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EMP Audit
Iluka Resources Limited
29-Nov-2018
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Audit of 2017 Mineral Sands By-product Disposal Annual Reports

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Client: Iluka Resources Limited

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Prepared by

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Quality Information

Document Audit of 2017 Mineral Sands By-product Disposal Annual Reports

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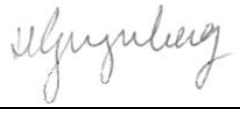
Prepared by Paul Greig

Reviewed by Suanna Harvey

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
1	28 Nov 2018	Audit Report	Dr Harry Grynberg Technical Director - Environment	
2	29 Nov 2018	Amended Audit Report – minor edits to Table 2 and Appendix A	Dr Harry Grynberg Technical Director - Environment	

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Executive Summary

AECOM Australia Pty Ltd (AECOM) was commissioned by Iluka Resources Limited (Iluka) to conduct an independent audit of the Pit 23 By-Products Disposal Facility Annual Reports addressing the Environment Management Plan (EMP), Rehabilitation and Vegetation Management Plan (RVMP) and Incoming Waste Monitoring Plan (IWMP) for the year ended December 31 2017.

The conditions of the planning permit (15-105) addressing the Pit 23 By-Products Disposal Facility include:

14 (e): annual auditing of records to verify compliance with the requirements of the Incoming Waste Monitoring Plan (IWMP).

20: The annual performance report must be reviewed by an independent suitably qualified person with expertise in risk management plans in the context of mines and quarries, and is an environmental auditor appointed under the EP Act 1970.

31: The permit holder must submit an annual performance statement (within the wider EMP annual report).

42: The permit holder must prepare an EMP and Rehabilitation performance review report covering its compliance requirements under the various sub-components of the EMP and R&VMP for provision to a suitably qualified environmental auditor as agreed by the Responsible Authority annually or less frequently as agreed to in writing, by the Responsible Authority.

43: The environmental auditor must review the EMP and Rehabilitation performance review report and provide conclusions on the report's content against its key sub-components, and recommendations for any required amendments to the plans ('auditor's review').

The 2017 annual reports are provided in Appendix A (IWMP) and Appendix B (EMP and RVMP).

The annual reports for 2017 were submitted to Horsham Rural City Council (HRCC) in July 2018. HRCC formed a Technical Reference Group (TRG) and referred the reports to them (email dated 19 September 2018) and received comments which were conveyed to Iluka. Iluka has subsequently responded (see Appendix C).

The reports and audit covered the period from 11 May 2017 (surrender of the MIN and commencement of the Planning Permit condition) to 31 December 2017.

The Hamilton Mineral Separation Plant (MSP) was placed into care and maintenance mode in late 2017. Therefore, a number of activities could not be inspected during the Site visit.

The opportunities for improvement have a common theme, being the need to implement checking/verification of all the data included in the annual reports. The data anomalies identified for tracking of incoming waste loads are highly unlikely to have increased the risks from the operations or the impacts on the environment.

The placing of the Hamilton MSP into care and maintenance mode is a significant event that should generate a reassessment of the risks from current operations and potentially modifications to the EMP. This should include the current staffing of the site.

It is the auditor's view that in relation to the McGlashin's Swamp trigger exceedance, the scope of the response indicated by Iluka in its response to the TRG comments is appropriate. Given the second precautionary trigger exceedance was in September 2017 the timing of the response report (although not required by the EMP), being November 2018, could be improved.

The specific recommendations from the audit are as follows:

IWMP:

- Iluka should implement a check/verification of all data included in the annual report.
- Inspections associated with the audit should occur during active periods where possible.
- Analyses used to demonstrate compliance with regulated environmental requirements should be conducted in Laboratories accredited by NATA.
- Analysis should be conducted in a timely fashion so that rectification can occur if necessary.
- The auditor should review the annual report before submission to the responsible authority. Any comments/issues should be incorporated into the report before submission together with the auditor's report.

EMP and Rehabilitation Performance Report:

- The report should address the Rehabilitation and Vegetation Management Plan, even if this means reporting that no action has been undertaken due to continued Pit 23 operations.
- Historic Surface Water and Groundwater data should be presented to identify trends and anomalies.
- Responses to exceedances of precautionary trigger levels should be documented.
- Iluka has a monthly Douglas site inspection and report. Routine inspections required by the EMP could be included in the site inspection protocol.
- The auditor should review the performance report before issuing to the responsible Authority. Any comments/issues should be incorporated into the report before submission together with the auditor's report.
- An annual review of the Risk Register should be conducted. This is also a requirement of the Iluka Risk and Hazard Management Standard.
- The EMP could be reviewed and the requirements for inspections included in a working calendar for the site.
- The auditor agrees with Iluka's proposal that an EMP and Rehabilitation Performance Report be prepared and submitted for each six-month period. The auditor suggests that the report be submitted within 3 months after completion of the six-month period.
- It is recommended that Iluka review both the Environment Protection Amendment Act 2018 and SEPP (Waters) for relevance to the EMP and update the EMP as necessary.

Abbreviations

ARPANSA	Australian Radiation Protection and Nuclear Safety Authority.
DEDJTR	Department of Economic Development, Jobs Transport and Resources.
DHHS	Department of Health and Human Services
EHS	Environment Health and Safety
EMP	Environment Management Plan
EPA	Environment Protection Authority
HMC	Heavy Mineral Concentrate
HRCC	Horsham Rural City council
IWMP	Incoming Waste Monitoring Plan
MSP	Mineral Separation Plant
NATA	National Association of Technical Authorities
NORM	Normally Occurring Radioactive Material
RVMP	Rehabilitation and Vegetation Management Plan
TRG	Technical Reference Group

1.0 Introduction

1.1 Background

AECOM Australia Pty Ltd (AECOM) was commissioned by Iluka Resources Limited (Iluka) to conduct an independent audit of the Pit 23 By-Products Disposal Facility Annual Reports addressing the Environment Management Plan (EMP), Rehabilitation and Vegetation Management Plan (RVMP) and Incoming Waste Monitoring Plan (IWMP) for the year ended December 31 2017.

The conditions of the planning permit (15-105) addressing the Pit 23 By-Products Disposal Facility include:

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20: The annual performance report must be reviewed by an independent suitably qualified person with expertise in risk management plans in the context of mines and quarries, and is an environmental auditor appointed under the EP Act 1970.

31: The permit holder must submit an annual performance statement (within the wider EMP annual report).

42: The permit holder must prepare an EMP and Rehabilitation performance review report covering its compliance requirements under the various sub-components of the EMP and R&VMP for provision to a suitably qualified environmental auditor as agreed by the Responsible Authority annually or less frequently as agreed to in writing, by the Responsible Authority.

43: The environmental auditor must review the EMP and Rehabilitation performance review report and provide conclusions on the report's content against its key sub-components, and recommendations for any required amendments to the plans ('auditor's review').

The 2017 annual reports are provided in Appendix A (IWMP) and Appendix B (EMP and RVMP).

The annual reports for 2017 were submitted to Horsham Rural City Council (HRCC) in July 2018. HRCC formed a Technical Reference Group (TRG) and referred the reports to them (email dated 19 September 2018) and received comments which were conveyed to Iluka. Iluka has subsequently responded (see Appendix C).

The reports and audit covered the period from 11 May 2017 (surrender of the MIN and commencement of the Planning Permit condition) to 31 December 2017.

1.2 Review Criteria

1.2.1 IWMP

The review criteria include the relevant elements of the planning permit:

Incoming Waste Monitoring Plan

14. *Within 90 days of the commencement of this permit operating, an Incoming Waste Monitoring Plan (IWMP) must be submitted to the satisfaction of the responsible authority and the Department of Health and Human Services for approval by the responsible authority. Three copies of the IWMP must be submitted to the responsible authority. When approved by the responsible authority the IWMP will be endorsed and it will then form part of this permit. The IWMP must provide for:*

a. A monitoring and reporting system for ensuring that materials disposed of to Pit 23 are limited to those permitted under the conditions of this permit;

b. Recording of the origin, per load weight and radioactive properties of each incoming load;

c. Monitoring to ensure all vehicles transporting waste have fully secured and contained loads and that all waste loads have been transported in compliance with licensed requirements under the Radiation Act 2005;

d. Records of any transport incidents or spills and remedial actions taken in the event of such incidents; and

e. Annual auditing of records to verify compliance with the requirements of the IWMP.

15. *Amendments to the IWMP must be to the satisfaction of the responsible authority and Department of Health and Human Services and must only be made on written approval of the responsible authority.*

1.2.2 EMP

The review criteria include the relevant elements of the planning permit as well as the following elements of the endorsed EMP (Mineral Sands By-Product Disposal Environment Management Plan Iluka Rev. 4, 6 July 2017):

- Chapter 6 with respect to annual risk register review;
- Sections 7.12-7.14; 8.9- 8.11; 9.8-9.10; monitoring as outlined in sections 7, 8, 9 and 10;
- Chapters 12, 13 and 14; and
- Relevant environmental legislation nominated in the EMP.

1.2.3 RVMP

The planning permit requirements are:

42: The permit holder must prepare an EMP and Rehabilitation performance review report covering its compliance requirements under the various sub-components of the EMP and RVMP for provision to a suitably qualified environmental auditor as agreed by the Responsible Authority annually or less frequently as agreed to in writing, by the Responsible Authority.

43: The environmental auditor must review the EMP and Rehabilitation performance review report and provide conclusions on the report's content against its key sub-components, and recommendations for any required amendments to the plans ('auditor's review').

We note that as the pit to the end of 2017 was still receiving materials no rehabilitation and revegetation has occurred.

1.3 Approach

The review criteria noted above included the requirements to

- assess/ audit the information provided in the Annual reports;
- verify compliance with the IWMP; and
- assess Iluka's compliance with the EMP due to the following requirements:

<u>IWMP</u>

14 e. Annual auditing of records to verify compliance with the requirements of the IWMP

<u>EMP and RVMP</u>

EMP section 12.2

Each EMP and Rehabilitation Performance Report will include, at least:

- *A detailed discussion of all non-compliant events including progress toward resolution.*

It was the auditor's view that in assessing the discussion of non-compliant events it was also necessary to assess compliance with commitments in the EMP (in the absence of any non-compliances reported in the annual report).

The audit was performed through a combination of document /data review and onsite inspection conducted on the 7th November 2108. Iluka was provided with a list of documentation required for review, and the site inspection included data review and interviews with those responsible for data collection and management and annual report preparation.

The audit of the IWMP addressed the requirements noted in Table 1 that were sourced from the Planning permit requirements and the specific elements of the IWMP.

The audit of the EMP addressed the requirements noted in Table 2 that were sourced from the planning permit requirements and EMP sections 12.2 and 13.2.

The findings were assessed as:

- Comply - complied with the requirement as described;
- Non-comply - did not comply with the requirement as described;
- Partial Compliance - complied with some aspects of the requirements but not others as described;
- Partial Incorrect Data - generally part of the reported data does not align with the data records;
- OFI - opportunity for improvement, not a compliance issue but would improve outcomes, and
- Not triggered - requirement that could not be met as the timing will be later in the program after this audit period.

A draft report was provided for “Matters of Fact” review by Iluka. The report was then finalised for submission to Stakeholders.

1.4 Environmental Auditor

The audit team was led by Dr Harry Grynberg, a Technical Director with the Melbourne office of AECOM Australia Pty Ltd. Dr Grynberg has over 40 years’ experience and is accredited by the Victorian EPA as an Environmental Auditor (Industrial Facilities) appointed pursuant to the Environment Protection Act 1970. He has significant mining experience including risk management. Projects include: Review of the By Products Disposal facility EMP for Iluka; Lead Compliance Auditor at four Iron Ore Mines, Pilbara, WA; Lead auditor Statutory Audit of Bendigo Mining Environmental Monitoring Programs; EPA Auditor Signoff Unity Mining Rehabilitation Bond Calculation; Advice Holcim Australia Approvals Strategy for Quarry rehabilitation.

1.5 Site Location

The Mineral Sands By-Products approved for disposal to Pit 23 are produced at the Hamilton Mineral Sands Processing Facility located near Hamilton. The Mineral Sands By-Products approved for disposal to Pit 23 are transported by truck to the Douglas Mine site (in the Kanagulk area) and deposited into Pit 23. There are four Crown Allotments (CA) in the Parish of Telangatuk. Pit 23 is located predominantly in CA94.

2.0 Incoming Waste Monitoring Plan

2.1 Requirements

The requirements for the IWMP are provided in section 1.2.1.

2.2 Findings

The findings of the audit are presented in Table 1.

Table 1 Audit of IWMP Annual Report

Requirement	Observations	Compliance status	Recommendations
Planning Permit Clause 14. Within 90 days of the commencement of this permit operating, an Incoming Waste Monitoring Plan (IWMP) must be submitted to the satisfaction of the responsible authority and the Department of Health and Human Services for approval by the responsible authority. Three copies of the IWMP must be submitted to the responsible authority. When approved by the responsible authority the IWMP will be endorsed and it will then form part of this permit. The IWMP must provide for:	IWMP endorsed by council email dated 25 July 2017	Comply	
a. A monitoring and reporting system for ensuring that materials disposed of to Pit 23 are limited to those permitted under the conditions of this permit.	Described in section 5 and 6 of the IWMP. Spreadsheet data observed and annual report reviewed.	Comply	
b. Recording of the origin, per load weight and radioactive properties of each incoming load;	Described in section 5 and 6 of the IWMP. Spreadsheet data observed and annual report reviewed. Radioactivity is reported as ppm Ur and Th. It could be reported as Bq/g.	Partial Incorrect Data. Reported load did not align with hard copy records; (0.2% difference), the reported baghouse dust filter bags were incorrect (2.38T compared to 1.1T reported) and analyses of the baghouse dust filter bags were not obtained before preparation of the report.	Iluka should implement a check/verification of all data included in the annual report. Iluka could consider reporting Radioactivity also as Bq/g as it relates to transport regulatory requirements.
c. Monitoring to ensure all vehicles transporting waste have fully secured and contained loads and that all waste loads have been transported in compliance with licensed requirements under the Radiation Act 2005;	There is a written procedure prepared by the transporter (Kalari)	No truck loads were received during the site inspection.	Inspections associated with the audit should occur during active periods where possible.
d. Records of any transport incidents or spills and remedial actions taken in the event of such incidents	No incidents have been recorded on the Iluka incident data base	Comply	
e. Annual auditing of records to verify compliance with the requirements of the	This audit	Comply	

Requirement	Observations	Compliance status	Recommendations
IWMP.			
15. Amendments to the IWMP must be to the satisfaction of the responsible authority and Department of Health and Human Services and must only be made on written approval of the responsible authority.	No amendments have been made as this is the first year of reporting	Not triggered	
Acceptance criteria			
Acceptance criteria for the materials disposed of are described in the following sections. The acceptance criteria consider three aspects:	These are addressed in the IWMP.		
• source site;	The annual report and associated spreadsheets and hard copy records address these requirements.	Partial Incorrect Data. Reported load did not align with hard copy records; (0.2% difference), the reported baghouse dust filter bags weight was incorrect and analyses of the baghouse dust filter bags for the relevant load were not obtained before preparation of the report.	Iluka should implement a check of all data included in the annual report. Analyses should be conducted in a timely fashion so that rectification can occur if necessary.
• radioactivity; and			
• material description and physical form.			
Source site			
Disposal into Pit 23 is restricted to materials from the following source sites:	The records indicated that only materials from the MSP were accepted.	Comply	
• the Hamilton MSP;			
• the Douglas mineral sands mine;			
• the Kulwin mineral sands mine site (located 28 kilometres east of Ouyen);			
• the Woornack Rownack and Pirro mineral sands mine site (located 20 km southwest of Ouyen);			
• Facilities operated by transport contractors associated with the Port of Portland including the heavy mineral concentrate (HMC) storage and train loading facilities at Hopetoun; and			

Requirement	Observations	Compliance status	Recommendations
• storage facilities in Portland used for storage of the Hamilton MSP products.			
Radioactive materials			
Disposal to Pit 23 is restricted to materials that contain and are contaminated with naturally occurring radioactive material (NORM), which are:	The records indicated that only materials from the MSP were accepted.	Comply	
• mineral by-products from the Hamilton MSP, including gypsum produced at the MSP;			
• used Bag-house dust filter bags (used filter bags); and			
• concrete or steel from the sites listed in section 2.1 above.			
By products for disposal	The records indicated that only materials from the MSP were accepted.	Comply	
• Wet circuits rejects;			
• Dry circuits rejects;			
• Gypsum;			
• Bag-house dust filter bags; and			
• Contaminated concrete and steel.			

Requirement	Observations	Compliance status	Recommendations
Material description & physical form			
In accordance with Condition 6 of the Permit, import for disposal into Pit 23 is restricted to the following materials:	The records indicated that only materials from the MSP were accepted. It was advised that slurry was no longer transported to the site but mixed into other material at MSP to reduce risk of spillage and leakage during transport.	Compliance could not be assessed as no loads were received during the site audit.	
• non-liquid waste by-products associated with or sourced though mineral sands processing undertaken at the Hamilton MSP containing or contaminated with NORM;			
• used dust filter bags from the Hamilton MSP containing or contaminated with NORM; and			
• NORM-contaminated concrete and steel associated with plant and infrastructure from the sites listed in section 2.1 above.			
Monitoring of material quantity and quality			
Load weights			
In accordance with heavy vehicle mass management requirements under Chain of Responsibility legislation administered by the Department of Economic Development, Jobs, Transport and Resources (DEDJTR), the weight of every truck load of material to be disposed of will be measured at the point of loading, or the nearest possible location, prior to transport to the Douglas mine site. The load weight shall be measured by one of the following means:	Weights are measured at the MSP. The calibration records for the weighbridge were observed (UltraHawke P/L dated 08/06/2017)	Comply	
• calibrated weighbridge;			
• calibrated on-board weighing systems (such as airbag weightometers); or			
• any other mass measurement system or methodology approved by the DEDJTR for demonstrating compliance with heavy vehicle mass management requirement.			
Load descriptions			
For each individual load, the following information shall be recorded in an electronic data management system:	Electronic spreadsheet and hard copy records were observed.	Partial Incorrect Data. Reported load did not align with hard copy	Iluka should implement a check of all data included in the annual
• source site;			

Requirement	Observations	Compliance status	Recommendations
• load weight;		records; (0.2% difference), the reported baghouse dust filter bags weight was incorrect and analyses of the baghouse dust filter bags for the relevant load were not obtained before preparation of the report.	report. Analyses should be conducted in a timely fashion so that rectification can occur if necessary.
• material description;			
• radioactive properties, being:			
- concentrations of uranium and thorium in MSP by-products based on the weekly average of the by-products produced;			
- measured concentrations of uranium and thorium in used filter bags, concrete and steel.			
Control of access for disposal			
Prior to transport of materials to be disposed of in Pit 23, vehicles will be checked:	No records of vehicle checks are held. The transport contractor (Kalari) has a number of procedures that have been reviewed.	Compliance with this requirement could not be assessed as there were no deliveries during the site inspection.	Inspections associated with the audit should occur during active periods where possible.
• for compliance with the ARPANSA Code of Practice for Safe Transport of Radioactive Material; and			
• to confirm and ensure loads are fully secured and contained.			
Deliveries must enter the site via Elliotts Road and the mine access road shown on the site plan (Figure 2).			
All vehicles entering the site, including those carrying materials for disposal to Pit 23, must be authorised and must pass through a boom gate that may only be opened with a swipe card issued to authorised personnel or by an authorised Iluka employee at the site office. Each vehicle must hen stop at the site office to:			
• provide a record of the load being delivered (origin, material type, load weight); and			
• comply with any site-specific requirements that apply for entering the site.			
Vehicles carrying materials for disposal for which the required information is not provided or is not in conformance with the permitted use will not be allowed to dispose of their loads to Pit 23.			

<table>
<tr><th>Requirement</th><th>Observations</th><th>Compliance status</th><th>Recommendations</th></tr>
<tr><td>Monitoring program</td><td></td><td></td><td></td></tr>
<tr><td>Routine sampling</td><td></td><td></td><td></td></tr>
<tr><td>The sampling program for the MSP by-products disposed of at Douglas has been developed to reflect the operational requirements of the MSP, while also meeting the requirements of the Permit.</td><td></td><td></td><td></td></tr>
<tr><td>Mineral separation plant by-products</td><td></td><td></td><td></td></tr>
<tr><td>In order to confirm the presence of NORM within the MSP by-products, Table 2 in the IWMP specifies the samples collected and quantity measurements made:
<table>
<tr><th></th><th>Sampling Method</th><th>Quantity</th></tr>
<tr><td colspan="3">Wet Circuits Rejects</td></tr>
<tr><td>FPC Sand Tailing</td><td>Automatic Sampler within plant producing daily composite from frequent cuts</td><td>Continuous flow and density measurement to provide daily solids tonnage</td></tr>
<tr><td>FPC Fines</td><td>Manual sample from thickener underflow collected daily</td><td>Continuous density measurement and volume measurement from positive displacement pump operation to provide daily solids tonnage</td></tr>
<tr><td>ZWC Sand Tailings</td><td>Automatic Sampler within plant producing daily composite from frequent cuts</td><td>Continuous flow and density measurement to provide daily solids tonnage</td></tr>
<tr><td colspan="3">Dry Circuits Rejects</td></tr>
<tr><td>PDC Non-Conductor magnetics</td><td>Automatic Sampler within plant producing daily composite from frequent cuts</td><td>Weightometer integrated to provide daily tonnage.</td></tr>
<tr><td>DCC Magnetics</td><td>Automatic Sampler within plant producing daily composite from frequent cuts</td><td>Weightometer integrated to provide daily tonnage.</td></tr>
<tr><td>Gypsum</td><td>Manual sample from bunker collected daily</td><td>Continuous density measurement and volume measurement from positive displacement pump operation to provide daily solids tonnage</td></tr>
</table></td><td>The MSP was not operating so it was not possible to access the data.</td><td>Compliance could not be assessed.</td><td>Inspections associated with the audit should occur during active periods, where possible.</td></tr>
</table>

Requirement	Observations	Compliance status	Recommendations
Bag-house dust filter bags			
Prior to transport, sections of used filter bag cloth of approximately 100 x 100 mm will be cut from at least five used filter bags per consignment and each section submitted for analysis.	It was reported in the 2017 report that only one load of filter bags was sent, dated 24/10/17. Five samples were not submitted to lab until October 2018.	Comply	Analyses should be conducted in a timely fashion so that rectification can occur if necessary.
NORM contaminated concrete and steel			
The sampling method applied will be dependent on the precise nature of the material and will be developed and applied on a case-by-case basis. Representative samples of each consignment will be collected and submitted for analysis	No concrete was disposed of to pit 23 based on the records reviewed.	Comply	
Analysis			
Mineral separation plant by-products			
Analysis of MSP by-products is undertaken as follows:	Analytic procedures were provided and discussed with the Iluka Lab Manager. There were no analyses undertaken at the time of the site inspection as the MSP had been shut down late 2017.	Comply. Note that the Iluka laboratory is not NATA registered.	Analysis used to demonstrate compliance with regulated environmental requirements should be conducted in Laboratories accredited by NATA.
• desiccation within the MSP laboratory oven to remove moisture;			
• pulverisation (as required) to produce a fine granular matrix;			
• splitting to produce a representative sample of appropriate size;			
• fusion of the sample to produce a glass bead; and			
• assay of the bead using an X-Ray Fluorescence Spectrophotometer to determine the concentrations of uranium and thorium.			
The assay results are uploaded into Iluka's production statistics database as are the results of tonnage measurements of the various streams. The data is then used to calculate the uranium and thorium concentrations in each of the wet circuits rejects, dry circuits rejects and gypsum			

Requirement			Observations	Compliance status	Recommendations
Bag-house dust filter bag Samples					
Analysis of filter bag samples will be undertaken at either Iluka's Hamilton laboratory or an external laboratory to determine the concentrations of uranium and thorium.			Sample was analysed in October 2018.	Comply, Analyses were conducted in an external NATA accredited laboratory.	Analyses should be conducted in a timely fashion so that rectification can occur if necessary.
NORM contaminated concrete and steel samples					
Samples of NORM contaminated concrete and steel will be analysed at either Iluka's MSP lab an external laboratory to determine the concentrations of uranium and thorium.			There were no records of concrete and steel being disposed to pit 23; therefore, no analyses required.	Not triggered	
Summary of monitoring program					
Aspect	**Monitoring Method**	**Monitoring frequency**			
Concentration of uranium and thorium in MSP mineral by-product	Sampling and analysis of by-product streams plus tonnage measurements to enable calculation of the concentrations of thorium and uranium in each of the following: • wet circuits rejects; • dry circuits rejects; • gypsum.	Weekly	Data records reviewed.	Comply	
NORM contamination of MSP dust filter bags	Sampling of at least five (5) dust filter bags and analysis to determine concentration of uranium and thorium.	Per consignment	Data records reviewed (analysed in October 2018).	Comply	
NORM contamination of concrete and steel	Collection and analysis of a representative sample of each consignment to determine NORM contamination levels.	Per consignment	Data records reviewed.	Comply	

Requirement			Observations	Compliance status	Recommendations
Source site	Recording of source site.	Per load	Data records reviewed.	Comply	
Material description	Recording of material description, being either one or a mixture of: • wet circuits rejects; • dry circuits tailings; • gypsum; or • non-mineral waste	Per load	Data records reviewed.	Comply	
Weight	Determined by a mass measurement system approved by the Department of Transport for demonstrating compliance with heavy vehicle mass management requirements.	Per load	Data records reviewed.	Comply	
Reporting					
All data generated from the monitoring described above will be recorded electronically in a data base managed by Iluka. On an annual basis a report will be prepared showing the following:			The annual report was reviewed. It includes these elements and was consistent with the hard copy data and spreadsheets reviewed, except that reported loads did not align with hard copy records, records of the baghouse dust filter bags were incorrect and analyses of the baghouse dust filter bags were not obtained before preparation of the annual report.	Partial Incorrect data. Reported load did not align with hard copy records; (0.2% difference), the reported baghouse dust filter bags were incorrect and analyses of the baghouse dust had not been undertaken in the report period or shortly thereafter. Partial Compliance The report was audited after submission to the HRCC	Iluka should implement a check of all data included in the annual report.
• For each load:					
• source site;					
• load weight					
• radioactive properties, being:					
- assigned concentration of uranium and thorium in MSP mineral by-products, based on weekly averages of by-products produced; and					
- measured concentrations of uranium and thorium in used filter bags, concrete or steel.					
• For the report period:					
• average concentration of uranium and thorium for the MSP by-products, used filter bags, concrete and steel;					

Requirement	Observations	Compliance status	Recommendations
• total quantities of materials disposed of to Pit 23; and			
• records of any transport incidents or spills and remedial actions taken in the event of such incidents.			
The annual report will be provided to a suitably qualified auditor who will complete an audit of the data provided and compliance with this IWMP.	This audit report responds to the requirements.	Comply	
Copies of the annual report and the audit report will be submitted to the Responsible Authority.	Iluka advised that the Annual report was provided to HRCC in June 2018 in order for HRCC to assess the contents as being suitable rather than formal submission. The auditor was appointed after receipt of comments from HRCC. The submitted report should be audited before submission and submitted together with the audit report.	Compliance not assessed	The auditor should review the annual report before issuing to the responsible Authority. Any comments/issues should be incorporated into the report before submission together with the auditor's report.
IWMP review			
This IWMP shall be reviewed and amended if necessary to take account of:	Given the report was the first it will be appropriate to assess the contents and approach. One could consider the placement of the MSP into a care and maintenance mode as a significant change in operations.	Not triggered	Implement the recommendations included in this report.
• advances in knowledge and technology pertaining to by-product disposal;			
• any significant change in operations;			
• changes in applicable legislation or standards;			
• changes in Iluka's EHS standards;			
or every two (2) years, which-ever occurs soonest.			

Requirement	Observations	Compliance status	Recommendations
Proposals for amendment of this plan will be prepared to the satisfaction of the Responsible Authority and the Department of Health and Human Services.	No amendments have been made as this is the first year of reporting.	Not triggered	

3.0 Environment Management Plan and Rehabilitation Performance Report

3.1 Requirements

The requirements were outlined in section 1.2.2.

3.2 Findings

The findings of the audit are presented in Table 2

Table 2 Audit of the EMP and Rehabilitation Annual Report

Requirement	Observations	Compliance	Recommendations
Planning Permit Clause 20. The annual performance report must be reviewed by an independent suitably qualified person with expertise in risk management plans in the context of mines and quarries and appointed under the *Environment Protection Act 1970* pursuant to Condition 11.	This audit report addressed the requirement	Comply	
Planning Permit Clause 21. The permit holder must amend the EMP to address any relevant issues, or changes or recommendations of the independent environmental reviewer to the satisfaction of the responsible authority. Amended EMPs are to be placed on the Permit Holder's website from the time of endorsement by the Responsible Authority.	This is the first annual report and audit, so no changes have occurred to date	Not Triggered	
Planning Permit Clause 22. No changes are to be made to the approved use and development or operational practices that may affect environmental quality under the scope of the EMP, unless these have been approved within a revised EMP and monitoring program by the responsible authority.	This is the first annual report and audit, so no changes have occurred to date	Not Triggered	
EMP 12.2 Reporting			
A review of performance will be completed and an EMP and Rehabilitation Performance Report prepared annually, or less frequently as may be agreed with the Responsible Authority.	An annual report has been prepared and submitted to the responsible authority in June 2018 for the 2017 calendar year. No reference has been made to the Rehabilitation and Vegetation Management Plan. Iluka advised that as the pit is operational no action is required.	OFI. There was no mention of the RVMP in the report other than the title.	The report should address the Rehabilitation and Vegetation Management Plan, even if this means reporting that no action has been undertaken due to continued Pit 23 operations.

Requirement	Observations	Compliance	Recommendations
Each EMP and Rehabilitation Performance Report will include, at least:			
• for the period from the previous EMP and Rehabilitation Performance Report:			
- the total tonnage of materials disposed of;	This is included in the 2017 EMP&R Performance report and was audited through the IWMP annual report. Issues were identified with the reported truck load weights as noted in the IWMP review in Table 1. There was a variation of 0.2% between the audited weights and the reported weights. This was most likely due to transcription errors.	Partial Incorrect Data. There was a variation of 0.2% between the reported numbers and the audited numbers	See recommendation for the IWMP Annual report
- the average and maximum number of deliveries of materials for disposal per day; and	This is included in the 2017 EMP&R Performance and was audited through the IWMP annual report. The reported annual average was 3.6 per day compared to 3.7 audited due to rounding down. The audit also identified a maximum of 12 deliveries per day (on three occasions) compared to a reported maximum of 10.	Partial Incorrect Data due to reported error in maximum deliveries.	Iluka should implement a check of all data included in the annual report
- the results of all measurements of:			
▪ noise levels made in response to a complaint regarding noise;	No complaints were received and no monitoring was conducted	Not triggered	
▪ PM10 concentrations in air at sensitive receptors;	Data was reported and showed no non-compliances. The monitoring frequency is in accordance with the EMP requirements except for missing data for the Rises (5 Oct.18) and Lyons (4 Dec18). However, for part of the year, to September 2017, the HiVol filter papers were not weighed in a NATA accredited laboratory as specified in the EMP. Since then, a NATA	Non-compliance with the EMP with respect to use of a non-NATA laboratory and response to PM_{10} precautionary trigger level	Iluka should ensure that monitoring for compliance purposes be undertaken by appropriately accredited laboratories. Staff should review the requirements of the EMP

Requirement	Observations	Compliance	Recommendations
	accredited laboratory has been used. The precautionary trigger level nominated in the EMP was exceeded (50 µg/m^3) as reported in Figure 3 and no documented action appears to have been undertaken.	exceedance.	from time to time to ensure implementation of the commitments. Response to trigger level exceedance should be documented.
▪ environmental radiation monitoring results in accordance with the approved Radiation Management Plan, which will generally include:			
- radon concentration in air;	Data was reported and showed no non-compliances. The sampling program is not specified in the EMP but is included in the Radiation Management Plan -Murray Basin Operations and was complied with.	Comply	
- gross alpha activity concentration of airborne dust; and	Data was reported and is consistent with the lab reports. The sampling program is not specified in the EMP but is included in the Radiation Management Plan -Murray Basin Operations and was complied with.	Comply	
- radionuclide concentrations in groundwater and surface water	Groundwater Data was reported and showed no non-compliances with trigger levels. The monitoring program was consistent with the EMP requirements. A check of the Lab sheets and Table 3 found that there were a number of inconsistencies e.g. Limit of detection errors <001 instead of <0.002, date errors (12 July instead of 13 July noted on Lab report). <0.025 reported where there was no analysis for WRK303 and 304 on 25 July). Surface Water Data was reported and did not exceed trigger values. The monitoring was consistent with the EMP except as reported in section 5.5 of the Annual report.	Partial Incorrect Data	Iluka should implement a check of all data included in the annual report

Requirement	Observations	Compliance	Recommendations
▪ the results of all measurements of groundwater level and quality;	The reported results are consistent with the requirements of the EMP except as noted in section 5.5 of the annual report. The results were presented in graphs but not in tables. The presentation of the results in appendix C does not allow any assessment or trend analysis. Comparison with historic data would also assist understanding longer term trends.	OFI	Data presentation should include historic trends to identify any changes.
▪ the results of and actions taken in response to monitoring bore audits;	This was reported in section 5.1 of the annual report	Comply	
- discussion of any implications of the results of groundwater level monitoring on groundwater flow paths from Pit 23; and	This was addressed in section 5.2 of the annual report and is acceptable	Comply	
- descriptions of any model review and recalibration completed and the results of subsequent model re-runs;	This was addressed in section 5.3 of the annual report and is acceptable	Comply	
• the maximum elevation of the upper surface of materials disposed of at the end of the reporting period	The survey data was reviewed.	Comply	
• a detailed discussion of all non-compliant events including progress toward resolution;	This was discussed with respect to non-compliance with monitoring programs in section 5.5. However, during the course of the audit, a number of non-compliances with the EMP were identified in addition to those noted above. **Dust deposition**: a number of samples had elevated results (above 4g/m^2/m). These were reported by Iluka to be mainly due to impacts from bird excreta. Field notes did not always reflect this. **Weed Management**: quarterly inspections have not been undertaken or associated management action. **Vehicle Hygiene**: inspections not documented.	Partial Compliance due to a number of the inspections required by section 10 of the EMP, either not being conducted or documented.	Iluka has a monthly Douglas site inspection and report. Some of the inspections required by the EMP could be included. The EMP could be reviewed and the requirements for inspections not already included in the working calendar for the site should be added.

Requirement	Observations	Compliance	Recommendations
	Feral animals: inspections have not been conducted. **Geotechnical stability**: an annual inspection is conducted, the 2017 report was seen. **Safety and security**: inspections have not been documented other than monthly walkovers, Monthly downloads of camera surveillance data have not occurred. The camera (north of Pit 23) includes a vision trigger that generates a photo, alarm and incident report. No incidents were generated in 2017.		
• a summary of comments and complaints received and resulting actions;	This was addressed in section 5.6 of the annual report and is acceptable	Comply	
• plans for the next reporting period; and	This was addressed in section 5.7 of the annual report and is acceptable.	Comply	
• discussion on other matters considered relevant by the Responsible Authority or Iluka.	Not applicable.	N/A	
Deficiencies identified in an EMP and Rehabilitation Performance Report that can be addressed without amendment of this plan will be addressed as soon as practicable.	The main deficiency identified by Iluka in the report was non-compliance with parts of the monitoring plan, and these have been addressed.	Comply	
EMP and Rehabilitation Performance Reports will be subject to review by an independent auditor as described in section 13.2 of the EMP (Performance Review).	This review fulfils this requirement.	Comply	
EMP Section 13.2 Performance review			
The performance review function is, in part, an audit function in that the selected auditor will be required to audit EMP and Rehabilitation Performance Report to confirm its completeness and accuracy in terms of compliance of the implementation of the plan and compliance with established standards and limits.	This audit report addresses the requirement.	Comply	

Requirement	Observations	Compliance	Recommendations
In addition to these audit functions the selected auditor will be invited to recommend amendments to the EMP to ensure future compliance.	This audit report addresses the requirement.	Comply	
There are a number of requirements of the expert in this case, including: • EPA auditor accreditation; • independence (from Iluka); • suitable qualifications; • expertise in risk management plans in the context of mines and quarries; and • to the satisfaction of the Responsible Authority. It is extremely unlikely that an expert meeting all of these requirements exist, however, an expert may choose to direct the work of others. A scope of works will be prepared and a number of EPA accredited auditors asked to submit proposals for the completion of performance reviews. Iluka will select the best candidate and provide the Responsible Authority with details of the candidate and their proposal for completion of works. The Responsible Authority may indicate its agreement with the candidate selected or request that details of an alternative be provided.	Iluka selected Dr Harry Grynberg as meeting these criteria. Adam Moar (HRCC) confirmed that HRCC agreed with the appointment.	Comply	
A copy of the selected auditor's report will be provided to the Responsible Authority with each EMP and Rehabilitation performance review report.	Iluka advised that the Annual report was provided to HRCC in June 2018 in order to assess the contents as being suitable rather than formal submission. The auditor was appointed after receipt of comments from HRCC. The submitted report should be audited before submission and submitted together with the audit report.	Compliance not assessed	The auditor should review the annual performance report before issuing to the responsible Authority. Any comments/issues should be incorporated into the report before submission together with the auditor's report.
Any deficiencies identified or recommendations made by the auditor will be dealt with in accordance with Conditions 44 and 45 of the Permit, which require:	This is the first annual report and audit, so no changes have occurred to date	Not triggered	

Requirement	Observations	Compliance	Recommendations
• Copies of the EMP and Rehabilitation Performance Report and the auditor's report to be provided to the Responsible Authority with 28 days of receipt of the auditor's report	This is the first annual report and audit, so this could not be assessed.	Not triggered	
• A description of steps to be taken, including timeframes, to address any non-compliance and recommendations identified in the EMP and Rehabilitation Performance Report and the auditor's report be provided to the Responsible Authority within 28 days of submission of the EMP and Rehabilitation Performance Report to the Responsible Authority; and	This is the first annual report and audit, so this could not be assessed.	Not triggered	
• The Responsible Authority to determine whether amendment to the EMP or R&VMP is required and the timeframe and conditions under which such amendment is to occur.	This is the first annual report and audit, so this could not be assessed.	Not triggered	

4.0 Rehabilitation and Vegetation Management Plan

4.1 Requirements

The requirements are outlined in section 1.2.3. The RVMP was included in the annual report entitled Environment Management Plan and Rehabilitation Performance report.

4.2 Findings

We note that as Pit 23 was still receiving materials to the end of 2017, no rehabilitation and revegetation has occurred. We suggest that for completeness the annual report include a statement to that effect.

5.0 Other Aspects

5.1 Other Compliance Issues

A small number of other issues were identified that do not specifically relate to the report scope or the planning permit but relate to compliance with commitments or action in the EMP.

Requirement	Observation	Compliance	Recommendation.
EMP section 6: An annual review of the risk register	The auditor was advised that the risk register has not been updated.	Non-comply	An annual review of the Risk Register should be conducted. This is also a requirement of the Iluka Risk and Hazard Management Standard.

5.2 TRG Review and Iluka Response

The auditor was provided with the TRG review and Iluka response. The key issue and concerns in the TRG review were the impacts identified at McGlashin's Swamp. This resulted in requests for expanded monitoring including implementation of additional groundwater bores (as planned by Iluka), implementation of expanded surface water monitoring, updating the groundwater model (as planned by Iluka) and the need for a report on the McGlashin's Swamp issue before waiting for the 2018 annual report.

Iluka responded with respect to McGlashin's Swamp issue that a precautionary trigger in the EMP had been exceeded (in two sampling events) and not an upper trigger. The EMP requires detailed response and reporting only required for an upper trigger exceedance. Iluka committed to undertaking actions including additional monitoring, a formal seepage impact assessment and a hydrogeological model update. Iluka also committed to producing a report on these activities by 30 November 2018.

It is the auditor's view that the scope of the response is appropriate. Given the second precautionary trigger exceedance was in September 2017 the timing of the response report (although not required by the EMP), being November 2018, 14 months later, could be improved.

The auditor notes that consideration of cessation of disposal of materials to Pit 23 is part of the trigger response plan. This has in effect occurred since early 2018.

The Iluka response indicates that there has been agreement with HRCC that annual reports will be produced on the 30th June in the following year. Annual reporting six months after end of the year under consideration does not provide an adequate response time, particularly if issues have arisen.

As raised by Iluka in discussion, it is possible to produce a six-monthly report. The auditor recommends that the report be submitted 3 months after completion of the six-month period. As noted in Table 2 an important aspect that is the trend data that was absent for groundwater and surface water in the 2017 performance report except for radionuclides.

5.3 Changes in Environmental Regulation

Since issuing of the EMP and RVMP, two important revisions of environmental regulations have occurred. The Environment Protection Act 1970 is to be replaced by Environment Protection Amendment Act 2018.

The EPA advises that the Government intends for the amended 2017 Act to commence on 1 July 2020. When it commences, the amended Act will give EPA enhanced powers and tools to prevent risks to the environment and human health as well as the ability to issue stronger sanctions and penalties which hold environmental polluters to account.

A centre piece of the legislation is a new general environmental duty which will require businesses and individuals conducting activities that pose a risk to human health and the environment to understand those risks and take reasonably practicable steps to eliminate or minimise them. In an Australian first, the general environmental duty is criminally enforceable.

The SEPP (Waters of Victoria) and SEPP (Groundwaters of Victoria) have been replaced by the SEPP (Waters). The SEPP (Waters) commenced on 19th October 2018.

It is recommended that Iluka review both the revised Act and SEPP for relevance to the EMP and update the EMP as necessary.

6.0 Conclusions and Recommendations

The Hamilton Mineral Separation Plant (MSP) was placed into care and maintenance mode in late 2017. Therefore, a number of activities could not be inspected during the Site visit.

The opportunities for improvement have a common theme, being the need to implement checking/verification of all the data included in the annual reports. The data anomalies identified for tracking of incoming waste loads are highly unlikely to have increased the risks from the operations or the impacts on the environment.

The placing of the Hamilton MSP into care and maintenance mode is a significant event that should generate a reassessment of the risks from current operations and potentially modifications to the EMP. This should include the current staffing of the site.

It is the auditor's view that in relation to the McGlashin's Swamp trigger exceedance, the scope of the response indicated by Iluka in its response to the TRG comments is appropriate. Given the second precautionary trigger exceedance was in September 2017 the timing of the response report (although not required by the EMP), being November 2018, could be improved. The specific recommendations from the audit are as follows:

6.1 IWMP:

- Iluka should implement a check/verification of all data included in the annual report.
- Inspections associated with the audit should occur during active periods where possible.
- Analyses used to demonstrate compliance with regulated environmental requirements should be conducted in Laboratories accredited by NATA.
- Analysis should be conducted in a timely fashion so that rectification can occur if necessary.
- The auditor should review the annual report before submission to the responsible authority. Any comments/issues should be incorporated into the report before submission together with the auditor's report.

6.2 EMP and Rehabilitation Performance Report:

- The report should address the Rehabilitation and Vegetation Management Plan, even if this means reporting that no action has been undertaken due to continued Pit 23 operations.
- Historic Surface Water and Groundwater data should be presented to identify trends and anomalies.
- Responses to exceedances of precautionary trigger levels should be documented.
- Iluka has a monthly Douglas site inspection and report. Routine inspections required by the EMP could be included in the site inspection protocol.
- The auditor should review the performance report before issuing to the responsible Authority. Any comments/issues should be incorporated into the report before submission together with the auditor's report.
- An annual review of the Risk Register should be conducted. This is also a requirement of the Iluka Risk and Hazard Management Standard.
- The EMP could be reviewed and the requirements for inspections included in a working calendar for the site.
- The auditor agrees with Iluka's proposal that an EMP and Rehabilitation Performance Report be prepared and submitted for each six-month period. The auditor suggests that the report be submitted within 3 months after completion of the six-month period.
- It is recommended that Iluka review both the Environment Protection Amendment Act 2018 and SEPP (Waters) for relevance to the EMP and update the EMP as necessary.

7.0 References

20180924 Iluka Pit 23 - 2017 EMP and Rehabilitation Performance Report RFP FINAL (Rev02)

Iluka Resources Ltd Planning Permit 15-105 (Pit 23) EMP & Rehabilitation Performance Report 2017 (FINAL)

Incoming Waste Monitoring Plan (Rev 4) 5 April 2017

Environment Management Plan (Rev 4)6 July 2017

Rehabilitation and Vegetation Management Plan (Rev2) 12 April 2017

20180919 HRCC (Adam Moar) - Summary comments from TRG on 2017 Annual Reports 19 September 2018

20181002 Iluka Resources Pit 23 - 2017 Performance Reports - Iluka responses to TRG feedback. 2 October 2018

Lab Reports radionuclides-EML Chem. – Groundwater May 2017-December 2017

Lab Reports radionuclides-ALS– Groundwater May 2017-December 2017

Lab Reports radionuclides-ALS - Surface Water May 2017-December 2017

Lab Reports radionuclides-EML Chem. - Surface Water May 2017-December 2017

Dust Deposition Analysis Reports Ectimo. May 2017-December 2017

Certificates of Analysis Gross Alpha in Dust SGS Radiation Services May 2017-December 2017

Certificates of Analysis Radon and Thoron SGS Radiation Services May 2017-December 2017

MSP Baghouse Filter Analysis EML Chem. 30/10/2018

Laboratory PM_{10} Data-SGS September –December 2017

Iluka Waste Tracking Spreadsheets May 2017-December 2017

Iluka Waste Tracking Record Book May 2017-December 2017

Email dated 25 July 2018 Adam More HRCC confirming endorsement of management Plans

Iluka Analytic Sampling Procedures:

- Analytical - Analysis using XRF 11/6/15
- Analytical - Moisture Determination 10/9/15
- Analytical - Sample Preparation - Fusion of Heavy Mineral 4/12/08
- Analytical - Sample Preparation - Pulverising Grinding Samples 18/10/14
- Analytical - Sample Preparation - Riffle Splitting 23/10/14
- Analytical - XRF QA 23/7/18
- High Volume Air Sampler, Sampling Procedure 26/7/17

Trucking Procedures

- Work Instruction for Loading of Monazite &Ilmenite CL product at Iluka MSP V8 Kalari P/L
- Emergency Response Procedure for Non Conductor Magnetics V2 Kalari P/L
- Work Instruction for unloading MSP rejects at Pit 23 V2 Kalari P/L

8.0 Limitations

Dr Harry Grynberg (Technical Director – Environment) along with his support team from AECOM Australia Pty Ltd has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Iluka Resources Limited and Horsham Rural City Council. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the proposal dated 1 October 1018.

It is acknowledged that the report may be used by Iluka Resources Limited and Horsham Rural City Council in reaching conclusions about the site. The scope of work performed in connection with the audit may not be appropriate to satisfy the needs of any other person. Any other person's use of, or reliance on, the Report, or the findings, conclusions, recommendations or any other material presented to them, is at that person's sole risk.

The review and this report were prepared between October 2018 and November 2018 and is based on the conditions encountered and information reviewed at the time of preparation. AECOM disclaims responsibility for any changes that may have occurred or may occur after this time.

The methodology adopted and sources of information used by Dr Harry Grynberg and the support team are outlined in this report. Dr. Harry Grynberg and the support team have made no independent verification of this information beyond the agreed scope of works and we assume no liability for any inaccuracies in or omissions to that information. No indications were found during our investigations that information used as basis for this report as provided to Dr Harry Grynberg and the support team was false.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. This Report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Except as required by law, no third party may use or rely on this report unless otherwise agreed by AECOM, in writing. Where such agreement is provided, AECOM will provide a letter of reliance to the agreed third party in the form required by AECOM.

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Appendix A

IWMP Annual report

Iluka Resources Limited
Mineral Sands By-Product Disposal

Planning Permit 15-105

Crown Allotments 91, 94, 95, 96
Parish of Telangatuk

Incoming Waste Monitoring Plan
Annual Report – 2017

Iluka Ref: TRIM 2004810

Contact:
Nick Travers
Environment Superintendent, Murray Basin
Nick.Travers@iluka.com

Document control

Revision	Details of review or changes	Prepared by	Date created	Document reference
Draft_v01	Original draft	S. Alexander	20-06-2018	---
Draft_v02	Technical peer review	M. Little	29-06-2018	---
Final	Approved report for external issue	N. Travers D. Menzel	29-06-2018	2004810

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1 Executive Summary

Iluka Resources Limited (Iluka) disposes of heavy mineral processing by-products generated by its mineral separation plant (MSP), located near Hamilton in the Southern Grampians Shire, to a mining void at its Douglas Mine. The void, known as Pit 23, is located at the Douglas Mine in the Kanagulk area and within the municipality of the Horsham Rural City.

This report is submitted in accordance with Section 6 of the endorsed Iluka Mineral sands By-product Disposal Incoming Waste Monitoring Plan (IWMP); the report provides a summary of the wastes received into Pit 23 (origin, volumes/weights and radioactive properties) and records of incidents and remedial actions applicable to the reporting period of 11th May 2017 to 31st December 2017.

The abridged date of the 2017 reporting period covered herein reflects the date of commencement of Planning Permit 15-105, this being the date of the excision of Pit 23 from the Douglas Mining Licence (MIN5367).

Key commentary on monitoring outcomes and performance against compliance objectives in the IWMP for the 2017 reporting period:

- A total of 33,845 tonnes of by-product material sourced from the Hamilton MSP was transported to Pit 23;
- Average concentration for Uranium and Thorium for materials delivered to Pit 23 was 254ppm and 3873ppm, respectively;
- An average of 3.6 loads of material per day was received into Pit 23, with a maximum of 10 loads of material received per day at any one time.
- No transport incidents or spillages occurred;

Summary incoming waste data and incident information is provided in Section 3 of the enclosed report, with detailed waste data provided in Appendix 1.

2 Introduction

Iluka Resources Limited (Iluka) disposes of heavy mineral processing by-products generated by its mineral separation plant (MSP), located near Hamilton in the Southern Grampians Shire, to a mining void at its Douglas Mine. The void, known as Pit 23, is located at the Douglas Mine in the Kanagulk area within the municipality of the Horsham Rural City (Figure 1 and Figure 2).

2.1 Planning Permit 15-105

Under the Horsham Planning Scheme the subject land is in the Farming Zone and under the provisions of that zone a permit is required for use and development for Industry (Refuse Disposal). On 25th February 2017 Planning Permit 15-105, (the Permit) was issued by the Horsham Rural City Council as the Responsible Authority to allow:

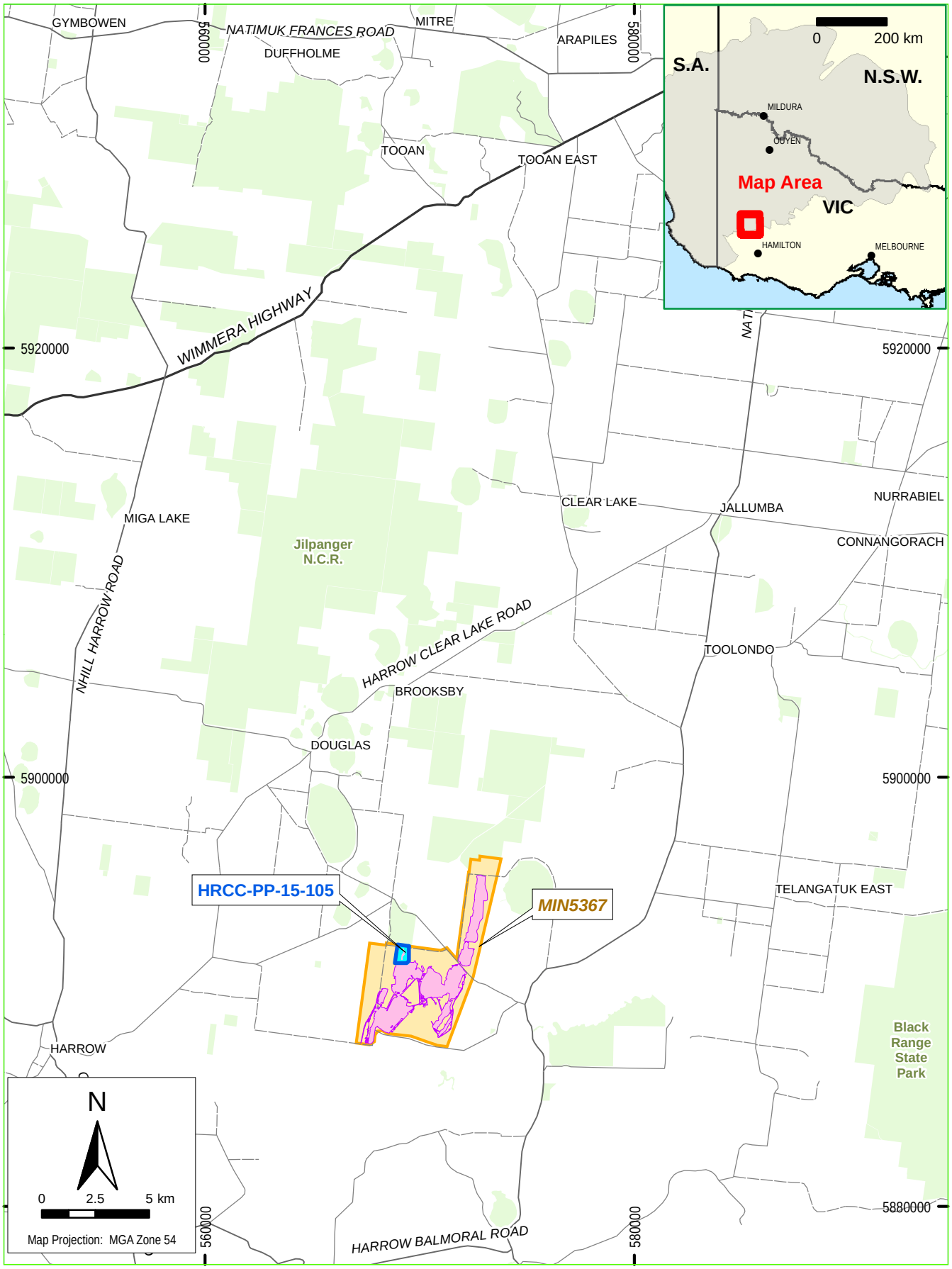
> *Use and development of the land for the disposal of waste by-products associated with or sourced through mineral sands processing undertaken at the Hamilton Mineral Separation Plant (MSP), including waste by-products and contaminated materials resulting from the processing and transport operations as follows:*
>
> - *By-products from the processing of heavy mineral concentrate at the Hamilton MSP;*
> - *used dust filter bags from the Hamilton MSP; and*
> - *Other chemically inert material contaminated with naturally occurring radioactive material.*
>
> *in accordance with the endorsed plans.*

2.2 Commencement of the Permit

Condition 1 of the Permit states:

> *This permit does not come into operation until:*
>
> *a. Iluka has applied to the Department of Economic Development, Jobs, Transport and Resources to vary the 2003 Work Plan to identify a new endues utilisation of Pit 23 and to vary the rehabilitation plan; and*
>
> *b. Iluka has applied to the Minister to surrender part of MIN 5367 (Pit 23); and*
>
> *c. The Department of Economic Development, Jobs, Transport and Resources has approved the Work Plan Variation; and*
>
> *d. The Minister has registered the partial surrender of MIN 5367.*
>
> *The permit comes into operation on the same day the Work Plan Variation is approved, and the partial surrender of MIN 5367 is registered.*

The Variation to the 2003 Douglas Mine Work Plan was approved on the 13th April 2017, and the partial surrender of MIN5367 was registered on 11th May 2017, being the date of commencement of the Permit.



Legend

- Douglas mine
- Pit 23
- HRCC-PP-15-105
- MIN5367 tenement

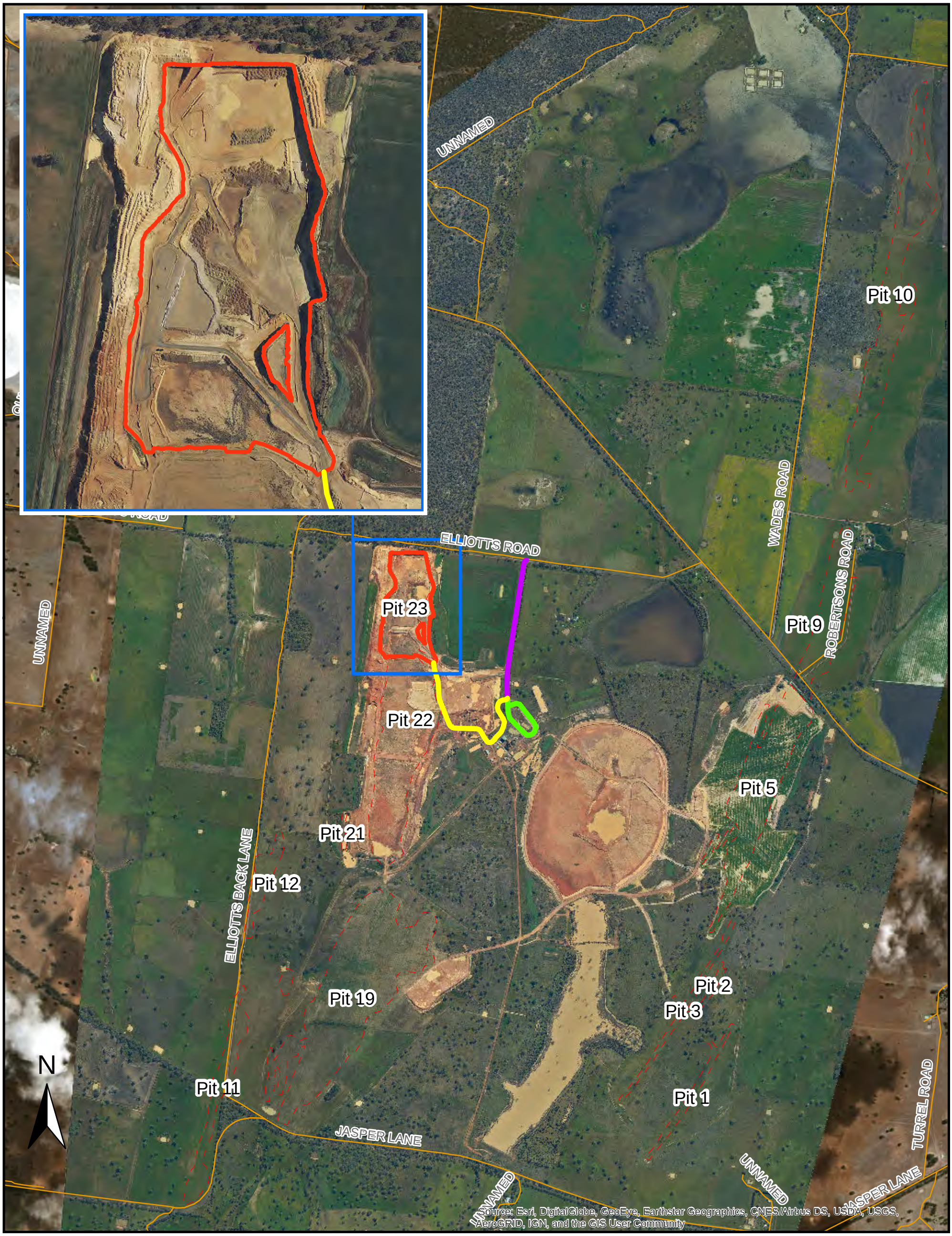
DOUGLAS

LOCATION PLAN

ILUKA

ORIG: N.Travers DRAWN: D.G.S. SCALE: 1:250,000 (A4) DATE: May 2018 DWG No: 247670 ver.00

FIGURE: 1



Legend

- Pit 23 haul road
- Mine Access Road
- Truck wash circuit
- Pit 23 crest
- Pit Crests
- Roads

0 250 500 1,000 1,500 2,000 Meters

LOCATION OF PIT 23

ILUKA

L:\Maps\2018\Unregistered\Douglas\mxd\Pit 23 Annual Report 2017 DRAWN: N. Travers DATE:26/06/2018

FIGURE: **2**

2.3 Endorsed Plans

Conditions 2, 3, 9, 14, 16 and 34 of the Permit relate to various management plans that once approved by the Responsible Authority will be endorsed to form part of the Permit, which includes:

- Incoming Waste Monitoring Plan (IWMP);
- Environmental Management Plan (EMP), incorporating;
    - Groundwater Monitoring and Management Plan (GWMMP);
    - Surface Water Monitoring and Management Plan (SWMMP);
    - Air Quality/Dust Control Plan (AQMP); and
- Rehabilitation and Vegetation Management Plan (R&VMP)

The plans were endorsed by Horsham Rural City Council on 17th July 2017.

2.4 Permit condition requirement for an IWMP

To ensure compliance with the permitted use (Section 2.1) the Permit includes the following condition requirement for an IWMP:

Incoming Waste Monitoring Plan

14. *Within 90 days of the commencement of this permit operation, an Incoming Waste Management Plan (IWMP) must be prepared to the satisfaction of the Responsible Authority in consultation with the Department of Health and Human Services for the approval by the responsible authority. Three copies of the plan must be provided to the responsible authority. When approved by the responsible authority the IWMP will be endorsed and it will then form part of this permit. The IWMP must provide for*

    a) A monitoring and reporting system for ensuring that materials disposed of to Pit 23 are limited to those approved under the conditions of this permit;

    b) Recording of the origin, per load weight and radioactive properties of each incoming load;

    c) Monitoring to ensure all vehicles transporting waste have fully secured and contained loads and that all waste loads have been transported in compliance with licence requirements under the Radiation Act 2005;

    d) Records of any transport incidents or spill and remedial actions taken in the event of such incidents; and

    e) Annual audits of records to verify compliance with the requirements of the IWMP

2.5 IWMP reporting requirements

Section 6 of the IWMP states the following reporting requirements:

On an annual basis a report will be provided showing the following:

- *For each load:*
    - *source site;*
    - *load weight; and*
    - *material description; and*
- *For the report period:*
    - *radioactivity of by-products on a monthly basis; and*
    - *total quantities of by-products disposed of to Pit 23.*

The annual report will be provided to a suitably qualified auditor who will complete an audit of the data provided and compliance with this IWMP.

Copies of the annual report and the audit report will be submitted to the Responsible Authority.

These reporting requirements are addressed in the following sections.

3 Monitoring Results

3.1 Per load monitoring data

In accordance with Section 6 of the endorsed IWMP, data associated with each load of incoming waste is listed in Appendix 1.

3.2 Reporting period monitoring data

In accordance with Section 6 of the endorsed IWMP, the monthly average radioactivity of by-products for 2017 is shown in Table 1.

Table 1: Average monthly radioactivity results for MSP by-products during the reporting period.

2017	Dry Circuit Rejects		Wet Circuit Rejects and Gypsum		Filter Bags	
	U (ppm)	Th (ppm)	U (ppm)	Th (ppm)	U (ppm)	Th (ppm)
May	516	7855	32	375	NA	NA
June	462	6926	52	640	NA	NA
July	394	5810	47	546	NA	NA
August	518	8506	91	1379	NA	NA
September	411	6365	29	333	NA	NA
October	592	9778	25	309	23*	414*
November	NA	NA	25	309	NA	NA
December	NA	NA	NA	NA	NA	NA

*Reference to 2011 analysis results. NA – No product transfer

In accordance with Section 6 of the endorsed IWMP, the total quantities of by-products disposed of to Pit 23 are shown in Table 2.

Table 2: Total quantities of by-products disposed of to Pit 23 during the reporting period.

Product	Product (tonnes)	Th (ppm)	U (ppm)
Dry circuit rejects	8,615	7,121	460
Wet circuit rejects	25,229	626	48
Baghouse dust filter bags	1.1	414*	23*
Total	**33,845.1**		

*Reference to 2011 analysis results.

A radionuclide assessment of the 2017 baghouse filter bags has not been completed to-date but will be sent off in the foreseeable future for analysis, it is envisioned that results will be similar to those undertaken in 2011 as shown in Table 2.

3.3 Incidents and remedial actions

3.3.1 Incidents or spills

No transport incidents or spillages occurred during the reporting period

3.3.2 Remedial actions taken

None required

3.4 Other matters

None identified.

4 Appendices

4.1 Appendix 1: Monitoring Data – Per load

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
11/05/2017	20	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	42.78	197	1457
12/05/2017	20	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.96	197	1457
13/05/2017	20	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.26	197	1457
14/05/2017	20	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.32	197	1457
16/05/2017	21	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	33.86	161	1237
24/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	42.34	126	1017
25/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.66	126	1017
26/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	113.98	126	1017
27/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.22	126	1017
30/05/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.62	145	1219
1/06/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	75.74	145	1219
3/06/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.62	145	1219
4/06/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.74	145	1219
6/06/2017	24	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.76	165	1305
14/06/2017	25	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	9.6	125	1092
15/06/2017	25	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.1	125	1092
17/06/2017	25	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	43.82	125	1092
18/06/2017	25	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.96	125	1092
19/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.46	141	1004
20/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	34.2	141	1004
21/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.3	141	1004
22/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.14	141	1004
23/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.34	141	1004
24/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.76	141	1004
25/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	77.06	141	1004
27/06/2017	27	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	238.84	145	1026
3/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.92	143	1085
4/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.84	143	1085
5/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.36	143	1085
6/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.86	143	1085
7/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	79.12	143	1085
8/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.42	143	1085
9/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	78.02	143	1085
10/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	34.3	149	1124
11/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.66	149	1124
12/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.64	149	1124
13/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.86	149	1124
15/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.92	149	1124
17/07/2017	30	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	74.46	147	1138
19/07/2017	30	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.12	147	1138

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
25/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	79.14	107	876
26/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.72	107	876
27/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.34	107	876
27/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.18	107	876
30/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.44	107	876
31/07/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	32.92	124	978
1/08/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.56	124	978
2/08/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	120.36	124	978
7/08/2017	33	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	80.24	102	891
8/08/2017	33	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	121.38	102	891
10/08/2017	33	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	162.78	102	891
18/08/2017	34	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.2	154	1244
18/08/2017	34	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	80.32	154	1244
19/08/2017	34	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	119.8	154	1244
22/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	77.9	131	1254
24/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	123.48	131	1254
26/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.44	131	1254
27/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.82	131	1254
28/08/2017	36	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.06	129	1331
31/08/2017	36	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	81.38	129	1331
1/09/2017	36	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	124.14	129	1331
6/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	81.28	146	1057
7/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.26	146	1057
8/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	94.8	146	1057
9/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.78	146	1057
10/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.2	146	1057
11/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.78	134	946
12/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.68	134	946
13/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.52	134	946
14/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.46	134	946
15/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	79.34	134	946
17/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	31.58	134	946
18/09/2017	39	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.02	163	1182
24/09/2017	39	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.04	163	1182
29/09/2017	40	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.04	136	823
3/10/2017	41	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	78.5	158	918
11/05/2017	20	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.02	773	12299
12/05/2017	20	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.48	773	12299
13/05/2017	20	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.52	773	12299
14/05/2017	20	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.26	773	12299
23/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	79.3	807	13465
24/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.42	807	13465
25/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.56	807	13465
26/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.9	807	13465

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
27/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.74	807	13465
28/05/2017	22	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.08	807	13465
29/05/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.4	780	12774
30/05/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.84	780	12774
31/05/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	76.36	780	12774
1/06/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.5	780	12774
2/06/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.46	780	12774
3/06/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.94	780	12774
4/06/2017	23	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.32	780	12774
5/06/2017	24	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	80.94	787	12867
13/06/2017	25	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.96	795	12961
14/06/2017	25	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	65.22	795	12961
16/06/2017	25	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38	795	12961
17/06/2017	25	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	65.34	795	12961
19/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.88	746	12003
20/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	71.94	746	12003
22/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	80.44	746	12003
23/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.78	746	12003
24/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.56	746	12003
25/06/2017	26	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.06	746	12003
26/06/2017	27	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.3	719	11675
28/06/2017	27	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35	719	11675
3/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.92	657	10639
4/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.92	657	10639
5/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.42	657	10639
7/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.92	657	10639
8/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.86	657	10639
9/07/2017	28	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.4	657	10639
10/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	72.6	603	9656
12/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	42.24	603	9656
14/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.5	603	9656
14/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.28	603	9656
15/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.34	603	9656
16/07/2017	29	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.68	603	9656
17/07/2017	30	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.5	667	10808
19/07/2017	30	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.72	667	10808
25/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.86	650	10519
26/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.02	650	10519
28/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.18	650	10519
28/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.54	650	10519
29/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.68	650	10519
30/07/2017	31	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	33.46	650	10519
31/07/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	75.64	660	10857
3/08/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	78	660	10857

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
2/08/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.96	660	10857
4/08/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.44	660	10857
5/08/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	34.1	660	10857
6/08/2017	32	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	32.82	660	10857
7/08/2017	33	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.42	728	12275
9/08/2017	33	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.34	728	12275
15/08/2017	34	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.56	827	14396
16/08/2017	34	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	72.72	827	14396
19/08/2017	34	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.38	827	14396
20/08/2017	34	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	33.86	827	14396
17/08/2017	34	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.08	827	14396
21/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41.16	856	15129
22/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.44	856	15129
23/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.68	856	15129
25/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.66	856	15129
25/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	43.42	856	15129
26/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.06	856	15129
27/08/2017	35	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	75.38	856	15129
28/08/2017	36	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	34.72	728	12489
29/08/2017	36	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.1	728	12489
4/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.14	567	9478
6/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.4	567	9478
7/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	78	567	9478
8/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	15.08	567	9478
9/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.56	567	9478
10/09/2017	37	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	41	567	9478
11/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.84	623	10628
12/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	40.24	623	10628
13/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.9	623	10628
14/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.14	623	10628
15/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.66	623	10628
16/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	36.32	623	10628
17/09/2017	38	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.26	623	10628
18/09/2017	39	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.04	702	12359
19/09/2017	39	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	35.88	702	12359
26/09/2017	40	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.86	617	10260
27/09/2017	40	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.04	617	10260
28/09/2017	40	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	78.44	617	10260
29/09/2017	40	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.68	617	10260
30/09/2017	40	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.88	617	10260
1/10/2017	40	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	37.36	617	10260
2/10/2017	41	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	38.56	660	11175
3/10/2017	41	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	39.24	660	11175
4/10/2017	41	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	21.08	660	11175

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
5/10/2017	41	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	26.2	660	11175
6/10/2017	41	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	32.18	660	11175
7/10/2017	41	Hamilton MSP	Douglas Pit 23	Dry circuit rejects	84.58	660	11175
11/05/2017	20	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	161.08	33	378
12/05/2017	20	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	119.88	33	378
13/05/2017	20	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	162.54	33	378
14/05/2017	20	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	160.72	33	378
15/05/2017	21	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	474.42	28	369
16/05/2017	21	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	435.1	28	369
17/05/2017	21	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	160.3	28	369
24/05/2017	22	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	119.32	30	384
26/05/2017	22	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	40.44	30	384
27/05/2017	22	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	156.56	30	384
28/05/2017	22	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	275.24	30	384
29/05/2017	23	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	192.3	37	366
30/05/2017	23	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	156.16	37	366
31/05/2017	23	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	234.56	37	366
1/06/2017	23	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	117.66	37	366
2/06/2017	23	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	191.72	37	366
3/06/2017	23	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	159.88	37	366
4/06/2017	23	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	81.98	37	366
6/06/2017	24	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	121.92	24	310
7/06/2017	24	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	240.18	24	310
8/06/2017	24	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	233.24	24	310
9/06/2017	24	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	397	24	310
10/06/2017	24	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	228.16	24	310
12/06/2017	25	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	77.36	33	347
15/06/2017	25	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	38.18	33	347
16/06/2017	25	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	119.34	33	347
17/06/2017	25	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	116.54	33	347
18/06/2017	25	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	199.5	33	347
19/06/2017	26	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	79.14	39	354
20/06/2017	26	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	40.06	39	354
21/06/2017	26	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	153.98	39	354
23/06/2017	26	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	40.12	39	354
24/06/2017	26	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	157.72	39	354
25/06/2017	26	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	122.08	39	354

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
26/06/2017	27	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	39.9	518	7950
26/06/2017	27	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	80.68	28	296
28/06/2017	27	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	204.48	28	296
29/06/2017	27	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	282.5	28	296
30/06/2017	27	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	246.84	28	296
1/07/2017	27	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	321.14	28	296
2/07/2017	27	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	439.54	28	296
5/07/2017	28	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	158.16	35	344
6/07/2017	28	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	203.04	35	344
7/07/2017	28	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	80.2	35	344
8/07/2017	28	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	163.1	35	344
9/07/2017	28	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	118.54	35	344
10/07/2017	29	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	121.72	32	320
11/07/2017	29	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	201.7	32	320
12/07/2017	29	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	40.24	32	320
13/07/2017	29	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	75.04	430	6402
14/07/2017	29	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	160.3	32	320
15/07/2017	29	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	157.6	32	320
16/07/2017	29	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	157.7	32	320
18/07/2017	30	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	242.24	29	286
19/07/2017	30	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	162.48	29	286
20/07/2017	30	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	246.54	29	286
21/07/2017	30	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	244.66	29	286
22/07/2017	30	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	240.9	29	286
23/07/2017	30	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	403.6	29	286
24/07/2017	31	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	40.9	36	344
25/07/2017	31	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	40.22	36	344
26/07/2017	31	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	78.6	36	344
28/07/2017	31	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	155.48	36	344
29/07/2017	31	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	200.98	36	344
30/07/2017	31	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	157.12	36	344
31/07/2017	32	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	123.9	35	332
1/08/2017	32	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	205.56	35	332
3/08/2017	32	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	81.44	35	332
2/08/2017	32	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	80.84	35	332
4/08/2017	32	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	163.88	35	332

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
5/08/2017	32	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	203.84	35	332
6/08/2017	32	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	205.22	35	332
7/08/2017	33	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	119.38	26	318
9/08/2017	33	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	83.42	220	3035
9/08/2017	33	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	199.76	26	318
10/08/2017	33	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	161.32	26	318
11/08/2017	33	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	403.26	26	318
12/08/2017	33	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	239.08	26	318
13/08/2017	33	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	228.6	26	318
14/08/2017	34	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	118.38	31	347
15/08/2017	34	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	41.94	31	347
16/08/2017	34	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	38.88	31	347
18/08/2017	34	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	40.12	623	10394
19/08/2017	34	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	79.5	623	10394
20/08/2017	34	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	198	31	347
17/08/2017	34	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	80.36	31	347
21/08/2017	35	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	149.5	29	325
22/08/2017	35	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	114.76	29	325
23/08/2017	35	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	202.84	29	325
24/08/2017	35	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	77.32	595	10132
25/08/2017	35	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	158.54	29	325
26/08/2017	35	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	165.1	29	325
27/08/2017	35	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	114.98	29	325
28/08/2017	36	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	79.52	16	305
29/08/2017	36	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	352.96	16	305
30/08/2017	36	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	359.2	16	305
31/08/2017	36	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	80.34	16	305
1/09/2017	36	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	145.8	16	305
2/09/2017	36	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	347.68	16	305
3/09/2017	36	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	150.58	16	305
4/09/2017	37	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	205.42	31	357
5/09/2017	37	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	81.54	31	357
8/09/2017	37	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	122.04	31	357
9/09/2017	37	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	81.6	31	357
10/09/2017	37	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	165.88	31	357
11/09/2017	38	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	120.86	31	348

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
12/09/2017	38	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	40.8	31	348
13/09/2017	38	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	155.76	31	348
14/09/2017	38	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	158.2	31	348
15/09/2017	38	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	120.1	31	348
16/09/2017	38	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	203.84	31	348
17/09/2017	38	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	163.42	31	348
18/09/2017	39	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	162.2	37	347
19/09/2017	39	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	117.6	37	347
20/09/2017	39	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	157.22	37	347
21/09/2017	39	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	236.86	37	347
22/09/2017	39	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	200.08	37	347
23/09/2017	39	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	241.96	37	347
25/09/2017	40	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	161.66	23	296
24/09/2017	39	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	162.58	37	347
26/09/2017	40	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	194.56	23	296
27/09/2017	40	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	124.42	23	296
28/09/2017	40	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	196.84	23	296
29/09/2017	40	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	162.54	23	296
30/09/2017	40	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	198.44	23	296
1/10/2017	40	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	195.42	23	296
2/10/2017	41	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	170.88	25	309
3/10/2017	41	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	125.08	25	309
4/10/2017	41	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	177.18	25	309
5/10/2017	41	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	240.32	25	309
6/10/2017	41	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	158.28	25	309
7/10/2017	41	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	160.84	25	309
9/10/2017	42	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	151.12	25	309
10/10/2017	42	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	77.42	25	309
11/10/2017	42	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	81.06	25	309
12/10/2017	42	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	79.14	25	309
13/10/2017	42	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	154.42	25	309
14/10/2017	42	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	248.8	25	309
15/10/2017	42	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	460.64	25	309
16/10/2017	43	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	166.92	25	309
16/10/2017	43	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	44	25	309
17/10/2017	43	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	44.38	25	309

Date	Week No.	Source site	Location Code	Material Code	Load weight (t)	Uranium (ppm)	Thorium (ppm)
19/10/2017	43	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	234.16	25	309
18/10/2017	43	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	160.24	25	309
20/10/2017	43	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	232.4	25	309
21/10/2017	43	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	157.02	25	309
22/10/2017	43	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	151.38	25	309
29/10/2017	44	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	38.26	25	309
30/10/2017	45	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	163.74	25	309
31/10/2017	45	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	194	25	309
1/11/2017	45	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	122.22	25	309
2/11/2017	45	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	79.42	25	309
2/11/2017	45	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	39.56	25	309
3/11/2017	45	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	37.82	25	309
3/11/2017	45	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	80.64	25	309
4/11/2017	45	Hamilton MSP	Douglas Pit 23	Wet circuit rejects & gypsum	39.4	25	309

Appendix B

EMP and RVMP Annual Report 2017

Iluka Resources Limited
Mineral Sands By-Product Disposal

Planning Permit 15-105

Crown Allotments 91, 94, 95, 96
Parish of Telangatuk

Environmental Management Plan and Rehabilitation Performance Report – 2017

Iluka Ref: TRIM 2004796

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Environment Superintendent, Murray Basin
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Document control

Revision	Details of review or changes	Prepared by	Date created	Document reference
Draft_v01	Revised draft	S. Alexander	20-06-2018	---
Draft_v02	Technical peer review	M. Little	29-06-2018	---
Final	Approved report for external issue	N. Travers D. Menzel	29-06-2018	2004796

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1 Executive Summary

Iluka Resources Limited (Iluka) disposes of heavy mineral processing by-products generated by its mineral separation plant (MSP), located near Hamilton in the Southern Grampians Shire, to a mining void at its Douglas Mine. The void, known as Pit 23, is located at the Douglas Mine in the Kanagulk area and within the municipality of the Horsham Rural City.

This report is submitted in accordance with Section 12.2 of the endorsed Iluka Pit 23 Environmental Management Plan (EMP), and outlines the results of monitoring and management actions undertaken during the period 11th May 2017 to 31st December 2017. The abridged date of the 2017 reporting period covered herein reflects the date of commencement of Planning Permit 15-105, this being the date of the excision of Pit 23 from the Douglas Mining Licence (MIN5367).

Key commentary on environmental monitoring outcomes and performance against compliance objectives in the Pit EMP for the 2017 reporting period:

- No noise complaints were received;
- There were no exceedances of the PM_{10} dust limit;
- There were no exceedances of the air concentration limits for Radon and Thoron;
- There were no exceedances of applicable limits for radionuclides in groundwater;
- There were no exceedances of applicable limits for radionuclides in surface water;
- There were no surface water discharges from the Pit 23 disturbance area;
- An indication of potential groundwater seepage from Pit 23 and expression in surface waters was observed at McGlashin's Swamp (DUSW24) in Q3 2017, with pH and electrical conductivity above the natural background precautionary trigger levels for this location identified during the same period. While these observations are likely to be a product of natural variation when considered against groundwater seepage model predictions and monitoring data for other locations, an update of the hydrogeological model and impact assessment is required. This model update will seek to validate or adjust existing model predictions on seepage and quality impacts in order to understand the cause and potential impacts of these observations. This work is scheduled for 2018 and outcomes will be reported in the 2018 EMP and Rehabilitation Performance Report;
- Updated groundwater level contours and flow-paths show no material change from the hydrogeological model contours developed in 2015 by CDM Smith; and
- Reported non-compliances relate to missed monitoring of groundwater levels or monitoring for specific groundwater quality indicators.

Detailed assessment of compliance, key results and management actions are provided in Section 4 and 5 of the enclosed report.

2 Introduction

Iluka Resources Limited (Iluka) disposes of heavy mineral processing by-products generated by its mineral separation plant (MSP), located near Hamilton in the Southern Grampians Shire, to a mining void at its Douglas Mine. The void, known as Pit 23, is located at the Douglas Mine in the Kanagulk area within the municipality of the Horsham Rural City (Figure 1 and Figure 2).

2.1 Planning Permit 15-105

Under the Horsham Planning Scheme the subject land is in the Farming Zone and under the provisions of that zone a permit is required for use and development for Industry (Refuse Disposal). On 25th February 2017 Planning Permit 15-105, (the Permit) was issued by the Horsham Rural City Council as the Responsible Authority to allow:

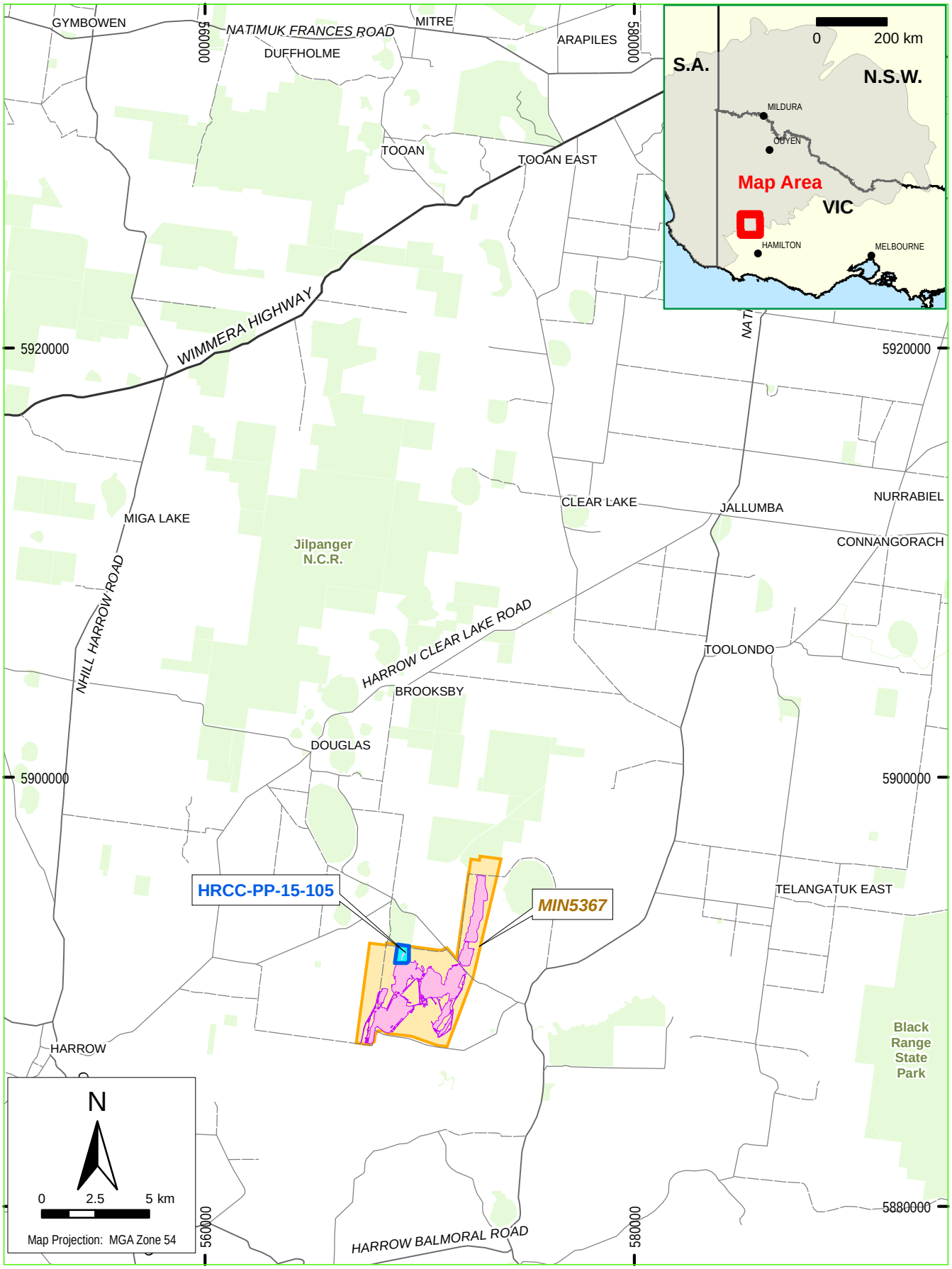
> *Use and development of the land for the disposal of waste by-products associated with or sourced through mineral sands processing undertaken at the Hamilton Mineral Separation Plant (MSP), including waste by-products and contaminated materials resulting from the processing and transport operations as follows:*
>
> - *By-products from the processing of heavy mineral concentrate at the Hamilton MSP;*
> - *used dust filter bags from the Hamilton MSP; and*
> - *Other chemically inert material contaminated with naturally occurring radioactive material.*
>
> *in accordance with the endorsed plans.*

2.2 Commencement of the Permit

Condition 1 of the Permit states:

> *This permit does not come into operation until:*
>
> *a. Iluka has applied to the Department of Economic Development, Jobs, Transport and Resources to vary the 2003 Work Plan to identify a new endues utilisation of Pit 23 and to vary the rehabilitation plan; and*
>
> *b. Iluka has applied to the Minister to surrender part of MIN 5367 (Pit 23); and*
>
> *c. The Department of Economic Development, Jobs, Transport and Resources has approved the Work Plan Variation; and*
>
> *d. The Minister has registered the partial surrender of MIN 5367.*
>
> *The permit comes into operation on the same day the Work Plan Variation is approved, and the partial surrender of MIN 5367 is registered.*

The Variation to the 2003 Douglas Mine Work Plan was approved on the 13th April 2017, and the partial surrender of MIN5367 was registered on 11th May 2017, being the date of commencement of the Permit.



Legend

- Douglas mine
- Pit 23
- HRCC-PP-15-105
- MIN5367 tenement

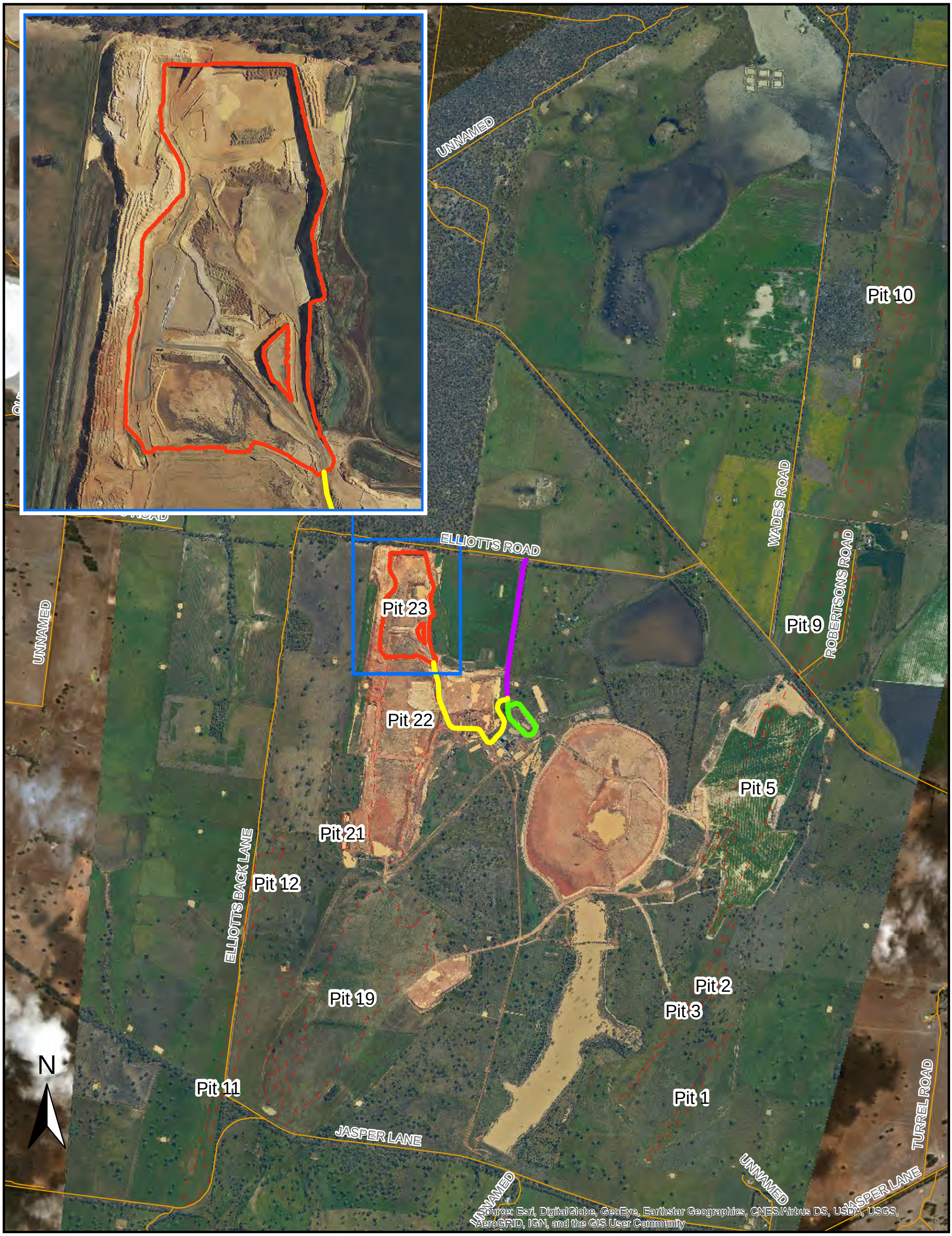
DOUGLAS

LOCATION PLAN

ILUKA

ORIG: N.Travers DRAWN: D.G.S. SCALE: 1:250,000 (A4) DATE: May 2018 DWG No: 247670 ver.00

FIGURE: 1



Legend

- Pit 23 haul road
- Mine Access Road
- Truck wash circuit
- Pit 23 crest
- Pit Crests
- Roads

0 250 500 1,000 1,500 2,000 Meters

LOCATION OF PIT 23

ILUKA

L:\Maps\2018\Unregistered\Douglas\mxd\Pit 23 Annual Report 2017 DRAWN: N. Travers DATE:26/06/2018

FIGURE: **2**

2.3 Endorsed Plans

Conditions 2, 3, 9, 14, 16 and 34 of the Permit relate to various management plans that once approved by the Responsible Authority will be endorsed to form part of the Permit, which includes:

- Incoming Waste Monitoring Plan (IWMP);
- Environmental Management Plan (EMP), incorporating;
    - Groundwater Monitoring and Management Plan (GWMMP);
    - Surface Water Monitoring and Management Plan (SWMMP);
    - Air Quality/Dust Control Plan (AQMP); and
- Rehabilitation and Vegetation Management Plan (R&VMP)

The plans were endorsed by Horsham Rural City Council on 17th July 2017.

2.4 Performance reporting

Section 12.2 of the endorsed EMP outlines the routine reporting requirements for the mineral sands by-product disposal operations which are:

> *A review of the performance will be completed and an EMP and Rehabilitation Performance report prepared annually, or less frequently as may be agreed with the Responsible Authority.*
>
> *Each EMP and Rehabilitation Performance Report will include, at least:*
>
> - *for the period from the previous EMP and Rehabilitation Performance Report:*
>   - *the total tonnage of materials disposed of;*
>   - *the average and maximum number of deliveries of materials disposed of per day; and*
>   - *the results of all measurements of:*
>   - *noise levels made in response to a complaint regarding noise;*
>   - *PM10 concentrations in air at sensitive receptors;*
>   - *environmental radiation monitoring results in accordance with the approved Radiation Management Plan, which will generally include:*
>   - *radon concentration in air;*
>   - *gross alpha activity concentration of airborne dust; and*
>   - *radionuclide concentrations in groundwater and surface water;*
>   - *discussion of any implications of the results of groundwater level monitoring on groundwater flow paths from Pit 23; and*
>   - *descriptions of any model review and recalibration completed and the results of subsequent model re-runs;*
> - *the maximum elevation of the upper surface of materials disposed of at the end of the reporting period;*
> - *a detailed discussion of all non-compliant events including progress toward resolution;*
> - *a summary of comments and complaints received and resulting actions;*
> - *plans for the next year; and*

- *discussion on other matters considered relevant by the Responsible Authority or Iluka.*

Deficiencies identified in an EMP and Rehabilitation Performance Report that can be addressed without amendment of this plan will be addressed as soon as practicable.

The EMP and Rehabilitation Performance Reports will be subject to review by an independent auditor as described in Section 13.2.

3 Delivery and Disposal of Materials into Pit 23

The tonnages of materials disposed into Pit 23 in accordance with the Incoming Waste Monitoring Plan (IWMP) are shown in Table 1 below.

Table 1: Production figures for the Iluka Murray Basin operations (May to December 2017)

Product	Product (tonnes)	Th (ppm)	U (ppm)
Dry circuit rejects	8,615	7,121	460
Wet circuit rejects	25,229	626	48
Baghouse dust filter bags	1.1	414*	23*
Total	**33,845.1**		

* Reference to 2011 analysis results

For the reporting period the average and maximum number of deliveries of materials for disposal per day was 3.6 and 10 respectively.

A radionuclide assessment of the 2017 baghouse filter bags has not been completed to-date but will be sent off in the foreseeable future for analysis, it is envisioned that results will be similar to those undertaken back in 2011 as shown in the above table.

4 Monitoring Results

4.1 Noise

In accordance with Section 10.1.4 of the endorsed EMP, noise level measurements will be undertaken in the unlikely event that complaints regarding noise levels are received.

No noise related complaints were received during the reporting period, and hence no noise levels measurements were undertaken.

4.2 PM10 concentrations in air

In accordance with Sections 9.6 and 10.1.4 of the endorsed EMP, the concentration of PM_{10} dust in air at the Lyon's, Rises and Chadwick's residences is measured using high volume ('hi-vol') air samplers on a one-in-six day monitoring cycle. The location of these hi-vol air samplers relative to Pit 23 are shown in Figure 4.

The PM_{10} results for the monitoring period are shown in Figure 3 below. There were no exceedances of the 0.06 mg/m^3 limit for PM_{10} limit during the reporting period.

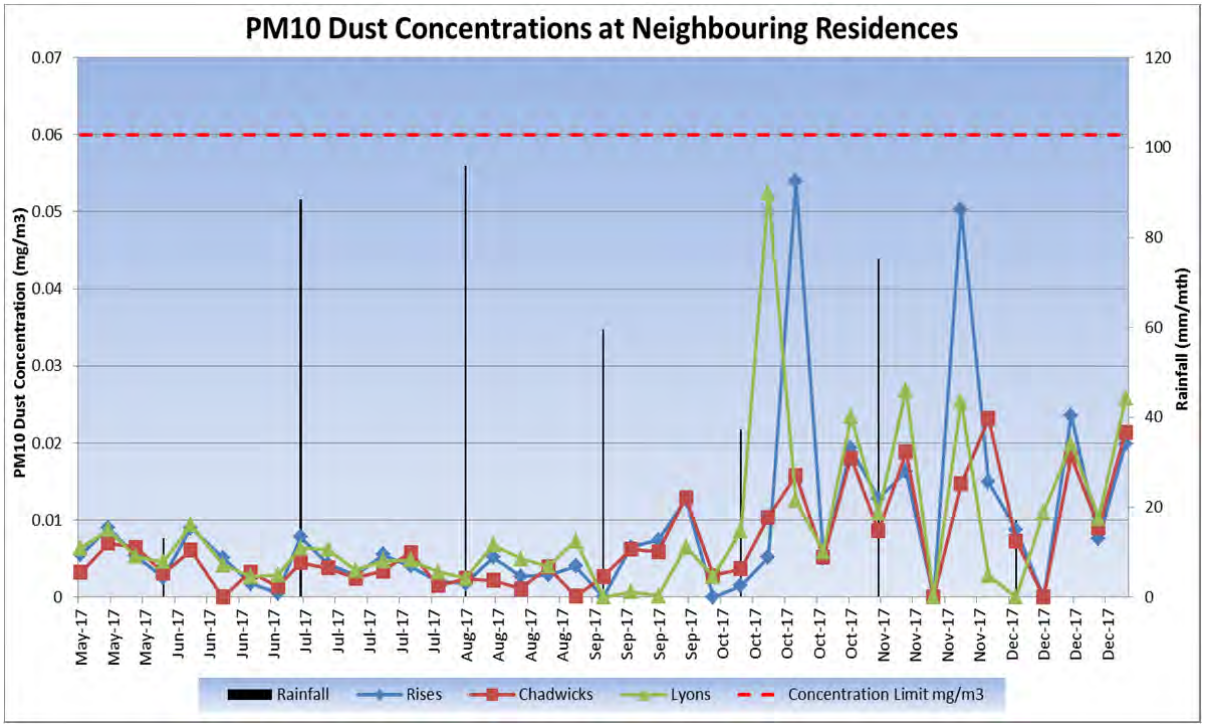


Figure 3: PM10 Dust concentrations at Neighbouring Residences

Pit 10
Chadwicks
Pit 23
Pit 9
Lyons
Pit 22
Pit 5
Pit 21
Pit 12
Pit 2
Pit 19
Pit 3
Pit 11
Pit 1
The Rises
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- PM10 monitoring
- Pit 23 crest
- Pit Crests

0 500 1,000 2,000 3,000 4,000 Meters

AIR QUALITY MONITORING LOCATIONS (PM10 - Hi Vols)

ILUKA

L:\Maps\2018\Unregistered\Douglas\mxd\Pit 23 Annual Report 2017

DRAWN: N. Travers

DATE:26/06/2018

FIGURE: 4

4.3 Environmental radiation monitoring

It is a requirement of Iluka Radiation Management Licence 300042022 that works relating to the minerals sands by-product disposal into Pit 23 are conducted in accordance with a Radiation Management Plan (RMP) and a Radioactive Waste Management Plan (RWMP), including the monitoring programs under those plans, to ensure that radiation doses are below the prescribed limit.

Radiation monitoring relevant to this Performance report includes:

- Radon concentration in air;
- Gross alpha activity concentration of airborne dust; and
- Radionuclide concentrations in groundwater and surface water.

These monitoring results are presented in the followings sections.

4.3.1 Radon concentrations in air

Monitoring of radon concentration in air at four locations within Pit 23 is undertaken using the Landauer “Radtrak” and “Radtrak2” radon and radon/thoron track etch detectors (Figure 5). The “Radtrak2” detectors supersede the “Radtrak” detectors which are no longer in supply.

Figure 5: Landauer "Radtrak" (left) and "Radtrak2" (right) track etch detectors

Radon and Thoron monitoring results for the reporting period are presented in Figure 6 and Figure **7**. Detailed data results for the measured Radon and Thoron monitoring results are provided in Section 7.1 – Appendix A.

Monitoring results indicate that Radon and Thoron concentrations in air during the reporting period were well under the threshold limits of 100 Bq/m^3 and 1,000 Bq/m^3, respectively.

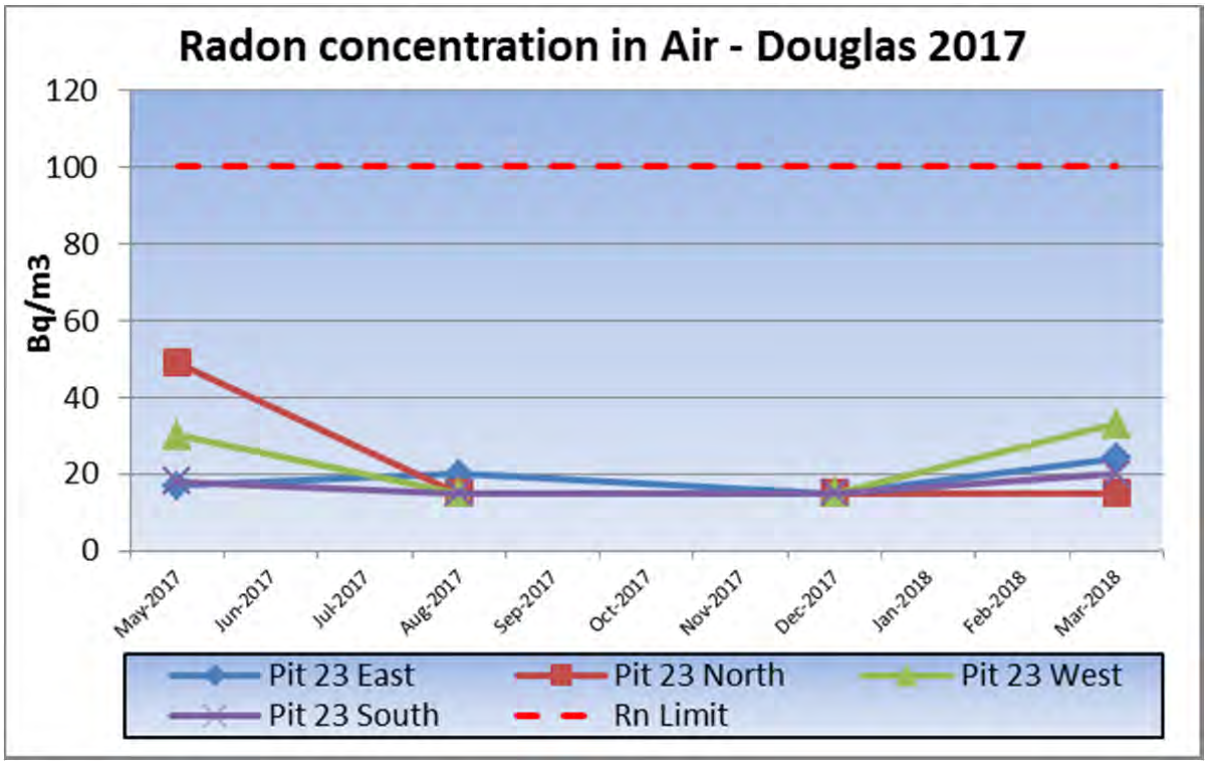


Figure 6: Radon concentration in air at Douglas 2017

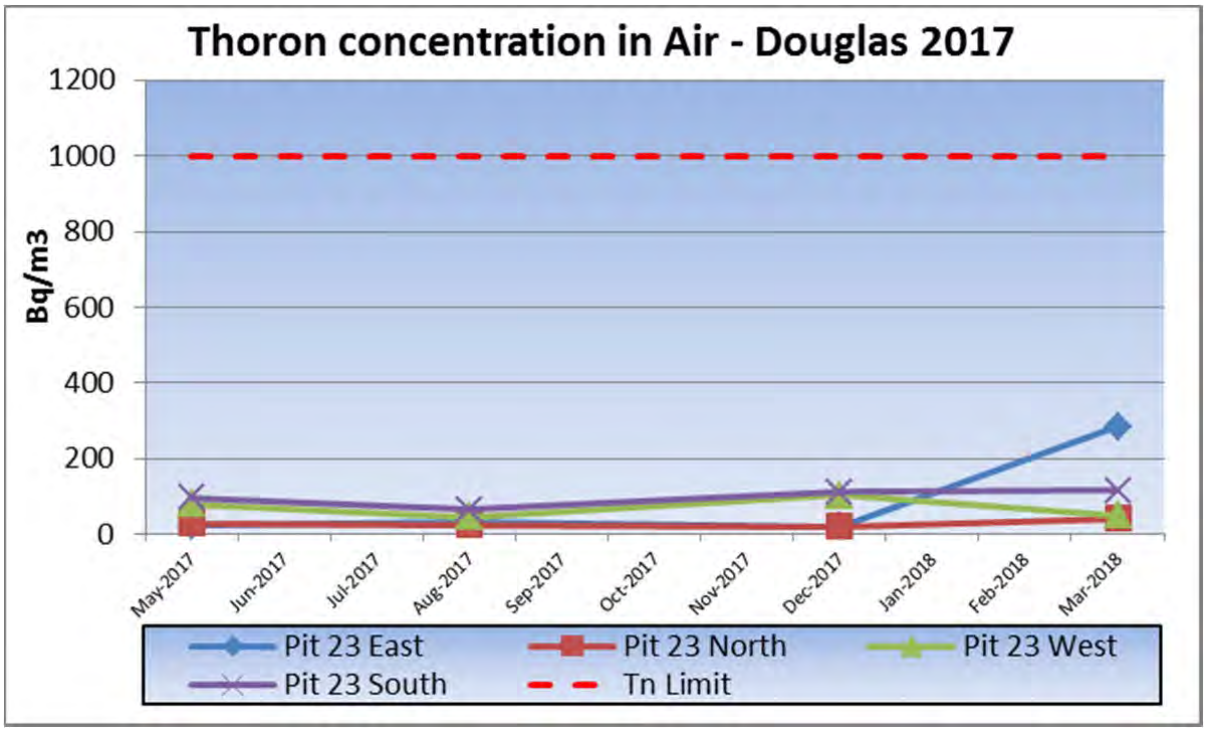


Figure 7: Thoron concentration in air at Douglas 2017

4.3.2 Gross alpha concentrations in airborne dust

As noted in Section 4.2, sampling for airborne particulates in PM_{10} dust is conducted using high volume air samplers, located at the in the vicinity of the Chadwick's, Lyons and Rises residences (see Figure 4).

For the purposes of monitoring gross alpha concentration in air, hi-vol samples are collected for a continuous 96 hour period every quarter, representing a total air sample volume of approximately 6,000 m^3. The filters are weighed to determine the total dust loading in mg/m^3 and then analysed for gross alpha activity, which is expressed as millibequerels/m^3 (mBq/m^3). The results for the monitoring period are shown in Table 2.

Table 2: Gross Alpha Radiation in PM10 dust

Location (Douglas)	Date	Sample No.	Run Time (Hrs)	Air Volume (m^3)	Activity Conc (mBq/m^3)
Chadwick's	1/07/2017	1244	95:45	6111	0.37
Lyons	14/06/2017	1225	95:08	6196	0.89
Rises	14/06/2017	1226	95:08	6107	0.87
Chadwick's	23/10/2017	B2	95:46	6037	0.15
Lyons	23/10/2017	B3	95:46	6020	0.20
Rises	23/10/2017	B4	95:45	6476	0.17
Chadwick's	16/12/2017	C4	95:45	5761	0.12
Lyons	16/12/2017	C5	95:46	5737	0.12
Rises	16/12/2017	C3	95:46	7090	0.12

4.3.3 Radionuclide concentrations in groundwater

Section 7.6.1 of the EMP prescribes the groundwater monitoring points and biannual frequency of monitoring; Section 7.6.7 of the EMP prescribes the laboratory analysis suite which includes target radionuclides (thorium, uranium, radium-226, radium-228 and uranium-238).

Radionuclide concentration results obtained in accordance with this schedule are presented in Table 3.

Iluka notes that several monitoring bores proposed for installation in the EMP will be installed as part of a drilling program in H1 2018. This drill program will include the drilling of a replacement bore for BW45, which is dry.

Table 3: Radionuclide concentrations in groundwater (May to December 2017)

Groundwater Bore ID	Date	Thorium (mg/L)	Uranium (mg/L)	U238 (Bq/L)	Ra226 (Bq/L)	Ra228 (Bq/L)
Precautionary trigger		*n/a*	*0.17*	*0.17*	*4.3*	*1.7*
Upper trigger		*n/a*	*0.2*	*0.2*	*5.0*	*2.0*
BW5	12/07/2017	<0.002	0.003	<0.025	<0.05	<0.08
BW28A	12/07/2017	<0.002	0.003	0.037	0.23	0.1
BW36	12/07/2017	<0.002	<0.001	<0.025	0.2	0.23
BW53 (“Puls”)	12/07/2017	0.0067	<0.001	<0.025	0.06	0.12
IWB2	12/07/2017	<0.002	<0.001	<0.025	<0.05	0.09
IWB6	12/07/2017	<0.002	<0.001	<0.025	0.07	<0.08
WRK300	26/07/2017	<0.002	<0.002	<0.025	<0.05	<0.08
WRK301	26/07/2017	<0.002	0.006	0.074	0.14	0.13
WRK302	26/07/2017	<0.002	<0.002	<0.025	0.25	1.12
WRK303	26/07/2017	<0.002	<0.002	<0.025	<0.05	<0.08
WRK304	26/07/2017	<0.002	<0.002	<0.025	<0.05	<0.08

NOTE: Where concentrations are reported as below the laboratory limit of reporting / limit of detection (as indicated by “<”) the numerical value is assumed as the actual concentration for purposes of reporting and graphical representation.

The monitoring results for radionuclides in groundwater obtained during the reporting period confirm nil exceedences of any precautionary trigger level or upper trigger level.

4.3.4 Radionuclide concentrations in surface water

Section 7.9.1 of the EMP prescribes the locations for surface water monitoring and the monitoring frequency, as summarised in Table 4. These locations are subject to sampling and laboratory analysis for radionuclides (thorium, uranium, radium-226, radium-228 and uranium-238).

Radionuclide monitoring results for the reporting period are presented in Figure 8, Figure 9 and Figure 10. The corresponding monitoring data for radionuclides in surface water is provided in Section 7.2 - Appendix B. Due to a misunderstanding by the sampling contractor no uranium-238 analysis was conducted on collected surface water samples during 2017.

Table 4: Monitoring program – radionuclide concentrations in surface water

Surface water monitoring locations	Frequency
SW14 – Costello’s Creek SW5b – White Lake SW24 – McGlashin’s Swamp SW20 – North-west drainage line SW 22 – Southern Drainage Line	• Quarterly; or • During or following an off-site discharge event (creek and drainage lines only)

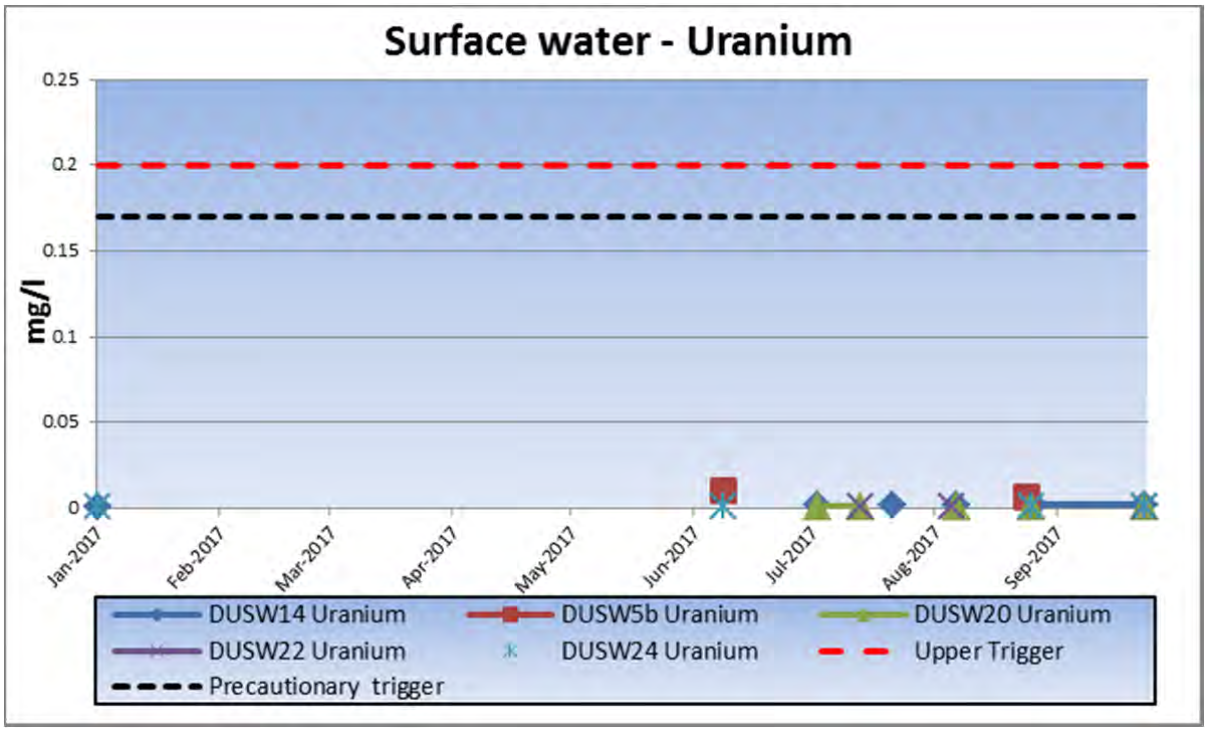


Figure 8: Uranium concentrations in Douglas Surface Water Sampling Locations

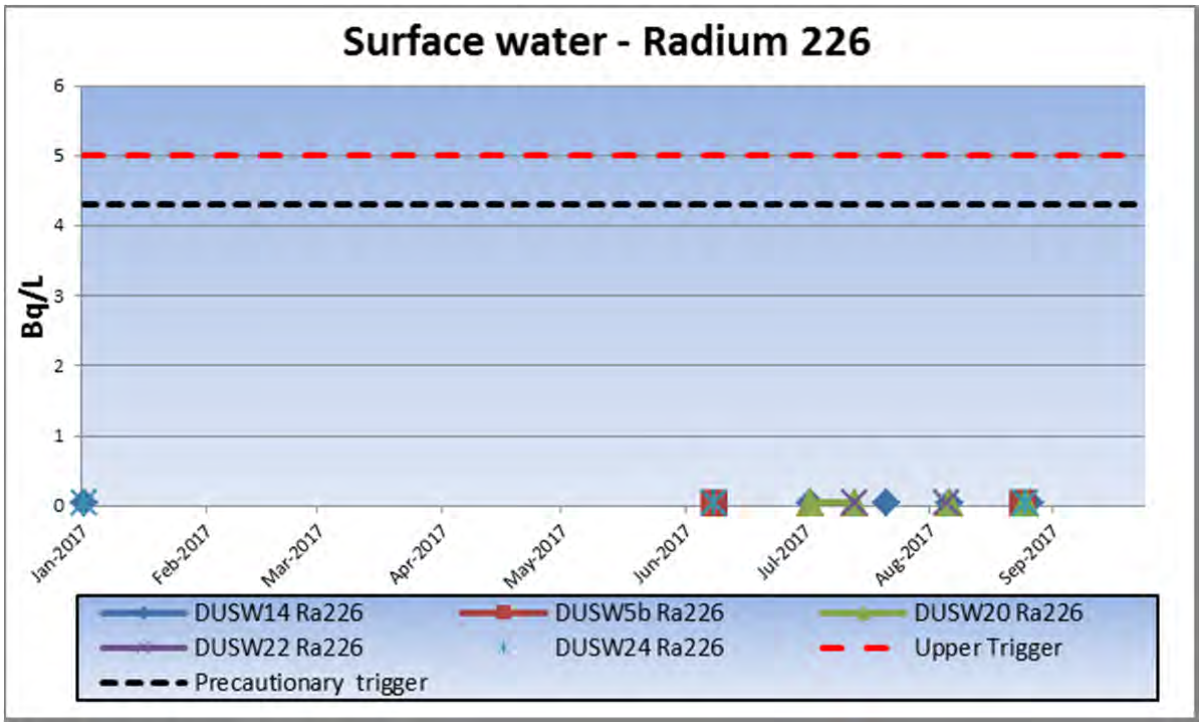


Figure 9: Radium 226 concentrations in Douglas Surface Water Sampling Locations

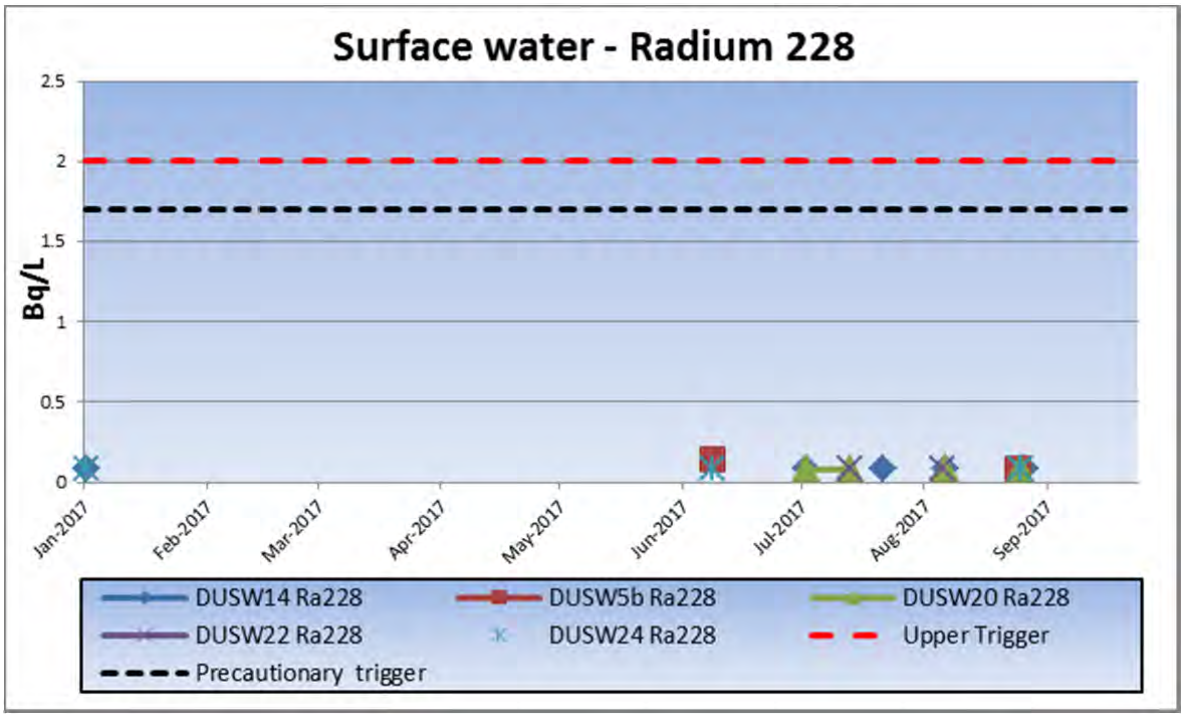


Figure 10: Radium 228 concentrations in Douglas Surface Water Sampling Locations

The monitoring results for radionuclides in surface water obtained during the reporting period confirm nil exceedances of any precautionary trigger level or upper trigger level. Further, no off-site discharges from the confines of Pit 23 or immediate area occurred.

4.4 Groundwater levels

In accordance with Section 7.9.1 of the EMP, groundwater levels are measured on a monthly basis at bores WRK300 – WRK304 inclusive, GW1 to GW7 inclusive, BW36 and BW45. The results of the groundwater level monitoring for the reporting period are shown in Figure 11.

No data is available for BW45 as this bore is dry and scheduled for replacement in 2018.

Monitoring of groundwater level was missed at BW36 for November and December 2017. However, levels were obtained in January 2018 which confirmed that standing water levels were in line with historical levels in bore BW36.

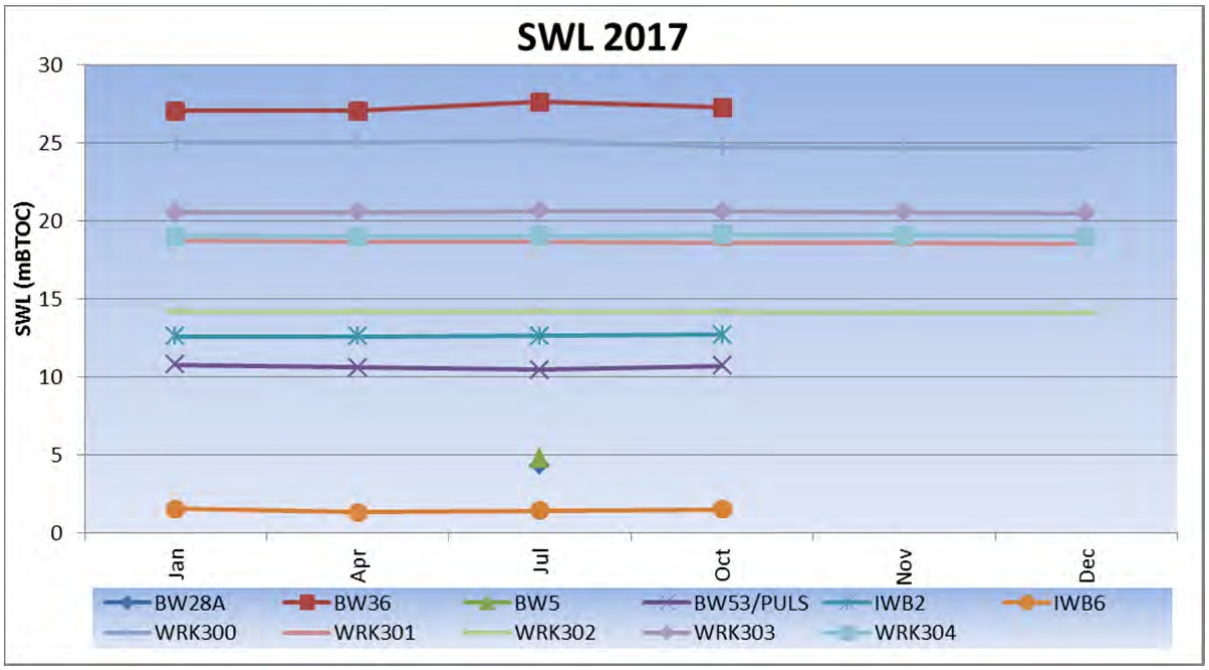


Figure 11: Douglas Groundwater Monitoring – Standing Water Levels, 2017

4.5 Groundwater quality

In accordance with Section 7.6.7 of the EMP, biannual groundwater samples obtained from the monitoring locations are subjected to in-field and laboratory analysis for a suite of target parameters.

The initial sampling round following issue of Planning Permit 15-105 and HRCC endorsement of the Pit 23 EMP was undertaken in July 2017, with the closest prior analysis completed 18 months earlier. Given this insufficient data, no comparative analysis of groundwater quality is possible within the 2017 reporting period and therefore will be undertaken in the following reporting period and presented in the 2018 report when sufficient data is available.

The results of the groundwater quality monitoring for the reporting period are shown in Section 6.3 Appendix C.

4.6 Surface water quality

4.6.1 Surface water potentially impacted by runoff from disturbed areas

In accordance with Section 8.7.1 of the EMP, surface water samples must be obtained from nominated surface water monitoring points if a discharge of run-off from the disturbed area of Pit 23 and surrounds occurs.

No discharges occurred during the reporting and consequently no follow-up monitoring was required.

4.6.2 Surface water potentially impacted by groundwater

In accordance with Section 8.7.2 of the EMP, surface water samples obtained from the monitoring locations each quarter are subjected to laboratory analysis for a suite of target parameters to identify the potential expression of Pit 23 groundwater seepage into surface waters.

Assessment of potential Pit 23 seepage and expression into surface waters is based on an analysis of chloride/sulphate and sodium/calcium ratios obtained from quarterly monitoring, with a reduction in either ratio by more than 10% applied as potential indicator of Pit 23 seepage and

expression at surface. The analysis of quarterly ionic ratio results for nominated surface water monitoring locations during the reporting period are given in Table 5.

Table 5: Surface water monitoring locations - ionic ratio balance results

Sample Point	Sample Date	Chloride (mg/L)	Sulfate (mg/L)	Chloride/Sulphate	Reduction in ratio	Confirmed repeated exceedence	Sodium (mg/L)	Calcium (mg/L)	Sodium/Calcium	Reduction in ratio	Confirmed repeated exceedence
DG_A_I_SW_DUSW5B	26/06/2017	100000	8300	12.05			53000	1700	31.176		
DG_A_I_SW_DUSW5B	11/09/2017	3200	390	8.21	32%		1800	130	13.846	56%	
DG_A_I_SW_DUSW5B	11/10/2017	44000	5200	8.46	-3%	No	23000	1400	16.429	-19%	No
DG_A_I_SW_DUSW5B	15/01/2018	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*
DG_A_I_SW_DUSW14	26/06/2017	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*
DG_A_I_SW_DUSW14	13/09/2017	190	34	5.59			130	13	10.000		
DG_A_I_SW_DUSW14	11/10/2017	1400	260	5.38	4%		850	49	17.347	-73%	
DG_A_I_SW_DUSW14	15/01/2018	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*
DG_A_I_SW_DUSW20	26/06/2017	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*
DG_A_I_SW_DUSW20	12/09/2017	360	61	5.90			230	27	8.519		
DG_A_I_SW_DUSW20	11/10/2017	1100	150	7.33	-24%		630	71	8.873	-4%	
DG_A_I_SW_DUSW20	15/01/2018	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*	*DRY*
DG_A_I_SW_DUSW22	26/06/2017	*DNS*	*DNS*	*DNS*	*DNS*	*DNS*	*DNS*	*DNS*	*DNS*	*DNS*	*DNS*
DG_A_I_SW_DUSW22	23/08/2017	190	35	5.43			110	14	7.857		
DG_A_I_SW_DUSW22	11/10/2017	1700	180	9.44	-74%		840	91	9.231	-17%	
DG_A_I_SW_DUSW22	15/01/2018	470	17	27.65	-193%		240	27	8.889	4%	
DG_A_I_SW_DUSW24	26/06/2017	530	8	66.25			430	87	4.943		
DG_A_I_SW_DUSW24	12/09/2017	500	38	13.16	80%		330	62	5.323	-8%	
DG_A_I_SW_DUSW24	11/10/2017	530	46	11.52	12%	Yes	360	69	5.217	2%	
DG_A_I_SW_DUSW24	15/01/2018	970	68	14.26	-24%		690	42	16.429	-215%	

DNS= Sample not taken

Per Table 5, monitoring data for DUSW24 (McGlashin's Swamp) indicated a reduction in the chloride/sulphate ratio by >10% between the June and September 2017 monitoring results.

Follow up sampling and analysis in October, as required under the EMP, showed that the chloride/sulphate ratio at DUSW24, although significantly reduced from 80% to 12%, was still greater than 10% ratio trigger.

Where consecutive results show a 10% reduction in the ionic balance at a nominated monitoring location, and may indicate potential seepage from Pit 23, the EMP requires that:

- *the timing of seepage from Pit 23 reaching the monitoring location will be compared with that predicted by the hydrogeological model and if there is variance of more than 10% the model will be recalibrated and the impact assessment re-examined.*
- *the full suite of analysis will be compared with trigger values, defined as follows:*
    - *Precautionary trigger value, set at 85% of the WoV SEPP objective or 85% of the background value, as defined below, whichever is the greater; and*
    - *Upper trigger value, set at the WoV SEPP objective or the background value, as defined below, whichever is the greater.*
- *If the average of the two results is greater than the precautionary trigger value, the following will occur:*
    - *Investigations to determine the cause of the indicated impact;*
    - *Increasing monitoring frequency in order to assess trends and understand processes occurring;*
    - *Possible analytical and/or numerical modelling to help determine the cause of impact.*

- *If the average of the two results is greater than the upper trigger value and exception report, as described in Section 12 of this document, will be prepared and submitted. The exception report will indicate a plan for remediation/prevention that may include any of all the following:*
    - *Further investigation of the cause, if not adequately understood;*
    - *Detailed impact assessment based on recalibrated models;*
    - *Development and implementation of strategies to prevent future unacceptable results or to mitigate any impacts, potentially including groundwater abstraction immediately adjacent and down-gradient of Pit 23; and*
    - *Reducing or ceasing the disposal of materials to Pit 23 until observations are stabilised and/or at acceptable levels if:*
        - *A change in the sodium/calcium or chloride/sulphate ratios is detected;*
        - *The change is found to due to seepage from Pit 23; and*
        - *The elevated result is assessed to be resulting in an unacceptable impact.*

Consistent with the above process, the following was identified:

- The hydrogeological model developed by CDM Smith (2015) predicted seepage from Pit 23 to reach McGlashin's Swamp (DUSW24) in the year 2160, or at least 143 years later than potentially indicated by the above chloride/sulphate results (less than 1 year).
- With respect to full-suite water quality analysis undertaken for sampling point DUSW24 (see Table 6) the following are noted:
    - For key indicators (pH, electrical conductivity, aluminium, total phosphorous and total nitrogen) sufficient data was available from monitoring conducted between January 2017 and January 2018 to determine background concentrations for these indicators, which are determined as the 75th percentile value based on the mean and standard deviation of the available data. For DUSW24, these 75th percentile (background) values are higher than the standard SEPP WoV objectives, and therefore apply as the upper trigger (background) values for the following step;
    - Comparison of the average of the two samples obtained within the reporting period (12/9/2017 and 11/10/2017) against the 75th percentile precautionary and upper trigger levels for DUSW24 indicated an exceedance of the *precautionary* trigger values for pH and electrical conductivity. Per the EMP, where this occurs:
        - investigation is required to determine the cause of the indicated impact;
        - the monitoring frequency shall be increased to assess trends and understand the processes occurring; and
        - consideration is given to analytical and/or numerical modelling to help determine cause of impact.

It is considered that the above observation at DUSW24 is the product of natural variation rather than the expression of any groundwater seepage from Pit 23 on the basis that:

- the difference between predicted seepage rates and expression at DUSW24, as compared to that potentially indicated in the ionic-balance data, is significant and unlikely based on hydraulic conductivity of the underlying lithology; and
- no indication of potential seepage was observed in other groundwater-seepage monitoring points, including the monitoring location closest to Pit 23 (DUSW20).

Notwithstanding the above, the requirement to update the hydrogeological model and impact assessment has been triggered based on the potential variance in predicted versus actual

seepage rates, and uncertainty in groundwater quality trends. This work will be undertaken in 2018 and outcomes reported in the 2018 EMP and Rehabilitation Performance Report.

Iluka notes that the monitoring frequency has already been increased to meet the required actions and obtain additional data required for this review.

Table 6: Surface water trigger levels – DUSW24 (McGlashin's Swamp)

DUSW24 (McGlashin Swamp)	Aluminium (mg/L)	Electrical Conductivity (uS/cm)	Total Nitrogen (mg/L)	pH	Total Phosphorous (mg/L)
19/01/2017	0.30	1500	1.20	8.57	1.66
26/06/2017	0.47	2530	5.00	8.91	1.80
12/09/2017	0.45	2120	2.80	8.61	0.92
11/10/2017	0.09	2290	3.00	9.61	0.69
15/01/2018	0.04	3710	4.60	10.40	0.35
Count	5	5	5	5	5
Max	0.47	3710	4.60	10.40	1.80
Min	0.04	1500	1.20	8.57	0.35
Average	0.27	2430	3.32	9.22	1.08
SD	0.20	811	1.53	0.78	0.63
WOV SEPP Objectives	0.08	1500	0.9	8.3	0.04
75%ile(background)	0.45	2530	4.60	9.61	1.66
Precautionary Trigger	**0.38**	**2151**	**3.91**	**8.17**	**1.41**
Upper Trigger	**0.45**	**2530**	**4.60**	**9.61**	**1.66**
2 Sample Average*	0.27	2205	2.9	9.11	0.805

*=The 2 sample average was calculated from data taken on the 26/9/17 and 11/10/17

Yellow shaded cells indicate values above the precautionary trigger

5 Management Actions

5.1 Monitoring bore audits

In accordance with Section 7.6.2 of the EMP, audits of the monitoring bore network are undertaken on monthly or bi-annually and outcomes reported annually within this EMP and Rehabilitation Performance Report.

Bore integrity (e.g. physical condition, blocked/dry or poor yield) is assessed as part of the groundwater monitoring program. Outcomes of monitoring bore audits performed during the reporting period are summarised in Table 7.

Table 7: Monitoring bore audit results, 2017

Well ID	Jul 2017	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017
WRK300	OK	NA	NA	OK	OK	OK
WRK301	OK	OK	OK	OK	OK	OK
WRK302	OK	OK	OK	OK	OK	OK
WRK303	OK	OK	OK	OK	OK	OK
WRK304	OK	OK	OK	OK	OK	OK
GW1	To be constructed – works scheduled in 2018					
GW2	To be constructed – works scheduled in 2018					
GW3	To be constructed – works scheduled in 2018					
GW4	To be constructed – works scheduled in 2018					
GW5	To be constructed – works scheduled in 2018					
GW6	To be constructed – works scheduled in 2018					
GW7	To be constructed – works scheduled in 2018					
GW8	To be constructed – works scheduled in 2018					
BW5	OK	NA	NA	NA	NA	NA
BW28A	OK	NA	NA	NA	NA	NA
BW36	OK	NA	NA	OK	OK	OK
BW45	To be re-drilled or replaced – works scheduled in 2018					
BW53	OK	NA	NA	OK	NA	NA
IWB2	OK	NA	NA	OK	NA	NA
IWB6	OK	NA	NA	OK	NA	NA

N/A = No sampling occurred therefore no audit completed

5.2 Groundwater flow paths from Pit 23

In accordance with Section 7.9.1 of the EMP, groundwater levels measured at bores WRK300 – WRK304 inclusive, GW1 to GW7 inclusive, GW9, BW36 and BW45 are used to construct groundwater contours in the area of Pit 23 and surrounds and infer groundwater flow paths from Pit 23, with these levels and flow paths compared with the groundwater levels and flow paths predicted by the hydrogeological model.

Interpreted groundwater level contours as at June 2018, compared against the original 2015 contours, are given in Figure 12 (EMM, 2018). From these updated contours it is demonstrated that:

- Groundwater contours and flow-paths are consistent between the 2018 and 2015 data; and
- Groundwater flow from Pit 23 is still to the north.

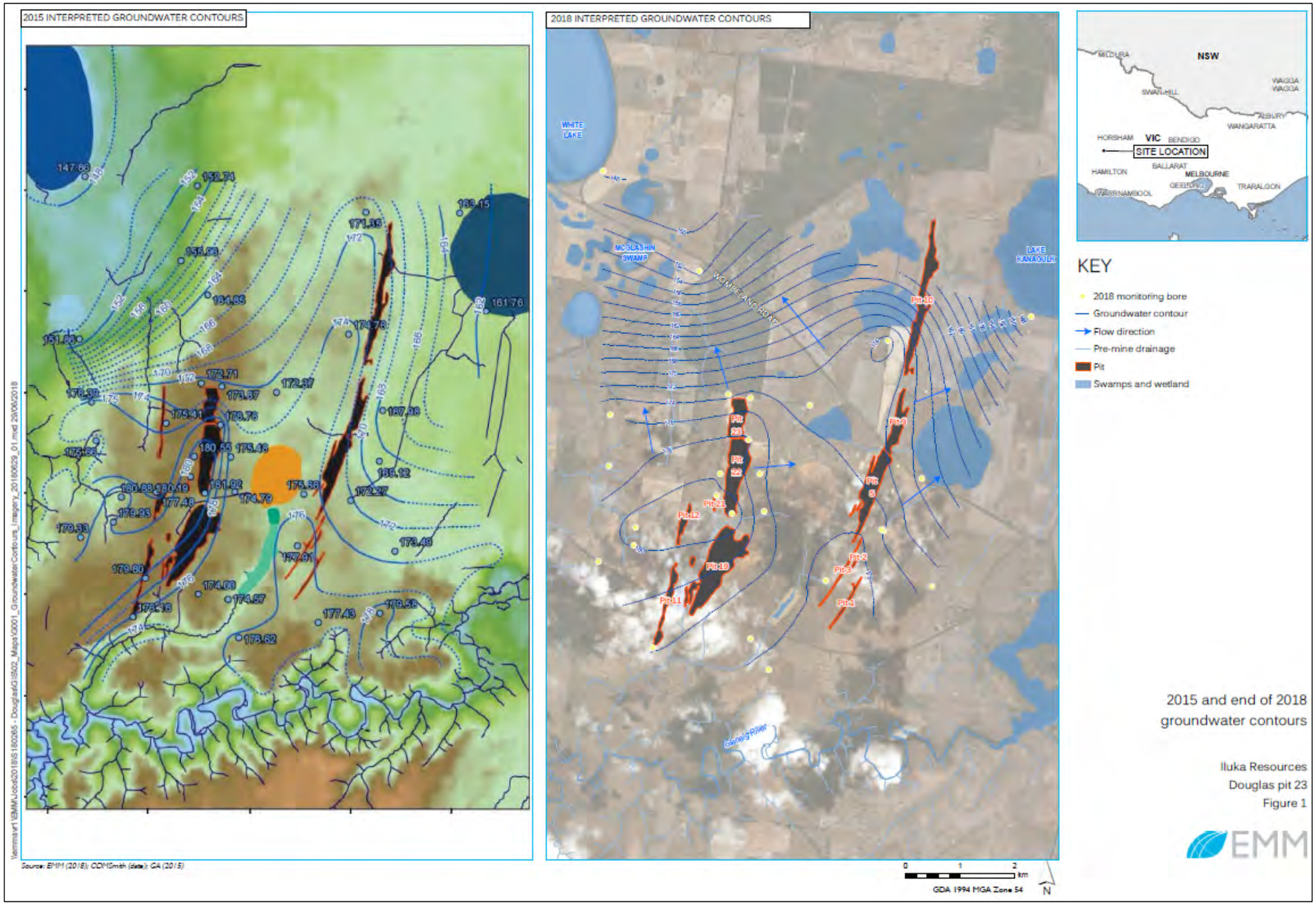


Figure 12: Douglas Groundwater contours and flow paths, as at June 2018

5.3 Groundwater model review and recalibration

Sections 7.10 and 8.7.2 of the endorsed EMP outlines the circumstances that will trigger a review and recalibration of the hydrogeological model. The requirement for review and recalibration was triggered during the reporting period as a result of surface water analysis indicating potential groundwater seepage via a reduction of the chloride/sulphate ratio greater than 10% at DUSW24 (McGlashin's Swamp) in quarter 3, 2017. A consultant has been engaged to review the data and groundwater model and re-examine the impact assessment.

5.4 Maximum surface level of disposed materials in Pit 23

In accordance with Section 7.9.1 of the EMP, the maximum elevation of the upper surface of materials disposed of at the end of the reporting period must be reported.

A survey undertaken on the 8th of December 2017 confirms that this level was 193mAHD[1].

5.5 Non-compliances

The following administrative non-compliances are declared:

- Sampling for Uranium-238 concentrations in surface water missed for surface water monitoring points DUSW5b, DUSW14, DUSW20, DUSW22 and DUSW24.
- Sampling for full suite analysis for concentrations in surface water missed for the surface water monitoring point DUSW22 for quarter 2, 2017.
- Sampling for Radium-226 and Radium-228 concentrations in surface water monitoring points DUSW5b, DUSW14, DUSW20, DUSW22 and DUSW24 was missed for quarter 4, 2017.
- Groundwater standing water level was missed at BW36 for November and December 2017; follow-up measurement in January 2018 confirms standing water levels are in line with historical levels.

These missed sampling events have been addressed with the Iluka contractor who is engaged to undertake groundwater and surface water monitoring.

5.6 Comments and complaints received

No complaints or comments were received during the reporting period.

5.7 Plans for next reporting period

The following activities are proposed for the 2018 reporting period:

- Installation of proposed groundwater monitoring bores (GW1, GW2, GW3, GW4, GW5, GW6, GW7, GW8, BW23A and BW45A).
- Increase monitoring frequency of surface water locations that have shown indication of potential seepage from Pit 23 and to assist with the recalibration of the groundwater model.
- Commission an update of the hydrogeological model and impact assessment to validate or adjust existing model predictions on Pit 23 seepage.

[1] mAHD = metres Australian Height Datum

5.8 Other matters

None identified.

6 References

EMM (2018) Memorandum to Iluka Resources Ltd – Douglas Pit 23 Compliance Reporting FY17/18: Groundwater contours and flow-paths, 29th June 2018.

CDM Smith (2014) Douglas Mine Site Hydrogeological Modelling. Completed on behalf of Iluka Resources, November 2014

CDM Smith (2015) Douglas Mine – Particle Tracking of Seepage Water. Completed on behalf of Iluka Resources, February 2015

7 Appendices

7.1 Appendix A: Monitoring Data – Radiation – Track Etch Detectors

Detector Number	Start date	End date	Location	Detector Type	Ave Rn Conc Bq/m^3	Ave Tn Conc Bq/m^3
191562-8 660102-5	22/02/2017	26/05/2017	Pit 23 east	Radon & thoron pair	17+/- 6	22 +/- 18
909679-3 660228-8	22/02/2017	26/05/2017	Pit 23 north	Radon & thoron pair	49 +/- 8	<30
140796-4 660531-5	22/02/2017	26/05/2017	Pit 23 west	Radon & thoron pair	30 +/- 8	80 +/- 28
170403-0 660201-5	22/02/2017	26/05/2017	Pit 23 south	Radon & thoron pair	18 +/- 6	96 +/- 24
198037-4 229836-6	26/05/2017	23/08/2017	Pit 23 east	Radon & thoron pair [#]	20	34
101953-8 177868-7	26/05/2017	23/08/2017	Pit 23 north	Radon & thoron pair [#]	15	24
115548-0 229901-4	26/05/2017	23/08/2017	Pit 23 west	Radon & thoron pair [#]	15	47
606645-0 229781-0	26/05/2017	23/08/2017	Pit 23 south	Radon & thoron pair [#]	15	64
6013087-6 466388-6	23/08/2017	13/12/2017	Pit 23 east	Radon & thoron pair [#]	15	21
117789-8 466372-0	23/08/2017	13/12/2017	Pit 23 north	Radon & thoron pair [#]	15	20
133730-2 660153-8	23/08/2017	13/12/2017	Pit 23 west	Radon & thoron pair [#]	15	102
401783-6 660202-3	23/08/2017	13/12/2017	Pit 23 south	Radon & thoron pair [#]	15	111
687417-6 660154-6	13/12/2017	8/03/2018	Pit 23 east	Radon & thoron pair [#]	24	285
400375-7 660198-3	13/12/2017	8/03/2018	Pit 23 north	Radon & thoron pair [#]	15	41
116814-5 660074-6	13/12/2017	8/03/2018	Pit 23 west	Radon & thoron pair [#]	33	50
780932-0 660568-7	13/12/2017	8/03/2018	Pit 23 south	Radon & thoron pair [#]	20	115

[#] Landauer “Radtrak2” track etch detector

7.2 Appendix B: Monitoring Data – Radiation – Surface Water

Surface Water Point ID		Date	Thorium (mg/L)	Uranium (mg/L)	Ra^{226} (Bq/L)	Ra^{228} (Bq/L)
White Lake	DUSW5b	26/06/2017	<0.02	<0.01	<0.05	0.14
McGlashin's Swamp	DUSW24	26/06/2017	<0.001	<0.001	<0.05	<0.08
Spring Creek	DUSW14	26/06/2017	DRY	DRY	DRY	DRY
Southern drainage line	DUSW22	26/06/2017	DNS	DNS	DNS	DNS
North-west drainage line	DUSW20	26/06/2017	DRY	DRY	DRY	DRY
Southern drainage line	DUSW22	23/08/2017	<0.002	<0.001	<0.05	<0.08
White Lake	DUSW5b	11/09/2017	0.0095	0.006	<0.05	<0.08
North-west drainage line	DUSW20	12/09/2017	<0.002	<0.001	<0.05	<0.08
McGlashin's Swamp	DUSW24	12/09/2017	<0.002	<0.001	<0.05	<0.08
Spring Creek	DUSW14	13/09/2017	<0.002	<0.001	<0.05	<0.08
Southern drainage line	DUSW22	11/10/2017	<0.002	<0.001	DNS	DNS
Spring Creek	DUSW14	11/10/2017	<0.002	<0.001	DNS	DNS
North-west drainage line	DUSW20	11/10/2017	<0.002	<0.001	DNS	DNS
McGlashin's Swamp	DUSW24	11/10/2017	<0.002	<0.001	DNS	DNS
White Lake	DUSW5b	11/10/2017	<0.002	0.02	DNS	DNS

DNS = did not sample

7.3 Appendix C: Monitoring Data – Groundwater Quality

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	410
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	36
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	470
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	34
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	34
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	14
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	220
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	360
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	100
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	30
Alkalinity (Bicarbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	34
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0
Alkalinity (Carbonate) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0
Alkalinity (Hydroxide) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	410
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	36
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	470
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	34
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	34

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	14
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	220
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	360
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	100
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	30
Alkalinity (Total) as CaCO3	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	34
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	1.1
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.15
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.22
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	2.4
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.11
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.19
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.25
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.44
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.2
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.13
Aluminium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.06
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	2.6
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.13
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.32
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.27
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.09
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.02
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.19
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.27
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.39
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.12
Ammonia Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.08
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	200
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	72
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	230
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	9.7
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	41
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	15
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	61
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	110
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	220
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	71
Anions (Total)	meq/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	69
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	1.1

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.005
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.008
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.028
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.003
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.006
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.003
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.004
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.003
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.003
Arsenic (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.009
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.19
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.021
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.024
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.025
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.004
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.021
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.033
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.022
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.022
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.027
Barium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.021
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.93
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.16
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	1.3
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.14
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.09
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.06
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.17
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.69
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	1.7
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.45
Boron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.55
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.0002

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.0002
Calcium	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	470
Calcium	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	74
Calcium	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	210
Calcium	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	10
Calcium	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	10
Calcium	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	5.8
Calcium	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	130
Calcium	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	240
Calcium	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	470
Calcium	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	93
Calcium	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	81
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	210
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	68
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	260
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	10
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	39
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	15
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	61
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	100
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	200
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	65
Cations (Total)	meq/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	65
Chloride	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	6300
Chloride	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	2200
Chloride	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	7000
Chloride	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	200
Chloride	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	1300
Chloride	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	360
Chloride	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	1800
Chloride	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	3100
Chloride	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	6700
Chloride	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	2100
Chloride	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	2000
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.005
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.01

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.002
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.004
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.007
Chromium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.033
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.042
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.005
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.001
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.001
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.003
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.002
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.004
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.003
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.037
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.001
Cobalt (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.007
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.006
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.002
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.003
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.003
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.001
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_BW28A	13/07/2017	19830
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_BW36	12/07/2017	7270
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_BW5	13/07/2017	22600
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	1026
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_IWB2	12/07/2017	4420
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_IWB6	12/07/2017	1673
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_WRK300	26/07/2017	6300
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_WRK301	26/07/2017	11000
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_WRK302	25/07/2017	19820
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_WRK303	25/07/2017	7030
Electrical Conductivity	µS/cm	Douglas	DG_A_I_PZ_WRK304	25/07/2017	7050

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Fluoride	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.5
Fluoride	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.34
Fluoride	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.68
Fluoride	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.5
Fluoride	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.18
Fluoride	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.1
Fluoride	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.38
Fluoride	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.56
Fluoride	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	1
Fluoride	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	1
Fluoride	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.39
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	11
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.16
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.39
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	6
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.06
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.18
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.16
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.06
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.01
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.07
Iron (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.01
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.005
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.004
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.001
Magnesium	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	530
Magnesium	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	110
Magnesium	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	410
Magnesium	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	15
Magnesium	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	110
Magnesium	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	20
Magnesium	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	120

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Magnesium	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	240
Magnesium	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	420
Magnesium	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	100
Magnesium	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	91
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	4.5
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.009
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.087
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.017
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.012
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.01
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.17
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.16
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.02
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.005
Manganese (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.005
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.0004
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.0001
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.002
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.001
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.002
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.001
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.001
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.001
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.012
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.002
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.001
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.001
Molybdenum (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.001
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.009
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.007
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.001

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.006
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.004
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.001
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.032
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.011
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.022
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.002
Nickel (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.002
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.07
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	7.3
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.74
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	7
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	4.7
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	8.5
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	3.8
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.08
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.39
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	5.1
Nitrate Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	2.9
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.015
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.001
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.001
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.013
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.001
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.003
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.001
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.001
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.002
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.001
Nitrite Nitrogen	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.001
pH	pH units	Douglas	DG_A_I_PZ_BW28A	13/07/2017	6.76
pH	pH units	Douglas	DG_A_I_PZ_BW36	12/07/2017	5.4
pH	pH units	Douglas	DG_A_I_PZ_BW5	13/07/2017	7.23
pH	pH units	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	6.64
pH	pH units	Douglas	DG_A_I_PZ_IWB2	12/07/2017	5.12
pH	pH units	Douglas	DG_A_I_PZ_IWB6	12/07/2017	5.23
pH	pH units	Douglas	DG_A_I_PZ_WRK300	26/07/2017	6.79
pH	pH units	Douglas	DG_A_I_PZ_WRK301	26/07/2017	7.19
pH	pH units	Douglas	DG_A_I_PZ_WRK302	25/07/2017	6.1
pH	pH units	Douglas	DG_A_I_PZ_WRK303	25/07/2017	5.92

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
pH	pH units	Douglas	DG_A_I_PZ_WRK304	25/07/2017	6.13
Potassium	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	41
Potassium	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	19
Potassium	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	73
Potassium	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	24
Potassium	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	4.8
Potassium	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	1.6
Potassium	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	14
Potassium	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	24
Potassium	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	26
Potassium	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	10
Potassium	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	16
Radium 226	Bq/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.23
Radium 226	Bq/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.2
Radium 226	Bq/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.05
Radium 226	Bq/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.06
Radium 226	Bq/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.05
Radium 226	Bq/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.07
Radium 226	Bq/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.05
Radium 226	Bq/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.14
Radium 226	Bq/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.25
Radium 226	Bq/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.05
Radium 226	Bq/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.05
Radium 228	Bq/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.1
Radium 228	Bq/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.23
Radium 228	Bq/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.08
Radium 228	Bq/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.12
Radium 228	Bq/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.09
Radium 228	Bq/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.08
Radium 228	Bq/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.08
Radium 228	Bq/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.13
Radium 228	Bq/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	1.12
Radium 228	Bq/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.08
Radium 228	Bq/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.08
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.002
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.003
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.011
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.001
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.001
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.002

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.003
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.006
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.012
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.023
Selenium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.013
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.001
Sodium	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	3300
Sodium	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	1300
Sodium	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	4200
Sodium	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	180
Sodium	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	670
Sodium	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	290
Sodium	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	1000
Sodium	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	1600
Sodium	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	3300
Sodium	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	1200
Sodium	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	1200
Sulphate	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	850
Sulphate	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	420
Sulphate	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	960
Sulphate	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	130
Sulphate	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	150
Sulphate	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	200
Sulphate	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	320
Sulphate	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	640
Sulphate	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	1400
Sulphate	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	570
Sulphate	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	500
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.002

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.0067
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.002
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	14000
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	4300
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	14000
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	690
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	2600
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	1200
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	3500
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	5800
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	13000
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	4100
Total Dissolved Solids	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	4100
Uranium	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.003
Uranium	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.002
Uranium	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.002
Uranium	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.002
Uranium	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.002
Uranium	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.002
Uranium	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.002
Uranium	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.006
Uranium	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.002
Uranium	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.002
Uranium	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.002
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.003
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.003
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.006
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.001

Variable	Unit	Site	Sample Point (Bore ID)	Date	Result
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.001
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.037
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.025
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.025
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.025
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.025
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.025
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.025
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.074
Uranium 238	Bq/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.025
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_BW28A	13/07/2017	0.012
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_BW36	12/07/2017	0.087
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_BW5	13/07/2017	0.003
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_BW53/PULS	13/07/2017	0.028
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_IWB2	12/07/2017	0.018
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_IWB6	12/07/2017	0.005
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_WRK300	26/07/2017	0.038
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_WRK301	26/07/2017	0.012
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_WRK302	25/07/2017	0.012
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_WRK303	25/07/2017	0.007
Zinc (Total)	mg/L	Douglas	DG_A_I_PZ_WRK304	25/07/2017	0.006

7.4 Appendix D: Monitoring Data – Surface water Quality

Variable	Unit	Site	Sample Point ID	Date	Result
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.5
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	73
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	5.6
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.43
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	5.9
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.26
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	11
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.08
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.47
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.45
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.09
Aluminium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	17
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.02
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.042
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.003
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.002
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.004
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.003
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.004
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.002
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.015
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.01
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.009
Arsenic (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.03
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.12
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.085
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.029
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.074
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.04
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.073
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.035
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.081
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.052
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.043
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.044
Barium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.11
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.0002

Variable	Unit	Site	Sample Point ID	Date	Result
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.0002
Cadmium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.002
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	1700
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	130
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	13
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	49
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	27
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	71
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	14
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	91
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	87
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	62
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	69
Calcium	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	1400
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	100000
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	3200
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	190
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	1400
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	360
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	1100
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	190
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	1700
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	530
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	500
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	530
Chloride	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	44000
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.01
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.077
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.007
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.009
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.007

Variable	Unit	Site	Sample Point ID	Date	Result
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.002
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.001
Chromium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.02
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.01
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.047
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.002
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.002
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.002
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.003
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.002
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.001
Copper (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.01
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW05	26/06/2017	170000
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW05	11/09/2017	9420
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW14	13/09/2017	825
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	4860
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW20	12/09/2017	1404
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	4100
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW20	11/10/2017 13:00	3920
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW22	23/08/2017	817
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	5370
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW24	26/06/2017	2530
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW24	12/09/2017	2120
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	2290
Electrical Conductivity	µS/cm	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	103200
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.1
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.22
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.11
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.23
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.2
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.22
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.17
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.38
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.45
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.34

Variable	Unit	Site	Sample Point ID	Date	Result
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.37
Fluoride	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	1
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.3
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	55
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	3.5
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	2.2
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	5.2
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	1.2
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	5.8
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	1.5
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.26
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.42
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.14
Iron (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	13
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.01
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.04
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.002
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.002
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.001
Lead (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.01
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	4600
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	160
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	11
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	88
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	24
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	76
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	16
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	130
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	41
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	32
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	36
Magnesium	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	2200
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.21
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	1

Variable	Unit	Site	Sample Point ID	Date	Result
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.026
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.18
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.024
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.055
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.028
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.39
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.015
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.081
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.021
Manganese (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.56
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.0002
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.0001
Mercury (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.001
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.01
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.043
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.004
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.001
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.007
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.004
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.005
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.003
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.002
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.003
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.003
Nickel (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.02
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	5.4
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	4
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	1
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.84
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	2.4
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	2

Variable	Unit	Site	Sample Point ID	Date	Result
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	1.8
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.77
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	5
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	2.8
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	3
Nitrogen (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	5.5
pH	pH units	Douglas	DG_A_I_SW_DUSW05	26/06/2017	8.4
pH	pH units	Douglas	DG_A_I_SW_DUSW05	11/09/2017	6.72
pH	pH units	Douglas	DG_A_I_SW_DUSW14	13/09/2017	7.91
pH	pH units	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	7.73
pH	pH units	Douglas	DG_A_I_SW_DUSW20	12/09/2017	7.86
pH	pH units	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	7.7
pH	pH units	Douglas	DG_A_I_SW_DUSW20	11/10/2017 13:00	7.84
pH	pH units	Douglas	DG_A_I_SW_DUSW22	23/08/2017	7.5
pH	pH units	Douglas	DG_A_I_SW_DUSW22	23/08/2017 12:40	7.5
pH	pH units	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	7.75
pH	pH units	Douglas	DG_A_I_SW_DUSW24	26/06/2017	8.91
pH	pH units	Douglas	DG_A_I_SW_DUSW24	12/09/2017	8.61
pH	pH units	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	9.61
pH	pH units	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	7.82
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.08
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	1.1
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.049
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.035
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.078
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.04
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.081
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.015
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	1.8
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.92
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.69
Phosphorus (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.83
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	600
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	35
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	3
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	8.6
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	4.4
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	5.1
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	4.2
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	7.3

Variable	Unit	Site	Sample Point ID	Date	Result
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	29
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	21
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	18
Potassium	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	310
Radium 226	Bq/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017 11:00	0.05
Radium 226	Bq/L	Douglas	DG_A_I_SW_DUSW05B	11/09/2017 12:40	0.05
Radium 226	Bq/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017 10:00	0.05
Radium 226	Bq/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017 12:50	0.05
Radium 226	Bq/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017 12:45	0.05
Radium 226	Bq/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017 11:30	0.05
Radium 226	Bq/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017 13:10	0.05
Radium 228	Bq/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017 11:00	0.14
Radium 228	Bq/L	Douglas	DG_A_I_SW_DUSW05B	11/09/2017 12:40	0.08
Radium 228	Bq/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017 10:00	0.08
Radium 228	Bq/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017 12:50	0.08
Radium 228	Bq/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017 12:45	0.08
Radium 228	Bq/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017 11:30	0.08
Radium 228	Bq/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017 13:10	0.08
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.01
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.001
Silver (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.01
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	53000
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	1800
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	130
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	850
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	230
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	630
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	110
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	840
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	430
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	330

Variable	Unit	Site	Sample Point ID	Date	Result
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	360
Sodium	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	23000
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	8300
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	390
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	34
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	260
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	61
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	150
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	35
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	180
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	8
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	38
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	46
Sulphate	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	5200
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.02
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.0095
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.001
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.002
Thorium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.02
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	150000
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	5200
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	530
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	2800
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	850
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	2400
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	550
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	3300
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	1600
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	1200
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	1400
Total Dissolved Solids	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	73000
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	22
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	1000

Variable	Unit	Site	Sample Point ID	Date	Result
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	25
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	26
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	9
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	8
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	4
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	8
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	10
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	5
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	6
Total Suspended Solids	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	1200
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.01
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.006
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.001
Uranium (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.02
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	26/06/2017	0.01
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW05	11/09/2017	0.1
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	13/09/2017	0.012
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW14	11/10/2017 13:00	0.005
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	12/09/2017	0.023
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW20	11/10/2017 12:45	0.028
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	23/08/2017	0.01
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW22	11/10/2017 10:10	0.015
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	26/06/2017	0.001
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	12/09/2017	0.005
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW24	11/10/2017 13:45	0.002
Zinc (Total)	mg/L	Douglas	DG_A_I_SW_DUSW5B	11/10/2017 13:25	0.01

Appendix C

TRG Comments and Iluka Response

Travers, Nick

From: Adam Moar <Adam.Moar@hrcc.vic.gov.au>
Sent: Wednesday, 19 September 2018 8:28 AM
To: Travers, Nick
Cc: Menzel, Dean; Angela Murphy
Subject: Summary comments from TRG on annual reports

Nick,

As you would be aware Council has formed a Technical Reference Group (TRG) to assist in assessing technical documents. The TRG is made up of representatives from Council, Department of Health and Human Services, Glenelg Hopkins Catchment Management Authority, EPA, Wimmera Catchment Management Authority, West Wimmera Shire, and the Department of Economic Development, Jobs, Transport and Resources.

Below are is the summary of comments we have received from the reviewing of the annual reports Iluka submitted to Council.

GHCMA

The potential groundwater seepage detected from Pit 23 into McGlashin's Swamp is of some concern. Despite the report providing a summary analysis of the issue and assessment of the seriousness of the seepage, there is insufficient detail regarding the remediation/prevention of the seepage. The EMP requires an exception report to be prepared and submitted, however the performance report does not indicate such a report will be completed, although a range of other actions are proposed (ie. updates to hydrogeological modelling and impact assessments). Iluka propose to undertake this work and report on the outcomes in the 2018 performance report, which seems insufficient. In our opinion, a detailed exception report and recommendations for future prevention/improvements should be provided in a more timely manner (not reported on 2 years post the occurrence when the next performance report is submitted).

EPA

The only comments to note are:

- The proposed groundwater bores to be installed, and subsequent revision of the hydrogeological model are appropriate response actions to the identified potential for groundwater seepage. The proposed locations of the new bores are considered appropriate.
- Increased monitoring of surface water locations in response to identified potential groundwater seepage also supported by EPA,
- The missed sampling events identified in section 5.5 were identified by Iluka as non-compliances, and EPA is keen to see these sampling requirements are properly met in the ongoing monitoring program.
- EPA may request an interim report to be provided to the Technical Reference Group prior to the next Annual Report to show the actions above have been implemented and to provide opportunity for consideration of the updated groundwater analysis.

WCMA

In relation to the potential groundwater seepage from pit 23 and expression in surface water at McGlashin's Swamp – It is agreed that an update of the hydrological model is required. It is concerning that:

1. Council has not been informed of this incident earlier so to discuss appropriate actions and the timing of these actions; and
2. The details of the timing of the remodelling have not been made clear. Given the observations were made in Q3 2017 it is suggested that there had been an unnecessary delay and that the report should set a data for this work to be completed as a matter of high priority.

DHHS

Incoming Waste Monitoring Plan 2017

The material placed into Pit 23 is as expected. It is assumed the auditor for the review of the Incoming Waste Monitoring Plan would find that all is in order, not that such is my area of expertise, but my reading of the report tells me that Iluka are meeting the requirements for waste monitoring as per Section 2.4 of the report, which cites the Permit requirements for this IWMP. It is noted that the results are cited using parts per million rather than Becquerels per gram as we are more familiar with, however, my calculations indicate that the materials emplaced meet the definition of radioactive material contained in the Radiation Act/Regs.

It is noted that the description of Condition 1 of the Permit contained in Section 2.2 of the report incorrectly describes emplacement of wastes into Pit 23 as a "new end use". From the perspective of the Radiation Act Management Licence place at the time of the removal of mining legislation, such is incorrect, and possibly reflects an incorrect text of the Permit. Certainly the DHHS licence permitted such to continue.

Environmental Management Plan and Rehabilitation Performance Report 2017

Specifically commencing with Section 4.3 Environmental Radiation Monitoring, radon and thoron concentrations remain predictably low.

Gross alpha in dust measurements are predicated on using activity concentrations from PM10 dust measurements, and are approximately at least a factor of 5000 less than average airborne activity concentrations during mining when the Douglas Pits were active. Average of the three largest measurements for the first third of the year is roughly 0.7 mBq/m3 compared with a rough average from the Dec 15 and Dec 17 Iluka reports to DHHS of 40 Bq/m3 (i.e. 4000 mBq/m3 divided by 0.7 mBq./m3).

Radionuclide concentrations in groundwater are all below the cited "trigger" levels. It should be noted that the specific radionuclide "trigger" levels are derived from the Australian Drinking Water Quality Guidelines and are as such (a) a comparison with worst case requirements where an individual is drinking 2 litres per day every day of the year, hence are not realistically reflective of any alleged health risk if exceeded as there is no conceivable pathway from such groundwater to human consumption, and (b) are merely an indicator for monitoring changes in the absence of any realistic pathway and in any event are non-binding i.e. not hard legislative limits.

Surface water monitoring results also show no impact. It should be noted that the specific radionuclide "trigger" levels are derived from the Australian Drinking Water Quality Guidelines and are as such (a) a comparison with worst case requirements where an individual is drinking 2 litres per day every day of the year, hence are not realistically reflective of any alleged health risk if exceeded as there is no conceivable pathway from such groundwater to human consumption, and (b) are merely an indicator for monitoring changes in the absence of any realistic pathway and in any event are non-binding i.e. not hard legislative limits.

It is noted that Iluka have self-referenced what they describe as non-compliances in Section 5.5 i.e. some measurements that were supposed to be taken were not, for some reason. Notwithstanding these measurement deficiencies. the conclusions remain the same given the knowledge of the impact of historical practices to date.

Regards

Adam Moar
Town Planner

2nd October 2018

Angela Murphy
Director Development Services
Horsham Rural City Council (HRCC)
Horsham, VIC 3402

Dear Angela,

RE: Pit 23 2017 Annual Performance Reports – Iluka responses to TRG feedback

Thank you for the email correspondence from HRCC on 19th September 2018 (c/o Adam Moar) summarising feedback from the Pit 23 Technical Reference Group (TRG) to the inaugural 2017 Annual Performance Reports as submitted to HRCC on 2nd July 2018.

With respect to the TRG feedback (**Attachment 1** to this letter) Iluka provides the following responses to key matters raised by the participant agencies.

Exception / incident reporting required per the Pit 23 EMP but not enacted (GHCMA & WCMA)

With respect to surface water matters, the trigger for exception reporting is defined in **Section 8.7.2** and **Section 12.1** of the endorsed Pit 23 EMP, this being the exceedance of an *upper* trigger level for an applicable indicator (where this correlates with a >10% reduction in chloride:sulphate ratios in consecutive monitoring). These upper trigger levels are either the limit prescribed in the SEPP Waters of Victoria (WoV), or the background value, whichever is greater.

No upper trigger levels for any parameter were exceeded in the 2017 reporting period.

Precautionary trigger levels were exceeded for selected indicators (pH and EC) in the 2017 reporting period. Per **Section 8.7.2** and **Section 12.1** of the approved Pit 23 EMP the exceedance of a precautionary trigger level (again, where this correlates with a >10% reduction in chloride:sulphate ratios in consecutive monitoring) does not require an exception or incident report. Management responses include increased monitoring, cause/impact investigation and possible analytical and/or numerical modelling to support any determination of cause. These management responses have been implemented by Iluka.

Insufficient detail regarding the remediation/prevention of the seepage (GHCMA)

Section 8.7.2 of the EMP contemplates the implementation of remedial/preventative actions where *upper* trigger level exceedances have occurred – for example, reducing or ceasing the disposal of materials into Pit 23 if seepage from Pit 23 is confirmed and/or unacceptable impacts identified.

The EMP does not require remedial/preventative actions where a *precautionary* trigger level exceedance has occurred other than increased monitoring, cause/impact investigation and possible analytical and/or numerical modelling to support any determination of cause.

It is Iluka's position that:

- due diligence has been observed in addressing the exceedance of precautionary triggers (pH and EC) through additional monitoring, a formal seepage impact assessment and hydrogeological model update and that these responses are consistent with commitments in the Pit 23 EMP (**Sections 8.7.2** and **12.1**); and

- that these studies are the appropriate mechanism to validate or refute the occurrence of any potential seepage from Pit 23 and hence the requirement, or otherwise, for any remedial or preventative actions.

Concern with delay in completing and reporting on follow-up impact assessment / modelling (GHCMA & WCMA)

Following consultation and agreement with HRCC, Iluka is to submit annual performance reports on a calendar-year basis, with submission due on 30th June in the following year.

Notwithstanding this arrangement, Iluka acknowledges agency comments regarding the timing of completion and reporting of follow-up studies.

With respect of the precautionary trigger level exceedances observed in the 2017 reporting period Iluka proposes to submit a *2017 Interim Performance Report*, addressing the findings of the follow-up seepage impact assessment, by **Friday 30th November 2018.**

Iluka will report on outcomes of the Douglas Mine hydrogeological model update within the 2018 Performance Report. The scope of the model update covers the broader Douglas site and is not limited to Pit 23. The study scope will be subject to consultation with members of the separate Douglas Mine Douglas Mine Environment Review Committee before issue to external consultants. Given this pathway for consultation and the time required to engage consultants and complete the works an earlier submission is not achievable.

Iluka notes that the pending seepage impact assessment will reference the current hydrogeological modelling studies (CDM Smith 2014; CDM Smith 2015), which were tested through VCAT, and thus hydrogeological processes relevant to Pit 23 will still be considered within the impact assessment.

EPA Victoria may request an Interim Performance Report

Acknowledged; as above, Iluka proposes to submit a *2017 Interim Performance Report,* addressing the findings of the seepage impact assessment, by Friday 30th November 2018.

In closing, Iluka acknowledges the comments provided by the TRG member agencies but is satisfied that its responses to the precautionary exceedances observed in the 2017 reporting period are consistent with the requirements of the endorsed Pit 23 EMP.

Iluka considers that other avenues of consultation with the member agencies on Pit 23 environmental performance and/or a revised approach to reporting may be beneficial, subject to consultation with HRCC.

Yours sincerely,

Nick Travers

Environment Superintendent
Iluka Resources Ltd – Murray Basin
0477 319 372 | nick.travers@iluka.com

Cc: *Adam Moar, HRCC*
Dean Menzel, Iluka