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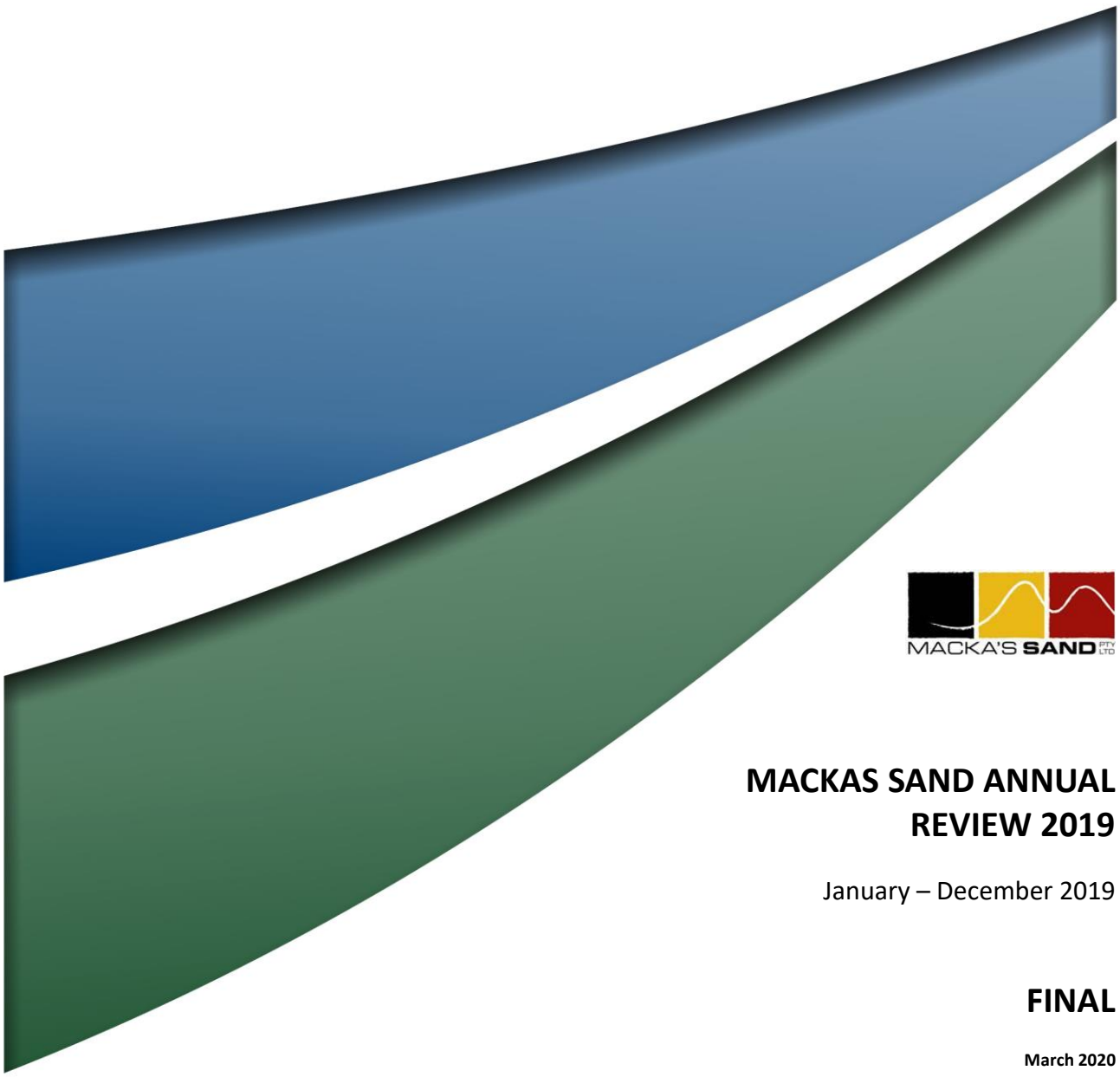

MACKA'S SAND PTY LTD

MACKAS SAND ANNUAL REVIEW 2019

January – December 2019

FINAL

March 2020

MACKAS SAND ANNUAL REVIEW 2019

January – December 2019

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Mackas Sand Pty Ltd

Project Director:	Bret Jenkins
Project Manager:	Rod Williams
Report No.	1646/R95
Date:	March 2020

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
1	Rod Williams	21 March 2020	Bret Jenkins	25 March 2020
2	Rod Williams	26 March 2020	Bret Jenkins	26 March 2020

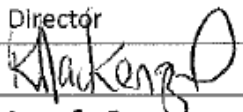
Annual Review Title Block	
Name of operation	Mackas Sand Project
Name of operator	Mackas Sand Pty Limited
Development Consent / Project Approval No.	PA 08_0142 (as modified)
Name of holder of development consent/project approval	Mackas Sand Pty Limited
Mining lease No.	No Mining Lease applicable to site under the *Mining Act* (1992).
Name of holder of mining lease	N/A
Water licence #	N/A
Name of holder of water licence	N/A
MOP/RMP start date	N/A
MOP/RMP end date	N/A
Annual Review start date	1 January 2019
Annual Review end date	31 December 2019

I, Robert Mackenzie, certify that this audit report is a true and accurate record of the compliance status of Macka's Sand Pty Ltd for the period 1 January 2019 to 31 December 2019 and that I am authorised to make this statement on behalf of Macka's Sand Pty Ltd.

Note.

a) *The Annual Review is an 'environmental audit' for the purposes of section 122B (2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

b) *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents – maximum penalty 2 years imprisonment or $22,000, or both.*

Name of authorised reporting officer	Mr Robert Mackenzie
Title of authorised reporting officer	Director
Signature of authorised reporting officer	
Date	30.3.20

Distribution Details

Distribution List
Department of Planning, Industry and Environment (DPIE)
Department of Planning, Industry and Environment – Water
Hunter Water Corporation
Mackas Sand Community Consultative Committee (after DPIE Approval)
General Public (via Mackas Sand Website after DPIE approval)

Table of Contents

1.0 Statement of Compliance 1

2.0 Introduction 4

2.1 Quarry Contacts 5

3.0 Approvals and Management Plans 7

3.1 Status of Approvals, Licences and Permits 7

3.2 Management Plans 7

4.0 Operations Summary 9

4.1 Mining Operations 9

4.1.1 Front End Loader Breakdowns and inefficiencies 9

4.1.2 Lot 218 9

4.1.3 Lot 220 10

4.2 Extraction Depth and Extent Survey Control 10

4.3 Production Limits 10

4.3.1 Hours of operations 10

4.4 Construction and Demolition Activities 11

4.5 2020 Report Period Extraction Operations 11

5.0 Actions required from previous Annual Review 12

6.0 Environmental Performance 13

6.1 Noise 15

6.1.1 Environmental Assessment Predictions 15

6.1.2 Noise Monitoring Results 16

6.1.3 Trends in Data 18

6.1.4 Proposed Improvements or Actions for the Next Reporting Period 18

6.2 Air Quality 18

6.2.1 Environmental Assessment Predictions 18

6.2.2 Air Quality Monitoring Results 19

6.2.3 Trends in Data 20

6.2.4 Proposed Improvements or Actions for the Next Reporting Period 21

6.3 Meteorology 21

6.3.1 Rainfall 21

6.3.2 Temperature 22

6.4 Landscape and Biodiversity Offset 23

6.4.1 Environmental Assessment Predictions 23

6.4.2 Impact Assessment Criteria 23

6.4.3 Monitoring Results 23

6.4.4 Trends in Data 29
6.4.5 Proposed Improvements or Actions for the Next Reporting Period 31
6.5 Aboriginal Heritage 31
6.5.1 Aboriginal Cultural Heritage Management 31
6.5.2 Environmental Assessment Predictions 31
6.5.3 Aboriginal Cultural Heritage Impact Assessment Criteria 32
6.5.4 Aboriginal Cultural Heritage Results 32
6.5.5 Proposed Improvements or Actions for the Next Reporting Period 32
6.6 Non-Aboriginal Heritage 32
6.7 Erosion and Sediment Control 33
6.8 Waste Management 33
6.9 Traffic 33
6.9.1 Environmental Assessment Predictions 34
6.9.2 Monitoring Results 34
6.9.3 Trend in Data 35
6.9.1 Proposed Improvements or Actions for the Next Reporting Period 35
7.0 Water Management 36
7.1 Surface Water 36
7.2 Groundwater 36
7.2.1 Environmental Assessment Predictions 36
7.2.2 Impact Assessment Criteria 37
7.2.3 Groundwater Monitoring Results 37
7.2.4 Trends in Data 39
7.2.5 Proposed Improvement or Actions Next Reporting Period 42
8.0 Rehabilitation 43
8.1 Rehabilitation of Disturbed Land 43
8.1.1 Lot 218 43
8.1.2 Lot 220 43
8.2 Annual Rehabilitation Inspection 45
8.3 Rehabilitation Trials and Research 46
8.4 Proposed Improvements or Actions for the Next Reporting Period 46
9.0 Community 47
9.1 Community Complaints 47
9.2 Community Liaison 47
10.0 Independent Audit 48
11.0 Incidents and Non-compliances during the Report Period 49
11.1 Incidents, Notifications and Non-Compliances 49
11.1.1 Groundwater Water Monitoring Program Notification 49

11.1.2 Finalisation of the Conservation Agreement 49
11.1.3 Additional Truck Movement 49
11.1.4 Video Recording Equipment Power Outage 50
11.2 Regulatory Correspondence 50
12.0 Activities Proposed in the 2019 Report Period 51
13.0 References 52

Figures

Figure 2.1 Locality Plan 6
Figure 6.1 Environmental Monitoring Network 14
Figure 6.2 Monthly Rainfall 2017-2019 22
Figure 6.3 Mackas Sand Project Biodiversity Offset Area 25
Figure 8.1 2019 Rehabilitation Status Lot 220 44

Tables

Table 1.1 Statement of Compliance 1
Table 1.2 Compliance Status Key (NSW Government, 2015) 2
Table 1.3 Non-compliances during the reporting period 3
Table 2.1 Project Approval Conditions for the Annual Review 4
Table 2.2 Personnel Responsible for Rehabilitation and Environmental Management during 2018 5
Table 3.1 Current Approvals, Licences and Permits 7
Table 3.2 Status of Management Plans 8
Table 4.1 Production Summary 2018 (Lot 218 and Lot 220) 11
Table 5.1 Mackas Sand Response to Actions identified in 2018 Annual Review 12
Table 6.1 Industrial Noise Impact Assessment Criteria, dB(A) 15
Table 6.2 Alternate Access Road Noise Impact Assessment Criteria dB(A) 16
Table 6.3 Traffic Noise Impact Assessment Criteria, dB(A) 16
Table 6.4 2019 Night Time Industrial Noise Levels – Sand Extraction Activities versus Noise Criteria, dB(A) 17
Table 6.5 2019 Day Time Industrial Noise Levels – Sand Extraction Activities versus Noise Criteria, dB(A) 17
Table 6.6 2019 Evening Industrial Noise Levels –Sand Extraction Activities versus Noise Criteria, dB(A) 17
Table 6.7 2019 Industrial Noise Levels – Alternate Access Road to Lot 218 17
Table 6.8 Mackas Sand 1 hour Night and Day Time Road Traffic Noise Level Contribution versus Noise Criteria, dB(A) 18
Table 6.9 Long term Impact Assessment Criteria for Particulate Matter 19
Table 6.10 Short term Impact Assessment Criterion for Particulate Matter 19
Table 6.11 Long term Impact Assessment Criteria for Deposited Dust 19
Table 6.12 Total Dust Deposition Levels at DDG 1 – Lot 220 (g/m^2/month) 19
Table 6.13 Total Dust Deposition Levels at DDG 2 – Lot 218 (g/m2/month) 20

Table 6.14	Annual averages for dust deposition 2015-2019	20
Table 6.15	Monthly Rainfall and Number of Rain Days during 2019	21
Table 6.16	Monthly Minimum and Maximum Daily Temperatures during 2019	22
Table 6.17	Results of *Diuris praecox* Searches Baseline, 2015 - 2019	26
Table 6.18	Results of *Diuris arenaria* Searches Baseline, 2015 - 2019	26
Table 6.19	Results of Habitat Assessment for baseline, 2016-2019	27
Table 6.20	Transect 1 Results of 50 m Transect Data	29
Table 6.21	Transect 2 Results of 50 m Transect Data	29
Table 7.1	Predicted Maximum Groundwater Levels	37
Table 7.2	Groundwater Quality Investigation Trigger Values	37
Table 7.3	Groundwater Levels (mAHD)	38
Table 7.4	Groundwater Quality – pH	38
Table 7.5	Groundwater Quality – Conductivity (µs/cm)	38
Table 7.6	Groundwater Quality – Turbidity (NTU)	38
Table 7.7	Groundwater Quality – Arsenic (mg/L)	39
Table 7.8	Groundwater Quality – Manganese (mg/L)	39
Table 7.9	Groundwater Quality – Iron (mg/L)	39
Table 8.1	Summary of Rehabilitation Status at Mackas Sand (Lot 220)	43
Table 9.1	Mackas Sand CCC Members for the 2019 Report Period	47
Table 10.1	Mackas Sand IEA non-compliance Summary	48
Table 10.2	Mackas Sand IEA Recommendations	48
Table 11.1	Regulatory Compliance Correspondence Summary	50
Table 12.1	Environmental Management Activities proposed for 2019	51

Appendices

Appendix 1	Quarterly Extraction Level Survey Plans of the Lot 218 and 220 Extraction Area
Appendix 2	Monthly Summary of Product Transport from Mackas Sand during 2018
Appendix 3	Groundwater Monitoring Results
Appendix 4	Operations Report

1.0 Statement of Compliance

Mackas Sand Pty Limited (Mackas Sand) operate the Mackas Sand Project (the Project), a sand quarry on Lot 218/DP 1044608 and Lot 220/DP 1049608, located approximately 25 kilometres (km) north-east of Newcastle, near Salt Ash in the Port Stephens Local Government Area (LGA) of New South Wales (NSW). The Mackas Sand directors have operated sand extraction operations in the area since 1992.

Lot 218 and Lot 220 are owned by the Worimi Local Aboriginal Land Council, with the Project being operated under agreement with Mackas Sand.

This Annual Review has been prepared to provide a summary of Mackas Sands' operational performance against the approvals listed in **Table 1.1** over the period 1 January to 31 December 2019 (referred to hereafter as the reporting period).

The compliance of the operation against relevant approvals was managed during the reporting period by Mackas Sand and is summarised in **Table 1.1**.

The statement of compliance in **Table 1.1** is based on compliance information provided by Mackas Sand. Umwelt (Australia) Pty Limited (Umwelt) has relied on this information in combination with other information sources such as; environmental monitoring documentation, discussions with Mackas Sand personnel and our general understanding of the operation.

In preparing this report Umwelt has not sought to undertake a full compliance audit, including secondary verification of the collated documentary evidence with relevant government agency staff, construction personnel or operational staff, site records etc.

Non-compliances recorded during the reporting period have been ranked according to the risk matrix included in **Table 1.2** and a brief description of each is provided in **Table 1.3**. Further information is provided in **Section 11.0**.

The most recent Independent Environmental Audit was undertaken during 2018. As at December 2019 only one non-compliance, which relates to the conservation agreement and one recommendation which relates to the timing of the 2021 audit have not been completed. Further details of which can be found in **Section 11.0**.

Table 1.1 Statement of Compliance

Relevant approval	All conditions complied with?
Development consent PA 08_0142	No – refer to **Table 1.3** for further details
Environment Protection Licence EPL 13218	No – refer to **Table 1.3** for further details
EPBC Approval 2011/6214	No
Hunter Water Corporation Regulation 2015 Clause 15(1)	No

The non-compliances for the reporting period are detailed below in **Table 1.3**.

Table 1.2 Compliance Status Key (NSW Government, 2015)

Risk Level	Colour Code	Description
High	**Non-compliant**	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	**Non-compliant**	Non-compliance with: Potential for serious environmental consequences, but is unlikely to occur Potential for moderate environmental consequences, but is likely to occur.
Low	**Non-compliant**	Non-compliance with: Potential for moderate environmental consequences, but is unlikely to occur Potential for low environmental consequences, but is likely to occur.
Administrative non-compliance	**Non-compliant**	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

Table 1.3 Non-compliances during the reporting period

Relevant Approval	Condition No.	Condition Description (Summary)	Compliance Status	Comment	Where addressed in Annual Review
PA 08_0142	Schedule 2 Condition 4	Request to update the maximum extraction depth map	**Administrative**	GHD has been commissioned to incorporate the latest rainfall data into the groundwater model and revised the maximum extraction depth map as needed. This work will be completed by April/May 2020 and DPIE provided with an update at that time.	**Section 7.2.2.1**
PA 08_0142	Schedule 3 Condition 18	Mackas Sand is required to prepare and implement the Soil and Water Management Plan	**Administrative**	Groundwater monitoring parameters above levels nominated in the Soil and Water Management Plan. DPIE have been notified of the issue and no further action has been requested or undertaken.	**Section 11.0**
PA08_0142	Schedule 3 Condition 28	Mackas Sand is required to make suitable arrangements to provide appropriate long-term security of the biodiversity area	**Administrative**	Mackas Sand submitted a finalised copy of the Mackas Sand Conservation Agreement during the reporting period however, the Mackas Sand Conservation Agreement was not finalised to the satisfaction of the Secretary as at the end reporting period.	**Section 0**
PA 08_0142	Schedule 3 Condition 4B (d)	Mackas Sand is required to ensure laden truck movements do not exceed 8 per hour between 6.00 – 9.00 am, Monday – Friday	**Administrative**	One additional laden truck movement was recorded by the weighbridge between the hours of 6.00 - 7.00 am on 17 October 2019. Mackas Sand understand the additional movement was a result of a software error identified in the weighbridge log.	**Section 6.9**
PA 08_0142	Schedule 3 Condition 33D	Mackas Sand is required to install and operate a video camera adjacent to the alternate access haul road to monitor the time and direction of travel of vehicles.	**Administrative**	From 26 November to 10 December there was a power supply issue with the building housing the video camera equipment**.**	**Section 6.9**

2.0 Introduction

Mackas Sand was granted PA08_0142 on 20 September 2009 by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to operate sand extraction operations at Lot 220 and Lot 218. It is estimated that in excess of 21 million tonnes of sand resource will be extracted from Lot 218 and Lot 220, with Lot 218 having an indefinite extraction life due to the ongoing movement of sand from the adjoining mobile dunes.

A modification to PA 08_0142 (MOD 1) was approved on 30 September 2013 by the NSW Planning Assessment Commission (PAC) under delegation of the Minister for the former Planning and Infrastructure (DPI), now Department of Planning, Industry and Environment (DPIE). The modification included a reduction in extraction level during operations, and the approval of an alternate route to access Lot 218. The alternate route connects directly from Lot 218, northward to Nelson Bay Road, as depicted within **Figure 2.1**.

A second modification to PA 08_0142, (MOD 2), was approved by the PAC on 16 March 2016. The modification allows for an increase in maximum hourly truck movements from Lot 218 via the approved alternate access road.

Mackas Sand has engaged Umwelt to assist with the preparation of this Annual Review document for the reporting period to meet the requirement of PA 08_0142 (as modified), Schedule 5, Condition 4. The report has been produced in accordance with the NSW Government *Annual Review Guideline: Post-approval requirements for State significant mining developments (October, 2015)*.

Requirements for the Annual Review under PA 08_0142 (as modified) are presented in **Table 2.1**.

Table 2.1 Project Approval Conditions for the Annual Review

Project Approval Condition	Section of Document
4. By the end of March each year, or other timing agreed by the Secretary, the Proponent shall review the environmental performance of the Project to the satisfaction of the Secretary. This review must:	This Document
a) describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the next year	Section 4.0
b) include a comprehensive review of the monitoring results and complaints records of the project over the past calendar year, which includes a comparison of these results against the: • relevant statutory requirements, limits or performance measures/criteria • requirements of any plan, program or strategy required under this approval • monitoring results of previous years • relevant predictions in the EA and the EA (MOD 1).	Section 6.0
c) identify any non-compliance over the past calendar year, and describe what actions were (or are being) taken to ensure compliance	Sections 1.0 and 11.0
d) identify any trends in the monitoring data over the life of the project	Sections 6.0 and 7.0
e) identify any discrepancies between the predicted and the actual impacts of the Project, and analyse the potential cause of any significant discrepancies	Sections 6.0 and 7.0
f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the Project.	Sections 6.0 and 12.0

2.1 Quarry Contacts

The Mackas Sand Quarry Manager is responsible to the regulatory authorities for all aspects of environmental compliance at the site including day-to-day site environmental management and reporting such as monitoring and supervision of environmental works.

The Quarry Manager contact details are listed in **Table 2.2**.

Table 2.2 Personnel Responsible for Rehabilitation and Environmental Management during 2018

Name	Position	Company	Contact Phone No.
Robert Mackenzie	Quarry Manager	Mackas Sand Pty Ltd	(w) 02 4982 6227 (m) 0408 490 911

Image Source: Nearmap (Feb 2020)

Legend

- Lot Boundaries
- Approval Areas
- Approved Site Access (not-utilised)
- Approved Site Access (utilised)
- Approved Alternate Site Access (utilised)

FIGURE 2.1

Locality Plan

File Name (A4): R95/1646_521.dgn
20200330 10.30

3.0 Approvals and Management Plans

3.1 Status of Approvals, Licences and Permits

The operation of the sand quarry during the reporting period was regulated by a range of approvals and licences. **Table 3.1** provides a list of the relevant approvals, licences and their status for reporting period.

Table 3.1 Current Approvals, Licences and Permits

Approval	Development	Date Granted	Expiry Date	Status	Authority
Project Approval 08_0142 (as modified)	Sand Extraction Operations from Lots 218 and 220, Salt Ash	20 September 2009	31 December 2029	Current	DPIE
Department of Environment Approval EPBC 2011/6214	Construction and use of Alternate Access Road (Lot 218)	29 November 2013	31 December 2029	Current	DAWE
Environment Protection Licence 13218	Mackas Sand	24 December 2009	Renewed annually	Current	EPA
Hunter Water Regulation (2015) Approval	Mackas Sand	7 June 2012	31 December 2029	Current	DPIE-Water

No changes were made to the above approvals, licences and permits during the reporting period.

3.2 Management Plans

In accordance with PA 08_0142 (as modified), Mackas Sand is required to implement a range of environmental management plans and Environmental Management Strategy (EMS).

Table 3.2 identifies the environmental management strategy and plans and their approval status as at the end of the reporting period.

Mackas Sand operated under a set of DPIE approved environmental management plans during the reporting period.

Operations are undertaken in accordance with the approved management plans, until such time as the revised plans are approved by DPIE.

Table 3.2 Status of Management Plans

Management Strategy/Plan	Revision Date of the Approved Plan	Relevant Agency	Comment
Environmental Management Strategy (EMS)	July 2016	DPIE	
Noise Management Plan (NMP)	November 2018	DPIE	
Air Quality Management Plan (AQMP)	June 2018	DPIE	
Soil and Water Management Plan (SWMP)	November 2014	DPIE	Revised and submitted to the Secretary for their satisfaction during reporting period
Unexploded Ordnance Management Plan (UOMP)	September 2011	DPIE	
Landscape and Rehabilitation Management Plan	April 2019	DPIE	
Aboriginal Cultural Heritage Management Plan (ACHMP)	July 2016	DPIE	
Non-Indigenous Heritage Management Plan (IHMP)	July 2016	DPIE	
Drivers Code of Conduct (DCoC)	December 2017	DPIE	
Pollution Incident Response Management Plan (PIRMP)	August 2017	EPA	
EPBC Landscape Management Plan	December 2013	DAWE	
Operations Management Procedures	January 2014 [Draft]	Hunter Water Corporation	

Note: All references to management plans within this document refer to the current DPIE approved version of the management plan unless specified

4.0 Operations Summary

A summary of the operations undertaken at Mackas Sand Quarry during the report period is included in the following sections.

4.1 Mining Operations

During the reporting period, sand extraction was undertaken at both Lot 218 and Lot 220. No significant operational changes during the reporting period, when compared to previous years. An overview of the operations for each Lot is below.

Mackas Sand notes that no hydrocarbon spills were recorded during the reporting period.

4.1.1 Front End Loader Breakdowns and inefficiencies

Mackas Sand experienced a number of significant machinery maintenance and part replacements on four front end loaders, three dump trucks, one excavator and one dozer across Lot 218 and Lot 220 during the reporting period. The manufacturers of the Front-End-Loader advised that these failures are due to extremely harsh operating conditions (i.e. soft dry sand) caused by operating at the depth constraints imposed under the Project Approval.

In addition, Mackas Sand reports that the Project Approval operating depth constraints that require equipment to operate in dry sand conditions results in significantly higher fuel use of around 60 litres per hour as opposed to the equipment specification of 23 litres per hour.

Mackas Sand continues to investigate equipment modifications, mining methodology and operational procedural changes to minimise the highly inefficient fuel consumption caused by the dry sand operating conditions, and the impact that these harsh operating conditions have on the loaders and the business overall.

4.1.2 Lot 218

Sand extraction operations at Lot 218 commenced during February 2015 following the construction of an alternate haul route, as approved by Modification 1 of the Project Approval.

During the reporting period sand continued to be extracted from the dune face using front end loaders, screened and stockpiled before being transported offsite by road truck via the alternate haul route.

No trucks used the Lavis Lane haul route to enter or exit the site.

Extraction activities continued to progress to the east and west adjacent to the northern (i.e. landward) extraction boundary. With the extraction activities primarily undertaken at the eastern and western extremities of the extraction area, as the approved sand resource has not been exhausted in either location (i.e. reached the full extent of the extraction boundary). Extraction activities are therefore continuing to progress in a linear fashion. The western operations are approximately 1.5 km from the nearest residential receiver at Lavis Lane.

An automated traffic light system at the weighbridge servicing Lot 218 is used to manage vehicle movement compliance with the requirements of PA 08_0142 (as modified).

Mackas received a warning letter from DPE on 30 January 2019 in relation to a non-compliance regarding a trucking number exceedance reported during the 2018 reporting period. In addition to this traffic light system, Mackas Sand completes a secondary validation process on the weighbridge logs to confirm compliance with truck movement Project Approval conditions.

4.1.3 Lot 220

Sand extraction operations in Lot 220 commenced during November 2009. During the reporting period, sand continued to be extracted primarily from the dune face in the south-eastern portion of Lot 220. A mobile screen and stacker remained in operation to process sand excavated by front end loader before being transported offsite by truck. Active operations at Lot 220 are within 250 m of the nearest resident (R27). Operations conducted within 250 m of the R27 are undertaken within the hours outlined within Schedule 3 Condition 3 of PA 08_0142.

Approximately 3 ha of land was cleared during the reporting period at Lot 220. If not directly applied to areas being prepared for rehabilitation, topsoil is salvaged and stockpiled until required for re-use on site.

4.2 Extraction Depth and Extent Survey Control

Mackas Sand operates a GSP unit in at least one operating loader at Lot 218 and Lot 220 which is uses to check the vertical and horizontal extraction limits of the active extraction/processing areas at each lot. The GPS is in addition to the physical markers which are used to complete visual checks of the extraction depth at both Lot 218 and Lot 220. These GPS checks have been supported by quarterly surveys. These surveys have confirmed that the extraction activities during the reporting period remained above the maximum extraction depth and also within the extraction boundary at Lot 218 and Lot 220. Copies of the quarterly surveys are provided in **Appendix 1**.

4.3 Production Limits

During the reporting period a total of 951,510 tonnes of product was transported from Lot 218 and 699,211 tonnes of product were transported from Lot 220. This is below the 1,000,000 tonnes per annum for each Lot permitted under PA 08_0142 (as modified).

Table 4.1 provides the annual amount of product transported for the 2018 and 2019 reporting years and a forecast for the 2020 reporting period. The 2018 and 2019 tonnages provided are based on the weighbridge data provided by Mackas Sand. A monthly summary of product transported from both Lots can be found in **Appendix 2**.

4.3.1 Hours of operations

Mackas Sand confirms that the extraction and haulage activities during the reporting period complied with the operating hours as detailed Schedule 3, Condition 9 of the Project Approval (as modified).

Quarrying operations at Lot 220 are generally undertaken between 7.00 am and 5.30 pm Monday to Friday. Therefore, the need to hold an extended hours agreement with the owners of private residence R27 has not been trigger, as per Schedule 3, Condition 9(a) of the Project Approval (as modified).

Quarrying operations at Lot 218 are permitted 24 hours/7 days a week.

Mackas Sand holds agreements with the owners of specified residences on Nelson Bay Road and Oakvale Drive for extended trucking hours, in accordance with Schedule 3, Condition 9(a) of the Project Approval (as modified). Copies of these agreements have previously been provided to the DPIE.

Table 4.1 Production Summary 2018 (Lot 218 and Lot 220)

Material	Approved Limit (Source – PA 08_0142 (as modified))	2018 Reporting Period (Actual Tonnes)	2019 Reporting Period (Actual Tonnes)	2020 Reporting Period (Forecast Tonnes)	Compliance with Approved Limit
Total Saleable Product from Lot 218	1,000,000 tonnes from Lot 218	997,313	951,510	1,000,000	Yes
Total Saleable Product from Lot 220	1,000,000 tonnes from Lot 220	994,831	699,211	1,000,000	Yes
Total Saleable Product from Lot 218 and 220 combined	2,000,000 tonnes of product in a calendar year (1,000,000 tonnes from Lot 218; 1,000,000 tonnes from Lot 220).	1,992,144	1,650,721	2,000,000	Yes

4.4 Construction and Demolition Activities

Mackas Sand continued to import Excavated Natural Material (ENM) during the reporting period. ENM continues to be used onsite to construct trafficable surfaces and extension of haul routes within Lot 218 and Lot 220 extraction areas to:

- Allow for heavy vehicle movements; and
- Minimise trucks being bogged in the dune sand environment.

Mackas Sand expects to continue to import nominal volumes of ENM for the ongoing development of internal haul roads during the next reporting period.

There were no construction or demolition activities undertaken during the reporting period at Lot 218 or Lot 220.

4.5 2020 Report Period Extraction Operations

2020 is expected to see a continuation of sand extraction operations at both Lot 218 and Lot 220 in accordance with statutory approvals.

Mackas Sand does not expect any significant changes to mining methods or quantities during the next reporting period. Mackas Sand has engaged an environmental consultant to review any potential environmental risks associated with mining deeper in Lot 218

5.0 Actions required from previous Annual Review

In accordance with Schedule 5, Condition 4 of PA 08_0142 (as modified), the 2017 Annual Review was submitted to DPIE on 29 March 2019.

DPIE acknowledged their satisfaction with the 2018 Annual Review on 18 June 2019 and requested the following be included in future Annual Review documents.

a) *Include a plan showing the biodiversity offset area;*

b) *Report on the qualitative and quantitative performance of the rehabilitation in relation to the Landscape Management Plan and include a Total (Cumulative) Area of Land Under Rehabilitation in Table 8.1; and*

c) *Status update of implementation of Umwelt's recommendations relating to ongoing restriction of grazing (including installing a permanent stock proof fence around the perimeter and installing a padlocked gate to limit access) and doing further weed control to assist in maintaining habitat for the orchid species.'*

A summary of Mackas Sand management commitments made in the 2018 Annual Review, DPIE's response on 18 June 2019, and a response to each is provided in **Table 5.1**.

Table 5.1 Mackas Sand Response to Actions identified in 2018 Annual Review

Action	Response	Status
Include a plan showing the biodiversity offset area;	Plan provided in **Section 6.4**	Complete
Report on the qualitative and quantitative performance of the rehabilitation in relation to the Landscape Management Plan and include a Total (Cumulative) Area of Land Under Rehabilitation in Table 8.1; and	Refer to **Section 8.0** of this document	Complete
Status update of implementation of Umwelt's recommendations relating to ongoing restriction of grazing (including installing a permanent stock proof fence around the perimeter and installing a padlocked gate to limit access) and doing further weed control to assist in maintaining habitat for the orchid species.'	Refer to **Section 6.4** of this document	Ongoing
Investigate with the groundwater sampling contractor the use of a low flow pump for groundwater sampling.	Refer to **Section 7.0** of this document	Complete
Mackas Sand will implement the rehabilitation recommendations at Lot 220, being: **1. Mackas Sand will engage a rehabilitation contractor to assist in the establishment, development and ongoing management of rehabilitation of Lot 220.** **2. Mackas Sand will continue to salvage tree hollows and spread over rehabilitation areas.** **3. Mackas Sand will continue to identify opportunities to rehabilitate areas which are no longer required for operational purposes/activities.**	Refer to **Section 8.0** of this document	1. Ongoing 2. Ongoing 3. Actioned in 2019 and ongoing
Mackas Sand will continue to work with the BCT to finalise the CA during 2019	Refer to **Section 6.4** of this document	Ongoing

6.0 Environmental Performance

The following sections provide a summary of environmental monitoring and management undertaken during the reporting period. In accordance with the *Annual Review Guideline* (NSW Government, 2015) this report contains a summary of environmental monitoring data where it is required to explain trends or environmental performance during the reporting period.

It is noted that environmental monitoring data has also been published on the Mackas Sand website (http://www.Mackassand.com.au) in accordance with Schedule 5, Condition 10 of the Project Approval.

A range of environmental monitoring is required to be undertaken by the Development Consent, EPL and management plans.

Figure 6.1 shows the Mackas Sand environmental monitoring locations.

Image Source: Nearmap (Feb 2020)

Legend

- Lot Boundaries
- Approval Area
- Approved Site Access (not-utilised)
- Approved Site Access (utilised)
- Approved Alternate Site Access (utilised)
- Noise Monitoring Location
- Dust Monitoring Location
- Groundwater Monitoring Location
- Residential Receivers
- Williamtown RAAF BOM Meteorological Station

FIGURE 6.1

Mackas Sand Monitoring Locations

File Name (A4): R95/1646_522.dgn
20200306 9.44

6.1 Noise

Noise management is undertaken in accordance with the Noise Management Plan (NMP) (Umwelt, November 2018). The NMP sets out the procedures and management measures to monitor, mitigate and assess the Project's noise impacts.

Mackas Sand holds agreements with the specified residences on Nelson Bay Road and Oakvale Drive for extended trucking hours and noise levels above that stated in the PA 08_0142 (as modified). Copies of these agreements have been provided to the DPIE. Attended noise monitoring is undertaken at up to five representative receiver locations, as shown on **Figure 6.1**.

6.1.1 Environmental Assessment Predictions

Operational Noise

A Noise Impact Assessment (2009) was developed in support of the Mackas Sand Project Environmental Assessment (2009). The Noise Impact Assessment concluded that operational noise would remain within project specific noise criteria during all operational periods at all residential receivers nearest to Lot 218 and Lot 220, if project specific controls were put in place whilst operations were within 250 m of private residence R27. Controls included limiting work to daytime only (7.00 am - 6.00 pm Monday – Saturday and 8.00 am - 6.00 pm on Sundays and Public Holidays).

Sleep Disturbance

Predicted noise levels are expected to be less than the project specific noise criteria. The Noise Impact Assessment further stated that predicted noise levels are expected to comply with the recommended sleep disturbance noise goals at all residential receivers of 41dB(a) $L_{A1,}$ 1 minute.

The noise impact assessment criteria specified in the PA 08_0142 (as modified) Schedule 3 Condition 4, that relate to operational noise generated specifically by sand quarrying are set out in **Table 6.1**.

Alternate Access Road Traffic Noise

Noise impact assessment criteria specified in the PA 08_0142 (as modified) Schedule 3 Condition 4A, that relate to the Alternate Access Road is shown in **Table 6.2**.

Table 6.1 Industrial Noise Impact Assessment Criteria, dB(A)

Location	Day[1] LAeq, 15 min	Evening[1] LAeq, 15 min	Night[1] LAeq, 15 min	Night[1] LA1, 1 min
R18 – 300 Nelson Bay Road	39	39	40	45
R1 –Lavis Lane residence	39	39	39	45
R19 – 316 Nelson Bay Road	36	36	37	45
R26 – Residence opp. Oakvale Farm	36	36	35	45
R27 – Hufnagl residence	36	35	35	45
R17 – 287 Nelson Bay Road	35	35	36	45
All other residences	35	35	35	45

Table 6.2 Alternate Access Road Noise Impact Assessment Criteria dB(A)

Location	Shoulder[1] LAeq, 15 min	Day [1] LAeq, 15 min	Evening[1] LAeq, 15 min
2344 Nelson Bay Road, Williamtown	38	40	40
2353 Nelson Bay Road, Williamtown	39	41	41
2367 Nelson Bay Road, Williamtown	36	38	38
2368 Nelson Bay Road, Williamtown	38	40	40
All other residences	35	35	35

Note 1: Day time is 7.00 am - 6.00 pm Monday to Saturday and 8.00 am - 6.00 pm Sundays and Public Holidays, evening is 6.00 pm - 10.00pm (NSW Industrial Noise Policy (INP) EPA, 2000). Shoulder is the period from 5.00 am - 7.00 am on Monday to Friday, but only for the use of the Alternate access road (see condition 4A of schedule 3 of Project Approval 08_0142 MOD 2).

As noted in PA 08_0142 Schedule 3, Condition 4, the Alternate Access Road noise impact assessment criteria do not apply if the Proponent has an agreement with the relevant owner/s of these residences/land to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Road Traffic Noise

The following noise criteria were assigned to road traffic from trucks servicing the Mackas Sand quarry using Lavis Lane, Oakvale Road and Nelsons Bay Road in PA 08_0142 (as modified), Schedule 3 Condition 7.

Table 6.3 Traffic Noise Impact Assessment Criteria, dB(A)

Road	Day/Evening	Night - Shoulder
Lavis Lane, Oakvale Drive	60 LAeq (1 hour)	55 LAeq (1 hour)
Nelson Bay Road	60 LAeq (15 hour)	55 LAeq (9 hour)

6.1.2 Noise Monitoring Results

In accordance with the NMP and EPL 13218 noise compliance monitoring is undertaken on an annual basis by a suitably qualified consultant. Monitoring is generally undertaken during winter to early spring as this is when noise propagation from the premises is likely to be at its worst.

During the reporting period monitoring was undertaken over two days being, 14 and 20 August 2019, at locations shown on **Figure 6.1**. These locations are representative of the nearest sensitive receivers to the extractive and haulage operations in accordance with NSW Industrial Noise Policy (EPA, 2000) and Australian Standard 1055:1:1997. For example, measurements of industrial noise levels at Site 6 are taken to be representative of industrial noise levels received at Site 5, as Site 5 is slightly farther than Site 6 from Lot 218 and from the Alternative Access Road. In determining compliance, since noise levels reduce with increasing distance from a noise source, it is deemed that the noise level at receivers located further from Site 6, for example at Site 5 being located in approximately the same direction, would therefore be lower noise levels than measured at Site 6.

Table 6.4 2019 Night Time Industrial Noise Levels – Sand Extraction Activities versus Noise Criteria, dB(A)

Location	LAeq, 15 minute		LA1,1 minute	
	Noise criteria	Mackas Sand noise level contribution	Noise criteria	Mackas Sand noise level contribution
Site 1	35	<30	45	38
Site 2	35	<30	45	<40
Site 4	36	Not Audible	45	Not Audible
Site 5[1]	35	Not Audible	45	Not audible
Site 6	35	Not Audible	45	Not Audible

Note: Monitoring not required as Site 6 is representative of Site 5 and if compliance is measured at Site 6 then compliance is achieved at Site 5.

Table 6.5 2019 Day Time Industrial Noise Levels – Sand Extraction Activities versus Noise Criteria, dB(A)

Location	LAeq, 15 minute	
	Noise criteria	Mackas Sand noise level contribution
Site 1	36	<35
Site 2	36	Not Audible
Site 4	35	Not audible
Site 5[1]	35	Not audible
Site 6	35	Not audible

Note: Monitoring not required as Site 6 is representative of Site 5 and if compliance is measured at Site 6 then compliance is achieved at Site 5.

Table 6.6 2019 Evening Industrial Noise Levels –Sand Extraction Activities versus Noise Criteria, dB(A)

Location	LAeq, 15 minute	
	Noise criteria	Mackas Sand noise level contribution
Site 1	35	<30
Site 2	36	Not Audible
Site 4	36	Not Audible
Site 5[1]	35	Not Audible
Site 6	35	Not Audible

Note: Monitoring not required as Site 6 is representative of Site 5 and if compliance is measured at Site 6 then compliance is achieved at Site 5.

Table 6.7 2019 Industrial Noise Levels – Alternate Access Road to Lot 218

Location	Period	LAeq, 15 minute	
		Noise criteria	Mackas Sand noise level contribution
Site 5	Day Time	41	<38
Site 6	Day Time	40	<38
Site 5[1]	Night Time/Shoulder	39	Not Audible
Site 6	Night Time/Shoulder	38	Not Audible
Site 5[1]	Evening	41	<38
Site 6	Evening	40	<38

Note: Monitoring not required as Site 6 is representative of Site 5 and if compliance is measured at Site 6 then compliance is achieved at Site 5.

Table 6.8 Mackas Sand 1 hour Night and Day Time Road Traffic Noise Level Contribution versus Noise Criteria, dB(A)

Road	Period	Noise criteria LAeq, 1hour	Noise level contribution LAeq,1hour	
			Cnr Oakvale Dr and Nelson Bay Rd (Site 4)	2353 Nelson Bay Road (Site 6)
Lavis Lane, Oakvale Drive as measured at corner of Oakvale and Nelson Bay Road	Night	55	55	50
	Day	60	Not Audible	50

6.1.3 Trends in Data

2019 attended noise monitoring indicates that Mackas Sand was complying with the industrial and traffic noise criteria at all sites in accordance with PA 08_0142, Schedule 3 Conditions 4 to 8, and EPL 13218 Condition L3.

The 2019 results are consistent with the long term trend associated with annual attended noise monitoring.

6.1.4 Proposed Improvements or Actions for the Next Reporting Period

No additional management or mitigation measures are proposed to be implemented which are outside the NMP.

6.2 Air Quality

Air quality monitoring is undertaken in accordance with the approved Air Quality Management Plan (AQMP) (Umwelt, June 2018) which sets out the procedures and mitigation measures for the management of dust. The air quality monitoring network consists of two dust deposition gauges (DDG1 and DDG2), which are used to measure depositional dust on a monthly basis (refer to **Figure 6.1**)

Particulate Matter (PM_{10}) and Total Suspended Particulate (TSP) monitoring are not currently undertaken. The trigger for commencing PM_{10} and TSP monitoring is the receipt of a written request from Resident R27, the nearest residential receiver to operations at Lot 220. As of the end of the reporting period, R27 had not issued such a request.

Previous years have demonstrated that Aeolian transport of dune sand during periods of high winds result in conditions where deposition levels can naturally exceed the air quality impact assessment criteria of 4 g/m^2/month and thereby producing false positive exceedance results.

6.2.1 Environmental Assessment Predictions

An Air Quality Impact Assessment (2009) was developed in support of the Mackas Sand Project Environmental Assessment (2009) (EA). The Air Quality Impact Assessment considered the direct and cumulative air quality impacts associated with the Project's ongoing operations. Modelling was undertaken which concluded that dust control measures at Lot 218 and Lot 220 would be required to remain within relevant compliance limits for PM10, TSP and Depositional Dust. As noted in the EA, the primary source of the dust generation at Mackas Sand was predicted to be from Wheel Generated Dust (Haulage). The alternate access road has been fully sealed to mitigate the risk of dust generation from this potential source.

Air Impact Assessment Criteria are specified in Schedule 3 Condition 11 of PA 08_0142 (as modified). These criteria are used to assess the environmental performance of the Project and are represented in **Table 6.9** to **Table 6.11.**

Table 6.9 Long term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	30 µg/m^3

Table 6.10 Short term Impact Assessment Criterion for Particulate Matter

Pollutant	Averaging period	Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3

Table 6.11 Long term Impact Assessment Criteria for Deposited Dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

6.2.2 Air Quality Monitoring Results

Twelve depositional dust gauge samples were collected during the reporting period on approximately a monthly basis. The monthly and annual average results for DDG1 and DDG2 are shown **Table 6.12** and **Table 6.13**.

Table 6.12 Total Dust Deposition Levels at DDG 1 – Lot 220 (g/m^2/month)

Sample date:	Exposure Period (Days)	Ash Content g/m^2/month	Total Insoluble Matter g/m^2/month
28/01/2019	32	0.3	0.5
26/02/2019	29	3.2	6.9
27/03/2019	29	0.9	1.9
26/04/2019	30	2.7	3.1
28/05/2019	32	0.2	0.4
26/06/2019	29	0.7	0.9
26/07/2019	30	0.3	0.3
26/08/2019	31	0.2	0.2
26/09/2019	31	0.6	0.7
26/10/2019	30	0.5	0.6
26/11/2019	31	0.9	1.1
26/12/2019	30	2.2	3.5
Annual Average			**1.7**

Table 6.13 Total Dust Deposition Levels at DDG 2 – Lot 218 (g/m2/month)

Sample date:	Exposure Period (Days)	Ash Content g/m².month	Total Insoluble Matter g/m².month
28/01/2019	32	0.5	0.7
26/02/2019	29	4.6	7.6
27/03/2019	29	1.6	2.2
26/04/2019	30	1.1	1.8
28/05/2019	32	4.1	4.5
26/06/2019	29	1.7	1.8
26/07/2019	30	0.7	0.8
26/08/2019	31	2.2	2.2
26/09/2019	31	8.7	9.7
26/10/2019	30	0.1	0.3
26/11/2019	31	5.6	6.5
26/12/2019	30	2.4	2.9
Annual Average			**3.4**

6.2.3 Trends in Data

The monthly results during the reporting period for DDG1 range from 0.2 g/m²/month and 6.9 g/m²/ month, with an annual average 1.7. While the monthly results for DDG2 varied from 0.3 g/m²/month and 9.7 g/m²/ month, with an annual average of 3.4.

There were no complaints received in relation to dust during the reporting period.

Table 6.14 provides a comparison of annual average deposition dust monitoring data for the previous five years. The annual averages recorded at both DD1 (Lot 220) and DD2 (Lot 218) were generally within historical range of previous monitoring results. The annual average result for DD1 (Lot 218) recorded during 2019 was higher than the 2018 value by approximately 1.7g/m^2/month. The result was largely influenced by elevated results recorded during February, May and September 2019. Mackas advised during the reporting period that results recorded during February and May 2019 may have been influenced by agricultural works on nearby properties, such as slashing and controlled back burning within the local area, respectively.

This shows the 2019 annual average is generally within historical range of results. This result indicates Mackas Sand operations have complied with the depositional dust criteria for the last five years.

Table 6.14 Annual averages for dust deposition 2015-2019

Year	Total Insoluble Solids (g/m2/month)	
	DDG1 (Lot 220)	DDG2 (Lot 218)
2015	1.7	10.0*
2016	1.3	1.6
2017	2.0	2.5
2018	1.6	1.7
2019	1.7	3.4

**High value during 2015 was due to an extreme storm event during April 2015. Refer to 2015 Annual Review for further details.*

The 2019 annual average results are also below the annual average criteria of 4 g/m2/month. The operations are therefore compliant with the depositional dust impact assessment criteria.

6.2.4 Proposed Improvements or Actions for the Next Reporting Period

No additional management or mitigation measures are proposed to be implemented which are outside the approved AQMP.

6.3 Meteorology

Meteorological data is collected from the Bureau of Meteorology station at the nearby Williamtown RAAF Base (Station 061078). As shown on **Figure 6.1**, Station 061078 is located approximately 5.3 km north-west of Lot 218 and 7.8 km west of Lot 220 and has been active prior to the commencement of operations at Lot 218 and Lot 220.

6.3.1 Rainfall

Rainfall data for 2019 is summarised **Table 6.15.**

Figure 6.2 a comparison of monthly rainfall from 2017-2019. During the reporting period, 729 mm of rainfall was recorded across 80 rain days. Approximately 42% of the annual recorded rainfall was experienced during March and June 2019.

The wider Hunter region has experienced ongoing below average rainfall over the previous 24 months which has contributed to drought conditions across the state.

Table 6.15 Monthly Rainfall and Number of Rain Days during 2019

Month	Rainfall (mm)	Highest Daily (mm)	Rain Days (i.e. >0.2 mm)
January	14.6	5.0	6
February	33.6	12.8	8
March	145.8	59.4	11
April	36.0	23.8	7
May	47.2	23.2	5
June	157.2	50.6	12
July	23.4	10.0	9
August	98.6	67.4	3
September	75.4	39.4	7
October	45.0	23.0	6
November	51.8	31.2	5
December	0.8	0.4	1
TOTAL	**729.4**	**67.4**	**80**

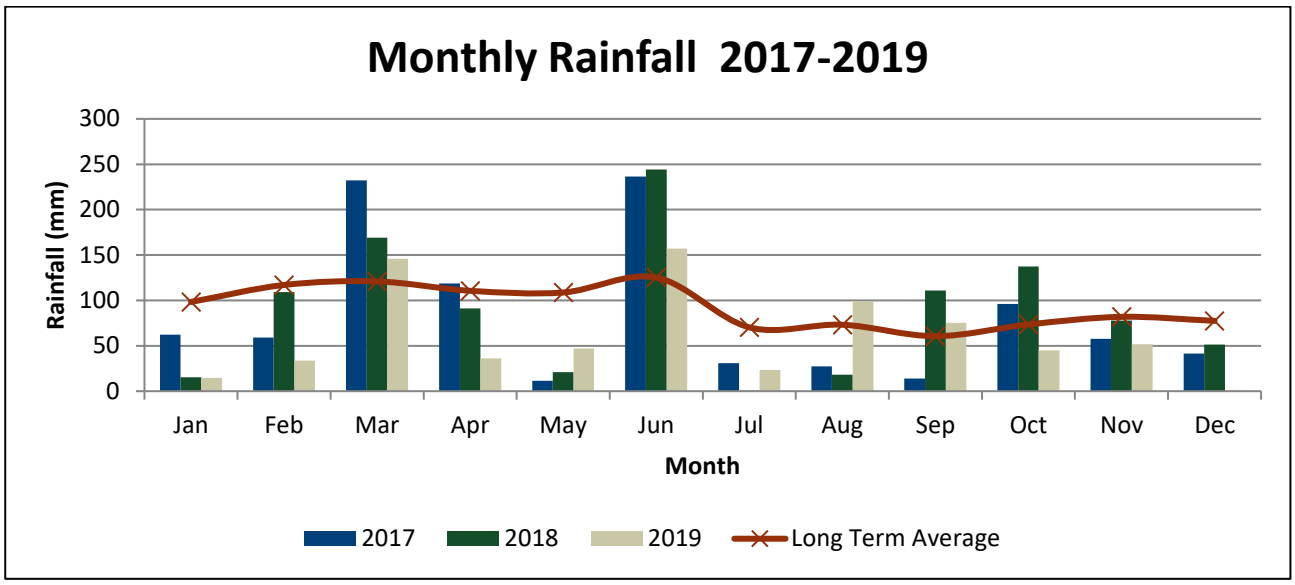


Figure 6.2 Monthly Rainfall 2017-2019

6.3.2 Temperature

2019 Minimum and Maximum daily and monthly average minimum and maximum temperatures are summarised below in **Table 6.16.** January was generally the warmest month of the year on average experienced at Mackas Sand with an average maximum daily temperature of 33.3°C. August was generally the coolest month of the year experienced at Mackas Sand with a minimum daily temperature of 0.7°C.

Table 6.16 Monthly Minimum and Maximum Daily Temperatures during 2019

Month	Minimum Temperature (°C)	Average Minimum Temperature (°C)	Average Maximum Temperature (°C)	Maximum Temperature (°C)
January	17.5	21.0	33.3	41.8
February	13.1	18.4	30.1	39.4
March	12.2	18.3	28.1	38.7
April	8.7	13.4	25.4	33.5
May	5.6	10.0	22.45	26.8
June	4.4	8.4	18.3	26.1
July	1.5	6.9	19.3	23.9
August	0.7	6.8	20.1	25.3
September	5.3	10.1	22.4	31.4
October	6.0	11.2	25.5	36.1
November	9.8	14.8	28.6	37.8
December	11.3	17.0	30.5	42.1

6.4 Landscape and Biodiversity Offset

In accordance with the project approval Mackas Sand holds an approved Landscape Management Plan (LMP) (Umwelt, April 2019). The LMP sets out the procedures and management requirements associated with the rehabilitation, ecological and biodiversity offset area.

The LMP was revised during the reporting period and submitted to the Secretary for their satisfaction.

6.4.1 Environmental Assessment Predictions

A detailed ecological assessment was undertaken to support of the Mackas Sand Project Environmental Assessment (2009) (EA). This assessment identified the existing natural environment and likely impacts of the proposal on the biodiversity of the area, particularly on threatened species, populations and communities.

No threatened flora species, endangered flora populations or threatened ecological communities were observed in the study area during surveys undertaken for the ecological assessment. Four threatened fauna species were identified and fourteen threatened or endangered fauna species are considered to have potential habitat in the study area.

The ecology impacts are limited to the clearance of vegetation primarily at Lot 220, but also the alternate access road to Lot 218. To address these impacts a pre clearance procedure, rehabilitation of Lot 220 and the establishment of a biodiversity area to offset the impact on two orchids (i.e. Newcastle Doubletail *(Diuris praecox)* and Leafless Tongue-orchid *(Cryptostylis hunteriana)*) and a number of fauna species were recommended.

6.4.2 Impact Assessment Criteria

The rehabilitation, ecological and biodiversity impact assessment criteria are associated with following the procedures as detailed in the LMP, being:

- Ecological pre-clearance surveys
- Limiting vegetation impacts to the approved areas (e.g. extraction area and haul roads)
- Salvage of topsoil and woody debris for rehabilitation of the extraction area at Lot 220
- Weed management
- Bushfire management
- Rehabilitation of the extraction area at Lot 220
- Monitoring the performance and progression of the rehabilitation areas
- Arranging for the long term security of the biodiversity offset area.

6.4.3 Monitoring Results

6.4.3.1 Rehabilitation and Ecological

The alternate access road to Lot 218 has been constructed and fully sealed. As the alternate access road is in use, rehabilitation of the alternate access road and subsequent rehabilitation performance monitoring has not been commenced.

During the reporting period, Mackas Sand implemented the following land management procedures in accordance with the LMP at Lot 220:

- Ecological pre-clearance surveys.
- Identified the limiting vegetation clearance in advance of the sand extractions operations.
- Salvage of topsoil and woody debris for rehabilitation of the extraction area at Lot 218.
- Continue to add to the total area of land under rehabilitation at Lot 220. Refer to **Section 8.0** for further details.
- Monitoring the performance and progression of the rehabilitation areas.

6.4.3.2 Biodiversity Offset

Mackas Sand in consultation with Biodiversity Conservation Trust (BCT – formerly OEH) is seeking to establish a Conservation Agreement with BCT to offset the impacts of construction of the alternate access road. The Conservation Agreement is the mechanism by which the security of the biodiversity offset area in perpetuity.

BCT provided further comment and requested amendments of the draft Conservation Agreement during the 2019 report period. Mackas Sand submitted a final draft Conservation Agreement to BCT in June 2019. As at the end of the reporting period, BCT were yet to finalise the Conservation Agreement. BCT provided further minor amendments to the draft conservation agreement to Mackas Sand on 16 January 2020.

Mackas Sand will continue to liaise and work with BCT to finalise this agreement. Subject to any further comments from BCT as well as BCT review and/or processing timeframes, Mackas Sand expects the agreement to be finalised during 2020.

Monitoring of the biodiversity offset area is undertaken generally during August/September to align with the peak flowering season of the Newcastle Doubletail *(Diuris praecox)* and Leafless Tongue-orchid *(Cryptostylis hunteriana)*. During the reporting period monitoring was undertaken on 27 August 2019 and 3 September 2019. While the timing of the monitoring is designed to target and monitor the orchid population numbers, the following additional ecological information is also collected:

- Habitat Assessment - including dominant flora species in each stratum, groundcover, evidence of disturbance and dieback, presence of standing and fallen dead timber and hollow-bearing trees.
- Vegetation Structure Assessment - Two permanent 50 m transects have been established at the eastern section of the Lot and are surveyed to monitor structural change to vegetation assemblage and habitat surrounding known orchid populations.
- Photo Monitoring – Five photo monitoring points have been established to monitor structural development in vegetation assemblage.
- Exotic Species Monitoring and Management – Monitoring and management of Whiskey Grass population and other exotic species.

The Mackas Sand Biodiversity Offset Area, transect, photographic monitoring locations and the 2019 orchid locations is provided in **Figure 6.3**.

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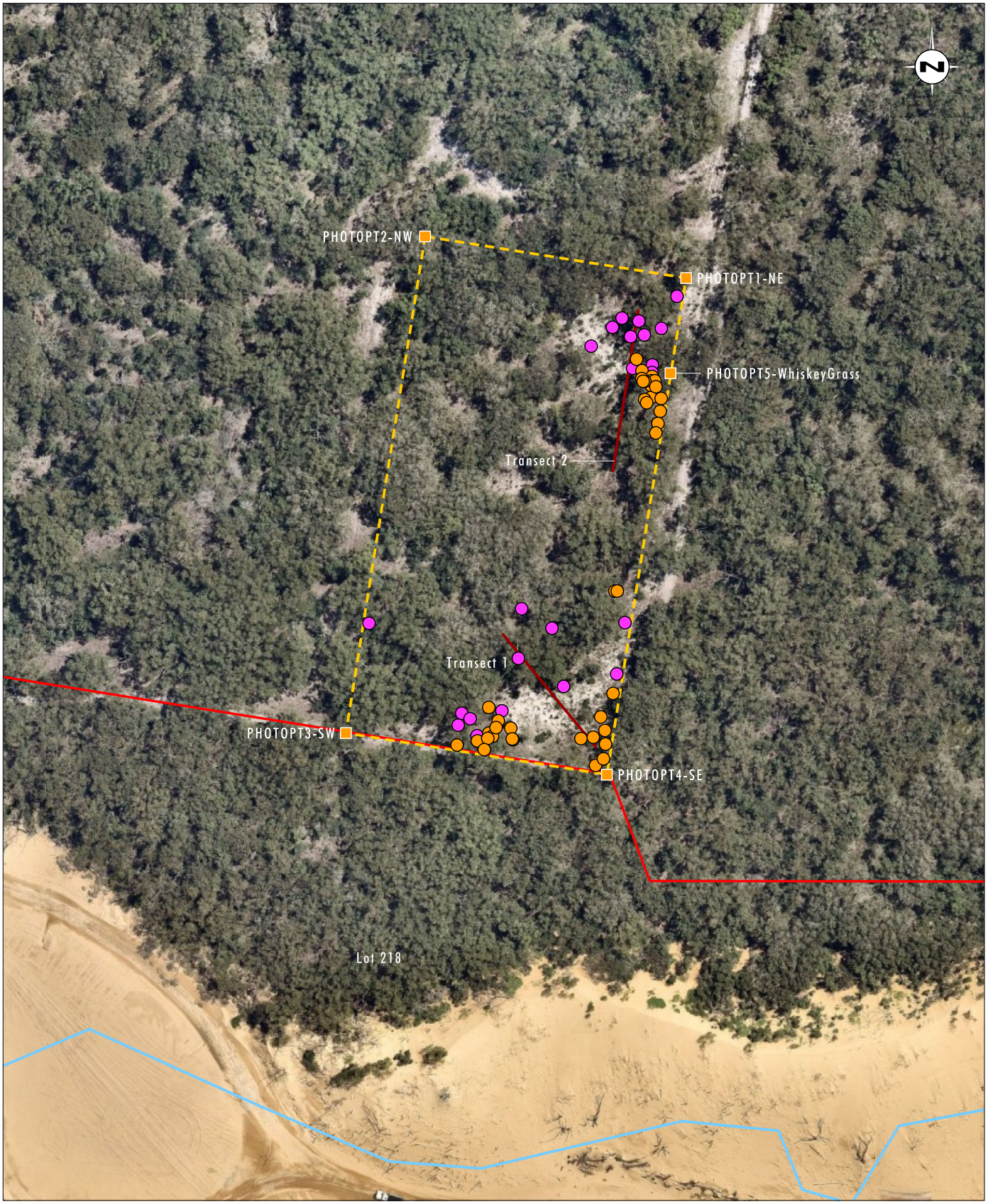

Image Source: Nearmap (Feb 2020)

0 20 40 80m
1:1 500

Legend

- Lot Boundary
- Approved Operational Area
- Biodiversity Offset Area
- Transect
- Photo Location
- *Diuris praecox*
- *Diuris arenaria*

FIGURE 6.3

Mackas Sand Biodiversity Area
2019

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20200324 21.48

Orchid Monitoring

The results of the monitoring data for Newcastle doubletail (*Diuris praecox*) and Sand doubletail (*Diuris arenaria*) between 2016 and 2019 are shown in **Table 6.17** and **Table 6.18**. Baseline results recorded during 2014 and LMP management criteria are also provided in **Table 6.17** and **Table 6.18** for reference.

Table 6.17 Results of *Diuris praecox* Searches Baseline, 2015 - 2019

	2014 (Baseline)	Criteria (25% of baseline for 3 consecutive years)	2015	2016	2017	2018	2019
Date of survey	27 August 2014	N/A	26 August 2015	26 August 2016	25 August 2017	7 September 2018	28 August 2019
Number of stems	64	16	69	39	93	20	23
Maximum flowers per stem	9	N/A	10	7	8	9	6
Minimum flowers per stem	0	N/A	0	0	0	0	1
Mean flowers per stem	4.2	N/A	4.7	2.7	3.4	4.3	4

Table 6.18 Results of *Diuris arenaria* Searches Baseline, 2015 - 2019

	2014 (Baseline)	Criteria (25% of baseline for 3 consecutive years	2015	2016	2017	2018	2019
Date of survey	10 September 2014	N/A	11 September 2015	14 September 2016	7 September 2017	7 September 2018	28 August 2019
Number of stems	72	18	156	200	150	119	39
Maximum flowers per stem	7	N/A	9	7	5	6	3
Minimum flowers per stem	1	N/A	0	0	0	0	0
Mean flowers per stem	2.2	N/A	2.4	2.7	1.3	1	1

Habitat Assessment Monitoring

The results of the 2019 habitat monitoring are shown in **Table 6.19** below. The table also shows the accumulated results from 2016-2019 and baseline survey results from 2014.

Table 6.19 Results of Habitat Assessment for baseline, 2016-2019

Habitat Attribute	2014 (Baseline)	2016	2017	2018	2019
Disturbances					
Weeds (density/species)	Low/whiskey grass (*Andropogan virginicus*)	Low/whiskey grass (*Andropogon virginicus*)	Low/whiskey grass (*Andropogon virginicus*)	Low/whiskey grass (*Andropogon virginicus*)	Low Whiskey grass (*Andropogon virginicus*)
Pests	Nil identified	Nil Identified	Nil Identified	Nil Identified	Rabbit (*Oryctolagus cuniculus*)
Fire	Evidence of previous	Nil during reporting year	Nil during reporting year	Nil during reporting year	Nil
Grazing	Cattle	Cattle	Cattle	Ground vegetation and small shrubs impacted by cattle grazing	Cattle present at the time of survey. Signs of historic cattle grazing during Stage 1 inspection; cattle grazing in the Biodiversity Offset Area during Stage 2 inspection. Grazing impacts present.
Erosion	Minor (Aeolian)	Minor (Aeolian)	Minor (Aeolian)	Minor (Aeolian)	Minor (Aeolian)
Logging	Historic (cut stumps)	Nil during reporting year	Nil during reporting year; Vegetation removed to install fence*	Nil during reporting year - Vegetation removed by grazing	Nil during reporting year; minor impacts to ground vegetation by grazing.

Habitat Attribute	2014 (Baseline)	2016	2017	2018	2019
Features (Relative Abundance)					
Fallen timber/logs	Moderate	Moderate	Moderate	Moderate	Moderate
Stags	Nil	Nil	Nil	Nil	Nil
Ground cover (litter)	Moderate	Common	Common	Moderate	Sparse – Moderate Signs of minor vegetation recovery and litter production following 2018 cattle grazing event. Signs of 2019 grazing impacts.
Mistletoe	Nil	Scarce	Few	Few	Few
Dieback	Nil	Nil	Nil	Minor canopy dieback	Nil
Loose bark on trees	Moderate	Moderate	Moderate	Few	Few
Tree Hollows					
Number of trees with hollows	12	12	12	12	12
Size classes present	Very small (vs), small (s), medium (m), large (l) and very large (vl)	vs, s, m, l, vl	vs, s, m, l, vl	vs, s, m, l, vl	vs, s, m, l, vl

*Vegetation removed along northern and western boundary – approx. 5m – 7m in width along with additional areas to stock pile.

Vegetation Structure Assessment, Exotic Species and Photo Monitoring

The results of the 2019 vegetation structure monitoring are shown in **Table 6.20** and **Table 6.21**. The tables also show the accumulated results since 2016.

Table 6.20 Transect 1 Results of 50 m Transect Data

% Cover	2016	2017	2018	2019
Canopy Cover				
Native Over-storey	12%	12%	6%	7%
Native Mid-storey	5%	4.5%	4%	6.6%
Ground Cover				
Native Grass	14%	20%	16%	41%
Native Shrubs	8%	24%	8%	6%
Native other (eg. Forbs)	32%	22%	10%	20%
Exotic	12%	4%	6%	2%
Bare Earth	36%	34%	62%	40%

Table 6.21 Transect 2 Results of 50 m Transect Data

% Cover	2016	2017	2018	2019
Canopy Cover				
Native Over-storey	31%	34%	18%	17%
Native Mid-storey	1%	1%	0.1%	3.8%
Ground Cover				
Native Grass	16%	12%	6%	4%
Native Shrubs	2%	2%	2%	0%
Native other (eg. Forbs)	44%	46%	8%	48%
Exotic	10%	12%	4%	2%
Bare Earth	34%	34%	80%	48%

6.4.4 Trends in Data

6.4.4.1 Orchids

Table 6.17 and **Table 6.18** show that there are annual fluctuations in the monitoring data for Newcastle doubletail (*Diuris praecox*) and Sand doubletail (*Diuris arenaria*) between 2014 and 2018. As shown in **Figure 6.3**, there continues to be two clusters of Newcastle doubletail (*Diuris praecox*) , with one extending from the north east and the other extending from the south east corner. Similarly, two clusters of Sand doubletail (*Diuris arenaria*) were recorded in 2019 monitoring, one extending from the north east and the other extending from the south east corner. The cluster mid way along the eastern boundary present in 2017 was not recorded in 2019.

Monitoring in 2019 determined that there was no substantial change in the population of Newcastle doubletail (*D. praecox)* compared to 2018 results where 23 stems and 20 stems were recorded respectively.

A total of 39 stems were recorded for Sand doubletail (*D. arenaria)* during the 2019 monitoring event. This is compared to the baseline survey results of 72 stems recorded during 2014 and represent a total of 54% of the population that was recorded in 2014.

These annual fluctuations are expected given the nature and response of these cryptic species to a range of environmental conditions. Future annual fluctuations will be used as a guide together with the triggers and management measures outlined in Item 1 of Annexure C to the Conservation Agreement for the ongoing management of the Biodiversity Offset Area.

The meteorological conditions leading up to monitoring in 2019 were a warm, dry autumn and winter period. Extended drought conditions have been experienced since December 2017 (DPI, 2019). These meteorological conditions are not typically favourable for spring flowering orchids which can remain as underground tubers until favourable conditions trigger them to emerge. The capacity of the orchids to persist underground is reduced in periods of severe and extended drought. The conditions experienced since 2017 have likely contributed to the low emerging populations of threatened orchid species recorded since 2017.

6.4.4.2 Habitat Assessment

The 2019 monitoring results were generally consistent to previous monitoring years in regards to the provision of habitat structures such as hollow bearing trees and fallen logs. The understorey is considered highly modified and a decrease in vegetation condition and structure was observed as a result of grazing activity in 2018 and 2019 within the Biodiversity Offset Area.

The occurrence of bare earth generally decreased where the colonisation of grasses (native and exotic species), with the percentage coverage of native sedges and native rushes typically increasing in 2019. This was evident at both Transect 1 and Transect 2 where bare earth decreased from 2018 by 22% and 32%, respectively.

6.4.4.3 Vegetation Structure, Exotic Species and Photo Monitoring

In 2019 the vegetation structure is one of a highly modified understory of groundcover vegetation. On comparing to previous years the groundcover vegetation in 2019 was less sparse and illustrated an increase diversity of grasses, forbs, shrubs, sedges and rushes that were previously dominant.

The presence of weed species, such as Whiskey Grass continues to be identified within the Biodiversity Offset Area and management action is recommended for 2020.

Umwelt noted that cattle were present in the Biodiversity Offset Area during the 4 September 2019 round of monitoring. Mackas Sand were immediately notified of this and the cattle were removed on the same day.

Opportunistic weed management continues to be undertaken in conjunction with the offset monitoring. Weed management activities undertaken during the report period included the removal of a total of 10 African love grass (*Eragrostis curvula*) plants, 45 bitou bush (*Chrysanthemoides monilifera*) saplings and 30 whiskey grass (*Andropogon virginicus*) plants were hand-pulled during the 2019 monitoring survey. The removal of exotic plants is aimed to reduce their spread through known threatened orchid habitat. However, a dedicated weed removal program of works will be implemented in 2020.

Mackas Sand notes the perimeter of the Biodiversity Offset Area is fenced with a combination of electric and wire fencing materials. A wire fence has previously installed along eastern and southern boundaries of the offset area and electric wire fencing continues to be in place along the western and northern boundaries of the offset area. Mackas Sand advised that an upgraded solar regulator was installed on the electric wire fence during the report period however, as noted in the 2019 offset monitoring; this did not exclusively prevent cattle entering the area.

Mackas Sand has advised that a stock proof fence will be installed along the northern and western alignment of the boundary in line with relevant obligations contained within the draft Conservation Agreement.

Mackas Sand will continue to undertake future monitoring events in accordance with relevant obligations within the Mackas Sand Landscape Management Plan and draft Conservation Agreement.

6.4.5 Proposed Improvements or Actions for the Next Reporting Period

Mackas Sand has advised that a wire fence will be installed along the northern and western boundary of the Biodiversity Offset Area.

Additional weed management activities will be undertaken periodically throughout the reporting period to target colonising weed species such as Bitou Bush and Whiskey Grass.

Mackas Sand will continue to seek the finalisation of the Conservation Agreement in consultation with BCD.

6.5 Aboriginal Heritage

6.5.1 Aboriginal Cultural Heritage Management

In accordance with the project approval Mackas Sand holds an approved Aboriginal Cultural Heritage Management Plan (ACHMP) (Umwelt, July 2016). The ACHMP sets out the procedures and management requirements associated with the Aboriginal Cultural Heritage matters and consultation regarding the rehabilitation, ecological and biodiversity offset matters as well as the establishment of the Aboriginal Cultural Heritage Group as the primary consultation mechanism for ongoing Aboriginal Cultural Heritage management matters for the project.

It is noted that the Mackas Sand extraction area is owned by the Worimi Local Aboriginal Land Council (Worimi LALC), who at the time of the environmental assessment dedicated a significant area of remnant coastal vegetation adjacent to the sand extraction area to permanent conservation status. Worimi LALC members are members of the ACHG.

6.5.2 Environmental Assessment Predictions

A detailed Aboriginal Cultural Heritage Assessment (ACHA) was prepared to support of the Mackas Sand Project Environmental Assessment (2009) (EA). The study area was determined to have high Aboriginal cultural significance through consultation undertaken with Aboriginal stakeholders.

The ACHA determined that the sand extraction operations at Lot 218 may uncover buried former soil horizons within the transient sand dunes that may contain archaeological material. As these soil surfaces are distributed discontinuously at varying depths across and within the dune field, significant logistical and safety issues have been experienced with traversing the transient sand dunes with mechanical sampling equipment prior to extraction occurring. As such, it has not been possible to safely undertake a typical sub-surface sampling program prior to extraction of the sand, in order to accurately identify where the remnant soil horizons occur prior to extraction commencing.

In contrast, all of Lot 220 consists of stabilised soils which will be impacted by the proposal, making it safe and achievable to undertake further archaeological investigations where required. One area of Potential Archaeological Deposit (PAD) was identified in the low-lying central area of Lot 220. Impacts to the area of PAD in the central section of this site were expected to be minimal, as any impact is limited to the construction of up to two vehicle access tracks across the narrowest sections of the PAD area. The key impacts associated with the proposal will occur in the elevated dunes and associated slopes that have been assessed as unlikely to contain PAD, although may contain low densities of archaeological material. Removal of vegetation on this site will also cause destruction of integral components of the Aboriginal cultural landscape.

6.5.3 Aboriginal Cultural Heritage Impact Assessment Criteria

The Aboriginal cultural heritage impact assessment criteria are associated with the following procedures as detailed in the ACHP:

1) Establishment of an Aboriginal Cultural Heritage Group (ACHG)
2) Cultural awareness training
3) The recording and salvage of Archaeological sites and PADs
4) Monitoring inspections by the ACHG
5) Analysis and interpretation of results of mitigation activities
6) Care and control of salvaged material

6.5.4 Aboriginal Cultural Heritage Results

Mackas Sand has established an ACHG and the plant operators have completed cultural awareness training as part of the induction process. This training is supplemented by the plant operator(s) also attending and participating in the ACHG meeting and the monitoring inspections by the ACHG.

An ACHG inspection was undertaken at Lot 218 and Lot 220 during May 2019.

Artefacts identified during inspections are inspected and analysed by the ACHG. Artefacts are stored securely onsite for later reburial at the ACHG's nominated keeping place. Artefacts identified during the May 2019 inspection will be reburied as part of the 2020 AHMG inspection routine.

The ACHG has previously indicated there is no need to bag materials from Lot 220 for later analysis, however any artefacts are to be stored and returned to Lot 220 as part of the site rehabilitation process.

6.5.5 Proposed Improvements or Actions for the Next Reporting Period

No additional management or mitigation measures are proposed to be implemented which are outside the ACHMP. The ACHG will discuss the opportunity to revise the ACHMP to more closely reflect safe artefact recovery practices that have been developed for Lot 218.

6.6 Non-Aboriginal Heritage

The Mackas Sand Environmental Assessment (2009) (EA) identified an alignment of World War II era tank traps traversing a section of Lot 220. These tank traps are also believed to exist beneath the mobile sand dunes on north-eastern end of Lot 218. No other historical heritage items were identified within the study area.

The tanks traps within the Lot 220 extraction area have been temporarily relocated during a previous reporting period. They will be returned to their original position when they will not restrict extraction and/or rehabilitation activities. No tanks traps were uncovered at Lot 218 during the reporting period.

No actions or impacts in relation to non-Aboriginal heritage occurred during the 2018 reporting period.

No additional management or mitigation measures are proposed to be implemented.

6.7 Erosion and Sediment Control

In accordance with the project approval Mackas Sand holds an approved Soil and Water Management Plan (SWMP) (Umwelt, November 2014), which sets out the procedures and management requirements.

The SWMP was revised during the reporting period and submitted to the Secretary for their satisfaction.

The Mackas Sand Environmental Assessment (2009) (EA) identified that small quantities of surface run-off will be generated from access roads and small parking areas. With this surface run-off readily managed through the establishment of table drains and flow dissipation structures, such as level spreaders along each access road. Rainwater tanks will be connected to the roofs of any permanent buildings to collect rainfall runoff.

Mackas Sand's experience in relation to the extraction area is that the sand is highly permeable. This in combination with the extraction area being the lowest point in the landscape results in there being negligible potential for the operation to generate runoff or impact on surface waters.

Mackas Sand completed an extensive road sealing program during 2017. This effectively eliminated the potential for erosion and sediment transport along the Lot 218 alternate and Lot 220 access roads. Spoon drains and localised erosion sediment controls are located near the entrance to the sand extraction areas where the road has not been sealed.

No additional erosion and sediment control works were completed during the 2019 reporting period.

No additional management or mitigation measures are proposed to be implemented which are outside the SWMP.

6.8 Waste Management

The Mackas Sand Environmental Assessment (2009) (EA) identified that wastes from the Project include sand processing and ablution wastes.

During the reporting period sand processing wastes (i.e. screen waste) have consisted of sand aggregates, fallen vegetation and litter. These wastes have been incorporated into the final landform of the site as per the EA.

No additional management or mitigation measures are proposed to be implemented.

6.9 Traffic

Traffic Management at Mackas Sand is undertaken in accordance with the approved Drivers Code of Conduct (DCoC) (Umwelt, December 2017). The DCoC applies to drivers of all project-related vehicles, including trucks that haul sand from Mackas Sand operations on Lot 218 and Lot 220.

The DCoC details:

- potential safety issues on site and when on public road haulage routes
- times of heavy traffic
- school bus travel times and bus stop locations

- potential interactions with traffic and fauna on roads
- emergency and accident contact details (including details for care of injured fauna)
- local road condition updates
- measures to minimise truck noise impacts, and
- measures to minimise movement to site prior to 5am weekdays.

As part of standard site procedure, the DCoC is sent to all contracting companies for their distribution to drivers. All haulage contractors are required to read/understand the DCoC before gaining access to the site.

6.9.1 Environmental Assessment Predictions

A detailed Traffic Assessment was prepared by GHD to support a modification to the Mackas Sand Project and was included as an appendix within the Environmental Assessment (July 2015) (EA) (i.e. Modification 2). The modification allows for an increase in maximum hourly truck movements from Lot 218 via the approved alternate access road. All other traffic aspects remained unchanged from that approved as part of the 2009 EA. No changes to the transport routes were sought by this modification.

The traffic impact assessment concluded that the site access and the intersection with Nelson Bay Road will continue to operate with spare capacity from 2015 to 2035 and that the existing road network will continue to operate with minimal negative impacts as a result of the proposed modification to the approved truck movements.

6.9.2 Monitoring Results

6.9.2.1 Vehicle Movements

As part of standard site procedure, the DCoC is sent to all contracting companies.

Transport of product material was undertaken generally in accordance with the hourly limits specified in the Project Approval during the reporting period, with the exception of one laden truck movements which exited Lot 218 between 6.00 am – 7.00 am on 17 October 2019. Further details regarding the one extra truck movement can be found in **Section 11.0**.

Mackas Sand also notes that power supply to video recording equipment required under Schedule 3, Condition 33D of the Project Approval was interrupted between 26 November and 10 December 2019. While the video equipment was inoperable Mackas Sand, continued to manage and monitor its operation via the weighbridge and associated video equipment, in accordance with Schedule 3 Condition 33E. No non-compliances with Schedule 3 Condition 33E were identified during this period. Further details regarding this matter can be found in **Section 11.0**.

Mackas Sand is not aware of any traffic accidents involving truck entering or departing via the Lot 218 or Lot 220 access roads intersection with Nelson Bay Road.

6.9.2.2 Road Haulage

Condition 33 of Schedule 3 of Project Approval 08_0142 (as modified) states that all vehicles entering and leaving the site are covered and that all loaded vehicles leaving the site are cleaned of materials that may fall on the road, before they leave the site.

Mackas Sand notes there were no non-compliances with Condition 33 of Schedule 3 during the reporting period.

6.9.2.3 Fauna Strikes

Conditions 33B and 33C of Schedule 3 of Project Approval 08_0142 (as modified) details the requirement for the DCoC to be assessed in each Annual Review. This shall include details of all fauna injured or killed by vehicle strikes, time and date of any such strike, species involved, action taken immediately following the strike and any consequent measures put in place to prevent or minimise a recurrence of fauna strikes.

There were no reports made to Mackas Sand management of any fauna injured or killed during the reporting period.

6.9.3 Trend in Data

During the reporting period Mackas Sand achieved almost 100% compliance with its traffic movements.

6.9.1 Proposed Improvements or Actions for the Next Reporting Period

No additional management or mitigation measures are proposed to be implemented which are outside the approved DCoC.

7.0 Water Management

Mackas Sand does not extract groundwater for use at either Lot 218 or Lot 220 and does hold any licences for the extraction of groundwater for use at either Lot 218 or Lot 220. Water management needs on-site are negligible and are limited to surface runoff from the sealed access road. The remainder of the site is comprised of sand which is free draining. There is no surface water runoff at either of the Lots that requires diversion or specific management.

The potential major water demands for the Project are the wash plant and dust suppression associated with the minimisation of vehicle generated dust emission. Mackas Sand has however, effectively minimised its water demand to nil, as the wash plant has not been constructed and the access roads have been sealed. As noted in Section 2.5 of the SWMP, Mackas Sand will keep a record of any extraordinary water usage on-site and will compile and present this information as part of the Annual Review.

No extraordinary water usage was recorded at Mackas Sand during the reporting period.

7.1 Surface Water

There are no surface flow or drainage lines on either Lot 218 or Lot 220 due to the high permeability of the underlying sand. As a result, there is no surface water that can be monitored to establish baseline conditions other than in low-lying areas that may intermittently flood following an intense rainfall event due to the infiltration rate being exceeded (i.e. perched water). As this water is intermittent and reports to the local groundwater, it is considered that these areas would have water quality that is consistent with that recorded in the groundwater monitoring bores.

7.2 Groundwater

In accordance with the Project Approval, Mackas Sand holds an approved SWMP (Umwelt, November 2014), which sets out the procedures and management requirements for groundwater.

The SWMP was revised during the reporting period and submitted to the Secretary for their satisfaction.

The groundwater monitoring network consists of six bores, which are monitored each quarter. The location of the monitoring bores is shown on **Figure 6.1**.

7.2.1 Environmental Assessment Predictions

The Mackas Sand Environmental Assessment (2009) identified that the sand extraction areas are located on the Stockton Sandbeds, which form part of the Tomago-Tomaree-Stockton groundwater source that is managed in accordance with the Hunter Water (Special Areas) Regulation 2003, Tomago-Tomaree-Stockton Groundwater Management Plan 1996 and Water Sharing Plan for the Tomago-Tomaree-Stockton Groundwater Sources 2003.

A Groundwater Impact Assessment was developed in support of the Mackas Sand Project Environmental Assessment (2009). The EA predicted that the sand extraction operations at Lot 218 and Lot 220 would have a negligible impact at both locations under average rainfall conditions.

The EA does not include information on groundwater quality impacts. The assessment findings for the temporary reduction in extraction level (i.e. Modification 1 of the Project Approval) are unchanged from the 2009 EA.

7.2.2 Impact Assessment Criteria

7.2.2.1 Groundwater Level

To ensure adequate protection of the underlying groundwater resource, the SWMP includes a Maximum Extraction Depth Map for Lot 218 and Lot 220, which satisfies the requirements of Schedule 2, Conditions 7 and 7A of the Project Approval. The standing water level in the six bores is measured each quarter and compared to the predictions shown in **Table 7.1**. Mackas Sand has commissioned GHD to incorporate the latest rainfall data into the groundwater model in response to a request from the DPIE. The output of the model will be compared against the Maximum Extraction Depth Map for Lot 218 and Lot 220 and update as appropriate. Mackas Sand anticipate that this process will be completed by April/May 2020 and will provide DPIE with an update at that time.

Table 7.1 shows the predicted maximum groundwater levels at each groundwater monitoring bore.

Table 7.1 Predicted Maximum Groundwater Levels

Groundwater Monitoring Bore	Approximate Predicted Maximum (mAHD)
SP1	3.6
SP2	2.8
SP3	2.6
SP4	1.25
SP5	3.6
BL158	3.7

7.2.2.2 Groundwater Quality

The SWMP includes a suite of groundwater monitoring parameters and trigger levels which are measured each quarter, as shown in **Table 7.2**.

Table 7.2 Groundwater Quality Investigation Trigger Values

Parameter	Units	Minimum	Maximum
pH	pH Unit	4.5**	8.5*
Conductivity	µS/cm	NA	600**
Turbidity	NTU	NA	50**
Arsenic	mg/L	NA	0.01*
Manganese	mg/L	NA	0.1*
Iron	mg/L	NA	5.70**

*These values are based on NHMRC, NRMMC 2011.

**These values are based on long term groundwater monitoring from a previous operation in the local area.

7.2.3 Groundwater Monitoring Results

During the reporting period, four regular monitoring events were undertaken in accordance with the SWMP. The 2019 monitoring results are shown in **Table 7.3** to **Table 7.9.**

The results are compiled and compared against the trigger values in provided in **Table 7.1** and **Table 7.2**, the minimum/maximum range and trends in the previous results.

7.2.3.1 Groundwater Level

Table 7.3 shows the recorded groundwater levels for the reporting period.

Table 7.3 Groundwater Levels (mAHD)

Sample Date	Groundwater Monitoring Bore (mAHD)					
	SP1	SP2	SP3	SP4	SP5	BL158
Approximate Predicted Maximum (mAHD)	**3.6**	**2.8**	**2.6**	**1.25**	**3.6**	**3.7**
14-Mar-19	1.06	1.95	1.46	0.42	2.08	1.36
24-Jun-19	1.29	2.41	1.64	1.01	2.32	1.53
16-Sep-19	1.44	2.41	1.75	0.66	2.38	1.71
11-Dec-19	1.22	2.04	1.60	0.28	2.21	1.64

7.2.3.2 Groundwater Quality

Table 7.4 to **Table 7.9** shows the recorded groundwater quality for the reporting period.

Table 7.4 Groundwater Quality – pH

Sample Date	Groundwater Monitoring Bore (pH)					
	SP1	SP2	SP3	SP4	SP5	BL158
Trigger Value Minimum/Maximum	**4.5/8.5**	**4.5/8.5**	**4.5/8.5**	**4.5/8.5**	**4.5/8.5**	**4.5/8.5**
14-Mar-19	5.48	5.20	5.20	5.74	5.50	5.28
24-Jun-19	5.51	5.15	5.04	4.64	4.94	5.01
16-Sep-19	5.86	5.02	5.36	4.46	5.38	5.94
11-Dec-19	5.46	5.08	5.22	5.61	5.46	5.51

Table 7.5 Groundwater Quality – Conductivity (µs/cm)

Sample Date	Groundwater Monitoring Bore (µs/cm)					
	SP1	SP2	SP3	SP4	SP5	BL158
Trigger Value Maximum	**600**	**600**	**600**	**600**	**600**	**600**
14-Mar-19	132	75	170	195	90	435
24-Jun-19	162	76	244	815	303	555
16-Sep-19	223	110	284	464	121	389
11-Dec-19	190	83	103	350	134	419

Table 7.6 Groundwater Quality – Turbidity (NTU)

Sample Date	Groundwater Monitoring Bore (NTU)					
	SP1	SP2	SP3	SP4	SP5	BL158
Trigger Value Maximum	**50**	**50**	**50**	**50**	**50**	**50**
14-Mar-19	36.0	4.1	1.7	1.2	15.0	1.0
24-Jun-19	110.0	2.9	20.0	12.0	20.0	3.3
16-Sep-19	85.0	2.6	2.7	20.0	70.0	8.8
11-Dec-19	89.0	2.6	36.0	3.9	24.0	2.1

Table 7.7 Groundwater Quality – Arsenic (mg/L)

Sample Date	Groundwater Monitoring Bore (mg/L)					
	SP1	SP2	SP3	SP4	SP5	BL158
Trigger Value Maximum	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
14-Mar-19	<0.001	<0.001	<0.001	<0.001	0.002	<0.001
24-Jun-19	0.001	<0.001	<0.001	0.002	0.003	<0.001
16-Sep-19	<0.001	<0.001	<0.001	0.009	<0.001	<0.001
11-Dec-19	<0.001	<0.001	<0.001	0.001	<0.001	<0.001

Table 7.8 Groundwater Quality – Manganese (mg/L)

Sample Date	Groundwater Monitoring Bore (mg/L)					
	SP1	SP2	SP3	SP4	SP5	BL158
Trigger Value Maximum	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
14-Mar-19	0.004	0.007	0.002	0.014	0.016	0.014
24-Jun-19	0.004	0.006	0.001	0.233	0.135	0.006
16-Sep-19	0.003	0.006	0.001	0.089	0.008	0.008
11-Dec-19	0.004	0.009	0.002	0.053	0.018	0.015

Table 7.9 Groundwater Quality – Iron (mg/L)

Sample Date	Groundwater Monitoring Bore (mg/L)					
	SP1	SP2	SP3	SP4	SP5	BL158
Trigger Value Maximum	**5.70**	**5.70**	**5.70**	**5.70**	**5.70**	**5.70**
14-Mar-19	0.08	0.46	0.09	0.27	0.46	1.08
24-Jun-19	0.32	0.58	0.14	22.5	2.50	0.82
16-Sep-19	0.05	0.79	0.10	12.6	0.05	1.47
11-Dec-19	<0.05	0.68	<0.05	1.26	0.47	1.14

Groundwater level measurements and groundwater quality monitoring data for the current and previous reporting period are provided in **Appendix 3**.

7.2.4 Trends in Data

In accordance with Section 5.4 of the SWMP, if groundwater monitoring results exceed the nominated investigation trigger values and predictions of Table 5.5 of the approved SMWP, the Quarry Manager is required to further investigate.

If results are within 10% of the nominated trigger value, the Quarry Manager will further interrogate and explore any reasons for the elevated result. If results are greater than 10% of the nominated trigger value, the Quarry Manager will further interrogate and explore any reasons for the elevated result and provide a notification to DPIE and relevant agencies of any findings of this investigation.

Mackas Sand provided notification to DPIE and relevant agencies on 15 July 2019 and 10 October 2019 regarding groundwater results recorded above the SWMP trigger levels. An additional notification following the receipt of Quarter 4 2019 groundwater monitoring results was made to DPIE on 4 February 2020. Details of these notifications are summarised below.

7.2.4.1 Groundwater Level

During the reporting period the groundwater level at all locations was below the approximate Predicted Maximum Groundwater Level. It is considered that recorded groundwater levels are consistent with predictions within the EA.

The groundwater results since 2015 are shown graphically in **Appendix 3**. Since 2015 the groundwater levels generally show similar rising and falling trends over time. It is noted that quantum of change between individual readings at different monitoring locations is not consistent. The cause of this variability is unclear. However, it is hypothesised that this may be due to localised topographical or vegetation influences. As Mackas Sand does not extract any groundwater for it use in the operation, it is unlikely that these changes are due to the sand extraction operations.

SP5 and BL158 recorded new minimum levels of 2.08 mAHD and 1.36 mAHD, respectively during the reporting period. SP5 recorded a decrease of approximately 0.13 m from the previous recorded minimum of 2.21 mAHD and BL158 recorded a decrease of approximately 0.25 m from the previous minimum of 1.61 mAHD.

7.2.4.2 Groundwater pH

With the exception of the 4.46 pH result recorded during September 2019 at SP4, all pH results for the reporting period remained within the SWMP specified trigger value range. The September 2019 result was within 10% of the trigger value range and as such no further investigation was undertaken.

The groundwater pH results since 2015 are shown graphically in **Appendix 3**. The results for the reporting period are within the previous range of results, except for the June and September results at SP4which were up to 0.2 pH units below the historical minimum of 4.66. The December pH result has risen to 5.61.

7.2.4.3 Groundwater Conductivity

With the exception of the Electrical Conductivity (EC) June 2019 at SP4 result of 815 µS/cm, all EC results during the reporting period remained below the trigger value of 600 µs/cm. The EC results since June 2019 at SP4 have declined to below the trigger level.

SP4 was inspected following the receipt of the elevated result and it was identified the steel casing for SP4 had been broken – presumably by cattle. The casing at SP4 was replaced and monitoring undertaken since and re-sampled on 1 August 2018. Monitoring results for the additional round of sampling returned to below the EC trigger value. A summary of the investigation undertaken by Mackas Sand and actions taken as result of the investigation were provided to DPE on 15 July 2019.

Monitoring results at SP5 recorded a new maximum of 303 µS/cm in June 2019, from the previous maximum of 272 µS/cm.

7.2.4.4 Groundwater Turbidity

The turbidity results for SP2-4 and BL158 during the reporting period remained below the specified trigger value and were generally consistent with historical records.

Elevated results were recorded at SP1 during June (110 NTU), September (85 NTU) and December (89 NTU) 2019. Mackas Sand reviewed these results and investigated whether its operations may have influenced these results. As the turbidity measurements recorded at SP2-4 were within normal range, it is believed that the elevated result is localised/specific to SP1. A summary of the investigation undertaken by Mackas Sand and actions taken as result of the ongoing investigation were provided to DPIE and relevant agencies in July and October 2019 and February 2020.

An elevated result was recorded at SP5 during September (70 NTU) 2019. Mackas Sand reviewed and investigated these results. A review of the sampling notes identified the presence of sediment within the sample, suggesting elevated turbidity results may have occurred due to sediment being disturbed whilst the water sample was collected.

Turbidity results collected from SP1 samples during the reporting period are considered to be reflective of false positive measurements. Sampling notes indicate that elevated turbidity results may have been due to sediment being disturbed whilst the water sample was being collected. As noted in the 2018 Annual Review document, Mackas Sand requested the monitoring contractor undertake a review of monitoring methodology options and instrumentation used at SP1 during 2019. This resulted in the monitoring contractor replacing the use of a disposable groundwater bailer with a pump based system to collect samples at SP1. It was understood by utilising a pump based collection system, less sediment would be collected in the sample. Mackas Sand will continue to review the turbidity results and the sampling methodology in 2020.

The groundwater turbidity results since 2015 are shown graphically in **Appendix 3**.

7.2.4.5 Groundwater Arsenic

During the reporting period the arsenic result all locations were recorded below the SWMP trigger value of 0.01mg/L during the reporting period.

The groundwater arsenic results since 2015 are shown graphically in **Appendix 3**. The arsenic results during the reporting period were typically below the limit of detection <0.001 mg/L, which is consistent with previous results. SP4 recorded a new maximum arsenic result of 0.009mg/L, but below the SWMP trigger value.

7.2.4.6 Groundwater Manganese

During the reporting period manganese results at all monitoring locations were an order of magnitude below the trigger level, except for one monitoring result at SP4 and one at SP5. SP4 recorded a result of 0.233 mg/L during June 2019, while SP5 recorded a result of 0.135mg/L in June 2019. Both of which were above the trigger value. However, only SP5 was above the historical maximum.

SP4 was inspected following the receipt of the result as previously discussed in **Section 7.2.4.3**. Following the replacement of the casing, the manganese monitoring results have returned to levels below the trigger value. As also noted in **Section 7.2.4.3**, this was communicated to DPIE during the reporting period.

Operations onsite at the time of sampling were consistent with normal operations and no unusual activities were identified onsite at the time. It was noted to review the next round of monitoring results to identify any trends. The manganese results for September and December returned to and continued to trend below the trigger level. No cause has been identified for this anomaly.

7.2.4.7 Groundwater Iron

During the reporting period the iron result for all bores was below the trigger level with the exception SP4 during June and September 2019.

SP4 was inspected following the receipt of these results as previously discussed in **Section 7.2.4**. The iron result recorded in December 2019 at SP4 has since returned to be below the trigger level and is within the range of previous results.

The groundwater iron results since 2015 are shown graphically in **Appendix 3**. All the other iron results for the reporting period are below the historical maximum.

7.2.5 Proposed Improvement or Actions Next Reporting Period

Mackas Sand will continue to investigate monitoring results which are recorded outside the trigger value.

Monitoring bore SP4 appears to provide inconsistent water quality and depth results compared to other bore monitoring results at this site. Mackas Sand will redevelop the bore in 2020. Investigations of potential causes were inconclusive during 2019 and will continue in 2020. No additional management or mitigation measures are proposed to be implemented which are outside the approved SWMP.

8.0 Rehabilitation

8.1 Rehabilitation of Disturbed Land

In accordance with Schedule 3, Condition 24 of the Project Approval (as modified), progressive rehabilitation of disturbed areas at Lot 220 is being undertaken in a manner that is generally consistent with the final landform in the EA, in alignment with statutory conditions and requirements within plans.

8.1.1 Lot 218

Rehabilitation requirements at Lot 218 include the establishment of a vegetative bund on the western edge of the extraction area as the site is governed by the natural movement of sand into the extraction area.

As active quarrying occurred within the western portion of the pit during 2019, the bund has not yet been constructed and vegetated. The objective of the bund is to provide a physical barrier between the mobile sand and native vegetation on the landward side of the mobile dunes.

8.1.2 Lot 220

Rehabilitation at Lot 220 is being undertaken progressively as sand extraction and operating space on the active quarry floor permits. Ongoing short term rehabilitation strategies are primarily focused on maximising the availability and viability of biological resources for use in rehabilitation activities, including the salvage and reuse of material for habitat enhancement and the management of topsoil.

Approximately 9 ha of land in the southern section of Lot 220 commenced rehabilitation during 2019. An additional 2.3 ha of land in Lot 220 underwent landform establishment preparations (i.e. topsoil placement) for rehabilitation as at the end of the reporting period.

Mackas Sand is targeting a Spring 2020 or Autumn 2021 seeding window a part of the next rehabilitation works program. It is expected that at least 2.3 ha undergoing land preparation works as at the end of the 2019 reporting period will transition to an active rehabilitation status during 2020/2021 and contribute to the 12.6 ha that is currently in the active rehabilitation category.

Other works include the utilisation of vegetative material cleared ahead of sand extraction operations. No additional rehabilitation was completed during the report period. **Table 8.1** and **Figure 8.1** show the status of rehabilitation at Lot 220.

Table 8.1 Summary of Rehabilitation Status at Mackas Sand (Lot 220)

	2018 Report Period (ha)	2019 Report Period (ha)	2020 Report Period (ha) (forecast)
Total Mine Footprint	29.2	33.7	38.0
Total Active Disturbance	25.9	17.2	20.5
Land being prepared for rehabilitation	5	2.3	1.5
Land under active rehabilitation	3.3	12.6	16.0
Completed Rehabilitation	0	0	0

Image Source: Nearmap (Feb 2020)
Data Source: DFSI (2019)

0 100 250 500m
1:10 000

Legend

- Lot 220 LPI Boundary
- Lot 220 Approved Operational Area
- Rehabilitation Area
- Land Prepared for Rehabilitation

FIGURE 8.1

Lot 220 Rehabilitation Status

8.2 Annual Rehabilitation Inspection

The annual rehabilitation inspection of Lot 220 was undertaken late winter/early spring in 2019. Monitoring is undertaken to track current rehabilitation processes and to further inform any rehabilitation management actions required onsite. The rehabilitation inspection focused on Rehabilitation Areas 1 and 2 and northern portion of Rehabilitation Area 3. Rehabilitation monitoring for the Southern portion of Rehabilitation Area 3 and Rehabilitation Area 4 was undertaken will commence during the next reporting period.

Management actions may include:

- infill planting
- weed Management.

Key observations made during the 2019 rehabilitation monitoring inspection included:

- Approximately half of the rehabilitation established to date contains a mix of native shrubs, juvenile trees and ground cover species that are indicative of the surrounding vegetation community type.
- Severe drought stress and dieback of all ground cover species was recorded during 2019.
- Eucalyptus tubestocking previously planted during 2016 in Rehabilitation Area 2 has demonstrated low survival rates, however in 2019 the persisting individuals were found in good health with limited signs of dieback.
- Rehabilitation Areas 1 and 2 are not considered to be trending towards the structural or floristic composition of the community required to be present in the final landform.
- Approximately half of the Rehabilitation Area was dominated by weed or exotic species such as including red natal grass (*Melinis repens*), kikuyu grass (*Pennisetum clandestinum*), bitou bush (*Chrysanthemoides monilifera*), farmer's friend (*Bidens pilosa*), Large-leaved Pennywort (*Hydrocotyle bonariensis)* and *Acanthospermum austral.*
- Continued salvaging of tree hollows being direct return within Lot 220 Rehabilitation Areas.
- Commencement of topsoil being directly returned to new (2019) Rehabilitation Areas has displayed good signs of vegetation establishment.

As noted within the LMP (April, 2019), the annual rehabilitation inspection utilises qualitative monitoring practices during the early stages of rehabilitation and typically until vegetation within the Rehabilitated Areas has reached has reached a level of maturity where a quantitative assessment is of benefit. As a result, qualitative monitoring practices continue to be undertaken across Rehabilitation Areas 1, 2 and 3 due to the level of maturity of the rehabilitation.

A number of recommendations were made for Rehabilitation Areas 1 and 2, following the rehabilitation inspection and included:

- Weed management across Northern and Southern sections of Lot 220, and
- Undertake vegetation infill works (including seeding and/or planting) in northern area (Rehabilitation Areas 1 and 2) of Lot 220 up to 300 stems/ha.

Mackas Sand will continue provide an update of the actions completed against the rehabilitation monitoring recommendations in the next annual review document.

Mackas Sand developed a scope of works and sought a number of proposals to engage a rehabilitation contractor to assist with future rehabilitation works and its ongoing management during 2018. Ongoing drought conditions experienced during 2018 and 2019 delayed the engagement of a rehabilitation contractor during the reporting period. Mackas Sand will seek to re-engage a rehabilitation contractor during 2020.

Recommendations made in the 2019 rehabilitation monitoring report are consistent with the recommendations made in 2018. Limited maintenance and rework activities were undertaken in Rehabilitation Areas 1 and 2 during the reporting period. Extended drought conditions have been experienced since December 2017 (DPI, 2019). These unfavourable meteorological conditions are not typically favourable or conducive to the establishment of rehabilitation. As a result of the severe drought stress and dieback experienced over consecutive monitoring periods, it was also evident that the continued climatic conditions reduced the condition and presence weeds across the area. Mackas Sand further advised that additional weed spraying activities across Lot 220 rehabilitation areas were undertaken following 2019 rehabilitation monitoring round.

8.3 Rehabilitation Trials and Research

No rehabilitation trials were undertaken during the report period.

8.4 Proposed Improvements or Actions for the Next Reporting Period

Mackas Sand will continue to salvage tree hollows and spread over rehabilitation areas.

Mackas Sand will continue to identify opportunities to rehabilitate areas which are no longer required for operational purposes/activities.

9.0 Community

9.1 Community Complaints

Mackas Sand received one community complaint on 15 April 2019 during the reporting period. The complaint was received from a nearby private receiver in relation to a contracting driver using the vehicle's engine braking system when accessing the Lot 218 alternate access road. Additional traffic signage was installed along the alternate access road reminding drivers not to utilise the engine braking system when accessing the site. The Quarry Manager contacted to the complainant to discuss the matter. No further actions were taken.

9.2 Community Liaison

The Mackas Sand Community Consultative Committee (CCC) met once during the report period, as agreed by the CCC. The CCC meeting was held on 3 April 2019. CCC representatives act as a point of contact to provide feedback between Mackas Sand and wider community. Members of the Mackas Sand CCC are included in **Table 9.1**.

Table 9.1 Mackas Sand CCC Members for the 2019 Report Period

Name	Organisation
Ms Margaret Macdonald-Hill	Chairperson
Mr Robert Mackenzie	Mackas Sand
Ms Julie Towers	Community Representative
Mr Stephen Hufnagl	Community Representative
Mr Kent Samson	Community Representative
Mr Cliff Johnson	Port Stephens Council representative
Ms Lizzy Slater*	Worimi Aboriginal Land Council
Mr Rod Williams	Umwelt (Australia) Pty. Ltd.

*Ms Lizzie Slater represented Worimi Aboriginal Land Council at 2018 CCC meeting due to Mr Andrew Smith's absence.

General items discussed during the 2019 CCC meeting included:

- Update provided on status of 2018 Annual Review document.
- Update provided on 2018-2019 compliance status and actions taken to resolve outstanding issues including DPIE's approval of Independent Environmental Audit and revision and subsequent submission of a number of management plans.
- The frequency of CCC meetings (agreed to once per year).
- General discussion of operational matters.

10.0 Independent Audit

OnSite Environmental Management was engaged by Mackas Sand to undertake an IEA of the Mackas Sand Project in 2018 for the operational period from 2015 to 2017. The IEA report was finalised, submitted and approved by DPIE during the 2018 reporting period.

A number of the administrative and low risk non-compliances and recommendations were identified and addressed during the 2018 reporting period. As at December 2019 only one non-compliance, which relates to the conservation agreement and one recommendation which relates to the timing of the 2021 audit have not been completed (refer to **Table 10.1** and **Table 10.2**).

The next IEA is scheduled to be undertaken post March 2021.

Table 10.1 Mackas Sand IEA non-compliance Summary

Non-Compliance	Audit Finding	Status	Response
PA 08_0142 S3 C 28B	No appropriate long term security for the Biodiversity Offset Area has been agreed upon by Mackas Sand and OEH to the satisfaction of the Secretary.	Ongoing	Mackas Sand have continued to work with the BCT to finalise the Conservation Agreement. (Refer to **Section 6.4** for further details)

Table 10.2 Mackas Sand IEA Recommendations

Ref	Recommendation	Status	Response
Audit Timing	Given the large volume of data to be reviewed and the requirement to publish the Annual Review in March of the following year, it is recommended that the independent audit be scheduled to April of the following year. This would allow the review of all 3 Annual Reviews reports. The next audit would therefore be scheduled to occur in 2021 for the years 2018, 2019, 2020.	Noted - Ongoing	Noted.

11.0 Incidents and Non-compliances during the Report Period

For a full summary of non-compliances identified during the Independent Environmental Audit, reference is made to **Section 10.0** of this document.

11.1 Incidents, Notifications and Non-Compliances

As noted in **Section 1.0,** Mackas Sand identified five administrative non-compliances during the reporting period. Further details of which are provided in **Sections 11.1.1** to **11.1.4**.

11.1.1 Groundwater Water Monitoring Program Notification

Elevated iron, manganese, electrical conductivity and turbidity results and one low pH result were recorded as part of the routine groundwater monitoring during the reporting period. These results are restricted to primarily SP4 and to a less extent SP1 and SP5. Mackas Sand reviews and investigates all elevated groundwater monitoring data in accordance with the Mackas Sand SWMP.

11.1.2 Finalisation of the Conservation Agreement

In accordance with Schedule 3, Condition 28B, Mackas Sand is required to make suitable arrangements to provide a long-term security of for the Biodiversity Offset Area by December 2014. BCT provided further comment and requested amendments of the draft Conservation Agreement during the 2019 reporting period. Mackas Sand submitted a final draft Conservation Agreement to BCT in June 2019.

As at the end of the reporting period, BCT were yet to finalise the Conservation Agreement. BCT provided further minor amendments to the draft conservation agreement to Mackas Sand on 16 January 2020.

Subject to any further comments from BCT as well as BCT review and/or processing timeframes, Mackas Sand expects the agreement to be finalised during 2020.

11.1.3 Additional Truck Movement

Mackas Sand is required to ensure laden truck movements are in accordance with Schedule 3 Condition 4B, inclusive of sub-conditions a-I for respective operating hours. An automated traffic light and boom gate system at the weighbridge servicing Lot 218 is used to manage vehicle movement compliance with the requirements of PA 08_0142 (as modified). With an additional validation program also undertaken to confirm compliance with truck movement Project Approval conditions

As part of the routine validation program, Mackas Sand advised that one extra laden truck movement was recorded by the site weighbridge between the hours of 6.00 am - 7.00 am on 17 October 2019 than permitted by in Schedule 3 Condition 4B (d). In total there were 25, 348 compliant laden truck movements during the 2019 report period. This is a one off event/anomaly that did not occur at any other time during the reporting period. Mackas Sand subsequent investigation in consultation with the operators of the weighbridge believe this was a result of an error in the weighbridge's coding following a software update. The coding was subsequently addressed following the identification of the error.

11.1.4 Video Recording Equipment Power Outage

In accordance with Schedule 3 Condition 33D, Mackas operates a video camera in a shed adjacent to the alternate access road, approximately 100 m from its intersection with Nelson Bay Road. Power supply was lost to the building where video recording equipment is house from 26 November to 10 December 2019 and as such there is no video footage for this time period. An electrician inspected the circuitry and wiring associated with the building following the identification of the outage and advised the potential cause of the issue was related to a circuit breaker malfunction.

It is noted that that the video camera is a secondary compliance measure and that Mackas Sand continues to utilise the weighbridge data as the primary tool to assess compliance to laden truck movements as specified in Schedule 3 Condition 4B. Mackas Sand has reviewed the weighbridge data for the above periods and confirms that all truck movements during these periods complied with Schedule 3 Condition 4B of the Project Approval.

11.2 Regulatory Correspondence

A summary of official regulatory correspondence received during the reporting period outside the scope of non-compliances identified in **Section 11.1** is provided in **Table 11.1**.

Table 11.1 Regulatory Compliance Correspondence Summary

Date	Agency	Summary
30/1/2019	DPIE	Mackas received a warning letter from DPE on 30 January 2019 in relation to a non-compliance regarding a trucking number exceedance reported during the 2018 reporting period. No further action was taken during the reporting period.

12.0 Activities Proposed in the 2019 Report Period

The anticipated environmental management activities for Mackas Sand during the 2020 report period are included in **Table 12.1**. Additional environmental management activities may be undertaken if identified during the next reporting period.

Table 12.1 Environmental Management Activities proposed for 2019

2019 Document Section	Area/Nature of Activity	Action Proposed
6.4	Offset	Mackas Sand will consider: • Consider installing a permanent stock proof fence around the perimeter • Consider installing padlocked gate through which all access is gained • Consider a management period prior to winter to target recovering and colonising weed species (such as whiskey grass and bitou bush) and to assist in maintaining the habitat requirements for these orchid species. • Continue to seek to finalise the Conservation Agreement in consultation with OEH. Upgrade Northern and Western sides of the Biodiversity Offset Area fenceline • Seek finalisation of Conservation Agreement in consultation with BCT
7.2	Groundwater	• Investigate elevated Turbidity results at SP1 • Investigate elevated results at SP4
8	Rehabilitation	• Mackas Sand will implement the rehabilitation recommendations as noted above. Progress against these recommendations will be reported in the next Annual Review document. • Mackas Sand will engage a rehabilitation contractor to assist in the establishment, development and ongoing management of rehabilitation of Lot 220.

13.0 References

ANZECC (2000) *National Water Quality Management Strategy Vol 1.*

Department of Primary Industries (2019). *Seasonal Conditions Information Portal: Combined Drought Indicator*. Accessed Thursday, 19 Dec 2019 from: https://edis.spaceport.intersect.org.au/

NHMRC, NRMMC (2011) *Australian Drinking Water Guidelines Paper 6 – National Water Quality Management Strategy.*

NSW Environment Protection Agency (NSW EPA) (2014) *Protection of the Environment Operations (Waste) Regulation 2014.*

NSW Government (2015) *Annual Review Guideline: Post-approval requirements for State significant mining developments.*

OnSite Envirommental Management (2018) *Mackas Sand Pty Ltd – MP 08_0142 Independent Environmental Audit 2015, 2016, 2017.*

Umwelt (Australia) Pty Limited (2011) *Determination of Maximum Predicted Groundwater Level and Maximum Extraction Level at Lot 218 and Lot 220, Salt Ash.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2012) *Environmental Assessment of Modifications to Macka's Sand Extraction Operations on Lot 218 and Lot 220, Salt Ash*. Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2014) *Macka's Sand Ecological Monitoring Program for Lot 220 DP 1049608, Salt Ash.* Prepared for Macka's Sand Pty Limited.

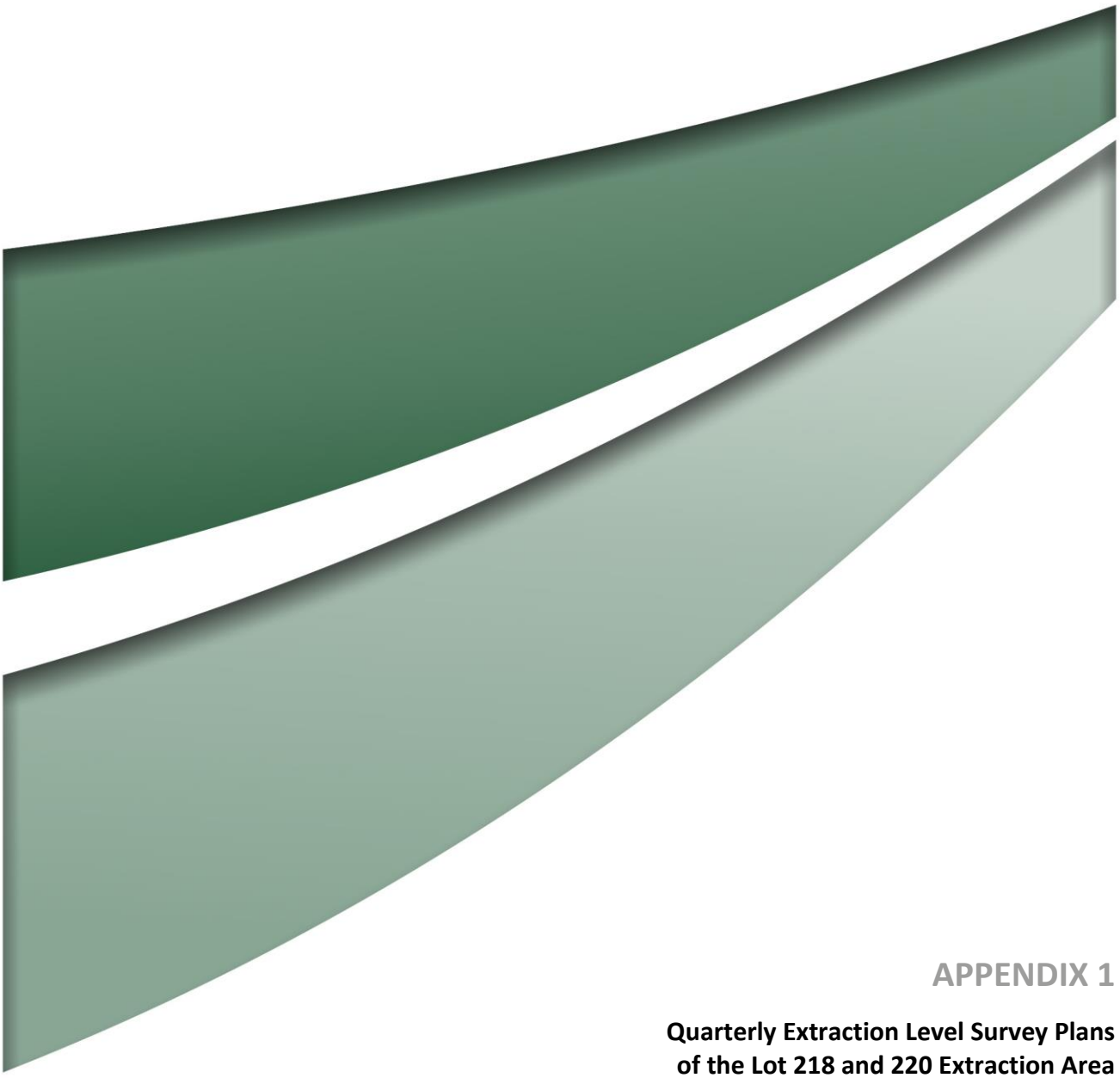
Umwelt (Australia) Pty Limited (2017) *Mackas Sand Lot 218 Offset Monitoring Report 2017.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2017) *Mackas Sand Lot 220 Rehabilitation Monitoring Report 2017.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2017) *Mackas Sand Annual Review 2017.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2018) *Mackas Sand Environmental Noise Monitoring Report 2018.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2019) *Mackas Sand EPBC 2011/6214 2018 Annual Compliance Report.* Prepared for Macka's Sand Pty Limited.



APPENDIX 1

Quarterly Extraction Level Survey Plans of the Lot 218 and 220 Extraction Area

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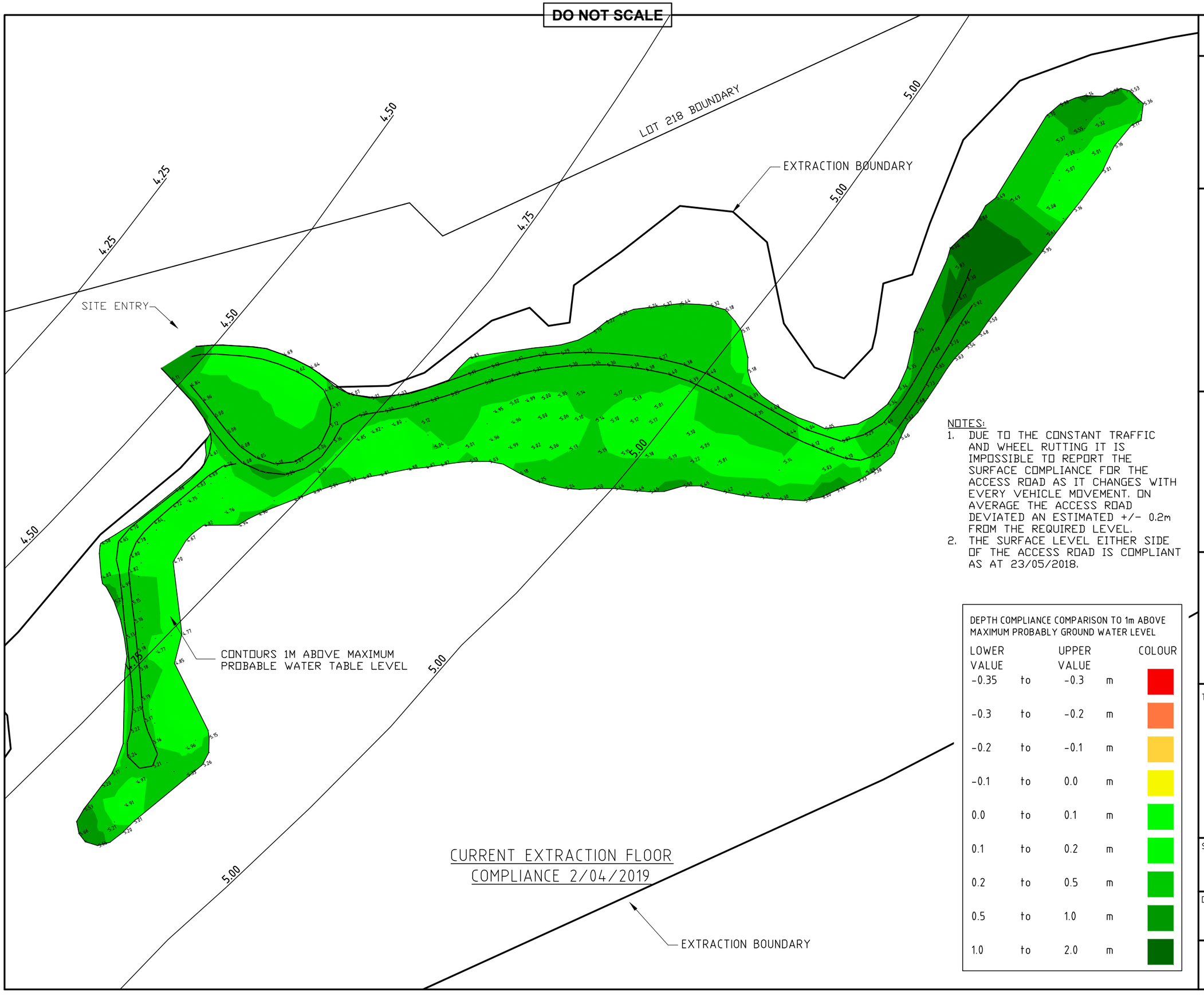

NOTES:

1. DUE TO THE CONSTANT TRAFFIC AND WHEEL RUTTING IT IS IMPOSSIBLE TO REPORT THE SURFACE COMPLIANCE FOR THE ACCESS ROAD AS IT CHANGES WITH EVERY VEHICLE MOVEMENT. ON AVERAGE THE ACCESS ROAD DEVIATED AN ESTIMATED +/- 0.2m FROM THE REQUIRED LEVEL.
2. THE SURFACE LEVEL EITHER SIDE OF THE ACCESS ROAD IS COMPLIANT AS AT 23/05/2018.

DEPTH COMPLIANCE COMPARISON TO 1m ABOVE MAXIMUM PROBABLY GROUND WATER LEVEL

LOWER VALUE		UPPER VALUE		COLOUR
-0.35	to	-0.3	m	
-0.3	to	-0.2	m	
-0.2	to	-0.1	m	
-0.1	to	0.0	m	
0.0	to	0.1	m	
0.1	to	0.2	m	
0.2	to	0.5	m	
0.5	to	1.0	m	
1.0	to	2.0	m	

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DATUM:	AHD
ISSUE DATE:	2/04/2019
REVISION:	A

CLIENT & JOB:

MACKAS
SAND & SOIL
SALT ASH

COMPLIANCE
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TITLE:

LOT 218
EXTRACTION LEVEL
COMPLIANCE

STATUS:
MARCH 2019

DRAWING NUMBER:

SHEET 1 OF 1 SHEETS

A3

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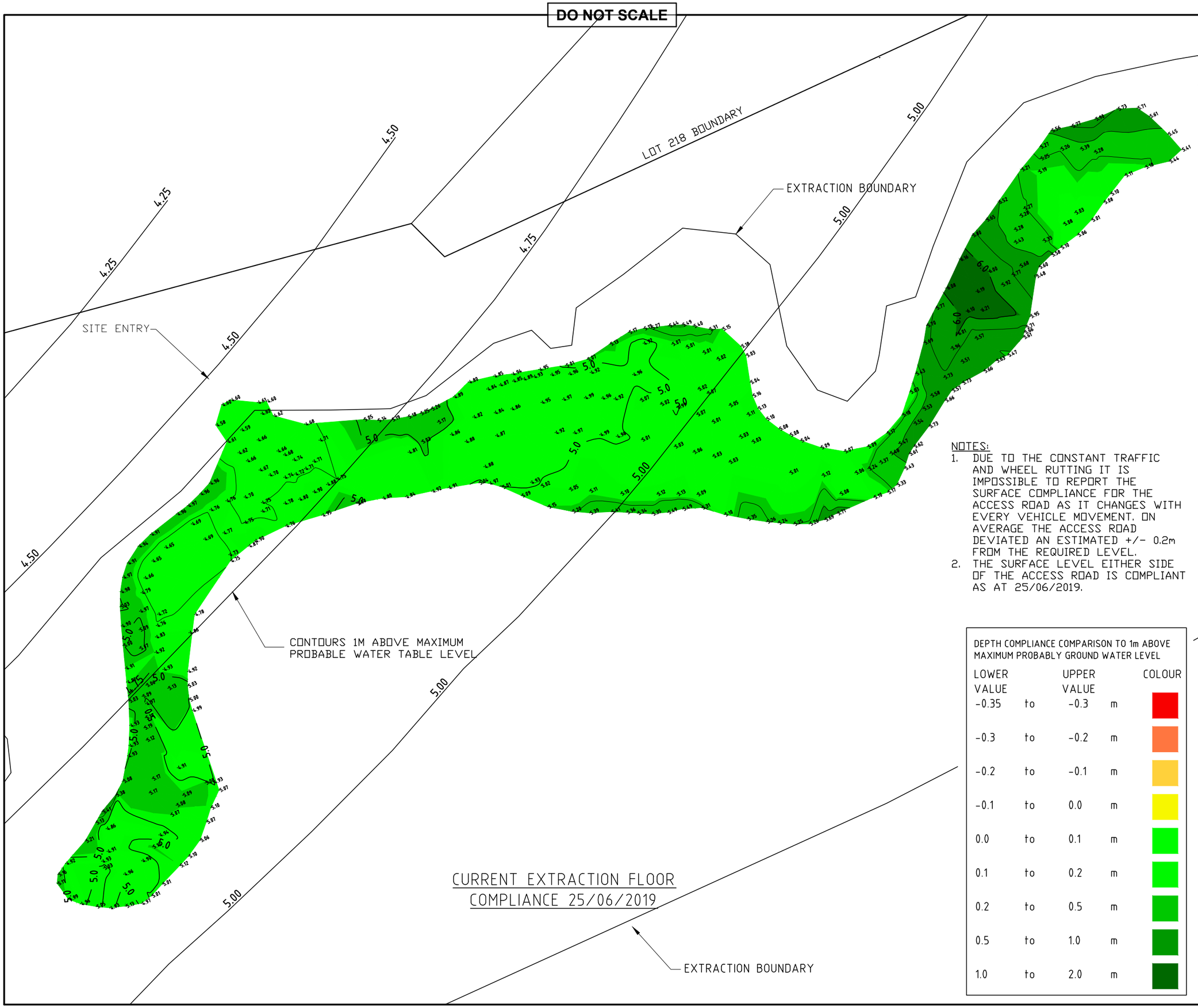

CURRENT EXTRACTION FLOOR COMPLIANCE 25/06/2019

EXTRACTION BOUNDARY

NOTES:

1. DUE TO THE CONSTANT TRAFFIC AND WHEEL RUTTING IT IS IMPOSSIBLE TO REPORT THE SURFACE COMPLIANCE FOR THE ACCESS ROAD AS IT CHANGES WITH EVERY VEHICLE MOVEMENT. ON AVERAGE THE ACCESS ROAD DEVIATED AN ESTIMATED +/- 0.2m FROM THE REQUIRED LEVEL.
2. THE SURFACE LEVEL EITHER SIDE OF THE ACCESS ROAD IS COMPLIANT AS AT 25/06/2019.

DEPTH COMPLIANCE COMPARISON TO 1m ABOVE MAXIMUM PROBABLY GROUND WATER LEVEL

LOWER VALUE		UPPER VALUE		COLOUR
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-0.3	to	-0.2	m	
-0.2	to	-0.1	m	
-0.1	to	0.0	m	
0.0	to	0.1	m	
0.1	to	0.2	m	
0.2	to	0.5	m	
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CLIENT & JOB:

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TITLE:

LOT 218
EXTRACTION LEVEL
COMPLIANCE

STATUS:

JUNE 2019

DRAWING NUMBER:

SHEET 1 OF 1 SHEETS

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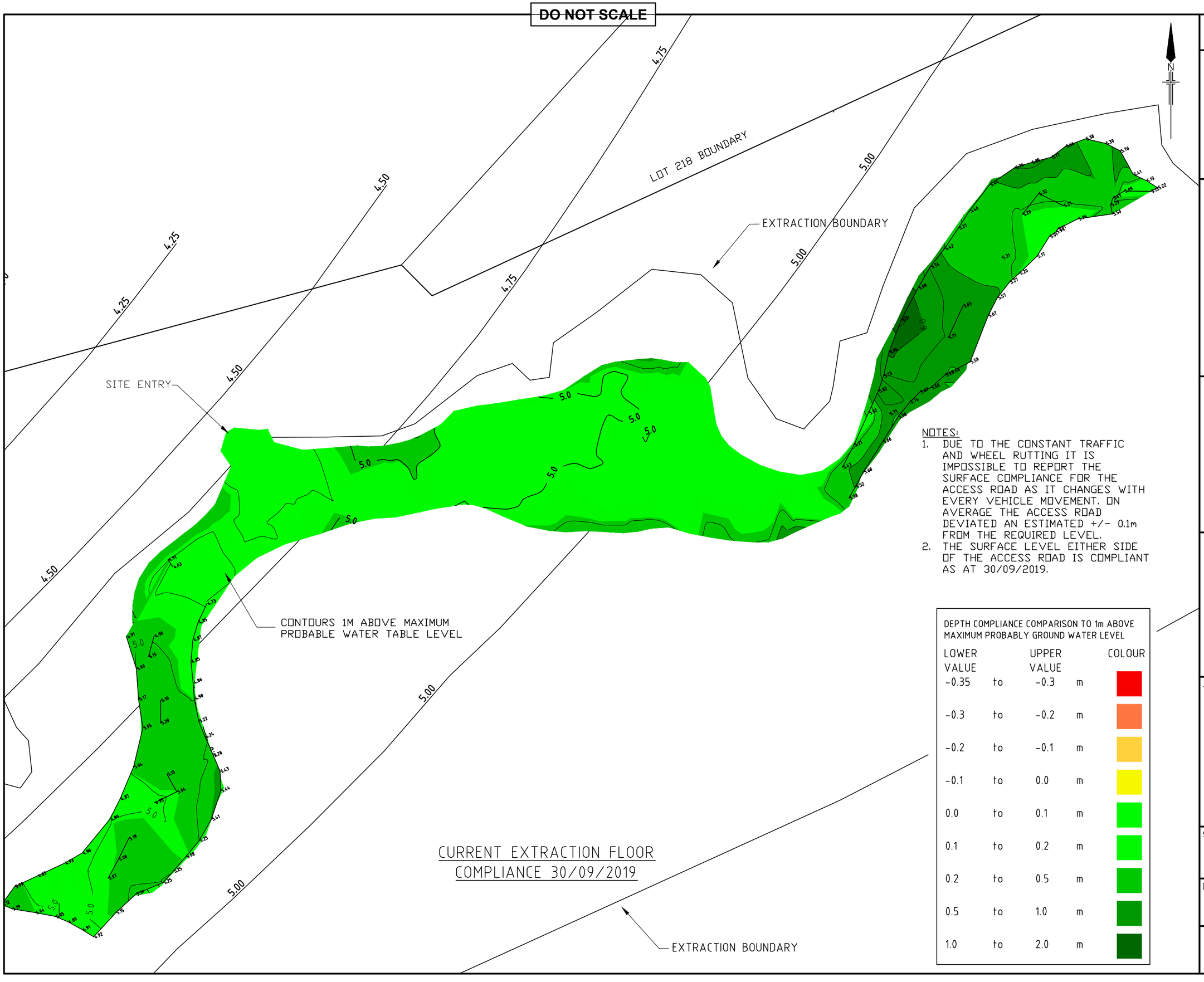

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1. DUE TO THE CONSTANT TRAFFIC AND WHEEL RUTTING IT IS IMPOSSIBLE TO REPORT THE SURFACE COMPLIANCE FOR THE ACCESS ROAD AS IT CHANGES WITH EVERY VEHICLE MOVEMENT. ON AVERAGE THE ACCESS ROAD DEVIATED AN ESTIMATED +/- 0.1m FROM THE REQUIRED LEVEL.
2. THE SURFACE LEVEL EITHER SIDE OF THE ACCESS ROAD IS COMPLIANT AS AT 30/09/2019.

DEPTH COMPLIANCE COMPARISON TO 1m ABOVE MAXIMUM PROBABLY GROUND WATER LEVEL

LOWER VALUE		UPPER VALUE		COLOUR
-0.35	to	-0.3	m	
-0.3	to	-0.2	m	
-0.2	to	-0.1	m	
-0.1	to	0.0	m	
0.0	to	0.1	m	
0.1	to	0.2	m	
0.2	to	0.5	m	
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ISSUE DATE:	30/09/2019
REVISION:	A

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TITLE:

LOT 218
EXTRACTION LEVEL
COMPLIANCE

STATUS:

SEPTEMBER 2019

DRAWING NUMBER:

SHEET 1 OF 1 SHEETS

A3

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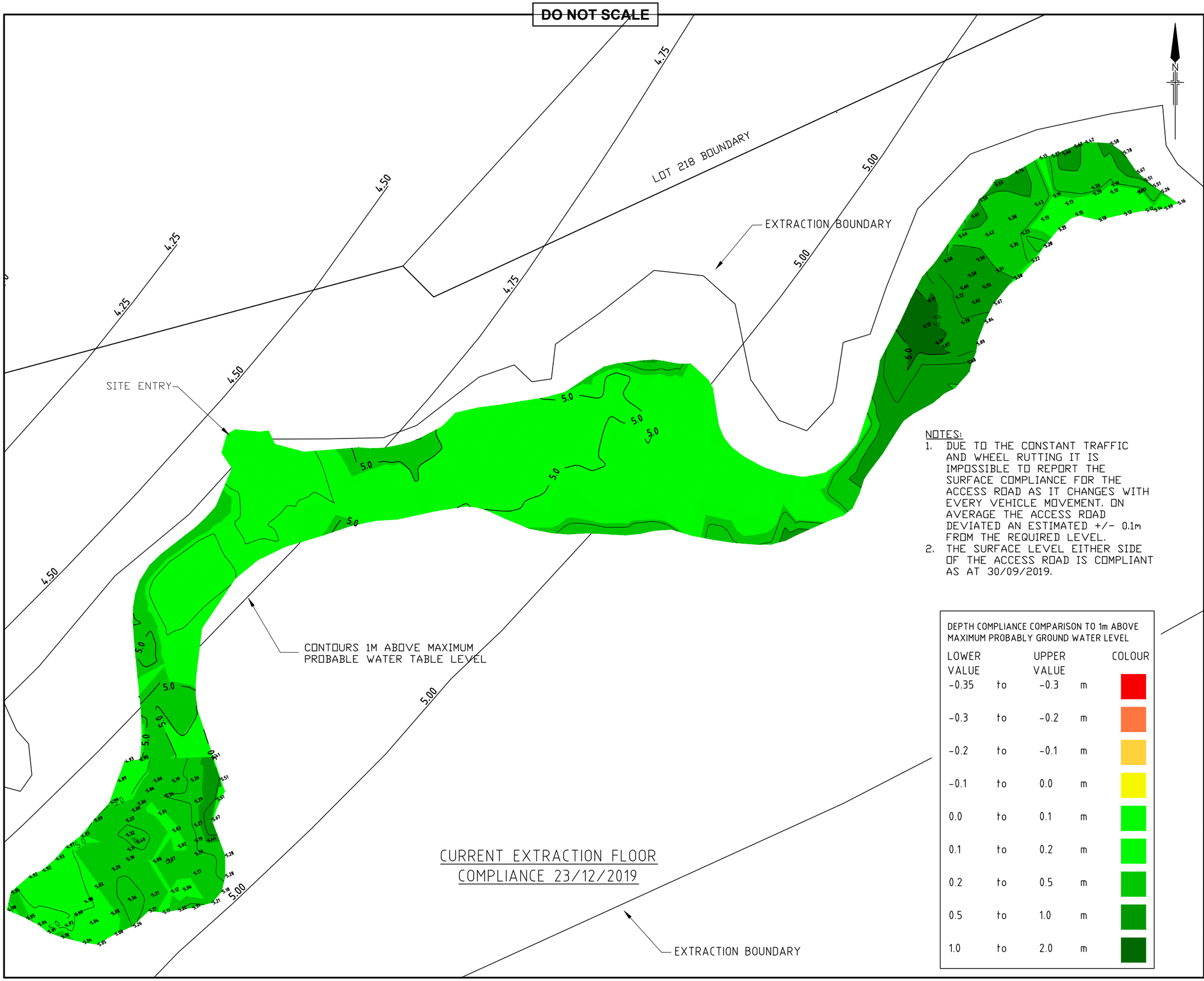

CURRENT EXTRACTION FLOOR COMPLIANCE 23/12/2019

NOTES:

1. DUE TO THE CONSTANT TRAFFIC AND WHEEL RUTTING IT IS IMPOSSIBLE TO REPORT THE SURFACE COMPLIANCE FOR THE ACCESS ROAD AS IT CHANGES WITH EVERY VEHICLE MOVEMENT. ON AVERAGE THE ACCESS ROAD DEVIATED AN ESTIMATED +/- 0.1m FROM THE REQUIRED LEVEL.
2. THE SURFACE LEVEL EITHER SIDE OF THE ACCESS ROAD IS COMPLIANT AS AT 30/09/2019.

DEPTH COMPLIANCE COMPARISON TO 1m ABOVE MAXIMUM PROBABLY GROUND WATER LEVEL

LOWER VALUE		UPPER VALUE		COLOUR
-0.35	to	-0.3	m	
-0.3	to	-0.2	m	
-0.2	to	-0.1	m	
-0.1	to	0.0	m	
0.0	to	0.1	m	
0.1	to	0.2	m	
0.2	to	0.5	m	
0.5	to	1.0	m	
1.0	to	2.0	m	

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DATUM:	AHD
ISSUE DATE:	30/09/2019
REVISION:	A

CLIENT & JOB:

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TITLE:

LOT 218
EXTRACTION LEVEL
COMPLIANCE

STATUS:

DECEMBER 2019

DRAWING NUMBER:

SHEET 1 OF 1 SHEETS

A3

DO NOT SCALE

DEPTH COMPLIANCE COMPARISON TO 0.7m ABOVE MAXIMUM PROBABLY GROUND WATER LEVEL

LOWER VALUE		UPPER VALUE		COLOUR
-0.35	to	-0.3	m	
-0.3	to	-0.2	m	
-0.2	to	-0.1	m	
-0.1	to	0.0	m	
0.0	to	0.1	m	
0.1	to	0.2	m	
0.2	to	0.5	m	
0.5	to	1.0	m	
1.0	to	2.0	m	

SITE ENTRY

LOT 220 BOUNDARY

EXTRACTION BOUNDARY

NOTE: THIS AREA HAS NOT BEEN EXTRACTED AT THIS POINT IN TIME

2.5m

3.0m

3.5m

4.0m

CONTOURS 0.7m ABOVE MAXIMUM PROBABLE WATER TABLE LEVEL

AREAS WELL ABOVE THE EXTRACTION LEVEL AS REHAB HAS BEGUN.

STOCKPILE OF REHAB MATERIAL

STOCKPILE OF REHAB MATERIAL

STOCKPILE OF SCREENED SAND

LOT 220 BOUNDARY

EXTRACTION BOUNDARY

CURRENT EXTRACTION FLOOR COMPLIANCE 2/04/2019

SCALE: NOT TO SCALE

FILE:	0014_CS_LOT_220_Compliance_190402.dwg
SURVEYED:	CJ & JW
DRAWN:	CJ
CHECKED:	CJ
DATUM:	AHD
ISSUE DATE:	2/04/2019
REVISION:	A

CLIENT & JOB:

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SAND & SOIL
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COMPLIANCE
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Mayfield NSW 2304

TITLE:

LOT 220
EXTRACTION LEVEL
COMPLIANCE

STATUS: MARCH 2019

DRAWING NUMBER:

SHEET 1 OF 1 SHEETS

A3

DO NOT SCALE

DEPTH COMPLIANCE COMPARISON TO 0.7m ABOVE MAXIMUM PROBABLY GROUND WATER LEVEL

LOWER VALUE		UPPER VALUE		COLOUR
-0.35	to	-0.3	m	
-0.3	to	-0.2	m	
-0.2	to	-0.1	m	
-0.1	to	0.0	m	
0.0	to	0.1	m	
0.1	to	0.2	m	
0.2	to	0.5	m	
0.5	to	1.0	m	
1.0	to	2.0	m	

SITE ENTRY

LOT 220 BOUNDARY

EXTRACTION BOUNDARY

NOTE: THIS AREA HAS NOT BEEN EXTRACTED AT THIS POINT IN TIME

2.5m

3.0m

3.5m

4.0m

CONTOURS 0.7m ABOVE MAXIMUM PROBABLE WATER TABLE LEVEL

AREAS WELL ABOVE THE EXTRACTION LEVEL AS REHAB HAS BEGUN.

STOCKPILE OF REHAB MATERIAL

STOCKPILE OF REHAB MATERIAL

STOCKPILE OF SCREENED SAND

LOT 220 BOUNDARY

EXTRACTION BOUNDARY

CURRENT EXTRACTION FLOOR COMPLIANCE 20/06/2019

SCALE: NOT TO SCALE

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SURVEYED:	CJ & JW
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DATUM:	AHD
ISSUE DATE:	30/06/2019
REVISION:	A

CLIENT & JOB:

MACKAS
SAND & SOIL
SALT ASH

COMPLIANCE REPORTING

CENTURION SURVEY PTY LTD

ABN: 66 605 045 314
P: (02) 4967 5927
M: 0429 987 821
Unit 11 56 Industrial Dr
Mayfield NSW 2304

TITLE:

LOT 220
EXTRACTION LEVEL
COMPLIANCE

STATUS: JUNE 2019

DRAWING NUMBER:

SHEET 1 OF 1 SHEETS

A3

DO NOT SCALE

DEPTH COMPLIANCE COMPARISON TO 0.7m ABOVE MAXIMUM PROBABLY GROUND WATER LEVEL

LOWER VALUE		UPPER VALUE		COLOUR
-0.35	to	-0.3	m	
-0.3	to	-0.2	m	
-0.2	to	-0.1	m	
-0.1	to	0.0	m	
0.0	to	0.1	m	
0.1	to	0.2	m	
0.2	to	0.5	m	
0.5	to	1.0	m	
1.0	to	2.0	m	

SITE ENTRY

LOT 220 BOUNDARY

EXTRACTION BOUNDARY

NOTE: THIS AREA HAS NOT BEEN EXTRACTED AT THIS POINT IN TIME

CONTOURS 0.7m ABOVE MAXIMUM PROBABLE WATER TABLE LEVEL

AREAS WELL ABOVE THE EXTRACTION LEVEL AS REHAB HAS BEGUN.

STOCKPILE OF SCREENED SAND

2.5m

3.0m

3.5m

4.0m

CURRENT EXTRACTION FLOOR COMPLIANCE 30/09/2019

SCALE: NOT TO SCALE

FILE:	0014_CS_LOT_220_Compliance_190930.dwg
SURVEYED:	CJ & JW
DRAWN:	CJ
CHECKED:	CJ
DATUM:	AHD
ISSUE DATE:	30/09/2019
REVISION:	A

CLIENT & JOB:

MACKAS
SAND & SOIL
SALT ASH

COMPLIANCE
REPORTING

CENTURION SURVEY PTY LTD

ABN: 66 605 045 314
P: (02) 4967 5927
M: 0429 987 821
Unit 11 56 Industrial Dr
Mayfield NSW 2304

TITLE:

LOT 220
EXTRACTION LEVEL
COMPLIANCE

STATUS:

SEPTEMBER 2019

DRAWING NUMBER:

SHEET 1 OF 1 SHEETS

A3

DO NOT SCALE

DEPTH COMPLIANCE COMPARISON TO 0.7m ABOVE MAXIMUM PROBABLY GROUND WATER LEVEL

LOWER VALUE		UPPER VALUE		COLOUR
-0.35	to	-0.3	m	
-0.3	to	-0.2	m	
-0.2	to	-0.1	m	
-0.1	to	0.0	m	
0.0	to	0.1	m	
0.1	to	0.2	m	
0.2	to	0.5	m	
0.5	to	1.0	m	
1.0	to	2.0	m	

SITE ENTRY

LOT 220 BOUNDARY

EXTRACTION BOUNDARY

NOTE: THIS AREA HAS NOT BEEN EXTRACTED AT THIS POINT IN TIME

2.5m

3.0m

3.5m

4.0m

CONTOURS 0.7m ABOVE MAXIMUM PROBABLE WATER TABLE LEVEL

AREAS WELL ABOVE THE EXTRACTION LEVEL AS REHAB HAS BEGUN.

STOCKPILE OF SCREENED SAND

STOCKPILE OF SCREENED SAND

SPOT LEVEL IDENTIFY ACTIVE AREA WHICH WAS SURVEYED ON THE 23/12/2019. ALL OTHER AREA ARE UNDER ACTIVE REHABILITATION AND WERE WELL ABOVE THE EXTRACTION LIMIT.

EXTRACTION BOUNDARY

LOT 220 BOUNDARY

CURRENT EXTRACTION FLOOR COMPLIANCE 23/12/2019

SCALE: NOT TO SCALE

FILE:	0014_CS_LOT_220_Compliance_191223.dwg
SURVEYED:	CJ & MH
DRAWN:	CJ
CHECKED:	CJ
DATUM:	AHD
ISSUE DATE:	30/12/2019
REVISION:	A

CLIENT & JOB:

MACKAS
SAND & SOIL
SALT ASH

COMPLIANCE REPORTING

CENTURION SURVEY PTY LTD

ABN: 66 605 045 314
P: (02) 4967 5927
M: 0429 987 821
Unit 11 56 Industrial Dr
Mayfield NSW 2304

TITLE:

LOT 220
EXTRACTION LEVEL
COMPLIANCE

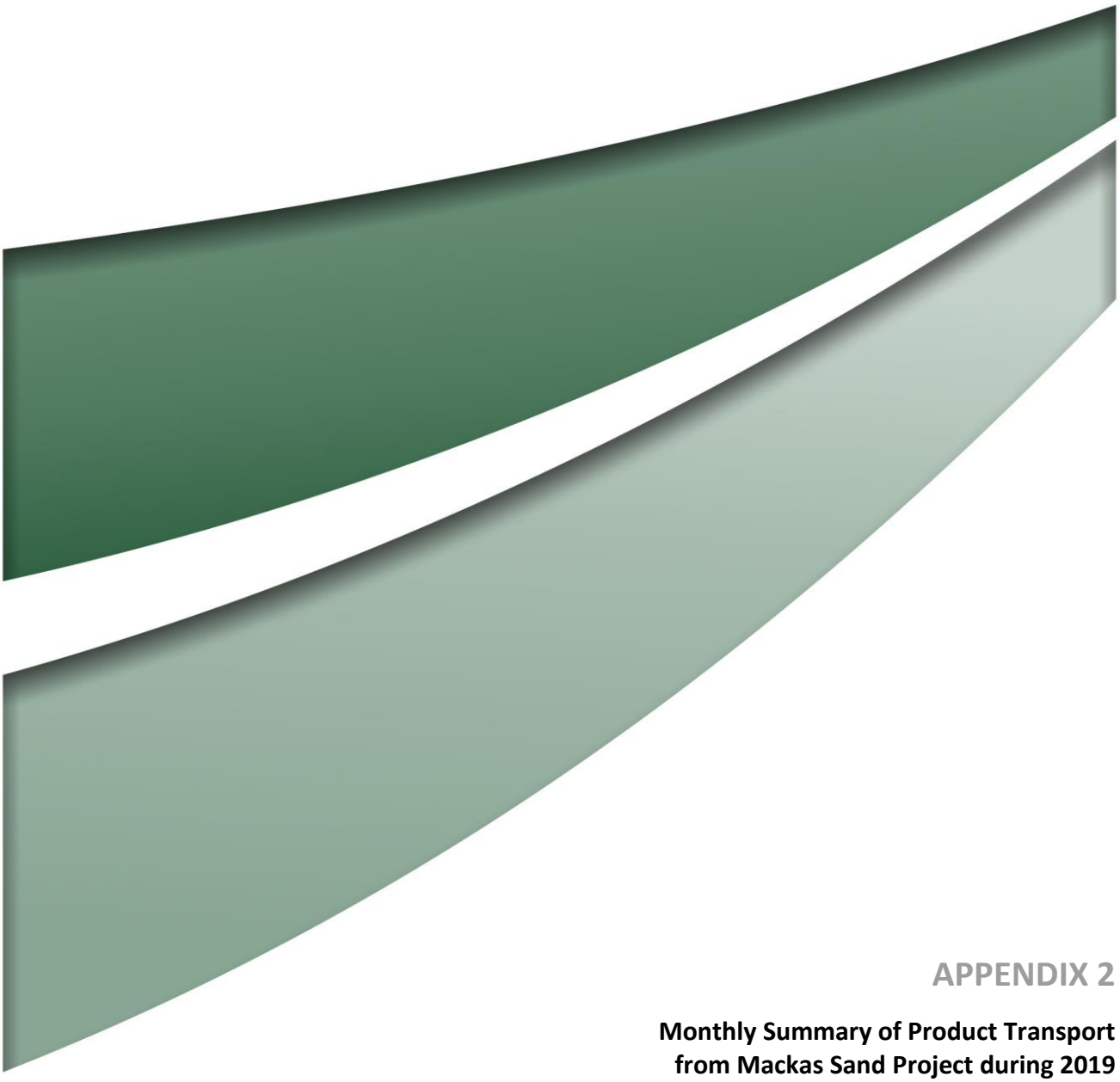
STATUS:

DECEMBER 2019

DRAWING NUMBER:

SHEET 1 OF 1 SHEETS

A3



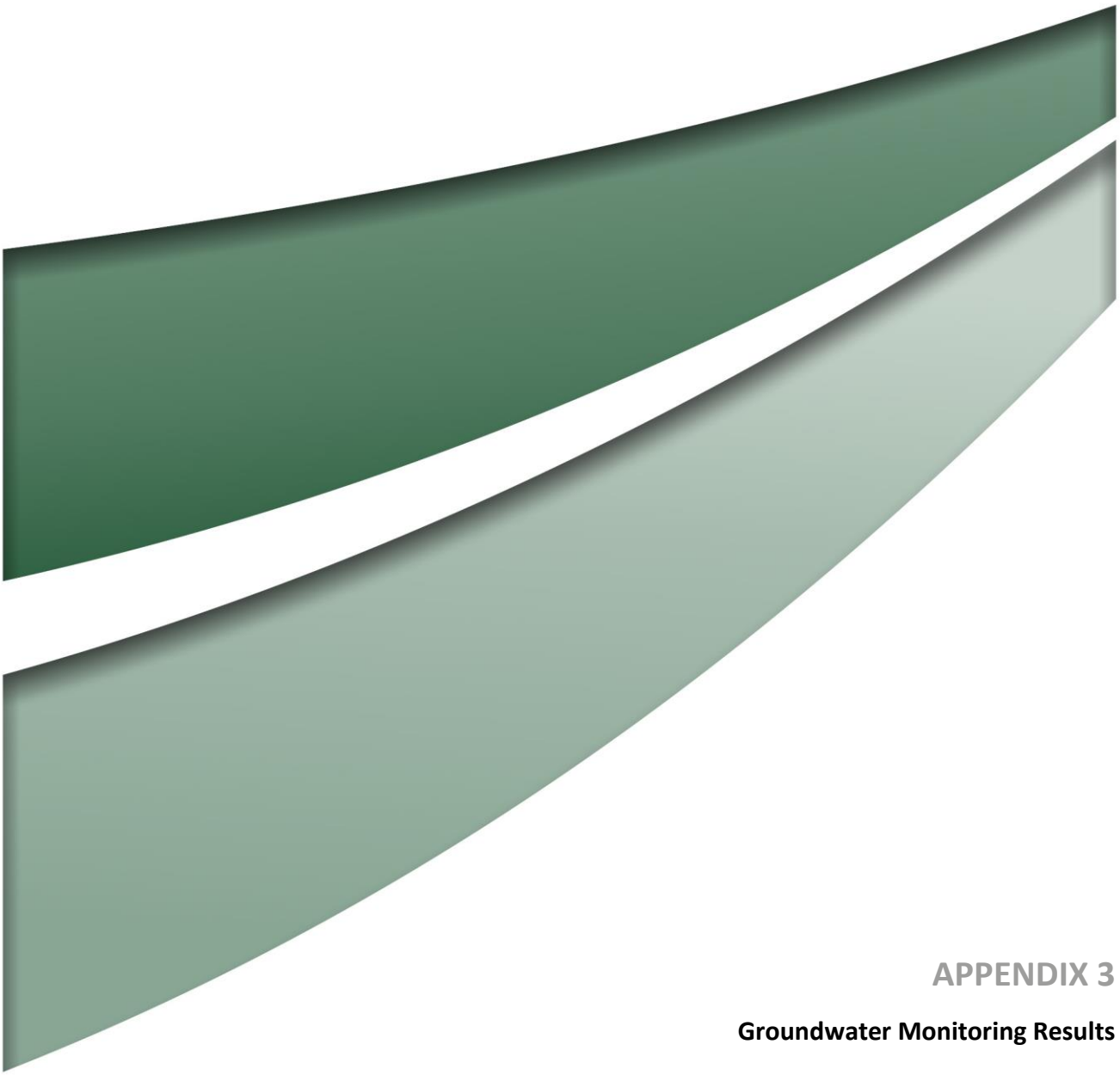
APPENDIX 2

Monthly Summary of Product Transport from Mackas Sand Project during 2019

2019 Transport Summary

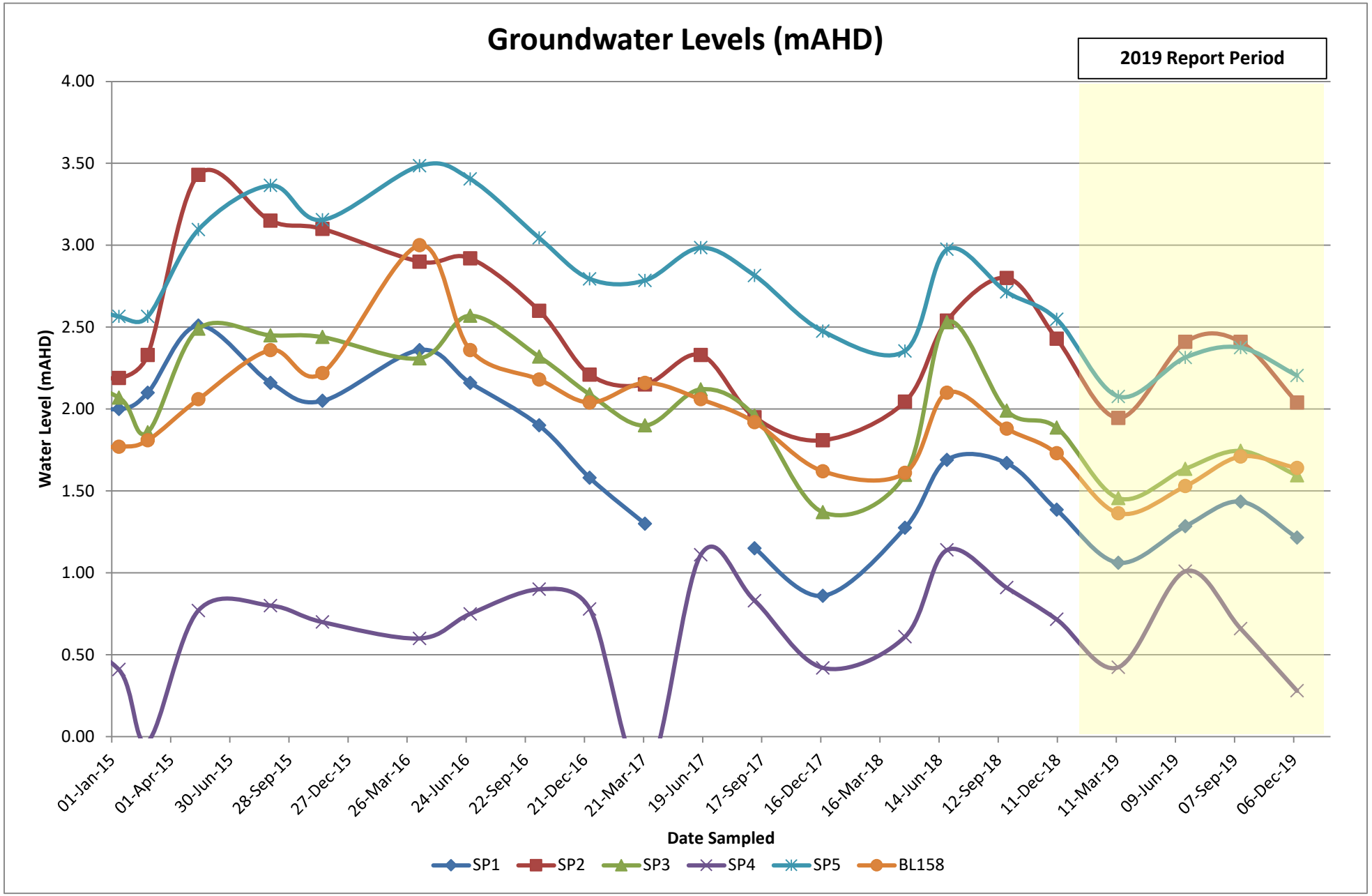
Table 1.1 2019 Monthly Transport Summary

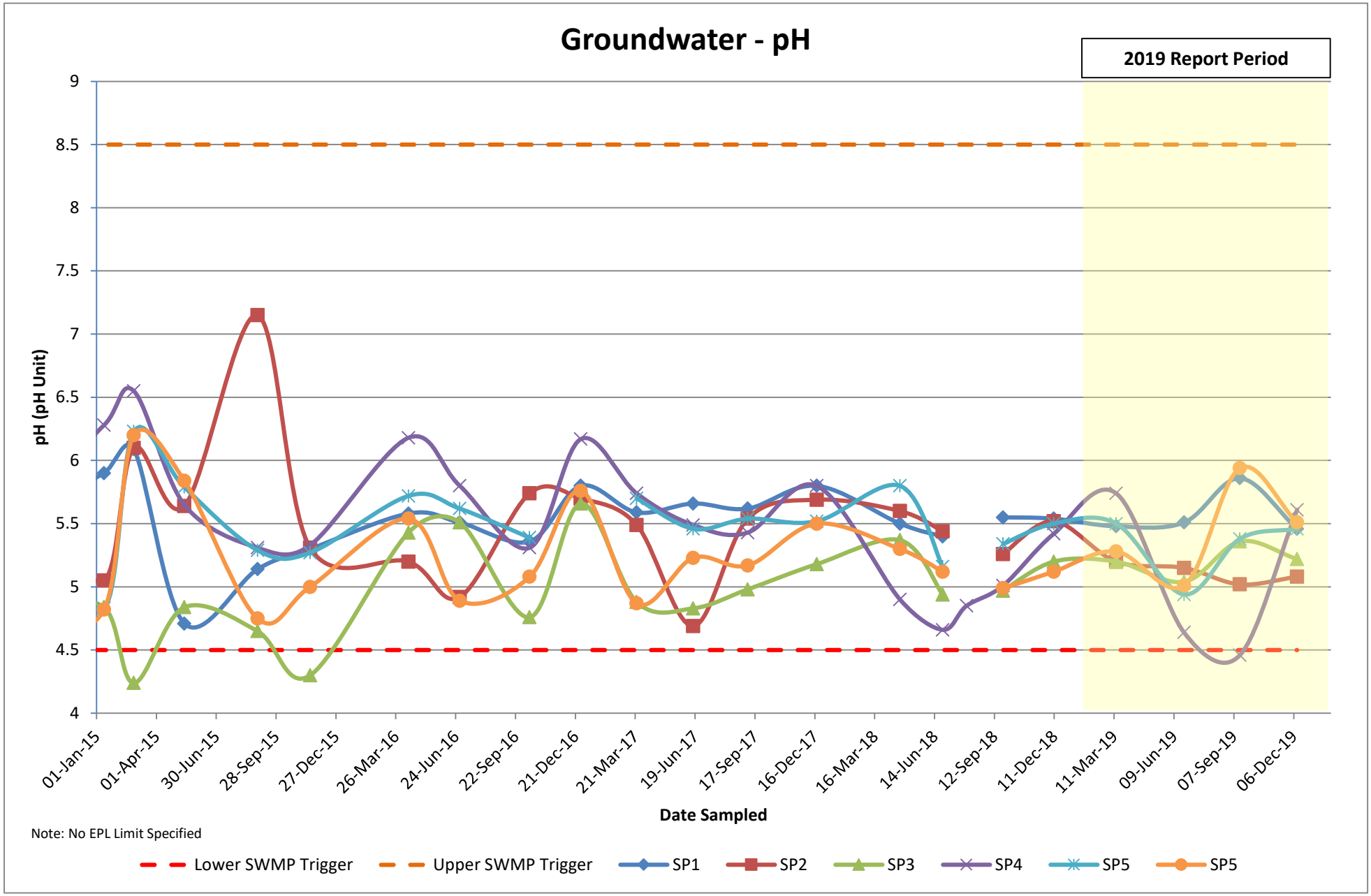
Month	Lot 218 (tonnes)	Lot 220 (tonnes)
January	60,708.26	59,269.84
February	79,483.78	74,604.67
March	80,923.30	70,882.30
April	74,500.08	62,004.53
May	95,498.60	74,782.12
June	70,792.16	55,016.58
July	86,917.48	72,200.27
August	95,752.52	66,11375
September	89,439.28	42,079.55
October	66,609.80	44,510.90
November	84,515.12	42,914.36
December	66,369.88	34,831.88
Total	951,510.26	699,210.75

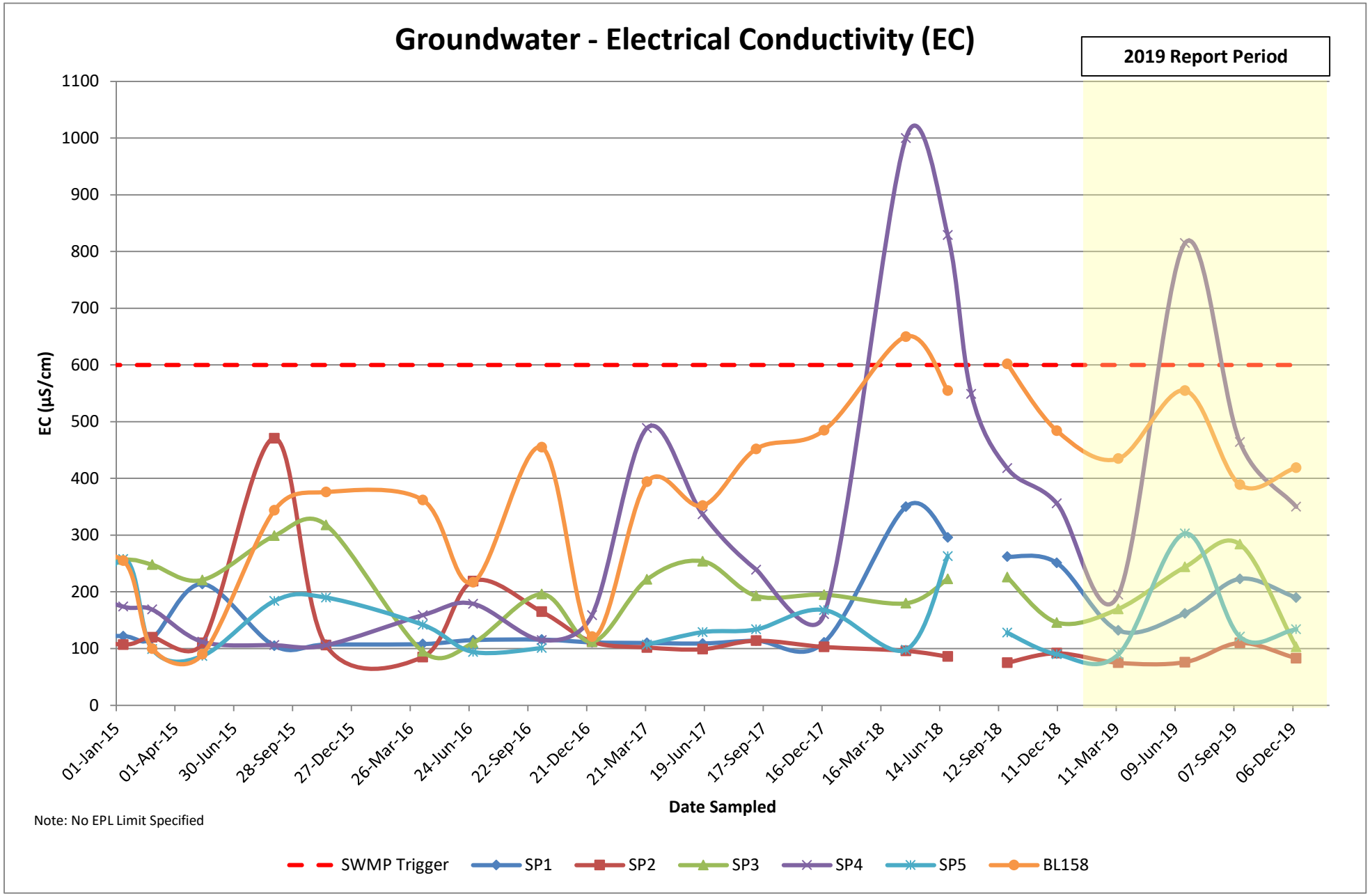


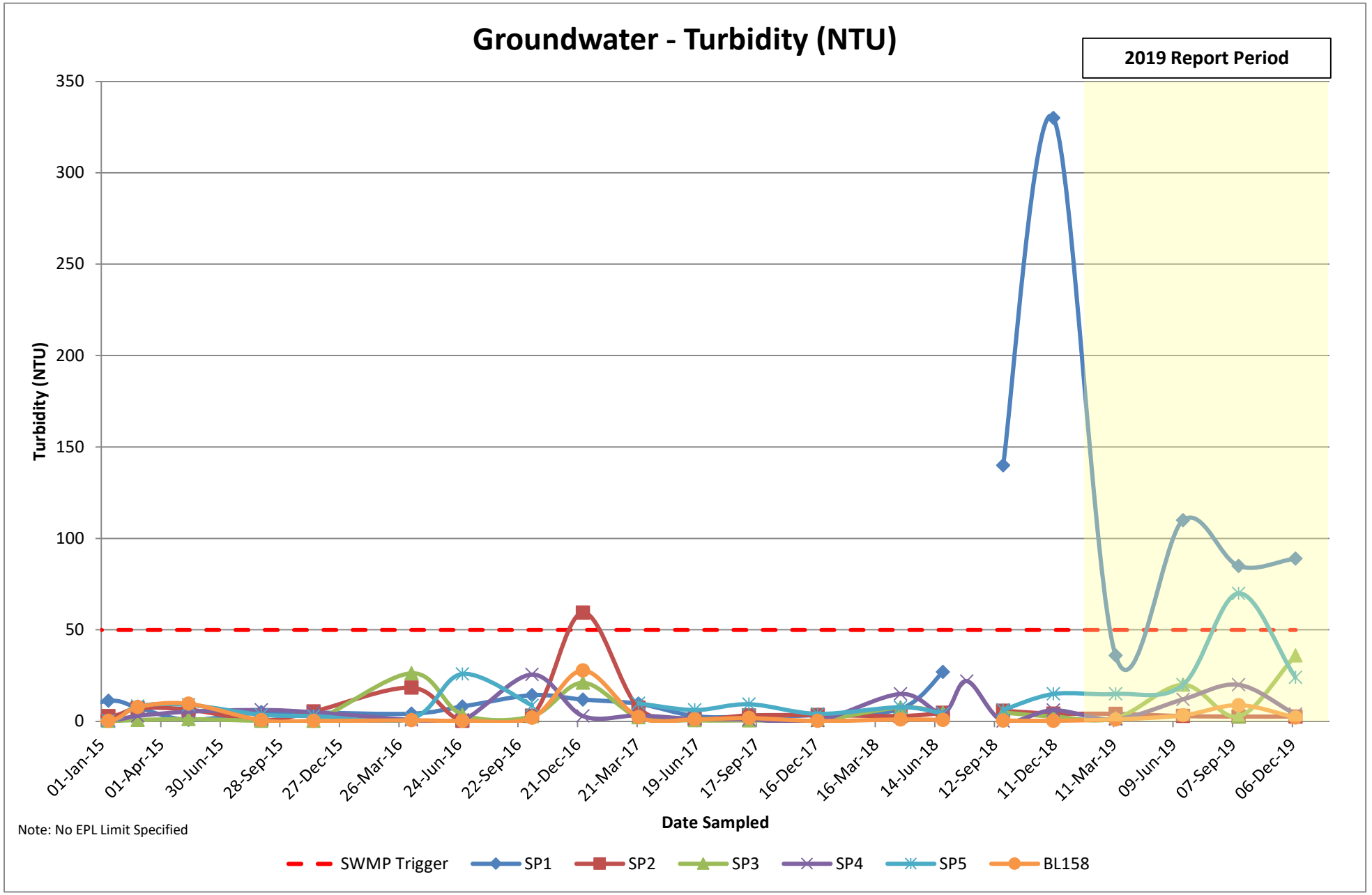
APPENDIX 3

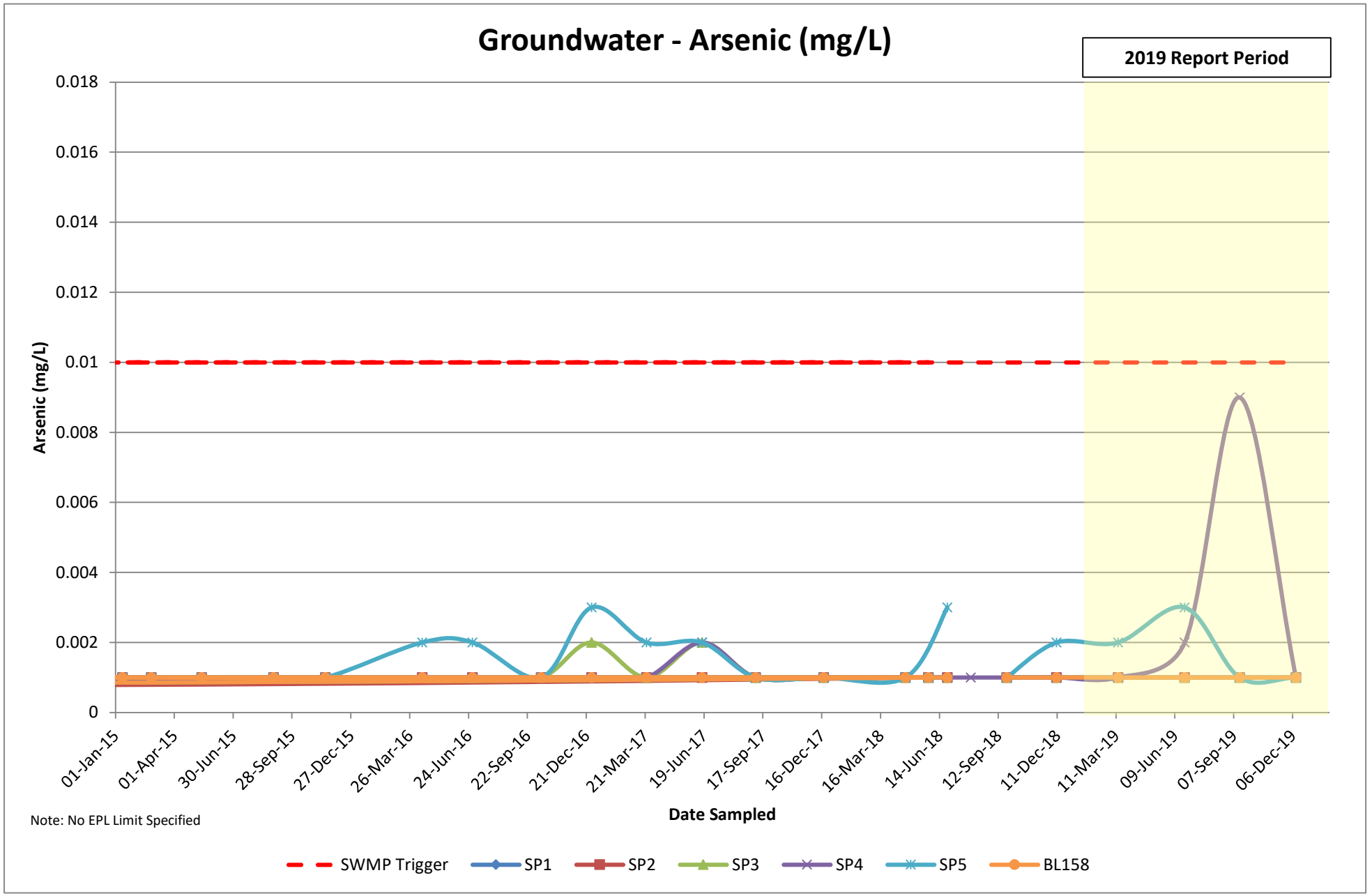
Groundwater Monitoring Results

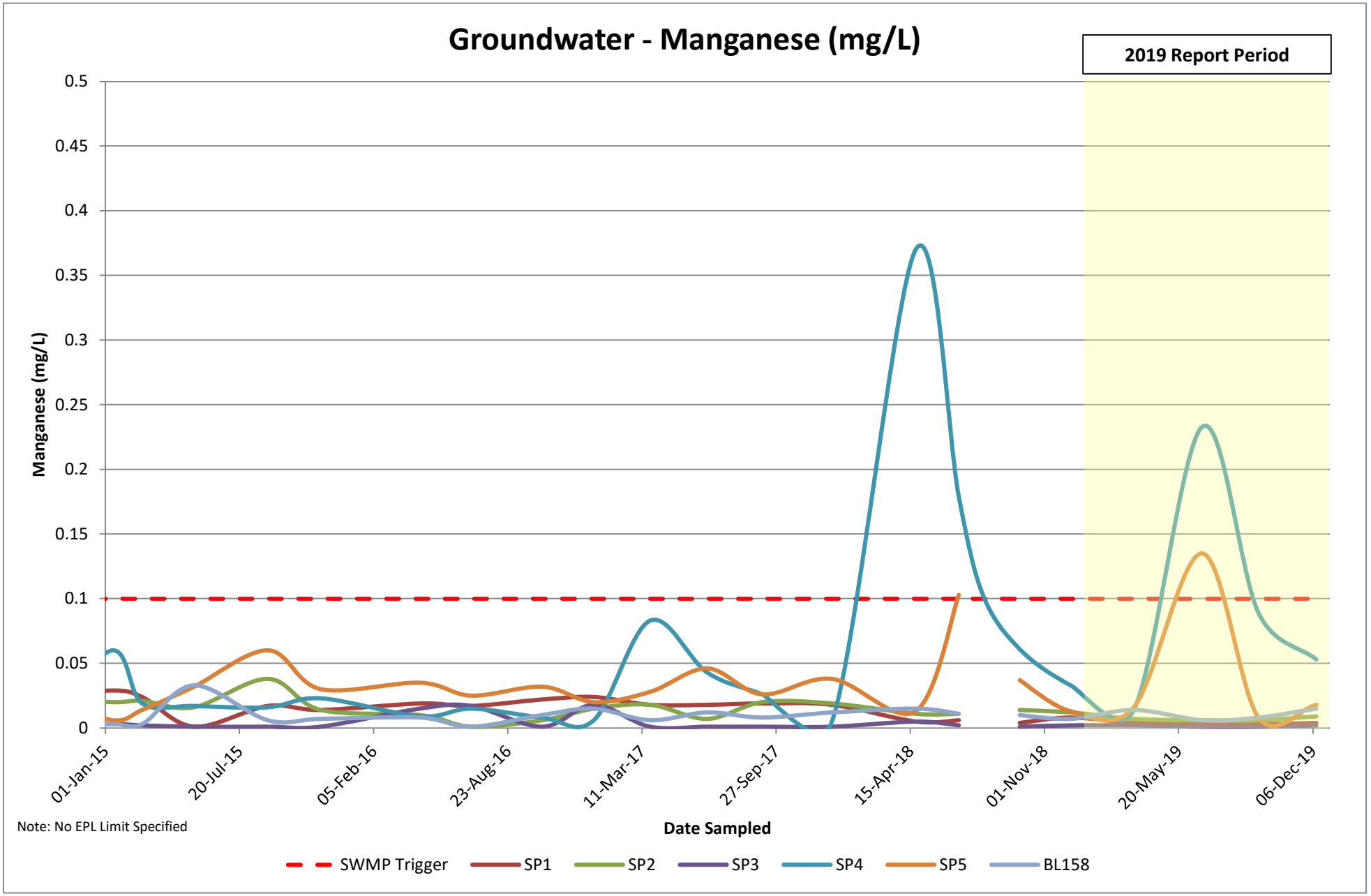

Groundwater Levels (mAHD)
2019 Report Period
Water Level (mAHD)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
01-Jan-15
01-Apr-15
30-Jun-15
28-Sep-15
27-Dec-15
26-Mar-16
24-Jun-16
22-Sep-16
21-Dec-16
21-Mar-17
19-Jun-17
17-Sep-17
16-Dec-17
16-Mar-18
14-Jun-18
12-Sep-18
11-Dec-18
11-Mar-19
09-Jun-19
07-Sep-19
06-Dec-19
Date Sampled
SP1
SP2
SP3
SP4
SP5
BL158

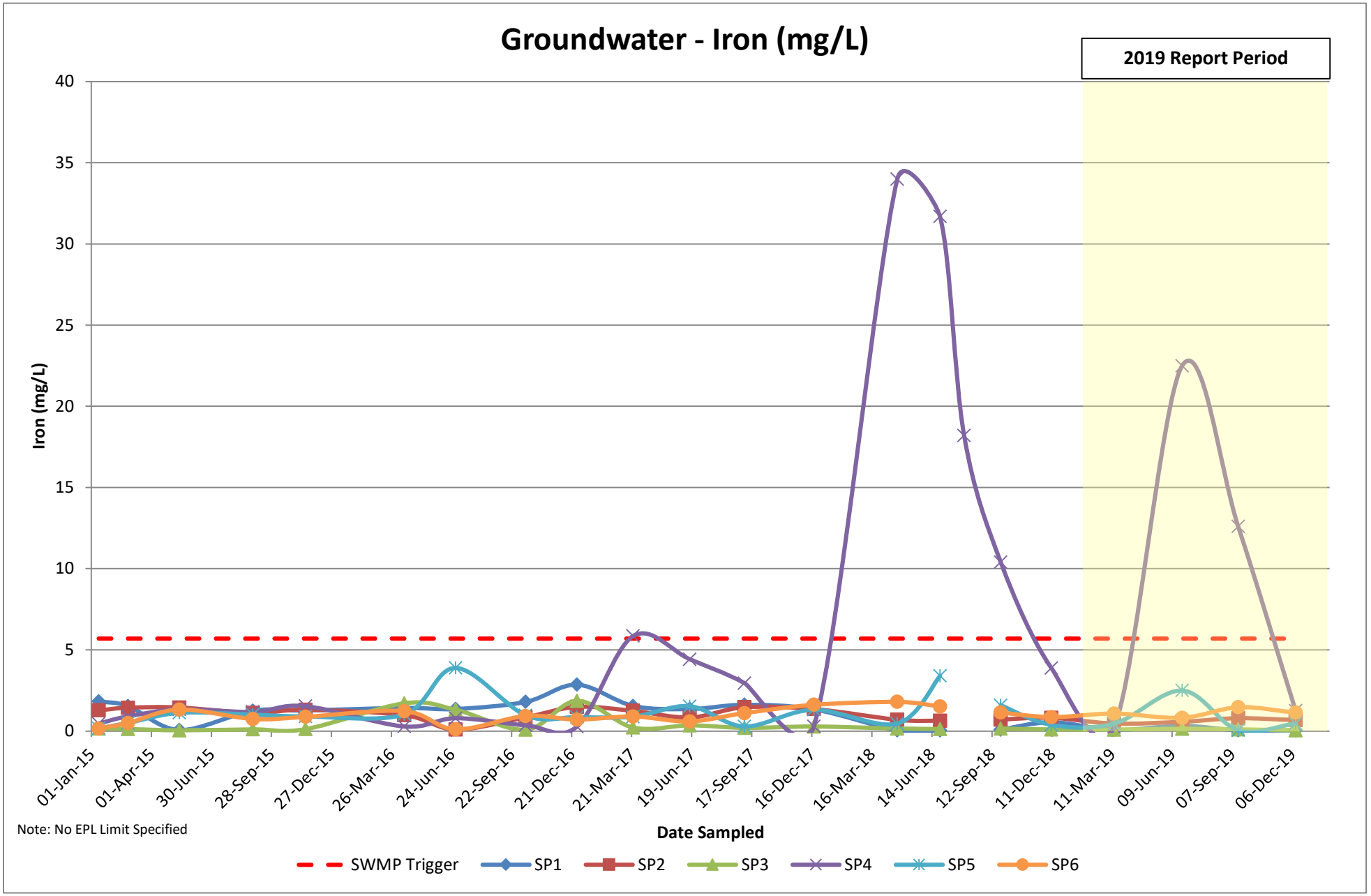

Groundwater - pH
2019 Report Period
pH (pH Unit)
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
01-Jan-15
01-Apr-15
30-Jun-15
28-Sep-15
27-Dec-15
26-Mar-16
24-Jun-16
22-Sep-16
21-Dec-16
21-Mar-17
19-Jun-17
17-Sep-17
16-Dec-17
16-Mar-18
14-Jun-18
12-Sep-18
11-Dec-18
11-Mar-19
09-Jun-19
07-Sep-19
06-Dec-19
Date Sampled
Note: No EPL Limit Specified
Lower SWMP Trigger
Upper SWMP Trigger
SP1
SP2
SP3
SP4
SP5
SP5

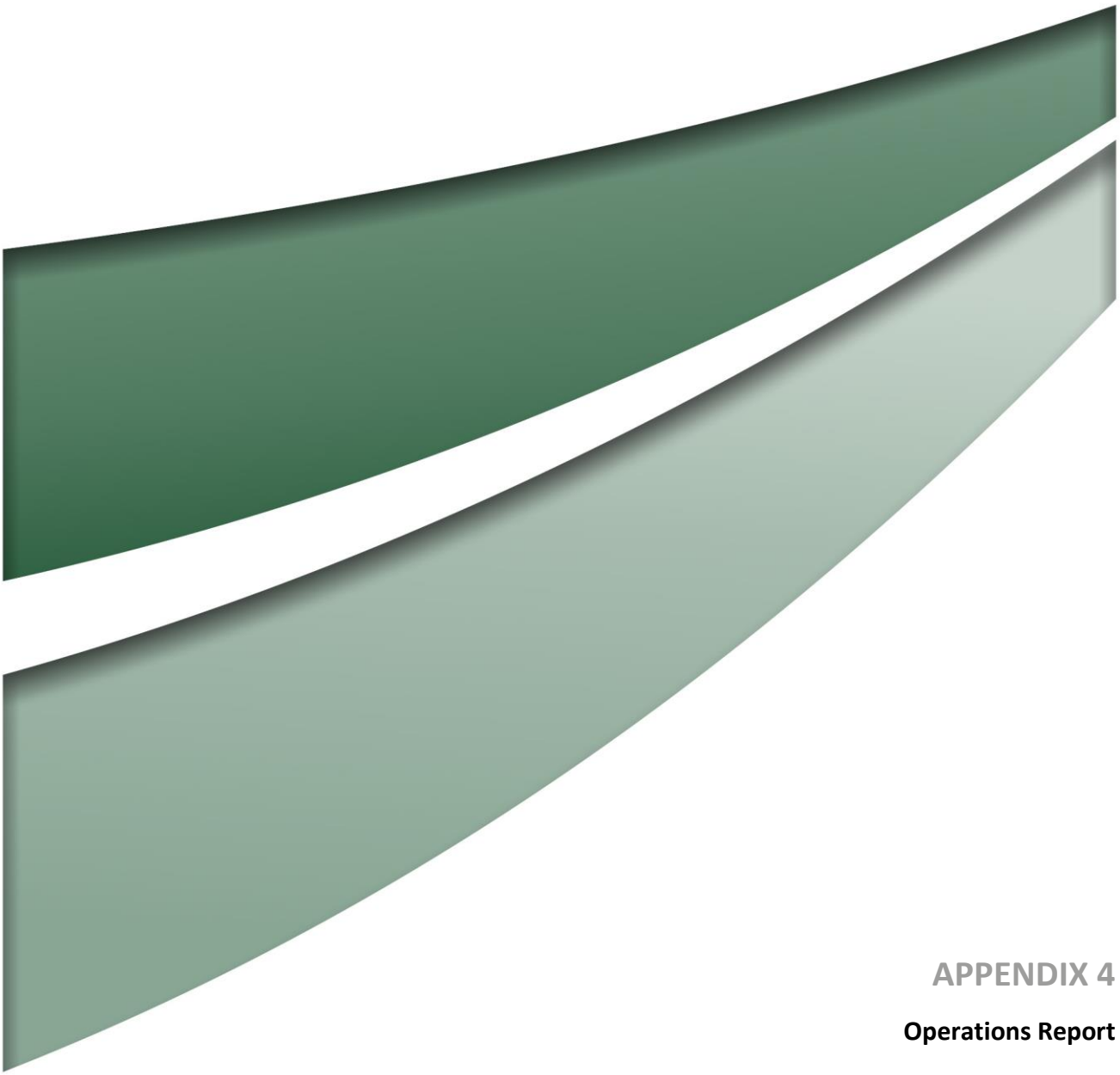

Groundwater - Electrical Conductivity (EC)
2019 Report Period
EC (µS/cm)
1100
1000
900
800
700
600
500
400
300
200
100
0
01-Jan-15
01-Apr-15
30-Jun-15
28-Sep-15
27-Dec-15
26-Mar-16
24-Jun-16
22-Sep-16
21-Dec-16
21-Mar-17
19-Jun-17
17-Sep-17
16-Dec-17
16-Mar-18
14-Jun-18
12-Sep-18
11-Dec-18
11-Mar-19
09-Jun-19
07-Sep-19
06-Dec-19
Date Sampled
Note: No EPL Limit Specified
SWMP Trigger
SP1
SP2
SP3
SP4
SP5
BL158


Groundwater - Turbidity (NTU)
2019 Report Period
Turbidity (NTU)
350
300
250
200
150
100
50
0
01-Jan-15
01-Apr-15
30-Jun-15
28-Sep-15
27-Dec-15
26-Mar-16
24-Jun-16
22-Sep-16
21-Dec-16
21-Mar-17
19-Jun-17
17-Sep-17
16-Dec-17
16-Mar-18
14-Jun-18
12-Sep-18
11-Dec-18
11-Mar-19
09-Jun-19
07-Sep-19
06-Dec-19
Date Sampled
Note: No EPL Limit Specified
SWMP Trigger
SP1
SP2
SP3
SP4
SP5
BL158


Groundwater - Arsenic (mg/L)
2019 Report Period
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Arsenic (mg/L)
01-Jan-15
01-Apr-15
30-Jun-15
28-Sep-15
27-Dec-15
26-Mar-16
24-Jun-16
22-Sep-16
21-Dec-16
21-Mar-17
19-Jun-17
17-Sep-17
16-Dec-17
16-Mar-18
14-Jun-18
12-Sep-18
11-Dec-18
11-Mar-19
09-Jun-19
07-Sep-19
06-Dec-19
Date Sampled
Note: No EPL Limit Specified
SWMP Trigger
SP1
SP2
SP3
SP4
SP5
BL158


Groundwater - Manganese (mg/L)
2019 Report Period
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Manganese (mg/L)
01-Jan-15
20-Jul-15
05-Feb-16
23-Aug-16
11-Mar-17
27-Sep-17
15-Apr-18
01-Nov-18
20-May-19
06-Dec-19
Date Sampled
Note: No EPL Limit Specified
SWMP Trigger
SP1
SP2
SP3
SP4
SP5
BL158


Groundwater - Iron (mg/L)
2019 Report Period
Iron (mg/L)
40
35
30
25
20
15
10
5
0
01-Jan-15
01-Apr-15
30-Jun-15
28-Sep-15
27-Dec-15
26-Mar-16
24-Jun-16
22-Sep-16
21-Dec-16
21-Mar-17
19-Jun-17
17-Sep-17
16-Dec-17
16-Mar-18
14-Jun-18
12-Sep-18
11-Dec-18
11-Mar-19
09-Jun-19
07-Sep-19
06-Dec-19
Note: No EPL Limit Specified
Date Sampled
SWMP Trigger
SP1
SP2
SP3
SP4
SP5
SP6



APPENDIX 4

Operations Report

umwelt
Environmental & Social Consultants

MACKA'S SAND PTY LTD

OPERATIONS REPORT

Approval for Extractive Industry in the
North Stockton Catchment Area

FINAL

March 2020

OPERATIONS REPORT

Approval for Extractive Industry in the North Stockton Catchment Area

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Mackas Sand Pty Ltd

Project Director:	Bret Jenkins
Project Manager:	Rod Williams
Report No.	1646/R95a
Date:	March 2020

Newcastle

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
1	Rod Williams	30 March 2020	Rod Williams	30 March 2020

Table of Contents

1.0 Introduction 1

1.1 Project Background 1

1.2 Scope 1

2.0 Statement of Compliance 3

3.0 Requirements for the Method of Extractive Operations 4

3.1 Laser Level Monitoring 4

3.2 Machinery and Equipment 4

3.3 Storage of Contaminants 4

3.4 Refuelling 4

4.0 Operations Management Procedure 6

5.0 Rehabilitation 7

6.0 Non-compliance Summary 8

Figures

Figure 1.1 Locality Plan 2

1.0 Introduction

1.1 Project Background

Macka's Sand Pty Ltd (Macka's Sand) was granted Major Project Approval 08_0142 in September 2009 by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to operate sand extraction operations at Salt Ash, approximately 25 kilometres (km) north-east of Newcastle, New South Wales (NSW) (refer to **Figure 1.1**).

Macka's Sand has approval to extract and process sand from Lot 218 and Lot 220. Lot 220 has an identified resource of 9.6 million tonnes (Mt) however Lot 218 has a potentially indefinite extraction life due to the ongoing movement of sand from the mobile dunes into the approved extraction area. At the time of preparing this report, sand extraction was being undertaken on both Lot218 and Lot 220.

1.2 Scope

In accordance with Condition 3 & 4 of Clause 9 of the NOW Approval under Clause 10(1) of the *Hunter Water Regulation 2015* (the 'NOW Approval'), Mackas is required to submit an annual report to summarise compliance against this approval.

Conditions 3 and 4 of Clause 9 of the NOW Approval states:

(3) On the date on which the AEMR is submitted in accordance with subclause (1), the Approval Holder must also submit the following to HWC and Office of Water;

a) 'an electronic copy of the monitoring results for groundwater levels and quality during the past year collected in accordance with the Soil and Water Management Plan, and

*b) A written report (**Operations Report**)addressing whether the Approval Holder has achieved compliance with:*

i. the requirements for the method of Extractive Operations in Clause 3 of the Schedule;

ii. the Operations Management Procedure;

iii. the Hydrocarbon Spill Procedure; and

iv. the requirement for the progressive replacement of topsoil provided in Clause 6(3) of the Schedule

(4) The Operations Report must:

a) identify any non-compliance during the previous year, and

b) identify what actions were, or are being, taken to ensure compliance.

The details of compliance with the above conditions are detailed in the sections below.

This report has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Macka's Sand. The reporting requirements for Macka's Sands are outlined in the DPI – Water (formerly NSW Office of Water (NOW)) Approval to undertake extraction works within the North Stockton Catchment Area. This report has been prepared to provide a summary of the performance of Macka's Sand during the 2018 calendar year.

Image Source: Nearmap (Feb 2018)

0 1 2 4km
1:85 000

Legend

- Lot Boundaries
- Approval Areas
- Approved Site Access (not-utilised)
- Approved Site Access (utilised)
- Approved Alternate Site Access (utilised)

FIGURE 1.1

Locality Plan

2.0 Statement of Compliance

This report has been prepared to provide a summary of the performance of the Mackas Sand operation over the period 1 January to 31 December 2019 (i.e. the compliance review period). The compliance status of the Macka's Sand operation against the NOW Approval and associated operations management procedure was managed during the reporting period by Mackas Sand.

This report specifically addresses and summarises compliance in accordance with Condition 3(b) of Clause 9 of the NOW Approval and its associated conditions.

In preparing this report, Umwelt has relied on this information in combination with other information sources such as environmental monitoring documentation, discussions with Macka's Sand representatives, and our general understanding of the operation. Umwelt has not sought to undertake a full compliance audit, including secondary verification of the collated documentary evidence with relevant government agency staff, construction personnel or operational staff, site records, etc.

No non-compliances were identified the 2019 Operations Report period.

3.0 Requirements for the Method of Extractive Operations

3.1 Laser Level Monitoring

As part of a compliance audit campaign on NSW sand quarries (DPE, 2015), DPE identified that one of the most common non-compliances related to the implementation of adequate controls to manage extraction depth.

As a result, Macka's Sand has engaged Centurion Civil to undertake quarterly surveys of the extraction area. Through the survey process compliance with the extraction depth and area is determined. Quarterly survey plans demonstrating compliance are provided in **Appendix 1** of the 2019 Annual Review.

3.2 Machinery and Equipment

Mackas Sand experienced a number of significant machinery maintenance and part replacements on four front end loaders, three dump trucks, one excavator and one dozer across Lot 218 and Lot 220 during the reporting period. The manufacturers of the Front-End-Loader advised that these failures are due to extremely harsh operating conditions (i.e. soft dry sand).

In addition, Mackas Sand reports that the Project Approval operating depth constraints that require equipment to operate in dry sand conditions results in significantly higher fuel use of around 60 litres per hour as opposed to the equipment specification of 23 litres per hour.

Mackas Sand continues to investigate equipment modifications, mining methodology and operational procedural changes to minimise the highly inefficient fuel consumption caused by the dry sand operating conditions, and the impact that these harsh operating conditions have on the loaders and the business overall.

Clause 3 (2) of the NOW approval states that 'the approval holder must remove all machinery used in the Extractive Operations from the Land at the end of each day's operation'. Macka's Sand has approval to operate for 24 hours a day. However, all mobile machinery not anticipated to be in active use is to be removed from Lot 218 or Lot 220. Vehicle storage locations are located outside of the North Stockton Catchment Area.

3.3 Storage of Contaminants

Macka's Sand has advised that during the report period, no hydrocarbon materials or other potential contaminants were stored on either Lot 218 or Lot 220, within the North Stockton Catchment Area.

3.4 Refuelling

Refuelling of vehicles occurs at the Macka's Sand and Soil administration and maintenance facility, or at the vehicle storage area at the Alternate Access Route.

Macka's Sand uses sieves and/or stackers at Lot 220 and Lot 218 that have limited mobility and are not considered to be vehicles. This relocatable plant is moved once or twice a year as the sand extraction face advances. Offsite refuelling of plant with limited mobility is not considered feasible.

As noted within Section 4.2.1 of the Operations Management Procedure, refuelling of plant with limited mobility occurs within the extraction areas via the use of mobile refuelling equipment.

In order to minimise the risk of fuel spills, and the impact of spills should they occur, refuelling equipment consists of a fuel tank, spill catch tray and spill kit. An additional mobile spill kit is located within the extraction area to enable prompt clean up in the event of an accidental spill during refuelling activities.

4.0 Operations Management Procedure

The Operations Management Procedure outlines the standard methods and practices of utilisation of plant and equipment at the site. Macka's Sand has advised that the works at the site were undertaken in accordance with the Operations Management Procedure during 2018.

Hydrocarbon Spill Procedure

Macka's Sand has advised that the works at the site were undertaken in accordance with the Hydrocarbon Spill Procedure during 2019. No spills were recorded during 2019.

Any spills, should they occur, will be managed in accordance with Section 4.3.3 of the Operational Management Procedure to prevent fuel from contaminating the North Stockton groundwater source.

Any contaminated material to be disposed of will be done so in accordance with relevant waste management requirements.

5.0 Rehabilitation

Rehabilitation at Lot 220 is being undertaken progressively as sand extraction and operating space on the active quarry floor permits.

Approximately 4 ha of land in the southern section and 1 ha in the northern section of Lot 220 was undergoing landform establishment preparations (i.e. topsoil placement) for rehabilitation as at the end of the reporting period.

Prior to seeding, land undergoing preparation for rehabilitation are required to be surveyed to ensure they comply with final landform heights as noted within the Macka's Sand Landscape Management Plan, in accordance with Part 2 Clause 6 of the Hunter Water Regulations approval.

Activities undertaken during the reporting period were generally consistent with the Landscape Management Plan.

6.0 Non-compliance Summary

No non-compliances were identified within the 2019 Operations Report period.

umwelt
Environmental & Social Consultants

Newcastle | Perth | Canberra | Brisbane | Sydney | Orange

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