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Dunmore Sand and Soil

Combined Annual Review

2011-2015

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Document Control			
Version	Prepared by	Date	Distribution
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Table of Contents

1. Introduction

1.1. Purpose/Scope

This report has been prepared to address Annual Review requirements in accordance with Condition 9, of Schedule 5 (Condition 9(5)) in Development Consent DA 195-8-2004 for Dunmore Sand and Soil Quarry. The review and associated report accounts for the period between 1 July 2011 and 30 June 2015. Condition 9(5) and all other relevant conditions required as part of the Annual Review are outlined in Table 1 with reference to the section of this report where each has been addressed.

Table 1: Relevant Conditions of Approval

Condition of Approval	Condition Requirements	Where addressed in this report
5(9)	By the end of September each year, or other timing as may be agreed by the Secretary, the Applicant must review the environmental performance of the development to the satisfaction of the Secretary. This review must: (a) Describe the development (including rehabilitation that was carried out in the previous financial year, and the development that is proposed to be carried out over the current financial year, (b) Include a comprehensive review of the monitoring results and complaints records of the development over the previous financial year, which includes a comparison of these results against: • The relevant statutory requirements, limits or performance measures/criteria; • Requirements of any plan or program required under this consent; • The monitoring results of previous years; and • The relevant predictions in the documents listed in condition 2(a) of Schedule 2; (c) Identify any non-compliances over the last year, and describe what actions were (or are being) taken to ensure compliance; (d) Identify any trends in the monitoring data over the life of the development; (e) Identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and (f) Describe what measures will be implemented over the current financial year to improve the environmental performance of the development. The Applicant must ensure that copies of the Annual Review are submitted to Council and are available to the Community Consultative Committee (see condition 6 of schedule 5) and any interested person upon request.	Section 2 Section 2.5, 3 & 4 Section 5 Sections 3 & 4 Sections 3 & 4 Sections 2, 3 & 4
3(27)	The Applicant must ensure that the flood storage capacity of the site is no less than the pre-existing flood storage capacity at all stages of the	Section 2.3

	development. Details of the available flood storage capacity must be reported in the Annual Review.	
3(57)	The Applicant must maximise the use of rail transport for delivery/despatch outside the Illawarra Region, to the satisfaction of the Secretary. Details of transportation modes and measures to assess and encourage rail transport must be provided in the Annual Review.	Section 2.2.1
3(72)	The Applicant must: (a) Provide annual production data to the DPI using the standard form for that purpose; and (b) Include a copy of this data in the Annual Review.	Section 2.2.1

1.2. Background and Site Description

Dunmore Sand and Soil Quarry, owned and operated by Boral Resources (NSW) Pty Ltd, is located at Tabbita Road Dunmore, approximately 12 kilometres north-west of Kiama in the Shellharbour Local Government Area. Dunmore Sand and Soil produces a range of sand and landscaping products through the process of sand dredging.

Development Consent (DA 195-8-2004), issued 29 June 2005 for stages 2, 3 and 4 by the Minister for Infrastructure and Planning, allows Boral to produce up to 800,000 tonnes of product per year, and transport it offsite by road and rail to local and regional markets.

Dunmore Sand and Soil (the site) covers approximately 88 hectares and is surrounded by private property, predominantly agricultural grazing land and tracts of remnant native vegetation, to the south and north. The site is bound by the Princess Motorway (Kiama Bypass) to the east and directly to the west is the Boral owned and operated Dunmore Quarry.

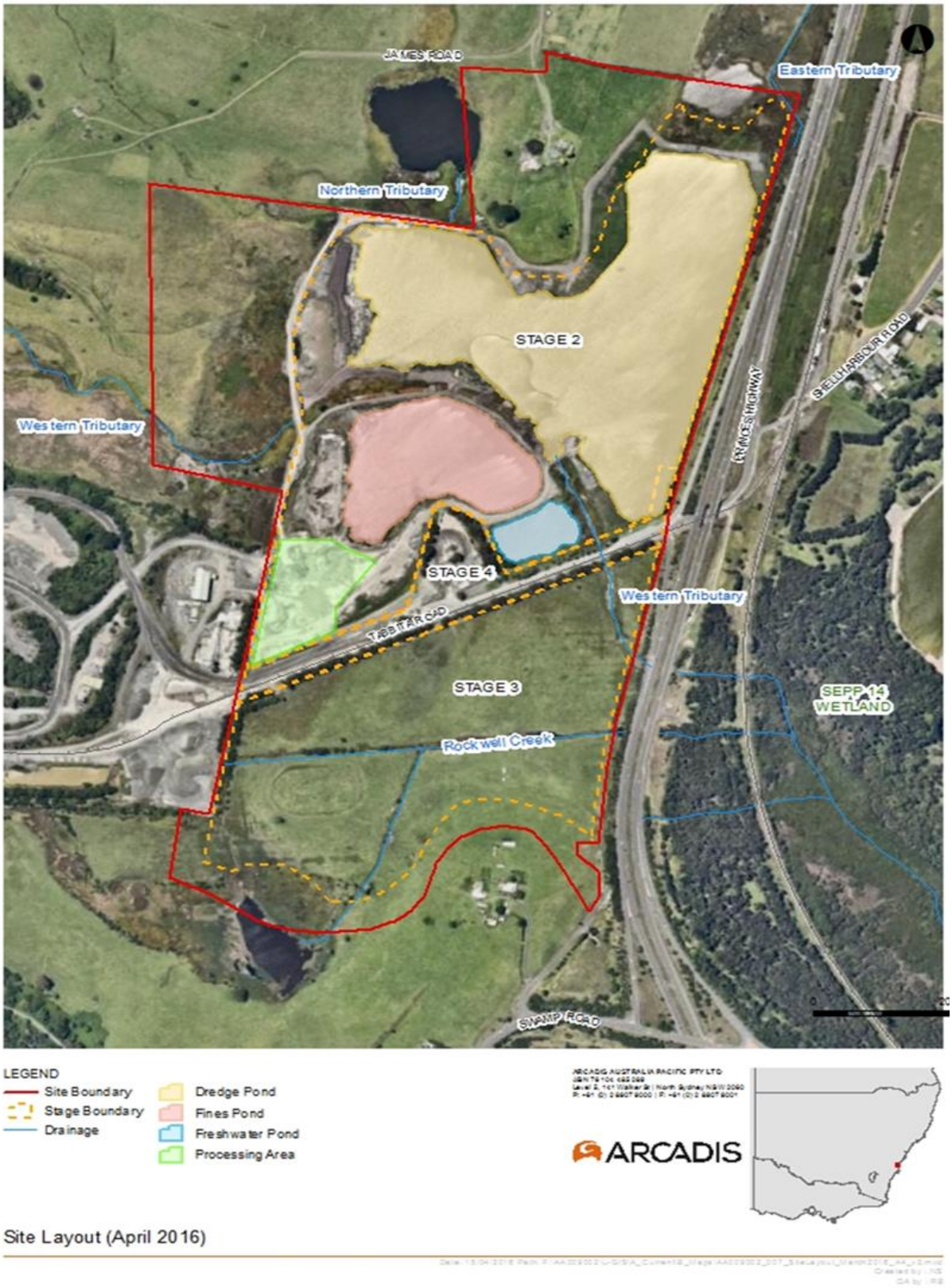
Operation of the quarry involves the sequential dredging and excavation of approximately eight million tonnes of sand and soil from Stage 2, 3 and 4. The method of extraction of these resources includes both sand and soil extraction by excavator and dredge sand extraction, followed by washing, processing and material blending. The final product is then stockpiled on site until they are transported to local and regional markets. A layout of the site is illustrated in Figure 1.

A summary of all the approvals relevant to the Dunmore Sand and Soil Quarry are provided in Table 2.

Table 2: Summary of Approvals

Approval Type	Approval Authority	Approval No.	Date Granted
Development Consent	Department of Planning & Environment	195-8-2004	29/06/2005
Environment Protection Licence	Environment Protection Authority	11147	04/05/04
Water Extraction Licence	Department of Primary Industries - Water	10BL600813	01/07/2011
Controlled Activity Approval	Department of Primary Industries - Water	10 ERM2010-1116	03/11/2010

Figure 1: Site Layout



Site Layout (April 2016)

2. Dunmore Sand and Soil Quarry Operations

2.1. Quarry Development

Throughout this FY12 to FY15 reporting period, sand dredging activities continued in the main pond of stage 2. The focus was to maintain the extraction limits and offsets on the eastern side of stage 2 boundary. Dredging activities have followed the offset along the boundary of the Princess Highway (to the east of the project) and have moved in the northern direction in the main pond prior to stopping short of the offsets of the eastern wetland area.

Future sand dredging activities will continue in stage 2, with the focus on removing the remaining resources in stage 2, towards the western end of the project. This will ensure the full extent of the material is extracted prior to commencing dredging operations in stage 3. It is expected that preparation for stage 3 will commence in the FY16 reporting period.

2.2. Production, Sales & Transport

Table 3 details the production figures for the combined reporting period (Note: the combined rail and road figures for each financial year does not equal total production for that financial year. Road and/or rail sales may include transfers from other sites).

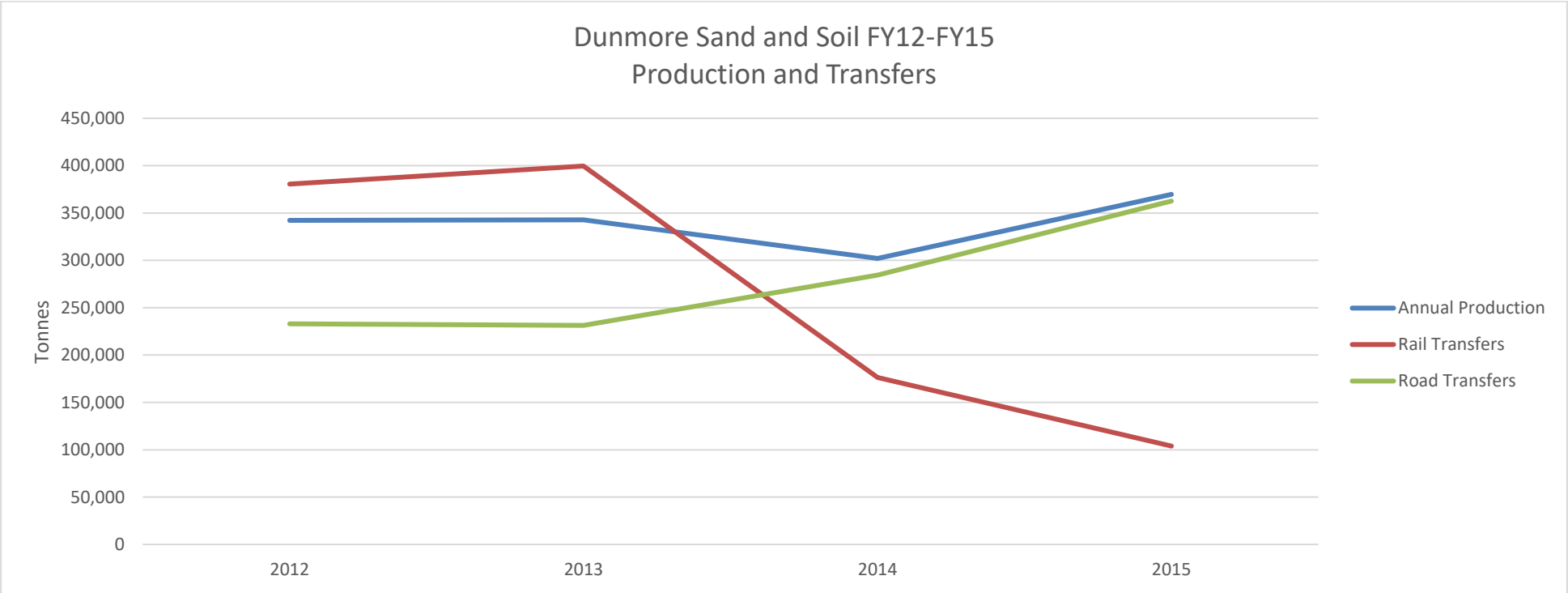
During the 2012 reporting period Dunmore Sand and Soil produced 342,236 tonnes of fine sand product and moved via rail 380,530 tonnes of product and a further 233,080 tonnes of product via road. In 2013 the annual production was 342,774 tonnes of fine sands, while the site moved a total of 399,629 tonnes of product via rail and a further 231,332 tonnes via road. In 2014 fine sand production was slightly less at 302,060 tonnes with a movement of 176,189 tonnes of product via rail and a further 284,430 tonnes via road. In 2015 fine sand production increase to 369,673 tonnes with a total movement of 103,865 tonnes via rail and 363,663 tonnes of product via road. Figure 2 compares the reporting period production and rail and road tonnes. As per the development consent, Dunmore Sand and Soil is approved to produce and transport 800,000 tonnes of product per calendar year.

Appendix 1 provides the production data currently available within the combined reporting period.

Table 3: Production Data

Month	2012			2013			2014			2015		
	Production (t)	Rail	Road	Production (t)	Rail	Road	Production (t)	Rail	Road	Production (t)	Rail	Road
January	30,600	30,658	18,187	28,200	29,567	8,442	25,437	32,490	17,021	30,196	2,215	16,670
February	27,020	28,857	21,415	27,720	34,529	15,749	24,754	35,656	29,651	30,668		29,196
March	24,350	27,314	16,853	22,090	33,821	18,620	23,030	32,150	27,747	33,184	2,233	37,818
April	22,300	27,663	12,697	16,780	31,990	14,258	28,175	25,746	23,029	24,493	2,211	21,554
May	29,304	33,327	27,259	36,158	31,428	22,230	29,842	17,002	25,833	15,965	12,412	33,387
June	32,873	28,566	17,799	23,607	28,196	15,165	23,151	12,530	19,792	35,627	12,604	31,763
July	31,971	35,221	15,043	32,286	38,203	16,742	28,529	8,712	26,238	37,072	4,402	43,974
August	26,672	38,452	22,532	30,043	38,781	20,386	20,836	8,335	14,771	30,205	6,509	34,017
September	36,214	34,665	20,357	31,334	35,189	23,864	22,544	1,824	16,218	31,081	17,460	26,335
October	27,626	37,655	17,498	32,113	37,211	26,452	21,350	1,744	26,097	31,387	15,442	31,180
November	31,498	38,011	20,961	37,341	35,132	23,623	27,787		34,321	39,453	15,299	31,270
December	21,808	20,141	22,479	25,102	25,582	25,801	26,625		23,711	30,342	13,078	25,501
Total	342,236	380,530	233,080	342,774	399,629	231,332	302,060	176,189	284,430	369,673	103,865	362,663
		613,609			630,961			460,619			466,528	

Figure 2: Production, Road and Rail Data



2.2.1. Next 12 Months

Overall production is expected to continue within stage 2 with an annual production rate compared to FY12 to FY15. Sand dredging activities will continue towards the western boundary to remove the remaining resource.

2.3. Water Management

2.3.1. Flood Storage Capacity

The site is located at the confluence of three tributaries of the Minnamurra River and, given the close proximity of groundwater to the surface, has a very high potential for flooding. Water backing up along Rocklow Creek from the Minnamurra River is also a major contributor to on-site flooding. Peak tidal flows in these waterways also influence the flood levels and duration of inundation on the site (R. W. Corkery & Co 2006).

Major floods occur in the Dunmore area at least once every 10 years and, during these events, parts of the site are likely to be inundated to a depth of one to 1.5 metres and remain inundated for a few days (R. W. Corkery & Co 2006).

The Environmental Management Plan (R. W. Corkery & Co 2006) noted that the RTA designed and constructed the North Kiama by-pass to *"match the openings of the downstream railway embankment which was designed and constructed following a flood study completed by Webb McKeown (1989) – predicting a 100 year average recurrence interval (ARI) flood level of up to 3.3m on Rocklow Creek".* The EMP went on to state that: "*The culvert system would, therefore, not impact on local flooding regimes, which based on previous flood studies of Rocklow Creek, (including Webb McKeown 1989), are considered to approximate the following:*

- *100 year Average Recurrence Interval (ARI): 3.6m AHD*
- *20 year Average Recurrence Interval (ARI): 3.3m AHD*
- *10 year Average Recurrence Interval (ARI): 3.2m AHD."*

To protect the site from floods up to and including the 1 in 100 year event the processing and stockpile area have been constructed above 3.6m AHD and site bunds are generally at 3.7 metres AHD. The majority of the access road off Tabbita Road is also above 3.6 metres AHD; however, the ramp abutting Tabbita Road was constructed below 3.6 metres AHD due to the presence of overhead powerlines and potential safety risks to heavy vehicles.

2.4. *Flora and Fauna Management*

2.4.1. Flora and Fauna Management Plan

2.4.1.1. Summary

In accordance with Condition 3(38), a Flora and Fauna Management Plan (FFMP) was prepared by Cumberland Ecology for Boral in November 2011. This FFMP incorporated a Vegetation Clearing Protocol, a Compensatory Habitat Management Plan and a Pest and Weed Management Strategy.

2.4.2. Rehabilitation Management Progress Report

During the combined reporting period limited rehabilitation or landscaping activities have occurred within dredging stage 2. Weed management activities continue across the entire site which includes periodic weed removal by hand and weed spraying.

2.4.3. Next 12 Months

During the next reporting period Dunmore Sand and Soil is expected to continue similar site management practices which includes the management of weeds fine the application of chemical spray treatment and removal be hand. Limited rehabilitation of sites is expected to occur as sand dredging activities will continue with the stage 2 pond area. The site will begin the initial consultation and works associated with the Western Trib. This works will include the following:

- Flora and Fauna Assessment,
- Survey and marking of site boundary locations,
- Preparation and submission of a controlled activities application; and
- Assessment and final design of weir criteria.

2.5. *Waste Management*

2.5.1. Waste Minimisation Measures

Boral is committed to ensuring its extraction and processing activities produces minimal waste material. Approximately 85-90% of the sand processed at Dunmore Sand and Soil becomes washed sand for internal and external sales. The remaining 10-15% of by product created during the washing process is considered as fines material or oversized material. The fines material is washed into the fines ponds which is used in the creation of the wetlands area, while the oversized product is used in site rehabilitation.

Boral is committed to continuing non-production waste management minimisation in accordance with the waste hierarchy, and minimising the amount of waste sent to landfill. Dunmore Sand and Soil and

Dunmore Quarry combine site waste and divide them further into recyclable waste materials. Table 4 outlines the site identified waste streams across Dunmore Sand and Soil and Dunmore Quarry and associated management.

Table 4: Waste Streams

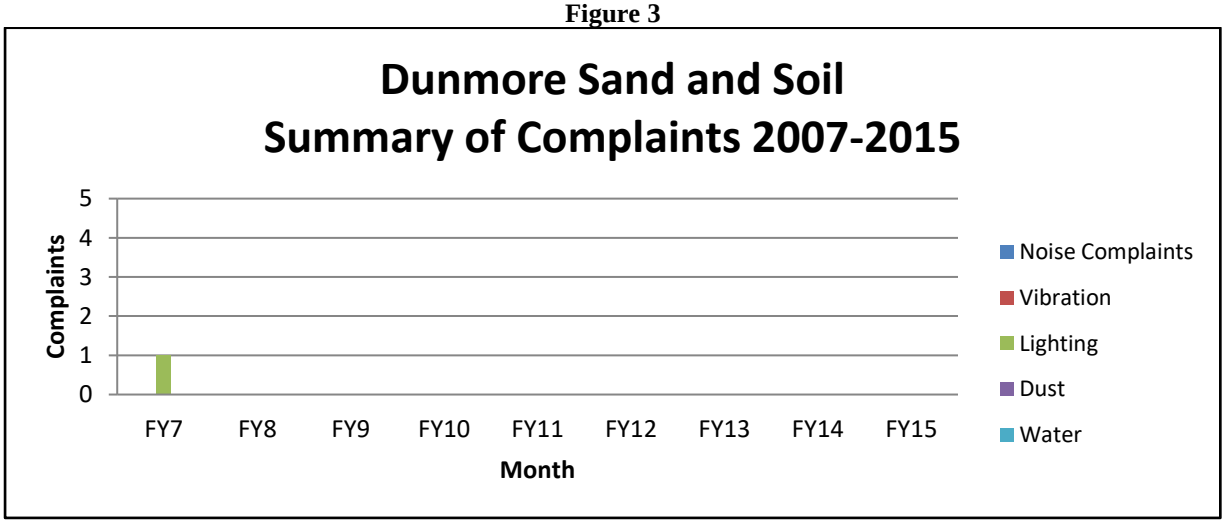
Waste Stream	Action/End use
Waste Oils	Recycled by EPA licensed contractors.
Steel	Either reused on site by boiler makers or recycled.
Vehicle Batteries	Stored on pallets and picked up by contractors for re-use/recycling.
Paper and Cardboard	All paper and cardboard waste is recycled.
Heavy Vehicle Tyres	The majority of heavy vehicle tyres are re-used on site for safety purposes, with others returned to the tyre fitting contractor for recycling.
Conveyor Belt	Stored in a designated area and periodically transported for recycling.
Timber Waste	Stored in a designated area and periodically transported for recycling.
General garbage	All other municipal waste that cannot be reused or recycled is sent to the Shellharbour Waste Depot.

3. Complaints and Community Management

3.1. Complaints Summary and Analysis

Dunmore Sand and Soil Quarry maintain a complaint register that identifies actions required to resolve issues and concerns raised by the community. During the combined reporting period no community complaints were received. Figure 3 provides an overview of the noise, vibration and dust complaints received since 2007. There have been minimal complaints received over the history of the project.

Figure 3



The complaints register is published on the Boral website.

3.2. Community

The Dunmore Sand and Soil Community Consultative Committee (CCC) continues to serve as a valuable dialogue between Boral and the local community with valuable input and feedback being provided by the community regarding operations and plans. Members are informed of the environmental performance of the site, provided with an update on operations and given a chance to tour the site and ask questions they may have regarding the operation. CCC members have also been diligent in disseminating the information from the meetings to other interested community members in the local area. The minutes of each meeting is published in the Boral website. The CCC met eight times between 2011-2015 combined reporting period. No community correspondence was received during the reporting period.

4. Environmental Monitoring

4.1. Noise

A noise monitoring program was prepared in recognition of Schedule 3 Condition 16 to monitor noise at the three receiver locations specified in the consent and EPL. These locations are displayed in Appendix 2. The noise monitoring program includes:

- Annual attended noise monitoring surveys within the months of winter; and
- Annual unattended noise monitoring surveys within the months of winter.

A Noise Compliance Assessment Report was prepared by SLR Consulting Australia and presents results of attended and unattended noise monitoring surveys undertaken at receiver locations 1 (Renton Residence), 2 (Dunmore Village) and 3 (Stocker Residence) during the combine reporting period (FY12-FY15).

The reports found that Dunmore Sand and Soil achieved compliance with the licence noise limits at all locations during all monitoring periods. Copies of the Noise Compliance Assessment Reports are attached as Appendix 6 of this report.

Figure 4 and 5 provides a graphical representation of the noise monitoring results (estimated Dunmore Sand and Soil LA_{eq} [15 minute] contribution sourced from Annual Noise Monitoring Assessments) from financial year 12 to the current financial year 15.

Figure 4

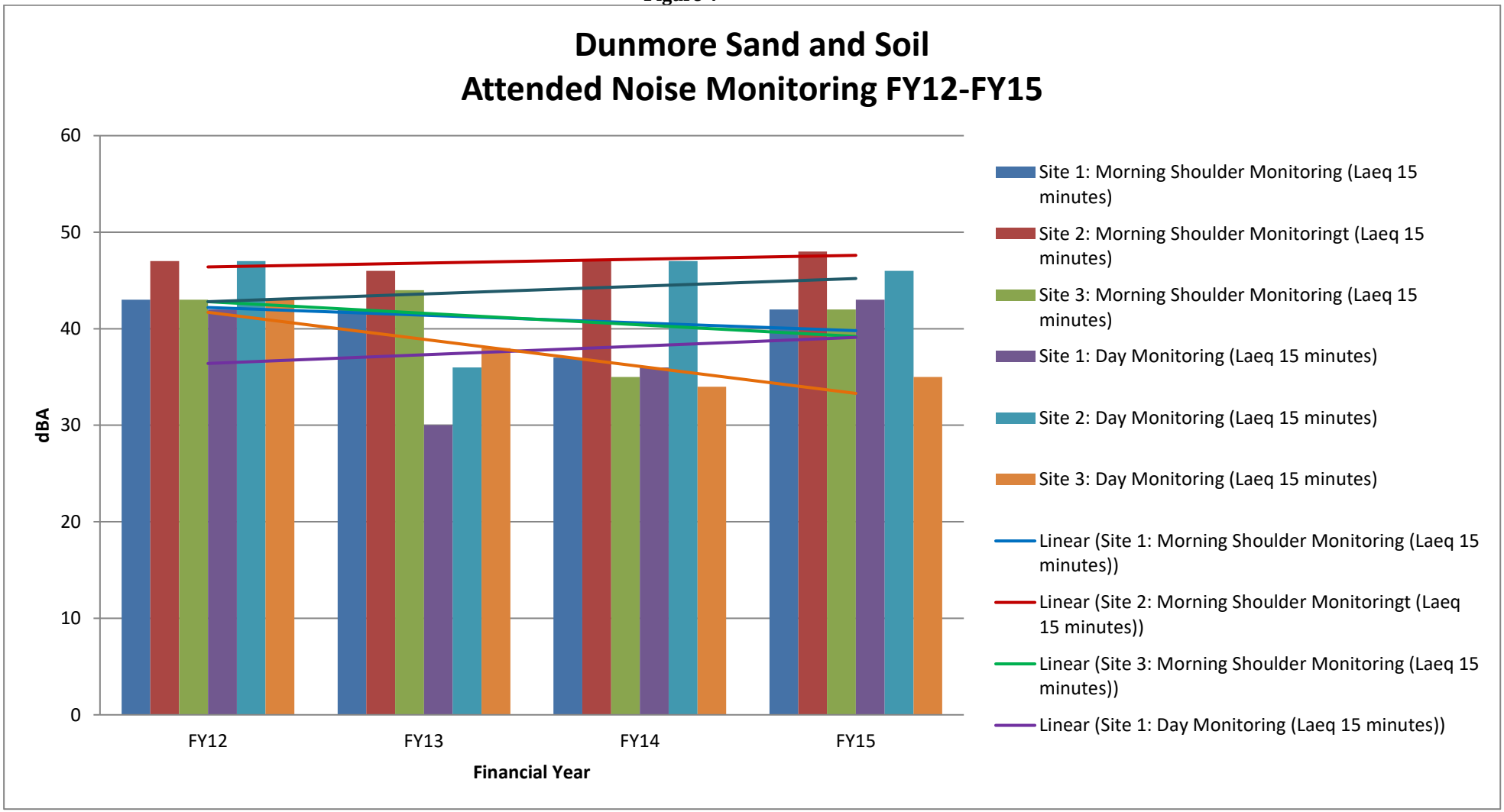
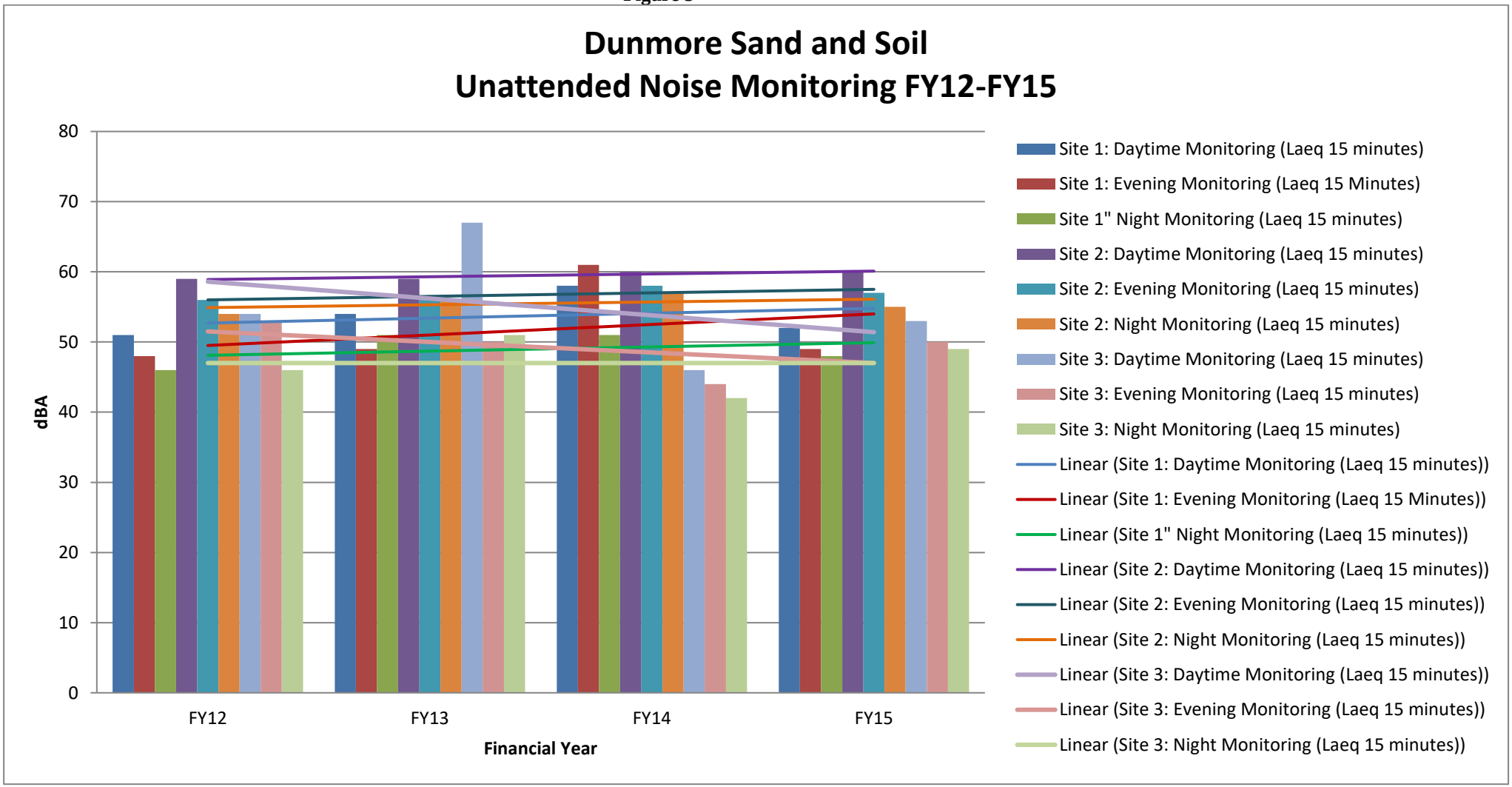

Dunmore Sand and Soil
Attended Noise Monitoring FY12-FY15
60
50
40
30
20
10
0
dBA
FY12
FY13
FY14
FY15
Financial Year
Site 1: Morning Shoulder Monitoring (Laeq 15 minutes)
Site 2: Morning Shoulder Monitoringt (Laeq 15 minutes)
Site 3: Morning Shoulder Monitoring (Laeq 15 minutes)
Site 1: Day Monitoring (Laeq 15 minutes)
Site 2: Day Monitoring (Laeq 15 minutes)
Site 3: Day Monitoring (Laeq 15 minutes)
Linear (Site 1: Morning Shoulder Monitoring (Laeq 15 minutes))
Linear (Site 2: Morning Shoulder Monitoringt (Laeq 15 minutes))
Linear (Site 3: Morning Shoulder Monitoring (Laeq 15 minutes))
Linear (Site 1: Day Monitoring (Laeq 15 minutes))

Figure 5


Dunmore Sand and Soil
Unattended Noise Monitoring FY12-FY15
80
70
60
50
40
30
20
10
0
dBA
FY12
FY13
FY14
FY15
Financial Year
Site 1: Daytime Monitoring (Laeq 15 minutes)
Site 1: Evening Monitoring (Laeq 15 Minutes)
Site 1" Night Monitoring (Laeq 15 minutes)
Site 2: Daytime Monitoring (Laeq 15 minutes)
Site 2: Evening Monitoring (Laeq 15 minutes)
Site 2: Night Monitoring (Laeq 15 minutes)
Site 3: Daytime Monitoring (Laeq 15 minutes)
Site 3: Evening Monitoring (Laeq 15 minutes)
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Linear (Site 1: Daytime Monitoring (Laeq 15 minutes))
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Linear (Site 2: Daytime Monitoring (Laeq 15 minutes))
Linear (Site 2: Evening Monitoring (Laeq 15 minutes))
Linear (Site 2: Night Monitoring (Laeq 15 minutes))
Linear (Site 3: Daytime Monitoring (Laeq 15 minutes))
Linear (Site 3: Evening Monitoring (Laeq 15 minutes))
Linear (Site 3: Night Monitoring (Laeq 15 minutes))

4.2. Air Quality

4.2.1. Deposited Dust

For Stages 2-4 of the Dunmore Lakes Sand Project, 7 deposited dust gauges have been in operation for approximately 9 years. The location of these dust gauges can be seen Appendix 3. Table 5 present the average results of deposited dust monitoring during the reporting. Figure 6 provides a graphical representation of the annual averages and linear trend patterns for the life of the project at each monitoring location. Both averages and trend patterns for insoluble solids and ash content is provided, as ash content is considered a better indicator of the project's contribution to the deposited dust gauge results. The EIS (Environmental Impact Statement) predicted annual deposited dust goal for site adopts the amenity-based guideline for dust deposition that involves restricting the increase in the mean annual dust deposition rate to no more than 2g/m2/month above existing levels, provided the existing levels are not already high. The levels recorded around the Swamp Road Quarry indicate air quality is good and it is therefore appropriate to adopt the 2g/m2/month criterion.

4.2.1.1. DD 2

During the FY 12 reporting period, deposited dust gauge 2 (DD2) yielded an annual average insoluble solids of 5.51 g/m2/month, with an average ash content of 2.82 g/m2/month. The assessment criteria of 4g/m2/month (Insoluble Impact Assessment Criteria) was exceeded on seven (7) occasions for insoluble solids, however of these only two (2) occasions yielded an ash content greater than 4g/m^2/month. This indicates that the project contribution to this monitoring location is relatively minor. Further, it was noted that bird droppings potentially contaminated a number of samples, and may have been a contributing factor to the increased deposited dust readings.

In the FY 13 reporting period, the average insoluble solids and average ash content yielded 4.19 and 2.19 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on three (3) occasions during this period for insoluble solids, however none of these occasions returned an ash content greater than 4g/m^2/month. This indicates that the project contribution to this monitoring location is very minor.

During the FY 14 reporting period, the average insoluble solids and average ash content yielded 2.21 and 1.42 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was not exceeded during FY14.

During the FY 15 reporting period, the average insoluble solids and average ash content yielded 3.57 and 1.77 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on two (2) occasions during the consolidated reporting period for insoluble solids, however of these only one (1) occasion returned an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

Over the life of the project, DD-2 had a neutral trend pattern for insoluble solids. There is a decreased trend pattern for ash content and this is considered a better reflection of the project's contribution. These results are within the EIS predicted annual deposited dust.

4.2.1.2. DD 5

During the FY 12 reporting period, deposited dust gauge 5 (DD5) yielded an annual average insoluble solids of 3.09g/m2/month, with an average ash content of 1.82 g/m2/month. The assessment criteria of 4g/m2/month (Insoluble Impact Assessment Criteria) was exceeded on three (3) occasions during FY12 for insoluble solids, however of these only two (2) occasions yielded an ash content greater than 4g/m^2/month. This indicates that the project contribution to this monitoring location is minor.

In the FY 13 reporting period, the average insoluble solids and average ash content yielded 3.26 and 1.84 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on one (1) occasion during this period for insoluble solids, however none of these occasions returned an ash content greater than 4g/m^2/month. This indicates that the project contribution to this monitoring location is very minor.

During the FY 14 reporting period, the average insoluble solids and average ash content yielded 3.63 and 1.76 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded three (3) instances during this reporting period, however none of these occasions returned an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

During the FY 15 reporting period, the average insoluble solids and average ash content yielded 2.55 and 1.46 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on two (2) occasions during the consolidated reporting period for insoluble solids, however neither of these returned an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

Over the life of the project, DD-5 has a decreasing trend for both insoluble solids and ash content. These results are within the EIS predicted annual deposited dust.

4.2.1.3. DD 6

During the FY 12 reporting period, deposited dust gauge 6 (DD6) yielded an annual average of insoluble solids of 3.17 g/m2/month, with an average ash content of 2.32 g/m2/month. The assessment criteria of 4g/m2/month (Insoluble Impact Assessment Criteria) was exceeded once (1) for insoluble solids, however this did not yield an ash content greater than 4g/m^2/month, indicates that the project contribution to this monitoring location is minor.

In the FY 13 reporting period, the average insoluble solids and average ash content yielded 3.70 and 2.48 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on two (2) occasion during this period for insoluble solids, however only one of these returned an ash content greater than 4g/m^2/month. This indicates that the project contribution to this monitoring location is minor.

During the FY 14 reporting period, the average insoluble solids and average ash content yielded 2.67 and 1.58 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on one (1) occasion during this reporting period, however this instance did not return an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

During the FY 15 reporting period, the average insoluble solids and average ash content yielded 3.94 and 2.00 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on four (4) occasions during this period for insoluble solids, however none of these returned an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

Over the life of the project, DD-6 has a noticeable decreasing trend for both insoluble solids and ash content. These results are within the EIS predicted annual deposited dust.

4.2.1.4. DD 7

During the FY 12 reporting period, deposited dust gauge 7 (DD 7) yielded annual average of insoluble solids of 2.75 g/m2/month, with an average ash content of 1.81 g/m2/month. The assessment criteria of 4g/m2/month (Insoluble Impact Assessment Criteria) was exceeded on three (3) instances during for insoluble solids, however none of these yielded an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

In the FY 13 reporting period, the average insoluble solids and average ash content yielded 3.36 and 2.36 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on three (3) occasion during this period for insoluble solids, however only two of these returned an ash content greater than 4g/m^2/month. This indicates that the project contribution to this monitoring location is minor.

During the FY 14 reporting period, the average insoluble solids and average ash content yielded 3.201 and 2.00 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on one (1) occasion during this reporting period, however this instance did not return an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

During the FY 15 reporting period, the average insoluble solids and average ash content yielded 3.10 and 1.98 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on three (3) occasions during the FY15 period for insoluble solids, however none of these returned an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

Over the life of the project, DD-7 has a noticeable decreasing trend for both insoluble solids and ash content. These results are within the EIS predicted annual deposited dust.

4.2.1.5. DD 8

During the FY 12 reporting period, deposited dust gauge 8 (DD 8) yielded annual average of insoluble solids of 6.81 g/m2/month, with an average ash content of 3.98 g/m2/month. The assessment criteria of 4g/m2/month (Insoluble Impact Assessment Criteria) was exceeded on nine (3) occasions during for

insoluble solids, however only two of these yielded an ash content greater than 4g/m^2/month. Further analysis shows that the February 2012 result was much higher than the preceding and following months, suggesting that the gauge was in face contaminated with non-project related material. As the dust gauge is located in an active grazing paddock, there is increased potential for this gauge to collect localised matter from agricultural practices. If the February 2012 result is removed, the adjusted average for insoluble solids and ash content is significantly reduced to 5.71 and 3.12 g/m^2/month, suggesting the project's contribution is relatively minor.

In the FY 13 reporting period, the average insoluble solids and average ash content yielded 4.91 and 2.81 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on six (6) occasion during this period for insoluble solids, however only two (2) of these returned an ash content greater than 4g/m^2/month. This indicates that the project contribution to this monitoring location is minor.

During the FY 14 reporting period, the average insoluble solids and average ash content yielded 2.68 and 1.80 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on two (2) occasions during this reporting period, however neither instance returned an ash content greater than 4g/m^2/month, indicating that the project contribution to this monitoring location is very minor.

During the FY 15 reporting period, the average insoluble solids and average ash content yielded 5.93 and 4.96 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on six (6) occasions during the FY15 period for insoluble solids, and each of these returned an ash content greater than 4g/m^2/month. During these high readings, stripping operations and Stage operational pond development was taking place. As such, it should be noted that monitoring point DD-8 is located directly adjacent the Stage 2 operating pond boundary and borders the Stage 2 operating pond unsealed service road, and this gauge would have captured localised dust. Further, investigation of particularly high result for April 2015 has identified that the deposited dust bottle was full to the brim with captured rain water, and was approximately over 4 times greater than both the preceding and following months results suggesting that the gauge was contaminated with either non-project related matter or very localised dust associated with nearby earthmoving operations. Removing the April 2015 result from analysis yields a significantly decreased average insoluble solids and average ash content of 4.09 and 3.18 g/m^2/month respectively. During the next reporting period this gauge will continue to be assessed for its location appropriateness.

Over the life of the project, DD-8 has a noticeable decreasing trend for insoluble solids; however there is a slight increasing trend for ash content. This increase is considered a result of the Stage 2 operations footprint increasing outward. These results are within the EIS predicted annual deposited dust when the contaminated sample collected in April 2015 is removed.

4.2.1.6. DD 9

During the FY 12 reporting period, deposited dust gauge 7 (DD 7) yielded an annual average of insoluble solids of 4.84g/m2/month, with an average ash content of 3.29 g/m2/month. The assessment criteria of 4g/m2/month (Insoluble Impact Assessment Criteria) was exceeded on five (5) occasions for insoluble solids, however only two (2) of these yielded an ash content greater than 4g/m^2/month. Investigation of the April 2012 result shows that the preceding and following monthly results are much lower; indicating that the April result is likely to be contaminated with non-project related material. Removing the April 2012 result from analysis yields a significantly decreased average insoluble solids and average ash content of 3.66 and 2.46 g/m^2/month respectively. This suggests that the contribution to this monitoring location is very minor.

In the FY 13 reporting period, the average insoluble solids and average ash content yielded 5.87 and 3.60 g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on eight (8) occasions during this period for insoluble solids, and of these five (5) returned an ash content greater than 4g/m^2/month. DD 9 is the closest monitoring location to the adjacent Dunmore Quarry processing plant, suggesting that the project may not be the only contributor operation to this monitoring location.

During the FY 14 reporting period, the average insoluble solids and average ash content yielded 4.61and 3.28g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on eight (8) occasions during this reporting period, however only 4 instances an ash content greater than 4g/m^2/month. The annual average ash content was lower than 4g/m^2/month indicating that the project contribution to this monitoring location was minor.

During the FY 15 reporting period, the average insoluble solids and average ash content yielded 7.36 and 4.42g/m^2/month respectively. The Insoluble Impact Assessment Criteria was exceeded on ten (10) occasions during the FY15 period for insoluble solids, and of these three (3) returned an ash content greater than 4g/m^2/month. Investigation into the particularly high readings, considering the preceding and following months are much lower, suggests the December 2014 and March 2015 samples were contaminated. Removing these results from analysis yields a significantly decreased average insoluble solids and average ash content of 5.70 and 3.37 g/m^2/month respectively.

There are also certain characteristics of the monitoring site which have been considered in this analysis. The dust deposition gauge is situated in an active livestock grazing paddock which is regularly slashed by the land manager. The gauge is also adjacent a well-worn (i.e a dirt track) paddock transfer point which is always open for livestock to move from one paddock to another, and as such creates potential for localised dust. All of these characteristics are considered non-project related potential contributors to the dust deposition results. Further, the project's existing Air Quality Monitoring Program stipulates that DD 9 be decommissioned with the commencement of Stage 3 extraction operations. As such, it is anticipated that DD 9 will be decommissioned during the FY16 reporting period.

Over the life of the project, DD-9 has an increasing trend for both insoluble solids and ash content. This is considered to be a reflection of increased operations at the Dunmore Lakes Sand Project, the adjacent Dunmore Quarry and agricultural practices. These results are within the EIS predicted annual deposited dust when the contaminated sample collected in December 2014 and March 2015 are removed.

4.2.1.7. DD10

Deposited dust gauge 10 (DD10) was installed on 05/01/15. In FY15, DD 10 yielded annual average insoluble solids of 3.38 g/m2/month, with an average ash content of 2.01 g/m2/month. The assessment criteria of 4g/m2/month (Insoluble Impact Assessment Criteria) was exceeded on one (1) occasion during the reporting period for insoluble solids which also returned ash content greater than 4g/m2/month. The available averages indicates that the project contribution to this location is very minor

The trend patterns over the life of the project at DD10 are not yet applicable. These results are within the EIS predicted annual deposited dust

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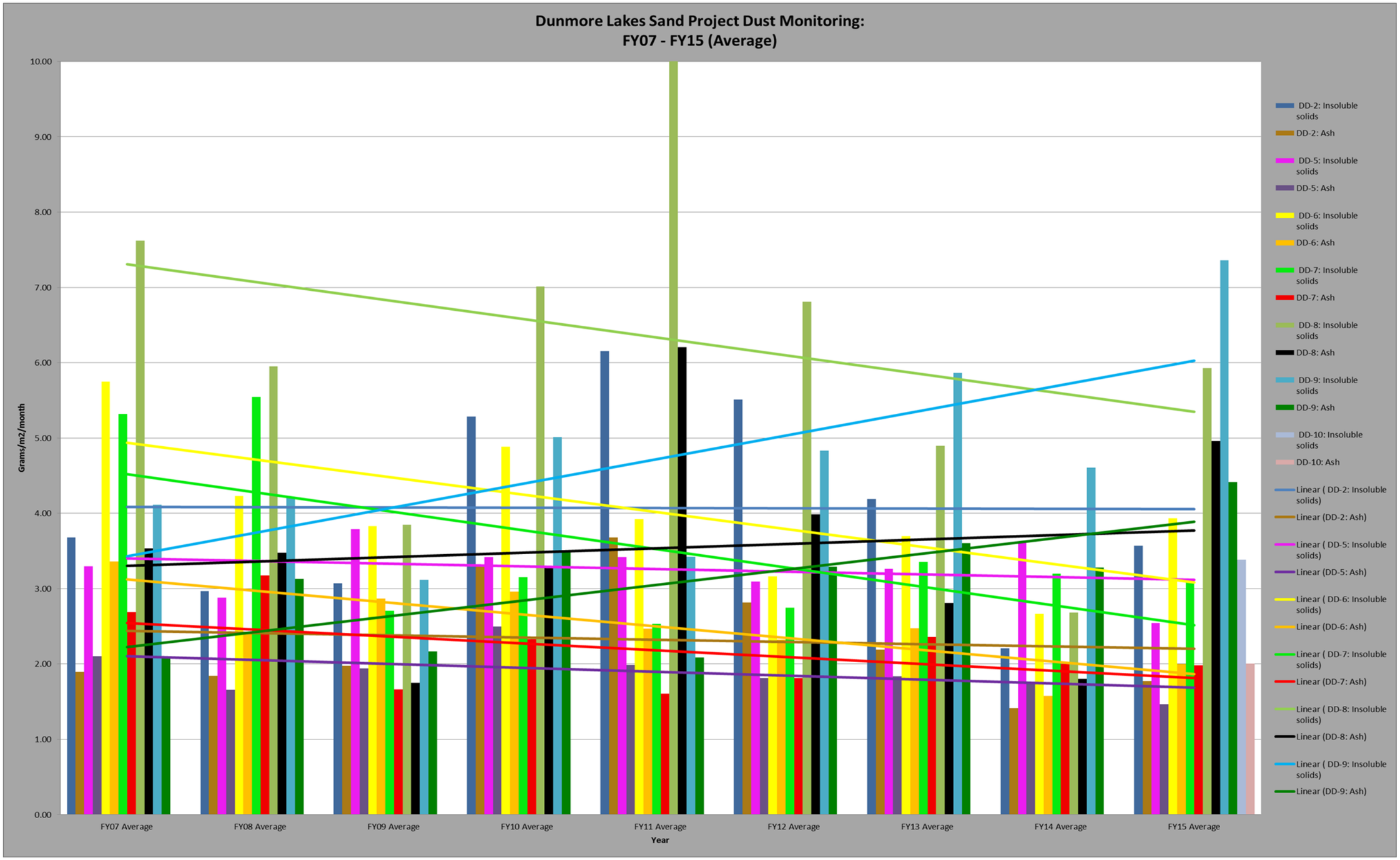
Table 5: Deposited Dust Measurements

	DD-2 g/m2/month		DD-5 g/m2/month		DD-6 g/m2/month		DD-7a g/m2/month		DD-8 g/m2/month		DD-9 g/m2/month		DD-10 g/m2/month	
Date	DD-2: Insoluble solids	DD-2: Ash	DD-5: Insoluble solids	DD-5: Ash	DD-6: Insoluble solids	DD-6: Ash	DD-7: Insoluble solids	DD-7: Ash	DD-8: Insoluble solids	DD-8: Ash	DD-9: Insoluble solids	DD-9: Ash	DD-10: Insoluble solids	DD-10: Ash
FY07 Average	3.68	1.90	3.30	2.10	5.75	3.36	5.32	2.69	7.62	3.54	4.11	2.08	Not active	
FY08 Average	2.97	1.84	2.88	1.66	4.23	2.43	5.55	3.17	5.95	3.48	4.21	3.13		
FY09 Average	3.07	1.98	3.79	1.94	3.83	2.87	2.71	1.66	3.85	1.75	3.12	2.17		
FY10 Average	5.29	3.30	3.42	2.50	4.88	2.96	3.15	2.33	7.01	3.29	5.02	3.49		
FY11 Average	6.16	3.68	3.42	1.99	3.92	2.47	2.53	1.60	12.20	6.21	3.43	2.09		
FY12 Average	5.51	2.82	3.09	1.82	3.17	2.32	2.75	1.81	6.81	3.99	4.84	3.29		
FY13 Average	4.19	2.19	3.26	1.84	3.70	2.48	3.36	2.36	4.90	2.81	5.87	3.60		
FY14 Average	2.21	1.42	3.63	1.76	2.67	1.58	3.20	2.00	2.68	1.81	4.61	3.28		
FY15 Average	3.57	1.77	2.55	1.46	3.94	2.00	3.10	1.98	5.93	4.96	7.36	4.42	3.38	2.01

Figure 6


Dunmore Lakes Sand Project Dust Monitoring:
FY07 - FY15 (Average)
Grams/m2/month
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
FY07 Average
FY08 Average
FY09 Average
FY10 Average
FY11 Average
FY12 Average
FY13 Average
FY14 Average
FY15 Average
Year
DD-2: Insoluble solids
DD-2: Ash
DD-5: Insoluble solids
DD-5: Ash
DD-6: Insoluble solids
DD-6: Ash
DD-7: Insoluble solids
DD-7: Ash
DD-8: Insoluble solids
DD-8: Ash
DD-9: Insoluble solids
DD-9: Ash
DD-10: Insoluble solids
DD-10: Ash
Linear (DD-2: Insoluble solids)
Linear (DD-2: Ash)
Linear (DD-5: Insoluble solids)
Linear (DD-5: Ash)
Linear (DD-6: Insoluble solids)
Linear (DD-6: Ash)
Linear (DD-7: Insoluble solids)
Linear (DD-7: Ash)
Linear (DD-8: Insoluble solids)
Linear (DD-8: Ash)
Linear (DD-9: Insoluble solids)
Linear (DD-9: Ash)

4.2.1.8. Deposited Dust Summary and Opportunities for Improvement

Analysis of the deposited dust records indicates that there were a number of exceedances of insoluble solids monthly results; however there were significantly fewer of ash content recorded across the consolidated reporting period. It is evident that the project's contribution may be limited.

To continue managing air quality and dust levels the site will continue dust management; via the application of the water cart on roads and the entrance road. Further, the site will continue to actively manage dust on site through supervisor inspections and watering of stockpiles.

Measures planned for the coming year include:

- Investigate the location appropriateness of DD 8 and DD 9.

4.3. Meteorology

A meteorological monitoring station has been operating at Dunmore since 2002. Table 6 presents a summary of the results of rainfall received during the reporting period against that received in previous years and regional averages. Seasonal wind roses showing the local wind movements are available in Appendix 5.

Table 6: Rainfall Data

Month	Rainfall (mm)													Regional Averages* (mm)
	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	
July	20	24	27.5	41	66.8	30.5	63.5	35.5	78	194	39	57.9	5	63.4
August	13.5	39	17	3	51	58.5	39	0.5	72	85.5	4.5	17	252	83.3
September	14	8	20	33	104	39	56	19.5	145.5	58.5	11.5	85.5	150.5	67.4
October	6.5	49	248.5	48	12	17	79	125.5	126	124.5	83.5	6.5	102.5	100.5
November	17	150	79	144.5	39.5	161.5	46.5	65	198	165.5	25	173	24	115.6
December	70	41	71	36.5	68.5	120	112.5	80.5	147.5	60.5	32	71.5	232.5	94.6
January	68	31	39.5	90	14	65.5	9.5	79	59.5	52	183	42.5	192.5	130.3
February	112	70	126.5	87.1	218	351.5	107.5	197.5	48	307.5	142.5	59	99.5	156.4
March	121	84	0	43.5	68.5	36.5	39	74	362.5	146.5	23.5	326	57	160.4
April	91.5	200	25	8	167	90.5	106	63	37.4*	85	136	64.5	308.5	129.3
May	427.5	44	66	65.5	21	8	20	80.5	58.3*	9.5	81	13	49	106.4
June	74.5	42	12.5	124	287.5	85.5	67	52	74	88	239	34	76	112.4
Total	**1035.5**	**782**	**732.5**	**724.1**	**1117.8**	**1064**	**745.5**	**872.5**	**1407**	**1377**	**1000.5**	**950.4**	**1549**	**1320**

* Source: Bureau of Meteorology, Climate Statistics for Australian Location, Wollongong University http://www.bom.gov.au/climate/averages/tables/cw_068188.shtml. Red values indicate month received higher than the regional average rainfall.

4.4. Water

4.4.1. Surface Water

Water quality monitoring was collected from existing water monitoring points as per the conditions of Environmental Protection Licence (EPL) 11147 and Development Consent DA 195-8-2004 (see Appendix 4 for all Dunmore Sand and Soil water monitoring locations). The four (4) licenced monitoring points include:

- DW12 (EPL11)
- DW11 (EPL12)
- DW20a (EPL9); and
- DW18 (EPL13).

The main water monitoring parameters tested across Dunmore Sand and Soil include:

- pH,
- Turbidity (NTU),
- Total Suspended Solids (TSS); and
- Electrical Conductivity (EC).

Figures 7 to 10 provide a comparison of water quality results across all monitoring points for Dunmore Sand and Soil (note: there are no relevant predictions provided in the EIS to provide a comparison).

Monitoring point DW12 (EPL11) is located upstream of Dunmore Sand and Soil in a North West location. The site is highly influenced by farming practises with cattle often found within the waters of the monitoring locations. The site is furthermore influenced by water discharge from nearby quarry practices not associated with Boral.

During the FY12 reporting period DW12 (EPL11) recorded a minimum pH of 6 and a maximum pH of 6.3 with an annual average of 6.2. The minimum turbidity was 9.3 and the maximum was 22 with an annual average of 14.4. The minimum TSS recorded at site was 0.3 with a maximum of 5.1 and an annual average of 2.1. The minimum EC recorded was 202 with a maximum of 239 and an average of 219.7.

During the FY13 reporting period DW12 (EPL11) recorded a minimum pH of 6.2 and a maximum pH of 6.5 with an annual average of 6.4. The minimum turbidity was 1.1 and the maximum was 27 with an annual average of 8.7. The minimum TSS recorded at site was 1 with a maximum of 18 and an annual average of 3.6. The minimum EC recorded was 170 with a maximum of 335 and an average of 248.6.

During the FY14 reporting period DW12 (EPL11) recorded a minimum pH of 6.4 and a maximum pH of 7.1 with an annual average of 6.6. The minimum turbidity was 7.5 and the maximum was 24 with an annual average of 14.4. The minimum TSS recorded at site was 0.4 with a maximum of 66 and an annual average of 22.5. The minimum EC recorded was 180 with a maximum of 305 and an average of 213.2.

During the FY15 reporting period DW12 (EPL11) recorded a minimum pH of 6.4 and a maximum pH of 7 with an annual average of 6.7. The minimum turbidity was 5.4 and the maximum was 26 with an annual average of 13.3. The minimum TSS recorded at site was 1 with a maximum of 13 and an annual average of 5.2. The minimum EC recorded was 203 with a maximum of 236 and an average of 217. Table 7 provides a summary of the annual monitoring results.

Table 7: DW12 (EPL11) FY17 Monitoring Results

Month	DW12 (EPL11)			
	pH	NTU	TSS	EC
FY06 Average	-	-	-	-
FY07 Average	7.57	7.5	8.9	832
FY08 Average	7.87	6.3	23.5	-
FY09 Average	-	-	-	-
FY10 Average	-	-	-	-
FY11 Average	6.2	9	1.5	259.4
FY12 Average	6.2	14.4	2.1	219.7
FY12 Minimum	6	9.3	0.3	202
FY12 Maximum	6.3	22	5.1	239
FY13 Average	6.4	8.7	3.6	248.6
FY13 Minimum	6.2	1.1	1	170
FY13 Maximum	6.5	27	18	335
FY14 Average	6.6	14.4	22.5	213.2
FY14 Minimum	6.4	7.5	0.4	180
FY14 Maximum	7.1	24	66	305
FY15 Average	6.7	13.3	5.2	217

FY15 Minimum	**6.4**	**5.4**	**1**	**203**
FY15 Maximum	**7**	**26**	**13**	**236**

Monitoring point DW11 (EPL12) is located upstream of Dunmore Sand and Soil in a North, North/West location. The site is highly influenced by farming practises and water discharge from nearby quarry practices not associated with Boral. Table 8 provides a summary of the annual monitoring results.

During the FY12 reporting period DW11 (EPL12) recorded a minimum pH of 6.8 and a maximum pH of 8.5 with an annual average of 7.2. The minimum turbidity was 1 and the maximum was 75 with an annual average of 28.5. The minimum TSS recorded at site was 0.4 with a maximum of 38 and an annual average of 212. The minimum EC recorded was 338 with a maximum of 882 and an average of 563.9.

During the FY13 reporting period DW11 (EPL12) recorded a minimum pH of 7.1 and a maximum pH of 7.6 with an annual average of 7.4. The minimum turbidity was 3.2 and the maximum was 130 with an annual average of 32.4. The minimum TSS recorded at site was 1.6 with a maximum of 77 and an annual average of 13.3. The minimum EC recorded was 284 with a maximum of 798 and an average of 594.4.

During the FY14 reporting period DW11 (EPL12) recorded a minimum pH of 7.5 and a maximum pH of 87.8 with an annual average of 7.6. The minimum turbidity was 5.4 and the maximum was 240 with an annual average of 71.6. The minimum TSS recorded at site was 2.8 with a maximum of 92 and an annual average of 19.9. The minimum EC recorded was 453 with a maximum of 831 and an average of 605.1.

During the FY15 reporting period DW11 (EPL12) recorded a minimum pH of 6.7 and a maximum pH of 8.3 with an annual average of 7.6. The minimum turbidity was 2.2 and the maximum was 100 with an annual average of 26.3. The minimum TSS recorded at site was 0.8 with a maximum of 63 and an annual average of 13.7. The minimum EC recorded was 77 with a maximum of 1025 and an average of 646.1.

Table 8: DW11 (EPL12) FY17 Monitoring Results

Month	DW11 (EPL12)			
	pH	NTU	TSS	EC
FY06 Average	-	-	-	-
FY07 Average	7.58	7	31.8	837
FY08 Average	8.1	43.9	30	258
FY09 Average	7.25	-	1.3	1030
FY10 Average	7.3	36	9.4	887.5
FY11 Average	7.5	34.7	15.3	682.5
FY12 Average	7.2	28.5	12.2	563.9
FY12 Minimum	6.8	1	0.4	338
FY12 Maximum	8.5	75	38	882
FY13 Average	7.4	32.4	13.3	594.4
FY13 Minimum	7.1	3.2	1.6	284
FY13 Maximum	7.6	130	77	798
FY14 Average	7.6	71.6	19.9	605.1
FY14 Minimum	7.5	5.4	2.8	453
FY14 Maximum	7.8	240	92	831
FY15 Average	7.6	26.3	13.7	646.1
FY15 Minimum	6.7	2.2	0.8	77
FY15 Maximum	8.3	100	63	1025

Monitoring point DW20a (EPL9) is located downstream of Dunmore Sand and Soil in a South East location. The site is influenced by Dunmore Sand and Soil water discharge from stage 2 works and from the Princess Highway. Table 9 provides a summary of the annual monitoring results.

During the FY12 reporting period DW20a (EPL9) recorded a minimum pH of 6.5 and a maximum pH of 7.3 with an annual average of 6.9. The minimum turbidity was 1.5 and the maximum was 100 with an annual average of 15.4. The minimum TSS recorded at site was 0.4 with a maximum of 94 and an annual

average of 13.1. The minimum EC recorded was 135 with a maximum of 847 and an average of 524.2. During the reporting period this monitoring location has recorded results outside the goal levels. The main influence noted on water quality is the impact of cattle using the area churning up sediment. No discharge has occurred from Stage 2 operations upstream of the sampling site except in the instance of localised flooding experienced over the reporting period. Some samples were not able to be taken due to the site being too shallow or having no flow.

During the FY13 reporting period DW20a (EPL9) recorded a minimum pH of 5.2 and a maximum pH of 7.9 with an annual average of 6.7. The minimum turbidity was 3 and the maximum was 60 with an annual average of 19.5. The minimum TSS recorded at site was 3.4 with a maximum of 90 and an annual average of 21.1. The minimum EC recorded was 269 with a maximum of 18000 and an average of 1605.8. During the reporting period this monitoring location has recorded results outside the goal levels. Similar to the previous reporting period the main influence noted on water quality is the impact of cattle using the area churning up sediment. No discharge has occurred from Stage 2 operations upstream of the sampling site except in the instance of localised flooding experienced over the reporting period. During times of localised flooding extractive activities were ceased as a precautionary measure to reduce any potential downstream impacts. The fines pond remained isolated from surrounding tributaries over the reporting period by use of a soil bund. Some samples were not able to be taken due to the site being too shallow or having no flow. At times the water level around the sample site can be too high preventing safe access to the site resulting in some samples not being able to be obtained. Some samples recorded a pH less than 6.5 with no operational activities occurring to influence these results. Operational measures to reduce potential downstream impacts such as bunding of the fines pond and ceasing extractive activities during localised flooding have been employed by the sites across this and previous reporting periods.

During the FY14 reporting period DW20a (EPL9) recorded a minimum pH of 7 and a maximum pH of 7.4 with an annual average of 7.3. The minimum turbidity was 6.5 and the maximum was 50 with an annual average of 21. The minimum TSS recorded at site was 3.2 with a maximum of 92 and an annual average of 19.5. Note: the maximum TSS result is has occurred as a result of a sustained rainfall event. The minimum EC recorded was 341 with a maximum of 735 and an average of 534.4.

During the FY15 reporting period DW20a (EPL9) recorded a minimum pH of 7.1 and a maximum pH of 7.8 with an annual average of 7.4. The minimum turbidity was 7.1 and the maximum was 28 with an annual average of 13.6. The minimum TSS recorded at site was 2.8 with a maximum of 22 and an annual average of 12.7. The minimum EC recorded was 491 with a maximum of 1306 and an average of 681.1.

Table 9: DW20a (EPL9) FY17 Monitoring Results

Month	DW20a (EPL9)			
	pH	NTU	TSS	EC
FY06 Average	-	-	-	-
FY07 Average	7.12	23	24	-
FY08 Average	7.76	8.5	3.2	592.5
FY09 Average	6.85	24.6	64.7	4778
FY10 Average	6.7	21.5	36.6	7267.9
FY11 Average	6.6	13.4	10	484.7
FY12 Average	6.9	15.4	13.1	524.2
FY12 Minimum	6.5	1.5	0.4	135
FY12 Maximum	7.3	100	94	847
FY13 Average	6.7	19.5	21.1	1605.8
FY13 Minimum	5.2	3	3.4	269
FY13 Maximum	7.9	60	90	18000
FY14 Average	7.3	21	19.5	534.4
FY14 Minimum	7	6.5	3.2	341
FY14 Maximum	7.4	50	92	735
FY15 Average	7.4	13.6	12.7	681.1
FY15 Minimum	7.1	7.1	2.8	491
FY15 Maximum	7.8	28	22	1306

Monitoring point DW18 (EPL13) is located south of Dunmore Sand and Soil in a South, South/West location in Rocklow Creek. The site is influenced by farming practises and water discharge from nearby quarry practices associated with Boral. Table 10 provides a summary of the annual monitoring results.

During the FY12 reporting period DW18 (EPL13) recorded a minimum pH of 6.2 and a maximum pH of 7.3 with an annual average of 6.8. The minimum turbidity was 2.2 and the maximum was 30 with an annual average of 14.1. The minimum TSS recorded at site was 1.7 with a maximum of 45 and an annual average of 13.4. The minimum EC recorded was 168 with a maximum of 745 and an average of 444.1.

During the FY13 reporting period DW18 (EPL13) recorded a minimum pH of 6.4 and a maximum pH of 7.5 with an annual average of 6.8. The minimum turbidity was 11 and the maximum was 70 with an annual average of 26.4. The minimum TSS recorded at site was 4 with a maximum of 147 and an annual average of 27.6. The minimum EC recorded was 153 with a maximum of 6900 and an average of 807.6.

During the FY14 reporting period DW18 (EPL13) recorded a minimum pH of 6.8 and a maximum pH of 7.5 with an annual average of 7.1. The minimum turbidity was 16 and the maximum was 110 with an annual average of 36.2 .The minimum TSS recorded at site was 8.8 with a maximum of 43 and an annual average of 20.9. The minimum EC recorded was 164 with a maximum of 1298 and an average of 548.1.

During the FY15 reporting period DW18 (EPL13) recorded a minimum pH of 4.8 and a maximum pH of 8.4 with an annual average of 7.1. The minimum turbidity was 6.7 and the maximum was 42 with an annual average of 21.2. The minimum TSS recorded at site was 4 with a maximum of 171 and an annual average of 32.1. The minimum EC recorded was 215 with a maximum of 4320 and an average of 702.5.

Table 10: DW18 (EPL13) FY17 Monitoring Results

Month	DW18 (EPL13)			
	pH	NTU	TSS	EC
FY06 Average	-	-	-	-
FY07 Average	6.72	42.5	25.3	3140
FY08 Average	7.8	15.8	9.8	665
FY09 Average	7.19	148	241	855.8
FY10 Average	6.6	57.9	149.5	1246.9
FY11 Average	6.7	18	31.2	424.1
FY12 Average	6.8	14.1	13.4	444.1
FY12 Minimum	6.2	2.2	1.7	168
FY12 Maximum	7.3	30	45	745
FY13 Average	6.8	26.4	27.6	807.6
FY13 Minimum	6.4	11	4	153

FY13 Maximum	**7.5**	**70**	**147**	**6900**
FY14 Average	**7.1**	**36.2**	**20.9**	**548.1**
FY14 Minimum	**6.8**	**16**	**8.8**	**164**
FY14 Maximum	**7.5**	**110**	**43**	**1298**
FY15 Average	**7.1**	**21.2**	**32.1**	**702.5**
FY15 Minimum	**4.8**	**6.7**	**4**	**215**
FY15 Maximum	**8.4**	**42**	**171**	**4320**

During the reporting period Dunmore Sand and Soil did not released water from stage 2 works at point DW16. DW16 was a closed loop circuit of water and any water leaving site between the FY12 and Fy15 reporting period was due to flooding. Table 11 provides a summary of the annual monitoring results.

During the FY12 reporting period DW16 recorded a minimum pH of 6.8 and a maximum pH of 7.3 with an annual average of 7. The minimum turbidity was 1.3 and the maximum was 25 with an annual average of 7.5. The minimum TSS recorded at site was 0.8 with a maximum of 60 and an annual average of 17.1. The minimum EC recorded was 543 with a maximum of 804 and an average of 591.9.

During the FY13 reporting period DW16 recorded a minimum pH of 6.6 and a maximum pH of 7.3 with an annual average of 7. The minimum turbidity was 1.8 and the maximum was 24 with an annual average of 10.7. The minimum TSS recorded at site was 1.6 with a maximum of 23 and an annual average of 9.4. The minimum EC recorded was 302 with a maximum of 804 and an average of 558.

During the FY14 reporting period DW16 recorded a minimum pH of 7.1 and a maximum pH of 8 with an annual average of 7.4. The minimum turbidity was 9 and the maximum was 45 with an annual average of 28.8. The minimum TSS recorded at site was 5 with a maximum of 332 and an annual average of 99.5. The minimum EC recorded was 537 with a maximum of 878 and an average of 713.5.

During the FY15 reporting period DW16 recorded a minimum pH of 7.2 and a maximum pH of 8.1 with an annual average of 7.7. The minimum turbidity was 6.9 and the maximum was 500 with an annual average of 176.62. The minimum TSS recorded at site was 4 with a maximum of 1076 and an annual average of 368.3. The minimum EC recorded was 509 with a maximum of 779 and an average of 630.3.

Table 11: 16 FY17 Monitoring Results

Month	DW16			
	pH	NTU	TSS	EC

FY06 Average	**-**	**-**	**-**	**-**
FY07 Average	**-**	**5.7**	**2.7**	**60.4**
FY08 Average	**7.72**	**20.1**	**142.5**	**703**
FY09 Average	**7.35**	**42.8**	**176.4**	**980.7**
FY10 Average	**6.7**	**15.4**	**39.5**	**1572.8**
FY11 Average	**7.2**	**4.2**	**11.3**	**660.9**
FY12 Average	**7**	**7.5**	**17.1**	**591.9**
FY12 Minimum	**6.8**	**1.3**	**0.8**	**543**
FY12 Maximum	**7.3**	**25**	**60**	**804**
FY13 Average	**7**	**10.7**	**9.4**	**558**
FY13 Minimum	**6.6**	**1.8**	**1.6**	**302**
FY13 Maximum	**7.3**	**24**	**23**	**804**
FY14 Average	**7.4**	**28.8**	**99.5**	**713.5**
FY14 Minimum	**7.1**	**9**	**5**	**537**
FY14 Maximum	**8**	**45**	**332**	**878**
FY15 Average	**7.7**	**176.6**	**368.3**	**630.3**
FY15 Minimum	**7.2**	**6.9**	**4**	**509**
FY15 Maximum	**8.1**	**500**	**1076**	**779**

The water discharged throughout the reporting period were within the water discharge limits of the Development Consent with a TSS limit of 50mg/L and a pH of + or – 1 within the 100 percent concentration limit.

Figure 7

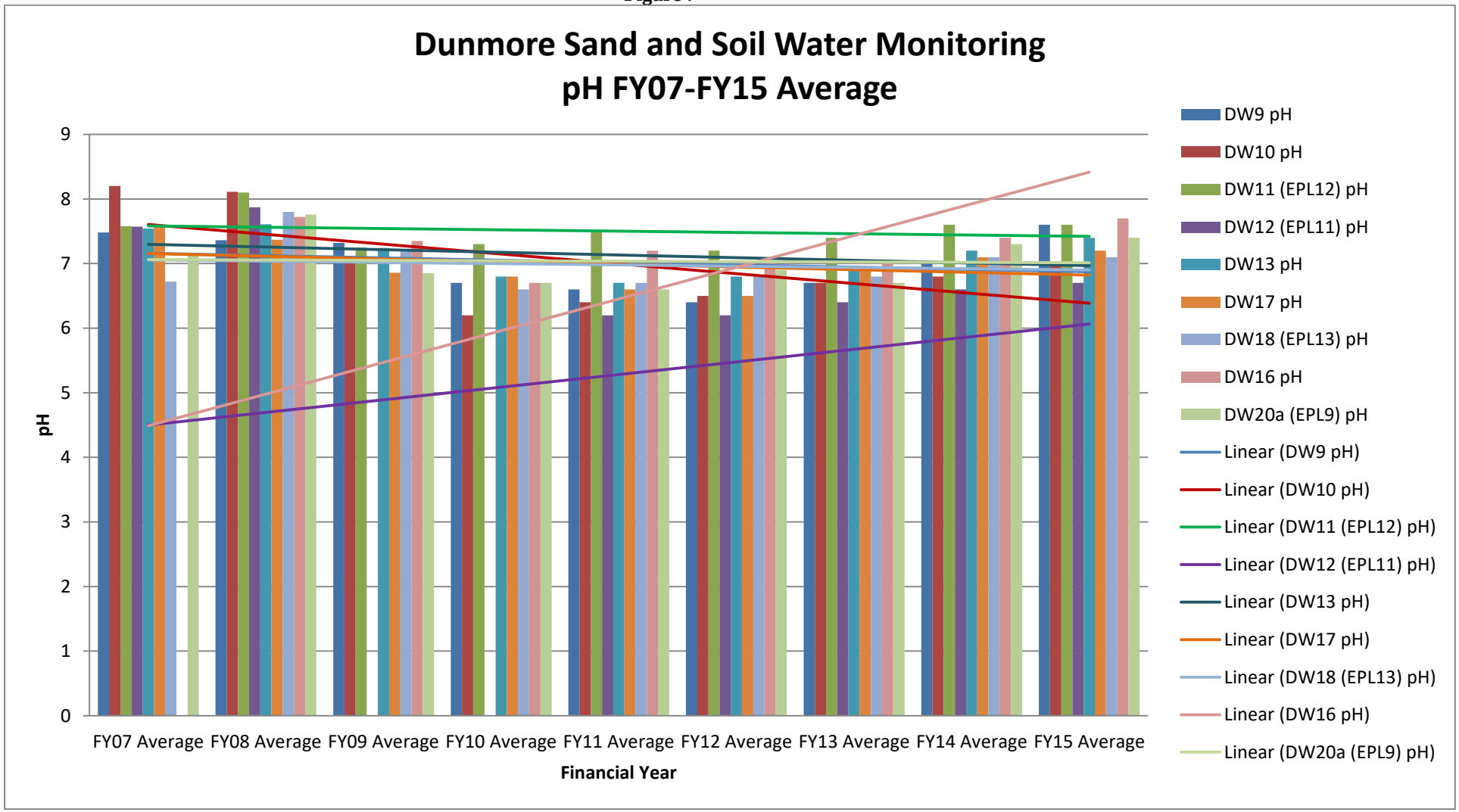

Dunmore Sand and Soil Water Monitoring
pH FY07-FY15 Average
pH
0
1
2
3
4
5
6
7
8
9
FY07 Average
FY08 Average
FY09 Average
FY10 Average
FY11 Average
FY12 Average
FY13 Average
FY14 Average
FY15 Average
Financial Year
DW9 pH
DW10 pH
DW11 (EPL12) pH
DW12 (EPL11) pH
DW13 pH
DW17 pH
DW18 (EPL13) pH
DW16 pH
DW20a (EPL9) pH
Linear (DW9 pH)
Linear (DW10 pH)
Linear (DW11 (EPL12) pH)
Linear (DW12 (EPL11) pH)
Linear (DW13 pH)
Linear (DW17 pH)
Linear (DW18 (EPL13) pH)
Linear (DW16 pH)
Linear (DW20a (EPL9) pH)

Figure 8

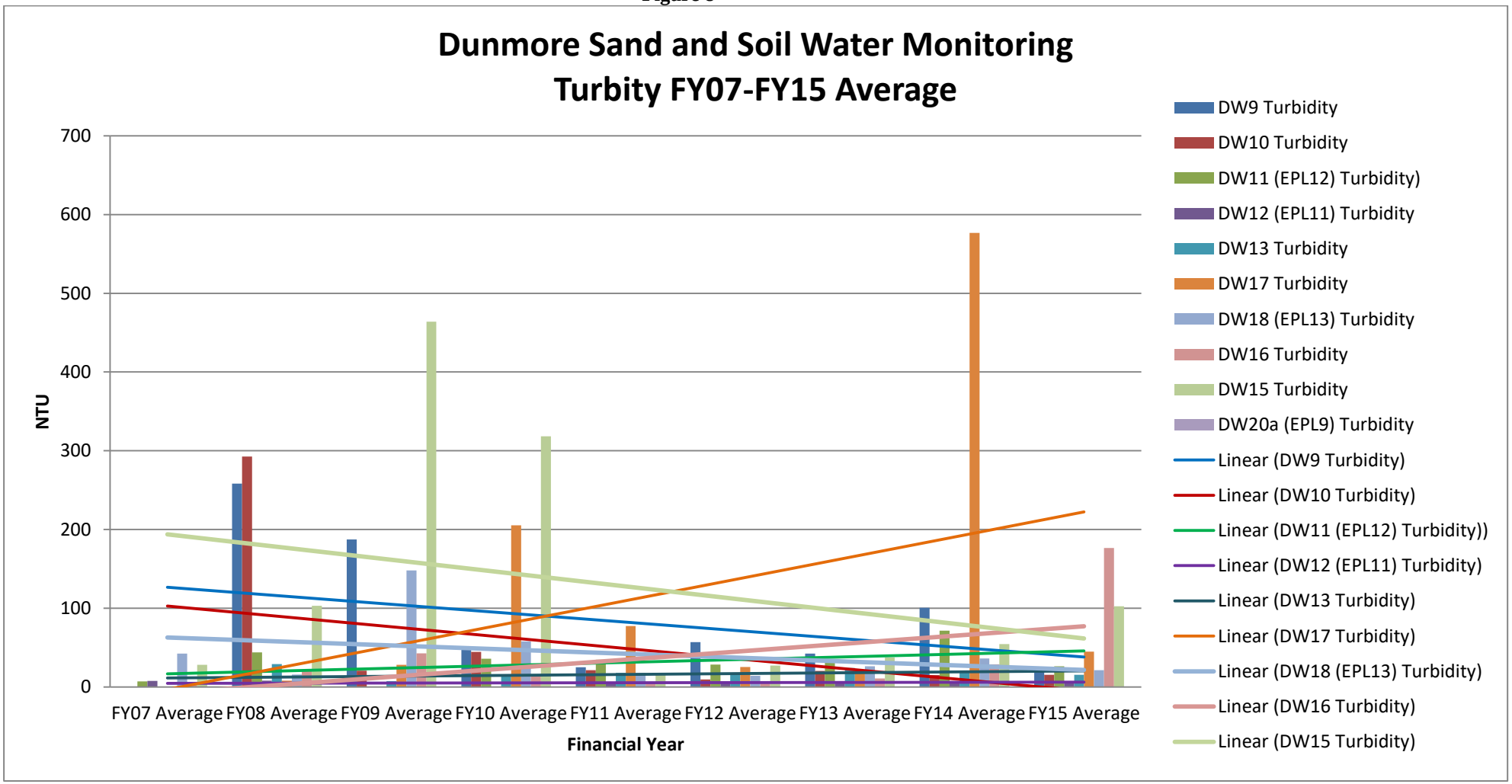

Dunmore Sand and Soil Water Monitoring
Turbity FY07-FY15 Average
NTU
700
600
500
400
300
200
100
0
FY07 Average
FY08 Average
FY09 Average
FY10 Average
FY11 Average
FY12 Average
FY13 Average
FY14 Average
FY15 Average
Financial Year
DW9 Turbidity
DW10 Turbidity
DW11 (EPL12) Turbidity)
DW12 (EPL11) Turbidity
DW13 Turbidity
DW17 Turbidity
DW18 (EPL13) Turbidity
DW16 Turbidity
DW15 Turbidity
DW20a (EPL9) Turbidity
Linear (DW9 Turbidity)
Linear (DW10 Turbidity)
Linear (DW11 (EPL12) Turbidity))
Linear (DW12 (EPL11) Turbidity)
Linear (DW13 Turbidity)
Linear (DW17 Turbidity)
Linear (DW18 (EPL13) Turbidity)
Linear (DW16 Turbidity)
Linear (DW15 Turbidity)

Figure 9

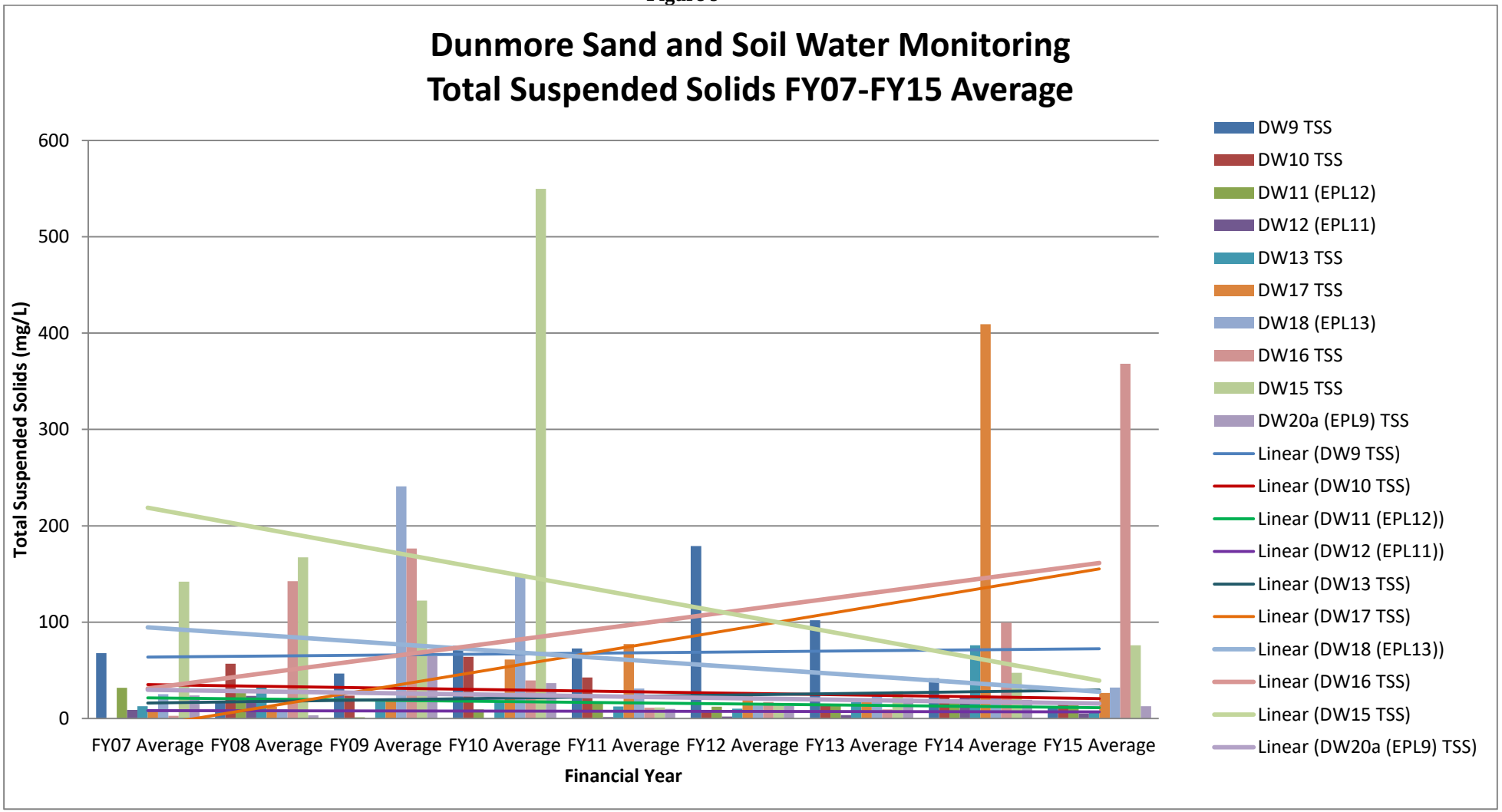
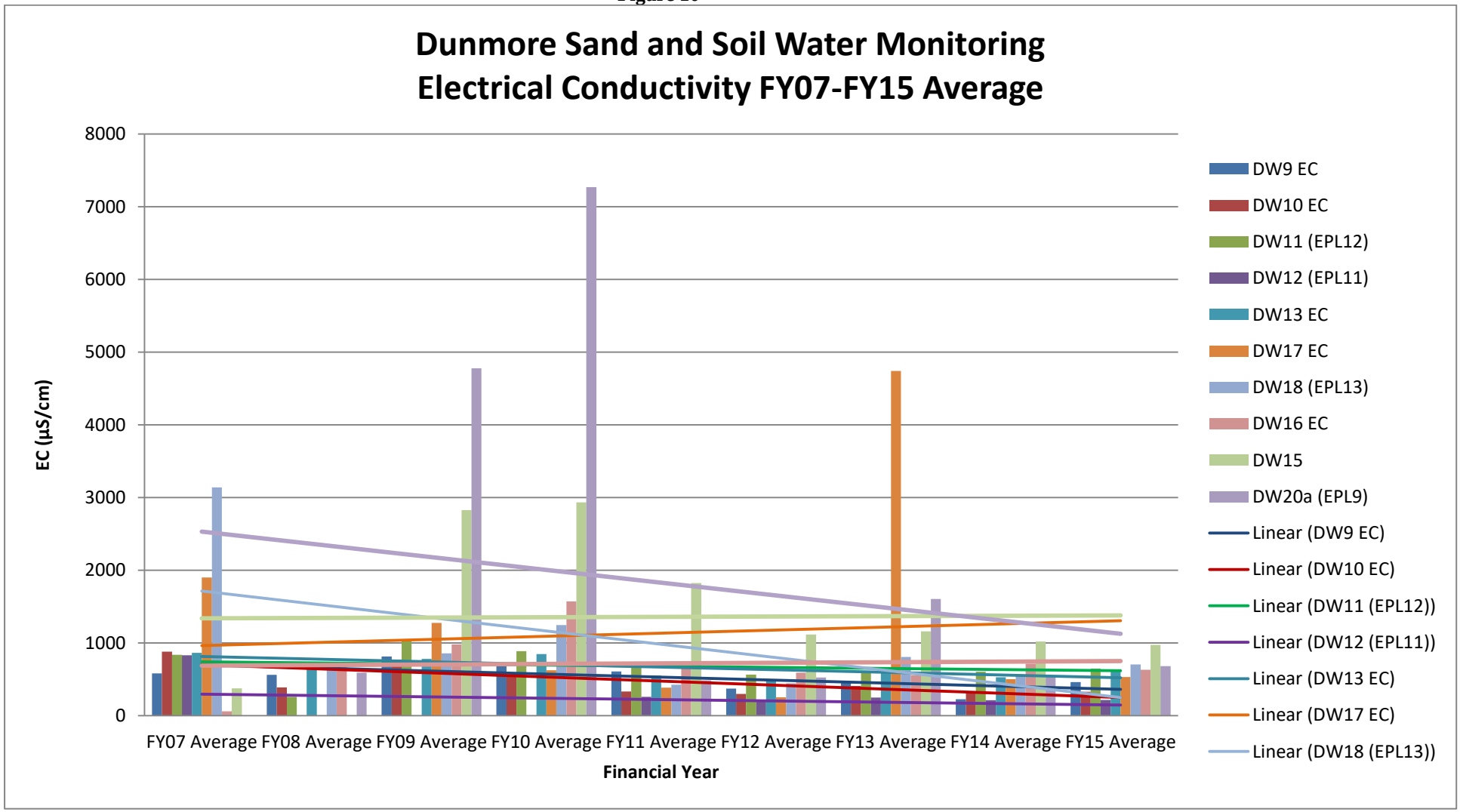

Dunmore Sand and Soil Water Monitoring
Total Suspended Solids FY07-FY15 Average
Total Suspended Solids (mg/L)
600
500
400
300
200
100
0
FY07 Average
FY08 Average
FY09 Average
FY10 Average
FY11 Average
FY12 Average
FY13 Average
FY14 Average
FY15 Average
Financial Year
DW9 TSS
DW10 TSS
DW11 (EPL12)
DW12 (EPL11)
DW13 TSS
DW17 TSS
DW18 (EPL13)
DW16 TSS
DW15 TSS
DW20a (EPL9) TSS
Linear (DW9 TSS)
Linear (DW10 TSS)
Linear (DW11 (EPL12))
Linear (DW12 (EPL11))
Linear (DW13 TSS)
Linear (DW17 TSS)
Linear (DW18 (EPL13))
Linear (DW16 TSS)
Linear (DW15 TSS)
Linear (DW20a (EPL9) TSS)

Figure 10


Dunmore Sand and Soil Water Monitoring
Electrical Conductivity FY07-FY15 Average
EC (µS/cm)
8000
7000
6000
5000
4000
3000
2000
1000
0
FY07 Average
FY08 Average
FY09 Average
FY10 Average
FY11 Average
FY12 Average
FY13 Average
FY14 Average
FY15 Average
Financial Year
DW9 EC
DW10 EC
DW11 (EPL12)
DW12 (EPL11)
DW13 EC
DW17 EC
DW18 (EPL13)
DW16 EC
DW15
DW20a (EPL9)
Linear (DW9 EC)
Linear (DW10 EC)
Linear (DW11 (EPL12))
Linear (DW12 (EPL11))
Linear (DW13 EC)
Linear (DW17 EC)
Linear (DW18 (EPL13))

4.4.2. Ground Water

During the combined reporting period Environmental Earth Sciences NSW were engaged by Boral to undertake a review of the annual groundwater environmental monitoring data. The review periods are between FY12 and FY15. See Appendix 7 for each Groundwater report (Note there are no relevant predictions provided in the EIS to provide a comparison). The common results indication the following:

- Influences on groundwater levels are related to recharge from rainfall and minor tidal influx;
- Reductions in groundwater levels are related to periods of low rainfall; and
- Water-table fluctuations are naturally occurring and cannot be seen to be impacted by dredging activities in the area.

Groundwater monitoring will continue across the Dunmore Sand and Soil borehole sites during the FY16 reporting period.

5. Compliance

5.1. Internal Environmental Audit

During the combined reporting period an internal environmental audit was conducted by Boral personnel to determine the current environmental state of the operation. The audit included a review of the following:

- Environmental Protection Licence 11147,
- Development Approval DA 195-8-2004,
- Environmental monitoring and compliance,
- Complaints and community relations,
- Waste management;
- Site equipment and stockpiles;
- Dangerous goods and chemicals;
- Environmental planning and controls; and
- Environmental management systems.

A summary of the site environmental results and recommendations in Table 12.

Table 12: Internal Audit Results and Recommendations

Description of Potential Environmental Impact	Recommendations	Actions
Soil and Groundwater Pollution: There are no procedures in place for hydrocarbon spills at diesel refuelling point.	Create a spill procedure for the diesel refuelling point.	A Pollution Incident Response Management Plan (PIRMP) has been implemented to cover all site potential environmental incidents.
Waste Pollution: Septic system is due to be re-registered with council.	Register septic system with council.	The septic system has been registered with council.
Soil and Groundwater Pollution: Evidence of spills at the truck grease refill point.	Provide a spill tray for the truck grease refill point.	Spill trays provided for the truck grease refill point.
Waste Pollution: Maintain the waste tracking register.	Compile and maintain a waste tracking register.	Waste register implemented. To be maintained.
Administration: Out of date site contacts.	Update the site contact details.	Site contact details have been updated.

6. Conclusion

Throughout this reporting period Dunmore Sand and Soil maintained extraction and processing of sand materials within stage 2 sand dredging pond. Extraction in stage 2 pond involved the dredge initially removing resources in a northern direction before heading in a western direction to commence claiming remaining resources. Production levels across all reporting calendar years were consistent and within the consent approval conditions.

Site rehabilitation was minimal across site during the combined reporting period. With the expansion of stage 2 and continual works within this area, there was little to no areas on site where the site could be reformed to its final design as per the sites rehabilitation management plan. The project continued management of flora with weed management activities conducted periodically across site and within stage 1 of the project.

The annual dust monitoring program continued during the combined reporting period and consisted of monthly monitoring and analyses of dust deposition gauges. The results across the reporting period were within the site criteria goals. The annual noise monitoring conducted by using both attended and unattended techniques proved to be compliant and within the site criteria goals.

Water quality results for the combined reporting period were consistent and were aligned with the site goals. As the sand dredging within stage 2 pond develops so will the monitoring and management of both surface and groundwater up and downstream, along with internal water monitoring.

Dunmore Sand and Soil is working towards complete site compliance and during the reporting period a combined internal environmental audit was conducted. The audit identified low to medium actions/recommendations.

Appendix 1 – DPI Production Data

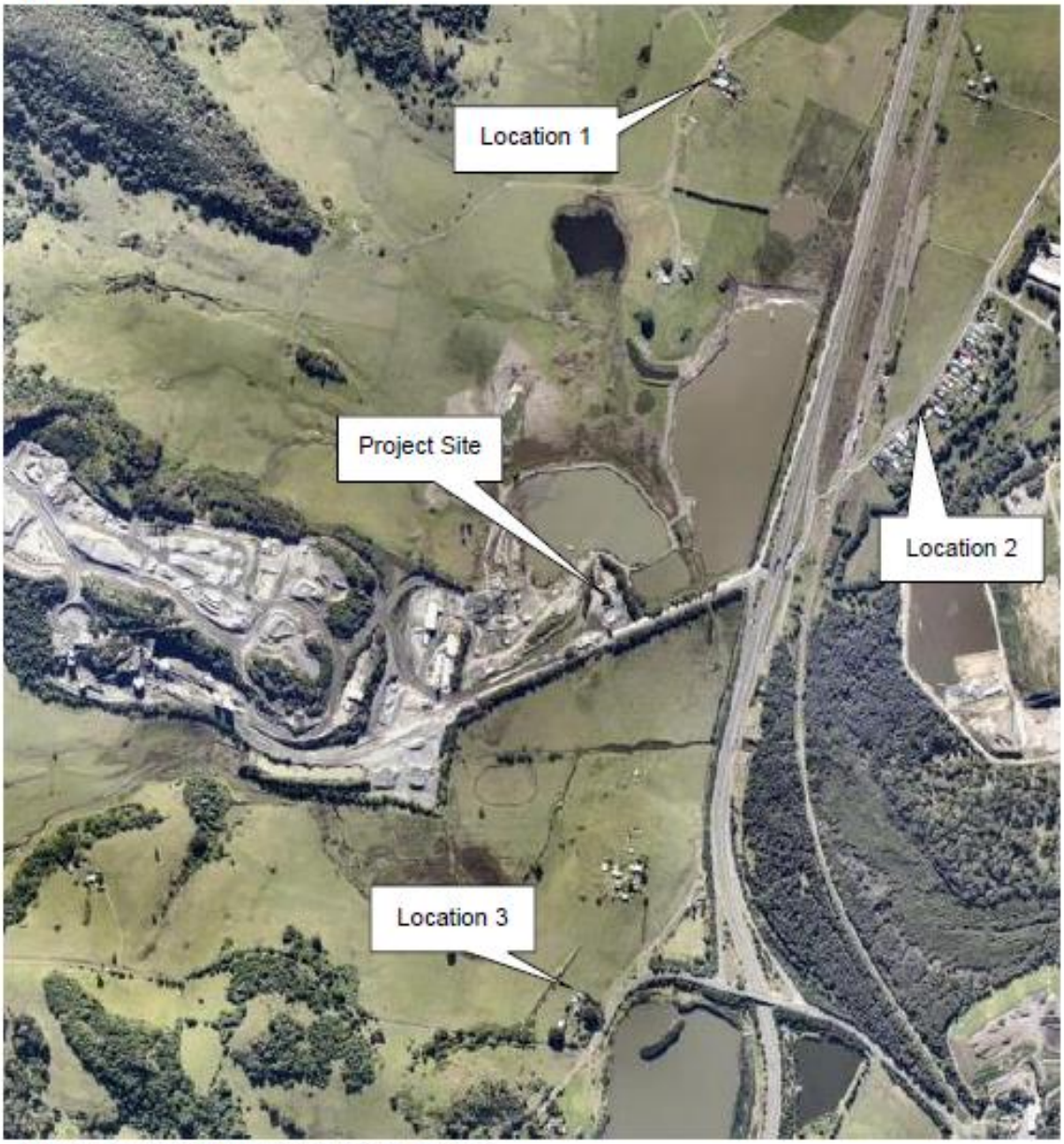
Product	Quantity Tonnes FY14	Quantity Tonnes FY15
Virgin Materials **Crushed Coarse Aggregates**		
Over 75mm		
Over 30mm to 75mm		
5mm to 30mm		
Under 5mm	**59,599**	**35,897**
Natural Sand	**31,742**	**45,695**
Manufactured Sand	**94,220**	
Prepared Road Base & Sub Base		
Other Unprocessed Materials	**6,016**	**5,039**
Construction Sand **Excluding Industrial**		**110,718**
Industrial Sand		
Foundry, Moulding		
Glass		
Other (Specify)		
TOTAL SITE PRODUCTION	**191,577**	**197,349**

Appendix 2 – Noise Monitoring Locations

Table 1 Monitoring Locations

Location	Description
Location 1	Renton Residence – James Road
Location 2	Dunmore Village – 25 Shellharbour Road
Location 3	Stocker Residence – 40 Swamp Road

Figure 1 Noise Monitoring Locations

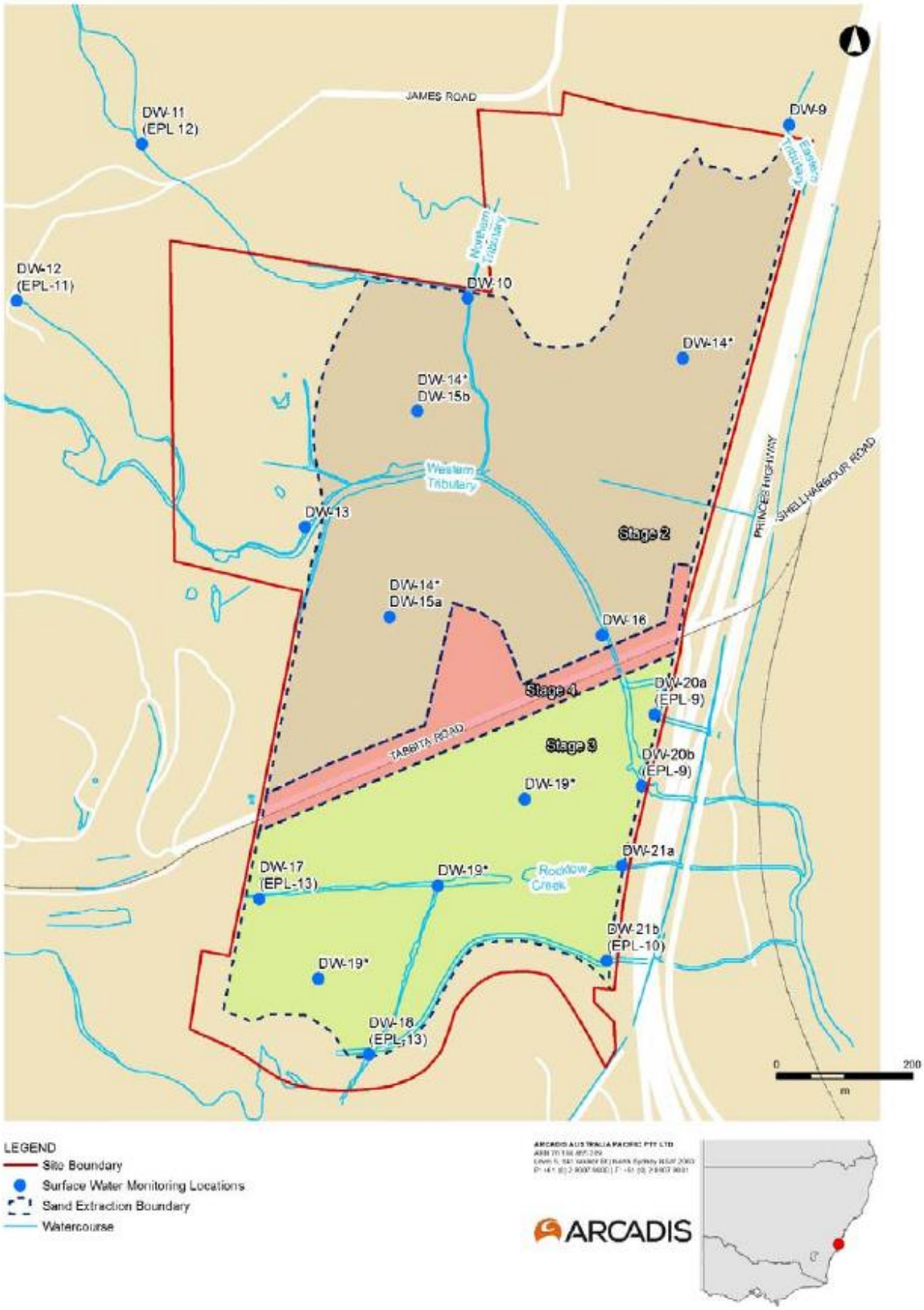


Note: Image courtesy of Nearmap (dated 21 June 2014).

Appendix 3 – Air Quality Monitoring Locations


DD10/7b
DD6
DD8
DD7a
DD9
DD5
DD2

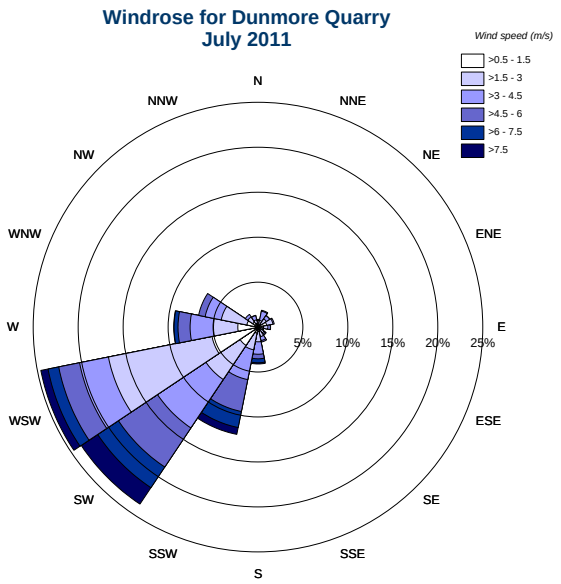
Appendix 4 – Surface Water Quality Monitoring Locations


JAMES ROAD
DW-11 (EPL 12)
DW-9
DW-12 (EPL-11)
DW-10
DW-14*
DW-14* DW-15b
Western Tributary
DW-13
Stage 2
PRINCES HIGHWAY
SHELLHARBOUR ROAD
DW-14* DW-15a
DW-16
Stage 4
DW-20a (EPL-9)
TABBITA ROAD
Stage 3
DW-20b (EPL-9)
DW-19*
DW-21a
DW-17 (EPL-13)
DW-19*
Rodillow Creek
DW-21b (EPL-10)
DW-19*
DW-18 (EPL-13)
0
200
m
LEGEND
Site Boundary
Surface Water Monitoring Locations
Sand Extraction Boundary
Watercourse
ARCADIS

Appendix 5 – Wind Roses

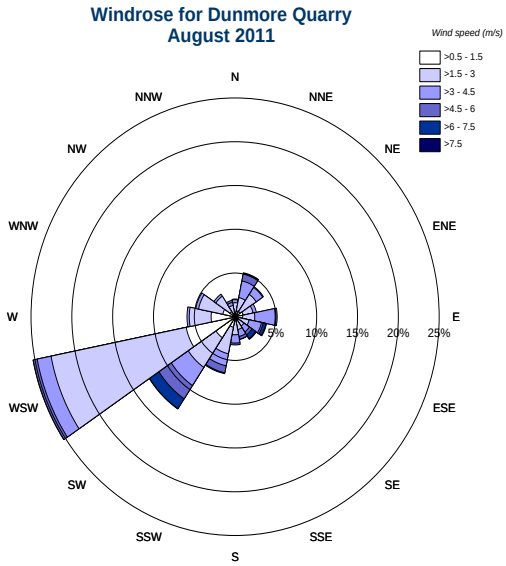
Wind Roses – July 2011 to June 2012

July 2011



Calms = 5.2%

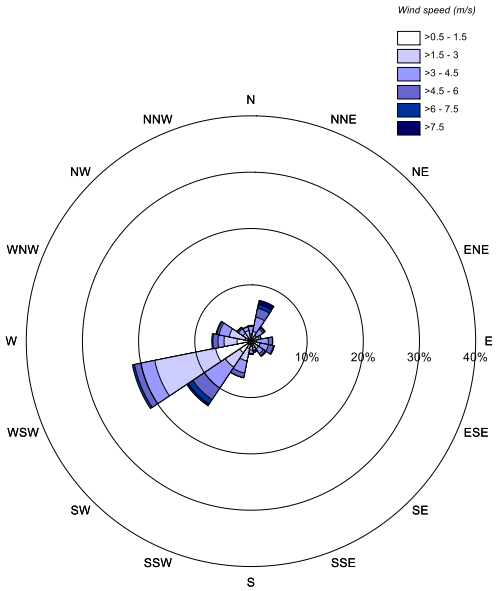
August 2011



Calms = 7.6%

September 2011

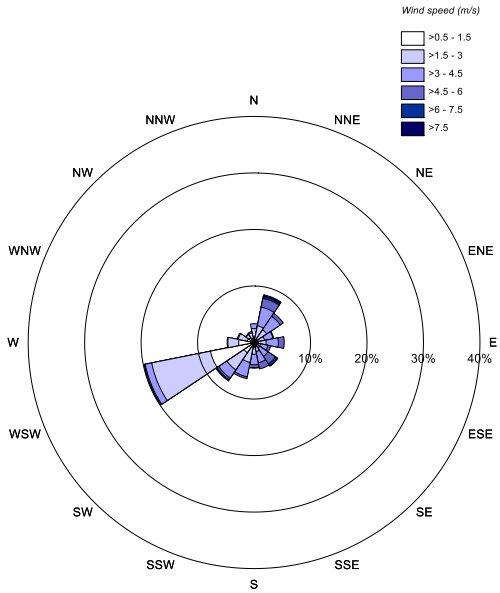
Windrose for Dunmore Quarry
September 2011



Calms = 8.0%

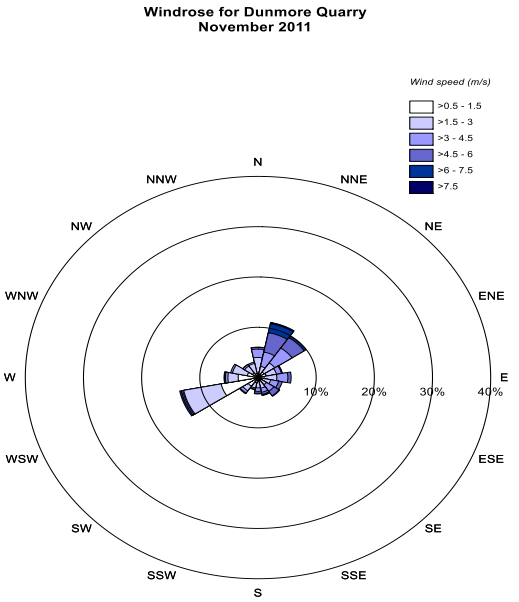
October 2011

Windrose for Dunmore Quarry
October 2011



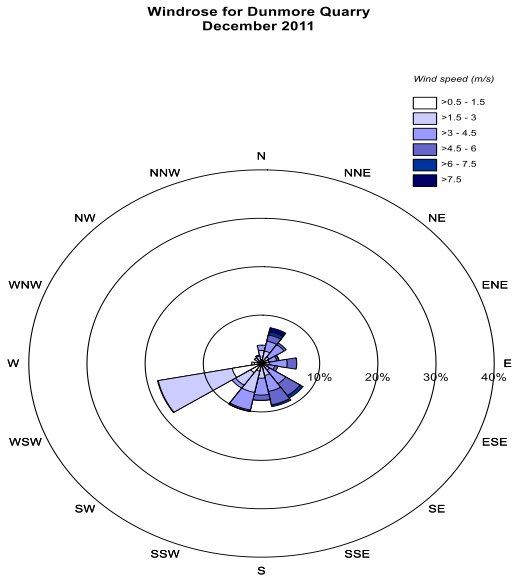
Calms = 9.3%

November 2011



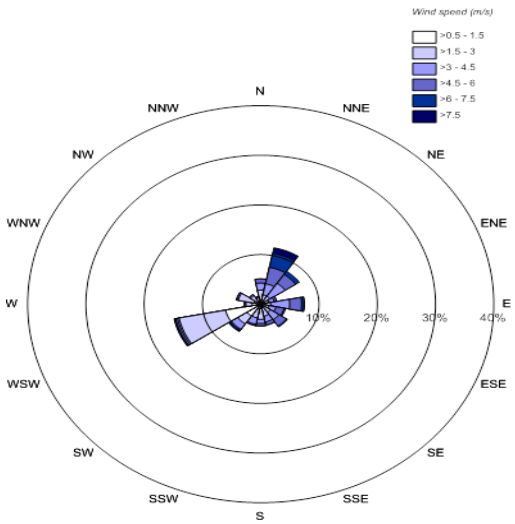
Calms = 10.2%

December 2011



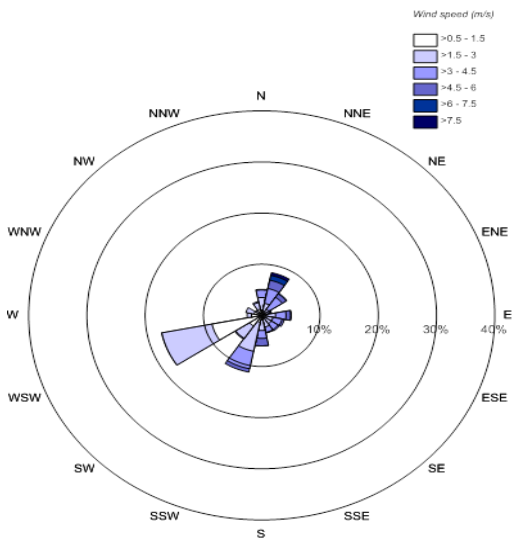
Calms = 6.2%

January 2012



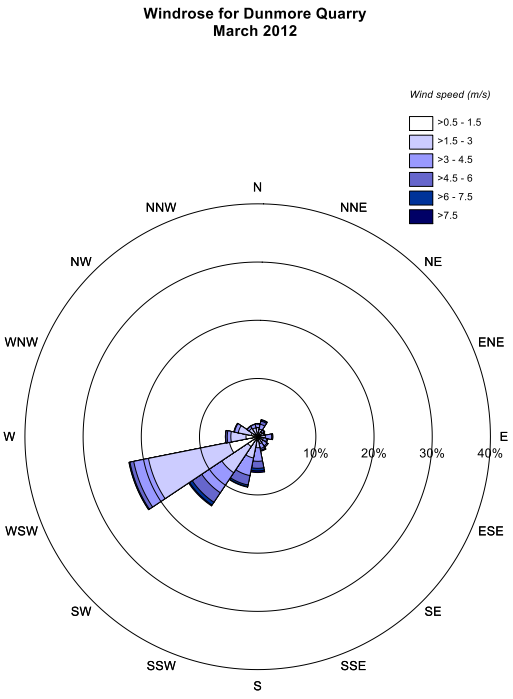
Calms = 8.9%

February 2012



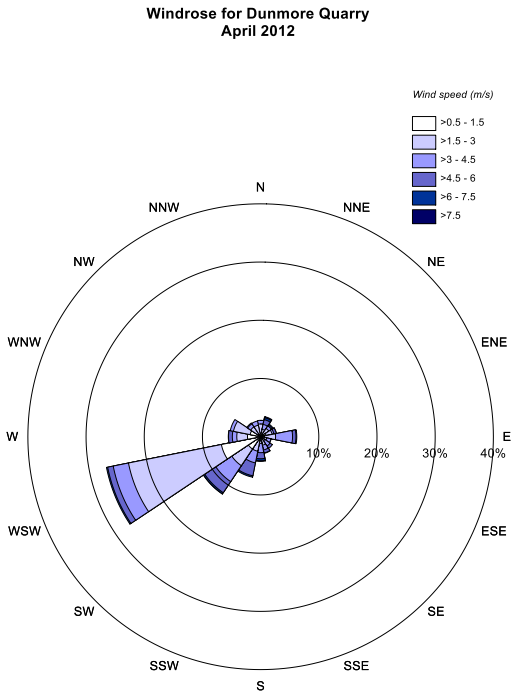
Calms = 13.4%

March 2012



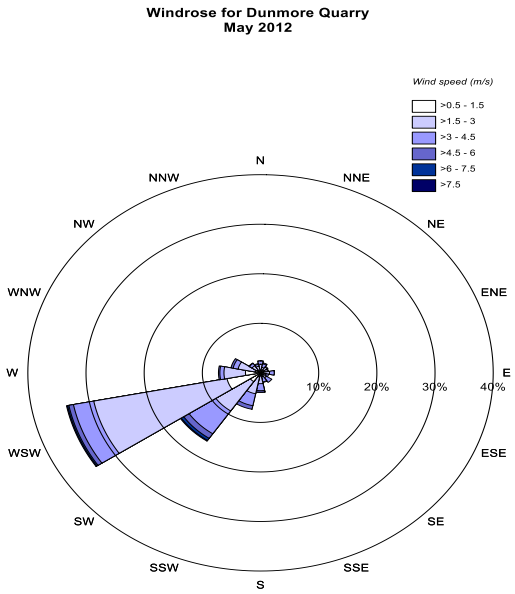
Calms = 16.8%

April 2012



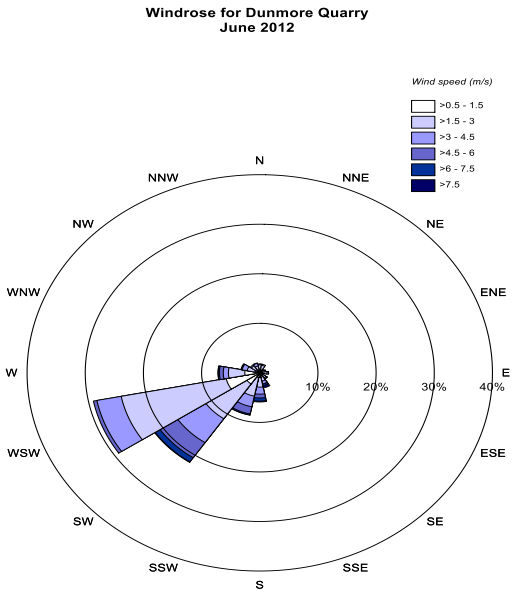
Calms = 8.2%

May 2012



Calms = 5.7%

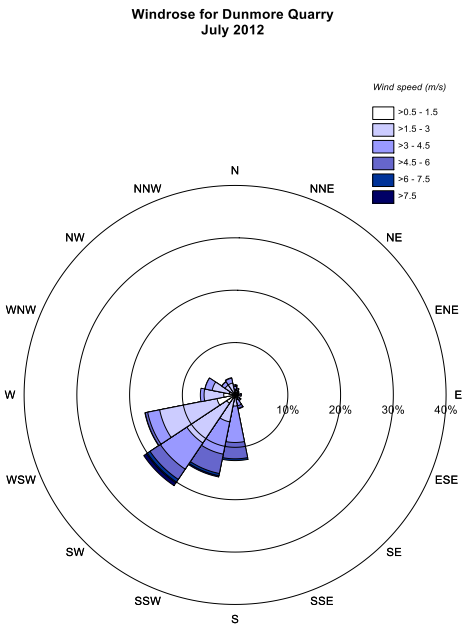
June 2012



Calms = 7.5%

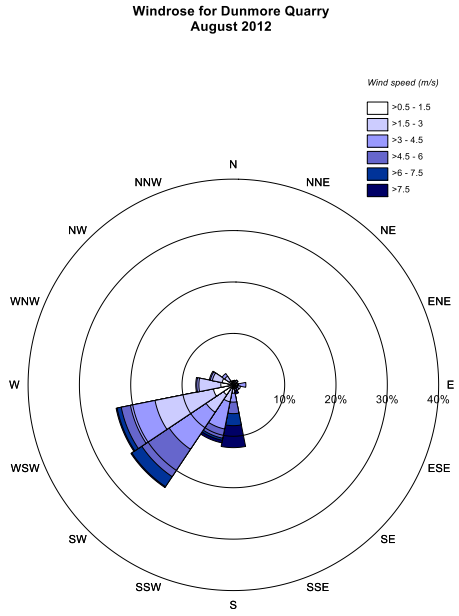
Wind Roses – July 2012 to June 2013

July 2012



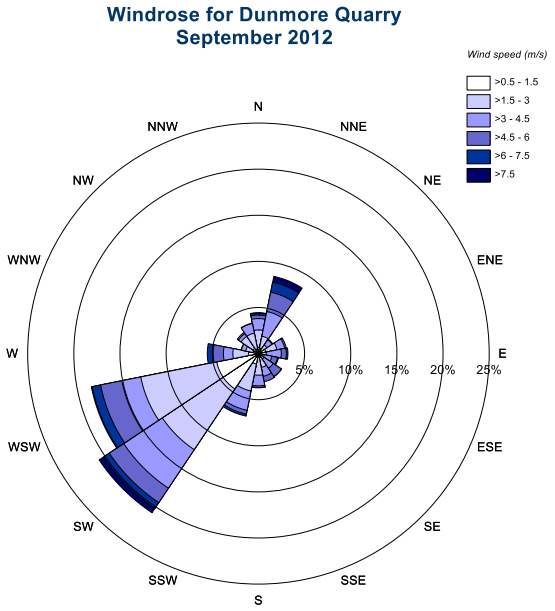
Calms = 3.7%

August 2012



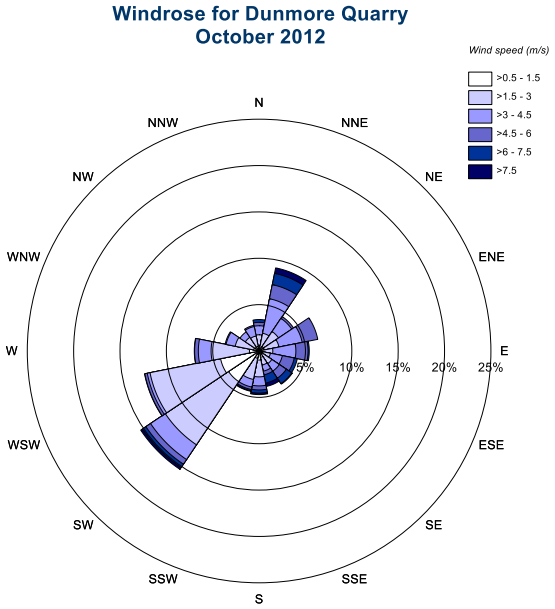
Calms = 2.8%

September 2012



Calms = 7.1%

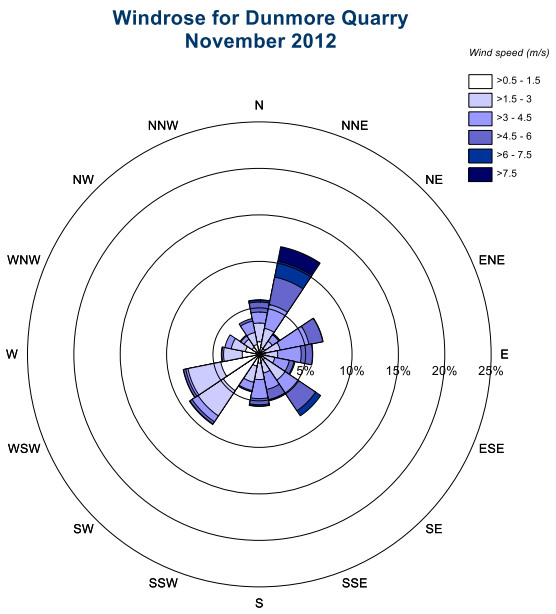
October 2012



Calms = 5.6%

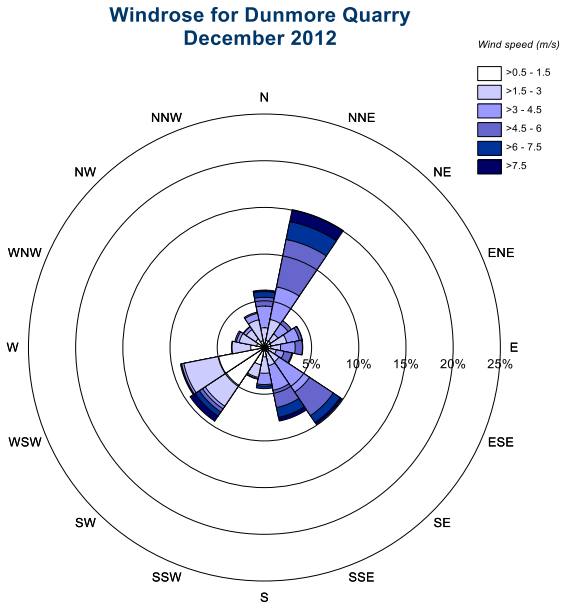
Note: No data available from 1/9 – 6/9/2013 13:30 due to damage to the weather station mast.

November 2012



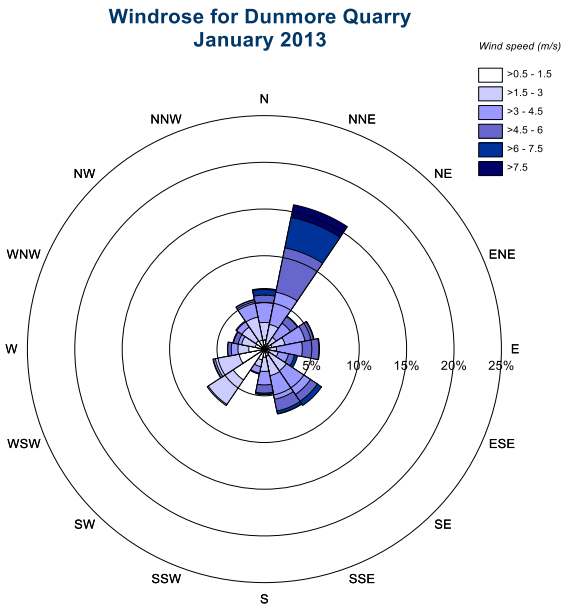
Calms = 11.4%

December 2012



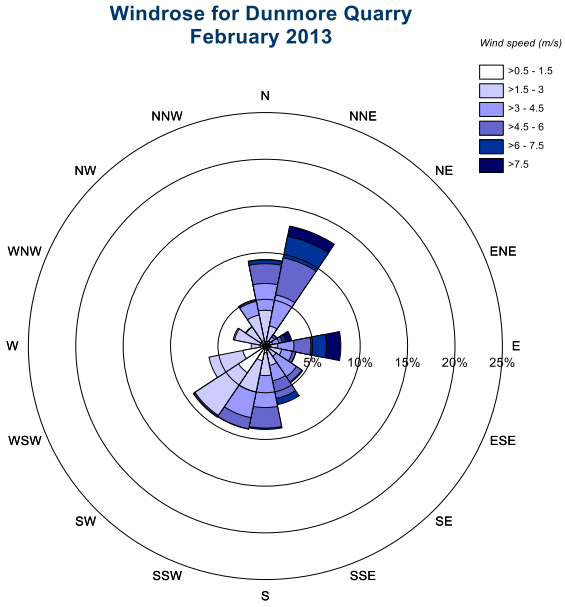
Calms = 6.5%

January 2013



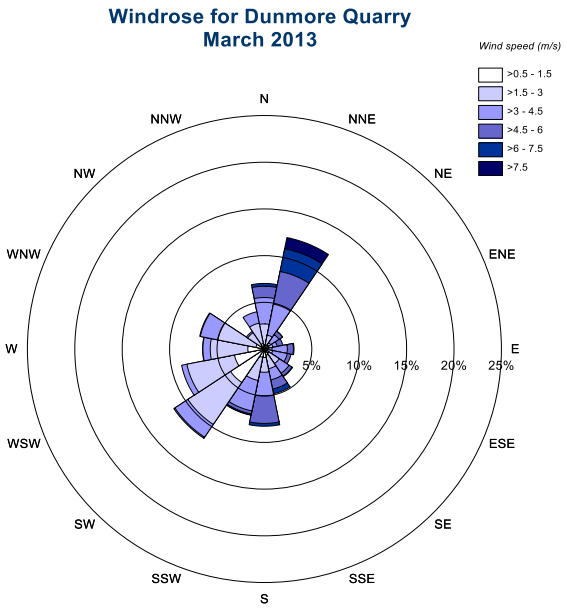
Calms = 7.7%

February 2013



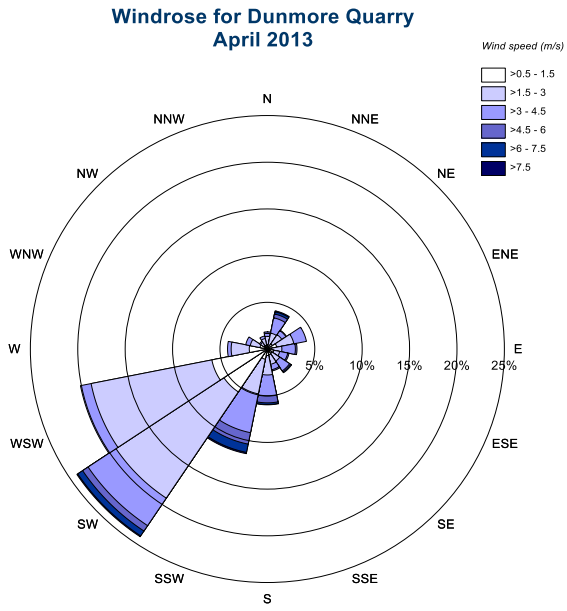
Calms = 5.2%

March 2013



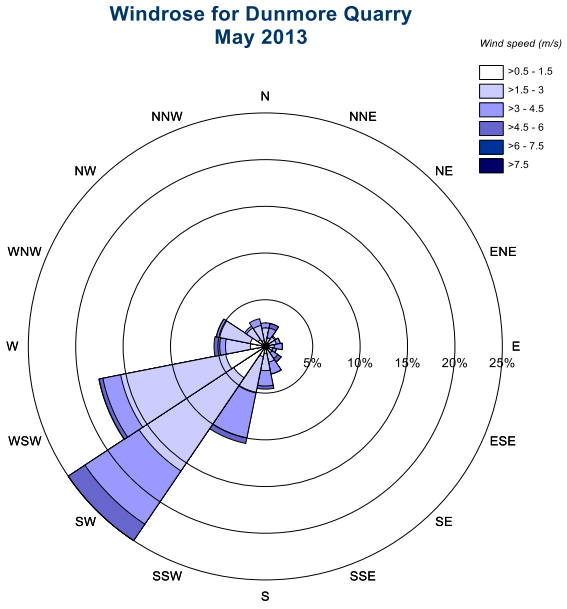
Calms = 6.4%

April 2013



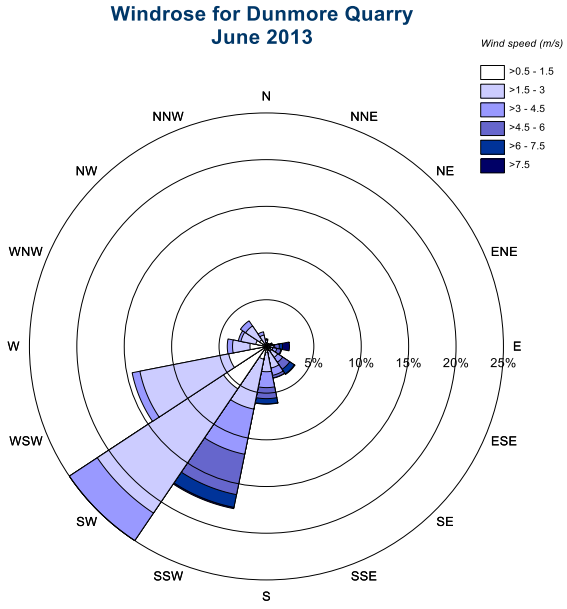
Calms = 8.9%

May 2013



Calms = 5.2%

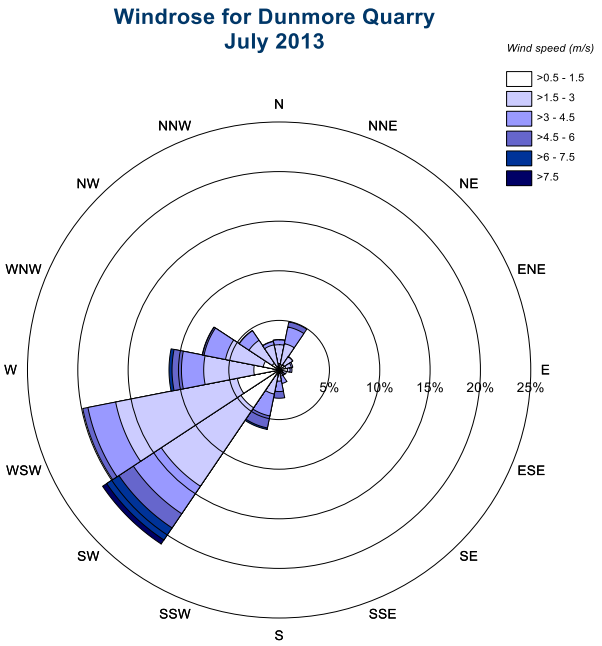
June 2013



Calms = 8.8%

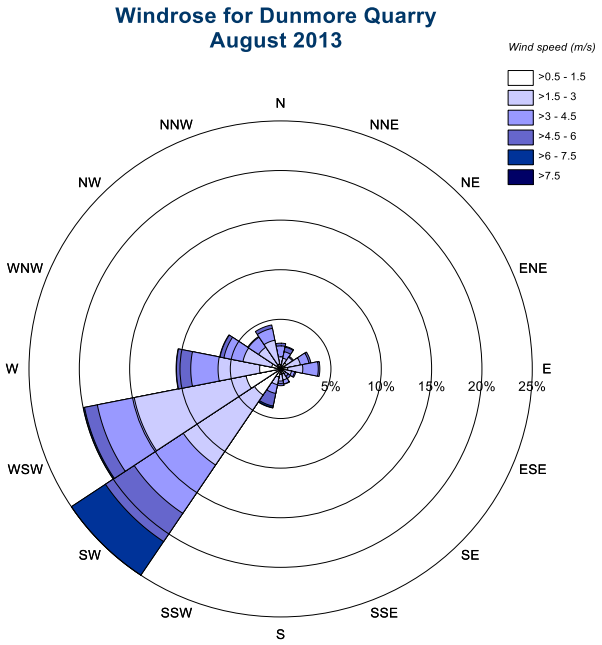
Wind Roses – July 2013 to June 2014

July 2013



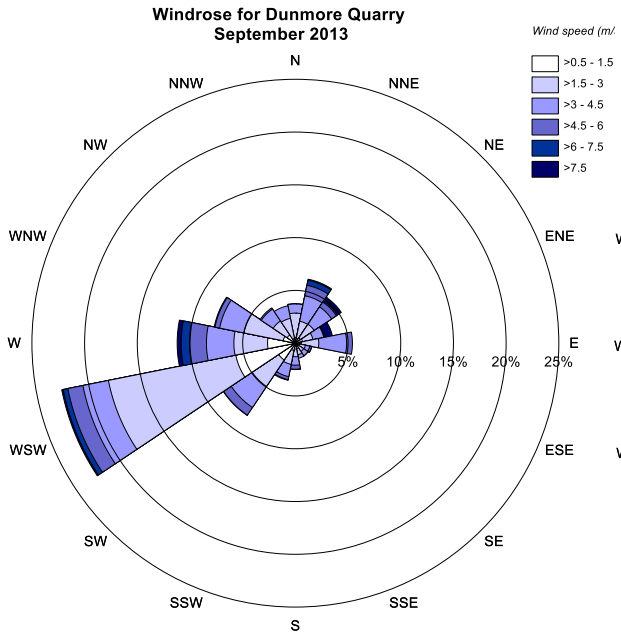
Calms = 17.9%

August 2013



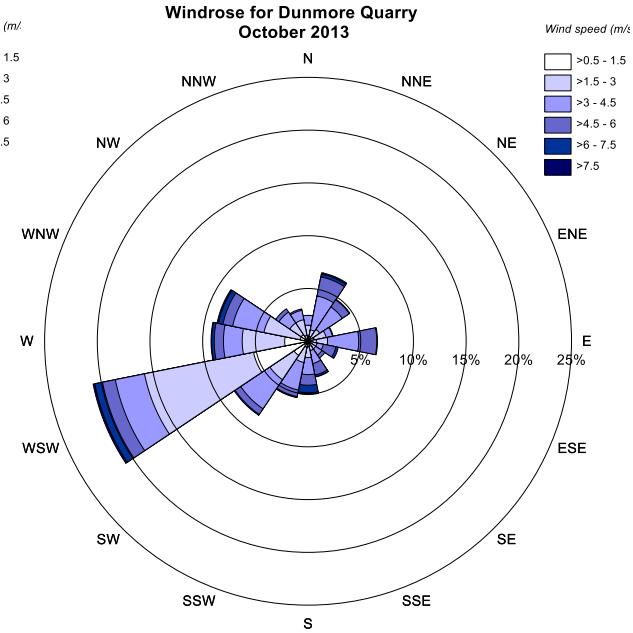
Calms = 18.0%

September 2013



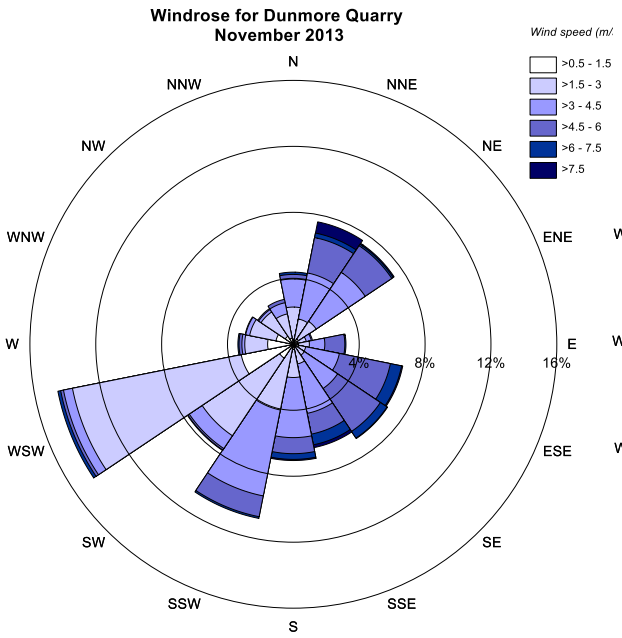
Calms = 7.7%

October 2013



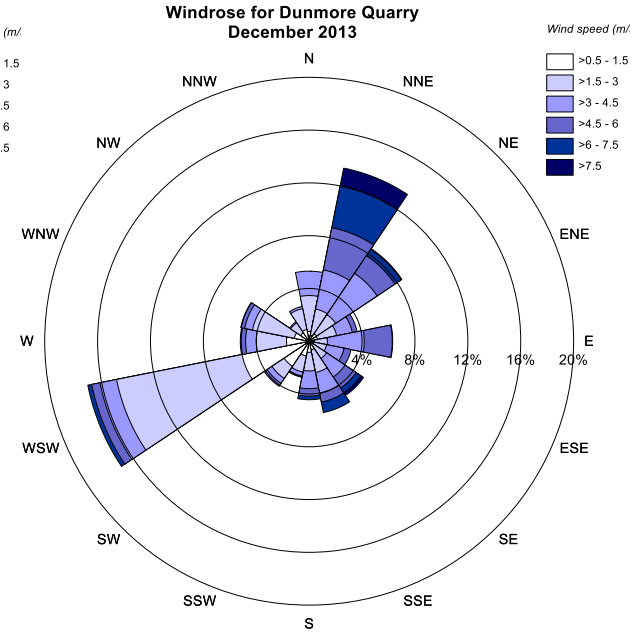
Calms = 4.3%

November 2013



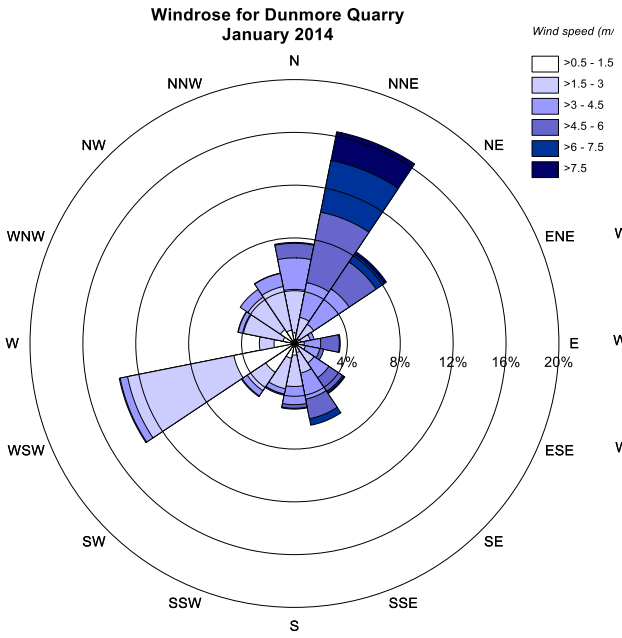
Calms = 4.4%

December 2013



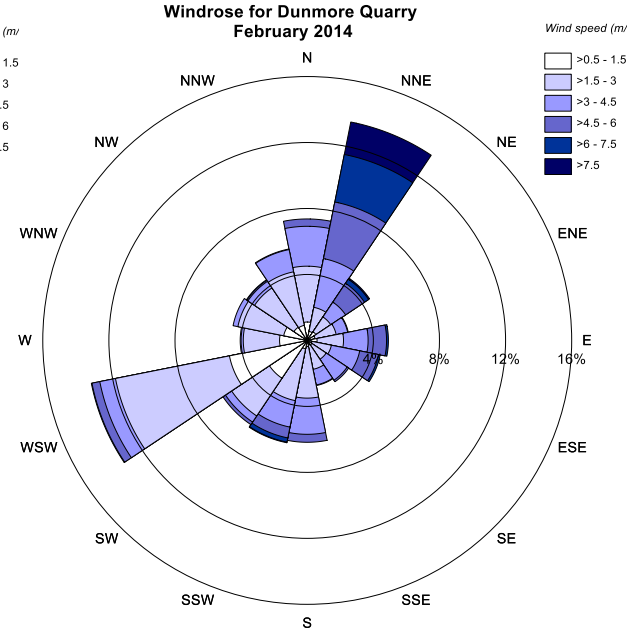
Calms = 5.8%

January 2014



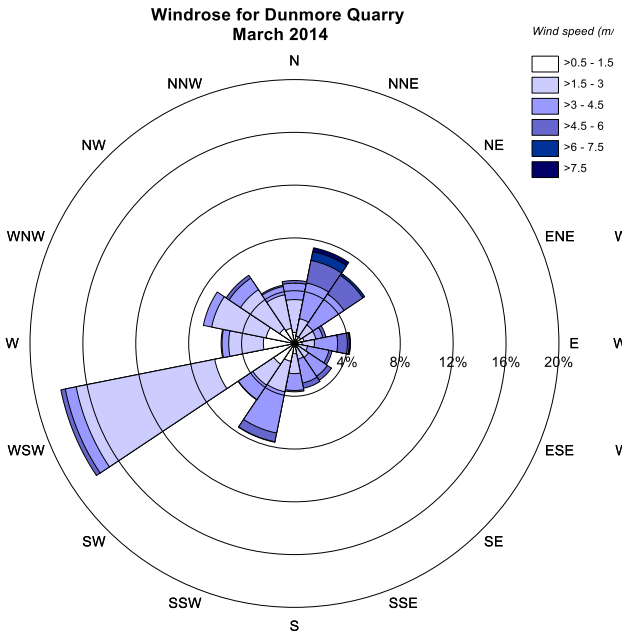
Calms = 4.7%

February 2014



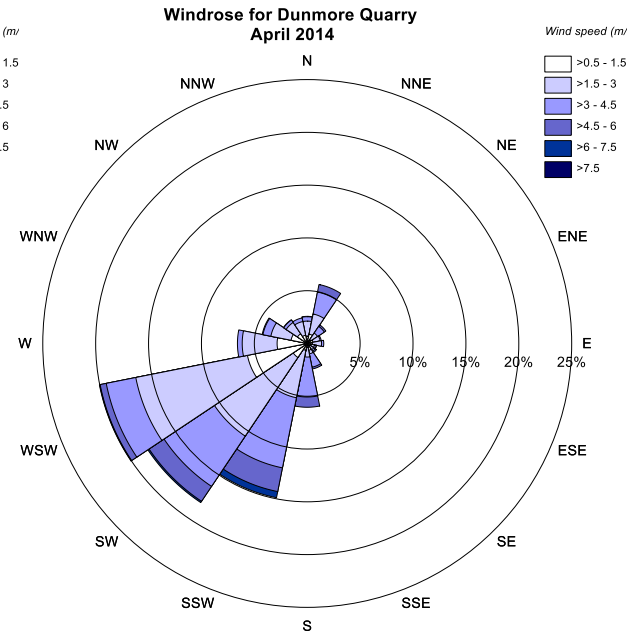
Calms = 6.2%

March 2014



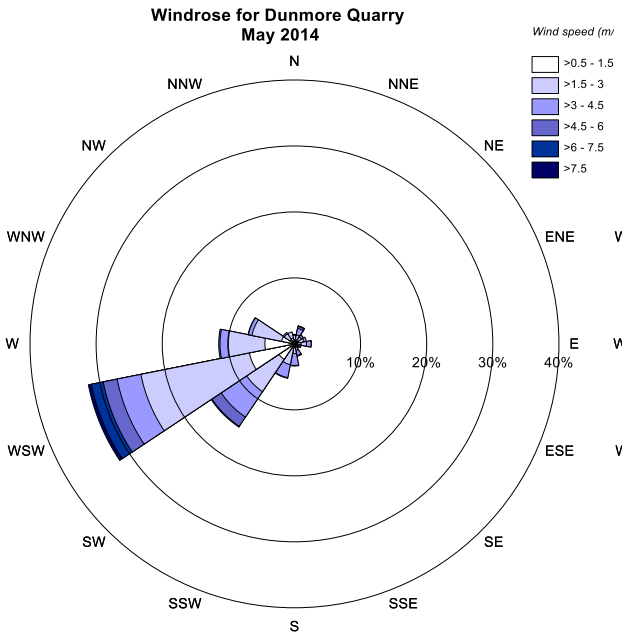
Calms = 7.4%

April 2014



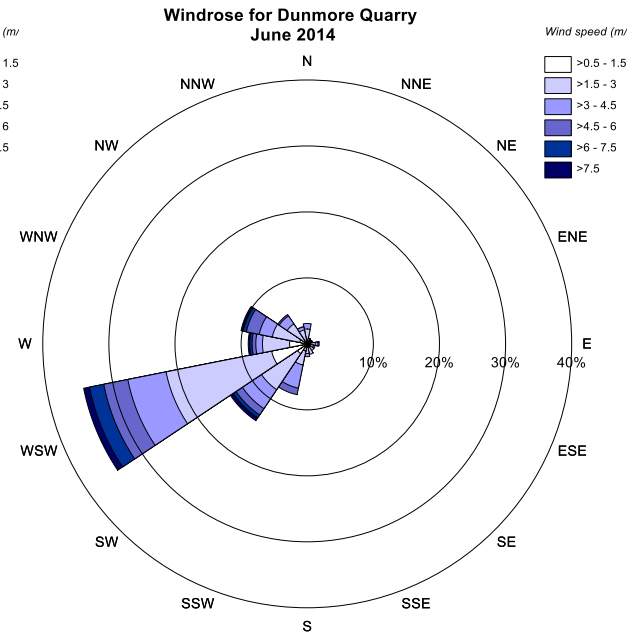
Calms = 6.9%

May 2014



Calms = 7.6%

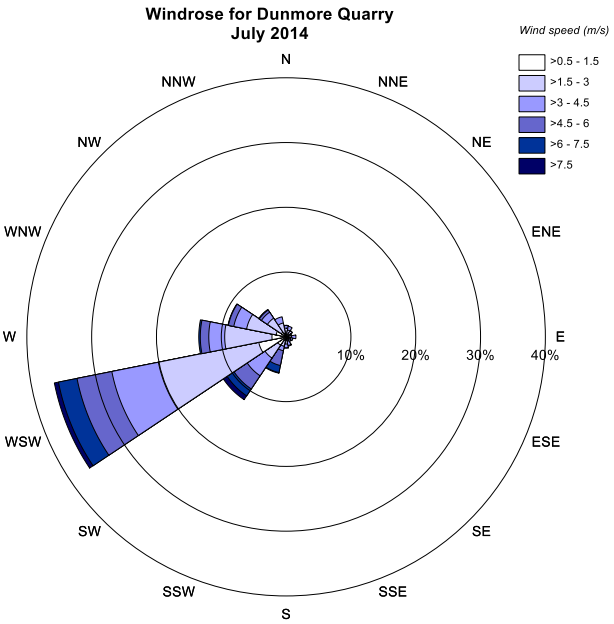
June 2014



Calms = 3.1%

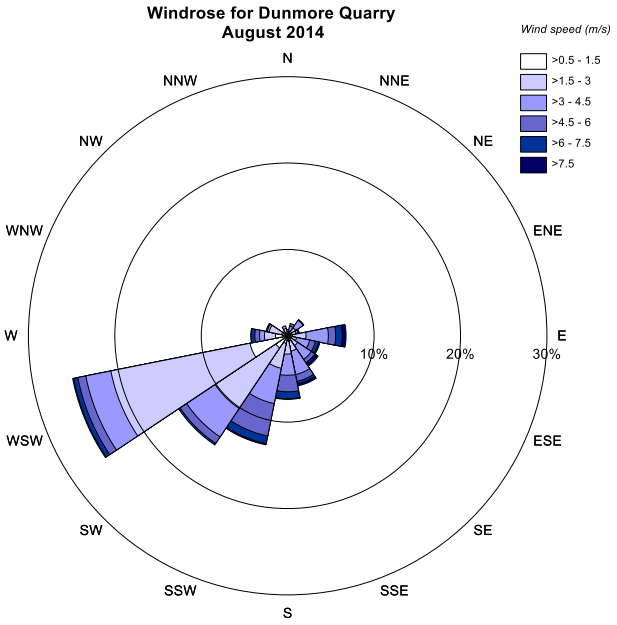
Wind Roses – July 2013 to June 2014

July 2014



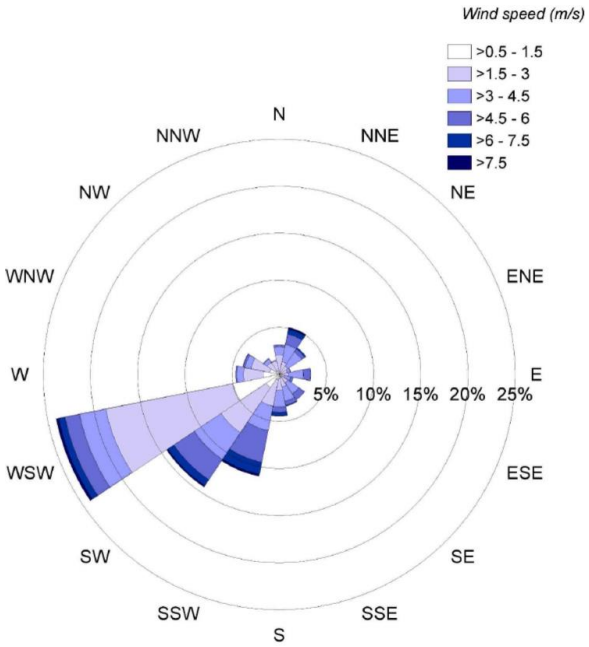
Calms = 3.1%

August 2014



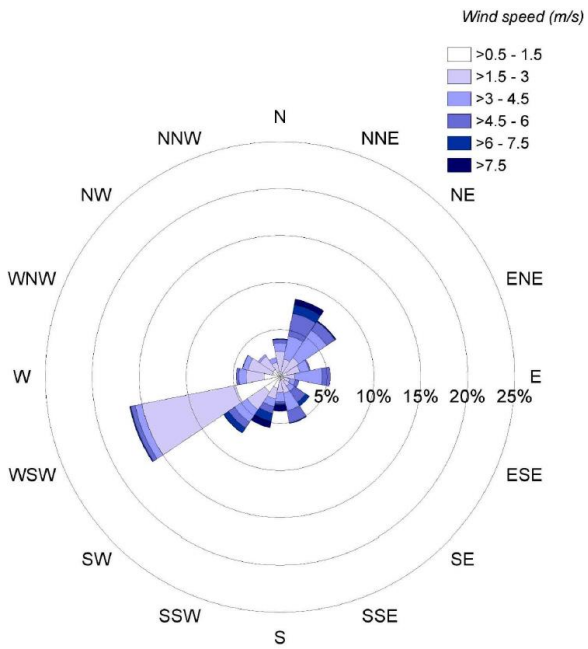
Calms = 4.1%

September 2014



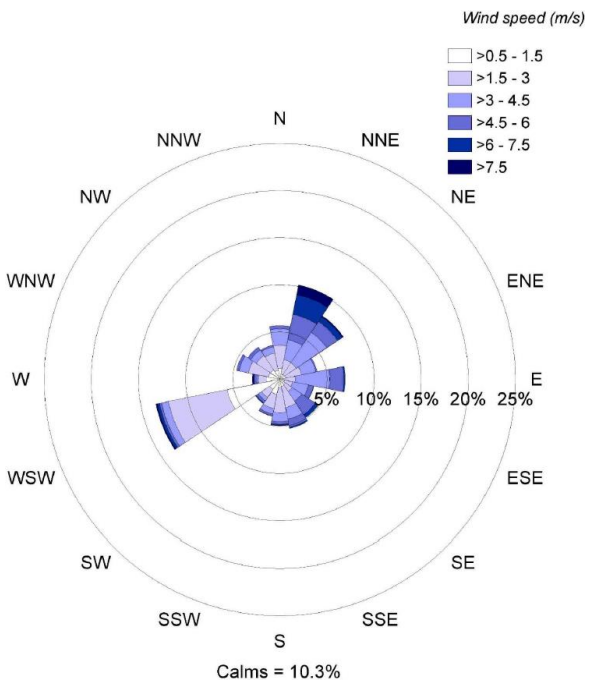
Calms = 9.5%

October 2014

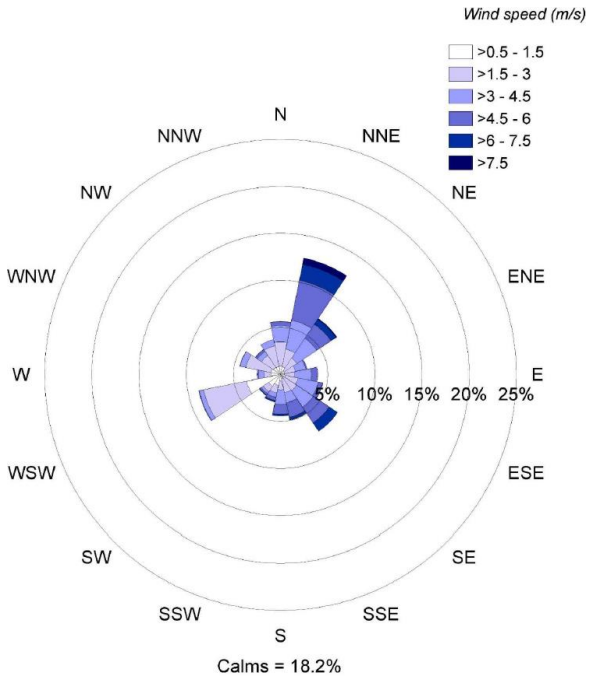


Calms = 14.3%

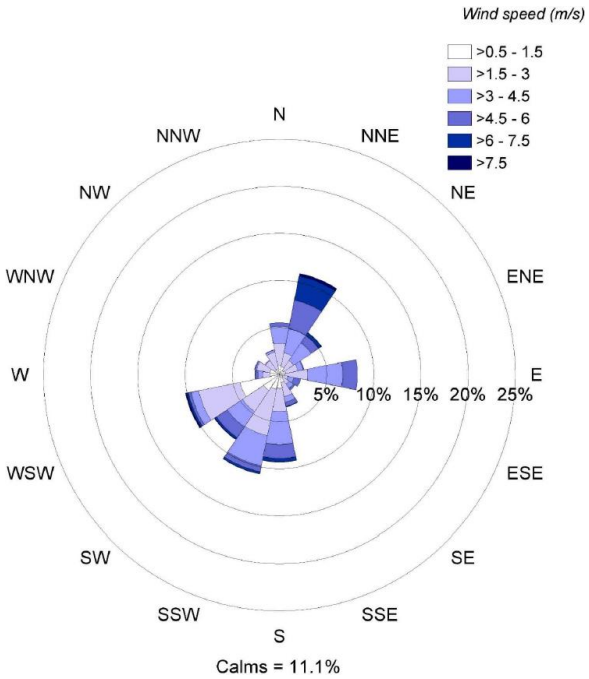
November 2014



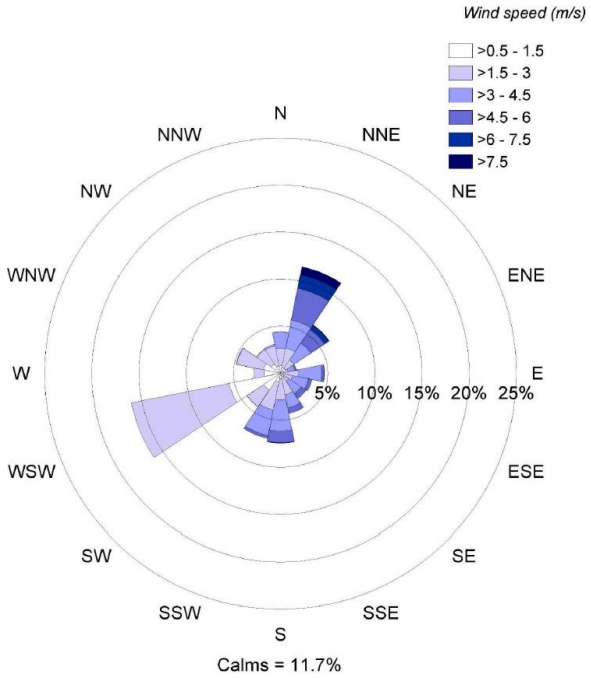
December 2014



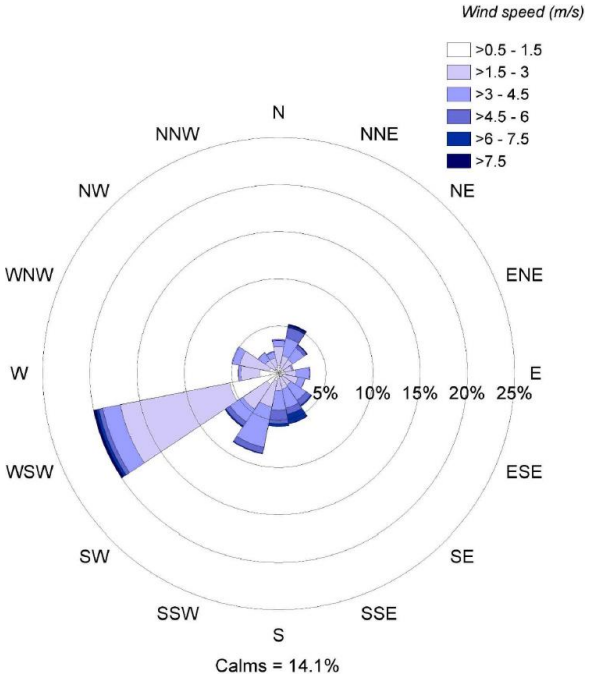
January 2015



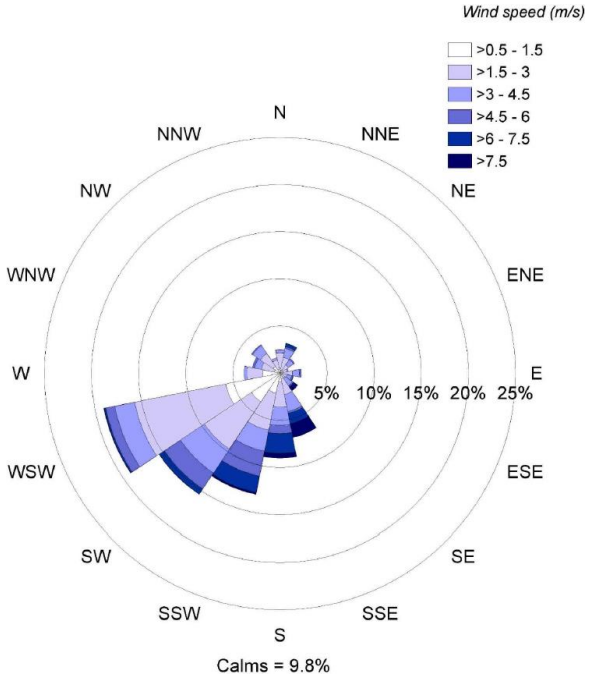
February 2015



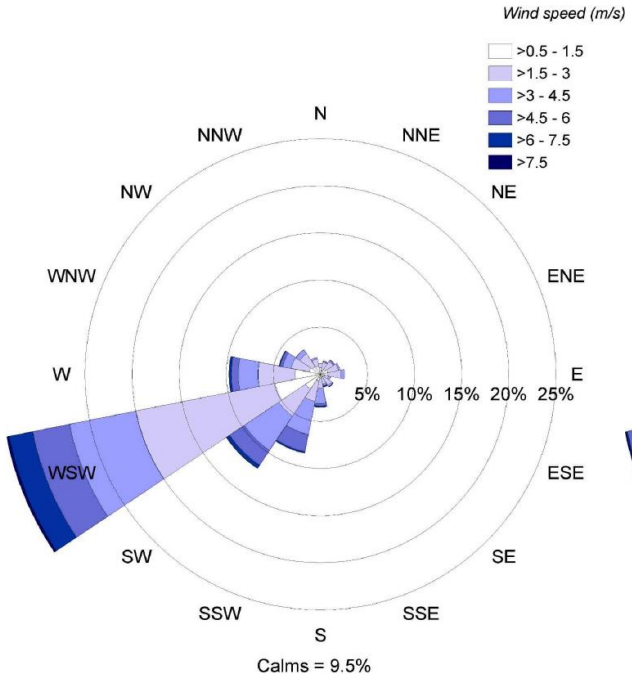
March 2015



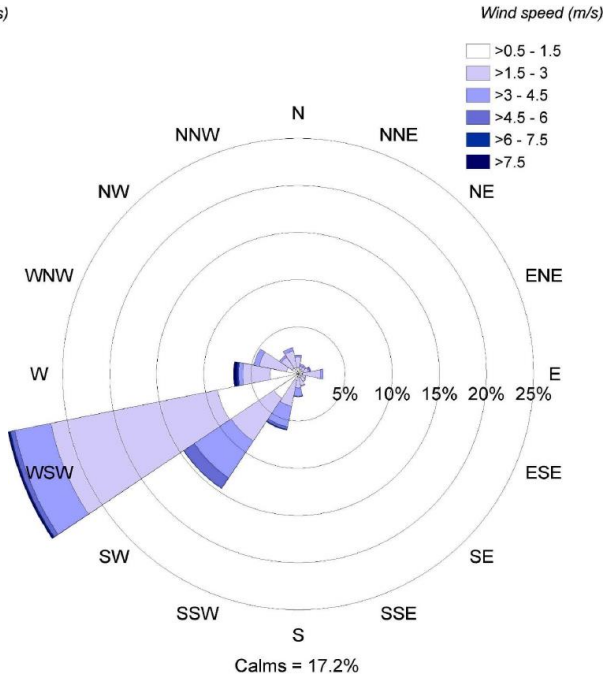
April 2015



May 2015



June 2015



Appendix 6 – Annual Noise Assessment Report

Appendix 7 – Annual Monitoring Report at 38 Tabbita Road, Dunmore, NSW