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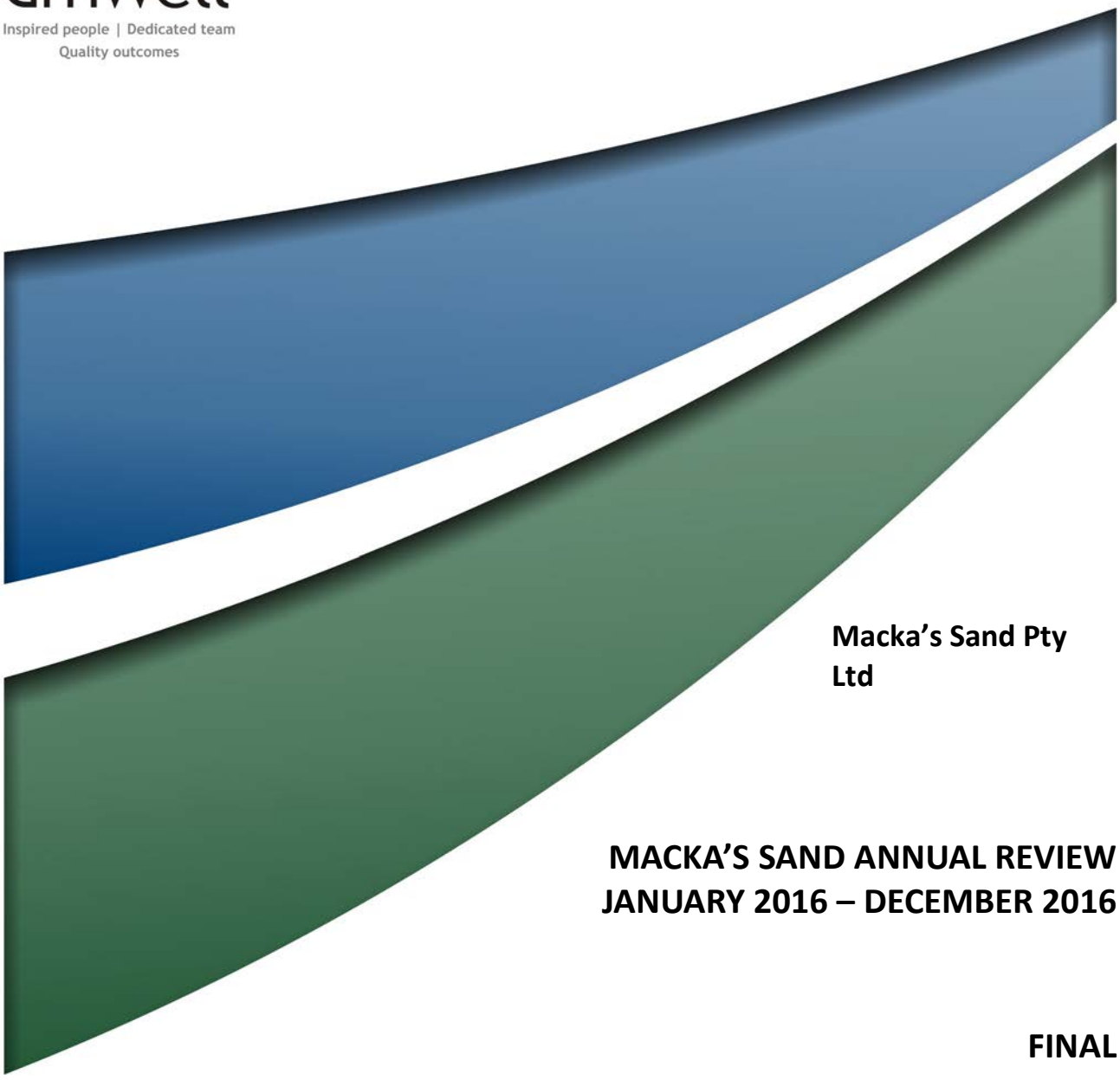

Macka's Sand Pty Ltd

MACKA'S SAND ANNUAL REVIEW JANUARY 2016 – DECEMBER 2016

FINAL

August 2017

Mackas Sand Pty Ltd

MACKAS SAND ANNUAL REVIEW JANUARY 2016 – DECEMBER 2016

FINAL

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

Project Director:	Peter Jamieson
Project Manager:	Brendan Rice
Report No.	1646/R71/FINAL
Date:	August 2017

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

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Annual Review Title Block

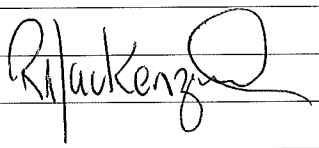
Name of operation	Macka's Sand
Name of operator	Macka's Sand Pty Ltd
Development Consent / Project Approval No.	08_0142 MOD 2
Name of holder of development consent / project approval	Macka's Sand Pty Ltd
Mining lease No.	No Mining Lease applicable to site under *Mining Act* (1992).
Name of holder of 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 2016
Annual Review end date	31 December 2016

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 2016 to 31 December 2016 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 7-8-2017	

1.0 Statement of Compliance

Macka's Sand operations on Lot 218 and Lot 220 are located approximately 25 kilometres north-east of Newcastle near Salt Ash in the Port Stephens local government area (LGA), New South Wales. Macka's 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 and operated under agreement by Macka's Sand.

The following section provides a statement of compliance in regards to the operations undertaken at Lot 218 and Lot 220. It is noted that during the report period an independent compliance audit was not required to be undertaken by Macka's Sand with the next audit due in 2017. There was no audit undertaken by the Department of Planning and Environment (DPE) during the 2016 report period.

Table 1.1 below provides a statement of compliance for the report period. The key for the compliance status can be found in **Table 1.2**. The non-compliances are summarised in **Table 1.3** below. There were two non-compliances with the statutory approvals identified during the report period (refer in **Table 1.3**).

Table 1.1 Statement of Compliance

Relevant approval	All conditions complied with?
Development consent DA 200-5-2003	No – refer to **Table 1.3**
Environment Protection Licence EPL 13218	No – refer to **Table 1.3**

The non-compliances for the 2016 reporting period are detailed below in **Table 1.2**.

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 2016 report period

Relevant Approval	Condition No.	Condition Description (Summary)	Compliance Status	Comment	Where addressed in Annual Review
DC 08_0142 MOD 1	Schedule 2, Condition 7 and Schedule 3, Condition 2 EPL Condition L5.1	Extraction will comply with approved maximum depth map.	Non-Compliant	Extraction depth surveying undertaken in December 2016 has confirmed that the site was non-compliant with the approved extraction depth limits allowed in the Project Approval and in the EPL 13218 at both Lots 218 and Lot 220 during the 2016 report period.	Section 11
	Schedule 3, Condition 4B	Truck movements via the Alternate access road will comply with approved hourly conditions	Non-Compliant	Truck movement data for the 2016 period has confirmed that the site was non-compliant under MOD1 and MOD2 of Condition 4B of Schedule 3 of the Project Approval.	Section 11
DC 08_0142 MOD 1	Schedule 3, Condition 11	Air quality monitoring (depositional dust) samples collected from depositional dust gauges on a monthly basis throughout the report period.	Non-compliant	Air quality monitoring was undertaken during the report period for all locations, however on 1 occasion samples were obtained for an approximate 6 week period, which is not in compliance with the sample timeframes within the NSW Air Sampling Methods. As such the sample duration was not in accordance with relevant measurement standards.	Section 11

2.0 Introduction

Macka's Sand operations on Lot 218 and Lot 220 are located approximately 25 kilometres north-east of Newcastle near Salt Ash in the Port Stephens LGA, New South Wales (refer to **Figure 2.1**). Macka's Sand has operated sand extraction operations in the area since 1992. Lot 218 and Lot 220 operational areas are owned by the Worimi Local Aboriginal Lands Council and operated under agreement by Macka's Sand.

Macka's Sand was granted Project Approval (PA) No. 08_0142 on 20 September 2009 by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* 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.

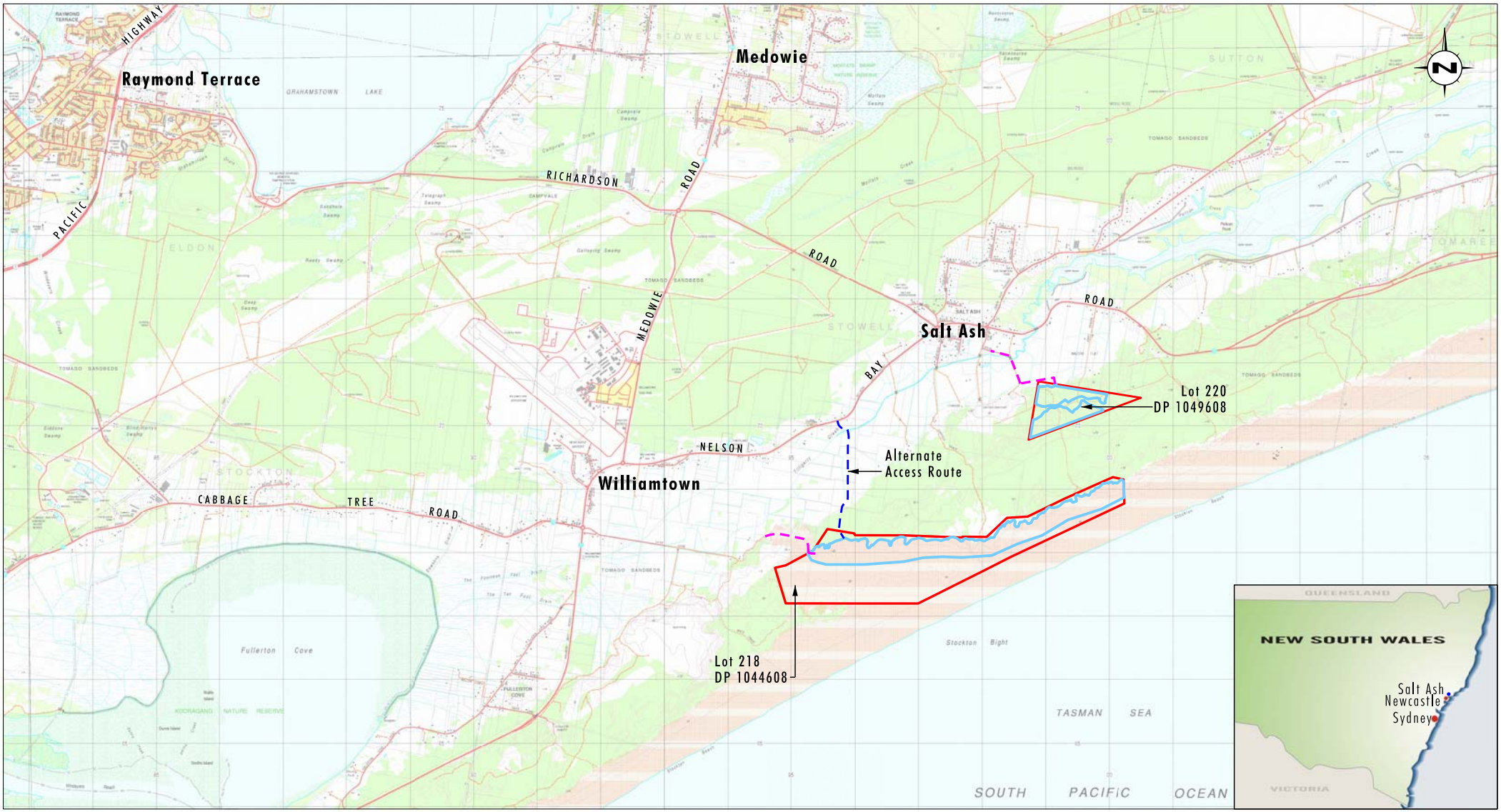
A modification to PA 08_0142 (MOD1) was approved on 30 September 2013 by the NSW Planning Assessment Commission (PAC) under delegation of the Minister for the former Planning and Infrastructure (DP&I), now Department of Planning and Environment (DPE). The modification includes a temporary reduction in extraction level 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, (MOD2), was approved by the PAC on 16 March 2016. The modification allows for an increase in maximum hourly truck movements (in and out) of Lot 218 via the approved alternate access road.

Macka's Sand has engaged Umwelt (Australia) Pty Limited (Umwelt) to assist in the preparation of this Annual Review for the 2016 report period to meet the requirement of PA 08_0142 MOD 2, 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 MOD 2 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:	Whole 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, Section 8.0**
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: o relevant statutory requirements, limits or performance measures/criteria o requirements of any plan, program or strategy required under this approval o monitoring results of previous years o relevant predictions in the EA and the EA (MOD 2).	**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	**Section 11.0**
d) identify any trends in the monitoring data over the life of the project	**Section 6.0**
e) identify any discrepancies between the predicted and the actual impacts of the Project, and analyse the potential cause of any significant discrepancies	**Section 6.0**
f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the Project.	**Section 6.0, Section 12.0**



Source: Department of Lands, 2006

Legend

- Lot Boundaries
- Approval Areas
- Approved Site Access
- Alternate Access Route

FIGURE 2.1

Locality Plan

File Name (A4): R71_V1/1646_476.dgn

2.1 Quarry Contacts

The Macka's 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 details of the Quarry Manager are listed in **Table 2.2.**

Table 2.2 Personnel Responsible for Rehabilitation and Environmental Management at Macka's Sand during 2016

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

3.0 Approvals

The operations at Macka's Sand on Lot 218 and Lot 220 were subject to a range of statutory approvals during the report period and these are summarised below and discussed in further detail in the following sections:

- PA 08_0142 MOD 2
- approval under the *Hunter Water Regulations 2015* Clause 15(1) and the corresponding Operations Management Procedure (Umwelt 2015a)
- Environment Protection Licence (EPL) 13218 and the corresponding Pollution Incident Response Management Plan (PIRMP) (Umwelt 2016a)
- Department of Environment Approval EPBC 2011/6214 and the corresponding EPBC Landscape Rehabilitation Management Plan (Umwelt 2016b)
- Macka's Sand Environmental Management Strategy (EMS) (Umwelt 2016c) and related documentation prepared in accordance with the requirements of the Project Approval. These were updated in 2016 in accordance with PA 08_0142 MOD 2, Schedule 5 Condition 1. These include:
    - Noise Management Plan (NMP) (Umwelt 2016c)
    - Air Quality Management Plan (AQMP) (Umwelt 2016d)
    - Soil and Water Management Plan (SWMP) (Umwelt 2016e)
    - Unexploded Ordinance Management Plan (for operations in Lot 218) (OMP) (Umwelt 2016f)
    - Landscape Management Plan (LMP) (Umwelt 2016g)
    - Aboriginal Cultural Heritage Management Plan (ACHMP) (Umwelt 2016h)
    - Non-Indigenous Heritage Management Plan (HHMP) (Umwelt 2016i).

3.1 Status of Development Consents/Project Approval

3.1.1 Project Approval (PA 08_0142)

Macka's Sand was granted Project Approval (PA) No. 08_0142 on 20 September 2009 by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* to operate sand extraction operations at Lot 218 and Lot 220. 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.

3.1.2 Modification 1 of the Project Approval (PA08_0142)

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 DP&I, now DP&E. The modification includes a temporary reduction in extraction level 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**, and permits access with reduced impacts upon nearby residents.

3.1.3 Modification 2 of the Project Approval (PA08_0142)

Macka's Sand sought a second modification (MOD 2) in 2014. MOD 2 was approved by the PAC on 16 March 2016. Under this modification, the operation increased its laden truck movements from Lot 218 between the hours of 7am and 10pm Monday to Friday and 7am and 4pm on Saturdays. This proposal will not alter truck movements on Sundays and public holidays, or from Lot 220. Further, the licensed extraction limit of the operation will remain the same.

An overview of the Development Consent history for Macka's Sand is included in **Table 3.1** below.

Table 3.1 Development Consent History for Macka's Sand

Approval No.	Development	Consent Granted/ Endorsed	Duration of Consent
08_0142	Macka's Sand Project	20 September 2009	31 December 2029
08_0142 MOD 1	Access road and extraction depth	30 September 2013	31 December 2029
08_0142 MOD 2	Increased hourly truck movements	16 March 2016	31 December 2029

3.2 Status of Licences and Permits

3.2.1 Environment Protection Licence

The operations at Macka's Sand at Lots 218 and 220 are regulated under EPL No. 13218. Originally issued in 2012, EPL No. 13218 was reviewed and updated during 2014 to conform with the EPA's risk based licensing system. EPL No. 13218 was updated in July 2016 to accommodate a range of additional monitoring and operating requirements associated with ongoing sand extraction activities.

3.2.2 EPBC Referral 2011/6214

Macka's Sand was awarded Federal Approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), to construct an alternative haul road from Lot 218 to Nelson Bay Road in November 2013. This approval prescribes specific conditions to the alternative access road, effective until 31 December 2029.

3.2.3 Hunter Water Regulation (2015) Permit

The *Hunter Water Regulation 2015* is a regulation under the *Hunter Water Act 1991* that applies to the Chichester, Grahamstown, Nelson Bay, North Stockton and Tomago Catchment Areas. Macka's Sand lies within the North Stockton Catchment. Under Clause 15 (1) of the Regulation, a person can only engage in an extractive industry with an approval given by the Secretary of the Department of Trade and Investment.

A Permit has been issued by the Director General of DPI – Water (formerly NSW Office of Water) under the *Hunter Water Regulation (2015)* that consents to the undertaking of sand extraction from Lots 218 and 220 in accordance with the Project Approval. In accordance with Part 3, Clause 9 of the Hunter Water Regulation 2015 Permit, Macka's Sand has prepared an Operations Report detailing compliance with the Hunter Water Regulation 2015 Permit, refer to **Appendix 1**.

3.2.4 Water Licences

Macka's Sands Operations do not require Water Licences as no water extraction is undertaken at the facility. As per the SWMP (Umwelt 2016e), all clean water used onsite is trucked to the premises by an approved provider.

4.0 Operations Summary

A summary of the operations undertaken at Macka's Sand Quarry during the report period are included in the following sections.

4.1 Mining Operations

During the report period, sand extraction was undertaken within both Lot 218 and Lot 220. An overview of the operations within each lot is below with Macka's Sand production during the report period for Lot 218 and Lot 220 detailed within **Table 4.1**.

Lot 218

Sand extraction operations in Lot 218 commenced during February 2015 following the construction of an alternate haul route, as approved by Modification 1 of the Project Approval. Sand extraction continued throughout the 2016 report period and involved a front end loader excavating sand which is then sieved before being loaded onto haul trucks within the extraction area.

A summary of sand production during the 2016 report period is provided in **Table 4.1**.

Lot 220

Sand extraction operations in Lot 220 commenced during November 2009 and continued throughout the 2016 report period. A mobile screen and stockpiler remained in operation to process sand excavated by front end loader before being transported offsite by haul truck.

Table 4.1 Production Summary 2016 (Lot 218 and Lot 220)

Material	Approved Limit (Source – DA)	2015 Reporting Period (Actual tonnes)	2016 Reporting Period (Actual Tonnes)	2017 Reporting Period (Forecast Tonnes)
Total Saleable Product from Lot 218	1,000,000 tonnes from Lot 218	374,189.1	999,299.70	899,369.73*
Total Saleable Product from Lot 220	1,000,000 tonnes from Lot 220	873,804.87	871,779.35	784,601.41*
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).	1,247,993.93	1,871,079.05	1,683,971.1*

*Based on a predicted decrease of 10% in 2017 on 2016 numbers

4.1.1 Hours of operations

Sand extraction and haulage activities at Macka's Sand complies with the operating hours in **Table 4.2** and the conditions specified by Schedule 3, Condition 9 of the Project Approval (MOD 2). This Condition also states that Macka's Sand may undertake:

(a) quarrying operations within 250 metres of residence R27 if the Proponent has an agreement with the owner of the residence to extend the hours of operation; and/or

(b) transportation outside the hours in **Table 4.2**, to a maximum of 5.00am to 10.00pm Monday to Saturday, and 8.00am to 12.00pm on Sundays and Public Holidays, if the Proponent has agreements to extend the hours of transportation with the following:

- all owners of privately-owned land with frontage to Lavis Lane (between the site and Nelson Bay Road), for transportation from Lot 218 using the Lavis Lane access road; and/or
- all owners of 2344, 2353 and 2368 Nelson Bay Road, for transportation from Lot 218 using the Alternate access road; and/or
- all owners of privately-owned land with frontage to Oakvale Road (between the site and Nelson Bay Road), for transportation from Lot 220; and
- Macka's Sand has advised the Department in writing of the terms of these agreements.

Macka's Sand continued to operate within the operating hours specified by Schedule 3, Condition 9 of the Project Approval (MOD 2) throughout the report period.

Table 4.2 Macka's Sand Approved Operating Hours (Project Approval Mod 2)

Activity	Day	Time
Quarrying Operations (other than Transportation)	Any day	Any time
Quarrying Operations on Lot 220 (other than transportation), when operating less than 250 metres from residence R27	Monday to Friday	7.00 am to 6.00 pm
	Weekends and Public Holidays	None
Transportation	Monday to Friday	6.00 am to 6.00 pm (EST)
		6.00 am to 7.00 pm (DST)
	Saturday	7.00 am to 4.00 pm
	Sundays and Public Holidays	None

4.2 Construction Activities

Construction activities during 2016 were limited to the addition of gravel and grading of an approximate 3 kilometre section of the Lot 218 access road. Earthworks have been undertaken in preparation for haul road sealing activities during 2017. No construction activities were undertaken in Lot 220 during the report period.

4.3 2017 Report Period Extraction Operations

The 2017 report period will see continuation of sand extraction in both Lot 218 and Lot 220 in accordance with statutory approvals. It is anticipated that during 2017 there will be no upgrades made to current plant and equipment utilised onsite.

Macka's Sand will continue with current rehabilitation procedures during the 2017 report period.

5.0 DP&E Annual Review Response

5.1 2015 Annual Review Actions

The Annual Review was submitted to DP&E in accordance with Condition 4 of Schedule 5 of the Project Approval on 31 March 2016. DP&E provided response to the Macka's Sand 2015 Annual Review in a letter dated 9 May 2016. The actions required in The DPE's response are outlined in the table below and reference is given to where these requirements are addressed in this document.

Table 5.1 2015 Annual Review actions from DP&E

Action required by The Department	Reference
a) Schedule 2, condition 6; Provide production summary information (e.g. Table 4.1) separated for each Lot (218 and 220)	Refer to **Section 4.1** 2017 Report Period Extraction Operations
b) Schedule 3, condition 28A; provide a summary of the annual ecological monitoring of the Lot 218 Biodiversity offset area within the Annual Review (as required by Schedule 5, condition 4b)	Refer to **Section 6.4.1** Biodiversity Offset Monitoring
c) Schedule 5, condition 10; Ensure all monitoring results required by the Project Approval are available on the website and updated at least every 3 months. It is noted that the noise monitoring results from sampling 19 August 2015 are not published, as at 6 May 2016	All monitoring results are published on the website, most recent update occurred in June 2017. Refer to Macka's Sand website at http://www.Mackassand.com.au

6.0 Environmental Performance

In accordance with the Project Approval (MOD 2), Macka's Sand has prepared a number of management plans in consultation with relevant stakeholders. The management plans have been prepared for a number of environmental management aspects. The management plans prepared for Macka's Sand are detailed below, with a copy of all of the management plans available on the Macka's Sand website:

- Noise Management Plan
- Air Quality Management Plan
- Soil and Water Management Plan
- Unexploded Ordinance Management Plan
- Landscape Management Plan
- Aboriginal Cultural Heritage Management Plan and
- Non-Indigenous Heritage Management Plan.

The following sections provide a summary of environmental monitoring and management undertaken during the 2016 report 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 report period. It is noted that environmental monitoring data has also been published on the Macka's Sand website (http://www.Mackassand.com.au/) in accordance with Condition 9B of Schedule 5 of the Project Approval.

A summary of the environmental performance of Macka's Sand is included in **Table 6.1** below with further contextual information included within the following **Sections 6.1** to **6.7**.

Table 6.1 Summary of Environmental Performance during 2016

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / key management implications	Implemented / proposed management actions
Noise **(Refer to Section 6.1)**	Schedule 3, Conditions 4 -10 of Project Approval and L3 of EPL 13218. Macka's Sand will ensure that the noise generated by the project does not exceed the prescribed criteria.	Compliant. At time of noise monitoring on 29 August, 6 September and 26 September 2016, Macka's Sand was found to comply with Industrial noise assessment criteria and traffic noise assessment criteria.	Ongoing noise assessment at sensitive receivers showed generally similar levels to those previously measured.	The annual attended noise monitoring program will continue in accordance with the Project Approval and EPL 13218.
Air Quality **(Refer to Section 6.2)**	Schedule 3, Condition 11 of Project Approval. Total Suspended Particulate (TSP) matter < 90 ug/m^3, averaged annually.	Installation of TEOM is dependent upon written approval from resident at R27. At this time, the resident at R27 does not permit air quality monitoring on their property.	No monitoring undertaken as monitoring equipment has not been installed.	Macka's Sand will continue to liaise with the DP&E and EPA regarding the installation of a TEOM air quality monitoring unit at this residence, if required.

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / key management implications	Implemented / proposed management actions
Air Quality **(Refer to Section 6.2)**	Schedule 3, Condition 11 of Project Approval. Particulate matter <10 ug/m^3 (PM10) <30 ug/m^3, averaged annually. Schedule 3, Condition 11 of Project Approval. PM10 <50 ug/m^3, averaged 24hrs.	It is considered that HVAS or other monitoring of PM_{10} or TSP near Lot 218 is not considered necessary at this time as: • Extraction operations at Lot 218 are in excess of 1.5 kilometres from residential receivers • Trucks no longer travel past dwellings adjacent to the formerly approved haul road that accessed Lavis Lane due to the approval of the alternate haul route to Lot 218 • The most northern 200 metres of the alternate access road closest to residential receivers on Nelson Bay Road has been sealed.	Letter provided to EPA from Macka's Sand.	N/A

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / key management implications	Implemented / proposed management actions
Air Quality **(Refer to Section 6.2)**	Schedule 3, Condition 11 of Project Approval. Deposited dust <4 g/m^2/month or <2g/m^2/month increase, averaged annually.	Non-Compliant. 11 of 12 samples collected during report period. The samples obtained cover the 12 months of the report period as required, however the sample duration exceeded the required sample duration and as such 11 samples were collected rather than 12. Dust monitoring was undertaken for all locations for the entire report period.	Deposited dust sampling will be undertaken in accordance with AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.	Undertake air quality monitoring in accordance with regulatory requirements.
Air Quality **(Refer to Section 6.2)**	Schedule 3, Condition 12 of the Project Approval. Macka's Sand shall ensure any visible air pollution generated by operations is assessed regularly and that operations are relocated, modified, and/or stopped appropriately to minimise impacts upon privately-owned land.	Compliant. Macka's Sand did not receive any complaints relating to visible dust production during the report period.	Macka's sand utilises a water cart for dust control on unsealed surfaces as required.	Continued implementation of existing controls.

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / key management implications	Implemented / proposed management actions
Meteorological **(Refer to Section 6.3)**	Schedule 3, Condition 14 of the Project Approval. During the life of the project, the Proponent shall ensure that there is a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline.	Compliant.	Meteorological data obtained as required during the report period.	Macka's Sand Operations utilise the Bureau of Meteorology Meteorological Station situated at the nearby Williamtown RAAF base for all weather data.
Soil and Water Management – Groundwater **(Refer to Section 7.0)** **Soil and Water**	Schedule 3, Condition 22 of the Project Approval. Macka's Sand shall ensure that it has sufficient water for all stages of the project, and adjust the scale of operations to match supply.	Compliant.	All water supplied to site by licensed external contractor as required.	Continued implementation of existing controls.

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / key management implications	Implemented / proposed management actions
Management – Groundwater **(Refer to Section 7.0)**	Schedule 3, Condition 22 of the Project Approval and M2.2 of EPL 13218. Macka's Sand must monitor groundwater depth levels and specific groundwater quality parameters on a quarterly basis for comparison against previously developed baseline trigger criteria for investigating impacts.	Compliant. Turbidity values recorded at sites SP2 and SP4 on the 29/12/2016 were above the developed baseline trigger values for groundwater with results of 59.5 and 159 NTU respectively.	In accordance with Section 5.4 of the SWMP Macka's Sand will implement the contingency action of reviewing the data against the results of Quarter 1 2017 to confirm if there is a trend developing in Turbidity data for the boreholes. All other parameters were within trigger values set by the operation.	Groundwater depth levels and specific groundwater quality was monitored at all approved sites on a quarterly basis during the report period, with monitoring to continue to be undertaken during the 2017 report period.
Soil and Water Management – Groundwater **(Refer to Section 7.0)**	Schedule 2, Condition 7 of the Project Approval. Sand extraction shall not be undertaken within: • 0.7m of maximum predicted groundwater level on Lot 220 • 1.0m of maximum predicted groundwater level on Lot 218, unless the core sample testing program demonstrates that extraction to within 0.7m of the maximum predicted groundwater level can be undertaken without disturbing acid sulphate soils.	Survey mapping for December 2016 identifies the site as non-compliant with the approval criteria for extraction depth. Non-compliant. It was identified that areas of Lot 218 were below the extraction depth from October 2016 to beyond the end of the report period Lot 220 was shown to be non-compliant for a period of less than 6 weeks during late 2016.	Extraction depth surveying undertaken in October 2016 and December 2016 has confirmed that the site was non-compliant with the approved extraction depth limits allowed in the Project Approval and in the EPL 13218 at both Lots 218 and Lot 220 during the 2016 report period.	Non-compliance information is provided in **Section 11**.

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / key management implications	Implemented / proposed management actions
Soil and Water Management – Groundwater **(Refer to Section 7.0)**	Section 1.9.1, Appendix 2 of the Project Approval. Macka's Sand will install table drains and flow dissipation structures along on-site access roads as required in accordance with the Erosion and Sediment Control Regional Policy (PSC Stephens Council, 2002) and the Code of Practice for Managing Urban Stormwater – Soils and Construction (Landcom, 2004).	Compliant.	No significant environmental impacts identified.	Continued implementation of erosion and sediment controls.
Ecology **(Refer to Section 6.4)**	Schedule 3, Condition 28 of Project Approval. Macka's Sand must prepare and implement a Biodiversity Offsets Strategy for a Biodiversity Offset Area in consultation with OEH that includes performance criteria, management measures and a monitoring strategy. Ecological monitoring undertaken every 3 years (last monitoring undertaken during 2014).	A Voluntary Conservation Agreement is currently being prepared for the Macka's Sand biodiversity offset area.	Macka's Sand will secure the proposed offset area.	A Voluntary Conservation Agreement will be submitted to OEH for review.

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / key management implications	Implemented / proposed management actions
Heritage (Aboriginal and Non-Aboriginal) **(refer to Section 6.5)**	Schedule 3, Conditions 29 and 30 of the Project Approval. Macka's Sand shall manage both Aboriginal and Non-Aboriginal Heritage items in accordance with approved management plan and in consultation with OEH and relevant Aboriginal community.	Meetings of the Aboriginal Cultural Heritage Management Group (AHMG) occurred in accordance with the ACHMP (Umwelt, 2016h). In accordance with the ACHMP, Macka's Sand undertook archaeological investigations to confirm that extractive activities through the remnant soil profile did not result in non-compliance.	N/A	Continued AHMG meetings and record keeping as appropriate.
Traffic and Transport	Schedule 3, Condition 4B of the Project Approval. Macka's Sand shall ensure vehicle movements on the Alternate access road are within prescribed limits, vehicles do not obstruct traffic, and vehicles are maintained to a satisfactory level that will prevent deposit of material onto public roads.	Non - Compliant. Truck movement data for 2016 period indicates exceedances in number of trucks exiting the site hourly via the Alternate Access road during the report period. This includes exceedances of traffic movement conditions under MOD 1 and MOD 2.	Discussion regarding the non-compliance and actions taken to address the non-compliance are provided in **Section 6.9.2** and **Section 11.0**	Further information discuss in **Section 11.0**
Traffic and Transport	Schedule 3, Condition 33A of the Project Approval. Macka's Sand shall prepare a Drivers' Code of Conduct in consultation with Roads and Maritime and PSC prior to 14 April 2016.	Compliant. A Drivers' Code of Conduct was submitted to DP&E on 13 April 2016 following consultation with Roads and Maritime and PSC.	Heavy vehicle contractors are required to sign-off on having read and understood the requirements of the Drivers Code of Conduct.	Code of Conduct will be provided to all contract heavy vehicle drivers and external contracting truck operators.

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / key management implications	Implemented / proposed management actions
Rehabilitation **(refer to Section 8)**	Schedule 2, Condition 7A of the Project Approval (MOD 1). The final rehabilitated ground surface level on Lot 218 and Lot 220 is at least 1.0m above the maximum predicted groundwater level.	Rehabilitation efforts on Lot 218 include the establishment of a vegetative bund on the western edge of the extraction area. No areas have been fully rehabilitated given stage of operations. Completed areas of Lot 220 rehabilitation are compliant.	N/A	Rehabilitation to be undertaken where land is available for rehabilitation.
Rehabilitation **(refer to Section 8)**	Schedule 3, Condition 24 of the Project Approval (MOD 1). Macka's Sand shall progressively rehabilitate the site in a manner that is generally consistent with the final landform in the EA (Umwelt, 2012).	Compliant.	Progressive rehabilitation measures undertaken during the report period. Refer to **Section 8.0**.	Rehabilitation proposed for the 2017 report period is detailed in **Section 8.0**.

6.1 Operational Noise

The Project Approval (MOD 2) and EPL 13218 define industrial noise impact assessment criteria for sensitive receivers during the following stages of operations:

- Noise generated by the Project – Industrial noise (**Table 6.2**)
- Noise generated along the Alternate Access Road (where agreements have not been signed with relevant owner/s of residence/s) (**Table 6.3**)
- Traffic noise generated by offsite haulage (**Table 6.4**).

In accordance with the approved Macka's Sand NMP (Umwelt 2016c) and EPL 13218, noise compliance monitoring was undertaken on 29 August 2016 and 6 September 2016 at locations representative of locally sensitive receivers (**Figure 6.1** and **Table 6.5**). Criteria for the monitoring locations are listed in **Table 6.2, Table 6.3** and **Table 6.4**. Results from the compliance monitoring are discussed in **Section 6.1.2**.

6.1.1 Noise Criteria

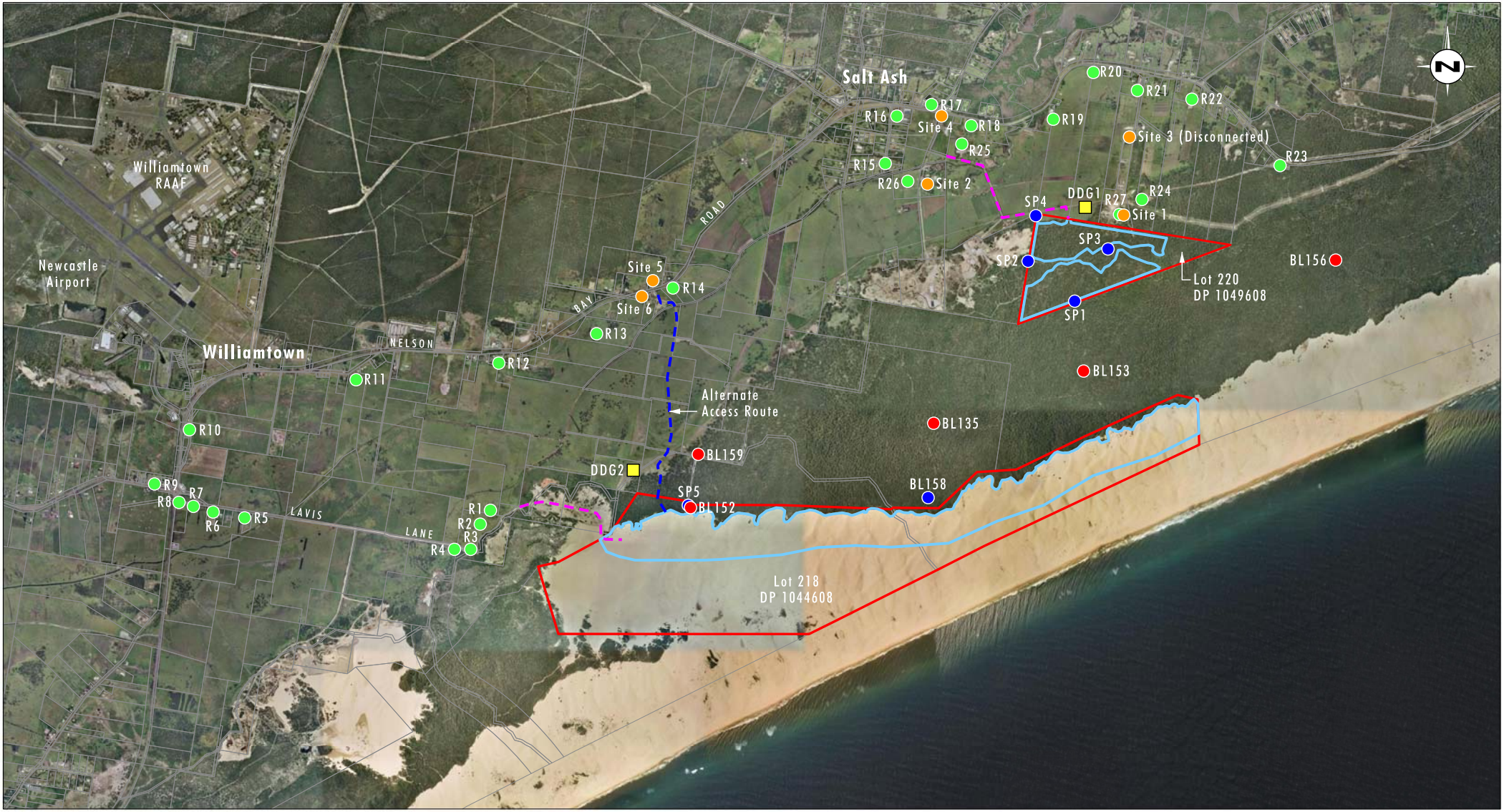
Table 6.2 Industrial Noise Impact Assessment Criteria, dB(A)

Location	Day[1] $L_{Aeq, 15\ min}$	Evening[1] $L_{Aeq, 15\ min}$	Night[1] $L_{Aeq, 15\ min}$	Night[1] $L_{A1, 1\ min}$
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 6.3 Alternate Access Road Noise Impact Assessment Criteria dB(A)

Location	Shoulder[1] $L_{Aeq, 15\ min}$	Day [1] $L_{Aeq, 15\ min}$	Evening[1] $L_{Aeq, 15\ min}$
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 to 6.00 pm Monday to Saturday and 8.00 am to 6.00 pm Sundays and Public Holidays, evening is 6.00 pm to 10.00 pm (NSW Industrial Noise Policy (INP) EPA, 2000). Shoulder is the period from 5 am to 7 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).



Source: Department of Lands (2003)

Legend

- Lot Boundaries
- Approval Area
- Approved Site Access
- Alternate Access Route
- Noise Monitoring Location
- Dust Monitoring Location
- EPL Groundwater Monitoring Location
- Hunter Water Groundwater Monitoring Location
- Residential Receivers

FIGURE 6.1

Mackas Sand Monitoring Locations

File Name (A4): R71_V1/1646_475.dgn

Table 6.4 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)

Table 6.5 Noise Monitoring Locations

Monitoring ID	Location
Site 1	Private residence (R27 – Hufnagl residence, 10 Janet Parade, Salt Ash) MGA E = 399542, MGA N = 6370639
Site 2	Private residence R26 – 6 Oakvale Drive, Salt Ash (adjacent to Oakvale Farm) MGA E = 397917, MGA N = 6370880
Site 4	Private residence, Lot 2, DP 818198, 2642 Nelson Bay Road, Salt Ash (situated on the corner of Oakvale Drive and Nelson Bay Road) MGA E = 398078, MGA N = 6371444
Site 5	Private residence (2353 Nelson Bay Road, Williamtown) MGA E = 395690, MGA N = 6370097
Site 6	Private residence (2344 Nelson Bay Road, Williamtown) MGA E = 395639, MGA N = 6370005

Note: R24 to R27 descriptors are from *'Noise Management Plan for Sand Extraction Operations*' (Umwelt 2016c).

6.1.2 Monitoring Data

During the attended noise monitoring program (Umwelt, 2016l) the ambient noise levels surrounding the Macka's Sand site were recorded with particular attention paid to the contribution of the Macka's Sand site operations.

6.1.2.1 Industrial Noise

Results of the attended industrial noise monitoring program conducted on 29 August, 6 September and 26 September 2016 and detailed in **Table 6.6**, **Table 6.7**, **Table 6.8** and **Table 6.9**, indicate Macka's Sand was complying with the industrial noise assessment criteria as outlined in the Macka's Sand Major Project Approval 08_0142 MOD 2 and EPL 13218 for the meteorological conditions experienced at the time of monitoring.

A comparison of industrial noise data collected over 2014, 2015 and 2016 indicating compliance for all periods is provided in **Appendix 3**.

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

Location	LAeq, 15minute		LA1,1minute	
	Noise criteria	Macka's Sand noise level contribution	Noise criteria	Macka's Sand noise level contribution
Site 1	35	<35	45	<35
Site 2	35	<35	45	<35
Site 4	35	<35	45	<35
Site 5	35	Not Audible	45	Not Audible
Site 6	35	Not Audible	45	Not Audible

Note 1: Based on noise levels measured at Site 2
Note 2: Based on noise levels measured at Site 6

Table 6.7 Day Time Industrial Noise Levels – Sand Extraction Activities versus Noise Criteria, dB(A)

Location	LAeq, 15minute	
	Noise criteria	Macka's Sand noise level contribution
Site 1	36	<30 (29/08/2016) <35 (06/09/2016)
Site 2	36	<35 (29/08/2016) <35 (06/09/2016)
Site 4	35	Not audible (29/08/2016) Not audible (06/09/2016)
Site 5	35	Not audible (29/08/2016) Not audible (06/09/2016)
Site 6	35	Not audible (29/08/2016) Not audible (06/09/2016)

Note 1: Estimated based on noise level measured at Site 6

Table 6.8 Evening Industrial Noise Levels –Sand Extraction Activities versus Noise Criteria, dB(A)

Location	LAeq, 15minute	
	Noise criteria	Macka's Sand noise level contribution
Site 5	35	Not audible
Site 6	35	Not audible

Note 1: Estimated based on noise level measured at Site 6

Table 6.9 Industrial Noise Levels – Alternate Access Road to Lot 218

Location	Period	LAeq, 15minute	
		Noise criteria	Macka's Sand noise level contribution
Site 5	Day Time (16:05 – 16:20)	41	<40
Site 6	Day Time (09:04 – 09:19)	40	<40
Site 5	Night Time/Shoulder (05:51 – 06:06)	39	<38
Site 6	Night Time/Shoulder (05:51 – 06:06)	38	<38
Site 5	Day Time (07:23 – 07:38)	41	<40
Site 6	Day Time (07:23 – 07:38)	40	<40
Site 5	Evening (18:05 – 18:20)	41	<40
Site 6	Evening (18:05 – 18:20)	40	<40

Note 1: Estimated based on noise level measured at Site 6

6.1.2.2 Traffic Noise

Results of the road traffic noise monitoring program are detailed in **Table 6.10** below. The program was conducted from 6.00 am to 7.00 am and 7.00 am to 8.00 am, 6 September 2016 at the private residence on the corner of Oakvale Drive and Nelson Bay Road, as well as at 2353 Nelson Bay Road. The results indicate that Macka's Sand was complying with the road traffic noise assessment criteria as outlined in the Macka's Sand Major Project Approval 08_0142 MOD 2 and EPL 13218 for the meteorological conditions experienced at the time of monitoring.

A comparison of industrial noise data collected over 2014, 2015 and 2016 indicating compliance for all periods is provided in **Appendix 3**.

Table 6.10 Macka's 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	2353 Nelson Bay Rd
Lavis Lane, Oakvale Drive, Nelson Bay Road	Night	55	36	34
	Day	60	38	30

6.2 Air Quality

In accordance with Condition 13 of Schedule 3 of Project Approval 08_0142 (MOD 2), Macka's Sand Operations have prepared and implemented an AQMP (Umwelt, 2016d) for its operations.

Condition 11 of Schedule 3 of Project Approval 08_0142 (MOD 2) sets out air quality impact criteria for Macka's Sand. These criteria are used to assess the potential impacts of operations at nearby residential receivers. Criteria which apply to operations are specified in **Tables 6.11, 6.12** and **6.13** below. Dust monitoring locations are identified in **Figure 6.1**.

Table 6.11 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 6.12 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 6.13 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

The status of air quality monitoring for PM10 and TSP is discussed in **Section 6.2.1** below.

6.2.1 Management Measures

Total Suspended Particulate (TSP) monitoring is not currently undertaken by Macka's Sand as the installation of High Volume Air Sampling (HVAS) or Tapered Element Oscillating Microbalance (TEOM) units close to Lot 218 and Lot 220 is subject to certain constraints. Installation of a unit near Lot 220 is dependent upon receiving written approval from the nearest sensitive receiver (R27) for installation of a TEOM air quality monitoring station on their property. At time of writing, resident R27 has not provided such permission, however this would be revised should a written request be received by the resident. The opportunity to have a HVAS unit installed will be offered annually to the resident at R27 in writing, unless a written statement nullifying this requirement from the resident at R27 is received.

Extraction operations at Lot 218 are distant from residential receivers (in excess of 1.5 kilometres) and unlikely to cause unacceptable levels of dust, with the main source of dust being from product transport on unsealed haul roads. With the approval of the alternate haul route to Lot 218, trucks will no longer travel past dwellings adjacent to the formerly approved haul road that accessed Lavis Lane. In addition the most

northern 200 metres of the alternate access road closest to residential receivers on Nelson Bay Road is sealed and further sealing works will be undertaken in 2017. Taking these factors into account, in addition to the operational controls in place and described in the AQMP (Umwelt 2016d), it is considered that HVAS or other monitoring of PM10 or TSP near Lot 218 is not considered necessary at this time.

6.2.2 Dust Monitoring Data

Dust Deposition at DDG1 (Lot 220) recorded Total Dust Deposition levels varying between 0.2 g/m²/month and 5.6 g/m²/month during the report period. There were no significant changes to operations on Lot 220 during 2016. There was no result for Lot 220 for the month of April as the sample bottle was accidentally broken by the laboratory. This rendered the sample for the month of April invalid. The results of samples received indicate that operations on Lot 220 comply as there has been an increase of less than 2 g/m²/month annual average from the previous report period and total dust deposition of less than 4 g/m²/month, refer to **Table 6.14**.

Table 6.14 and **Table 6.15** indicates that only 11 samples were taken during the 2016 period, rather than the 12 samples (one for each month) required under the Project Approval.

Umwelt has been advised that the Macka's Sand Quarry Manager was overseas during September 2016 when the September monthly sample was required to be taken. The September sampling event did not occur as at that time no personnel on site were trained to complete the air quality sampling. To prevent this from happening again, additional site personnel have since been trained to undertake air quality sampling in the Quarry Manager's absence. Air quality monitoring was undertaken during the report period for all locations, however on 1 occasion samples were obtained for an approximate 6 week period (30 August 2016 – 13 October 2016), which is not in compliance with the sample timeframes within the NSW Air Sampling Methods. This applies to both Lot 218 and Lot 220.

Table 6.14 Total Dust Deposition Levels at DDG 1 – Lot 220 (g/m²/month)

Sample date:	Ash Content	12 Month Average	Total Insoluble Matter	12 Month Average
	g/m².month	g/m².month	g/m².month	g/m².month
4/01/2011	0.7		6.2	
13/04/2011	0.7		1.6	
20/05/2011	0.6		0.7	
20/06/2011	0.5		0.5	
25/07/2011	0.4		0.6	
23/08/2011	0.7		0.7	
23/09/2011	0.9		1.2	
24/10/2011	0.2		0.2	
22/11/2011	1.1		2	
24/12/2011	2.4		3.2	
25/01/2012	1.1		1.9	

Sample date:	Ash Content	12 Month Average	Total Insoluble Matter	12 Month Average
	g/m².month	g/m².month	g/m².month	g/m².month
23/02/2012	0.7	0.83	1	1.65
23/03/2012	1.8	0.93	2.8	1.37
23/04/2012	1	0.95	1.7	1.38
23/05/2012	0.2	0.92	0.3	1.34
21/06/2012	0.4	0.91	0.6	1.35
20/07/2012	14.7	2.1	19.4	2.92
29/08/2012	1.3	2.15	1.7	3
25/09/2012	0.3	2.1	0.4	2.93
24/10/2012	0.3	2.11	0.5	2.96
26/11/2012	0.1	2.03	0.3	2.82
26/11/2012	0.1	1.83	0.3	2.58
27/12/2012	0.5	1.78	1.4	2.53
28/01/2013	0.6	1.78	1.9	2.61
28/02/2013	1	1.71	2.8	2.61
22/03/2013	0.8	1.69	0.8	2.53
29/04/2013	1.1	1.77	1.1	2.6
26/05/2013	3.4	2.02	3.7	2.86
27/07/2013	0.08	0.75	1.5	1.34
3/09/2013	0.1	0.73	0.1	1.31
6/10/2013	0.8	0.78	1.4	1.39
12/11/2013	1	0.86	2.2	1.56
27/12/2013	2.1	1.04	1.4	1.66
6/01/2014	0.4	0.99	3.5	1.82
1/02/2014	0.8	1.02	1.9	1.86
4/03/2014	1.2	1.07	2	1.87
14/04/2014	0.8	1.05	1.3	1.74
31/05/2014	0.3	1.01	0.8	1.74
26/07/2014	0.8	0.98	1.4	1.77
30/08/2014	0.5	0.74	1.3	1.57

Sample date:	Ash Content	12 Month Average	Total Insoluble Matter	12 Month Average
	g/m².month	g/m².month	g/m².month	g/m².month
1/10/2014	0.4	0.77	1.1	1.53
20/10/2014	0.9	0.83	1.1	1.62
12/11/2014	0.4	0.8	0.7	1.56
15/12/2014	0.7	0.78	1.7	1.52
30/01/2015	0.8	0.67	2.7	1.63
27/02/2015	3.5	0.93	4.5	1.71
29/03/2015	1.5	0.98	2.7	1.78
30/04/2015	2.4	1.09	3.5	1.91
30/05/2015	0.4	1.03	1	1.83
29/06/2015	0.7	1.02	1.5	1.85
10/08/2015	0.6	1.05	0.9	1.85
22/09/2015	0.8	1.09	1.2	1.88
29/10/2015	0.3	1.08	0.4	1.83
18/12/2015	0.7	1.07	1.4	1.85
20/01/2016	**0.8**	**1.10**	**1.6**	**1.93**
22/02/2016	**1.1**	**1.13**	**1.9**	**1.94**
27/03/2016	**0.2**	**0.86**	**0.3**	**1.49**
20/04/2016	*	*	*	*
21/05/2016	**0.1**	**0.59**	**0.2**	**1.04**
16/06/2016	**0.2**	**0.53**	**0.3**	**0.91**
20/07/2016	**1.3**	**0.68**	**2**	**1.14**
30/08/2016	**4.3**	**1.10**	**5.6**	**1.68**
13/10/2016	**0.2**	**0.99**	**0.2**	**1.50**
20/11/2016	**0.5**	**0.94**	**0.7**	**1.42**
29/12/2016	**0.8**	**0.95**	**1.8**	**1.46**

*20/4/2016 – Sample was broken by the lab that conducts the testing on behalf of Macka's Sand

Results from dust deposition samples at DDG2 (Lot 218) recorded readings of Total Insoluble Matter ranging from 0.2 g/m²/month to 6.2 g/m²/month during the report period. While there were no significant operational changes during the report period, previous observations of sand movement on the mobile dune system have demonstrated that during high wind conditions significant volumes of sand can be

transported over large distances. This confirms that this area can, on occasions, be a high sand deposition environment where deposition levels naturally exceed the criteria set out in Condition 11 of Schedule 3 of Project Approval 08_0142 (MOD 2) of 4 g/m^2/month. Results indicate that operations on Lot 218 are complying with an increase of less than 2 g/m²/month annual average and total dust deposition of less than 4 g/m²/month refer to **Table 6.15**.

Table 6.15 represents Total Dust Deposition Levels at DDG 2 – Lot 218 as a continuing 12 month average. In the earlier months of 2016, the 12 month average for January, February and March (10.43 g/m²/month, 10.39 February and March 11.25g/m²/month respectively) is significantly higher than in later months as the 12 month rolling average includes data from the 2015 report period. An analysis of the 2015 data has been reported in the 2015 Annual Review (Umwelt, 2016). It is noted that a large storm event during 21 April 2015 contained strong winds from the SSE, causing wind-blown sand from the Aeolian dune system to be transported in the direction of DDG2. The reading for April 2015 was 75 g/m2/month. In addition, March 2015 contained events of strong winds from the S, SE and SW. The data for September 2015 indicates an exceedance, however the sampling frequency is over a six week period (10 August 2015 till 22 September 2015) and high wind events occurred during this time. Refer to **Appendix 4** for wind direction and intensity data in April 2015 where depositional dust levels were significantly increased due to weather events.

No exceedances of dust deposition levels occurred in 2016 and therefore BOM data for the 2016 period has not been provided.

Table 6.15 Total Dust Deposition Levels at DDG 2 – Lot 218 (g/m2/month)

Sample date:	Ash Content	12 Month Average	Total Insoluble Matter	12 Month Average
	g/m².month	g/m².month	g/m².month	g/m².month
4/01/2011	0.4		0.9	
13/04/2011	0.8		2.9	
20/05/2011	7.4		7.5	
20/06/2011	23.1		23.1	
25/07/2011	0.8		0.8	
23/08/2011	3.9		4	
23/09/2011	1.9		2.1	
24/10/2011	1.2		1.6	
22/11/2011	1.9		2	
24/12/2011	8.6		10	
25/01/2012	3		4.6	
23/02/2012	1	4.5	1.3	5.07
23/03/2012	1.1	4.56	1.4	5.11
23/04/2012	2	4.66	2.5	5.08
23/05/2012	0.3	4.07	0.6	4.5

Sample date:	Ash Content	12 Month Average	Total Insoluble Matter	12 Month Average
	g/m².month	g/m².month	g/m².month	g/m².month
21/06/2012	0.9	2.22	1.5	2.7
20/07/2012	2.2	2.33	3.8	2.95
29/08/2012	1	2.09	1.7	2.76
25/09/2012	0.1	1.94	0.3	2.61
24/10/2012	0.7	1.9	1.2	2.58
26/11/2012	1.2	1.84	1.8	2.56
26/11/2012	1.2	1.23	1.8	1.88
27/12/2012	1.3	1.08	2.1	1.67
28/01/2013	3.7	1.31	4.6	1.94
28/02/2013	1.8	1.37	2.8	2.06
22/03/2013	8.7	1.93	8.8	2.58
29/04/2013	3.4	2.18	3.7	2.84
26/05/2013	1.1	2.2	1.1	2.81
27/07/2013	1.9	2.28	2.1	2.75
3/09/2013	0.1	2.28	0.2	2.75
6/10/2013	5.8	2.75	6.9	3.26
12/11/2013	1.7	2.79	2	3.28
27/12/2013	1.3	2.8	0.5	3.16
6/01/2014	0.7	2.63	1.1	2.99
1/02/2014	0.8	2.58	1.2	2.92
4/03/2014	2.6	2.49	5.3	2.98
14/04/2014	6.7	2.9	7.1	3.33
31/05/2014	1.4	2.29	2.5	2.81
26/07/2014	0.3	2.03	0.4	2.53
30/08/2014	1.9	2.1	2.1	2.62
1/10/2014	0.7	2	0.7	2.5
20/10/2014	0.7	2.05	1.1	2.58
12/11/2014	0.4	1.6	0.6	2.05
15/12/2014	1.4	1.58	2.6	2.1

Sample date:	Ash Content	12 Month Average	Total Insoluble Matter	12 Month Average
	g/m².month	g/m².month	g/m².month	g/m².month
30/01/2015	0.4	1.5	0	2.06
27/02/2015	0.9	1.52	2.1	2.14
29/03/2015	8.3	2.14	12.3	3.07
30/04/2015	72.6	7.56	73.2	8.46
30/05/2015	2.1	7.52	3.1	8.29
29/06/2015	10.4	7.81	12.4	8.7
10/08/2015	0.5	7.74	0.9	8.58
22/09/2015	4.5	8.58	5.4	9.53
29/10/2015	5.8	9	6.4	10.01
18/12/2015	2.5	9.15	4.7	10.31
20/01/2016	**1.4**	**9.23**	**2.1**	**10.43**
22/02/2016	**0.8**	**9.18**	**2.1**	**10.39**
27/03/2016	**0.7**	**9.96**	**1.1**	**11.25**
20/04/2016	**1.6**	**3.03**	**2.1**	**3.03**
21/05/2016	**0.1**	**2.62**	**0.2**	**3.74**
16/06/2016	**0.5**	**1.84**	**0.5**	**2.55**
20/07/2016	**5.1**	**2.30**	**6.2**	**3.08**
30/08/2016	**0.4**	**1.89**	**0.7**	**2.61**
13/10/2016	**0.4**	**1.35**	**0.7**	**2.04**
20/11/2016	**1.2**	**1.34**	**1.7**	**2.01**
29/12/2016	**0.2**	**1.13**	**0.4**	**1.62**

Dust deposition monitoring will continue on a monthly basis at DDG1 and DDG2 to detect any impacts due to sand extraction operations at Lot 220 and Lot 218 in the next report period.

6.2.3 Proposed Improvements 2016

Previous years have demonstrated that Aeolian transport of the dune sands during periods of high winds result in conditions where deposition levels naturally exceed the criteria set out in Condition 11 of Schedule 3 of Project Approval 08_0142 (MOD 2) of 4 g/m^2/month thereby producing false positive exceedance results. Results for 2016 were compliant with approval conditions, as no improvements are proposed as the current system is effective.

6.3 Meteorological Monitoring

Meteorological monitoring data is collected from the Bureau of Meteorology station located at the nearby Williamtown RAAF Base (Station 061078), refer to **Figure 6.1**. The results of the meteorological monitoring for 2016 are presented in the following sections.

6.3.1 Rainfall monitoring

Rainfall data has been sourced from the records of the Williamtown RAAF Base meteorological station and is summarised in **Table 6.16**.

Table 6.16 Monthly Rainfall and Number of Rain Days during 2016

Month	Rainfall (mm)	Rain Days (>0.2 mm)
January	422.4	13
February	32.4	9
March	40.8	6
April	150.8	6
May	10.0	6
June	151.2	10
July	52.6	9
August	51.8	11
September	42.8	10
October	75.6	12
November	40.8	7
December	59.8	3
TOTAL	**1131**	**102**

6.4 Ecology

Long term ecological monitoring is required to be undertaken every three years and last occurred during the 2014 report period (Umwelt, 2014). Ecological monitoring will therefore be undertaken during 2017.

6.4.1 Biodiversity Offset Monitoring

2015

The results of the 2015 monitoring surveys indicated that the condition of the Biodiversity Offset Area had remained similar to the baseline surveys in 2014 (Umwelt, 2015b).

2016

Surveys in 2016 refined monitoring methods to assist processes that detect a change to the habitat and vegetation structure of the Biodiversity Offset Site. The results demonstrate a more robust and strategic approach whilst still incorporating previous monitoring methodologies and the relevance of previously collected data (Umwelt, 2016k). The methods employed in 2016 are consistent with those requested by OEH.

The results of the 2016 monitoring surveys indicate the condition of the Biodiversity Offset Area has remained relatively similar to previously conducted surveys in 2014 and 2015. Survey timing is imperative for maximising the rate of detection where peak flowering periods may offer a small window of opportunity, 2016 surveys were therefore conducted as close as possible to the dates of the previous survey. Annual fluctuations are expected given nature and response of these species to a specific range of conditions.

6.5 Aboriginal Heritage

6.5.1 Aboriginal Cultural Heritage Management Measures

Macka's Sand is operated in accordance with the approved ACHMP (Umwelt, 2016h) during the report period.

6.5.2 Aboriginal Site Impacts

During early 2016, inspections were undertaken of disturbed artefactual materials found with soil and logs that had been pushed to the perimeter bund in Lot 220. Material from these stockpiles was salvaged in accordance with the requirements of the ACHMP.

During August 2016, works were undertaken with the Aboriginal community to undertake test excavations within an area of identified exposed soil at Lot 218 in accordance with the specifications of the Macka's Sand ACHMP. The excavations did not result in the recovery of any cultural material. In discussions with the Aboriginal parties, it was agreed that there were no grounds to recommend further archaeological salvage within any continuation of that specific remnant soil profile. Macka's are required to adhere to ACHMP requirements for ongoing monitoring and any subsequent identification of a remnant soil.

6.6 Non-Aboriginal Heritage

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

6.7 Erosion and Sediment Control

No additional erosion and sediment control works were completed during 2016.

6.8 Waste Management

The current waste management program utilises licensed waste contractors to incorporate recycling, in addition to the disposal of wastes in accordance with the waste provisions of the *Protection of the Environment Operations* (Waste) *Regulation 2014 (NSW EPA, 2014)*. There were no changes to the waste management system at Macka's Sand during the report period.

6.9 Traffic

6.9.1 Drivers' Code of Conduct

Condition 33A of Schedule 3 of Project Approval 08_0142 (MOD 2) sets out the requirements for a Drivers' Code of Conduct which is applicable to drivers of all project-related vehicles, including trucks that haul sand from Macka's Sand operations on Lot 218 and Lot 220. A Drivers' Code of Conduct was prepared by Umwelt in April 2016 on behalf of Macka's Sand with consultation from Port Stephens Council (PSC) and Roads and Maritime Services (RMS). All haulage contractors are required to read and understand the Drivers Code of Conduct before gaining access to the site.

The Drivers Code of Conduct details:

- the potential safety issues both on site and on the public road haulage routes
- when heavy traffic volumes are likely to be encountered on Nelson Bay Road, including the 6 am to 9 am peak and the summer holiday period
- the usual school bus travel times on Nelson Bay Road and Cabbage Tree Road as well as the location of all bus stops on these roads
- potential interactions with general traffic on Nelson Bay Road whilst merging from the acceleration lane of the access road intersection
- contact details in case of emergencies or accidents
- potential environmental hazards, such as potential for fauna to cross the access road, particularly at dawn and dusk
- the protocol that sets out what drivers are required to do to arrange for the care of any injured fauna and that they must immediately report all fauna strikes on the site to Macka's Sand's management
- updates on local road conditions
- measures to minimise truck noise impacts at residences and
- measures to minimise travel to the site prior to 5 am on weekdays.

6.9.2 Vehicle Movements

Condition 4B of Schedule 3 of Project Approval 08_0142 sets out the operating conditions relating to maximum truck movements to and from site. Modification 2 (MOD 2) of the Project Approval was granted on 15 March 2016 and an increase in hourly truck movements was established. Non-compliances of hourly truck movements have been identified under Modification 1 (MOD 1) and MOD 2 of the Project Approval for the 2016 report period. Further information on the truck movement non-compliances is provided in **Section 11.1**.

6.9.3 Traffic Restrictions

Condition 32 of Schedule 3 sets out the restrictions on traffic movements (in plus out) on Oakvale Road and states that there is a maximum of 10 traffic movements per hour during the night time period and on Sundays and public holidays.

During 2016, there were no non-compliances with Condition 32 of Schedule 3.

6.9.4 Road Haulage

Condition 33 of Schedule 3 of Project Approval 08_0142 (MOD 2) 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.

During 2016, there were no non-compliances with Condition 33 of Schedule 3.

Vehicle Monitoring

Conditions 33B and 33C of Schedule 3 of Project Approval 08_0142 (MOD 2) details the requirement for the Drivers' Code of Conduct 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.

Macka's Sand reports that there were no reports made to Macka's Sand management of any fauna injured or killed during the 2016 reporting period.

To further assist with monitoring, and in accordance with Conditions 33D and 33E of Schedule 3 of Project Approval 08_0142 (MOD 2); two other measures were introduced in 2016 to assist with vehicle monitoring. These were:

- the installation of fixed position video cameras adjacent to the Alternative access road approximately 100 metres from its intersection with Nelson Bay Road, and
- the recording of vehicle details at the weighbridge on the Alternate access road including the time of arrival, time of dispatch, weight of load and vehicle identification.

In accordance with Conditions 33D and 33E of the consent, Macka's Sand holds recordings from the monitoring cameras for the Lot 218 Access Road for 30 days and retains weighbridge records for 12 months.

7.0 Water Management

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 be inundated when the groundwater level is high. As this water is intermittent and directly connected to the groundwater, it is considered that these areas would have water quality that is consistent with that recorded in the groundwater of the site as discussed in **Section 7.2** below.

7.2 Groundwater

7.2.1 Groundwater Monitoring

Groundwater monitoring was undertaken on a quarterly basis during the report period in accordance with Condition M2 of the EPL 13218. Bore locations are shown in **Figure 6.1**. Groundwater level measurements are shown in **Appendix 2**. Note that the report period is highlighted in blue within all tables and charts.

In accordance with the Project Approval 08_0142 (MOD 2), Schedule 5 Condition 4 (b), the Annual Review must include a comprehensive review of the monitoring results and predictions within the Environmental Assessment (EA). A comparison between predicted and recorded groundwater levels from the SWMP is provided in **Table 7.1**, and a summary of trigger values developed in analysis of previous data and the Australian Drinking Water Guidelines (NHMRC, NRMMC 2011) is presented in **Table 7.2**.

During 2016, all groundwater monitoring undertaken at the site was conducted in accordance with the requirements of the site Groundwater Monitoring Program. A total of 4 monitoring events were undertaken at an approximate quarterly basis during 2016. Results of turbidity, pH and EC for SP5 were not completed during the December 2016 monitoring event due to insufficient water collected during sampling. This was due to a sample bottle leaking in transit to the laboratory. In the event of a lost sample in the future, Macka's Sand will re-sample the affected bore to prevent incomplete data.

Noting the discussion within **Section 7.1** regarding the SWMP (Umwelt, 2016e) and **Table 7.2**, it is considered that recorded groundwater levels are consistent with the requirements within the SWMP (Umwelt, 2016e) and previous monitoring results.

Table 7.1 Recorded and predicted groundwater levels (mAHD) for duration of operations

Monitoring Point	Recorded Maximum	Approximate Predicted Maximum	Difference
SP1	2.51	3.6	-1.09
SP2	3.43	2.8	0.63
SP3	2.7	2.6	0.1
SP4	1.03	1.25	-0.22
SP5	3.41*	3.6	-0.19

Monitoring Point	Recorded Maximum	Approximate Predicted Maximum	Difference
SP6	2.77	3.6	-0.83
BL158	3.13	3.7	-0.58

*Recorded maximum groundwater level occurred during the report period. SP5 groundwater level was recorded during the 29 June 2016 sampling event following extreme rainfall in the days prior to sample collection.

Noting the discussion within **Section 7.1** regarding the SWMP and **Table 7.2**, it is considered that recorded groundwater levels are consistent with relevant predictions within the EA (Umwelt, 2012) and other documentation (e.g. Umwelt (2011) *Determination of Maximum Predicted Groundwater Level and Maximum Extraction Level at Lot 218 and Lot 220, Salt Ash*).

Table 7.2 Groundwater Investigation Trigger Values

Parameter	Units	Minimum	Maximum
pH	pH Unit	4.5**	8.5*
Conductivity	uS/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.

It is considered that with the exception of two turbidity values, recorded groundwater quality results are generally consistent with the requirements within the SWMP (Umwelt, 2016e). Results of turbidity for samples collected at sites SP2 and SP4 on 29/12/2016, the turbidity of samples were 59.5 and 159 respectively, and are higher than the maximum trigger values defined within the SWMP (Umwelt, 2016e). In accordance with Section 5.4 of the SWMP (Umwelt, 2016e), pH values were within 10% of minimum trigger values and therefore do not require further contingency management actions. Turbidity results for these sites will be closely monitored for ongoing trend implications during 2017. All other analytes tested for these bores during the December 2016 monitoring event were within criteria.

It is considered that recorded groundwater quality results are generally consistent with previous monitoring results, refer to **Appendix 2**.

8.0 Rehabilitation

8.1 Rehabilitation of Disturbed Land

In accordance with Schedule 3, Condition 24 of the Project Approval (MOD 2), progressive rehabilitation of disturbed areas is being undertaken in a manner that is generally consistent with the final landform in the EA (Umwelt, 2012), in alignment with statutory conditions and requirements within plans. A Landscape Management Plan (Umwelt 2016g) was prepared for Macka's Sand in August 2016 to further assist in this regard.

Rehabilitation efforts on 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. 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.

Rehabilitation is being undertaken progressively as sand extraction proceeds. It is anticipated that rehabilitation will be undertaken at a rate of approximately two to three hectares annually, relative to the rate of extraction. 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.

Initial works including revegetation and weed control have commenced on boundary bunds and within an approximately 2 hectare area where extraction is complete. Other works include the utilisation of vegetative material cleared ahead of quarrying operations. The vegetative material is utilised as perimeter bunding to control erosion of the active faces of the quarry. No additional rehabilitation was undertaken during the report period.

Table 8.1 shows the status of rehabilitation at Macka's Sand.

8.2 Annual Rehabilitation Inspection

The annual rehabilitation inspection of extracted areas within Lot 218 and Lot 220 was undertaken during spring 2016. Key observations included:

- Approximately half of the rehabilitation established to date in Lot 220 contains a mix of native shrubs and ground cover species indicative of the surrounding vegetation community type
- The remaining half of the Lot 220 rehabilitation area is dominated by weed species such as red natal grass (*Melinis repens*) and kikuyu grass (*Pennisetum clandestinum)*

Table 8.1 Summary of Rehabilitation Status at Macka's Sand (Lot 220)

	2015 Reporting Period (ha)	2016 Reporting Period (ha)
Active Extraction Area	18.4	20.9
Area cleared for Extraction	4.6	3.5
Rehabilitation commenced	3.9	3.9

8.3 Rehabilitation Trials and Research

No rehabilitation trials were undertaken during the report period.

8.4 Actions for the 2017 Report Period

During the 2017 report period, Macka's Sand will maintain the current rehabilitated area in Lot 220 and seek to continue installation of nest boxes and salvaged tree hollows as per recommendations provided within the 2016 rehabilitation inspection (Umwelt, 2016k). Tree plantings have been undertaken in Lot 220 during Quarter 1 2017. No rehabilitation actions are planned for Lot 218 for 2017.

9.0 Community

9.1 Community Complaints

There were no community complaints received in the 2016 reporting period.

9.2 Community Liaison

The Macka's Sand Community Consultative Committee (CCC) met twice during the report period, as agreed by the CCC. CCC meetings were held on 6 April 2016 and 2 November 2016. Members of the Macka's Sand CCC are included in **Table 9.1** below.

Table 9.1 Macka's Sand CCC Members for the 2016 Report Period

Name	Organisation
Ms Margaret Macdonald-Hill	Chairperson
Mr Robert Mackenzie	Macka's Sand
Ms Julie Towers	Community Representative
Mr Cliff Johns	Port Stephens Council representative
Mr Stephen Hufnagl	Community Representative
Mr Kent Sampson	Community Representative
Mr Andrew Smith	Worimi Aboriginal Land Council
Mr Brendan Rice / Mr Daniel Sullivan	Umwelt (Australia) Pty. Ltd. - Consultant

10.0 Independent Audits

There were no independent audits undertaken during the 2016 reporting period. An independent audit is scheduled to occur during 2017.

11.0 Non-Compliances during the 2016 Report Period

A summary of non-compliances during the 2016 Report Period is detailed in **Table 11.1** below.

Table 11.1 2016 Report Period non-compliances

Date	Description of Non-Compliance / Incident	Corrective Action Taken/Status
September 2016	Depositional Dust Gauges DDG1 and DDG2 were not sampled at the required frequency of once per month during the report period.	• Air quality monitoring was undertaken during the report period for all locations, however on one occasion samples were obtained for an approximate 6 week period, which is not in compliance with the sample timeframes within the NSW Air Sampling Methods. As such the sample duration was not in accordance with relevant measurement standards. • To prevent this occurring in the future, additional site personnel have been trained on how to take samples.
March 2016 to September 2016	Analysis of the 2016 Truck movement data has indicated that restrictions of hourly truck movements via the Alternate access road have exceeded the maximum hourly allowance for truck movements to and from site under Condition 4B of Schedule 3 under MOD 1 and MOD 2 (refer to **Section 11.1**)	• The exceedances of truck movements have been attributed to a coding error in the Automated Weighbridge Management System (AWMS) software system. Regular maintenance of software will now be undertaken to ensure that it is operationally sound. • A monthly review of the AWMS system will be undertaken between July 2017 to December 2017 to ensure that the AWMS is operating correctly and truck movements are being restricted when maximum hourly movements are reached.

Date	Description of Non-Compliance / Incident	Corrective Action Taken/Status
October 2016 to 30 December 2016	**Exceedance of Lot 218 extraction depth non-compliance** Survey mapping of Lot 218 pit floor has identified that extraction of material breached maximum approved depth in Lot 218 during 2016.	• Full surveys will be conducted over Lot 218 on a quarterly basis. • Removal of tread on the tyres of the loaders was trialled however this measure was not effective at Lot 218 and was discontinued. • Laser level monitoring to demarcate extraction limits using GPS equipment has been installed on machinery and physical markers on the ground where possible. • Corrective actions continued into 2017 and further information in the 2017 Annual Review.
November 2016 to December 2016	**Exceedance of Lot 220 extraction depth non-compliance** Survey mapping of Lot 220 pit floor has identified that extraction of material breached maximum approved depth in both Lot 220 for a period of approximately six weeks from November 2016.	• Macka's Sand rectified the non-compliance by levelling out the sand level to 0.7 m above the maximum predicted groundwater level as required by the Project Approval conditions. • Full surveys will be conducted over Lot 220 on a quarterly basis. • Removal of tread on the tyres of the loaders has also been implemented. • Laser level monitoring to demarcate extraction limits using GPS equipment has been installed on machinery and physical markers on the ground where possible.

11.1 Truck Movement Non-Compliance Summary

A number of truck movement exceedances were identified during the 2016 period. All of the exceedances, with one exception, occurred in the period 4 January 2016 to 19 September 2016.

Table 11.2 contains a summary of the non-compliances under this condition for exceedances prior to 15 March 2016 (MOD 1) and exceedances under MOD 2 for the 2016 period.

Table 11.2 Non-compliances for 2016 period under Schedule 3, Condition 4B of Project Approval

Project Approval	*Schedule 3, Condition 4B*	*No. of Days*	*No. of Additional Trucks*	*No. of Non-compliances*
MOD 1 (1 Jan – 14 Mar 2016)	*c) Truck movements (in plus out) do not exceed 10 per hour during the shoulder period*	32	95	37
	d) Truck movements (in plus out) do not exceed 16 per hour between 7am and 10pm	23	65	29
MOD 2 (15 March – 31 December 2016)	*c) laden truck movements exiting the site do not exceed 14 per hour during the period from 5am to 6am, Monday to Friday (except for Public Holidays)*	17	32	17
	d) laden truck movements exiting the site do not exceed 8 per hour during the period from 6am to 9am, Monday to Friday (except for Public Holidays)	107	741	197
	f) laden truck movements exiting the site do not exceed 5 per hour between 5am and 6am on Saturdays (except for Public Holidays)	7	10	7
	g) laden truck movements exiting the site do not exceed 9 per hour between 6am and 7am on Saturdays (except for Public Holidays)	12	45	12
	TOTAL:	**198**	**988**	**299**

Under MOD 1, a total of 66 non-compliances occurred between 4 January and 14 March 2016. Where the criteria were exceeded, an additional 160 truck movements occurred on 55 individual days above the allowable limit during this time.

233 non-compliances occurred under MOD 2 of the Project Approval in 2016. These events occurred between 17 March 2016 and 18 November 2016 over 143 individual days. Where the criteria were exceeded, 828 additional trucks exited the site above the allowable limit during this period (refer to **Table 11.2**).

During the period 4 January 2016 to 18 March 2016 Macka's Sand site operators were managing truck movements manually at the site. In 2015, Newcastle Weigh Services (NWS) installed the AWMS software on site, however there were no truck movement restrictions coded in the software until the AWMS was updated on 19 March 2016. The AWMS software was updated at this time with the intention to restrict truck movements from the site in accordance with MOD 2 of the Project Approval. On 19 September 2016 a software error in the AWMS was identified by NWS, this error was resolved immediately upon discovery and since this time has successfully resulted in the AWMS limiting trucks in accordance with PA 08_0142. One additional truck movement exceedance occurred on Friday 18 November 2016 (5am – 6am timeframe). This additional exceedance was identified as a result of a separate software error in the AWMS. Umwelt has consulted with NWS and this additional software error will be rectified in the 2017 report period by Macka's Sand to eliminate the potential for other exceedances to occur as a result of software errors.

To ensure that no further exceedances take place, Macka's Sand has requested that NWS ensure that regular maintenance of software be undertaken to ensure that it is operationally sound.

12.0 Activities Proposed in the 2017 Annual Review Period

Anticipated activities for Macka's Sand during the 2017 report period include:

- continuation of extraction operations in Lot 218 and Lot 220
- continuation of rehabilitation activities as detailed in **Section 9**
- continued liaison with OEH regarding the Biodiversity Offsets Strategy and approval of the Voluntary Conservation Agreement
- continued implementation of conditions as prescribed under MOD 2 approval.

13.0 References

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

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

Umwelt (Australia) Pty Limited (2015a) *Macka's Sand Draft Operations Management Procedure, Lot 218 and Lot 220, Salt Ash* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2015b). Results of the 2015 Annual Ecological Monitoring of the Lot 218 Biodiversity Offset Area, Mackas Sand, Salt Ash, NSW

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Umwelt (Australia) Pty Limited (2016c) *Macka's Sand Environmental Management Strategy*. Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2016c) *Macka's Sand Noise Management Plan for Extraction Operations, Lot 218 And Lot 220, Nelson Bay Road, Salt Ash, NSW.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2016d) *Macka's Sand Air Quality Management Plan for Lot 218 and Lot 220, Salt Ash, NSW.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2016e) *Macka's Sand Soil and Water Management Plan for Lot 218 and Lot 220, Salt Ash, NSW.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2016f) *Macka's Sand Unexploded Ordnance Management Plan for the Extraction of Wind-Blown Sand From Lot 218 In Deposited Plan 1044608 at Williamtown NSW*. Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2016g) *Macka's Sand Landscape Management Plan Including Rehabilitation Management Plan and Long Term Management Strategy.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2016h) *Macka's Sand Aboriginal Cultural Heritage Management Plan for Sand Extraction Operations From Lot 218 DP 1044608 and Lot 220 DP 1049608, Salt Ash.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2016i) *Macka's Sand Non-indigenous Heritage Management Plan for Sand Extraction Operations From Lot 218 DP 1044608 and Lot 220 DP 1049608, Salt Ash.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (2016j) *Macka's Sand Drivers' Code of Conduct.* Prepared for Macka's Sand Pty Limited.

Umwelt (2016k). Results of the 2016 Annual Ecological Monitoring of the Lot 218 Biodiversity Offset Area, Mackas Sand, Salt Ash, NSW.

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.

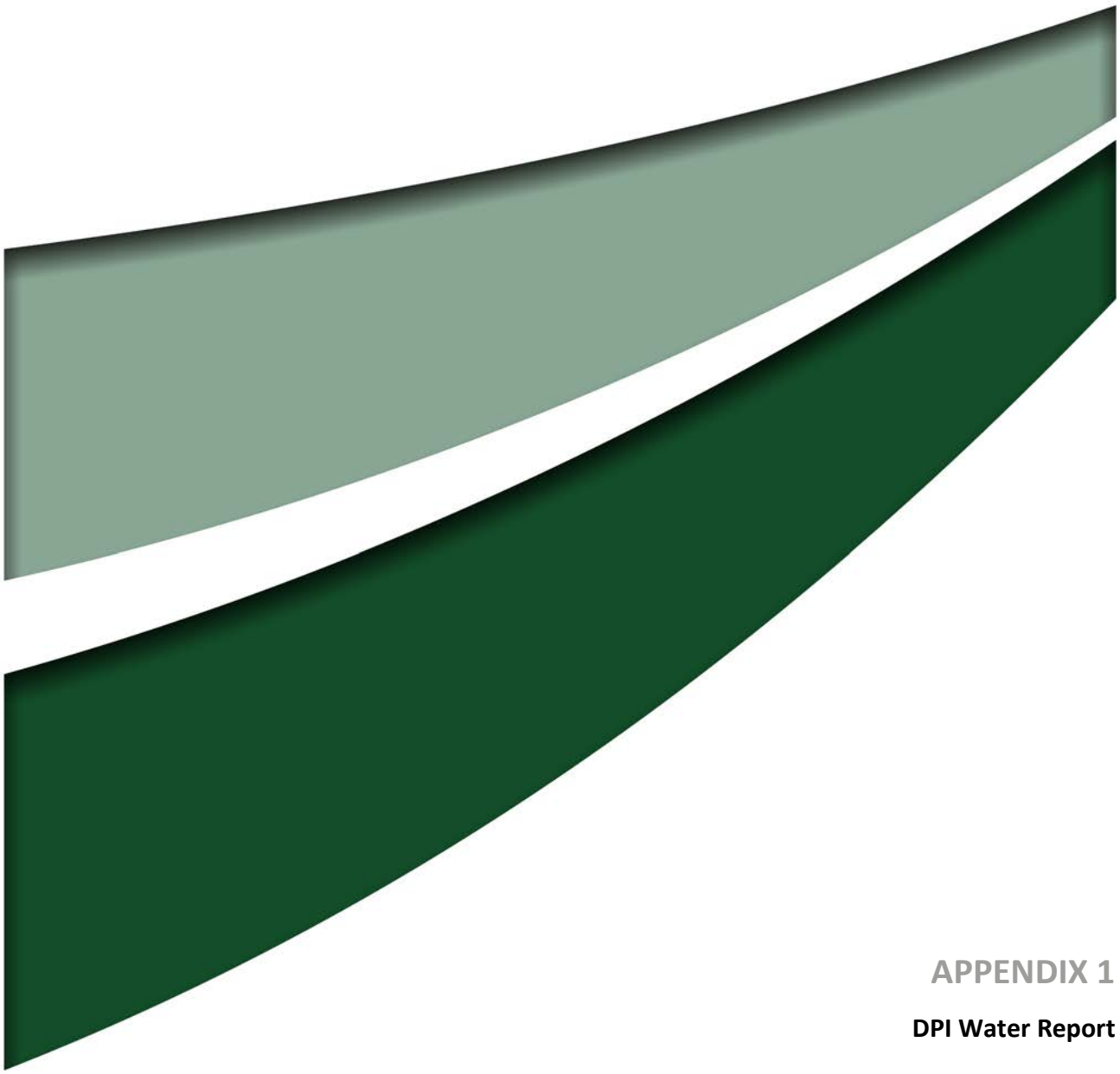
Umwelt (Australia) Pty Limited (2014) *Macka's Sand Ecological Monitoring Program for Lot 220 DP 1049608, Salt Ash.* Prepared for Macka's Sand Pty Limited.

Umwelt (Australia) Pty Limited (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 (2016k) *Macka's Sand Lot 218 Ecological Offset Monitoring Briefing*, *2016*.

Umwelt (Australia) Pty Limited (2016l) *Macka's Sand Annual attended noise monitoring report, 2016*.

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



APPENDIX 1

DPI Water Report

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* to operate sand extraction operations at Salt Ash, approximately 25 kilometres north-east of Newcastle, in the Port Stephens local government area of 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 as shown on **Figure 1.1**. Lot 220 has an identified resource of 9.6 million tonnes 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 Lot 220 and Lot 218.

Scope

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 New South Wales Office of Water (NOW)) Approval to undertake extraction works within the North Stockton Catchment Area.

In accordance with Condition 3 of Clause 9 of the NOW Approval under Clause 10(1) of the *Hunter Water Regulation 2015* (the 'NOW Approval') Macka's Sand is required to submit the following to Hunter Water Corporation (HWC) and NOW:

'...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'

In addition, in accordance with Condition 4 of the NOW Approval, the Operations Report must:

'4a) identify any non-compliance during the previous year; and
4b) 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.

Requirements for the Method of Extractive Operations

Laser Level Monitoring

As part of a May 2015 audit of Macka's Sand Operations, DPE identified that extraction of material breached the maximum approved depth level in both Lot 218 and Lot 220 voids of Macka's Sand Quarry. As a result, Macka's Sand has since undertaken laser level monitoring to demarcate extraction limits using GPS equipment installed on machinery and physical markers on the ground where possible. In addition to laser level monitoring, Macka's Sand completed analysis of exposed material for contamination before returning the floor to approved AHD depth level using clean product material. Macka's Sand have also identified a breach of extraction depth during 2016 report period at both Lot 218 and Lot 220.

Macka's Sand will continue regular surveying of the site in accordance with the Operational Management Practices.

Machinery and Equipment

Macka's Sand has advised that during the report period that all site machinery and equipment was maintained in a proper and efficient condition. 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.

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.

Refuelling

Macka's Sand has advised that during the report period, all refuelling was undertaken by a registered contractor. Refuelling of mobile equipment occurs at the Macka's Sand and Soil administration and maintenance facility, or at the vehicle storage area at the northern end of the Alternate Access Route, as appropriate. Macka's Sand uses sieves and/or stockpilers at Lot 220 and Lot 218 that have limited mobility, being moved once or twice a year. Offsite refuelling of plant with limited mobility is not considered feasible. As such, refuelling of plant with limited mobility occurs within the extraction areas via the usage 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.

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 2016.

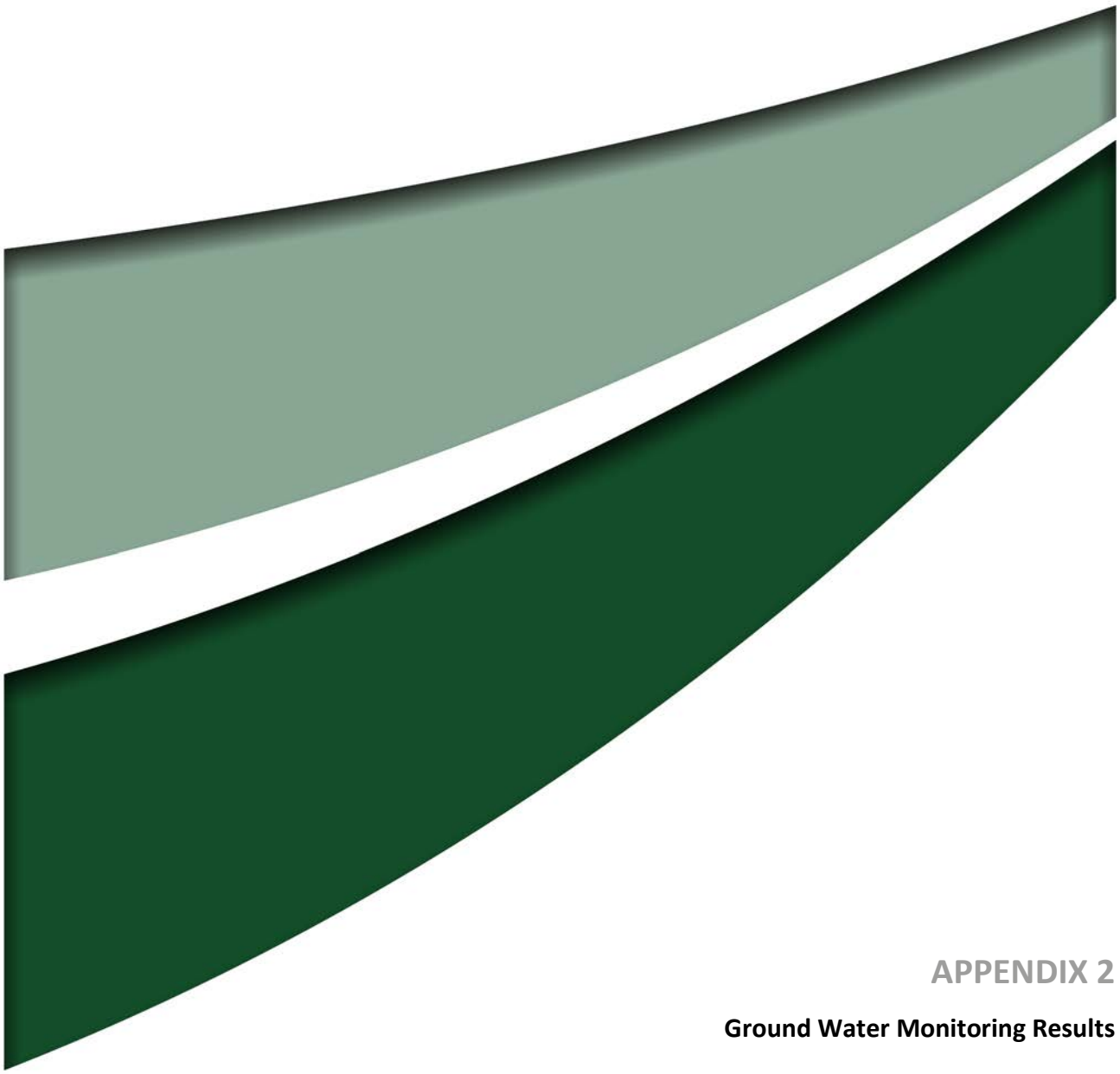
Hydrocarbon Spill Procedure

Macka's Sand has advised that the works at the site were undertaken in accordance with the Hydrocarbon Spill Procedure during 2016. No spills were recorded during 2016.

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.

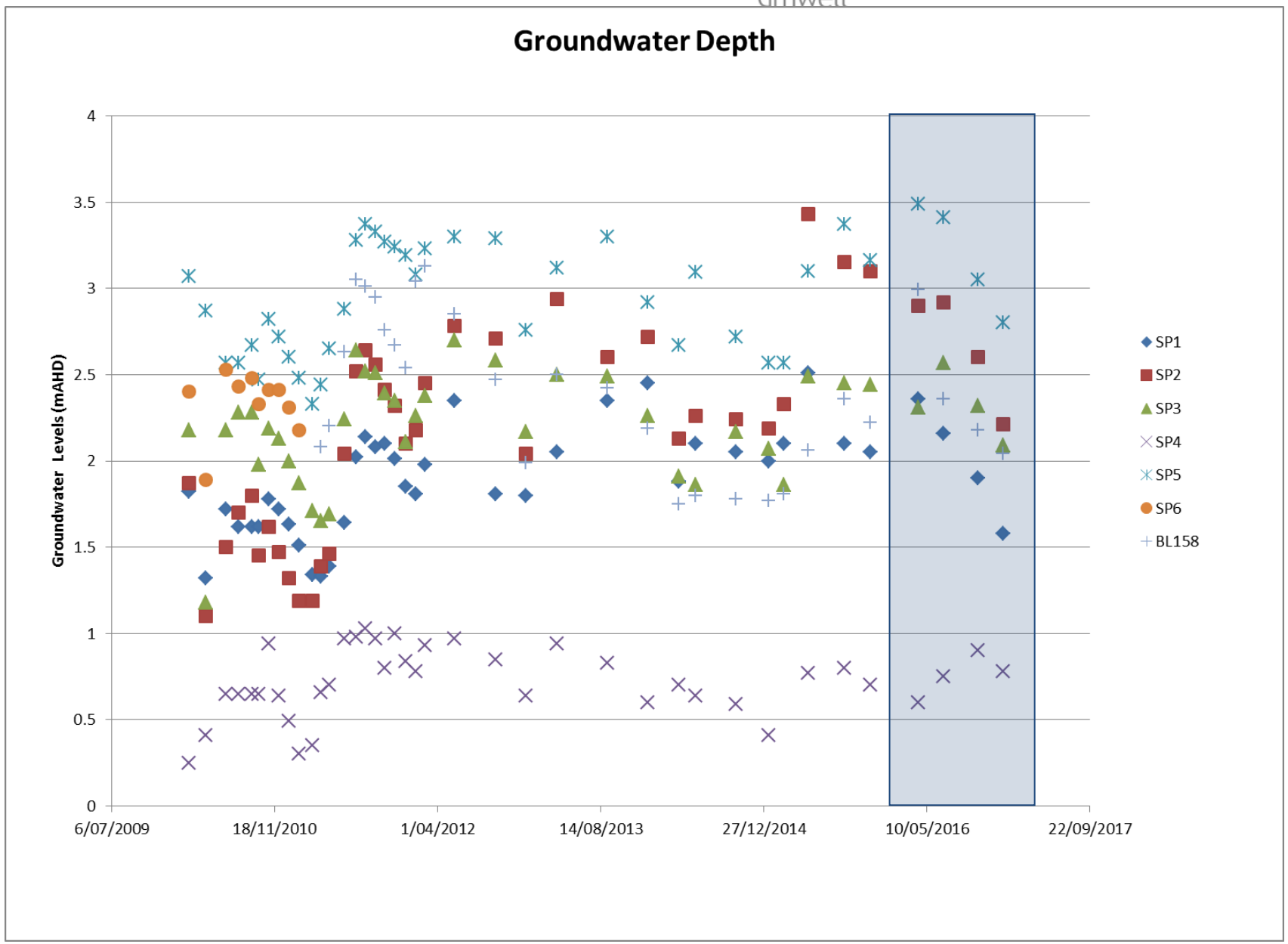
Rehabilitation

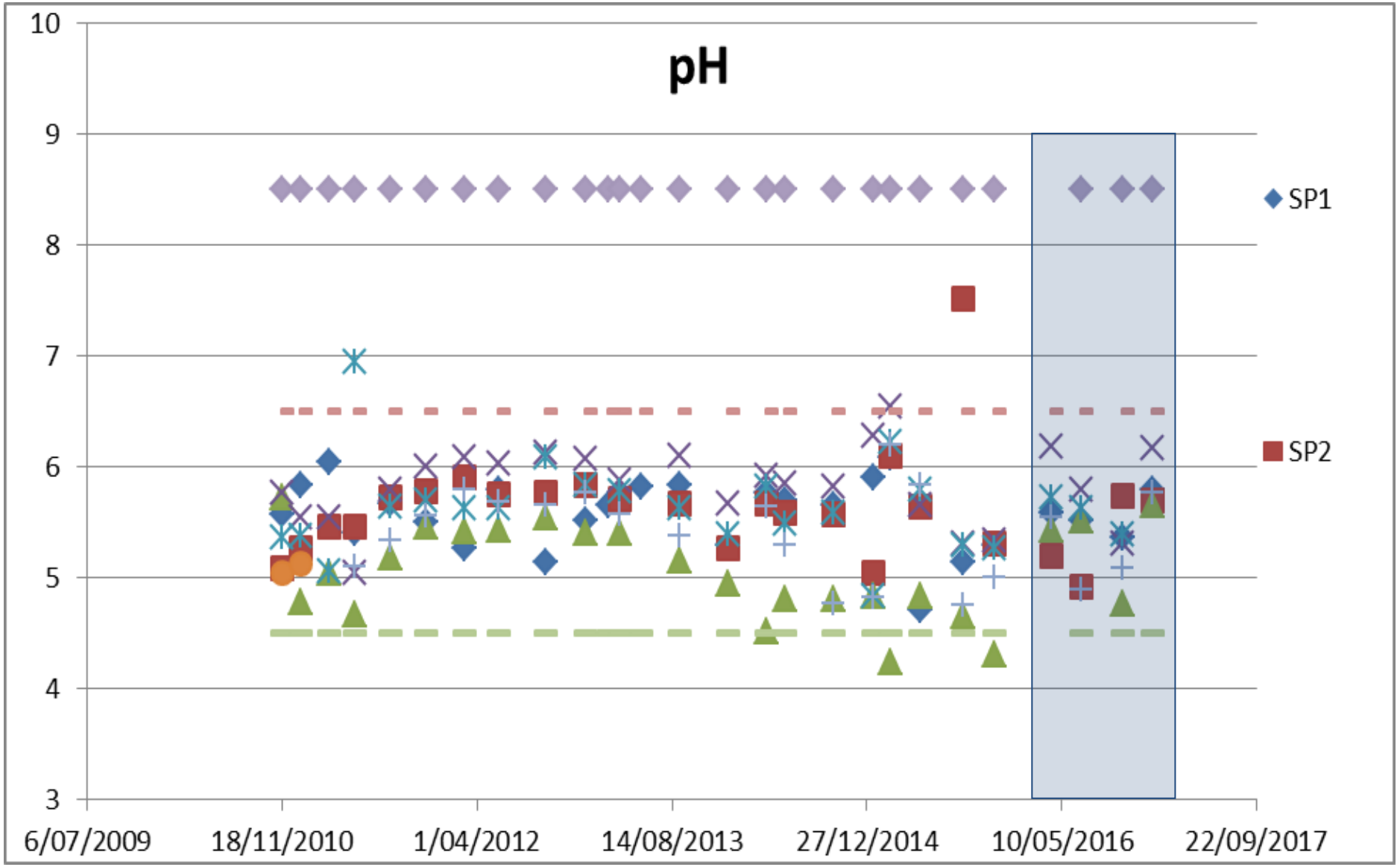
No topsoil was emplaced at Lot 220 as part of rehabilitation works during 2016.



APPENDIX 2

Ground Water Monitoring Results


Groundwater Depth
Groundwater Levels (mAHD)
4
3.5
3
2.5
2
1.5
1
0.5
0
6/07/2009
18/11/2010
1/04/2012
14/08/2013
27/12/2014
10/05/2016
22/09/2017
SP1
SP2
SP3
SP4
SP5
SP6
BL158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1/04/2012
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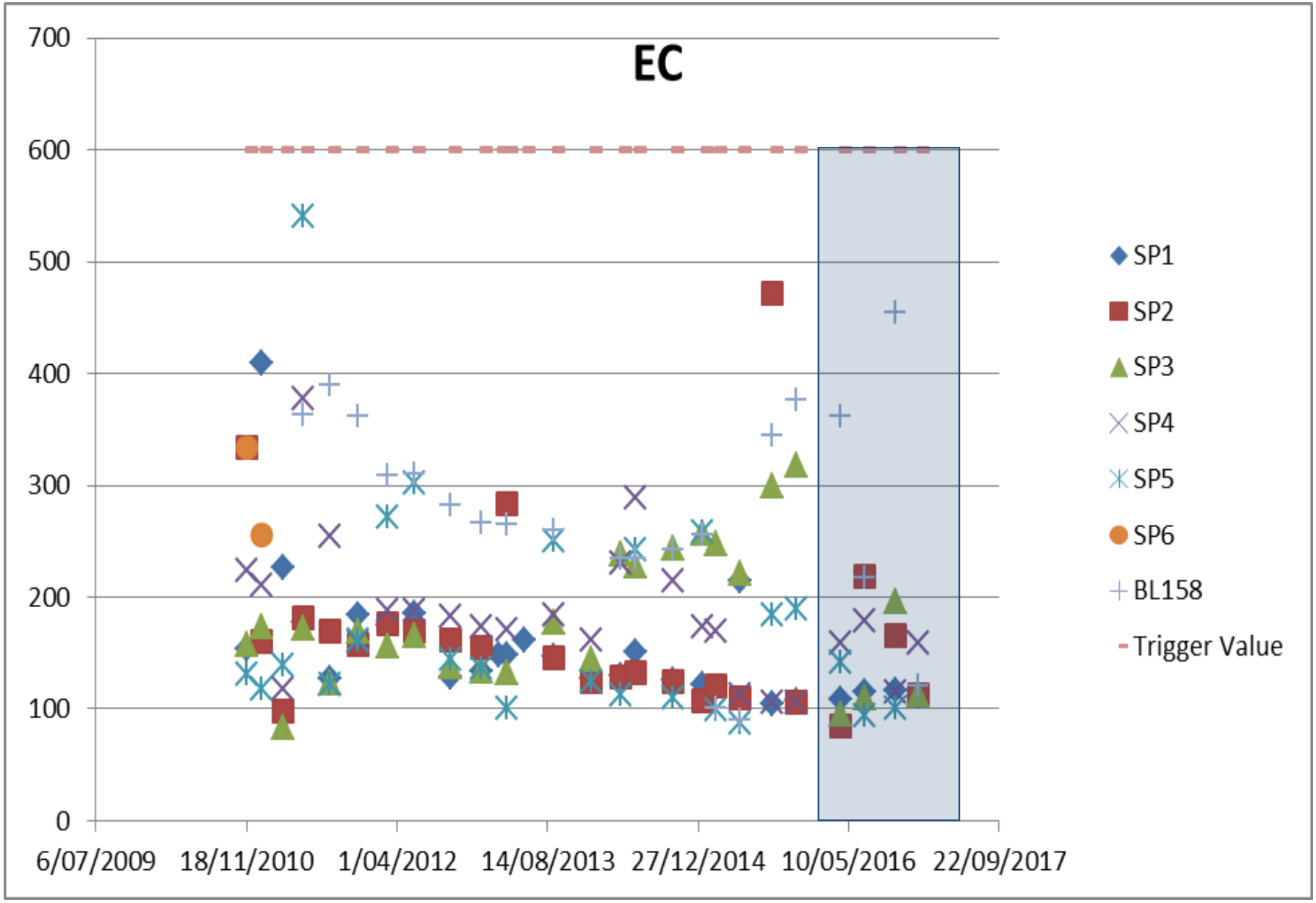
10/05/2016
22/09/2017
SP1
SP2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1/04/2012
14/08/2013
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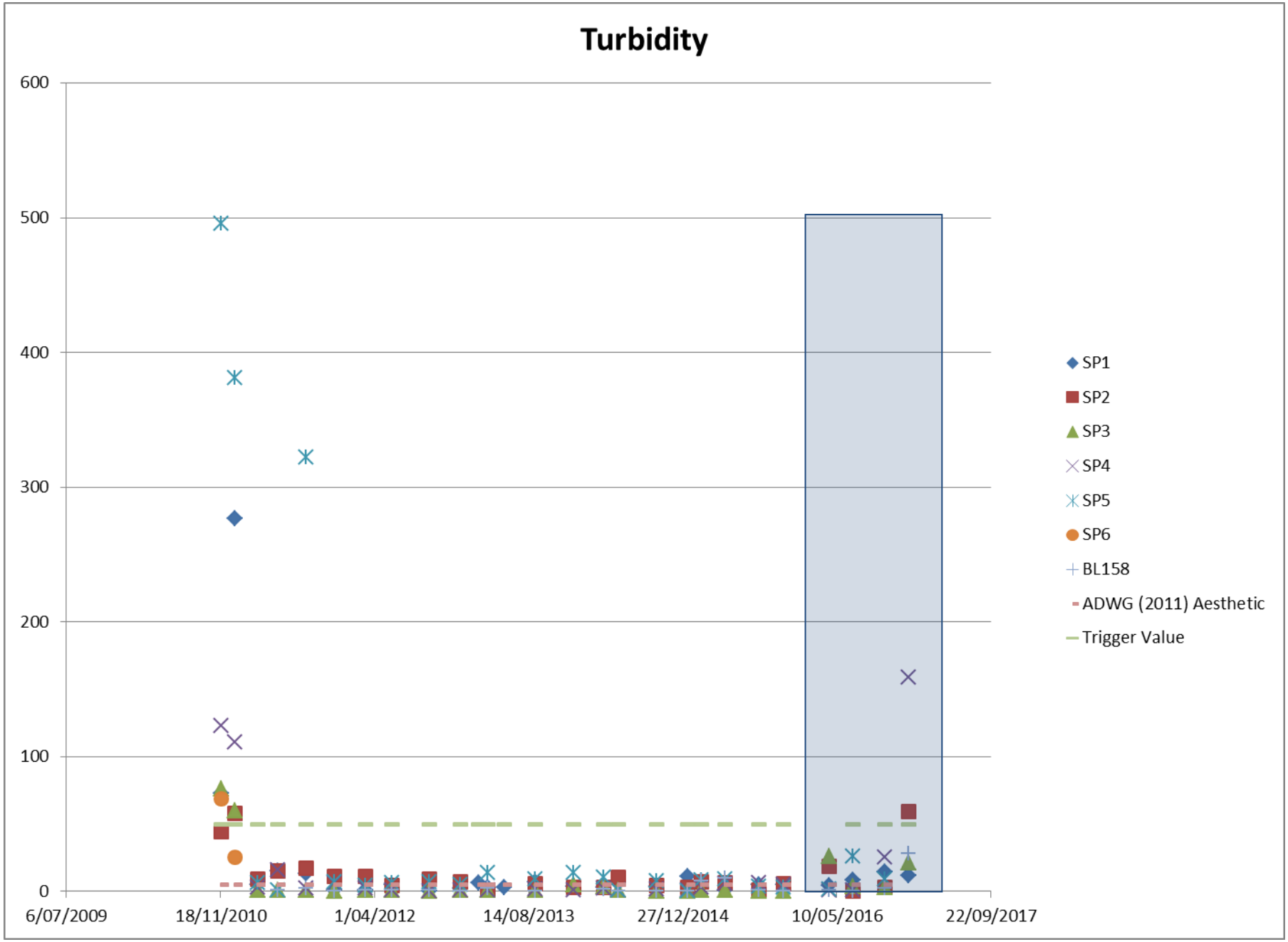
10/05/2016
22/09/2017
SP1
SP2
SP3
SP4
SP5
SP6
BL158
Trigger Value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400
300
200
100
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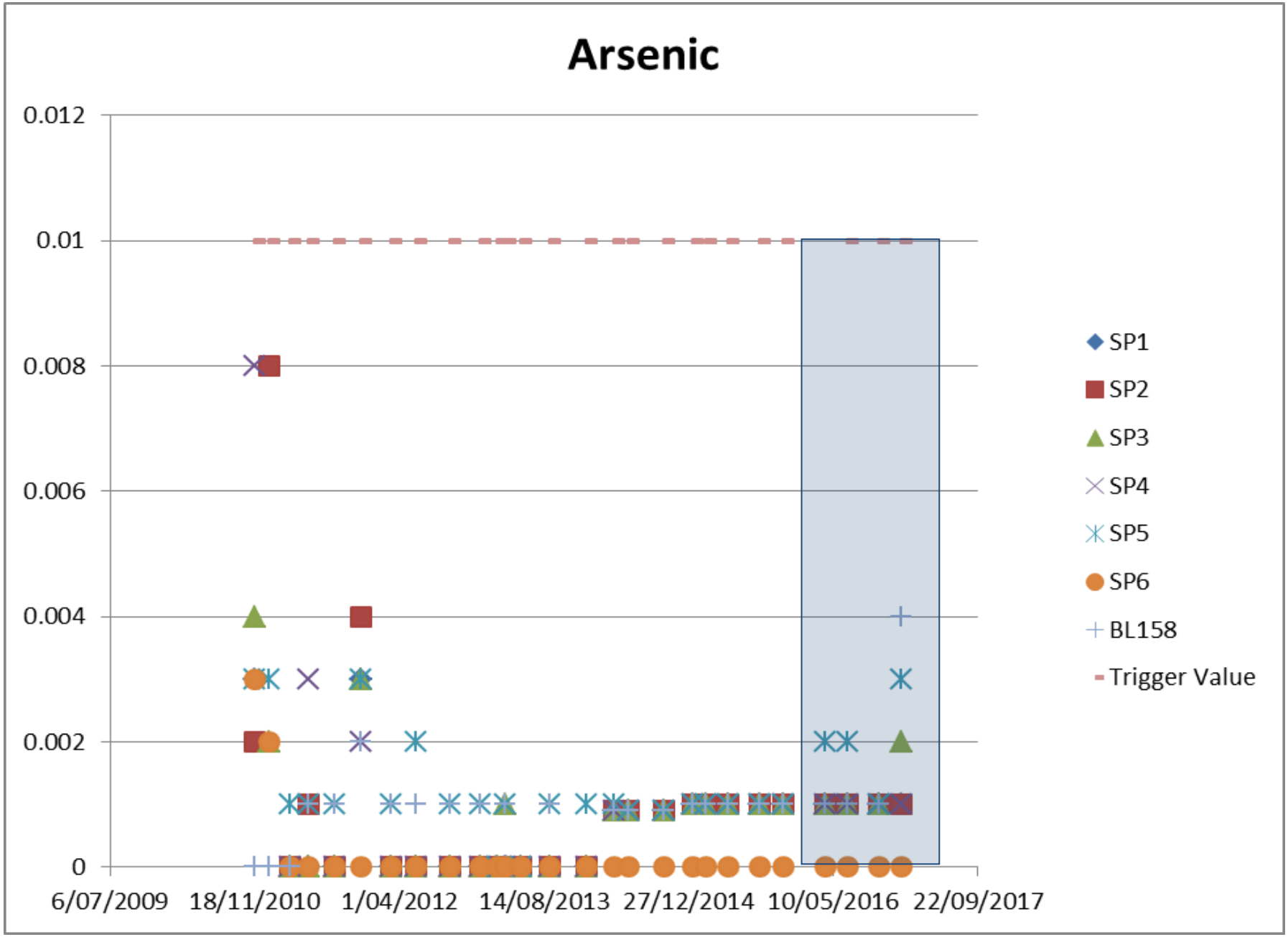
18/11/2010
1/04/2012
14/08/2013
27/12/2014
10/05/2016
22/09/2017
SP1
SP2
SP3
SP4
SP5
SP6
BL158
ADWG (2011) Aesthetic
Trigger Value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0.002
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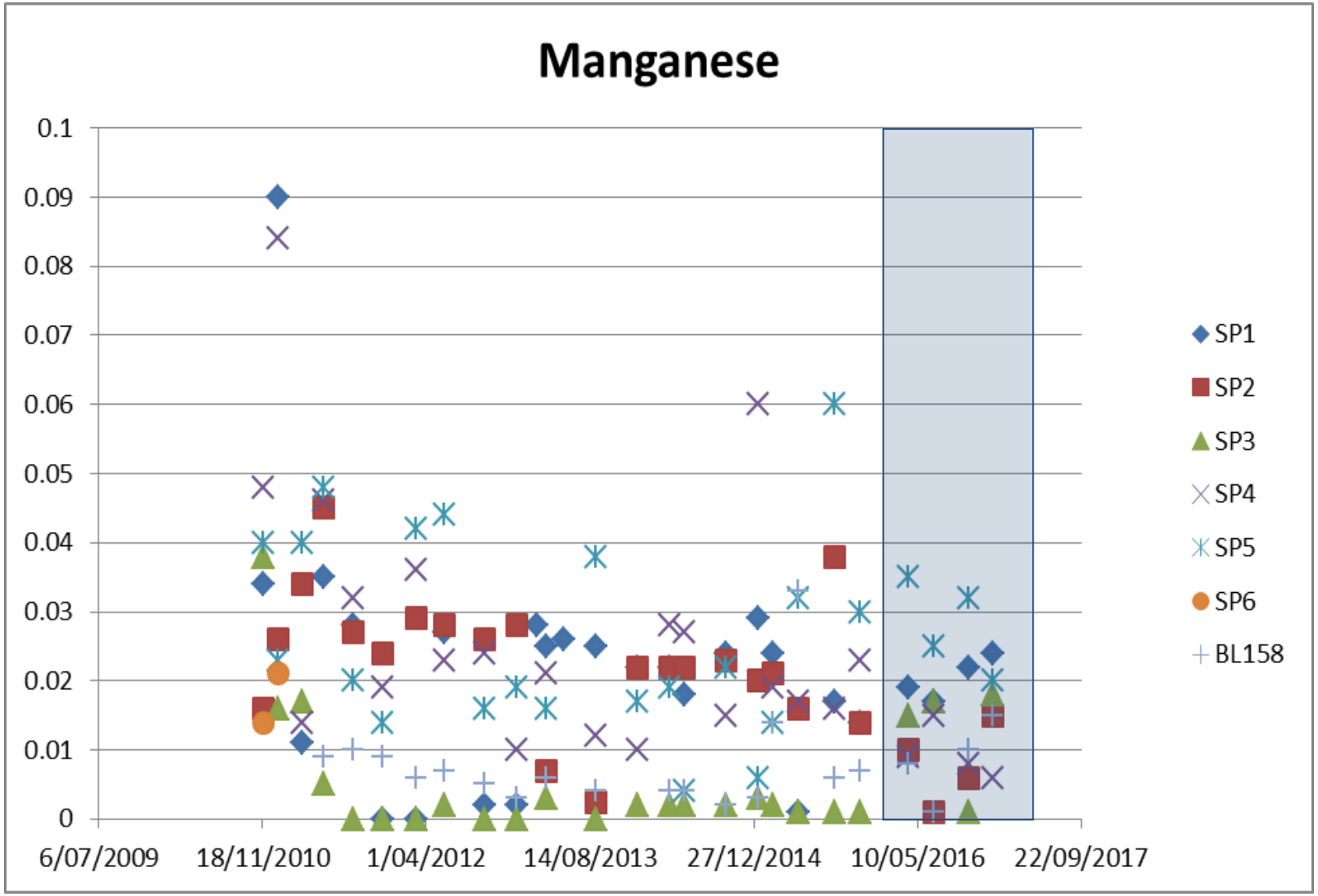
18/11/2010
1/04/2012
14/08/2013
27/12/2014
10/05/2016
22/09/2017
SP1
SP2
SP3
SP4
SP5
SP6
BL158
Trigger Value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0.05
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0.02
0.01
0
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18/11/2010
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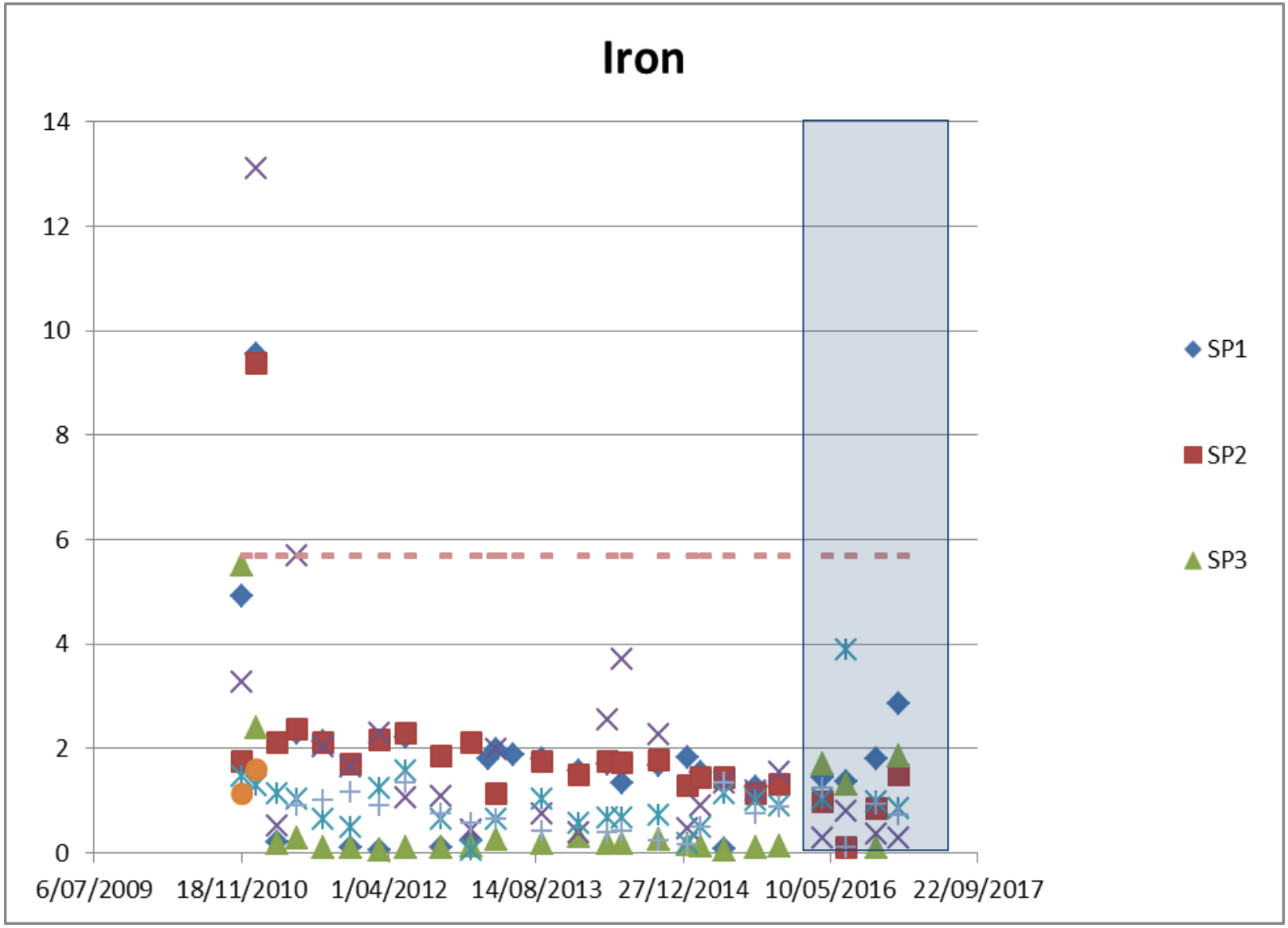
SP1
SP2
SP3
SP4
SP5
SP6
BL158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8
6
4
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6/07/2009
18/11/2010
1/04/2012
14/08/2013
27/12/2014
10/05/2016
22/09/2017
SP1
SP2
SP3

APPENDIX 3

Previous Noise Monitoring Results

2014-2016

Compliance results – Attended Industrial Noise Monitoring – Night Time Period 2014, 2015 & 2016

Location	Year	Monitoring period	Measure	Measured noise level	Estimated contribution from Macka's Sand	Meteorological conditions	Compliant
Site 1	2014	6:30am	LA90, 15 min	50	- [2]	Calm, 8°C, 98%	Yes
			LAeq, 15 min	53	< 35		Yes
			LA1, 1 min	67	< 45		Yes
	2015	06:23 – 06:38	LA90, 15 min	47.8	-	Calm conditions; few clouds; 5.9°C; 93% RH	Yes
			LAeq, 15 min	50.0	< 35		Yes
			LA1, 1 min	62.7	< 35		Yes
	2016	06:25 – 06:40	LA90, 15 min	47.4	-	Calm conditions, 0/8 okta, 8°C, 95% RH	Yes
			LAeq, 15 min	49.5	< 35		Yes
			LA1, 1 min	59.7	< 35		Yes
Site 2	2014	6:00am	LA90, 15 min	48	- 2	Calm, 6°C, 94%	Yes
			LAeq, 15 min	50	< 30		Yes
			LA1, 1 min	54	< 45		Yes
	2015	06:49 – 07:04	LA90, 15 min	49.6	-	Calm conditions; few clouds; 4.4°C; 94% RH	Yes
			LAeq, 15 min	54.9	<35		Yes
			LA1, 1 min	71.1	<35		Yes
	2016	06:54 – 07:09	LA90, 15 min	52.4	-	Calm conditions, 0/8 okta, 8°C, 95% RH	Yes
			LAeq, 15 min	60.0	< 35		Yes
			LA1, 1 min	77.4	< 35		Yes
Site 6	2014	-	-	-	-	No measurements conducted during night period	-
			-	-	-		-
			-	-	-		-
	2015	5:50-6:05	LA90, 15 min	50.6	-		Yes
			LAeq, 15 min	55.7	<35 sand extraction 37 Alternate Access Road		Yes
			LA1, 1 min	63.5	<35		Yes
	2016	05:51 – 06:06	LA90, 15 min	57.2	-	Calm conditions, 0/8 okta, 5°C, 90% RH	Yes
			LAeq, 15 min	60.1	Sand extraction operations not audible < 38 Alternate Access Road		Yes
			LA1, 1 min	66.7	Sand extraction operations not audible		Yes

Compliance results – Attended Industrial Noise Monitoring – Day Period 2014, 2015 & 2016

Location	Year	Monitoring period	Measure	Measured noise level	Estimated contribution from Macka's Sand	Meteorological conditions	Compliant
Site 1	2014	7am	LA90, 15 min	50	-	Calm, 8°C, 97%	Yes
			LAeq, 15 min	53	<30		Yes
			LA1, 1 min	66	N/A		Yes
	2015	10:04-10:19	LA90, 15 min	50.1	Not audible	Wind at 0.4m/s to 0.6m/s, gusting to 0.9m/s from the WSW to W; few clouds; 17.3°C;58% RH	Yes
			LAeq, 15 min	58.7	Not audible		Yes
			LA1, 1 min	78.1	Not audible		Yes
	2016	08:35- 8:50	LA90, 15 min	39.4	<35	Wind at 0.5 to 0.8m/s, gusting to 1.1m/s from the NNW, 0/8 okta, 14°C, 85% RH	Yes
			LAeq, 15 min	43.4	<35		Yes
			LA1, 1 min	64.5	<35		Yes
Site 2	2014	7:57am	LA90, 15 min	47	-	1.8 m/s, SW, 10°C, 91%	Yes
			LAeq, 15 min	49	<30		Yes
			LA1, 1 min	63	N/A		Yes
	2015	10:46-11:01	LA90, 15 min	40.8	Not audible	Wind at 0.6m/s to 1.3m/s, gusting to 2.1m/s from the ESE to SSE; few clouds; 18.1°C; 56% RH	Yes
			LAeq, 15 min	46.6	Not audible		Yes
			LA1, 1 min	57.2	Not audible		Yes
	2016	09:04 – 09:19	LA90, 15 min	42.3	Not audible	Wind at 0 to 0.4m/s, gusting to 2.3m/s from the NNW; 0/8 okta; 18°C; 70% RH	Yes
			LAeq, 15 min	54.7	Not audible		Yes
			LA1, 1 min	74.6	Not audible		Yes
Site 4	2014	Location not measured during this time					
	2015	11:14-11:29	LA90, 15 min	46.6	Not audible	Wind at 0.9m/s to 1.6m/s, gusting to 2.4m/s from the ESE to SSE; few clouds; 17°C; 52% RH	Yes
			LAeq, 15 min	58.8	Not audible		Yes
			LA1, 1 min	78.4	Not audible		Yes
	2016	09:26-09:41	LA90, 15 min	51.1	Not audible	Wind at 0.8 to 1.6m/s, gusting to 2.3m/s from the NNW; 0/8 okta; 18°C; 70% RH	Yes
			LAeq, 15 min	57.7	Not audible		Yes
			LA1, 1 min	69.8	Not audible		Yes
Site 5	2014	Location not measured during this time					
	2015	09:32-09:47	LA90, 15 min	56.1	Not audible	Wind at 0.4m/s to 0.8m/s, gusting to 1.1m/s from the NW; sky clear; 15.6°C; 64% RH	Yes
			LAeq, 15 min	66.2	Not audible		Yes
			LA1, 1 min	78.5	Not audible		Yes
	2016	07:49 – 08:04	LA90, 15 min	57.2	Sand extraction operations not	Calm, gusting to 0.6m/s from the NW;	Yes
			LAeq, 15 min	65.8			Yes

Location	Year	Monitoring period	Measure	Measured noise level	Estimated contribution from Macka's Sand	Meteorological conditions	Compliant
			LA1, 1 min	76	audible; <40 Alternate Access Road	0/8 okta; 12°C; 85% RH	Yes
Site 6	**2014**	Location not measured during this time					
	2015	09:04-09:19	LA90, 15 min	50.7	Not audible	Calm conditions' sky clear; 18.4°C; 55% RH	Yes
			LAeq, 15 min	58.2	Not audible		Yes
			LA1, 1 min	67	Not audible		Yes
	2016	07:23 – 07:38	LA90, 15 min	55.2	Sand extraction operations not audible; <40 Alternate Access Road	Calm, gusting to 0.6m/s from the N; 0/8 okta; 12°C; 85% RH	Yes
			LAeq, 15 min	58.5			Yes
			LA1, 1 min	64.7			Yes

Compliance results – Comparison of traffic noise results in 2014, 2015 and 2016

Macka's Sand 1 hour Night and Day Time Road Traffic Noise Level Contribution versus Noise Criteria, dB(A)

Road	Period	Noise criteria $L_{Aeq,1hour}$	Noise level contribution $L_{Aeq,1hour}$				
			2642 Nelson Bay Rd	Cnr Oakvale Dr and Nelson Bay Rd		2353 Nelson Bay Rd	
			2014	2015	2016	2015	2016
Lavis Lane, Oakvale Drive, Nelson Bay Road	Night	55	44	36	<46	34	<54
	Day	60	50	38	<40	30	<56
	Compliant		Yes	Yes	Yes	Yes	Yes

APPENDIX 4

March, April, June, August and September 2015 Daily Weather Observations

umwelt

Williamtown, New South Wales
March 2015 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Su	18.1	37.8	0.2	15.0	7.0	S	70	17:56	25.0	76	1	NW	9	1007.6	37.0	28	2	WNW	19	1003.8
2	Mo	20.1	24.7	8.2	10.0	1.1	SSE	54	23:23	21.8	72	7	S	24	1017.5	23.7	51	8	SE	24	1017.2
3	Tu	12.3	28.9	0	4.6	10.3	ENE	39	17:22	20.1	83	1	NW	9	1016.3	27.2	54	1	E	20	1013.1
4	We	20.0	30.4	0.4	6.0	9.4	SSE	35	13:13	21.6	92	7	N	7	1013.0	26.7	69	1	SE	24	1009.7
5	Th	20.2	31.5	0	6.2		SSE	63	14:37	25.7	55	1	WNW	28	1006.2	27.3	35	2	S	37	1007.1
6	Fr	14.0	30.7	0						20.0	60		NW	20	1008.9	29.0	16		WNW	26	1004.9
7	Sa	13.4	26.2	0			ENE	41	16:48	21.1	75		WNW	2	1012.6	25.6	58	1	E	30	1009.8
8	Su	17.0	31.9	0		10.5	W	31	13:48	19.9	92	4	NNW	9	1010.9	31.1			W	20	1008.8
9	Mo	19.9	29.8	0	29.8	11.3	SE	28	12:10	23.8	79	1	W	13	1012.1	28.5	57	1	SE	19	1010.4
10	Tu	18.0	26.8	0	5.4	6.0	SSE	35	12:33	24.5	82	7	SSE	22	1016.7	25.4	71	7	SSE	20	1016.3
11	We	21.1	29.5	0	5.6	8.2	SSE	37	11:13	23.6	89	7	W	2	1016.9	28.0	66	1	ESE	26	1014.0
12	Th	17.6	27.9	0	6.2		S	35	11:18	22.0	78	7	WNW	11	1014.5	26.3	70	2	SSE	22	1013.2
13	Fr	19.2	24.5				SSE	52	09:27	20.7	83	8	SSE	31	1018.3	23.1	53	8	SSE	28	1018.7
14	Sa	15.3	24.4				ESE	31	13:32	19.4	75		WNW	13	1018.8	23.6	45		SSE	19	1015.1
15	Su	13.0	26.0	20.0	16.8	6.3	S	61	10:35	20.6	64	5	WNW	19	1009.1	18.3	91	7	SE	26	1012.0
16	Mo	16.2	24.1	8.2	5.2	10.4	S	44	00:07	20.4	59	5	S	13	1017.3	22.8	35	1	SSE	19	1015.5
17	Tu	10.5	25.9	0	5.6	5.3	NNE	33	10:14	19.2	70	1	NE	4	1015.9	25.0	50	7	NE	9	1012.0
18	We	17.1	34.2	0	4.0	8.2	NNW	48	17:06	20.9	84	6	NW	7	1008.5	32.7	40	1	N	11	1003.2
19	Th	17.5	27.3	0	4.8		SSE	31	10:54	22.7	82	6	SSW	9	1011.5	27.1	63	1	SE	19	1010.6
20	Fr	15.9	37.7				S	59	16:22	22.7	74		NW	13	1011.8	35.8	28		SE	11	1009.0
21	Sa	20.1	22.7				SSE	50	23:14	22.0	58	8	SE	31	1023.9	21.9	64	8	SE	28	1024.1
22	Su	18.7	22.3				SE	41	00:28	19.8	89	8	N	17	1023.6	22.1	78	1	SSE	13	1021.2
23	Mo	16.0	28.5	4.8	23.0	10.8	ENE	33	16:51	21.2	86	2		Calm	1019.2	27.6	53	4	NE	19	1013.9
24	Tu	16.3	33.1	0	5.4	6.5	SSW	56	15:07	22.2	82	2	NNW	11	1012.2	30.9	45	6	ENE	13	1008.3
25	We	15.4	24.2	4.8	4.2	10.0	SSW	39	01:45	19.3	74	1	W	11	1016.6	23.6	62	2	S	28	1016.2
26	Th	13.9	29.2	0	5.4		NW	43	13:56	19.3	83	1	WNW	22	1018.0	28.3	25	1	WNW	30	1015.2
27	Fr	8.7	26.4	0			W	37	09:00	15.6	44		WNW	22	1021.5	25.2	18		WNW	19	1018.0
28	Sa	9.8	24.2	0			SSE	33	12:53	16.4	56		WNW	17	1023.2	23.0	50		SSE	24	1021.6
29	Su	12.7	26.3	0	17.8	10.0	ESE	35	14:43	19.7	74	6		Calm	1023.5	24.4	57	6	ESE	26	1020.7
30	Mo	17.3	24.8	0	4.6	1.7	E	35	11:14	19.7	89	8	WSW	13	1023.9	23.2	68	7	ESE	20	1022.2
31	Tu	16.9	22.9	11.8	2.8	0.5	ESE	37	17:13	19.9	88	7	E	7	1025.8	22.0	75	7	ESE	17	1023.9
Statistics for March 2015																					
Mean		16.2	27.9		9.0	7.4				21.0	75	4		13	1016.0	26.3	52	3		21	1013.9
Lowest		8.7	22.3		2.8	0.5				15.6	44	1		Calm	1006.2	18.3	16	1	NE	9	1003.2
Highest		21.1	37.8	20.0	29.8	11.3	S	70		25.7	92	8	#	31	1025.8	37.0	91	8	S	37	1024.1
Total				58.4	188.4	133.5															

Observations were drawn from Williamtown RAAF (station 061078)
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

Williamtown, New South Wales
April 2015 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	We	14.7	27.8	4.4	1.2	8.5	NE	37	10:48	19.0	97	4	ENE	9	1025.2	26.2	52	4	NE	24	1020.3
2	Th	14.9	29.5	0	4.6		NE	22	15:53	21.4	72	7	NNW	7	1019.8	29.4	41	7	ENE	7	1016.6
3	Fr	18.8	22.5				S	52	03:00	21.3	75	8	S	24	1022.4	21.8	70	8	SSE	22	1021.3
4	Sa	18.4	20.5				SSE	52	15:52	19.1	97	8	E	2	1018.2	19.0	96	6	SE	17	1014.8
5	Su	15.8	24.1				WSW	31	10:36	17.7	94	8	WNW	15	1010.4	21.8	68	8	SE	15	1006.1
6	Mo	13.4	27.8	48.4	11.4	8.6	WSW	74	16:35	20.1	80	1	NNW	13	1008.7	24.1	64	5	ENE	19	1005.0
7	Tu	13.0	26.5	14.6	5.8	8.4	WNW	80	13:30	16.6	93	6	WNW	9	1008.3	22.1	41	3	WNW	37	1007.7
8	We	14.5	23.0	0	8.8	7.8	NW	74	09:47	17.1	57	7	WNW	41	1012.6	21.4	43	3	WNW	37	1013.7
9	Th	14.8	22.7	0	7.8		SSW	48	16:12	17.6	57	7	WNW	20	1020.8	20.3	50	6	S	30	1019.7
10	Fr	12.7	22.0	0			SSW	41	13:41	18.5	65	8	SW	19	1023.9	19.9	69	6	SSW	28	1022.2
11	Sa	13.3	22.8	0			SSE	30	15:25	17.7	84	3	W	13	1022.9	20.8	72	7	SSE	19	1019.5
12	Su	10.7	24.4	0.4	10.8	5.2	S	46	13:55	17.7	85	2	WNW	20	1018.6	21.3	69	7	S	24	1016.8
13	Mo	12.9	22.2	0	4.0	7.9	S	37	13:18	18.8	69	6	SW	15	1023.0	20.6	52	2	SSE	20	1021.2
14	Tu	10.0	22.2	0	3.6	8.6	SE	33	12:54	18.0	72	2	WNW	11	1023.7	21.2	57	2	ESE	17	1021.6
15	We	9.3	27.3	0	3.0	10.2	SW	39	21:48	18.0	76	3	NW	13	1025.4	27.0	44	2	N	7	1021.8
16	Th	15.9	31.5	0	3.0		N	35	00:16	22.7	65	2	NW	11	1023.7	31.1	33	7	WNW	19	1019.9
17	Fr	19.5	25.2				SSW	35	01:28	22.3	84	8	S	7	1024.3	23.7	76		SSE	19	1020.7
18	Sa	15.6	26.1				NW	30	23:39	20.0	97	8	NW	11	1019.7	25.1	61	8	NNE	9	1015.6
19	Su	17.2	23.5				S	52	20:31	19.4	84	4	WNW	24	1018.3	20.6	74	8	SSW	30	1018.5
20	Mo	13.1	18.7	13.0	14.0	0.4	SSE	91	22:41	14.2	94	8	W	20	1021.7	17.6	89	8	SSW	11	1018.7
21	Tu	14.1	18.6	156.0		0.0	SSE	113	05:16	18.6	88	8	SE	61	1013.4	14.1	92	8	S	72	1012.5
22	We	12.4	19.5	114.4		2.6	W	41	10:27	16.9	90	6	WSW	17	1011.6	16.6	96	8	WNW	15	1010.3
23	Th	14.9	21.6	8.8	1.0			31	08:01	17.9	83	2	W	20	1012.2	20.3	73	4	SW	9	1009.8
24	Fr	12.2	26.2							18.1	87	7			1008.9	25.9	46		NW	24	1005.4
25	Sa	13.4	25.3				WSW	70	18:48	20.3	56	1	NW	22	1009.3	24.6	41		N	11	1005.2
26	Su	12.5	18.7	0	11.0	3.2	NW	52	07:15	14.4	66	7	WNW	33	1008.5	18.0	56	7	WSW	28	1009.6
27	Mo	12.4	20.1	0.4	3.2	10.4	WNW	35	08:26	16.3	61	1	WNW	26	1019.1	18.9	46	1	S	24	1018.4
28	Tu	9.7	20.2	0	3.0	10.0	S	44	12:09	16.5	61	1	WSW	17	1025.2	19.0	61	2	SSW	30	1023.9
29	We	11.6	20.2	3.0	4.0	6.5	S	35	12:38	15.8	85	6	W	13	1029.8	18.9	70	5	SSE	17	1027.8
30	Th	11.7	20.7	0.6	2.0		S	37	13:34	15.9	94	6	W	6	1030.3	19.8	69	4	S	24	1027.4
Statistics for April 2015																					
	Mean	13.8	23.4		5.7	6.6				18.3	78	5		17	1018.7	21.7	62	5		22	1016.4
	Lowest	9.3	18.6		1.0	0.0				14.2	56	1	E	2	1008.3	14.1	33	1	#	7	1005.0
	Highest	19.5	31.5	156.0	14.0	10.4	SSE	113		22.7	97	8	SE	61	1030.3	31.1	96	8	S	72	1027.8
	Total			364.0	102.2	98.3															

Observations were drawn from Williamtown RAAF (station 061078)
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

Williamtown, New South Wales
June 2015 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Mo	10.2	17.4	8.2	5.6	9.9	W	56	11:19	14.1	58	1	WNW	33	1014.4	15.0	23	1	SSW	30	1016.7
2	Tu	4.3	15.6	0	5.6	9.0	WSW	31	11:41	9.1	54	1	WNW	20	1024.1	14.4	46	5	WSW	17	1022.2
3	We	5.3	17.3	0	2.6	8.0	WNW	37	07:33	9.3	63	1	WNW	22	1023.3	16.2	54	6	S	13	1020.6
4	Th	5.0	17.2	0	2.2		NW	33	09:25	8.8	75	1	NW	20	1022.5	16.5	36	1	NW	19	1018.7
5	Fr	4.2	15.4				W	31	05:23	9.7	84	8	WNW	13	1019.6	15.3	51	3	WSW	17	1019.2
6	Sa	7.6	19.6				NW	30	08:42	12.3	64	3	NW	19	1028.3	18.7	60	1	S	9	1027.4
7	Su	5.3	21.0	2.2	5.2	9.7	NNW	28	16:12	10.4	94	1	NW	15	1030.3	20.5	52	1	NNW	11	1025.5
8	Mo	6.6	22.1	0	1.8	7.7	WNW	52	13:47	12.3	85	7	NNW	9	1026.1	21.2	40	1	NW	28	1021.4
9	Tu	5.5	23.0	0	2.6	7.8	WNW	63	12:36	14.1	72	6	NW	24	1021.9	22.4	33	2	WNW	35	1020.0
10	We	9.2	17.5	2.0	4.2	0.2	S	35	15:11	11.8	89	7	NW	11	1030.0	15.4	83	8	SW	17	1030.3
11	Th	11.8	17.3	6.4	1.4		SE	30	12:33	13.5	96	7	NW	9	1036.5	16.7	61	3	SE	15	1033.9
12	Fr	11.7	18.2				NW	15	05:14	13.6	93	8	NW	9	1034.6	17.1	70	7	S	9	1031.4
13	Sa	12.8	20.7				NNE	26	12:49	14.5	84	8	N	6	1031.4	18.3	55	7	NE	13	1027.3
14	Su	7.4	19.8				NW	20	08:33	11.0	89	8	NW	17	1028.4	18.1	69	1	SSE	13	1025.4
15	Mo	8.8	18.3	2.2	5.2	2.8	E	31	15:17	13.0	91	7	NW	13	1027.7	16.8	85	8	E	15	1025.1
16	Tu	13.0	18.7	0	1.2	1.3	NE	22	05:12	17.7	73	5	NNE	13	1023.1	15.7	96	8	NNW	6	1019.6
17	We	13.9	16.7	10.4	0.8	0.2	NW	39	17:08	14.8	97	8		Calm	1013.8	16.5	93	7		Calm	1010.3
18	Th	11.6	18.6	5.8	1.6		WNW	50	10:22	14.6	69	1	WNW	30	1015.0	18.2	53	1	WNW	24	1013.5
19	Fr	9.9	13.0				SW	35	15:33	10.9	90	8	W	13	1017.2	12.7	92	6	WSW	19	1016.8
20	Sa	8.0	14.9				W	26	01:00	9.6	93	8	NW	13	1023.7	13.5	65		SW	13	1022.9
21	Su	6.5	15.8	24.4	4.6	4.4	WNW	28	09:23	9.6	80	7	NW	17	1028.8	15.5	64	2	WNW	7	1027.4
22	Mo	4.4	17.6	0	1.4	9.0	WNW	20	10:41	7.7	94	2	NW	13	1030.2	17.0	51	6	NNW	11	1027.0
23	Tu	4.4	20.5	0	1.0	9.5	NW	26	09:52	10.3	79	1	NW	13	1027.8	20.2	48	1	NNE	13	1024.2
24	We	7.6	16.5	0	1.8	2.3	NW	20	12:41	13.2	77	2	NNW	7	1023.9	16.0	72	7	NW	11	1020.9
25	Th	9.4	20.2	0	0.6		SSW	35	15:05	15.1	76	5	WNW	24	1023.2	17.8	79	4	SSW	15	1022.8
26	Fr	12.0	19.2				S	37	03:08	14.3	76	8	W	13	1032.2	17.7	50		SSW	13	1031.0
27	Sa	6.2	18.4				WNW	26	09:13	10.2	86		WNW	17	1033.2	17.9	59		NW	11	1029.6
28	Su	5.4	18.9				WNW	30	09:39	9.7	84		NW	19	1032.8	18.6	48		WNW	9	1030.7
29	Mo	7.6	19.2	47.0	11.8		NW	22	08:49	10.4	82	1	NW	17	1033.3	16.6	70	2	SE	13	1030.0
30	Tu	6.0	14.7	0.2	2.2	0.7	WNW	33	10:46	8.8	100	7	NW	17	1029.7	14.1	82	5	WNW	13	1025.9
Statistics for June 2015																					
	Mean	8.1	18.1		3.2	5.5				11.8	81	4		15	1026.2	17.0	61	4		14	1023.9
	Lowest	4.2	13.0		0.6	0.2				7.7	54	1		Calm	1013.8	12.7	23	1		Calm	1010.3
	Highest	13.9	23.0	47.0	11.8	9.9	WNW	63		17.7	100	8	WNW	33	1036.5	22.4	96	8	WNW	35	1033.9
	Total			108.8	63.4	82.5															

Observations were drawn from Williamtown RAAF (station 061078)
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

IDCJDW2145.201506 Prepared at 16:02 UTC on 16 Aug 2015

Williamtown, New South Wales
August 2015 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Sa	2.6	23.4	0			NW	41	14:30	12.5	63		NW	13	1020.6	22.6	33		WNW	28	1016.8
2	Su	7.6	27.7	0			WNW	56	14:50	15.8	59		NW	9	1016.8	27.2	19		NW	35	1011.0
3	Mo	11.3	18.6	0	17.2	10.1	WNW	63	12:58	12.4	50	0	WNW	35	1016.6	18.3	30	0	WNW	35	1014.3
4	Tu	4.0	14.9	0	6.0	1.7	WNW	35	22:04	9.7	61	7	W	13	1022.8	13.7	39	7	W	13	1019.3
5	We	3.8	15.3	0	2.8	8.8	WNW	59	09:07	9.6	41	1	WNW	33	1016.0	14.5	34	5	NW	31	1012.2
6	Th	6.8	16.4	0	4.8		WNW	41	00:19	10.8	62	1	WNW	30	1017.0	15.5	29	2	SW	19	1016.9
7	Fr	5.4	17.4	0			WNW	41	08:23	10.3	55		WNW	30	1024.2	17.0	33		WSW	7	1021.1
8	Sa	4.7	17.0	0			SSW	41	13:15	11.1	63	4	WNW	15	1024.3	15.8	52		S	26	1022.0
9	Su	4.5	17.8	0	9.8	9.6	SE	28	13:47	9.8	79	5	WNW	17	1024.6	16.6	53	1	SE	17	1019.6
10	Mo	6.2	20.0	0	1.4	10.3	W	52	12:37	12.5	57	1	NNW	15	1019.0	19.7	29	0	WNW	31	1014.3
11	Tu	3.3	22.2	0	5.0	8.7	W	39	14:19	15.7	45	1	NNW	11	1015.5	21.0	26	2	WSW	13	1011.0
12	We	1.4	20.3	0	2.6	7.1	NW	63	19:25	11.7	65	1	NNW	7	1008.6	18.9	28	2	WNW	26	1004.2
13	Th	8.5	19.4	0	5.6		WNW	59	02:01	12.7	53	1	WNW	39	1015.6	18.7	30	1	WNW	30	1015.2
14	Fr	5.3	18.4				W	35	09:25	12.4	52		WNW	24	1025.8	18.0	35		NW	17	1023.7
15	Sa	3.0	18.4				WNW	30	08:35	10.7	70	8	WNW	17	1030.4	15.5	75	8	SSW	20	1028.7
16	Su	10.6	20.2	2.0	11.2	10.5	NE	28	16:50	15.5	81	1	WNW	9	1027.6	18.0	66	2	ESE	20	1022.2
17	Mo	6.7	19.8	0	2.6	9.9	NW	46	12:00	13.5	60	1	WNW	26	1018.6	18.9	32	6	NW	30	1014.3
18	Tu	6.7	16.8	0	5.8	10.2	SSE	33	12:59	13.2	56	1	WNW	20	1020.7	15.6	41	1	S	22	1020.5
19	We	4.2	18.9	0	3.0	10.6	SSE	30	12:40	11.9	68	1	NW	13	1026.9	17.5	48	1	ESE	15	1024.6
20	Th	5.2	22.2	0	2.6		SSE	30	15:31	13.2	74	1	WNW	11	1028.7	20.7	47	1	S	13	1024.7
21	Fr	5.6	23.3				WNW	26	10:30	13.6	80		WNW	15	1026.7	21.0	52		ENE	17	1021.8
22	Sa	9.6	27.2				NW	24	13:50	17.5	55		NNW	13	1022.9	26.6	36		NNE	13	1018.1
23	Su	14.1	15.9				S	35	07:52	15.2	93	8	S	15	1022.5	15.4	96	8	NE	9	1019.2
24	Mo	13.0	18.4	26.4	10.0	3.9	S	35	15:23	14.8	97	7	NNE	4	1018.1	17.8	89	7	SSE	13	1015.1
25	Tu	13.2	21.1	1.8	1.6	8.3	NW	57	15:45	16.6	79	6	WNW	13	1015.8	20.0	50	1	WNW	37	1015.0
26	We	13.0	19.6	0	4.0	1.2	NW	50	00:13	14.9	61	7	NW	31	1019.3	17.9	58	7	WNW	22	1017.9
27	Th	12.3	18.3	0	3.4		NW	52	13:48	14.9	71	7	NW	17	1020.5	17.7	52	7	WNW	30	1017.5
28	Fr	8.4	20.0	0			WNW	57	08:55	14.5	55		WNW	43	1020.6	19.0	36	3	W	22	1019.3
29	Sa	7.0	20.4	0			WNW	44	12:42	13.6	60		WNW	26	1023.5	19.6	37		WNW	26	1018.4
30	Su	7.0	18.2	0	13.0	10.8	SE	37	13:52	12.9	52	1	WNW	26	1020.3	16.9	39	1	S	24	1017.1
31	Mo	7.1	18.4	0	3.2	7.7	WSW	30	09:21	14.9	53	1	WSW	17	1017.5	16.4	49	6	SSE	17	1014.2
Statistics for August 2015																					
Mean		7.2	19.5		5.8	8.1				13.2	63	3		19	1020.9	18.5	44	3		21	1017.7
Lowest		1.4	14.9		1.4	1.2				9.6	41	0	NNE	4	1008.6	13.7	19	0	WSW	7	1004.2
Highest		14.1	27.7	26.4	17.2	10.8	#	63		17.5	97	8	WNW	43	1030.4	27.2	96	8	WNW	37	1028.7
Total				30.2	115.6	129.4															

Observations were drawn from Williamtown RAAF (station 061078)
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

IDCJDW2145.201508 Prepared at 13:02 GMT on 12 Aug 2016

Williamtown, New South Wales
September 2015 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Tu	7.5	20.0	0.4	3.6	10.9	WNW	41	08:53	13.2	57	1	WNW	30	1016.5	19.4	27	1	W	20	1013.3
2	We	4.2	20.9	0	4.0	7.8	NNE	31	14:57	13.3	51	4	NW	17	1018.7	20.2	33	3	NE	17	1012.8
3	Th	10.9	19.1	8.6	6.0		WNW	52	09:41	17.2	52	1	NW	30	1006.6	14.2	72	6	WNW	30	1007.4
4	Fr	10.9	16.7				SW	43	02:50	13.7	94	8	WSW	17	1021.0	14.9	92	8	W	13	1020.7
5	Sa	9.1	20.4				SSE	31	13:57	11.7	100	8	NW	19	1022.9	18.4	51	3	SE	13	1019.3
6	Su	11.4	18.3				ESE	30	15:21	16.1	80	3	NNW	13	1024.7	17.1	65		ESE	19	1021.8
7	Mo	7.7	24.6	34.2	10.8	10.4	WNW	46	12:25	15.8	74	1	NW	13	1020.0	22.7	38	5	WNW	20	1015.3
8	Tu	6.1	19.8	0	4.0	10.6	WNW	39	08:01	13.3	40	1	W	28	1020.3	19.2	29	1	W	20	1016.0
9	We	9.5	19.2	0	6.6	10.9	N	30	13:54	15.2	52	1	W	17	1022.9	18.2	46	1	SSE	22	1021.7
10	Th	10.1	18.5	2.2	5.6		SSW	35	11:46	15.6	81	7	SW	19	1030.5	17.6	58	6	SSW	24	1029.6
11	Fr	8.5	21.2	0			SE	33	13:02	17.0	63		N	7	1032.7	19.5	53		ESE	26	1028.5
12	Sa	6.5	26.1	0			WNW	35	13:09	16.6	66		NNW	13	1029.0	25.6	31		WSW	11	1024.6
13	Su	8.0	24.1	0	10.2	10.9	SE	33	13:49	17.5	67	1	NW	11	1028.8	22.5	57	1	ESE	20	1025.0
14	Mo	7.7	25.2	0	4.4	10.9	ENE	31	14:33	17.8	68	1	NW	11	1026.4	24.4	44	1	E	22	1021.1
15	Tu	9.0	28.4	0	5.0	10.6	NW	59	14:18	19.7	58	0	NNW	11	1017.4	27.9	26	1	NW	37	1011.7
16	We	9.6	20.2	0	8.0	11.1	SE	30	12:58	18.3	44	1	S	17	1017.8	19.6	46	1	SE	20	1014.4
17	Th	10.8	19.8	0	4.2		S	50	13:54	18.2	66	2		Calm	1017.0	16.4	69	7	S	28	1017.1
18	Fr	12.3	20.3	8.0	4.0		SSW	48	14:22	18.3	52		SSE	30	1025.2	16.7	68	8	SSW	26	1024.7
19	Sa	11.7	19.6				SE	41	11:43	15.8	78	8		Calm	1025.8	17.3	74	8	SE	30	1023.2
20	Su	13.4	20.0				ENE	31	16:23	16.7	90	8	SE	13	1024.0	18.6	67	8	E	15	1020.9
21	Mo	8.5	24.1	45.0	13.0	10.0	NW	30	12:51	17.0	72	1	NNW	13	1020.5	22.9	47	5	WNW	13	1015.7
22	Tu	10.7	20.3	0.6	3.6	8.2	S	59	12:47	17.7	65	7	WNW	15	1016.7	17.6	52	1	S	39	1016.4
23	We	9.2	15.1	2.0	6.0	2.0	SSW	72	14:29	10.2	81	7	SW	30	1024.8	14.4	65	7	SSW	35	1024.4
24	Th	7.6	16.2	14.0	4.4		SSW	63	14:09	12.5	59	6	SW	30	1024.8	14.6	61	2	SW	26	1023.6
25	Fr	10.3	17.1				SSW	56	14:13	13.1	88	8	WSW	19	1027.9	15.2	75	8	S	33	1026.5
26	Sa	11.5	19.0				SSE	41	00:18	13.9	85	6	WSW	13	1028.0	13.7	92	8	SW	17	1025.2
27	Su	11.1	17.8	30.8	9.8	4.7	S	48	16:06	14.5	82	7	WSW	22	1023.8	16.6	63	7	SSW	20	1020.9
28	Mo	9.0	21.2	1.2	2.8	11.3	WNW	33	07:00	16.4	62	1	WNW	20	1021.3	19.6	39	1	SSE	19	1018.0
29	Tu	6.7	25.6	0	4.4	11.2	WNW	30	13:20	16.6	64	0	NW	13	1020.1	25.3	23	1	NNW	13	1016.2
30	We	9.2	22.2	0	6.0	9.2	SSE	39	13:22	20.6	70	2	S	20	1021.6	19.9	71	5	SSE	28	1020.8
Statistics for September 2015																					
Mean		9.3	20.7		6.0	9.4				15.8	68	3		17	1022.6	19.0	54	4		22	1019.9
Lowest		4.2	15.1		2.8	2.0				10.2	40	0		Calm	1006.6	13.7	23	1	WSW	11	1007.4
Highest		13.4	28.4	45.0	13.0	11.3	SSW	72		20.6	100	8	#	30	1032.7	27.9	92	8	S	39	1029.6
Total				147.0	126.4	150.7															

Observations were drawn from Williamtown RAAF (station 061078)
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

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