Appendix 4

Air Quality Impact Assessment by SLR Consulting Pty Ltd

(Report Ref: 610.14535 Letter Report_22012015.docx)

(Total No. of pages including blank pages = 18)

This page has intentionally been left blank

22 January 2015

610.14535 Letter Report_22012015.docx

RW Corkery & Co Pty Ltd
Level 1, 12 Dangar Road
PO Box 239
BROOKLYN
NSW 2083

Attention: Alex Irwin

Dear Alex

Werris Creek - Proposed Modification to Project Approval 10_00585 Review of Air Quality Impacts

As requested, SLR Consulting Australia Pty Ltd (SLR) has performed a review of the potential impacts on air quality associated with a Proposed Modification to operations at the Werris Creek Coal Mine. This letter presents a summary of the approach, methodology and findings of our review and provides an assessment of the anticipated impacts on local particulate levels associated with the proposed operational changes.

The overall approach used in this review involved the following key steps:

- A review of the proposed site changes to enable the emission sources to be identified;
- A detailed review of the air emission inventory compiled by SLR (then Heggies Pty Ltd) in October 2010 as part of the Air Quality Impact Assessment (AQIA) for the Werris Creek Coal Mine Life Of Mine Project (Heggies, 2010);
- Collation of relevant activity data for the proposed operations to enable the emission inventory to be revised and updated to provide an estimate of particulate emissions for the proposed modified operations;
- A review of recent meteorological data collected by the on-site meteorological station and comparison against the meteorological dataset used in the air dispersion modelling study in the 2010 AQIA;
- A review of recent particulate monitoring data recorded by the mine-operated air quality monitoring station; and
- Based on the above, a qualitative assessment was made of the potential impacts on particulate levels at nearby sensitive receptors associated with the Proposed Modification.

We trust that the enclosed information is sufficient for your purposes. Should you require any additional information, please do not hesitate to contact us.

Yours sincerely

Martin Doyle
Martin Doyle – Principal Air Quality Consultant

SLR Consulting Australia Pty Ltd 2 Lincoln Street Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia) T: +61 2 9427 8100 F: +61 2 9427 8200
E: sydney@slrconsulting.com www.slrconsulting.com
ABN 29 001 584 612

1 Project Description

The Werris Creek Coal Mine ("the Mine") is located to the south of Werris Creek and 11 kilometres (km) north-northwest of Quirindi in the northwest slopes and plains region of New South Wales. The Mine lies within a 910 hectare (ha) area covered by Mining Lease (ML) 1563, ML1671 and ML1672. A summary of the current approved operations as approved in PA10_0059 and relevant to potential air quality impacts are provided below.

- **Open Cut Mining Area**: The approved open cut mining area is roughly elliptical in shape and has been developed as a series of east-west oriented benches. Access to the lower sections of the open cut has been obtained by haul ramps developed on the low wall of the open cut (where overburden is progressively placed within the mined out sections of the open cut). Benches at varying heights are maintained to ensure that development and coal recovery are being undertaken at consistent rates over the life of the mine, thereby ensuring a consistent supply of ROM coal to the processing plant. At its maximum extent the open cut will be developed to within 2.5 km of Werris Creek.
- **Overburden Emplacement Area**: Originally constructed around the eastern, southern and southwestern perimeter of the open cut area, overburden and interburden is now largely placed within the mined-out sections of the open cut. The out-of-pit disturbance footprint of the overburden emplacement has been effectively reached with successive lifts of 10 metres (m) to 20 m raising the height of the emplacement to 445 m AHD. Large sections of the eastern and southern embankments of the overburden emplacement have been profiled, spread with soil and revegetated.
- **Acoustic and Visual Amenity Bund**: The structure was proposed and approved to provide for an acoustic and visual screen of mining operations as the open cut is developed through "Old Colliery" Hill. Constructed as a northerly extension of the Out-of-Pit Overburden Emplacement around the eastern and northeastern perimeter of the open cut, this structure is approximately 60% complete. The Acoustic and Visual Amenity Bund is progressively profiled, respread with topsoil and revegetated as constructed to limit the visual impact of the bund itself from surrounding vantage points.
- **Coal Processing and Stockpiling Operations**: ROM coal mined from the open cut is delivered to the ROM Pad, approximately 3 km south-southwest of Werris Creek, where it is stockpiled according to quality, i.e. ash content and other impurities. No washing of the coal is undertaken, however, crushing and screening is required to achieve customer size requirement prior to despatch. Coal crushing and screening is currently undertaken at a rate of approximately 650 tonnes per hour (t/hr), which represents the average throughput rate.
- **Coal Transportation**: The despatch of product coal from the Mine is either by rail to the Port of Newcastle or by road/rail to domestic customers. The despatch of coal by rail requires the product coal to be transported via the Internal Haul Road to the Product Coal Storage Area and Rail Load-out Facility which is located approximately 2.5km southwest of Werris Creek. From the product coal stockpiles, the coal is delivered to a rail load-out bin by conveyor and discharged to rail wagons. A rail loop provides for efficient movement of the train from the Main Northern Rail Line, Werris Creek Siding and back. A small quantity of coal (50,000 tpa) is transported from the Mine by road for delivery to local markets, predominantly the Gunnedah Coal Handling and Preparation Plant operated by Whitehaven Coal Mining Ltd.
- **Dust Control**: The Mine utilises water carts as the principal method to minimise air quality impacts from mining and associated activities. Water carts operated during the 2013 - 2014 included one 50,000 litre (L) CAT 773 water truck and two 30,000 L Volvo articulated water trucks dedicated to the active mining operations area, and one 12,000 L water cart used at the coal processing and the train load out/product coal stockpile areas. Other measures implemented to minimise dust emissions include:
  - Overburden, coal and soil loading activities are not undertaken during periods of adverse weather (high winds or dry conditions). The first adverse weather threshold is triggered at winds greater than 7 metres per second (m/s) sending an SMS to the OCE to check for dust generated from mining operations. The second trigger is for winds greater than 9 m/s and depending on the exposure of each mining location then operations may be suspended to mitigate dust generation.
  - Water sprays are used on the coal feed hopper, crusher and at all conveyor transfer and discharge points.

- The extent of disturbed areas (pre-strip clearing and rehabilitation) are minimised to that required for mining operations, with these areas stabilised and revegetated as soon as practicable once no longer required for ongoing operations.
- All personnel are instructed that all vehicles must utilise existing tracks on-site and must be driven to the conditions to minimise trafficable dust generation.
- Prior to drilling, water carts are used to create a surface crust and minimise the potential for dust lift-off. Drill rigs utilise a combination of curtains, vacuum extraction and spray water on the cuttings to minimise dust generation.
- Blasting is not undertaken if on a 5 minute average, wind direction occurs between 182° and 204° (direction of Werris Creek township) or for wind speeds greater than 6 m/s unless approved by the Operations Manager.

The Mine operates 24 hours a day, seven days per week, aside from blasting, which is restricted to between 9.00 am and 5.00 pm, Monday to Saturday. In addition, the despatch of coal-carrying trucks from the Mine is restricted to 7:00 am to 6:00 pm Monday to Friday and 7:00 am to 2:00 pm Saturday.

The Proposed Modifications include the following activities as displayed on **Figure 1**:

- A small lateral extension of the Out-of-Pit Overburden Emplacement to the west over an area designated for soil stockpiles.
- A northerly extension of the 400 m to 445 m AHD benches of the Overburden Emplacement by approximately 200 m.
- Both components of the overburden emplacement extension would remain within areas previously identified as part of the Mine disturbance footprint, either for soil stockpiling or lower sections of the overburden emplacement.
- Incorporation of a new Dry Separation Plant to process coal and separate from rock and other impurities. This coal is likely to be recovered initially from those seams previously mined by the Werris Creek Colliery. **Figure 2** provides a schematic illustration of the dry separation process
- The use of void water for agriculture to land both owned by the Proponent and neighbouring landowners.
- Increase the hours of road transportation for coal products.

No changes to the approved Mine Site boundary are proposed, only a modification of the internal infrastructure and addition of off-site irrigation systems located adjacent to the Mine.

2 Air Quality Criteria

The air quality criteria applicable to the Mine are specified in Condition 16, Schedule 3 of PA10_0059 and are summarised in **Table 1**.

Table 1 Air Quality Impact Assessment Criteria

Pollutant	Averaging Period	AQGHGMP Criteria
Total Suspended Particulate (TSP) Matter	Annual	90 µg/m^3
Particulate Matter < 10 microns (µm) (PM_{10})	Annual	30 µg/m^3
Particulate Matter < 10 microns (µm) (PM_{10})	24-hours	50 µg/m^3
Particulate Matter < 2.5 microns (µm) ($PM_{2.5}$)	Annual	8 µg/m^3
Particulate Matter < 2.5 microns (µm) ($PM_{2.5}$)	24-hours	25 µg/m^3
Deposited Dust	Annual	4 g/m^2/month
Deposited Dust (the Mine only maximum incremental increase)	Annual	2 g/m^2/month

Note: AQGHGMP – Air Quality and Greenhouse Gas Management Plan includes criteria for $PM_{2.5}$ but not in PA 10_0059

Figure 1 Proposed Modifications

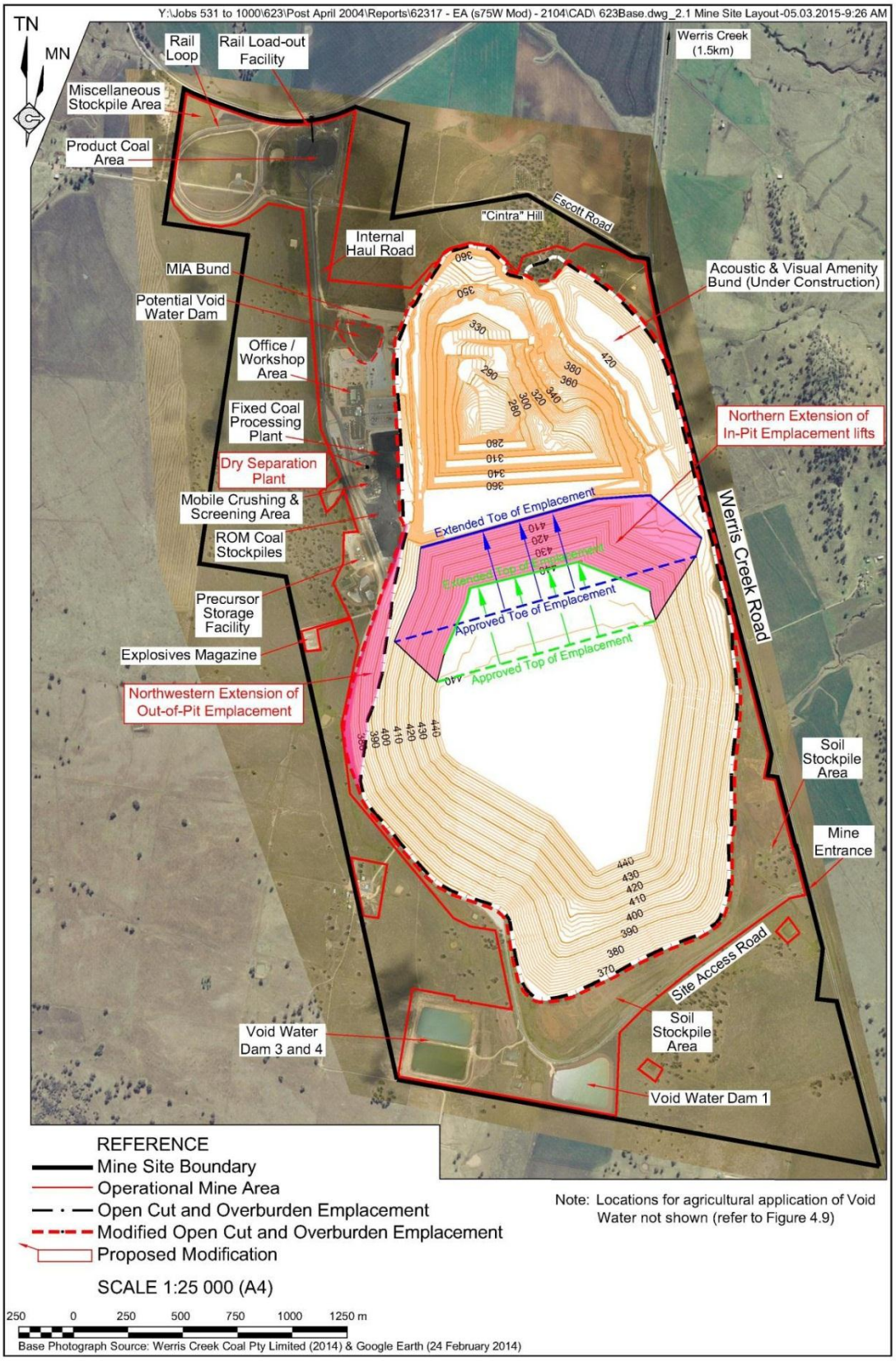
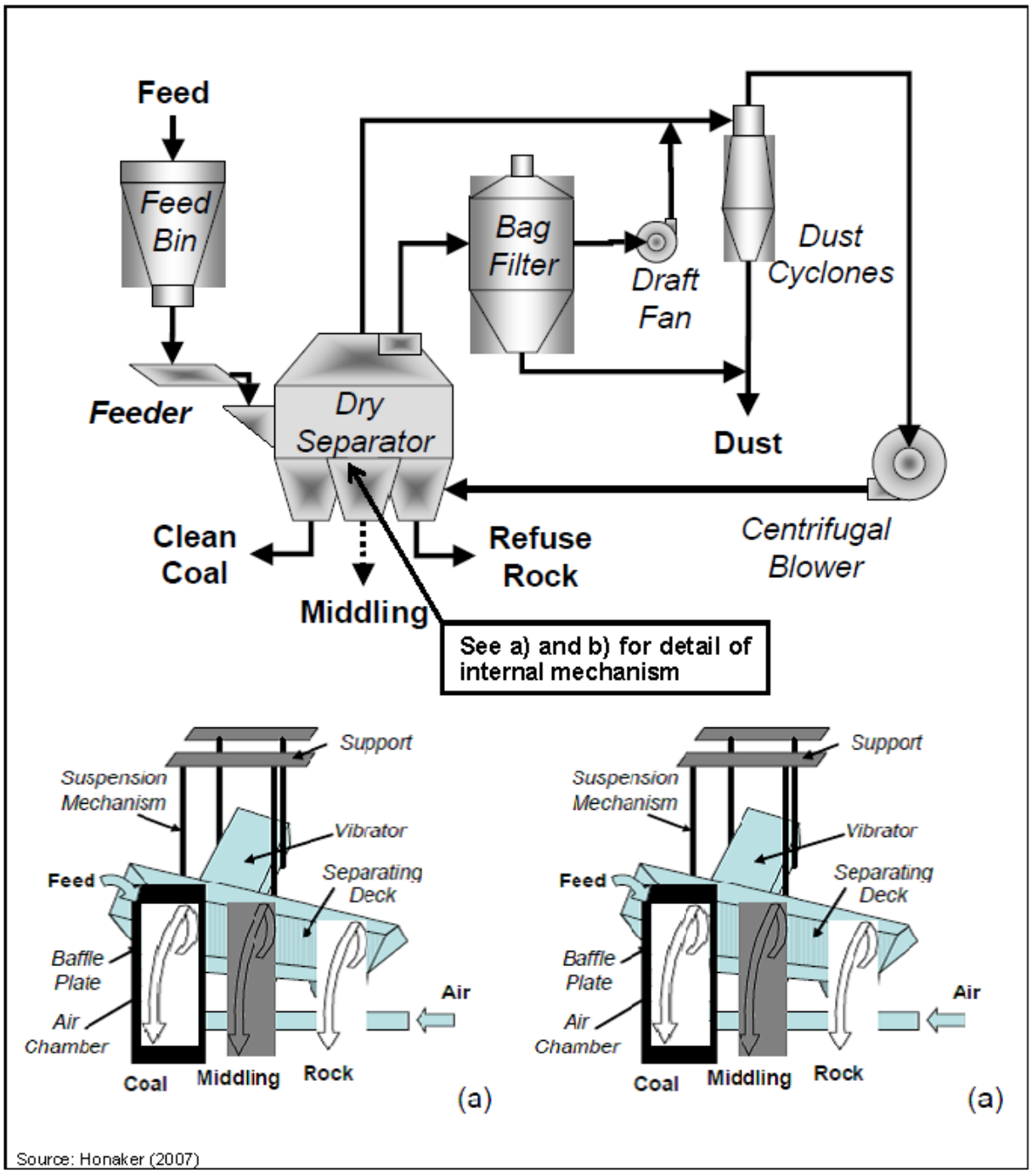


Figure 2 Dry Separation Process



Source: Honaker (2007)

3 Review of Existing Environment

3.1 Local Meteorology

Monthly windroses presented in the 2013/14 Annual Environmental Management Report (AEMR) compiled from data collected by the on-site wind sensor during the reporting period are included in **Appendix A**. Also included for comparison in **Appendix A** are monthly wind roses compiled from the meteorological dataset used in the 2010 AQIA dispersion modelling study that accompanied the application for the PA10_0059, referred to as "SLR (2010)".

The wind data used in Heggies (2010) modelling study was compiled based on data obtained from the on-site wind sensor over the period September 2007 to August 2008. An analysis of data recorded by this sensor with longer term records for this station from September 2007 to March 2010 indicated that the meteorological data period used in the modelling was representative of typical conditions in the area. A review of SLR (2010) AQIA windroses shows:

- Predominant moderate to strong southeasterly winds during the summer months and early autumn (December – April);
- An increasing frequency of northwesterly winds during late autumn and winter (May to August), with moderately strong winds from the northwest quarter predominating during July and August; and
- A progressive shift back to predominant southeasterly winds in spring (September to November).

The windroses presented in the 2013/14 AEMR based on more recent observations from the on-site wind sensor show a slightly different wind pattern. Southeasterly winds still predominated during the latter end of the reporting period in January to March 2014, however prior to this there was a distinct feature of north-south winds recorded in April – June 2013 and a predominance of northerly winds during July to September 2013.

It is considered that these differences are not significant and are not sufficiently different to require revision of the long term meteorological dataset used in the dispersion modelling exercise.

3.2 Ambient Particulate Monitoring Data

The Air Quality Monitoring Program undertaken by the Mine currently includes deposited dust, total suspended particulates (TSP), PM_{10} and $PM_{2.5}$ with the location of each provided on **Figure 3**. The following discussion of existing ambient air quality is based on the results of the Air Quality Monitoring Program, as reported in the 2013/14 AEMR.

3.2.1 Deposited Dust

Dust deposition rates are monitored using a network of 20 dust deposition gauges (DDGs) located in the surrounding area. For the 2013/14 reporting period, all DDGs recorded annual average dust deposition rates below the criterion of 4 g/m^2/month except for DDG34 (8 Kurrara St) which had a number of significantly high monthly results. These elevated results were concluded to be unrelated to the Mine mining operations due to either high levels of organic matter or the fact that they were significantly higher than other nearby dust gauges also within Werris Creek township.

The Mine has undertaken dust deposition monitoring since 2005 and the results for 2013/2014 compared to the previous periods are mixed, with six locations recording higher results and ten locations with lower results out of the 20 sites monitored. The trend of lower dust deposition results for the period is not consistent with the prevailing weather conditions during 2013/14 which included below average rainfall recorded for the period. DDG2 ("Cintra") was the only location with a clear increasing trend in dust deposition levels which is to be expected given that the distance has decreased to 1 km from the main open cut mining area.

3.2.2 TEOM Monitoring Data (PM_{10} and $PM_{2.5}$)

During the 2013/14 reporting period, the Mine operated a TEOM (Tapered Element Oscillating Microbalance) in central Werris Creek adjacent to the Water Treatment Plant and property R92 (see **Figure 2**) to monitor real time dust concentrations in Werris Creek township. Monitoring of PM_{10} concentrations in Werris Creek commenced in April 2012, however, the $PM_{2.5}$ component of the TEOM was not operational until September 2012.

The annual average PM_{10} concentration recorded by the TEOM in Werris Creek township was 13.7 µg/m^3, which is well below the annual criteria of 30 µg/m^3. The annual average PM_{10} concentration was also less than the annual average PM_{10} concentration of 15.1 µg/m^3 predicted for the area in Heggies (2010). The maximum measured 24-hour average PM_{10} concentration during the period was 43.7 µg/m^3 (recorded on 18 October 2014), which is below the relevant criterion of 50 µg/m^3.

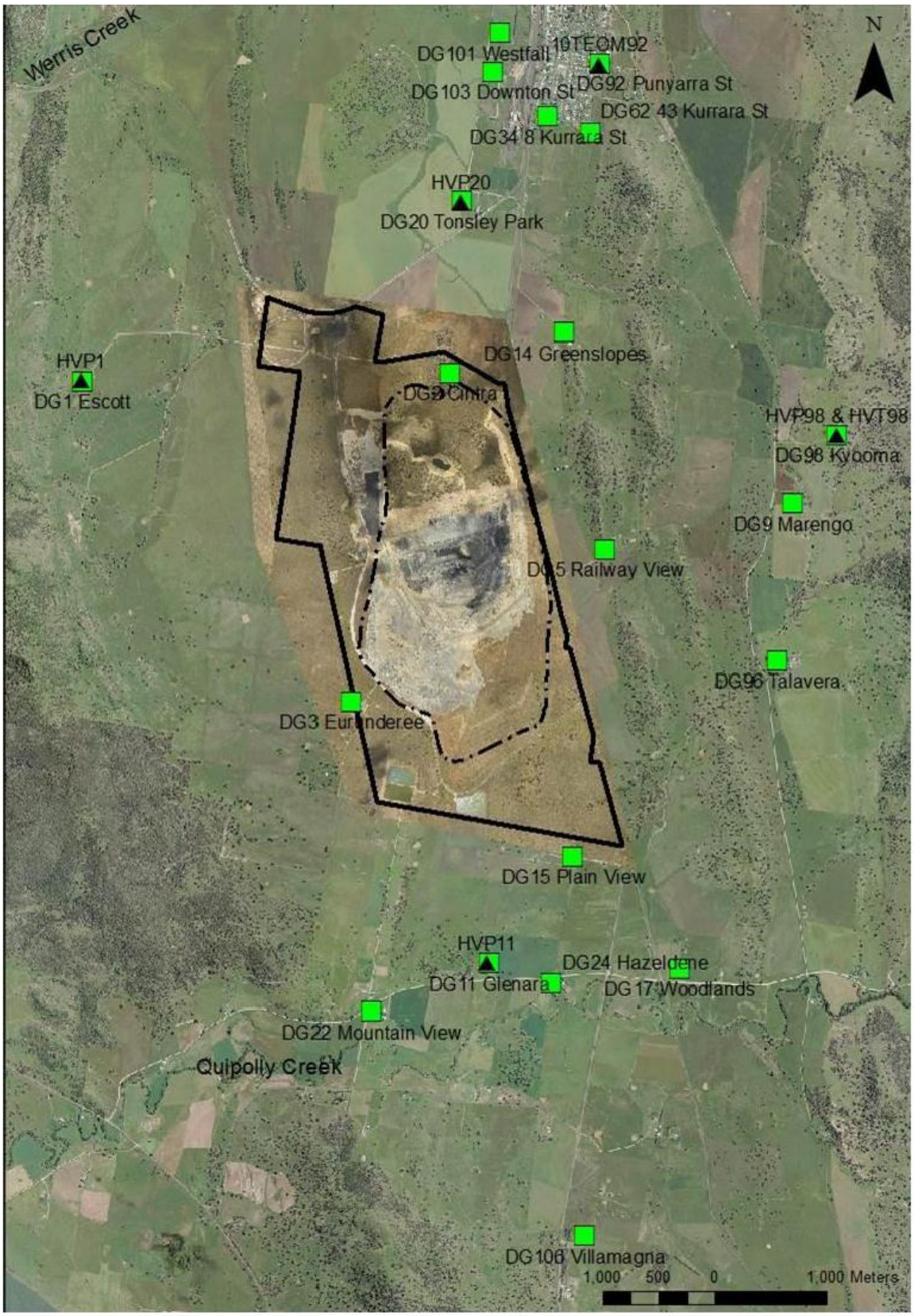
An analysis of the Werris Creek TEOM PM_{10} results was performed based upon two wind directions (wind towards Werris Creek (from the Mine) and wind not towards Werris Creek) and for various wind speeds. The results of the wind direction analysis showed no significant difference in PM_{10} levels when winds are blowing from the Mine to Werris Creek or not.

The annual average $PM_{2.5}$ concentration was measured to be 8.1 µg/m^3, fractionally above the annual criteria adopted in the AQGHGMP (based on the interim guideline published by NEPM) but did not exceed any air quality criteria outlined in the Project Approval. A review of wind patterns recorded at the site during the reporting period showed that winds blowing from the Mine to Werris Creek only occurred 8.7% of the time. On this basis it can be concluded that $PM_{2.5}$ emissions from the Mine would have had a minor contribution to the annual average concentration recorded by the TEOM.

There were three elevated 24-hour average $PM_{2.5}$ levels recorded during the 2013/14 reporting period.

- On 7 and 8 November 2013 the maximum 24 hour $PM_{2.5}$ concentration recorded was 27.6 µg/m^3. The wind was a moderate north northwesterly indicating that an upwind source was contributing to the dust and was not related to mining. It was noted that the PM_{10} concentration recorded by the EPA in Tamworth on this day was 50.0 µg/m^3 indicating that there was a regional dust event at this time.
- 24-hour average $PM_{2.5}$ concentrations reached 28.0 µg/m^3 on the 22 and 23 January 2014 due to the Carinya Road bushfire approximately 10 km southeast of Werris Creek.
- Elevated $PM_{2.5}$ concentrations were recorded on 11 February 2014 between 4 pm and 7:45 pm, with the wind blowing from the west-southwest during this period. This wind direction would not propagate dust emissions from the Mine towards Werris Creek township.

Figure 3 Monitoring Locations



3.2.3 High Volume Air Sampler Data (TSP and PM_{10})

The HVAS monitors are located north/east/south/west around the Mine (refer to **Figure 3**) to measure dust emissions representative of mining operations regardless of the prevailing wind direction.

The results of all four PM_{10} and one TSP HVAS averaged below the relevant annual criteria. There was one elevated result of 56.4 µg/m^3 recorded on 30 September 2014 at HVP11 "Glenara". The wind was a moderate north-northwesterly, with the upwind (unaffected by the Mine) HVAS at Tonsley Park recording 22.6 µg/m^3. This was consistent with the EPA monitor in Tamworth, which recorded 20.5 µg/m^3, while the Werris Creek TEOM recorded 13.6 µg/m^3 on this date. Assuming the background dust contribution on 30 September was 13.6 µg/m^3, then the worst case the Mine dust contribution at Glenara was estimated at 42.8 µg/m^3.

The Mine has undertaken PM_{10} dust monitoring since 2005 and a review of the annual averages measured since that time indicated an increasing trend of PM_{10} dust levels at "Tonsley Park" while "Escott/Eurunderee" dust levels are now declining after peaking in 2010. The central Werris Creek and "Glenara" sites recorded annual averages higher than the previous period.

The drivers for the higher dust levels was thought to be related to the drier conditions experienced during the 2013/14 reporting period due to below average rainfall, however, increased dust emissions from the Mine were also expected to contribute as production rates and area of disturbance increased while distances to neighbouring properties/Werris Creek decreased over this period.

Except for "Glenara", the annual average dust concentrations recorded by the other monitoring locations during 2013/2014 were below the predicted levels in the Heggies (2010) for Year 3 (Scenario 1). Actual dust levels for "Glenara" being higher than predicted is not considered to be significant with the drier and dustier conditions and localized agricultural activities affecting the air quality more than dust generated from mining operations.

3.3 Dust Complaints

The 2013/14 AEMR reported that dust related complaints have increased since 2010, which is believed to be due to the increase in scale of mining operations and as a consequence of operations moving closer to the township of Werris Creek (see **Table 2**).

Most dust complaints (particularly from Werris Creek residents) are related to general dust fallout issues (cleaning outdoor tables etc.) rather than specific events. These complaints are responded to by the Mine by taking a sample of dust, water from rainwater tank and reviewing the real time PM_{10} data. The 2013/14 AMER reported that the microscopic analysis of the dust samples usually found that if there was any coal in the sample it was at trace amounts, with dirt (from any source), vegetation and algae the predominant constituents. The drinking water quality was usually found to be within ANZECC guidelines.

Table 2 Air Quality related Complaints since 2005

Complaint Issue	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Dust – Mine	1	2	0	3	0	5	7	12	11
Dust – Rail Load Out	0	0	0	1	0	0	0	0	3
Odour	0	0	0	0	0	0	0	0	5
All Complaints	**8**	**10**	**7**	**16**	**12**	**52**	**117**	**56**	**93**

4 Estimated Impacts on Particulate Emission Rates of Proposed Modification

Predictions of air quality impacts resulting from the operation of the LOM Project extension of the Mine were provided in the Heggies (2010) AQIA (Heggies, 2010). Predictions were made for three scenarios which broadly represented three future years of operation; Year 3, Year 7 and Year 15 (refer to the AQIA for full details of each modelled scenario). Operations in Year 3 of the LOM Project are considered to most closely reflect the operations which are currently being performed at Werris Creek Coal Mine. The key activity data for the Year 3 Scenario compared to current activities is summarised in **Table 3**.

Table 3 Comparison of Current and Modelled (Year 3) Activity Data

Parameter	LOM Scenario 1 (Year 3)	AEMR 2013/14
Annual coal extraction rate (tpa)	2,500,000	2,076,806
Coal transported to product stockpile by trucks (tpa)	2,400,000	1,893,180
Coal transported to domestic market by trucks (tpa)	100,000	3,481
Overburden production rate (bcm)	23,500,000	16,121,382
Water usage on roads (ML)	289	339.7

The emission inventory compiled for the Heggies (2010) AQIA has been reviewed and updated to provide an estimate of TSP, PM_{10} and $PM_{2.5}$ emission rates for the Proposed Modification. This has included a review of emission factors and calculation methodologies to comply with current best practice emission estimation techniques.

A summary of the calculated total annual site emissions for the proposed operations, compared to emissions estimated for the three assessment scenarios used in the Heggies (2010) AQIA is provided in **Table 4**. The estimated active disturbance areas are reduced (~60%), however, haul road length (OB and ROM transport) has increased significantly (~50%) in the Proposed Modification scenario compared to the operational scenarios assessed in the Heggies (2010) AQIA. This is largely a result of haul ramp development and operation transferring from the low wall to the high wall side of the open cut.

As shown in **Table 4**, the estimated PM_{10} emissions for the Proposed Modification are similar to (fractionally lower than) those estimated in the Heggies (2010) for Scenario 3 (Year 15). The TSP emissions for the Proposed Modification however are around 30% higher than those estimated for Scenario 3. The reasons for the estimated TSP emissions increasing while the PM_{10} and $PM_{2.5}$ emissions decrease relate to updates in the emission factors used for key sources. Given that 24-hour PM_{10} concentrations are the constraining factor for air quality compliance, and that Scenario 3 gave the highest off-site predictions, it has conservatively been assumed that the air quality impacts outlined in the Heggies (2010) for Scenario 3 represent the likely worst case air quality impacts following modification.

Table 4 Comparison of Estimated Emissions with Heggies (2010) Inventories

Scenario		Total Annual Estimated Emissions (tonnes per annum)			Percentage Increase in Estimated Emissions		
		TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
2010 AQIA	Scenario 1	1,538	426	63	35%	33%	-2%
	Scenario 2	1,445	500	74	43%	14%	-16%
	Scenario 3	1,553	592	85	33%	-4%	-27%
Proposed Modification		**2,073**	**568**	**62**			

5 Assessment of Potential Impacts on Off-Site Air Quality of Proposed Modification

A summary of the TSP, PM_{10} and $PM_{2.5}$ concentrations and deposited dust levels predicted at identified nearby sensitive receptors in the Heggies (2010) AQIA is presented in **Table 5**. Since the Heggies (2010) AQIA was completed, the Mine have purchased four properties and these receptors are denoted with grey shading as they no longer classify as sensitive receptors. As shown in **Table 5**, these receptors were identified as having the greatest potential for impacts and now that they have been purchased, the worst case predicted impacts at the remaining sensitive receptors are significantly lower in many cases.

With respect to $PM_{2.5}$, the maximum 24-hour and annual average concentrations predicted at the worst affected receptor for Scenario 3 were 15.1 µg/m^3 and 4.3 µg/m^3 respectively (receptor 21), which are well below the relevant air quality criteria. Given that the revised emission inventory for the Proposed Modification gives significantly lower $PM_{2.5}$ emissions than the emission rates used in the modelling for this scenario (see **Table 4**), and given that the locations of dust producing activities are not significantly different to those assumed in the Heggies (2010) modelling study for Scenario 3, it can be expected that the worst case off-site concentrations would likely to be lower for the Proposed Modification than those presented in **Table 5**. On this basis, no significant increases in off-site air quality impacts are anticipated, and the risk of non-compliances of the $PM_{2.5}$ criteria is not expected to increase.

With respect to PM_{10}, the maximum 24-hour and annual average concentrations predicted at the worst affected receptor for Scenario 3 were 42.2 µg/m^3 and 19.1 µg/m^3 respectively (Receptor 21), which are below the relevant air quality criteria. Given that the revised emission inventory for the Proposed Modification gives slightly lower PM_{10} emissions than the emission rates used in the modelling for this scenario (see **Table 4**), and given that the locations of dust producing activities are not significantly different to those assumed in the Heggies (2010) modelling study for Scenario 3, it can be expected that the worst case off-site concentrations would not be significantly different for the Proposed Modification than those presented in **Table 5**. On this basis, no significant increases in off-site air quality impacts are anticipated, and the risk of non-compliances of the PM_{10} criteria is not expected to increase.

For TSP, the emissions estimated for the Proposed Modification are 33% higher than the emissions used in the modelling study for Scenario 3. The maximum annual average TSP concentration predicted at a sensitive receptor was 40.6 µg/m^3. If this increased by 33%, the maximum predicted concentration would be around 54 µg/m^3, which is still well below the assessment criterion of 90 µg/m^3.

As noted in the Heggies (2010), there is significant uncertainty associated with the estimation of $PM_{2.5}$ emissions from PM_{10} estimates using broad ratios for ranges of sources, and the dispersion modelling predictions for $PM_{2.5}$ should therefore be viewed as indicative only with an appropriate level of uncertainty attached. As discussed in **Section 3.2.2**, monitoring of $PM_{2.5}$ concentrations in the vicinity of the mine indicates that emissions from the mine do not have a significant impact on $PM_{2.5}$ concentrations within Werris Creek township.

6 Conclusion

Based on the analysis provided above, it is not considered that the Proposed Modification will result in any increased risk of exceedances of air quality criteria. Predictions of air quality impacts as outlined in the Heggies (2010) AQIA for Scenario 3 are considered to represent the likely worst case air quality impacts following modification, as the open cut area progressively moves northwards towards the Werris Creek township.

Since the provision of the Heggies (2010) AQIA, the NSW EPA has required every coal mining operation in NSW to perform a best management practice assessment of the particulate control measures in place at mining operations. Following this review, a number of dust control measures not included in the Heggies (2010) AQIA have been implemented at the Mine. These measures, and ongoing and extensive dust monitoring performed at key locations surrounding the mine, provide a proactive approach to dust management which is considered to be appropriate and effective given the general and ongoing compliance with air quality criteria as outlined in the Project Approval.

Table 5 Summary of Predicted Dust Levels at Sensitive Receptors (Heggies (2010) - Scenario 3)

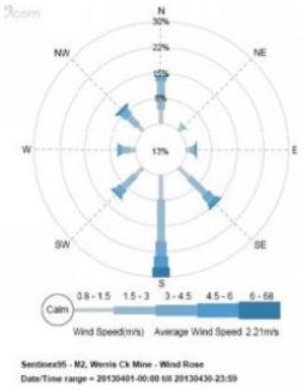
Receptor		Heggies (2010) Predicted Dust Levels – Scenario 3 (Year 15)									
		Annual Average TSP ($\mu g/m^3$)		Annual Average PM_{10} ($\mu g/m^3$)		24-Hour PM_{10} ($\mu g/m^3$)		Annual Average $PM_{2.5}$ ($\mu g/m^3$)	24-Hour Average $PM_{2.5}$ ($\mu g/m^3$)	Annual Average Deposited Dust (g/m^2/month)	
ID	Ownership	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Increment	Increment	Cumulative
5	R. & A. George	0.7	30.9	0.3	15.4	3.5	32.0	0.4	6.2	<0.1	0.6
7	P.R. & J.S. Andrews	1.2	31.4	0.5	15.6	4.4	32.1	0.6	7.6	<0.1	0.6
8	P.A. & T.M. Hird	1.2	31.4	0.5	15.6	4.4	32.1	0.6	7.5	<0.1	0.6
9	B.R. & A.J. Smith	1.2	31.4	0.5	15.6	4.2	32.1	0.6	7.3	<0.1	0.6
10	A. Blackwell	1.9	32.1	0.8	15.9	5.2	34.6	0.8	8.3	0.1	0.7
11	W.H. & S.I. Ryan	2.0	32.2	0.8	15.9	5.5	34.6	0.8	8.3	0.1	0.7
12	B.A. Fletcher	3.4	33.6	1.5	16.6	7.5	32.8	0.9	7.9	0.1	0.7
14	A.D. & C. Teskera	17.1	47.3	6.1	21.2	39.4	60.7	3.1	15.5	0.7	1.3
15	R.G. & A.R. Maxwell	4.2	34.4	1.6	16.7	13.7	35.5	1.2	11.3	0.2	0.8
17	M.M. Doolan & A.E. Hogan	1.6	31.8	0.7	15.8	5.0	32.0	0.7	6.5	0.1	0.7
18	R.F. & H.T. Withers	11.5	41.7	4.3	19.4	23.7	47.5	2.4	15.4	0.5	1.1
20	L. Patterson	13.1	43.3	4.8	19.9	24.7	44.9	2.5	16.4	0.5	1.1
21	G.J. Currey	10.4	40.6	4.0	19.1	18.4	42.2	2.3	15.1	0.4	1.0
22	L.F. & R.M. Parkes	1.1	31.3	0.5	15.6	4.2	32.1	0.6	7.2	<0.1	0.6
24	P. George	1.9	32.1	0.8	15.9	6.5	34.0	0.8	7.7	0.1	0.7
96	B. Davison	4.2	34.4	1.6	16.7	11.2	33.9	1.4	10.0	0.2	0.8
98	J. Colville	2.0	32.2	0.8	15.9	5.8	32.2	1.1	8.4	0.1	0.7
99	C. Colville	1.8	32.0	0.7	15.8	6.8	32.6	1.0	7.0	0.1	0.7
Criteria		-	90	-	30	-	50	8 *	25	2	4

Note: Shaded cells indicate sensitive receptors that are now under the ownership of the Mine.

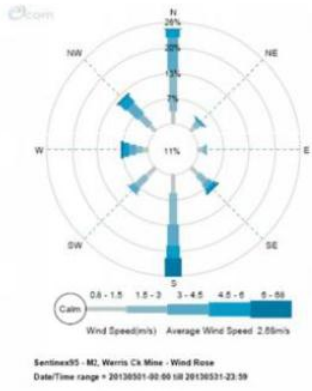
Appendix A

610.14535 Letter Report_22012015.docx
Page 1 of 3

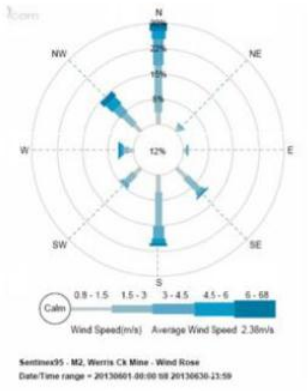
Windroses – Observed



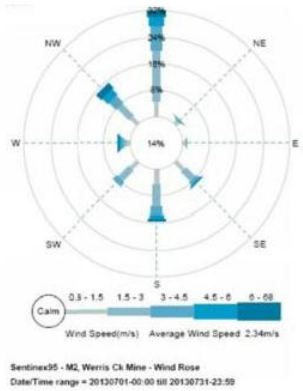
April 2013



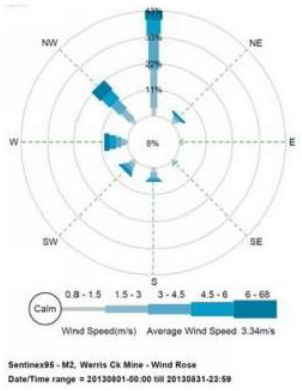
May 2013



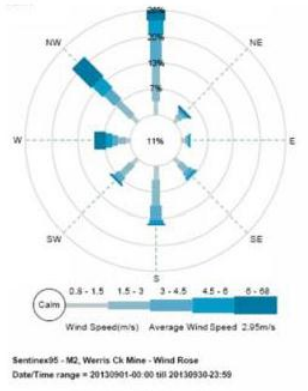
June 2013



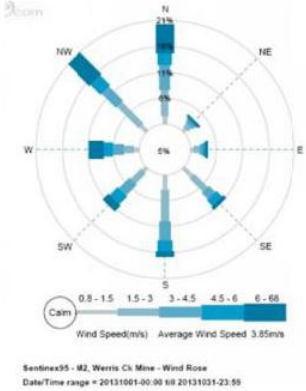
July 2013



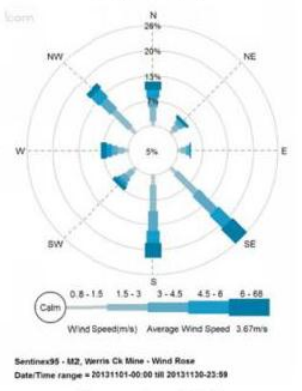
August 2013



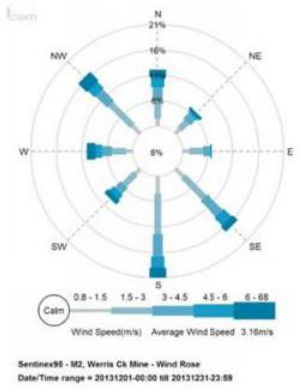
September 2013



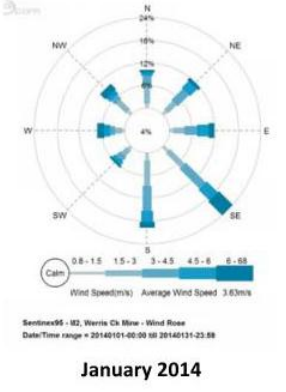
October 2013



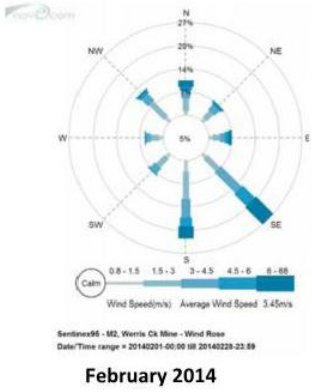
November 2013



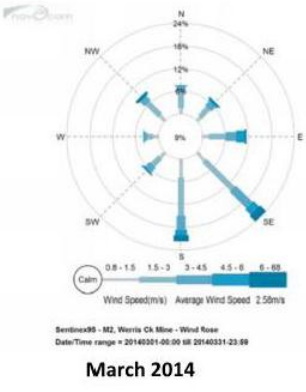
December 2013



January 2014



February 2014

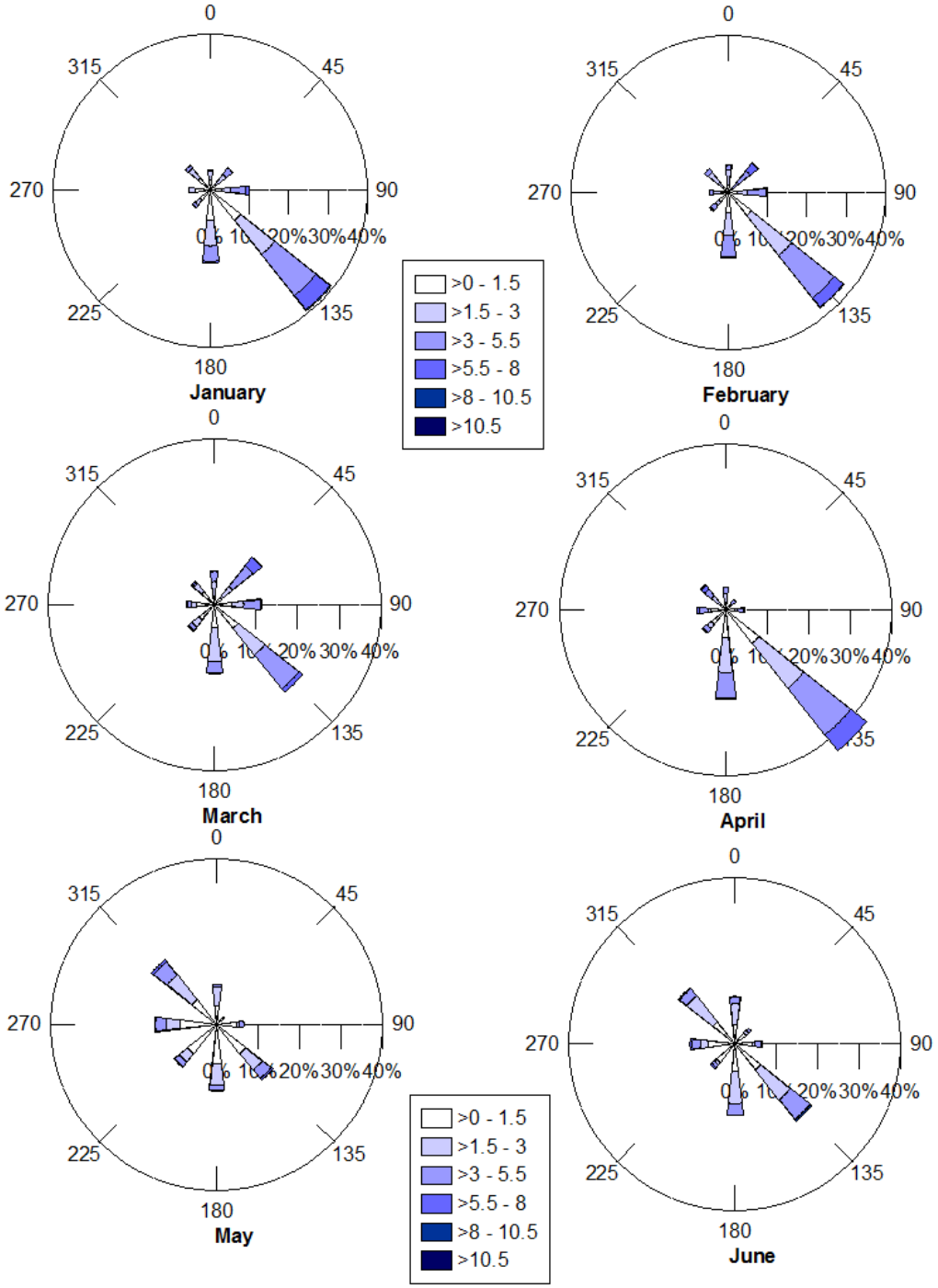


March 2014

Appendix A

610.14535 Letter Report_22012015.docx
Page 2 of 3

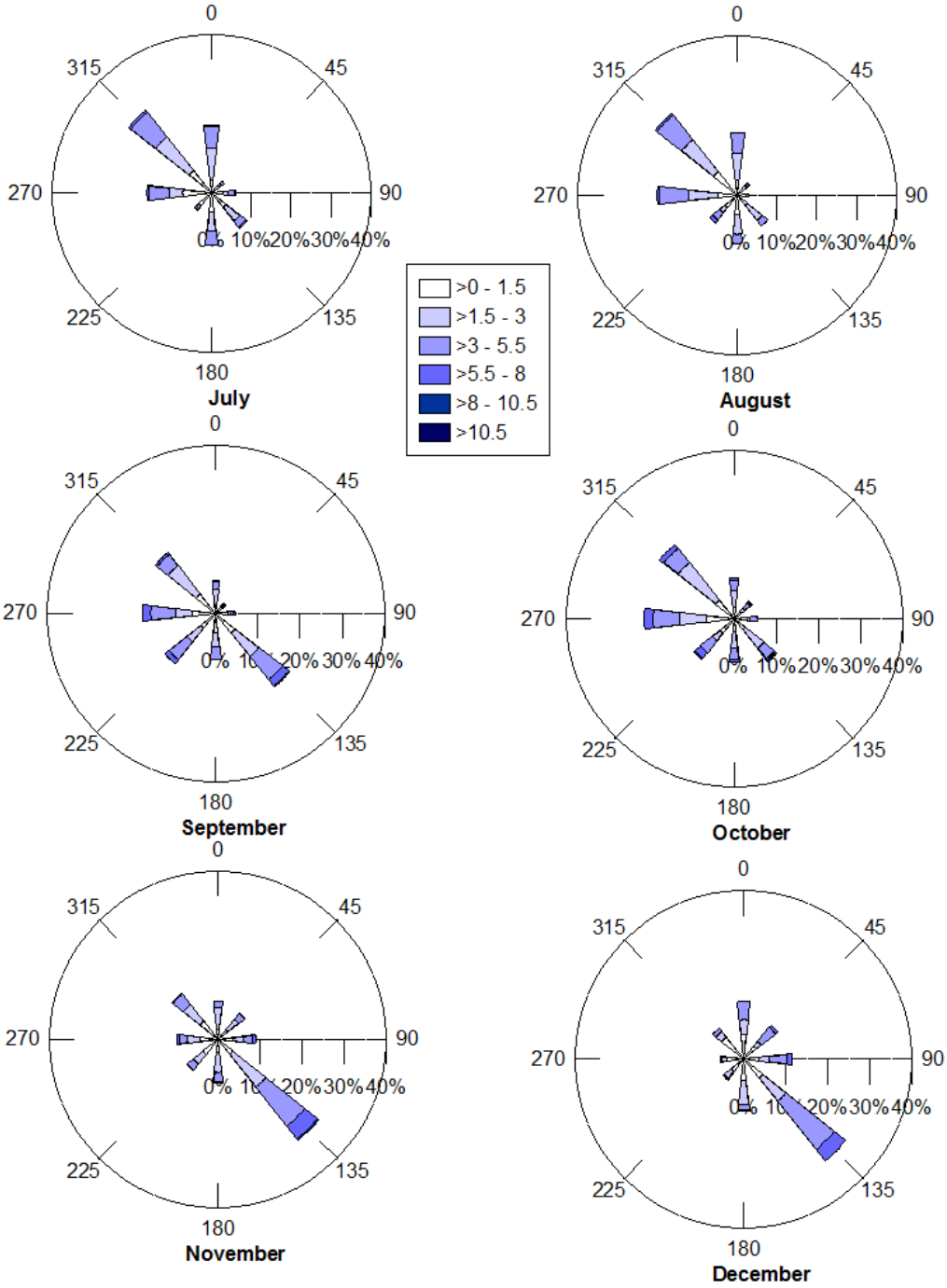
Windroses - Predicted



Appendix A

610.14535 Letter Report_22012015.docx
Page 3 of 3

Windroses - Predicted



This page has intentionally been left blank