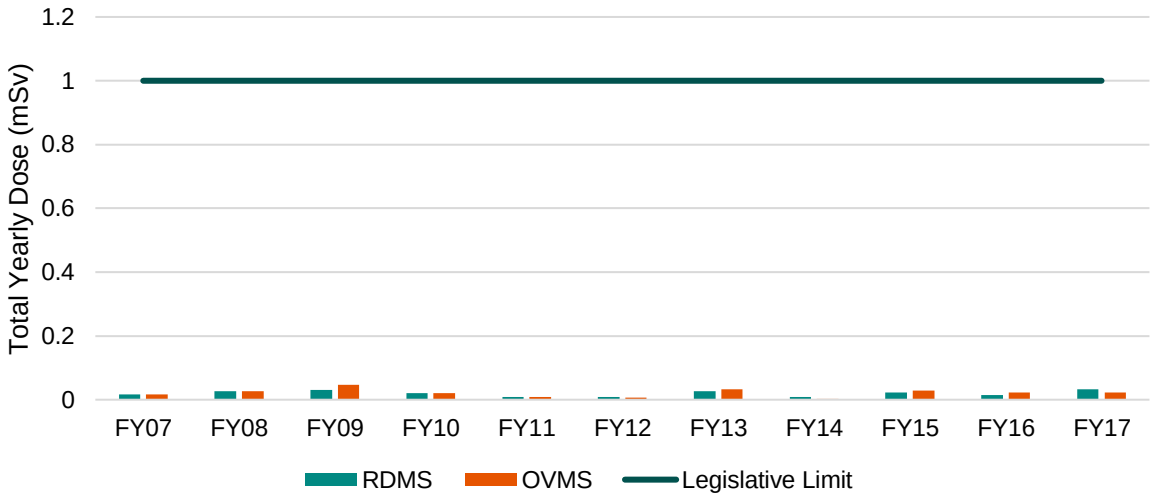


Figure 3.4-7: Yearly total effective dose trends for RDMS and OVMS.

3.4.5 Deliverables (ER 2.3.3)

Records from passive dust deposition monitoring sites and comparison with the annual compliance rate of 25 Bq/m^2/y at the NHB monitoring sites.

An assessment of the impacts to reference plants and animals (ARPANSA 2010) for the appropriate ERICA Tier level, including as necessary comparison of the results with the reference level of 10 µGy/h.

Dust deposition

Passive dust monitoring data for FY17 indicated an average project-originated (after background subtraction) ^{238}U deposition rate of 1.40 Bq/m^2/yr. Passive dust (PD) monitoring sites PD1, PD4, PD8 and PD13 were used for this assessment (Figure 3.4-8), with site PD14 used as the background site. The calculated results are below the limit of detection and well below the criterion of 25 Bq/m^2/yr as shown in Table 3.4-1.

Table 3.4-1: FY17 project originated dust and ^{238}U deposition.

	Project Originated Total Dust Deposition (g/m^2/yr)	Project Originated ^{238}U Deposition (Bq/m^2/y)	Compliance Criteria (Bq/m^2/y)
PD1	3.44	2.64	25
PD4	16.81	1.82	25
PD8	0	0.33	25
PD13	8.46	0.81	25

Dose rate reference level

The ERICA software tool was used to assess the significance of measured radionuclide dust deposition data, with a Tier 2 analysis conducted for all default terrestrial organisms. The analysis showed the estimated total dose rates and risk quotients for all organisms to be a substantially small (Table 3.4-2). The risk quotient is a unit-less measure that compares the calculated NHB dose rate with the reference level of 10 µGy/h.

Table 3.4-2: Estimated total dose rate and risk quotients as calculated for various organisms by the ERICA software.

Organism	Total Dose Rate	Reference Level	Risk Quotient
Default	µGy/h	µGy/h	Unit-less
Amphibian	4.54E-03	10	1.36E-03
Bird	4.78E-03	10	1.43E-03
Bird Egg	4.52E-03	10	1.36E-03
Detritivorous Invertebrate	1.16E-02	10	3.47E-03
Flying Insects	1.09E-02	10	3.28E-03
Gastropod	5.94E-03	10	1.78E-03
Grasses & Herbs	5.01E-03	10	1.50E-03
Lichen & Bryophytes	2.67E-02	10	8.02E-03
Mammal (Deer)	3.34E-03	10	1.00E-03
Mammal (Rat)	3.83E-03	10	1.15E-03
Reptile	4.52E-03	10	1.36E-03
Shrub	3.21E-03	10	9.64E-04
Soil Invertebrate (worm)	1.14E-02	10	3.42E-03
Tree	3.71E-04	10	1.11E-04

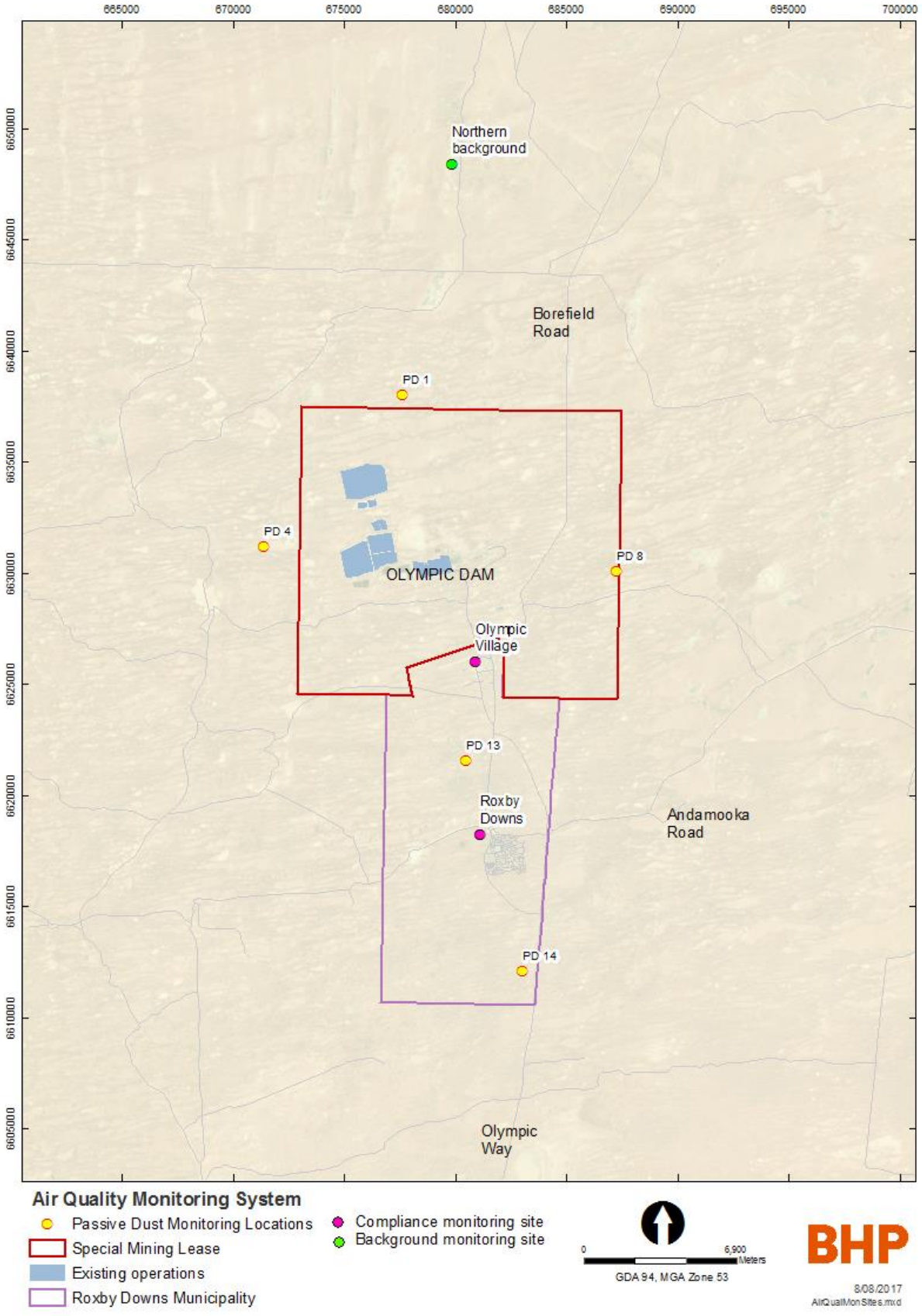


Figure 3.4-8: Location of dust deposition monitoring sites

3.4.6 Deliverables (ER 2.4)

A database of radionuclide concentrations in the environment over the long-term.

A database of radionuclide concentrations in the environment over the long-term has been maintained since 2005, refer to Figure 3.4-2 to Figure 3.4-6.

3.4.7 Targets FY17

Maintain radiation doses as low as reasonably achievable, as assessed through the annual Radiation Management Plan review.

The results of the monitoring program have shown operational contributions to radiation dose for members of public to be extremely low being less than 5% of the public dose limit of 1mSv/yr. Therefore, the current radiation protection situation for the members of public can be considered optimised.

3.4.8 Action Plan FY17

Continue exploring Low Level Radioactive Waste storage options.

A permanent contaminated waste disposal facility (CWDF) was approved and the first waste cell constructed in FY17. The facility is now operational and the temporary facilities have been decommissioned. The temporary facilities will be cleared of all contaminated waste by no later than the middle of FY18.

3.5 Greenhouse Gas Emissions

3.5.1 Environmental Outcome

Contribute to stabilising global atmospheric greenhouse gas concentrations to minimise environmental impacts associated with climate change.

ODC has a road-map to achieve a reduction in greenhouse gas (GHG) emissions to an amount equivalent to at least a 60 % reduction of 1990 emissions by 2050. Abatement of carbon emissions was achieved during FY17 through improvement projects.

3.5.2 Compliance Criteria

Quantified emission reduction opportunities and achievements, reported annually.

In FY17, 40kt of $CO_{2\text{-}e}$ was abated through improvement projects. Future projects will be investigated in line with BHP's recently released updated public performance targets for the coming five years. These include a target for BHP to maintain FY22 GHG emissions at or below FY17 levels while we continue to grow our business, with a longer term goal, in line with international commitments, for BHP to achieve net-zero operational GHG emissions in the second half of this century.

3.5.3 Leading Indicators

- None applicable.

3.5.4 Deliverables (EG 2.1)

Calculation of the site-wide GHG emission intensities, expressed as carbon equivalent intensity (kg $CO_{2\text{-}e}$/t milled).

GHG emissions were calculated using the National Greenhouse and Energy Reporting guidelines and emissions intensity was calculated and reported internally within BHP Billiton in line with monthly corporate reporting requirements. The calculated GHG emission intensity in FY17 was 76 kg $CO_{2\text{-}e}$/t ore milled, compared to 72 kg $CO_{2\text{-}e}$/t ore milled in FY16. The increased intensity reflects reduced efficiencies from the major power outage and downtime of the furnace during the year.

3.5.5 Deliverables (EG 2.2)

An annual 'road map' that quantifies emission reduction opportunities and achievements.

ODC initially developed a Carbon Emissions Management Plan (CEMP) in mid-2012, which was updated in mid-2013 to reflect the changing environment surrounding carbon emissions abatement, and to reflect the suspension of works associated with the Olympic Dam Expansion, for which the majority of GHG emissions and abatement opportunities were associated. This document incorporated the process for the setting of GHG targets and the identification, assessment and implementation of GHG reduction opportunities within the BHP Billiton business development framework.

Since that time the BHP group-wide 5 year emissions targets for the period FY13-17 have been completed, achieving the objective of maintaining FY17 GHG emissions below the adjusted FY06 baseline. The new set of targets, recently released, include a target for BHP to maintain FY22 GHG emissions at or below FY17 levels while we continue to grow our business, with a longer term goal, in line with international commitments, for BHP to achieve net-zero operational GHG emissions in the second half of this century.

Revised projections for energy use and GHG emissions over the next five years are shown in Table 3.5-1. Emissions are forecast to increase after FY18 due to increasing production and changing ore grades which are forecast to result in proportionally higher energy use and emissions from the Smelter. As over 75% of total emissions are forecast from electricity, the actual emissions will be heavily influenced by the South Australian

Electricity Emissions Factor which is used to calculate emissions. Similarly, actual emissions will be influenced by the strategy adopted for pursuit of group wide emissions targets.

Table 3.5-1: Energy Use Predictions by Type and GHG emissions for FY18, 19, 20, 21 and 22.

Energy Type	FY18	FY19	FY20	FY21	FY22
Electricity (MWh)	971,146				
Diesel (kL)	30,036				
LPG (t)	14,666				
Petrol (L)	36,000				
Coke (t)	8,252				
Anode paste (kg)	309,452				
Fuel oil (kL)	6,578				
Oil (L)	103,459				
Grease (L)	16,597				
Soda ash (t)	902				
Acetylene (m^3)	3,888				
GHG emissions Scope 1 (t $CO_{2\text{-}e}$)	169,876	173,382	169,390	164,753	182,590
GHG emissions Scope 2 (t $CO_{2\text{-}e}$)	514,708	575,712	595,037	607,959	694,306

Table 3.5-2 below outlines a summary of current emission reduction opportunities and achievements during FY17.

Table 3.5-2: Summary of Energy Efficiency Projects in FY17

Opportunity	Outcome	Status	Estimated FY17 GHG reduction kt $CO_{2\text{-}e}$/year (if implemented)
Electrowinning Current efficiency improvements	Less electricity wastage in Electrowinning Refinery to produce final copper product.	Implemented	7.6
Stabilisation of electorefinery operation and anode casting process and a change to the criteria for the rejection of anodes (feed to the electrorefinery)	Reduced Refinery scrap production and fewer rejected anodes which reduced the energy consumption (LPG) for the remelting of copper in either Smelter 1 or 2.	Implemented	1.8
Laundry dryer replacement	Replacement with a more efficient model leading to lower LPG use.	Implemented	0.1
Stabilisation of Electric Furnace operation	More stable operation (feed rate and properties) has led to a reduction of coke consumption per tonne of production	Implemented	12.4
Improve steam management and reduce steam demand	Better management of the auxiliary boiler that reduced unnecessary operation. Also a change in process conditions for leaching in the plant to run at a lower temperature, reducing the demand for steam. Both led to lower LPG use.	Implemented	7.6
Coke reduction	Reduction in coke requirements	Implemented	8.8

3.5.6 Targets FY17

Targets were set in FY12 for the period FY13 – FY17, being 3.7ktpa CO2 reduction. This target has been achieved and exceeded. Further targets will be introduced in the period FY18 – FY22.

3.5.7 Action Plan FY17

- None applicable.

4. Generation of Industrial Wastes

4.1 Embankment Stability

4.1.1 Environmental Outcome

No significant TSF embankment failure.

During FY17 the Tailings Storage Facilities (TSFs) were managed in accordance with the TRS Operations, Maintenance and Surveillance Manual (BHP Billiton Olympic Dam 2017d) and the Tailings Management Plan (BHP Billiton Olympic Dam 2017e) and no embankment failures of any magnitude occurred.

4.1.2 Compliance Criteria

No significant radioactive contamination arising from uncontrolled loss of radioactive material as a result of an embankment failure to the natural environment. ***NOTE: Any embankment failure that leads to a reportable spill under the Bachmann Criteria will be considered significant. Significant is defined as requiring assessment and remedial action in accordance with the NEPM or EPP and the Mining Code. Measurement and monitoring is carried out in response to a specific event.***

No uncontrolled loss of radioactive material to the natural environment as a result of an embankment failure occurred during FY17. To manage the risk of embankment failure, the rate of rise was maintained below 2 m per annum and the supernatant pond area was maintained below the 71 ha target set for this purpose, with the exception of a brief excursion above this limit in December 2016 as a result of rainfall and operational constraints.

4.1.3 Leading Indicators

Rate of rise of tailings at an average of 2 m per annum or less.

The rate of rise of tailings has been limited to 2 m per annum or less for all cells to ensure consolidation of tailings material. During the reporting period, tailings were distributed to TSF Cells 4 and 5 with an average rate of rise of the perimeter tailings beach of 1.15 m per annum with TSF4 and TSF5 at 1.06 m and 1.24 m per annum respectively.

The rate of rise of pore pressures within or adjacent to the TSF embankment is less than or equal to the rate of rise of tailings.

Assessing pore pressure against rate of rise provides an indication if excess pore pressures are developing in the embankment. The pore pressures within the TSF embankments have been level over the period, despite the embankments raising over 1 m.

The maximum supernatant pond area of individual TSF cells does not exceed 15ha for TSF1, 23ha for TSF2/3, 90ha for TSF4 and 135ha for TSF5.

Note: Each TSF has been assigned a maximum supernatant pond size which is calculated using critical operating parameters, surface contours and an allowance for significant rainfall events. Operating beyond these ponds sizes may not result in embankment failure but are considered an appropriate leading indicator in which operational processes should be reviewed.

The supernatant ponds are visually checked against marker poles daily, estimated monthly and confirmed by satellite quarterly. Over the period the recorded pond sizes have been below the leading indicator sizes.

4.1.4 Deliverables (WA 2.1)

The tailings stored at the TSF have a concentration over the 10 Bq/g exemption limit and also a total activity over the 10,000 Bq exemption limit for Radium, which defines it as a radioactive material under ARPANSA guidelines.

Monitoring of the TSF, including rate of rise of tailings, supernatant pond area, and pore pressure all contribute to management of the TSF to ensure no uncontrolled loss of radioactive material to the natural environment or significant embankment failure.

Monitoring data showing the size and location of the supernatant liquor ponds in each TSF cell on a monthly basis (EPA 31543.500-433).

Large supernatant liquor ponds have the potential to impact upon embankment stability by increasing the phreatic surface within the tailings and embankments, which in turn can lower the strength of the tailings and embankment materials. The TSF pond areas during FY17 are shown in Figure 4.1-1. Leading into December 2016 the pond size went slightly above the normal operating limit into the trouble shooting zone (an internal constraint that prompts additional actions). This was due to operational aspects related to EP5 and heavy rains at the end of December. After reducing the pond size through January and March, the pond areas remained reasonably steady for the remainder of the reporting period.

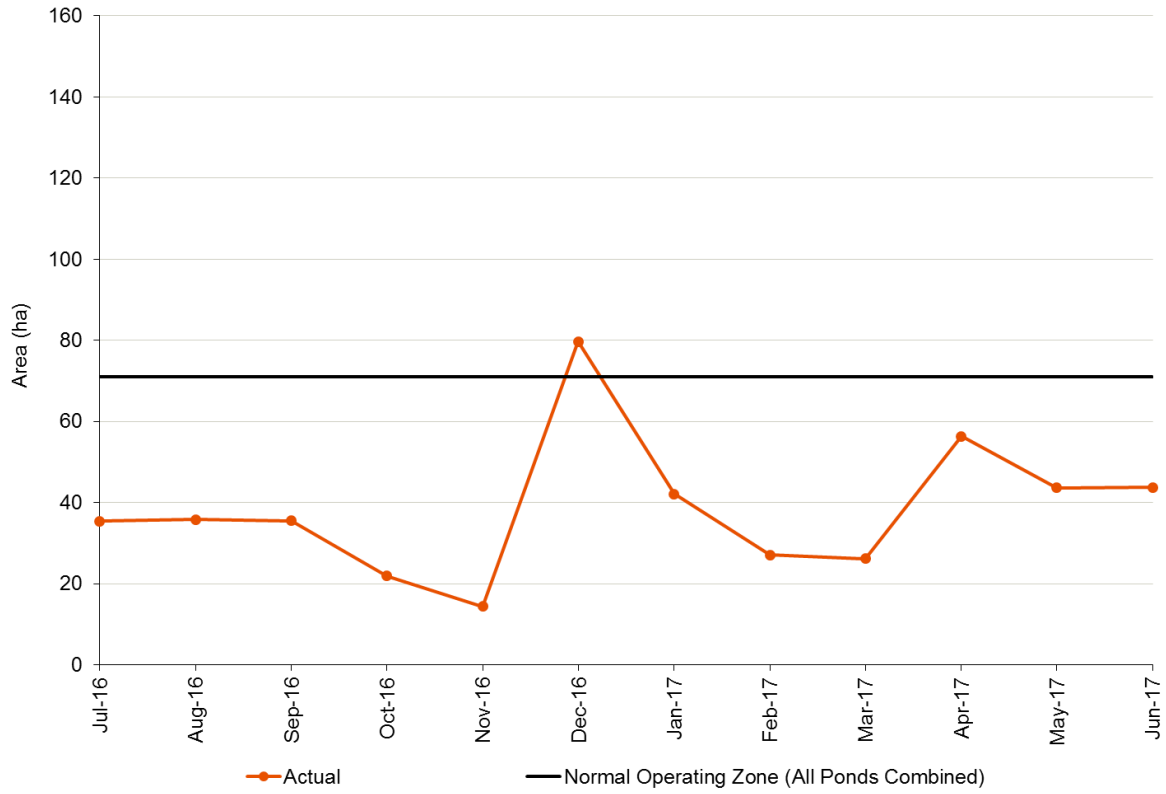


Figure 4.1-1: TSF Pond areas (ha) for FY17.

Monitoring data showing the rate of rise of tailings in each TSF cell.

At current processing rates, approximately 8-9 Mtpa of tailings, containing low levels of radioactivity are disposed of in the TSFs annually.

The rate of rise of tailings has been limited to 2 m per annum or less for all cells to ensure consolidation of tailings material. During the reporting period, tailings were distributed to TSF Cells 4 and 5 with an average rate of rise of the perimeter tailings beach of 1.15 m per annum with TSF4 and TSF5 at 1.06 m and 1.24 m per annum

respectively. The reduction in rate of rise, when compared to the FY16 rate of 1.35 m per annum, is due to lower production throughput resulting from several outages over the year.

Tailings delivery to TSF Cell 4 prior to 2003 was biased towards the internal east wall as the availability of this wall for tailings deposition was largely unaffected by wall-raising activities, resulting in a higher beach level when compared to the external wall. A plan was initiated in 2003 to address this issue and bias the tailings delivery to TSF Cell 4 external walls. For FY17, the rate of rise along Cell 4 east wall decreased to 1.27 m from 1.35 m.

No significant impacts have resulted from the difference in height between the internal east wall and external walls of TSF Cell 4. This issue will continue to be addressed by the program of reduced deposition to the east wall, gradually bringing it in line with other walls.

The elevation of tailings in the cells illustrated in Figure 4.1-2 gives an indication of the rate of rise of the perimeter tailings beaches.

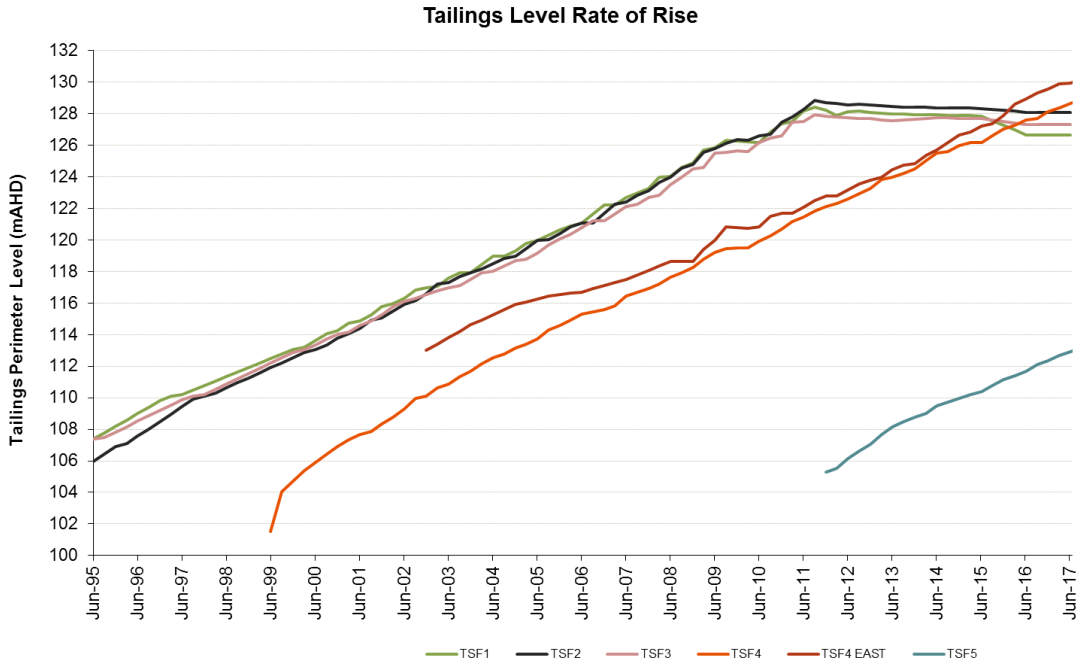


Figure 4.1-2: TSF rate of tailings rise.

Monitoring data showing the pore pressures within tailings adjacent to the external walls of the TSF.

Piezometers are monitored to assess the pore pressures within the tailings adjacent to the embankments of the TSFs (Figure 4.1-3). Monitoring of piezometers is carried out on a minimum two monthly basis with selected instruments more frequently as required. Piezometers used include standpipe and vibrating wire piezometers.

ANCOLD provides minimum Factors of Safety (FoS) for different loading conditions. Results of the stability analysis undertaken in FY17 (Golder Associates, 2016) indicated that the estimated FoS for current and final geometries of Cell 1-3 and Cell 5 meet or exceed the minimum levels recommended by ANCOLD (Table 4.1-1).

The FoS for Cell 4, however, ranges from 1.22 to 1.54 for static undrained condition i.e. generally not conforming to the minimum ANCOLD target of 1.5. This is only for static, and the minimum criterion for post seismic FoS for TSF4 is satisfied. Buttresses have been designed and are currently being constructed to increase the FoS and enable Cell 4 to be raised safely to the design level of RL 131 m. The buttresses work is anticipated to be completed in the second quarter of FY18.

Table 4.1-1: Stability Analysis Results (Golder Associates 2016)

Wall Section	Static Loading FoS (min – 1.5)	Post-Seismic FoS (min – 1.0)
Cell 1/2/3 East Wall	RL 130.5 m: 1.61	1.61
Cell 4 North Wall	RL 128.0 m: **1.47**	N/A
	RL 131.0 m: ***1.32***	1.20
Cell 4 West Wall	RL 128 m: ***1.36***	N/A
	RL 131.0 m: ***1.22***	1.11
Cell 4 South Wall	RL 129 m: 1.54	N/A
	RL 131.0 m: ***1.44***	1.30
Cell 5 North West Wall	RL 113.5 m: 2.52	N/A
	RL 131.0m: 1.55	1.43
Cell 5 South East Wall	RL 113.0 m: 2.43	N/A
	RL 131.0m: 1.57	1.45

* N/A = not assessed at intermediate height, assessed at final height only (worst case).

Piezometers located in the East Wall of Cells 1 - 3 generally show a gradual pressure drop consistent with no further addition of tailings. Piezometers installed in the tailings and upper embankment of Cell 4 show levels have been relatively constant over the period, with minor fluctuations. A very gradual increase can be discerned, which is as expected as tailings continue to be added in this cell. Piezometer data for the critical sections is presented in Figure 4.1-4 to Figure 4.1-6.

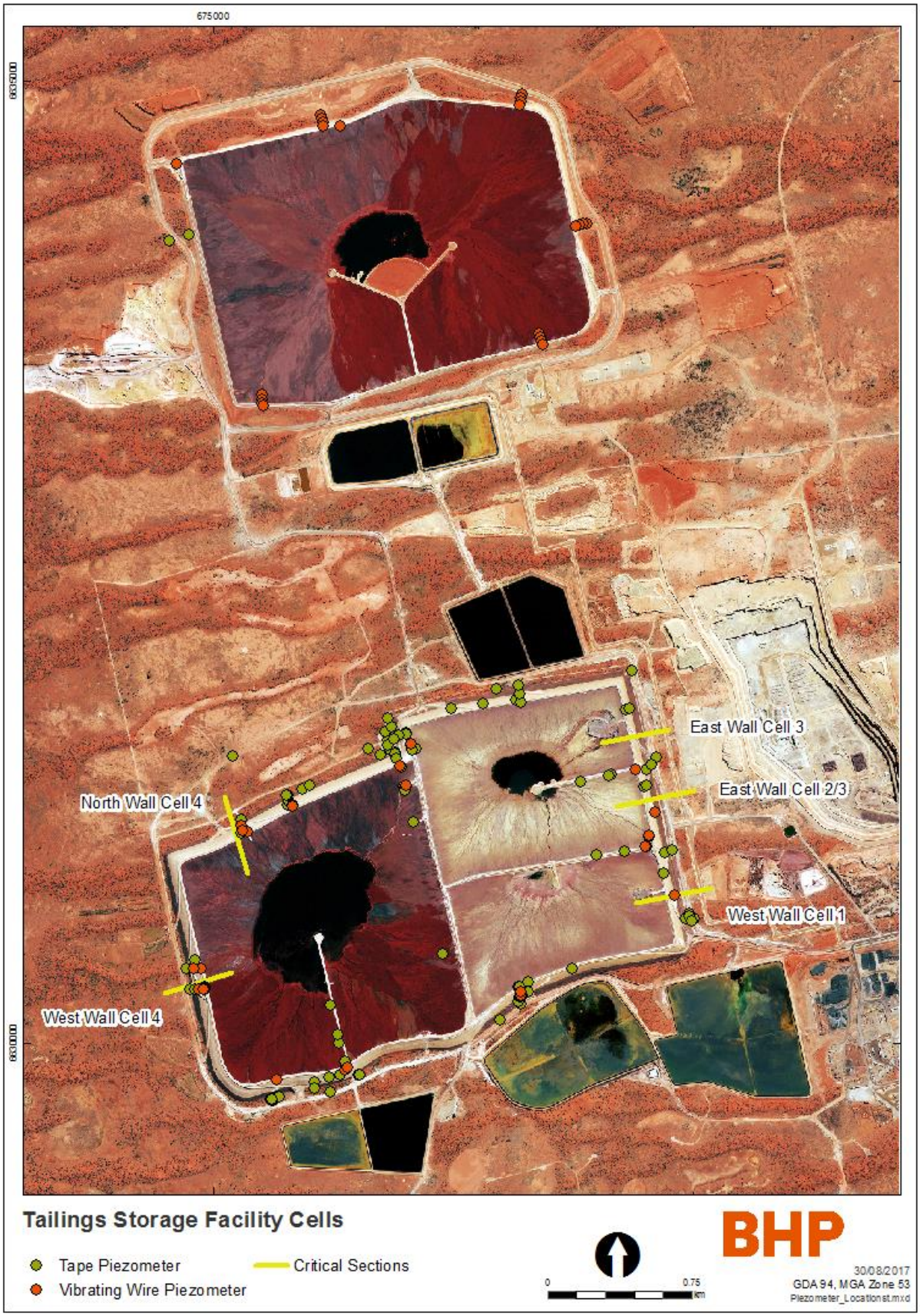


Figure 4.1-3: Piezometer locations at the critical sections of TSF cells.

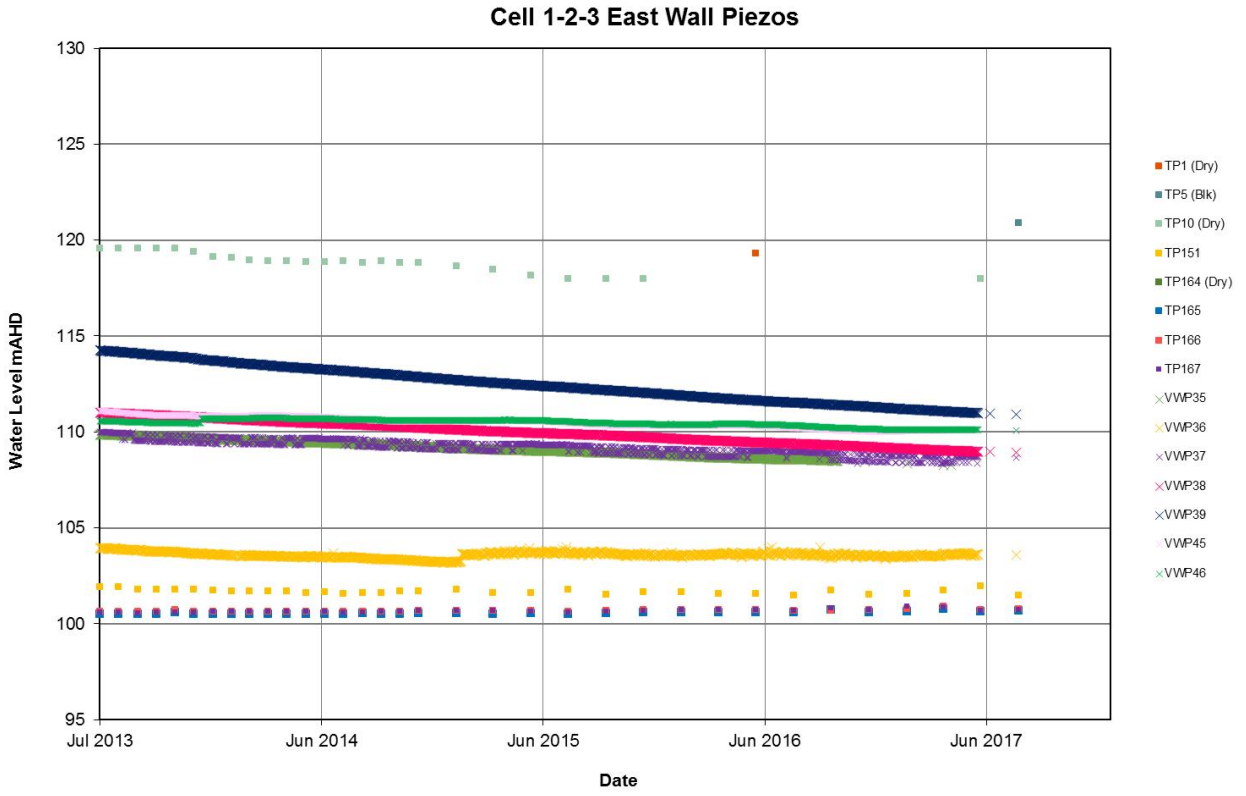


Figure 4.1-4: TSF Cell 1/2/3 East Hydrograph.

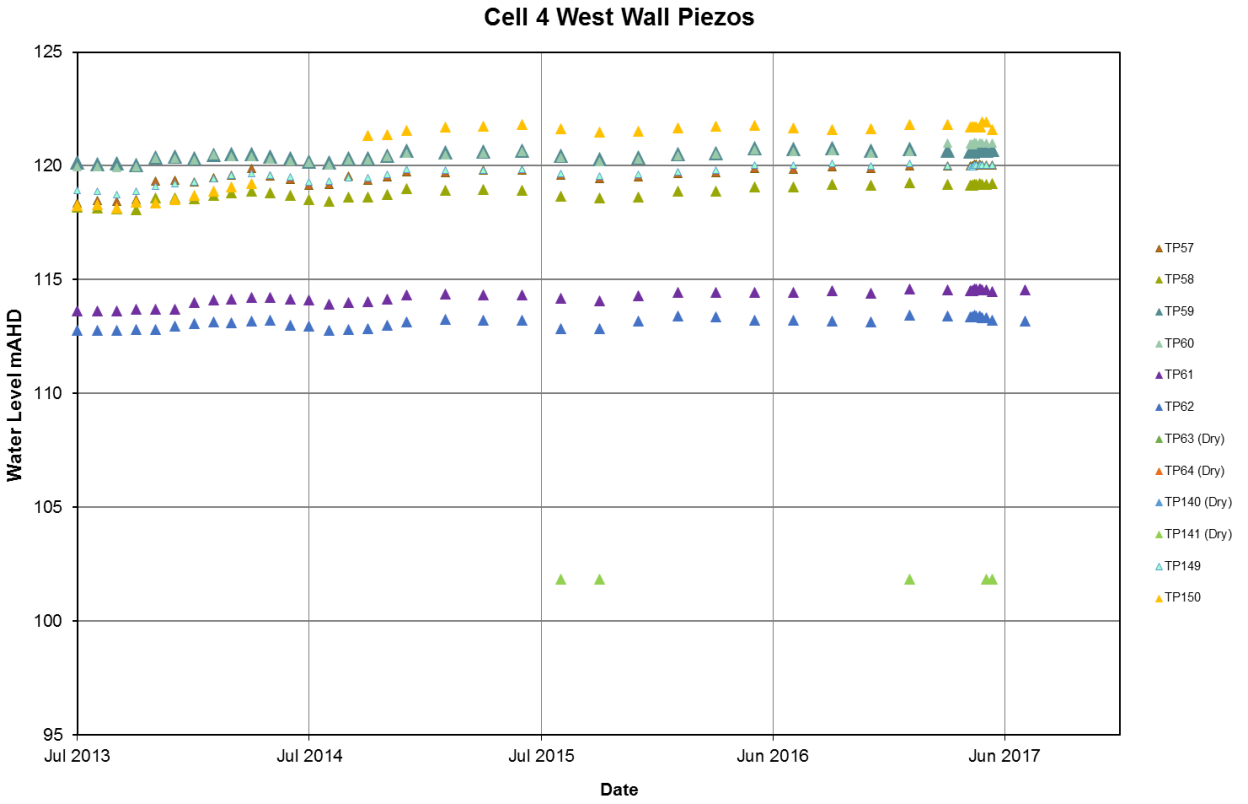


Figure 4.1-5: TSF Cell 4 West Hydrograph.

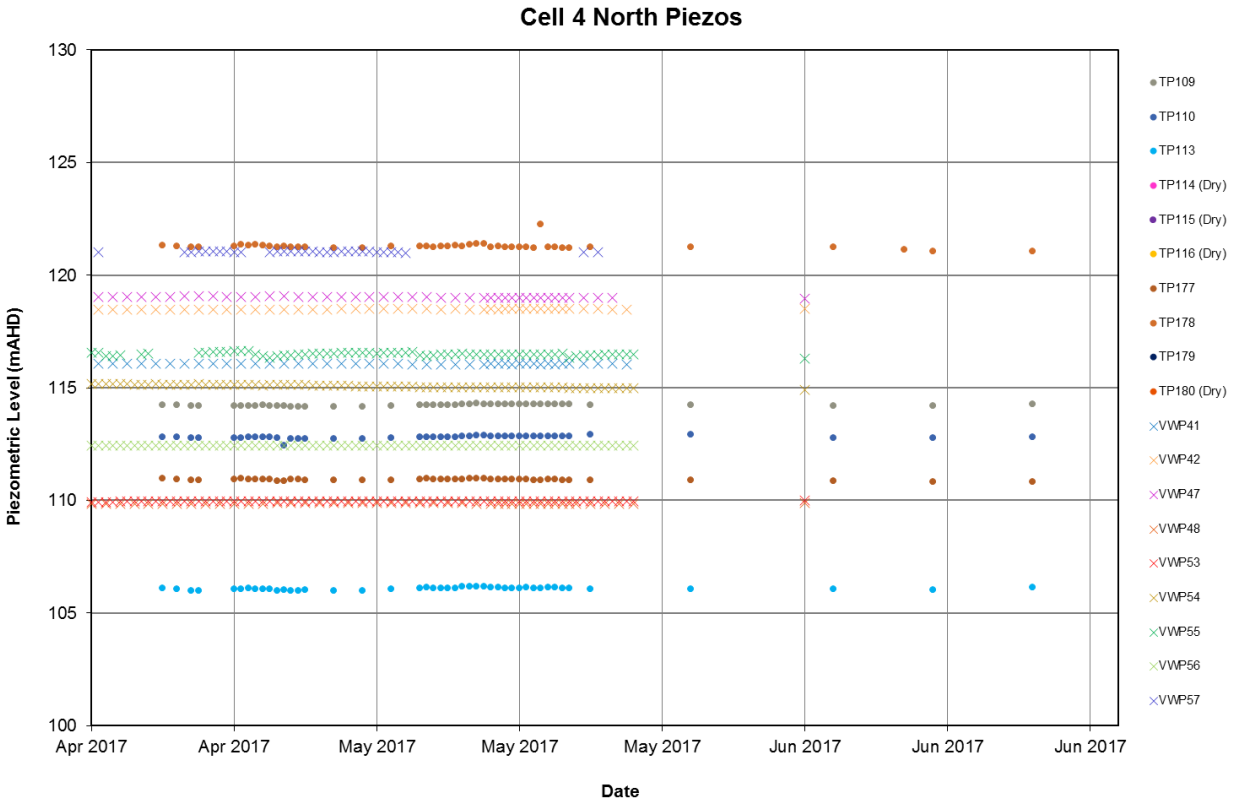


Figure 4.1-6: TSF Cell 4 North Hydrograph.

During FY17 two 6-monthly operational reviews of the TRS were completed by GHD and one annual comprehensive review covering the period July 2015 - June 2016 was completed by Golder Associates.

The reviews were carried out in accordance with the BHP Billiton TSF Management Guideline and ANCOLD Guidelines. Both reviews confirmed that the Tailings Retention System, including the Tailings Storage Facilities and Evaporation Ponds, are in good condition and are well managed.

A review of the water balance on an annual basis (EPA 31543.500-435).

See Chapter 4.2 - Tailings Seepage.

4.1.5 Targets FY17

- None applicable.

4.1.6 Action Plan FY17

Develop an action plan for appropriate recommendations arising from audits undertaken in FY16.

A procedure has been developed for reviewing external reviews, assessing them for implementation, and then capturing them within relevant risk and work management systems (GRC and 1SAP). This procedure is triggered within the work management system, and a record of the assessment, including the considerations behind each outcome, captured.

Undertake CPTu testing of tailings to confirm strength parameters used in stability analysis.

CPTu testing of the TSFs was undertaken in August 2016. The results were interpreted by Golder Associates before being used to refine the tailings strength parameters within a stability assessment model. The outcomes of this model informed the construction of the buttress for TSF4, while no issues were identified for TSF1-3 and TSF5.

4.2 Tailings Seepage

4.2.1 Environmental Outcome

No significant adverse impact on vegetation as a result of seepage from the TSF.

No significant adverse impact to vegetation as a result of seepage from the TSF has occurred. Eighty metres AHD (20 m below ground level) is considered as the level below which groundwater cannot interact with the root zone of plants in the Olympic Dam region. Groundwater levels in the vicinity of the TSF remain below 80 mAHD.

No compromise of current and future land uses on the Special Mining Lease (SML) or adjoining areas as a result of seepage from the TSF .

No compromise of current and future land uses on the SML or adjoining areas has occurred. Groundwater levels in the vicinity of the TSF remain below 80 mAHD and sampling indicates that seepage is being attenuated.

No compromise of the environmental values of groundwater outside the SML as a result of seepage from the TSF.

No compromise of the environmental values of groundwater outside the SML has occurred. Sampling indicates that seepage is being attenuated within the SML, and groundwater levels of bores along the SML are consistent with other regional bores. Seepage modelling has been updated to demonstrate that there are no expected future offsite impacts.

4.2.2 Compliance Criteria

Maintain groundwater level outside the external perimeter road of TSF Cells 1 to 5 to not higher than 80 mAHD (20 m below ground level).

Groundwater monitoring results indicate that the groundwater level has not reached a level higher than 80 mAHD beneath TSF Cells (refer Figure 1.2-7 in Chapter 1.3 - Aquifer Level Drawdown). The maximum groundwater level recorded below the TSF for the current reporting period was 62.62 mAHD at LT67.

All TSF seepage attenuated within the SML, as demonstrated by a numerical geochemical model confirmed by monitoring.

Geochemical modelling was carried out for the Expansion EIS (BHP Billiton Olympic Dam 2009) and demonstrated that all TSF seepage would be attenuated within the SML. This modelling was updated in 2015 (SRK 2015) to account for the current mine configuration (underground only) following the suspension of the Olympic Dam Expansion. Within the timeframe assessed (10,000 years), the modelling results indicate that no impacts on baseline groundwater quality at the mine lease boundary (SML) would be expected as travel times are predicted to be well beyond this timeframe and there is expected to be significant attenuation of pollutants within the SML.

Laboratory analysis of on-site and regional groundwater monitoring bores confirms the attenuation of TSF seepage within the SML. Samples from regional monitoring bores contained analytical concentrations either below limits of reporting, or within concentrations previously reported (see Chapter 1.2 - Aquifer Level Drawdown).

Groundwater levels of bores on the SML boundary, are consistent with other regional bores. This seepage attenuation is demonstrated in Figure 1.2-7 in Chapter 1.2 - Aquifer Level Drawdown, which shows water levels (AHD) from the perimeter of the TRS decreasing with distance from the TRS towards the SML boundary, to the same level as other regional bores.

4.2.3 Leading Indicators

A measurement of groundwater level outside the external perimeter road of the TSF that exceeds 70 mAHD (30 m below ground level) as a result of seepage.

A numerical geochemical model trend that indicates that all TSF seepage may not be attenuated within the SML should the trend continue.

No leading indicator criteria were triggered. Groundwater trends around the perimeter of the TSF remain well below 70 mAHD.

Updated TSF seepage modelling (SRK 2015) to account for the current mine configuration (underground only) demonstrates that within the timeframe assessed (10,000 years) no impacts on baseline groundwater quality at the mine lease boundary (SML) would be expected as travel times are predicted to be well beyond this timeframe and there is expected to be significant attenuation of pollutants within the SML.

4.2.4 Deliverables (WA 2.1)

A review of the water balance on an annual basis (EPA 31543.500-435).

The water balance for TSF Cells 4 and 5 indicates that the calculated evaporation factor to dispose of unaccounted liquor is 35 % of the Class A pan evaporation rate. It is noted that the unaccounted liquor also included seepage from beach areas.

Unaccounted liquor includes input liquor shown in Figure 4.2-1 (tailings liquor, rainfall, flushing liquor, and the decrease in supernatant pond inventory) minus liquor retained in tailings (moisture content assumed of 30 % by weight), liquor decanted to evaporation ponds, and estimated seepage from (supernatant liquor) ponds. Flushing liquor is liquor pumped out of the evaporation ponds to the TSF for the purpose of flushing lines and to enhance evaporation.

The total output liquor volume is equal to input liquor volume and is shown in Figure 4.2-1**.** Seepage from pond areas has been calculated based on the average supernatant pond areas for TSF Cells 1 – 5 (38.5 ha) and assumed tailings permeability ($2x10^{-8}$ m/s). Liquor retained in tailings was assumed to be 30 % of the weight of tailings solids deposited. This was based on previous testing of in-situ tailings.

The water balance shows 12 % of liquor input due to rainfall in FY16 compared to 7 % in the previous reporting period. This difference is due to a slightly reduced rainfall for FY17 (235.85 mm compared to the 146.5 mm in FY16) during the period. The median rainfall for the last 15 years is 147 mm.

A discussion on groundwater levels in the vicinity of the TSF in FY17 is provided in section 1.2 - Aquifer Level Drawdown.

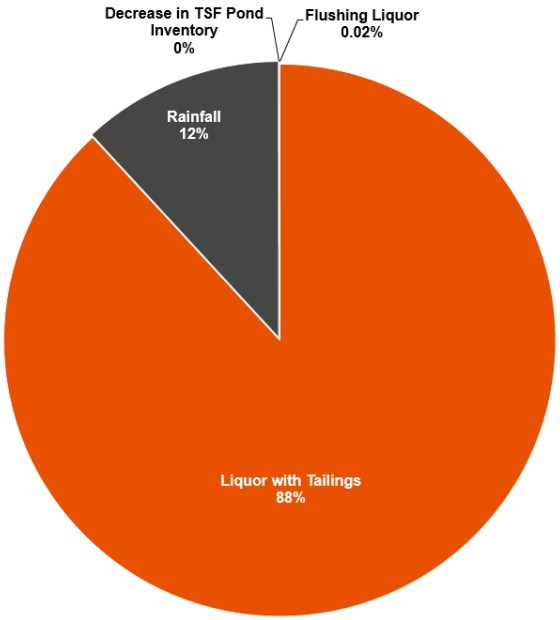


Figure 4.2-1: TSF Cells 4 & 5 Liquor Balance – Inputs, FY17.

Note: Liquor Inputs [Total 8761 ML]

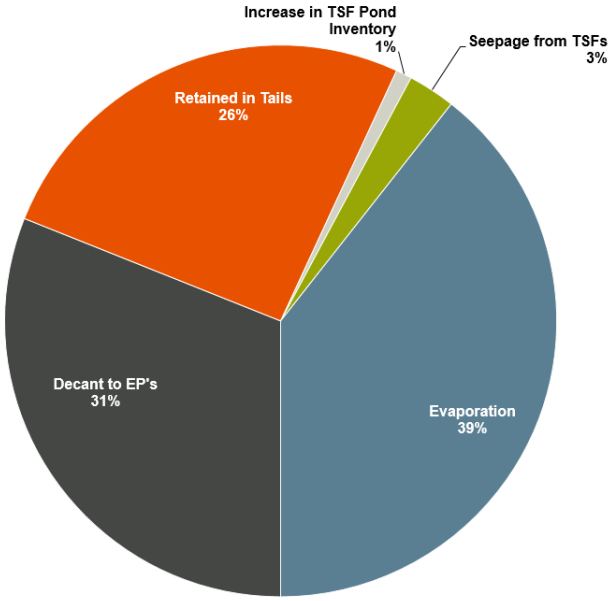


Figure 4.2-2: TSF Cells 4 & 5 Liquor Balance – Outputs, FY17.

Note: Liquor Outputs [Total 8761 ML]

4.2.5 Deliverables (WA 2.2)

Monitoring data showing the liquor level in each cell of the EPs.

Figure 4.2-3 shows the liquor levels in the evaporation ponds with respect to freeboard limits. Freeboard in the Evaporation Ponds (EPs) consists of allowances for wind, waves and rainfall runoff.

With EP5B out of service since December 2016, pond levels were high due to rainfall and dewatering of EP5B to other ponds, reducing over the summer and autumn of 2017.

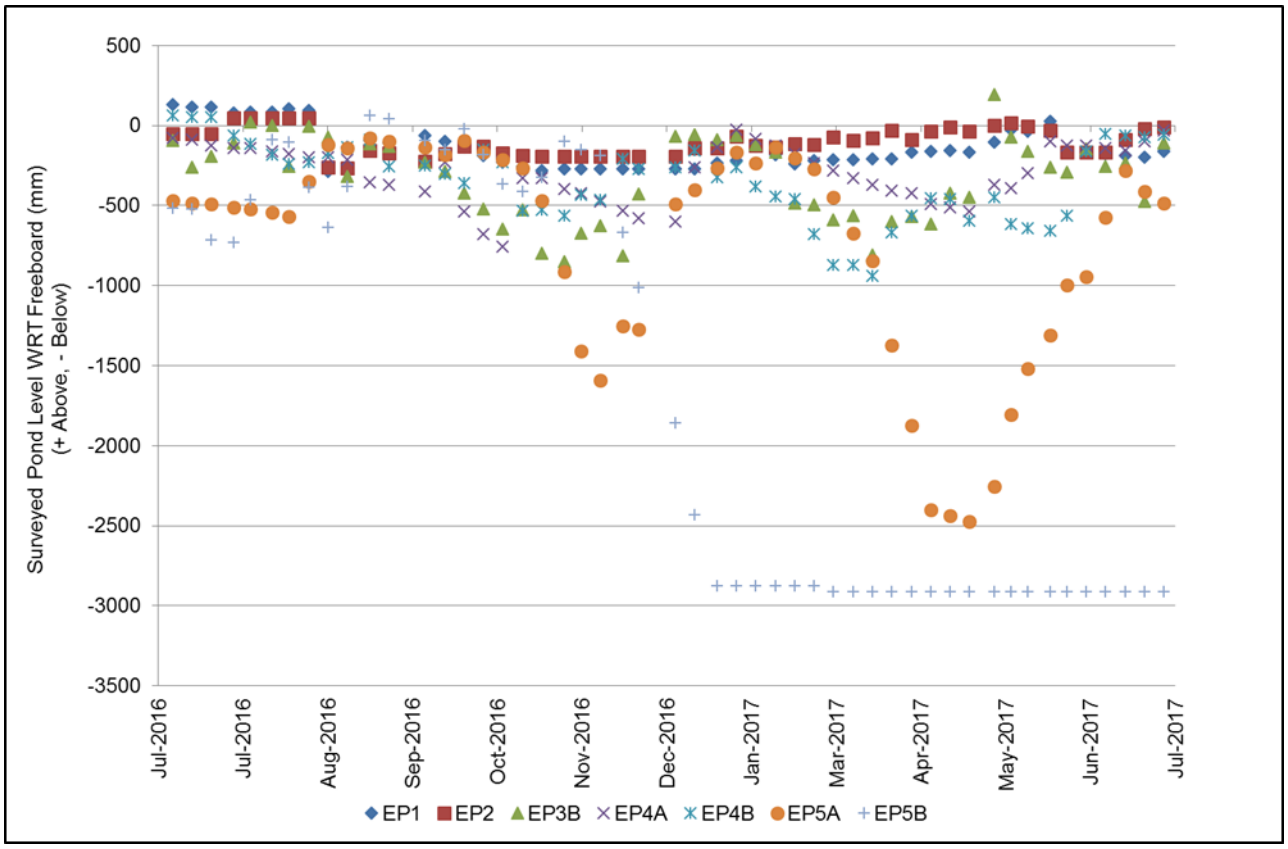


Figure 4.2-3: Evaporation Pond Liquor Levels.

Monitoring data showing the overall (solids and liquor) inventory in the EPs.

Figure 4.2-4 shows the evaporation pond capacity in relation to the normal maximum operational storage capacity. Additional pond capacity is available as a contingency to allow for extreme rainfall events and waves.

Reported liquor inventory in the evaporation ponds as a proportion of storage capacity was higher than normal throughout the reporting period. This was due to a variety of factors including reduced capacity resulting from EP5B being out of service since December 2016, and two large rainfall events. Agreement was received from the Department of State Development to change the freeboard level on EP1 and EP2 due to the high sediment levels. The levels have been increased once since then, May 2017, in response to the increasing sediment levels.

EP5B has returned to service for the winter, providing additional capacity during the months of low evaporation.

Monitoring data showing the minimum pond depth for operational EPs.

Table 4.3-1 in Chapter 4.3 - Fauna Interaction with Tailings Retention System shows ponds meeting the target minimum 250 mm liquor depth during FY17 on all operational EPs except as a result of rainfall or draining of a pond to measure sediment levels.

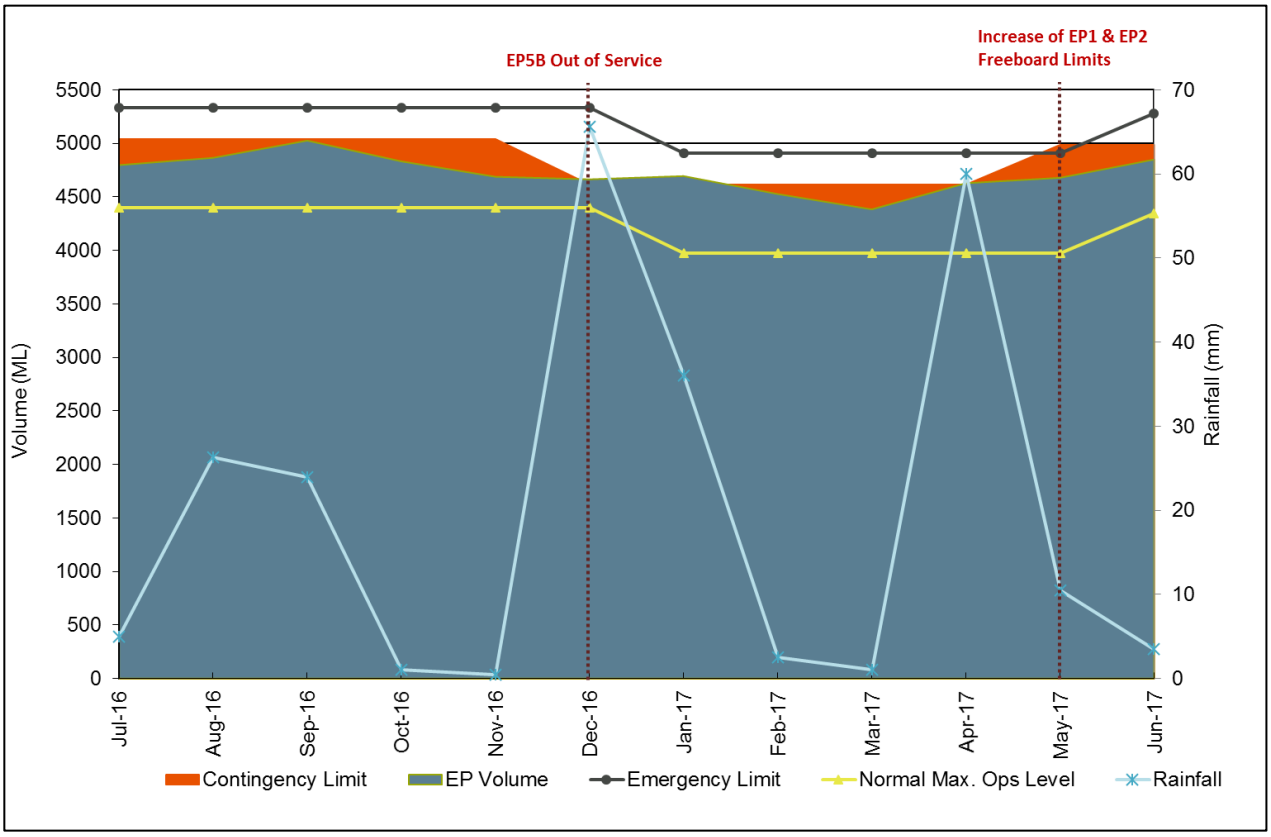


Figure 4.2-4: Evaporation pond capacity.

Results of a liquor balance for each EP cell.

Figure 4.2-5 shows the cumulative evaporation trends for all Evaporation Ponds. The upper and lower bounds have been calculated using the average evaporation rate from all operational cells and applying an estimated error or variation (plus or minus) to the average value.

A liquor balance is performed to highlight cells with potential significant leaks by comparison of the apparent evaporation from each cell of each EP. The comparison is carried out on a monthly basis. The evaporation response for each cell is consistent, demonstrating that significant unexplained losses have not occurred. Groundwater levels beneath the ponds remain within expectations. The result for EP4B is higher than the other cells, although we believe this is related to higher use this year in comparison to previous years, with compounding of errors in measurement. This result will be investigated over the coming year to identify if there are factors that lead to increased evaporation from this pond, or if the apparent increased evaporation is due to other causes.

Evaporation cells occasionally dry out when the free liquor is evaporated, exposing the surface of the precipitated solids built up in the cell. During these periods a liquor level is not able to be measured and the cumulative evaporation trends level out. Under these circumstances the water balance method is no longer effective in confirming cell integrity. However, as the cell is inactive there is minimal, if any, free liquor available and therefore very little potential for significant seepage from these cells.

EP1 and EP2 were only used sporadically during the reporting period. EP3A was out of service for the entirety of the reporting period due to a high level of precipitated solids. EP5B was placed out of service in December 2016, and will be put back in service in July 2017, for use only if required, and only until the summer months.

Groundwater level data collected in and around the ponds is used as an additional control to detect seepage from the Evaporation Ponds (discussed in more detail in Chapter 1.2 - Aquifer Level Drawdown) and to support the liquor balance calculations.

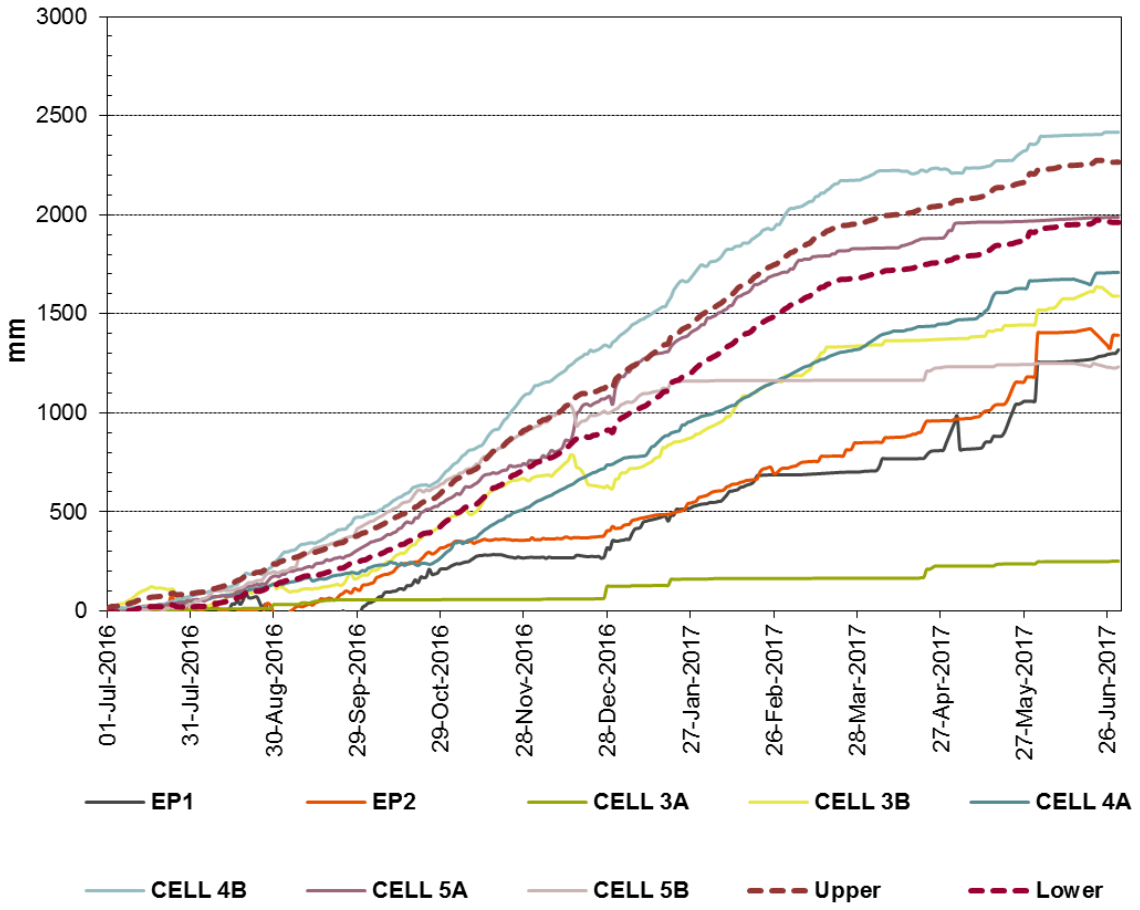


Figure 4.2-5: All EP Liquor Balance – cumulative apparent evaporation.

4.2.6 Targets FY17

- None applicable.

4.2.7 Action Plan FY17

Identify and install additional liquor interception systems as required.

The seepage management system along the eastern wall of TSF2 (Locations 17 & 19) was completed with geotextile, filter media, an interception drain and pumping system. Currently this transfers liquor to the location 13 system, with a more permanent pumping system being investigated in FY18.

Two new seepage locations were identified during FY17, one on the North Wall of Cell 3 adjacent to the embankment toe opposite EP4A and one on the East Wall of Cell 3 north of Cell 2/3 ramp.

A summary of new and previously identified locations of interest is shown in Table 4.2-1 with locations shown in Figure 4.2-6.

Table 4.2-1: List of perimeter features.

Location Number	Location	Discovery Date	Summary of Status (FY17)
1	East wall of TSF Cell 1 at the toe	2008	Interception drain, sump and pump to return seepage to the TSF installed. Mostly dry, damp after rain, seepage appears to be slowly extending north. There has been a further decrease in the average daily flow from 7.7 to 6.9m^3/day over the reporting period.
2	East wall of TSF Cell 1 at the toe and pipe corridor	2008	Liquor intercepted in trench, no change in dampness from previous reporting period. There has been a further decrease in the average daily flow from 5.7 to 5.2m^3/day over the reporting period.
3	South wall of TSF Cell 1 on the embankment face	Feb 2008	Filter Blanket installed over area. Some evidence of a few damp areas around the blanket, however there are no signs of liquor. No change from previous reporting period.
4	Adjacent to the south wall of TSF Cell 4	2006	Occasional periods of dampness and drying out.
5	Southwest Corner of TSF Cell 4 on the embankment face	2008	Occasional periods of dampness and drying out.
6A and 6B	West wall of TSF Cell 4 on the embankment face	2008	Generally dry, damp after rain.
7	Intersection of TSF Cell 3 and TSF Cell 4 at toe	Apr 2008	Beneath Cell 3-4 buttress, no change from previous reporting period. Flows into sump have been gradually increasing since 2013
8	Intersection of TSF Cell 3 and TSF Cell 4 on embankment face	Apr 2008	Beneath Cell 3-4 buttress, no change from previous reporting period. Flows into sump have been gradually increasing since 2013
9	Toe of the west wall of TSF Cell 3	Apr 2008	Beneath Cell 3-4 Buttress, no change from previous reporting period. Flows into sump have been gradually increasing since 2013
10	West wall of TSF Cell 4 on the embankment face	2008	Dry
11	South wall of TSF Cell 4 adjacent to the toe of the dune – east of decant pipe	2008	Occasional periods of dampness and drying out.
12	Cell 2 crest of starter embankment	2009	Damp strips noted regularly.
13, 13A and 13B	Cell 1 crest of starter embankment and at toe	2009	Liquor interception trench installed at Location 13A&B. Seepage extending slightly north of 13B beyond the filter blanket.
14	West wall of TSF Cell 4 at the embankment toe	2009	Dry
15	South wall of TSF Cell 4 (East of Location 11)	Jul 2010	Dry.
16	Northeast corner of Cell 3 (North of Location 12)	Dec 2010	Generally dry, damp after rain.
17	East Wall of Cell 2 at the embankment toe (north of Location 13B)	February 2012	Filter blanket installed January 2016 and seepage interception trench constructed June 2017. Area is dry after construction.
18	Eastern side of the north ramp of Cell 4	November 2012	Area covered by filter blanket with seepage collected and drained to a sump via a buried pipeline. Occasional damp spots below filter blanket noted.
19	East Wall of Cell 2 at the embankment toe (midway between of Location 12 & 17)	December 2013	Filter blanket installed January 2016 and seepage interception trench constructed June 2017. Area is dry after construction.

Location Number	Location	Discovery Date	Summary of Status (FY17)
20	West Wall of Cell 5 at t the embankment toe	June 2015	Damp areas increasing and ongoing water in collection drain chambers and sump. Permanent pumping system installed during FY17.
21	West Wall of Cell 5 at the embankment toe, south of Location 20	May 2016	Very damp along the toe of the dam.
22	North Wall of Cell 3 at the embankment toe	August 2016	Damp patches along the flat, west of the aquifer pump.
23 North and 23 South	East Wall of Cell 3 at the embankment toe	October 2016	Very damp along the toe of the dam.

Figure 4.2-6: Location of perimeter features.

4.3 Fauna Interaction with Tailings Retention System

4.3.1 Environmental Outcome

No significant adverse impacts to listed species (South Australian, Commonwealth) as a result of interactions with the Olympic Dam TRS.

No significant adverse impacts to listed species as a result of interactions with the Olympic Dam Tailings Retention System (TRS) have occurred.

Low numbers of four species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and two species listed under the *National Parks and Wildlife Act 1972* (NPW Act), were observed interacting with the TRS during FY17.

Therefore, it is concluded that there were no significant adverse impacts to South Australian or Commonwealth listed species as a result of interactions with the TRS.

4.3.2 Compliance Criteria

No significant adverse impact on the size of an important population of Category 1a and 1b fauna species as a result of interactions with the Olympic Dam TRS. *NOTE: Significant impact is as defined in the Significant Impact Guidelines and greater than predicted in the EIS* (FA 2.4).

Four species listed under the EPBC Act were observed within the TRS during FY17. In total, two dead Common Sandpipers (*Actitis hypoleucos*), 14 dead Red-necked Stints (*Calidiris ruficollis*), nine dead Sharp-tailed Sandpipers (*Calidiris acuminata*) and one Plains Rat (*Pseudomys australis*) were observed during routine weekly monitoring conducted by trained Environment personnel. No additional EPBC listed species were observed opportunistically by TRS technicians. These represent low numbers of recorded individuals for the species.

Two species listed under the NPW Act, the Common Sandpiper and the Musk Duck (*Biziura lobata*) were observed within the TRS during FY17. Two dead and one live, yet affected Musk Ducks were observed during routine weekly monitoring. An additional two live and one dead Banded Stilts were observed opportunistically by TRS technicians and Environment personnel during FY17.

4.3.3 Leading Indicators

- None applicable.

4.3.4 Deliverables (FA 2.4)

An assessment of fauna activity and losses within the TRS.

An evaluation of the effectiveness of control measures and targets in reducing the number of listed migratory birds lost within the TRS.

During FY17, 42 different bird species and 12 other animal species were observed during the weekly monitoring of the TRS. A total of 157 live animals were observed throughout the year, with 37 showing signs of being affected by the TRS liquor and 267 dead birds were observed. An increase in confirmed dead animals were observed after high summer rains (Figure 4.3-1). It is unclear whether all affected species die as a result of ingesting liquor. The Silver Gull was recorded in the highest numbers during FY17, with a total of 80 recorded.

Overall, there has not been a significant increase or decrease in the number of alive and dead birds observed at the TRS from FY12 to FY17 (Alive: $F1, 22 = 2.154$ $p < 0.156$; $R2 = 0.089$; Dead: $F1, 22 = 0.511$ $p < 0.482$, $R2 = 0.023$; Figure 4.3-2). The variability in the numbers observed is most likely due to environmental factors, such as rainfall (Figure 4.3-1).

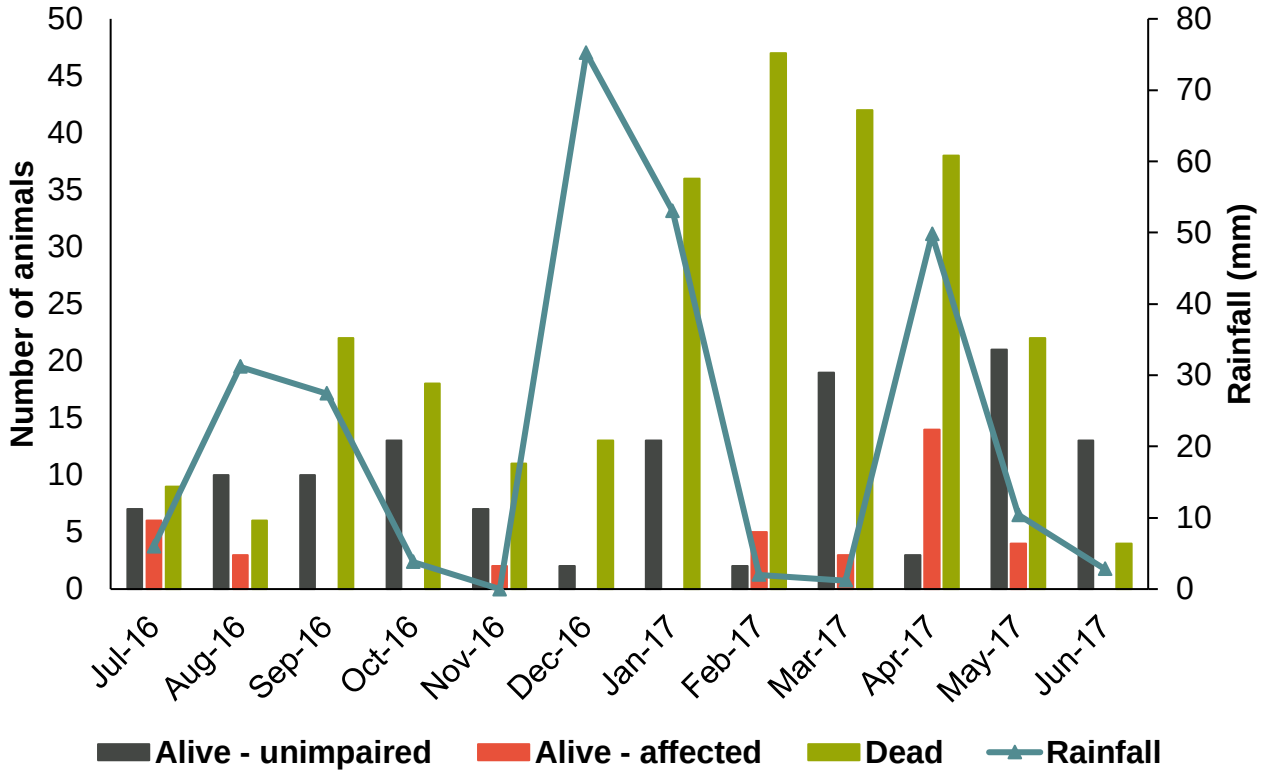


Figure 4.3-1: Monthly summary of weekly monitoring for FY17, showing total number of animals recorded as alive, yet unaffected, alive, but affected and confirmed as dead within the TRS. Rainfall data presented is collected from the Roxby Downs weather station.

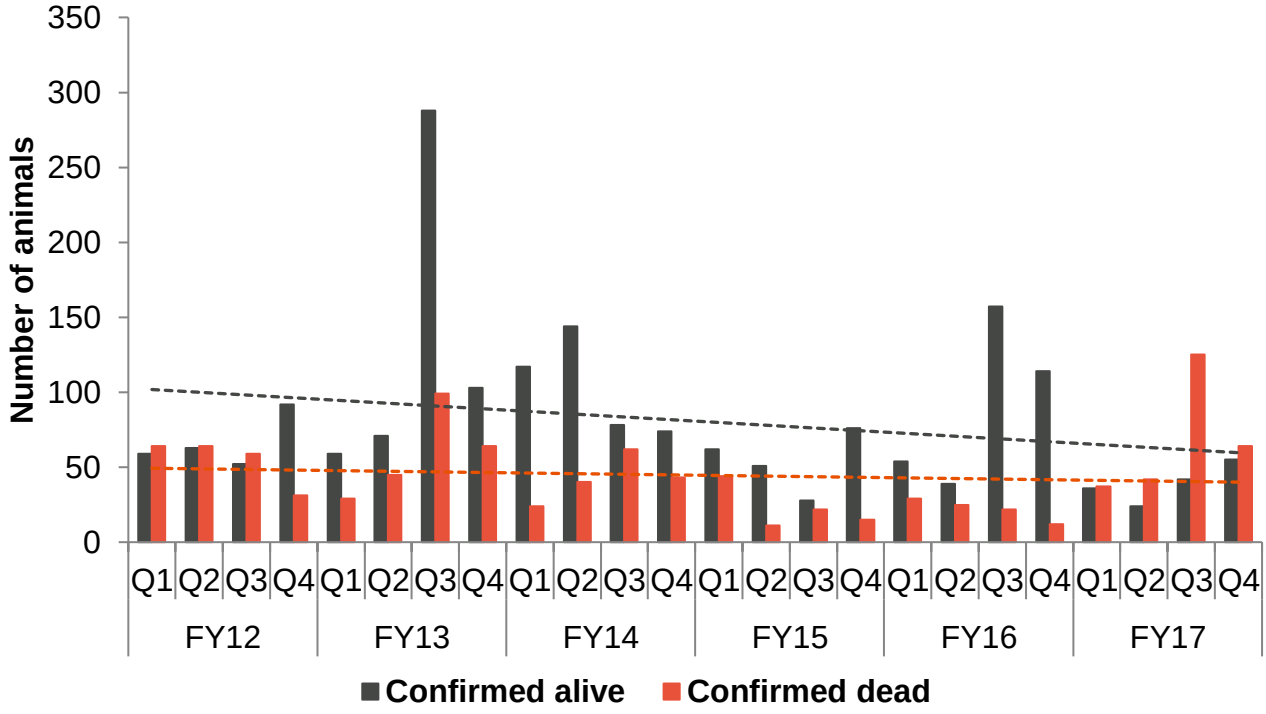


Figure 4.3-2: Quarterly summary of all weekly monitoring, showing total number of animals recorded within the TRS. Dashed lines represent linear trends.

All fauna observed opportunistically (i.e. outside formal monitoring sessions) during FY17 are summarised in Figure 4.3-3. Opportunistic observations bias towards live animals, especially large flocks, hence more live animals than dead animals are usually observed.

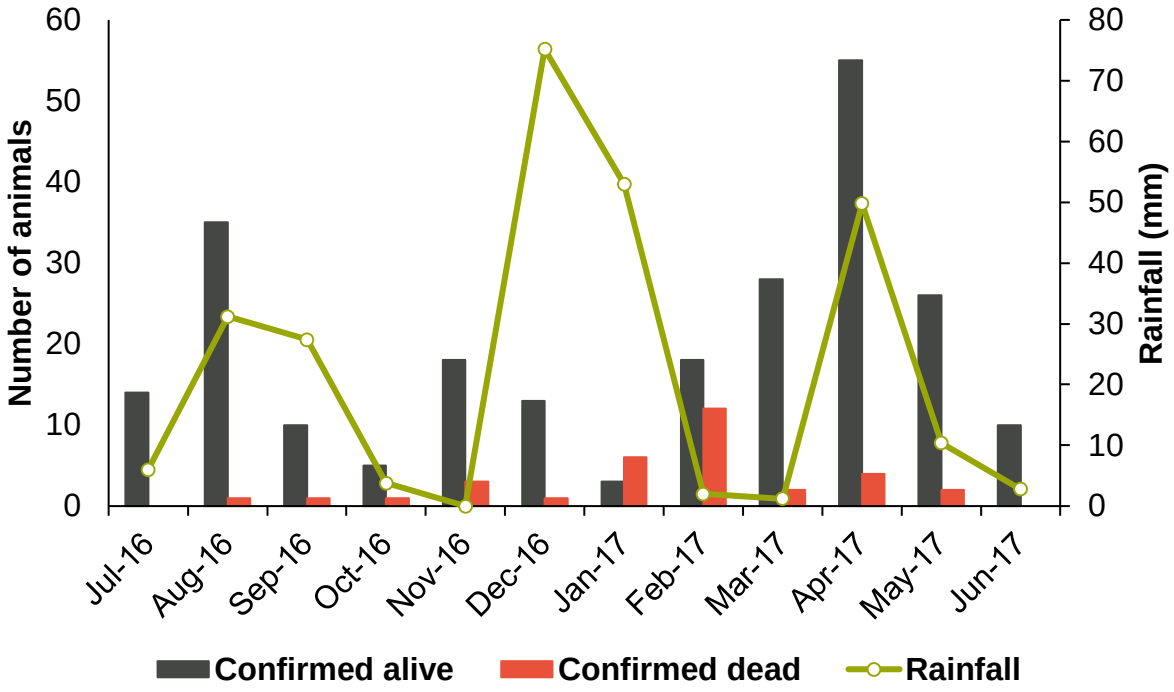


Figure 4.3-3: Monthly summary of opportunistic observations for FY17, showing total number of animals recorded within the TRS. Rainfall data presented is collected from the Roxby Downs weather station.

The data presented indicates the number of fauna counted and does not represent total numbers. They are presented as an index only. A number of factors must be considered when interpreting and refining our monitoring and data analyses:

- Birds may be seen and recorded as alive on one day and subsequently may be observed as dead. The total includes both observations, leading to a possible overestimate;
- Scavenging by birds of prey and corvids means that some carcasses may be removed from the system prior to an observation being made;
- Carcasses floating in the liquor may sink and disappear before being recorded; and
- Some fauna species may leave the system and die elsewhere.

The number of birds recorded dead at the TRS may represent a small proportion of those that visited. Preventing and deterring visitations by large flocks of birds, particularly Banded Stilts, remains a focus of management efforts at the TRS.

4.3.5 Targets FY17

A minimum liquor depth on operating TRS evaporation ponds of 250 mm. ***Note: Operating ponds are those in normal operational use and excludes ponds that are out of service, ponds being dried for maintenance, embankment raising or other purposes, and ponds required for temporary management of excess liquids as a result of rain. This target has been removed from the 2017 EPMP.***

The target for minimum liquor depth of the TRS evaporation ponds is 250mm. This depth is considered to reduce the evaporation ponds' resemblance to the natural preferred habitat of wading birds, and therefore reduce the amount of suitable 'habitat' available. Pond depth has been measured monthly since February 2013, and the results are presented as the pond maximum for the month. Bold text indicates that a pond was in compliance for the month, italic text indicates that the pond was non-compliant and 'O/O/S' if the pond was out of service (Table

4.3-1). Excess liquor levels recorded were due to rainfall. EP5B was drained for pond maintenance at the end of FY17.

Table 4.3-1: Compliance of evaporation ponds to minimum pond depth measured in millimetres.

Date	EP1	EP2	EP3A	EP3B	EP4A	EP4B	EP5A	EP5B
Jul-16	O/O/S	O/O/S	O/O/S	**1903**	**2245**	**2345**	**2563**	**2470**
Aug-16	O/O/S	O/O/S	O/O/S	**2017**	**2182**	**2165**	**2913**	**2894**
Sep-16	**406***	O/O/S	O/O/S	**1882**	**2109**	**2193**	**2959**	**3047**
Oct-16	O/O/S	O/O/S	O/O/S	**1767**	**2092**	**2129**	**2939**	**2962**
Nov-16	O/O/S	O/O/S	O/O/S	**1467**	**1993**	**2049**	**2821**	**2887**
Dec-16	O/O/S	O/O/S	O/O/S	**1568**	**1845**	**2072**	**1785**	**2794**
Jan-17	O/O/S	**322***	O/O/S	**1937**	**2295**	**2127**	**2866**	**1125**
Feb-17	**329**	**273**	O/O/S	**1877**	**2239**	**1899**	**2898**	O/O/S#
Mar-17	**292**	**358**	O/O/S	**1430**	**2042**	**1719**	**2586**	O/O/S#
Apr-17	**357**	**392**	O/O/S	**2190**	**1950**	**1832**	**783**	O/O/S#
May-17	**506**	**404**	O/O/S	**1922**	**2224**	**2121**	**2093**	O/O/S#
Jun-17	**500**	**479**	O/O/S	**1889**	**2291**	**2230**	**2751**	O/O/S#

Notes: O/O/S = Out of Service, * = Excess liquor levels due to rainfall, # = Liquor level drained to measure sediment levels

4.3.6 Action Plan FY17

Assess validity of deterrent measures listed as recommendations in the Deakin University research project.

In FY17, the Potentially Aversive Light Stimulus (PALS) apparatus developed by Deakin University and BHP Billiton was trialled over six months to investigate its effectiveness at deterring birds from EP5A. The trial had insufficient data to reach a definitive conclusion. However, substantial equipment reliability issues were encountered with at least two out of three units operating for only 77.7 % of 'treatment' weeks. Therefore, considering low visitations to the TRS comparative to non-toxic waterbodies in the region, equipment reliability issues and insufficient illumination coverage of EP5A it would have been difficult to obtain a significant result. ODC received government approval to cease further investment into the PALS system. Investigations into other technology has now commenced.

In addition, FY17 was the final year of the six-year ODC funded PhD research project led by Deakin University aimed at better understanding the movements and breeding ecology of the Banded Stilt. By satellite tracking 60 individuals, scientists were able to observe that Banded Stilts are capable of flights over sub-continental scales (Pedler and Bennett 2017). The research has also shown that the Banded Stilt attempted breeding more often than commonly thought (Pedler and Bennett 2017). Failed nest attempts were often a result of relatively low rainfall or nest predation by Silver Gulls (Pedler and Bennett 2017). These new findings are a great outcome for the scientific community as well as ODC.

Continue investigating and trialling alternative deterrent technologies when they become available.

Research into alternative deterrent technologies will continue in FY18. A summary of deterrents trialled to-date has been compiled and the process has derived a short-list of potential deterrent and offset options to be further explored based on their high feasibility, low cost and unknown effectiveness (e.g., most deterrent options only had anecdotal evidence available). The results of this desk-top review will be used to inform relevant stakeholders of the identified best approaches for managing avian interaction with the TRS.

4.4 Solid Waste Disposal

4.4.1 Environmental Outcome

No significant adverse impacts as a result of management of solid waste.

The Resource Recovery Centre (RRC) effectively manages solid waste as per the EPA approved Landfill Environmental Management Plan 2016 (LEMP). No evidence of material environmental harm was identified through routine auditing and/or based on the reporting of materials disposed of to the landfill. No significant adverse impacts resulted from the management of solid waste at Olympic Dam during FY17.

4.4.2 Compliance Criteria

No site contamination leading to material environmental harm arising from the operation of the Resource Recovery Centre (WA 2.5, 2.6).

Solid wastes that cannot be reused or recycled by the RRC and that are not contaminated are disposed of into the landfill facility. The RRC effectively manages solid waste as per the approved EPA Landfill Environmental Management Plan (LEMP) so that no material environmental harm is caused. Waste is minimised, stored, transported and disposed in a manner that controls the risk of adverse impacts to the environment and communities through implementation and maintenance of a LEMP. No evidence of material environmental harm was identified based on routine auditing and reporting conducted during landfill operations.

4.4.3 Leading Indicators

- None applicable.

4.4.4 Deliverables (WA 2.5)

Records of quantities of general and industrial waste disposed of to landfill.

Records of all general waste disposed of to landfill are maintained by the waste management contractor for the RRC. Total waste delivered to the RRC for FY17 was 48440.15 m³, of this waste, 30081.02 m³ was disposed to landfill and 18359.13 m³ was diverted for recycling. This equates to ~38 % of waste diverted from landfill for FY17, an increase of 2 % on FY16 amount of 36 % and an increase of 9 % on the FY14 amount of 29 %. Recycling removed from site in FY17 and historical waste data for the RRC is displayed in Table 4.4-1 and Table 4.4-2, respectively.

Records of quantities of material recovered for reuse and recycling.

All records of reused and recycled materials are maintained by the waste management contractor for the RRC. The total amount of recycling sent off-site for FY17 was ~ 1957 tonnes. New recycling materials removed in FY17 is conveyor, bulkas and printer cartridges. Table 4.4-1 displays the recycling removed from site for FY17.

Table 4.4-1: Recycling removed from site FY17.

Recycling removed from site FY17	Quantity	Unit
Copper Cable	181.52	Tonnes
Mill Liners	106.3	Tonnes
Polypipe	100.3	Tonnes
Light Vehicle Tyres	112.69	Tonnes
Scrap steel & stainless steel	1173.14	Tonnes
Batteries	15.23	Tonnes
Auctions/electric motors/pump casings/miscellaneous	110.28	Tonnes
Printer Cartridges	0.7	Tonnes
Conveyors	156.7	Tonnes
Bulkas	590	Each

Table 4.4-2: Historical waste data for Resource Recovery Centre.

Year	Landfill Disposal *(m^3)*	Waste Oil (L)	Recycled Materials (Tonnes)
2003	30,622	156,300	193
2004	27,348	206,100	617
2005	14,578	152,740	510
2006	45,361	276,580	347
2007	47,964	311,400	685
2008	52,171	288,130	673
2009	40,898	358,000	936
2010	32,980	325,000	1,890
2011	37,511	342,300	1,735
2012	36,291	653,500	2,644
2013 (June)	17,739	157,200	1,248
2014	31, 433	371, 600	1, 232
2015	34, 939	502, 000	3, 073
2016	27, 355	509, 000	2, 651
2017	30, 081	511, 300	1, 957

4.4.5 Deliverables (WA 2.6)

Records of categories, quantities and location of hazardous waste materials disposed of within the SML.

Depending on the type of hazardous or contaminated material, quantities are measured in meters cubed (m^3) or tonnes (t). Records of hazardous waste disposed within the SML is shown in Table 4.4-3. Contaminated waste disposed within the SML is discussed in section 4.5 - Radioactive Waste. Disposal of hazardous waste is to the TSF. The disposal method has recently changed to ensure material is consistent with tailings density. Process

waste that meets the tailings disposal criteria (i.e. not hydrocarbon; caustic or solid) is disposed via bunded areas which are directed to tails disposal. This reduces the amount of waste delivered and buried in the tailings waste finger.

All other hazardous waste is removed from site for disposal. This waste consists of hydrocarbon waste such as oily rags, grease drums and oil filters and is shown in Table 4.4-3.

Table 4.4-3: Record of hazardous waste disposed within the SML and removed off the SML.

Storage Location	Type of waste	Quantity of Waste	Units
Tailings Storage Facility	Hazardous waste disposed	3529	m^3
Off Site Disposal (Veolia)	Hazardous hydrocarbon waste	49.8	Tonnes

Records to provide evidence that listed waste is appropriately managed, specifically:

- **that listed waste is stored, contained and treated in a manner that does not cause environmental harm or nuisance or present risks to human health and safety;**
- **that all listed waste storage containers are of a suitable strength and durability, are clearly marked and contain appropriate safety warnings;**
- **that all listed wastes do not contact soils or stormwater, and that measures to prevent and recover spillages are implemented as necessary.**

The waste management contractor is responsible for maintaining hazardous waste management records for the RRC. The location, type and quantity of hazardous waste is recorded in an electronic register, as per all relevant regulations and site procedures. The transport of hazardous waste off site is documented through the EPA waste transport and tracking system, providing assurance to regulators that wastes are managed appropriately so as not to cause environmental nuisance or present a risk to human health and safety.

ODC complies with the requirements of EPA Licence 1301 pertaining to listed and controlled waste by adhering to the approved Landfill Environmental Management Plan (LEMP), which meets government and ISO 14001 requirements. Spill kits are available at all collection and loading points of listed waste (e.g. Waste Oil Facility and Distribution Centre).

4.4.6 Targets FY17

Increase at source waste segregation to reduce waste to landfill.

All recycling stations across site have colour coded skip bins to assist with segregation at source. This has resulted in approximately 38% diversion of recyclable material from landfill for FY17. Additionally new waste recyclable material is being removed off site as of FY17. This includes ~ 0.7 tonnes of printer ink cartridges; 156 tonnes of conveyor and 590 used empty bulkas. Recycling and segregation education is ongoing across site and has assisted in a reduction of waste from the landfill

Reduce recycling stockpiles by 20 %.

Approximately 1173 tonnes of scrap steel from the steel stockpiles was removed from site in FY17 compared to ~500 tonnes in FY16. Figure 1 and 2 display legacy scrap steel reduction at the RRC. The stockpiles will continue to be managed to reduce historical waste and the RRC will implement an ongoing strategy to ensure recycling stockpiles are maintained at a small volume going forward.

4.4.7 Action Plan FY17

Implement a plan for reducing stockpiles of recyclable material.

Further work was progressed this year to reduce stockpiles by a minimum of 20 %. Legacy waste stockpiles of bulkas and conveyor were specifically targeted in FY17. A total of 590 empty bulkas and 156.7 tonnes of conveyor was removed from site in FY17. Further to the above 1173 tonnes of scrap steel; 100 tonnes of polypipe and 112 tonnes of light vehicle tyres were removed from site for recycling.

Figure 4.4-1: Legacy scrap steel stockpile (redundant tank) prior to removal.

Figure 4.4-2: Stockpiles remaining following the removal scrap steel.

Implement a site wide paper/cardboard recycling programme with bailing and off site removal/recycling.

Cardboard skip bins are placed at recycling stations to assist in the segregation of cardboard and paper across site. Once the skip bins are delivered to the RRC the cardboard is segregated into a separate stockpile. Once backloads are available the cardboard will be removed offsite for recycling in Adelaide.

4.5 Radioactive Waste

4.5.1 Environmental Outcome

No adverse impacts to public health as a result of radioactive waste from ODC's activities.

ODC has consistently operated in a manner that limits radiation dose to members of the public, from radioactive waste, to less than a small fraction of the ICRP 1 mSv/yr limit. As a result, there are no adverse radiation exposure impacts to the public from activities undertaken at Olympic Dam.

No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive waste from ODC's activities.

There were no significant adverse impacts to populations of listed species or ecological communities as a result of ODC's activities. Monitoring of radiation doses to the public and the deposition of ^{238}U at non-human biota assessment sites is used as an indicator of the potential exposure of listed species to radioactive waste. Deposition of ^{238}U at non-human biota assessment sites was at a level which poses no significant adverse impacts to non-human biota.

4.5.2 Compliance Criteria

Radiation doses to members of the public of 1 mSv/y above natural background.

The total estimated dose to critical groups of members of the public in FY17 at Roxby Downs Monitoring Site and Olympic Village Monitoring Site contributed by ODC operations was 0.033 mSv and 0.022 mSv respectively, well below the 1 mSv/yr public dose limit and the OD internal constraint of 0.3 mSv/yr.

Deposition of project originated ^{238}U less than 25 Bq/m^2/y at the non-human biota assessment sites.

The average deposition of Uranium-238 at the four monitoring sites was determined to be 1.40 Bq/m2/y. This is well below the 25 Bq/m2/y compliance criteria.

4.5.3 Leading Indicators

Indications that a dose constraint of 0.3 mSv/y to members of the public above natural background will be exceeded.

Indications that a reference level of 10 µGy/h for impact on non-human biota above natural background will be exceeded.

No leading indicators were triggered. Doses to members of the public are below the dose constraint of 0.3 mSv/yr. Similarly the reference level of 10 µGy/h for impacts on non-human biota has not been triggered.

4.5.4 Deliverables (WA 2.7)

Records of the categories, quantities and location of LLRW and contaminated material disposed of within the SML.

Systems are maintained by ODC that record categories, quantities and location of waste disposed of within the SML, classified as Low Level Radioactive Waste (LLRW) or contaminated waste.

A permanent contaminated waste disposal facility (CWDF) was approved to be constructed adjacent to the Resource Recovery Centre (Figure 4.5-1) with the first cell of the facility being constructed this year. A contaminated waste management plan explains what waste can be disposed to this area, the specific contamination limit, how to clean; prepare, test and dispose of the waste. Previous to the permanent CWDF being constructed the Radiation Protection branch of the Environmental Protection Authority (EPA) had temporarily approved areas within the SML for the storage of contaminated waste.

Following the approval of the permanent CWDF a project was initiated to decommission these temporary facilities and clean, prepare, test and dispose of the waste as per the approved CWDF Waste Management Plan. The project ensured implementation of cleaning and recycling strategies in order to minimise contaminated waste. The project commenced in May and has successfully processed approximately 3846 tonnes of contaminated waste. Of the 3846 tonnes processed approximately 1127 tonnes has been removed off site as recycling with ~ 1600 tonnes cleaned and ready to be removed offsite for recycling subject to transport. Only 1118.1 tonnes of waste was determined to be contaminated and has been disposed of to the new CWDF. The project has successfully recycled 70% of contaminated waste to date with only 30% being disposed to the CWDF (Table 4.5-1).

Table 4.5-1: Permanent Contaminated Waste Disposal Facility (CWDF)

Storage Location	Type of waste	FY	Quantity of Waste	Units
CWDF	Contaminated structural equipment	FY17	1118.1	Tonnes

4.5.5 Targets

Maintain radiation doses as low as reasonably achievable, as assessed through the annual Radiation Management Plan review.

Quarterly ODC radiation monitoring results, radiation dose calculations and occupational hygiene results are presented to the regulatory authorities for review. In addition, an annual adequacy and effectiveness review is completed each year confirming that doses are as low as reasonably achievable.

4.5.6 Action Plan FY17

Implement cleaning and recycling strategies in order to minimise radioactive waste generated.

A contaminated waste management plan establishes radiation limits and types of waste that can be disposed to the permanent CWDF. All structural waste below 1 Bq/g activity concentration can be disposed of to these facilities. All areas have to test the waste they wish to dispose of to the area. Records of the waste with the tested limits are maintained by the RRC. The decommissioning of the temporary facilities ensured a strategy was in place to recycle approximately 70% of this waste with only 30% being disposed to the new CWDF. Ongoing management will continue to see limited amount of contaminated waste being disposed to the permanent CWDF.

Finalise the approval and establishment of a permanent contaminated waste facility for contaminated waste which cannot be disposed of in the TRS.

A permanent contaminated waste disposal facility (CWDF) was approved and the first waste cell constructed this year. The facility is now operational and the temporary facilities have been decommissioned. The temporary facilities will be cleared of all contaminated waste by no later than the middle of FY18.

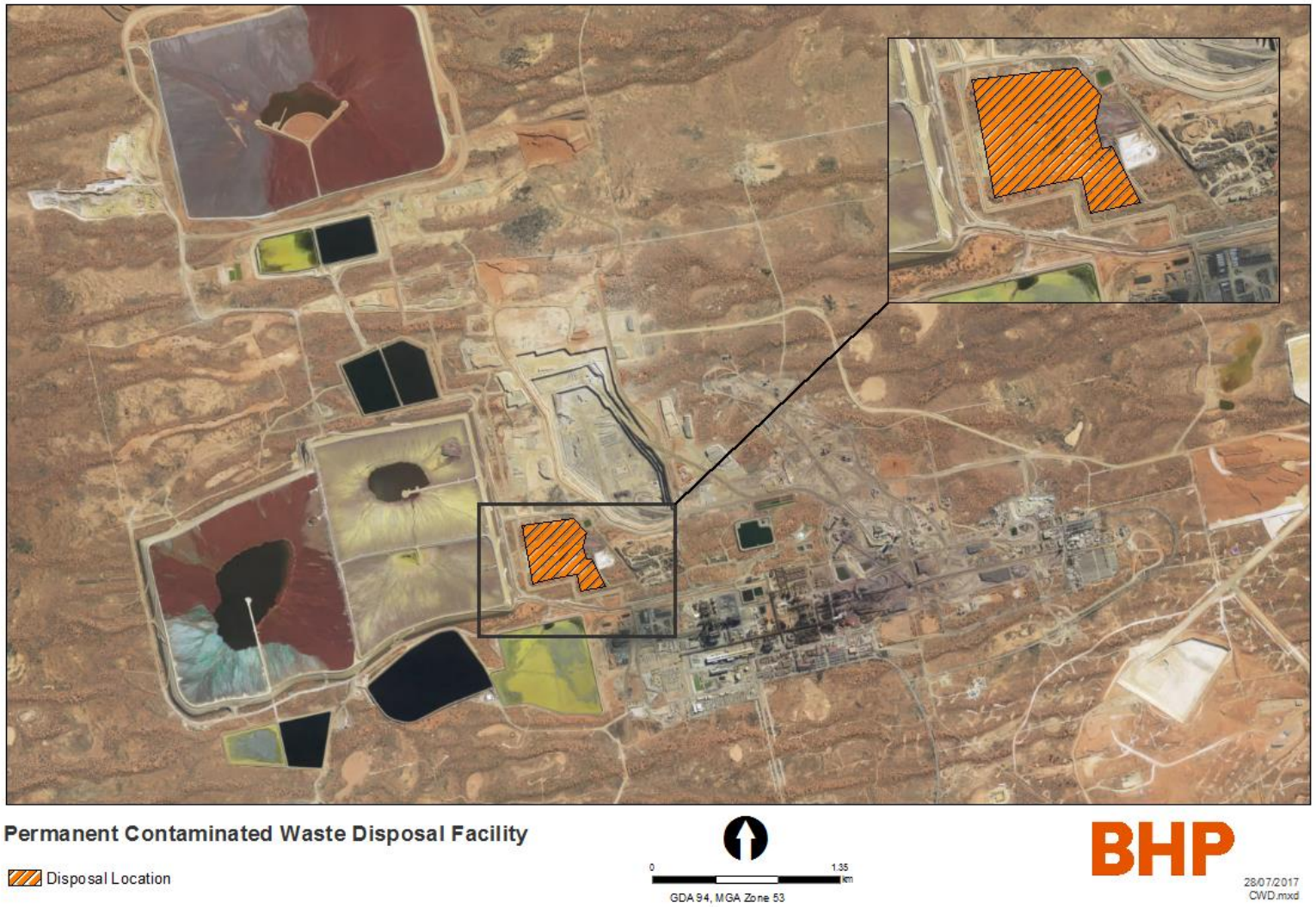


Figure 4.5-1: Approved Contaminated Waste Disposal Facility (CWDF).

5. Employment and Accommodation of People

5.1 Community Interaction

5.1.1 Environmental Outcome

Residents in Roxby Downs, Andamooka and Woomera trust ODC to act in their best interests.

Responses to the 2017 Olympic Dam Community Perception Survey indicate that ODC is a trusted organisation within its local communities. In addition to this, ODC provides employment to local and regional communities.

5.1.2 Compliance Criteria

Community concerns are tracked and all reasonable complaints are addressed where reasonably practical.

ODC has a process to receive and track community concerns through the company's stakeholder engagement management plan. ODC did not received any complaints in FY17.

5.1.3 Leading Indicators

- None applicable.

5.1.4 Deliverables (SE 2.1)

A description of the extent to which residents in Roxby Downs, Andamooka and Woomera trust ODC to act in their best interest (calculated triennially).

Responses to the 2017 Olympic Dam Community Perception Survey indicate that ODC is viewed favourably within its local communities. In addition to this, ODC provides employment to local and regional communities.

5.1.5 Deliverables (SE 2.2)

A description of residents' perceptions about quality of life services and facilities, safety and social fabric in Roxby Downs, Andamooka and Woomera (reported triennially).

ODC undertook a Community Perception Survey in 2017 Perceptions amongst survey participants raised concerns regarding availability of retail stores, cost and reliable access to power, job security and access to increased medical facilities.

5.1.6 Targets

A long-term desirable trend towards a minimum housing rental vacancy rate in Roxby Downs of 5 %.

Roxby Downs has experienced a growth in population from contracted FY16 population numbers, though housing rental vacancy is still considered to be above the desirable 5%.

5.1.7 Action Plan FY17

Undertake the triennial Community Perception Survey to monitor local community perceptions of ODC, and of local services and facilities.

The triennial Community Perception Survey was undertaken in 2017 to monitor local community perceptions of ODC, and of local services and facilities. The next survey is scheduled to take place in 2020.

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7. Glossary of Terms

ADU	Ammonium diuranate, commonly referred to as Yellowcake.
AE	Monitoring Program – Airborne Emissions
AHD	Australian Height Datum, a measure of elevation referenced from approximate sea level.
ANCOLD	Australian National Committee on Large Dams
ANZECC	Australian & New Zealand Environment & Conservation Council.
Aquifer	Porous water bearing formation of permeable rock, sand, or gravel capable of yielding significant quantities of water.
APTS	Acid Plant Tails Stack
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
BHP	BHP Billiton.
Bq	Bequerel, a unit of radioactive decay.
$Bq/m^2/y$	Bequerels per cubic meter per year
CEMP	Carbon Emissions Management Plan
Ca	Calcium.
CAF	Cemented aggregate fill.
Closure	Permanent cessation of operations at a mine or mineral processing site after completion of the decommissioning process, signified by tenement relinquishment.
CD1, CD2	Concentrate Dryer 1, Concentrate Dryer 2
CO_2-e	Carbon dioxide equivalent
Cu	Copper.
CWDF	Contaminated Waste Disposal Facility.
Domestic Water Use	Water used in the town of Roxby Downs or Olympic Dam Village.
DEIS	BHP Billiton Draft Environmental Impact Statement 2009
DPC	Department of Premier and Cabinet
EA	Monitoring Program – Environmental Radiation
ED	Effective dose.
EG	Monitoring Program – Energy Use and Greenhouse Gas (GHG) Emissions
ED_D	Effective dose attributable to radionuclides in dust
EEO	Energy Efficiency Opportunities – Federal government legislation
EDP	Environmental Disturbance Permit
EIP	Environmental Improvement Plan
EIS	Environmental Impact Statement.

EMM	Environmental Management Manual
EMS	Environmental Management System. The part of an organisation's management system used to develop and implement its environmental policy and manage its environmental aspects (Standards Australia / Standards New Zealand 2004). Note: A management system is a set of interrelated elements used to establish policy and objectives and to achieve those objectives. A management system includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources.
Environmental Aspect	An element of the organisation's activities or products or services that can interact with the environment (Standards Australia / Standards New Zealand 2004).
Environmental Impact	Any change to the environment, whether adverse or beneficial wholly or partially resulting from an organisation's environmental aspects (Standards Australia / Standards New Zealand 2004).
EPA	Environmental Protection Authority
EPBC Act	Environment Protection & Biodiversity Conservation Act 1999 (Cth).
EPMP	Environmental Protection and Management Program. Describes the environmental management and monitoring activities undertaken by BHP Billiton Olympic Dam for the purpose of quantifying any change in the extent or significance of its impacts, assessing the performance of control measures employed to limit impacts, and/or to meet legal and other obligations.
EPP 1994	Environment Protection (Air quality) Policy 1994
EPP 2015	Environment Protection (Water quality) Policy 2015
Evaporation Pond EP	A containment pond to hold liquid wastes to assist with disposal of liquor via evaporation.
FA	Monitoring Program - Fauna
FL	Monitoring Program - Flora
FoS	Factors of Safety
FY	Financial Year
GA	Monitoring Program – Great Artesian Basin
GAB	Great Artesian Basin
GIS	Geographical Information System
GHG	Greenhouse Gas
GW	Monitoring Program – Groundwater
g/m^3	Grams per cubic metre – a measure of dust concentration in air.
Gy/h	Grays per hour – a measure of absorbed radiation dose.
ha	Hectare
ICRP	International Commission on Radiological Protection.
ID	EMP chapter identification
Industrial Water use	Water used in mining or mineral processing operations and excluding domestic water use.

kg CO_2-e	Kilograms of carbon dioxide equivalence – a standard measure of greenhouse gas emissions
kg CO_2-e/t	Kilograms of carbon dioxide equivalence per tonne of material milled – a measure of greenhouse gas emission intensity of ODC.
kL/t	Kilolitres per tonne of ore milled.
kt	Kilotonne
Listed Species	Those species or communities that are listed as threatened or migratory under Commonwealth and/or relevant State or Territory legislation.
LEMP	Landfill Environmental Management Plan
LLRW	Low level radioactive waste
LNAPL	Light Non-Aqueous Phase Liquid
LoA	Life of Asset Plan
mAHD	Elevation in metres with respect to the Australian Height Datum
mg/Nm^3	Milligrams per normal cubic metre
ML	Megalitres.
ML/d	Megalitres per day.
MP	Monitoring Program. A document which describes the environmental monitoring activities undertaken by ODC for the purpose of quantifying any change in the extent or significance of its impacts, assessing the performance of the control measures employed to limit its impacts, and/or to meet its legal and other obligations.
Mt	Million tonnes
mSv/y	Millisieverts per year – a measure of equivalent radiation dose.
MWDP	Mine water disposal pond
NaCl	Sodium chloride (salt).
NEPM 2011	National Environment Protection Measure. NEPM investigation levels (Health Investigation Level Scenario D: Industrial/Commercial land use; Schedule B1 - National Environmental Protection (2011)
NGER	National Greenhouse and Energy Reporting – Federal government reporting of greenhouse gas emissions and energy use and production
NHB	Non-human biota
Nm^3	Normal metres cubed, referring to volume at standard temperature and pressure
NO_x	Oxides of nitrogen
NPW Act	National Parks & Wildlife Act 1972 (SA)
NRM SAAL	Natural Resources Management South Australia Arid Lands
NVMP	Native Vegetation Monitoring Program
ODC	BHP Billiton Olympic Dam Corporation Pty. Ltd.
OV	Olympic Village, the accommodation camp located at Olympic Dam township
OVMS	Olympic Village Monitoring Site
Pb	Lead

^{210}Pb	An isotope of lead, having mass number 82 and half-life 22.3 years
pH	A measure of acidity and alkalinity
PIRSA	Department of Primary Industries and Regions, South Australia
PM_{10}	Particulate matter with an effective aerodynamic diameter less than or equal to 10 µm
$PM_{2.5}$	Particulate matter with an effective aerodynamic diameter less than or equal to 2.5 µm
Po	Polonium
^{210}Po	An isotope of polonium, having mass number 84 and half-life 138.38 day
ppm	Parts per million
PRH	Practical Reference Heads
Ra	Radium.
^{226}Ra	An isotope of radium, having mass number 88 and half-life 1599 years
RDMS	Roxby Downs Monitoring Site
RDP	Radon Decay Product
Rehabilitation	The reclamation or repair, as far as practicable, of a facility to an appropriate or agreed state as required by law, or company self-regulation
RHDV	Rabbit Haemorrhagic Disease Virus
Rn	Radon. Chemically inert radioactive gaseous element formed from the decay of ^{226}Ra as part of the ^{238}U decay chain
^{222}Rn	An isotope of radon, having mass number of 86 and half-life 3.8235 days
RRC	Resource Recovery Centre
RSF	Rock Storage Facility
SAP	Systems Applications Products
SE	Monitoring Program – Social Effects
SEB	Significant Environmental Benefit
SEIS	BHP Billiton Supplementary Environmental Impact Statement 2011
Significant aspect	An environmental aspect that has or can have a significant environmental impact. Significance is determined by risk assessment.
Significant Impact Guidelines	Australian Government, 2009, 'Matters of National Environmental Significance: Significant impact guidelines 1.1, *Environment Protection and Biodiversity Conservation Act 1999*.
SML	Special Mining Lease
SO_2	Sulphur dioxide
SO_4	Sulphate
SW	Monitoring Program – Surface Water
SX	Solvent Extraction
t	Tonnes

TDS	Total dissolved solids
TP	Tapered Piezometers
TRS	Tailings Retention System. Incorporates all elements of the tailings delivery, deposition and storage system and elements associated with the collection and disposal or return of tailings liquor. The TRS includes the Tailings Storage Facility (TSF), Evaporation Ponds and Pipe Corridors including tailings delivery pipelines and liquor pipelines.
TSF	Tailings Storage Facility. Incorporates the tailings deposition and storage system, which currently comprises four storage cells.
Th	Thorium
^{230}Th	An isotope of thorium, having mass number 90 and half-life 7.54×10^4 years.
Total Industrial Water Use	Total water used including high quality (GAB) water and water recovered from other sources including abstraction of local saline water.
TSP	Total Suspended Particulates (dust)
U	Uranium.
^{238}U	The most common isotope of uranium, having mass number 238 and half-life 4.46×10^9 years.
µGy/h	Micro gray per hour
VOC	Volatile organic compound.
VWP	Vibrating Wire Piezometers
WA	Monitoring Program – Waste

8. Appendix A: Amendments to the 2016 Environmental Protection and Management Program (EPMP)

Document	Section	Description of Change	Change Explanation
All		Removal of all cross references to conditions of the 2011 **Major Development Approval.**	Olympic Dam expansion has not progressed. Cross-references may be reinstated in future if required.
EM Program	All	All continuous improvement opportunities have been migrated to the Annual Actions and Targets document. Amendments to the continuous opportunities from 2015 described in this table will reference the applicable section of the 2015 EPMP.	Continuous improvement opportunities relate to actions and targets and have been moved to improve the readability of EPMP
EM Program	1.1	Information from ID 1.2, Spread of pest plants and animals has been added to ID 1.1	To streamline the EM Program, ID 1.1 has been altered to include ID 1.2, Spread of pest plants and animals.
EM Program	1.1.12	Removal of references to the expanded Olympic Dam and the Port Augusta pre-assembly yard.	The Olympic Dam expansion has not progressed and the Port Augusta pre-assembly yard is due to be relinquished in May 2016.
EM Program	1.2	ID 1.2 Spread of pest plants and animals has been removed.	To streamline the EM Program, ID 1.1 has been altered to include ID 1.2, Spread of pest plants and animals.
EM Program	1.2.9	Addition of leading indicator	The hydraulic gradient in the North East Sub-Basin of Wellfield A can be used as an indicator of impending issues with spring flow in conjunction with the GAB8/HH2 drawdown compliance limit. A leading indicator for the six-monthly running mean hydraulic gradient between wells in the NESB and HH2 of 0.0009 m/m will provide early warning of potential spring impacts.
EM Program	1.3.14 (2015)	Removal of continuous opportunities relating to improving the understanding of hydrogeology and ecology of Yarra Wurta Springs.	Any potential future impacts to Yarra Wurta Springs would be in relation to open pit mining and is no longer applicable for the current operation.
EM Program	2.1.12	Removed " The EPA Guidelines are used for all new installations, which require bund sizes to be 120 per cent of the net capacity of the largest tank within the bund (or the sum of the capacity of any interconnected tanks) or 133 per cent for flammable liquids (EPA 1301.S-5).	Changed to align with wording in current EPA 1301.7(S-5) and EPA3101.8 (S-22)
EM Program	2.1.12	Removed statement "Relevant senior management personnel have personal KPIs for improving the performance of spill	Changes in organisational structure and a different approach to managing spill events at Olympic Dam have resulted in the removal of spill targets for

		management. Regular environment updates which include spill performance are presented to site personnel and site management."	operational areas. Operational areas will report on maintenance and corrective actions being executed in a timely manner.
EM Program	2.1.14 (2015)	Changes made to the continuous improvement /development opportunity section and removal of an opportunity "Identify any gaps and, if necessary, develop an action plan to ensure existing stormwater retention ponds are constructed to prevent the escape of material into the soil, surface water or groundwater resources."	A change in the approach to managing the risk to the environment from spill events occurred during this review. ODC will continue to focus on bund maintenance and process controls to minimise risks to the environment from spill events. Updates on listed development and improvement opportunities have been included. Changes to the Environment Protection (Water Quality) Policy in 2015 have resulted in the groundwater beneath the SML being considered as having no environmental value under Schedule 1 of the Policy (as it has a TDS level >13,000mg/L). Given that existing site requirements ensure that chemicals are appropriately bunded and spill events are remediated, there are not further bund upgrades proposed to existing stormwater ponds at this time.
EM Program	2.2.12	Removal of "Regular reports on spill performance are emailed to all personnel and presented to site management" and Relevant senior management personnel have personal KPI's for improving the performance of spill management"	Spill performance data are no longer emailed sitewide. Spill events are analysed and discussed with area managers during the annual aspects and impacts risk register review. Changes in organisational structure and a different approach to managing spill events at Olympic Dam have resulted in the removal of spill targets for operational areas. Operational areas will report on maintenance and corrective actions being executed in a timely manner.
Annual Actions and Targets	Table 3 ID2.1	Opportunity added "Ensure bunds are continuously maintained and process controls are implemented such as safe fill levels and Citect alarms when a risk has been identified."	Changes to the approach for spill management at ODC is focusing on existing bund maintenance and effectiveness of process controls where risks have been identified. The wording has been updated to reflect this.
EM Program	3.1.14 (2015)	Removal of continuous improvement opportunity as it has been realised. "Determine the most appropriate methods of at-source particulate mitigation and include air quality management options into the Dust Management Plan"	Operational controls for point source particulates have been implemented.
EM Program	3.1.14 (2015)	Removal of continuous improvement opportunity as it is already an action. " Opportunity: Implement the	Development of an EIP is an action should it be necessary.

		improvements identified in the Environmental Improvement Plan"	
EM Program	3.1.14 (2015)	Removal of continuous improvement opportunity as it has been realised. "To ensure dust levels at sensitive receivers do not exceed compliance criteria, a detailed understanding of the relationship between operational activities, background dust concentrations and local meteorology is required to be developed. This understanding will inform the operational response/control element of the dust management system, the exact nature of which is also to be investigated • Opportunity: Investigate the most appropriate and effective means of implementing an operational control regime to ensure the compliance criteria is not exceeded."	Real time data has been collected for the past three years which continuously shows us background dust levels; weather conditions and operational contributed dust. Daily reports are received which provide insight on all of the above criteria which allows the operation to make informed decisions regarding dust management on site. Detail is contained in the Dust Management Plan.
EM Program	3.2.14 (2015)	Removal and rewording of continuous improvement "Investigate options to reduce acid plant bypasses and reduce Acid Plant Tails Stack exceedances through the Smelter Environmental Improvement Plan."	Majority of Acid Plant Tails Stack exceedances only occur on plant start up after a plant shut down. This has an exemption attached and is currently unavoidable. Acid Plant bypasses are due to emergency plant maintenance requirements. The bypass is only operated after a purge of 120 minutes to ensure the SO_2 has decayed to not be a significant impact. A more value adding improvement has been included to help understand SO_2 emission threshold levels on vegetation.
EM Program	3.2.10	Removal of the Airborne Emission Monitoring Program, Document No. 2788: • An inventory of the main sources of air emissions (both point and diffuse source emissions) and the location of sensitive receivers is maintained, along with an impact assessment. Controls are also identified which reduce impacts to sensitive receivers, along with the associated monitoring programs.	The Airborne Emission Monitoring Program is not a management plan and it is referenced below in 3.2.11Included the Dust Management plan as it has been amended to include all airborne emissions
EM Program	3.3.13 (2015)	Removal of continuous improvement opportunity "Install and repair controls as per the standards around raise bores to improve capture of saline aerosol emissions" and include	Controls and standards are implemented on every new RB an improvement is required on what % they control emissions.
Annual Actions and Targets	Table 3 ID3.3	Addition of continuous improvement opportunity "Understand the reduction foot print of saline aerosol emissions achieved	Controls and standards are implemented on every new RB an improvement is required on what % they control emissions.

		through implementing controls and the actual saline aerosol emission impact zone based on emission levels."	
EM Program	3.4.11	Included the Airborne Emissions Monitoring Program, Document No. 2788 • monitoring of control systems (such as baghouse efficiencies and stack emissions).	The Airborne emissions monitoring program refers to radioactive emissions.
EM Program	3.4.11	Removal of the "Flora Monitoring Program, Document No. 2664, vegetation distributions"	Vegetation distributions are not used for Non-Human Biota (NHB) assessments.
EM Program	3.4.14 (2015)	Removal of continuous improvement opportunity as it has been realised. "As part of the expanded air quality monitoring network, BHP Billiton installed new generation radon and radon decay product monitors. The monitors provide real time data. Opportunity: Utilisation of the new generation radon and radon decay product monitors to improve understanding of radiological impacts of the operation."	Real time data is used to determine radiological impacts to the operation.
EM Program	3.4.14 (2015)	Removal of continuous improvement opportunity "Excess or uncontrolled radioactive waste can lead to emissions from the project leading to potential exposures to people and the environment. As the project expands, more permanent low level radioactive waste management becomes important. Opportunity: Continue to develop, update and implement a strategy towards management of radioactive waste on site (including the waste minimisation philosophy)."	A permanent contaminated waste disposal facility has been designed for construction.
EM Program	3.4.14 (2015)	Removal of continuous improvement opportunity 'The fundamental basis of radiation protection is the ALARA principle. To date BHP Billiton has implemented operational programs to ensure that occupational and public doses remain low. Radiation impacts are best controlled through good design and as the project expands, it is appropriate to better formalise the company's approach to ALARA to ensure that radiological impacts are managed. Opportunity: Develop and implement optimisation in design process.	Already incorporated into design see EMP 3.3.12.3 optimisation in design section.

EM Program	3.5.3	Removal of large part of section describing the planning process.	The plan has already been developed in accordance with approval conditions. The section has been simplified to focus on the requirement to quantify and report on emission reduction opportunities.
EM Program	3.5.8	Compliance criteria wording changed	Updated to reflect current operational requirements.
EM Program	3.5.10	Reference to reduce greenhouse gas levels by at least 60% of 1990 levels by 2050 removed	A plan has been developed, however the implementation is not relevant to current operations.
EM Program	3.5.13	Contingency options removed	The change to compliance criteria means that contingency options no longer apply.
EM Program	3.5.14 (2015)	Removal of all existing continuous improvement opportunities	Opportunities were developed in expectation of large scale expansion but removed given quantum possible at current production rates. Improvement opportunity to align with current operational direction.
Annual Actions and Targets	Table 3 ID3.5	• Added “Continue to identify and implement energy efficiency projects for the existing operation, particularly those identified opportunities that do not require capital expenditure.”	Operational targets for current reporting period have already been achieved. Changed to reflect current operational direction.
Annual Actions and Targets	Table 3 ID4.1	Removal of existing target; “rate of rise of tailings at an average of 2 m per annum or less” from the Actions and Targets document.	The target has been moved to the Leading Indicator section of the EM Program for Embankment Stability.
EM Program	4.1.9	Rewording of the existing and inclusion of two (2) new Leading Indicators.	The new Leading Indicators for Embankment Stability improve the transparency of operational controls that are already in place to monitor potential causes of an embankment failure. Maximum pond sizes, pore pressure comparisons and rate of rise data are clear and measureable leading indicators.
EM Program	4.1.14 (2015)	Addition of continuous improvement opportunity “Regular audits of the TRS operation are undertaken as described in the Waste MP. Opportunity: Ensure improvement actions and recommendations from audits are documented and where appropriate implemented in a timely manner.”	Opportunity was developed to capture the continuous improvement opportunities identified in regular operational and geotechnical audits.

EM Program	4.4.10	Updated the “Waste Management Plan” to Landfill Environmental Management Plan	Fulfils the requirements of the Landfill guidelines 2007
EM Program	4.4.14 (2015)	Amended the continuous improvement opportunity. Deleted “During FY13 a trial was conducted in the Concentrator Hydromet area which involved the implementation of four waste segregation stations (each station housed six waste stream disposal bins; steel; wood; plastic; oily waste; cardboard/paper and general waste). Data was collected on a regular basis, to determine correct segregation compliance and the general sustainability of the stations (housekeeping, maintenance, resource recovery centre upkeep).”	Segregation across surface has been implemented. Further program to improve waste segregation at mine end and underground for FY17.
EM Program	4.4.14 (2015)	Removal of continuous improvement opportunity as it has been realised. The Environmental Management of Landfill Facilities Guideline 2007 details the minimum standards required for landfill operations regarding engineering, monitoring and management. The development of a Landfill Environmental Management Plan (LEMP) is one component of the Landfill Guidelines. Opportunity: Expand the Waste Monitoring Program and Groundwater Monitoring Program to include assessment of specific impacts from the landfill operations.	Water samples are taken form LT17 and a Landfill Environmental Management Plan has been compiled as per the EPA Landfill guidelines (2007).
EM Program	4.5.3	Removed “An Environment Report is produced for each operational area: Mine, Processing, Smelter and Refinery and Non-Process Infrastructure. Details of non-conformances are included in these documents”	This process is now captured in the Quarterly EMS update to management.
EM Program	4.5.4	Removed “ Environmental Management of Landfill Facilities Guideline (SA EPA 2007)”	This is not applicable to radioactive waste management.
EM Program	4.5.10	Removed “Waste Management Plan, Document No. 83202” and replaced this with “Contaminated Waste Management Plan, Document No. 156800”	This is a new document that deals with contaminated waste and the waste management plan does not exist and is now a Landfill Environmental Management Plan for general waste.
EM Program	4.5.11	Removal of “Monitoring of data collection, including: number of radioactive process spills.”	Monitoring of radioactive process spills does not contribute to radioactive waste management monitoring.

EM Program	4.5.12.3	Added “All structural contaminated waste to be disposed to the CWDF must be cleaned to ensure an activity concentration of 1Bq/g or less.	A permanent contaminated waste disposal facility is being commissioned in the quarry with guideline son waste to be disposed to the facility.
Airborne Emissions MP	2.6	Removal of reference to the construction of the open pit mine and Rock Storage Facility.	No current expansion.
Airborne Emissions MP	3.2	Removal of Fugitive particulate emissions – dust deposition monitoring and ^{238}U ^{230}Th ^{226}Ra ^{210}Po ^{210}Pb activity in dust deposition.	This monitoring is discussed in the Environmental Radiation MP.
Energy Use and GHG Emissions MP	2.2.1	Modification of wording around how GHG emissions reductions will be achieved	Aligns with changes related to the expansion not being progressed
Energy Use and GHG Emissions MP	2.2.4	Method simplified to reflect changes to 2.2.3	Condition 13a refers to the expansion project which has not progressed.
Energy Use and GHG Emissions MP	Table 3.1	Update of carbon reduction targets, changed to carbon reduction opportunities.	Changed to align with condition requirements due to the expansion not being progressed
Environmental Radiation MP	Table 2.1	Removal of airborne radioactive dust concentration monitoring and radioactive dust deposition monitoring as they are not discussed in the Airborne Emissions Document No. 2788	Dust deposition monitoring and HiVolume Air Sampling are already discussed in the Environmental Radiation MP.
Environmental Radiation MP	2.3.4	Removal of reference to annual limestone dust monitoring	Visual inspection of limestone dust monitoring is not utilised for radiation monitoring neither does it form part of the Erica Assessment.
Environmental Radiation MP	2.4.1	Removal of reference to “radionuclides in airborne dusts are analysed when dust filter papers from the high volume dust monitoring program are analysed”	This is discussed in the Environmental Radiation MP in section 2.2.4
Environmental Radiation MP	Table 2.2	Removal of Note: PM10 monitoring is undertaken and used for the radiation assessment. (see section 2.2.4 and of the Airborne Emissions MP	PM10 dust monitoring is not used for the radiation dose assessment.

Environmental Radiation MP	Table 2.2	Removal of reference to (see section 2.5.4 of the Airborne Emissions MP)	Dust deposition is not discussed in the airborne emissions MP.
Environmental Radiation MP	2.3.4.	Removal of visual inspection of limestone dust deposition conducted during the flora inspection.	The visual inspection of limestone dust deposition during the flora monitoring is not used for the NHB or determining public dose.
Fauna MP	2.1	Removal of the Yarra Wurta Springs Lake Eyre Hardyhead monitoring program.	Open pit dewatering had the potential to impact groundwater levels at a regional scale and reduce fish habitat. As the open pit project has ceased and the local groundwater levels have recovered post dewatering the monitoring is considered unnecessary. Sufficient baseline data for any future modelling work has been collected over the last 5 years
Fauna MP	2.5	Remove the reduction of supernatant pond surface area (≤35 ha across all 5 cells) environmental target and the current bird deterrent system (gas cannons and Duck-off Lighting system) from ODC's current management plan.	Monitoring data suggests that both the reduction of supernatant pond surface area (≤35 ha across all 5 cells) environmental target and the current bird deterrent system (gas cannons and Duck-off Lighting system) are ineffective at reducing bird mortalities on the TRS. Ongoing research will continue into new technology that may be more effective at reducing bird numbers at the TRS.
Flora MP	2.1	Removal of Emission impacts to vegetation monitoring.	A comparison of the results from both the vegetation sampling and dust deposition records over a 10 year period has demonstrated that the area of impact has remained localised and that variations in the total detectible area are likely to be impacted by local rainfall events. Work by Griffin and Dunlop (2008) also showed that besides copper and sodium, very few plant symptom rank scores were related to the measured levels in the foliage. Given this, and acknowledging that the long-term vegetation monitoring programme which allows ODC to monitor changes in perennial plant communities surrounding the operation will continue, ODC proposes removing the short-term (annual) emissions-based monitoring program and investigate through improvement opportunities the links between changes in vegetation and emissions levels in plants and soil.
Flora MP	2.5	Removal of the Great Artesian Basin (GAB) springs vegetated wetland area monitoring program.	The changes in vegetated wetland area can potentially arise from changes in spring flow and/or a combination of other environmental factors, such as changes in spring water chemistry, broad scale weather patterns and spring community composition. Analysis of our data suggests that there is no correlation between vegetated wetland area and spring flow for springs monitored. Therefore, other programs, such as GAB springs wetland vegetation composition assessment and endemic invertebrate abundance surveys, are better suited to assessing the impact of aquifer drawdown.

Groundwater MP	Table 5-2	Removal of table 5-2 Yarra Wutra Bores and Spring Flow monitoring	Removal of Yarra Wurta bores and Spring monitoring. Open pit dewatering had the potential to impact groundwater levels at a regional scale. As the open pit project has ceased and the local groundwater levels have recovered post dewatering the monitoring is considered unnecessary. Sufficient baseline data for any future modelling work has been collected over the last 5 years
Waste MP	Table 3.2	Removal of monitoring size of solid waste inventories against relevant regulatory guidelines and criteria.	No relevant regulatory guidelines and criteria for solid waste inventories.
Waste MP	Table 3.2	Edited reference to maintain register of LLRW to include contaminated waste.	LLRW is disposed to the tailings facility while structural contaminated waste is disposed to the contaminated waste disposal facility.