



Centennial Coal

**Newstan Colliery
Main West Mining Project**

Response to Submissions

December 2011



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1 INTRODUCTION

Newstan Colliery is an existing underground coal mine owned and operated since 2002 by Centennial Newstan Pty Limited (Centennial Newstan). Newstan Colliery is regionally located approximately 25 kilometres south-west of Newcastle and 140 kilometres north of Sydney within the Lake Macquarie Local Government Area (LGA). The Newstan Colliery pit top and Surface Facilities Area is located in Fassifern approximately four kilometres north of the township of Toronto.

Newstan Colliery began mining operations in 1887, prior to the implementation of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act), and operated under continuing use rights pursuant to section 109 of the EP&A Act. On 14 May 1999 the (then) Minister for Urban Affairs and Planning granted development consent to Newstan Colliery under Part 4 of the EP&A Act for the Newstan Colliery Life Extension Area pursuant to Development Application 73-11-98 (DA 73-11-98).

Underground mining at Newstan Colliery has been undertaken in the: Young Wallsend; Great Northern; Fassifern; Borehole and West Borehole coal seams and has produced both a semi-soft coking coal and a thermal coal product for the domestic and export markets. Newstan Colliery temporarily ceased underground mining production in 2009, however has continued to operate the Surface Facilities Area for the handling and processing of coal from other Centennial Coal Company (Centennial) operations.

Centennial Newstan is seeking a modification to DA 73-11-98 subject to Section 75W of the EPA&A to allow for the recommencement of first workings, bord and pillar mining in an area referred to as Main West.

Specifically the Main West Mining Project involves:

- mining within the West Borehole coal seam in an area of approximately 152 hectares in size and beyond the existing development consent boundary;
- first workings, bord and pillar mining from within the Project Area with vertical subsidence being less than 20 millimetres;
- extraction of up to 3.2 million tonnes (Mt) of Run of Mine (ROM) coal at a maximum rate of 1 million tonnes per annum (Mtpa) from the Project Area;
- first workings (within the Project Area) developed using up to two continuous miners only, with other existing mining equipment utilised to support the mining activities and ongoing operations of the Newstan Colliery; and
- a workforce of up to 50 personnel will be required for the Project, well within the existing approved limit of 320.

As a result of the Main West Mining Project, there will be no changes to the existing Newstan Colliery:

- hours of operation;
- coal handling and transport;
- coal rejects and tailings management;
- mine support facilities/infrastructure;
- water management system;
- environmental management (other than upgrades to relevant management plans); and
- site rehabilitation.

A range of positive benefits will accompany the Project at a local, regional and state level. Notable benefits of the Project include, but are not limited to, the following:

- continued additional export income for Australia;
- additional wages, royalties and flow on effects injected into the local, regional and state economies for the life of the Project;
- revenue generation for Newstan Colliery while ongoing assessments for future mining within the Newstan mine lease area is undertaken;

- contribute to Centennial Coal meeting its current contract supplies of coal (to both the domestic and export markets);
- avoid sterilisation of coal resources, through the recovery of available coal resources at the existing mine;
- continued opportunities for local residents in relation to employment, training and lifestyle including full- time employment for approximately 50 personnel for the life of the Project; and
- continued community participation and support (i.e. sporting group sponsorship, assistance to local schools and charities).

An Environmental Assessment was prepared by GSS Environmental on behalf of Centennial Newstan to support the Main West Mining Project Application. The Environmental Assessment was placed on public exhibition from 22 June to 22 July 2011.

2 SCOPE

This report has been prepared in accordance with section 75H(6) of the EP&A Act and considers the matters raised in submissions received by the NSW Department of Planning and Infrastructure (DP&I) during the public exhibition of the Environmental Assessment. This report builds on information presented in the Environmental Assessment and is to be read in conjunction with the Environmental Assessment.

3 OVERVIEW OF SUBMISSIONS

16 submissions were submitted to the DP&I in regards to the Newstan Colliery Main West Mining Project. Submissions were received from:

- NSW Office of Environment and Heritage (OEH);
- NSW Office of Water (NOW);
- Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS);
- Department of Transport;
- Heritage Branch;
- Roads and Traffic Authority (RTA);
- Hunter Central Rivers – Catchment Management Authority (HCR-CMA);
- Lake Macquarie City Council (LMCC)
- Construction, Forestry, Mining and Energy Union (CFMEU); and
- Individuals (7).

Of the 16 submissions received, one submission was in support of the Project, one submission had no concerns regarding the project, seven submissions raised additional concerns or issues required to be considered for the Project and six submissions were in objection to the Project. Table 1 provides a summary of the issues raised in the submissions received by the DP&I.

Table 1 – Summary of Issues Raised in Submissions

Concern	Raised By	Summary of Concern
Water quality	HCR-CMA	Water quality discharged from Licenced Discharge Point 001 (LDP001) already exceeds ANZECC water quality trigger levels. The Project will increase the volume of water discharged through LDP001 and therefore water quality issues should be resolved.
Surface water	Individuals and NOW	There has been no surface water assessment undertaken during the preparation of the Environmental Assessment. Water quality is sampled at LDP001 to meet requirements of the Environmental Protection Licence. No other monitoring of this Creek has been acknowledged within the Environmental Assessment. Lords Creek is a tributary of Jigadee Creek and no monitoring is acknowledged within the Environmental Assessment. There are two major tributaries of Lords Creek located within the Project Area. The Project may impact on these tributaries, the associated alluvial groundwater and groundwater dependant ecosystems. As such the Precautionary Principal should apply. The application should be supported by additional information regarding the likely cumulative impact of additional water discharge to LT Creek and the likely hydrological and ecological impacts on the creek.
Groundwater	NOW	The Environmental Assessment does not acknowledge the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources. Any interception and/or removal of groundwater within the alluvium is considered take under the Water Management Act 2000. The Environmental Assessment has not provided licence details to account for the dewatering currently occurring at Newstan Colliery. There has been no indication of what water licences and/or approvals have been applied for by Centennial Newstan for the increased groundwater dewatering volume. The level of information known about groundwater presented in the Environmental Assessment is insufficient to be able to adequately assess this Project

		Application. The Environmental Assessment has identified the riparian vegetation along Lords Creek and the Endangered Ecological Community Swamp Mahogany-Paperbark Forest; however there was no monitoring of these communities for ecosystem health or baseline assessment of groundwater dependence. There has been no consideration of the baseflow ecosystems within Lords Creek and associated tributaries within the mine area.
Water management	Individuals	The Office of Environment and Heritage has not processed the Newstan Colliery EPL variation for an increase in discharge volumes as it is awaiting legal advice from the applicant to determine if the volume increase requested in the variation application has obtained or requires consent or approval under the Environmental Planning and Assessment Act 1974. The Environmental Assessment identifies that Centennial Newstan currently discharges through an underground emergency discharge pipeline (known as the "Stony Creek Pipeline"). This discharge point is not an authorised discharge point on EPL 395 and as such all discharges from the Stony Creek Pipeline are subject to Section 120 of the Protection of the Environment Operations Act 1997.
Awaba Nature Reserve	Individuals	The proposed Main west mining area is under land that has been proposed by the community to form part of the Awaba Nature Reserve. Previous mining by Centennial Newstan has had impacts in the area. The Environmental Assessment should provide for land offsets and promote conservation of land within the proposed Awaba Nature Reserve.
Ecology	Individuals and OEH	Further investigation and assessment of threatened species impacts is warranted as there appears to be a range of contradictory statements in documents concerning the population of threatened species in the area. The vegetation map prepared for the Project Area was based upon new field data, but did not appear to be based on any cluster or ordination analysis (Hunter Eco, 2010b). Such analysis could have helped resolve the relationship of the 'undefined riparian' vegetation community with the current vegetation community classification, and provided an indication of its conservation significance.
Community consultation	Individuals	The Environmental Assessment or the Stakeholder Engagement Plan is not available on the Centennial Coal website.

		There has been insufficient community consultation regarding the Project There has been inadequate consultation with the Aboriginal community regarding the Project.
Archaeology	Individuals and OEH	The Environmental Assessment does not consider impacts of discharge on the Kurra-Kurran Aboriginal site. The proposed Aboriginal Cultural Heritage Management Plan should specifically be updated to include details of the range of recent Aboriginal cultural heritage legislative reforms meet the current legislative requirements and cultural heritage management standards and include details of the additional proposed investigation processes for field surveys and monitoring.
European Heritage	Heritage Branch	No field surveys were undertaken for non-Aboriginal Heritage to confirm that there are no non-Aboriginal Heritage sites within the area. Field surveys should be undertaken. There is no recommendation in the Environmental Assessment for the management of the discovery of unexpected non-Aboriginal sites within the Project Area.
Air Quality	Individuals, RTA, LMCC and OEH	Section 5.3.2 of the Air Quality Impact Assessment states that there is no PM_{2.5} monitoring data available for the Project Site or the wider region. Consequently, a background concentration of PM_{2.5} was not assumed in the Air Quality Impact Assessment. PM_{2.5} monitoring commenced at Wallsend, the nearest Office of Environment and Heritage monitoring station to the Project Site, in 1996. The Air Quality Impact Assessment should adopt the Wallsend 2009 PM_{2.5} monitoring data for the background air quality. The specific emission rates used in the dispersion modelling are not included in the Air Quality Impact Assessment. It appears that the annual emission estimates were used in the dispersion modelling to predict ground level concentrations of TSP, PM₁₀ and PM_{2.5} for all averaging periods. An emissions inventory should have been developed for two scenarios: • Annual average estimates; and • Maximum hourly estimates. The maximum hourly emission estimates should be used in the dispersion modelling for the prediction of short term air quality impacts such as environmental

		criteria that are based on daily or monthly averaging periods. The emission factor used in the Air Quality Impact Assessment for unpaved haul route wheel dust was sourced from USEPA AP-42 and included a factor to account for natural mitigation of particles due to rainfall. The use of the rainfall factor in the unpaved haul route emission factor may result in an underestimate of worst case 24 hour average PM₁₀ impacts. The rainfall factor should not be used to estimate maximum hourly emissions. The Air Quality Impact Assessment does not use the most up to date version of the USEPA AP-42 emission factor for wheel dust from paved roads. For wind erosion, the Air Quality Impact Assessment uses the NPI default emission factor of 0.4 kg/ha/hr for TSP and 0.2 kg/ha/hr for PM₁₀ and an assumption that wind erosion does not occur below 5.4m/s. The NPI emission factor assumes wind erosion is constant above 5.4m/s and is not dependent on wind speed. As wind erosion is dependent on wind speed, the use of the NPI emission factor to calculate hourly emissions may result in an underestimate of 24 hour average PM₁₀ impacts. The effect of wind speed on wind erosion should be included in the estimate of maximum hourly emissions. From Appendix B it would appear that the reclaim conveyor is enclosed as a 100% control of particulate emissions has been assumed. Please confirm the reclaim conveyor is enclosed. The current and proposed particulate controls applied to the primary crusher (including the screens, crusher, feeder, surge bin and conveyor transfer points) should be clarified. The maximum cumulative 24 hour average PM₁₀ concentrations presented in Table 22 of the Air Quality Impact Assessment are not in accordance with the requirements of the Approved Methods for Modelling and Assessment of Air Pollutants (the Approved Methods). The proponent must revise the results of the 24 hour average PM₁₀ impact assessment to be in accordance with the requirements of the Approved Methods. Additional air quality mitigation measures are not proposed to resolve predicted exceedences of the Office of Environment and Heritage impact assessment criteria.
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		The application has not demonstrated what cumulative impacts may occur on the air quality of the receiving environment inclusive of odour impacts around the Main West area. There is the likelihood that venting of odorous or acrid air will occur from existing vents within the Awaba mine workings area. The Air Quality Impact Assessment inadequately assessed the impacts from coal haulage on the Awaba residents. Centennial Newstan must ensure there is adequate mitigation measure in place to ensure that there is no dust drift across the F3 freeway.
Noise	Individuals and OEH	Section 6.1.2 of the Noise Impact Assessment identifies existing and additional noise management and mitigation measures used in the noise modelling and assessment process. There are two management measures that have not been reiterated in the Statement of Commitments on page 70 of the EA, these are: 1) Night-time mobile plant management; and 2) Reversing alarms on mobile plant. Table 19 of the Noise Impact Assessment shows that the project specific noise criteria will be met at all receivers and time periods with the exception of a 2dB predicted exceedence at NC3 during a night-time temperature inversion. Therefore NC3 would be within the noise management zone under that night-time inversion scenario.
Subsidence	DTIRIS	There should be a requirement that the proposed mining does not cause subsidence beneath the angled tension tower identified in the Environmental Assessment. The proponent should be required to develop a subsidence monitoring program for the 330kV electricity transmission lines identified in the Environmental Assessment in consultation with the infrastructure owner.
Rehabilitation	DTIRIS	The proponent should amend the Mining Operations Plan to include the proposed modification, to the satisfaction of the Division of Resources and Energy. The proponent should review the proposed modification activities in the Annual Environmental Management Report to the satisfaction of the Division of Resources and Energy.

		Integrated rehabilitation and environmental management reporting is to be captured in the existing Mining Operations Plan and Annual Environmental Management Report to the satisfaction of the Division of Resources and Energy's Director Environmental Sustainability. The proponent should commence discussions with Division of Resources and Energy on the requirements for the preparation and submission of a Mining Operations Plan and Annual Environmental Management Report.
Impacts on rail and road network	RTA and LMCC	Centennial Newstan should consult with Transport NSW and Newcastle City Council regarding impacts of increased rail on the rail network, scheduling or the Adamstown level crossing. The application should be supported by a contingency plan detailing how coal will be transported to the port of Newcastle, should the rail network fail or be unavailable.
Surface Infrastructure	LMCC	The application should be supported by additional information with regard to the likelihood of impacts at the Main West site from additional surface facilities.
Community impacts	Individuals	The Environmental Assessment does not adequately assess impacts of the Project on the health of nearby residents or impacts on real estate values.
Mining Area	NOW	The mining footprint for the mining extension has not been made available in the Environmental Assessment.
Company ownership	Individuals	Section 11.3 of the Environmental Assessment refers to Centennial Coal being Australian owned. This is incorrect.

4 RESPONSE TO SUBMISSIONS

4.1 Water Quality

Water quality discharged from Licenced Discharge Point 001 (LDP001) already exceeds ANZECC water quality trigger levels. The Project will increase the volume of water discharged through LDP001 and therefore water quality issues should be resolved.

Centennial Newstan holds Environmental Protection Licence EPL 395. EPL 395 allows for Centennial Newstan to discharge up to 7 ML/day of water through LDP001. The proposed Main West Mining Project will contribute approximately 0.32 ML/day of groundwater into the existing Newstan Colliery water management system. Centennial Newstan recognise that the current 7 ML/day limit on discharge volumes is inadequate to accommodate the current and proposed water discharge requirements from the Newstan Colliery.

In order for Centennial Newstan to increase water discharge volumes from the Newstan Colliery to adequate levels, an EPL variation application has been submitted to the Office of Environment and Heritage requesting an increase in the discharge volume limits through LDP001 from 7 ML/day to 11 ML/day. As such the impacts of increasing the volume of water discharged into LT Creek through LDP001 were not considered as part of this Environmental Assessment. Until any increase in discharge volumes are approved, Centennial Newstan will continue to discharge water in accordance with the volume and water quality criteria of EPL 395 and will not increase the volume of water discharged from Newstan Colliery above what has already been assessed and approved.

In regards to water quality issues, Centennial Newstan acknowledges that data obtained from water quality monitoring undertaken on water discharged through LDP001 indicates exceedences of the ANZECC water quality trigger levels for NO_x, lead, zinc and aluminium. The exceedences (in particular those of (NO_x and aluminium) are likely a result of the adoption of the ANZECC and ARMCANZ (2000) default trigger values rather than site specific trigger values (due to a lack of background data at WMP01). Centennial Newstan has committed within the Environmental Assessment to undertake a research programme, in partnership with the University of Queensland, to improve its understanding of discharge water quality issues at the Newstan Colliery. The key objectives of the research programme are to:

- establish the source and mode of occurrence and transport of trace elements identified within
- the Newstan Colliery discharge water;
- determine the chemical forms of these trace elements;
- investigate the capacity of stream sediments to release trace elements;
- assess the potential risks associated with the current and future water and sediment quality; and
- recommend a suitable monitoring program and potential remedial actions.

In addition to the research programme discussed above, Centennial Newstan are currently investigating different water treatment options to improve the quality of the increased volume of water discharged from the Newstan Colliery into LT Creek through LDP001 and are investigation a regional water strategy for Centennials operations around Lake Macquarie.

4.2 Surface Water

There has been no surface water assessment undertaken during the preparation of the Environmental Assessment.

Whilst no technical impact assessment has been undertaken for surface waters as part of the Main West Mining Project, an assessment of the impacts of the Main West Mining Project on surface waters was discussed in Section 9.1 of the Environmental Assessment.

Water quality is sampled at LDP001 to meet requirements of the Environmental Protection Licence. No other monitoring of this Creek has been acknowledged within the Environmental Assessment.

Whilst no technical impact assessment has been undertaken for surface waters as part of the Main West Mining Project, an assessment of the impacts of the Main West Mining Project on surface waters was discussed in Section 9.1 of the Environmental Assessment. The Environmental Assessment identifies that an increase in discharge volumes will be required to support the current and ongoing operations of the Newstan Colliery and that an EPL variation has been applied for separately by Centennial Newstan to the Office of Environment and Heritage. The impacts associated with the increase in discharge volumes will be taken into consideration by the Office of Environment and Heritage in their assessment of the EPL variation application. As such, no further assessment on the impacts of the increase in discharge volumes has been included within the Environmental Assessment.

Centennial Newstan has an existing and comprehensive Surface Water Monitoring Programme in place which is detailed within the Newstan Colliery Revised Water Management Plan. The surface water monitoring programme includes a number of surface water monitoring locations within LT Creek to monitor the quality of water discharges and assess potential impacts. Monthly monitoring of a range of parameters (including heavy metals) is undertaken. Monitoring of these surface water monitoring points will continue to be undertaken during the mining activities within the Main West mining area.

Lords Creek is a tributary of Jigadee Creek and no monitoring is acknowledged within the Environmental Assessment.

Whilst no technical impact assessment has been undertaken for surface waters as part of the Main West Mining Project, an assessment of the impacts of the Main West Mining Project on surface waters was discussed in Section 9.1 of the Environmental Assessment. The surface water assessment concludes that as vertical subsidence over the Project Area will be less than 20 millimetres, surface impacts to Lords Creek will be negligible. As such, a detailed review of existing water quality within the Lords Creek catchment was not considered necessary for inclusion within the Environmental Assessment. An existing Surface Water Monitoring Programme is in place at Newstan Colliery which is detailed within the Newstan Colliery Revised Water Management Plan. The surface water monitoring programme includes surface water monitoring locations within Lords Creek (MP18) which will continue during the mining activities within the Main West mining area.

There are two major tributaries of Lords Creek located within the Project Area. The Project may impact on these tributaries, the associated alluvial groundwater and groundwater dependant ecosystems. As such the Precautionary Principal should apply.

To minimise the effect of subsidence by the Main West Mining on the surface, Centennial Newstan has made the decision to develop a bord and pillar, continuous miner operation that will result in less than 20 millimetres of subsidence. A subsidence assessment was undertaken for the Main West Mining Project by Seedsman Geotechnics and is provided in Appendix 4 and discussed in Section 7 of the Environmental Assessment. For pillars with a minimum width of 22 metres and at depths of 130 metres, the factor of safety against kinematic failure of the coal pillar itself is 5.18 at a 2.4 metre pillar height assumption (predicted seam thickness to be mined in the Project Area). As a comparison the standard design factor of safety used in New South Wales is 2.11, which relates to a long term stable design, with a one in a million chance of failure. The vertical subsidence over the Project Area is predicted to be less than 20 millimetres. There is an insignificant probability that the predicted 20 millimetres of subsidence will be exceeded. At 20 millimetres of vertical subsidence, surface impacts are negligible and cannot be measured.

The impacts of the Main West Mining Project on surface waters were discussed in section 9.1 of the Environmental Assessment. It was concluded that as the vertical subsidence within the Project Area will be less than 20 millimetres, surface impacts to Lords Creek or its tributaries will be negligible.

Potential impact to groundwater aquifers and other groundwater users associated with the Main West Mining Project were assessed by GHD in the Groundwater Impact Assessment provided in Appendix 6 and discussed in Section 9.2 of the Environmental Assessment. Where the Main West mining area underlies the Lords Creek alluvium, the depth of cover is approximately 70–90 metres. At this depth of cover it is very unlikely that fractures would develop and that there would be loss of groundwater from the alluvium for the proposed bord and pillar mining method (GHD 2010b). Any reduction in groundwater levels within the Lords Creek alluvium is also unlikely, based on the predicted subsidence calculations (GHD 2010b).

Current monitoring of groundwater levels within the Lords Creek alluvium indicates that recent mining, using longwall mining methods, adjacent to the Main West mining area has not resulted in a reduction in groundwater levels or a loss of groundwater from the alluvium. Therefore it is unlikely that the bord and pillar workings within the Project Area will impact the groundwater in the overlying Lords Creek alluvium (GHD 2010b). Whilst groundwater or aquifer impacts are not anticipated, ongoing monitoring of the existing network of monitoring bores to monitor for any potential changes in the groundwater as a result of mining activities will continue.

An Ecology Assessment was undertaken by Hunter Eco for the Project. A copy of the Ecology Assessment is provided in Appendix 7 and discussed in section 9.4 of the Environmental Assessment. The Ecology Assessment identified two communities that occupy an area of approximately 5 ha across the Project Area which are identified as being groundwater-dependent. These two communities are:

- swamp mahogany – paperbark forest (Endangered Ecological Community); and
- an undefined riparian community.

Any threat to the identified Groundwater Dependant Ecosystems would come from the loss of water in the upper alluvium as a result of cracking, particularly in the Lords Creek catchment within the Main West mining area. The bord and pillar mining method proposed for the Main West Mining area would be very unlikely to result in such cracking (GHD 2010b; Seedsman 2010). As such the potential impacts of the Main West Mining Project on Groundwater Dependant Ecosystems are negligible.

Centennial Newstan has taken into consideration the precautionary principle in regards to the Main West Mining Project and have adopted a mining method and layout which will result in negligible impacts to groundwater aquifers, groundwater dependant ecosystems and other groundwater users.

The application should be supported by additional information regarding the likely cumulative impact of additional water discharge to LT Creek and the likely hydrological and ecological impacts on the creek.

Centennial Newstan discharges water from the Newstan Colliery in accordance with the conditions of the Development Consent (DA 73-11-98) which requires for Centennial Newstan to only discharge water from the Newstan Colliery in accordance with the provisions of a current Environmental Protection Licence. Centennial Newstan holds Environmental Protection Licence EPL 395 which currently allows for Centennial Newstan to discharge up to 7 ML/day of water through LDP001. The proposed Main West Mining Project will contribute approximately 0.32 ML/day of groundwater into the existing Newstan Colliery water management system. Centennial Newstan recognise that the current 7 ML/day limit on discharge volumes is inadequate to accommodate the current and proposed discharge requirements from the Newstan Colliery. An application to vary EPL 395 has been submitted to the Office of Environment and Heritage to allow for an increase in the volume of water discharged through LDP001 from 7 ML/day to 11 ML/day. As such the impacts of increasing the volume of discharge were not considered as part of this Environmental Assessment.

4.3 Groundwater

The Environmental Assessment does not acknowledge the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources. Any interception and/or removal of groundwater within the alluvium is considered take under the Water Management Act 2000.

A Groundwater Impact Assessment for the Main West Mining Project was completed by GHD and is provided in Appendix 6 of the Environmental Assessment. Section 1.3.1 of the Groundwater Impact Assessment identifies that the relevance of the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 was considered as part of the assessment. As the proposed Main West Mining Project does not intercept or result in the removal of any water from the Lords Creek alluvium or the unregulated rivers which include two tributaries of Lords Creek that are covered by the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources, the Water Sharing Plan is not considered relevant to the Project.

The Environmental Assessment has not provided licence details to account for the dewatering currently occurring at Newstan Colliery.

A meeting was held on 6 May 2010 with Fergus Hancock from the Office of Water to resolve water licensing issues associated with the Newstan Colliery. Subsequent to this meeting, relevant water licence applications were submitted to the Office of Water on 9 July 2010 seeking to licence the annual extraction of 2575.5 ML per year (7 ML/day) from the Fassifern and Great Northern coal seams. Follow up regarding the processing of these applications has been conducted by Centennial Newstan on 14 October 2010, 1 November 2010, 13 May 2011 and 24 June 2011. No response on the progress of the water licence application processing has been received from the Office of Water and as such approval from the Office of Water for the current extraction of 7 ML/day has not yet been received. Centennial Newstan will follow up with the Office of Water to resolve this issue.

There has been no indication of what water licences and/or approvals have been applied for by Centennial Newstan for the increased groundwater dewatering volume.

If approval from the Office of Environment and Heritage to vary the Newstan Colliery EPL conditions to allow for an increase in the volume of water discharged through LDP001 from 7 ML/day to 11 ML/day is granted, Centennial Newstan would apply to the Office of Water for a new water licence for an annual net extraction of 4015 ML (11 ML per day).

The level of information known about groundwater presented in the Environmental Assessment is insufficient to be able to adequately assess this Project Application.

A Groundwater Impact Assessment was undertaken by GHD for the Main West Mining Project and is provided in Appendix 6 and discussed in Section 9.2 of the Environmental Assessment. The Groundwater Impact Assessment includes a review of the current groundwater environment and the impacts to groundwater, groundwater users and groundwater dependant ecosystems as a result of the Main West Mining Project.

The Environmental Assessment uses information obtained from the existing six groundwater monitoring bores installed within the alluvium of Lords Creek and Jigadee Creek along with information from two vibrating wire piezometers installed within the West Borehole seam. All monitoring bores used to assess groundwater conditions and quality is located in close proximity to the Main West mining area as is shown in Figure 1 of the Groundwater Impact Assessment.

Monitoring of groundwater pH and electrical conductivity within the Lords Creek alluvium indicates that the Lords Creek alluvium groundwater is generally fresh to brackish and slightly acidic. West borehole seam water is brackish and slightly alkaline, with low turbidity and suspended solids. The Groundwater Impact Assessment and Environmental Assessment identify that heavy metal concentrations within the West Borehole seam water is relatively low with respect to the ANZECC/ARCMANZ (2000) freshwater default trigger values for the protection of 95% of aquatic ecosystems.

The Groundwater Impact Assessment and the Environmental Assessment identify that monitoring of groundwater levels within Lords Creek alluvium indicates recent mining, using longwall mining methods, adjacent to the Main West mining area has not resulted in a reduction in groundwater levels or a loss of groundwater from the alluvium. Based on the predicted subsidence levels being less than 20 millimetres, the Groundwater Impact Assessment and the Environmental Assessment conclude that it is unlikely that the bord and pillar mining layout proposed within the Main West mining area will impact the groundwater in the overlying Lords Creek alluvium.

The Groundwater Impact Assessment identifies that the approximate groundwater inflow into the Project Area from the West Borehole Seam is predicted to be up to 0.32 ML/day from the West Borehole coal seam and not from any aquifers above the proposed Main West mining area. This is not expected to impact adjacent groundwater users since there are no registered bores in the West Borehole Seam as is identified in Section 2.2.3 of the Groundwater Impact Assessment. In addition the Groundwater Impact Assessment and Environmental Assessment conclude that there is negligible vertical fracturing predicted above the West Borehole Seam and it is not anticipated that seepage of groundwater will enter the workings from overlying strata, including the Awaba Colliery workings in the Great Northern Seam.

In addition to the Groundwater Impact Assessment prepared by GHD for the Environmental Assessment, Centennial Newstan has an existing detailed Water Management Plan for the site which includes detailed information on the existing water management system and groundwater issues associated with the Newstan Colliery operations

The Environmental Assessment has identified the riparian vegetation along Lords Creek and the Endangered Ecological Community Swamp Mahogany-Paperbark Forest; however there was no monitoring of these communities for ecosystem health or baseline assessment of groundwater dependence. There has been no consideration of the baseflow ecosystems within Lords Creek and associated tributaries within the mine area.

An Ecological Impact Assessment was undertaken by Hunter Eco for the Project and has been provided in Appendix 7 of the Environmental Assessment. The Ecological Impact Assessment identified approximately 5 hectares of riparian vegetation that has been considered to be groundwater dependant. This includes 3 hectares of Swamp Mahogany Paperbark Forest and 2 hectares of an undefined riparian community. This vegetation community is described as being undefined because there is no equivalent vegetation community identified within the NPWS (2000) classification.

The Ecological Impact Assessment identifies that the riparian vegetation would be dependent on both stormwater flow along the drainage line as well as basal flow originating from shallow groundwater seepage down the ridges to the drainage lines. As such the riparian vegetation would be groundwater dependant.

Section 5.1 of the Ecological Impact Assessment identifies that the proposed mining depth (minimum 70 metres) is well below the reach of the roots of any surface vegetation meaning that the loss of deep groundwater as a result of the mining activity would not impact on that surface vegetation. Any threat to vegetation would come from the loss of water in the upper alluvium as a result of cracking, particularly in the Lords Creek catchment within the mining area. The subsidence assessment undertaken by Seedsman Geotechnics for the Project provided in Appendix 4 of the Environmental Assessment identifies that the proposed mine design for the Project area would result in subsidence of less than 20 millimetres. The Groundwater Impact Assessment undertaken by GHD and provided in Appendix 6 of the Environmental Assessment identifies that since bord and pillar mining is proposed, it is very unlikely that fracturing would develop and that there would be loss of groundwater from the alluvium.

The Environmental Assessment identified that the Project is unlikely to have an impact on the surface water flows and quality within Lords Creek and its associated tributaries, impact on alluvial groundwater or impact on any groundwater dependant ecosystems. As such no further assessment of ecosystem health, baseflow ecosystems or groundwater dependence of ecosystems within the proposed Main West mining area is considered necessary.

4.4 Water Management

The Office of Environment and Heritage has not processed the Newstan Colliery EPL variation for an increase in discharge volumes as it is awaiting legal advice from the applicant to determine if the volume increase requested in the variation application has obtained or requires consent or approval under the Environmental Planning and Assessment Act 1974.

A meeting was held with representatives from the Office of Environment and Heritage following the submission of the Environmental Assessment to discuss water management issues at the Newstan Colliery. The legal advice requested by the Office of Environment and Heritage was provided on 3 August 2011. This EPL variation for an increase in discharge volumes is currently a matter of discussion between the Office of Environment and Heritage and Centennial Newstan.

The Environmental Assessment identifies that Centennial Newstan currently discharges through an underground emergency discharge pipeline (known as the "Stony Creek Pipeline"). This discharge point is not an authorised discharge point on EPL 395 and as such all discharges from the Stony Creek Pipeline are subject to Section 120 of the Protection of the Environment Operations Act 1997.

The Newstan Colliery Revised Water Management Plan identifies that the Stony Creek Pipeline is an emergency discharge point for water within the Fassifern / Great Northern Seam underground workings. Section 3.10 of the Environmental Assessment discusses the proposed measures to be implemented at Newstan Colliery to minimise the potential for water discharging from the Stony Creek Pipeline. These measures include increasing the volume of water discharged through LDP001 from 7 ML/day to 11 ML/day. The increase in discharge volumes will assist Centennial Newstan maintain the underground water level in the Fassifern / Great Northern Seam at least 2 metres below the invert of the Stony Creek Pipeline. An EPL variation application has been submitted separately to the Office of Environment and Heritage for the increase in discharge volumes and, as such, does not form part of this assessment.

4.5 Awaba Nature Reserve

The proposed Main west mining area is under land that has been proposed by the community to form part of the Awaba Nature Reserve. Previous mining by Centennial Newstan has had impacts in the area. The Environmental Assessment should provide for land offsets and promote conservation of land within the proposed Awaba Nature Reserve.

The land above the Main West mining area is currently vacant Crown land, State Forest and Freehold land. A detailed subsidence assessment for the Project was undertaken by Seedsman Geotechnics and is provided in Appendix 4 and discussed in section 7 of the Environmental Assessment. For the mine method and design proposed for the Main West mining area, the vertical subsidence over the Project Area has been predicted to be less than 20 millimetres. There is an insignificant probability that the 20 millimetres subsidence will be exceeded. At 20 millimetres of vertical subsidence, surface impacts are negligible and cannot be measured.

An Ecological Impact Assessment was also completed by Hunter Eco for the Main West Mining Project and has been provided in Appendix 7 and discussed in Section 9.4 of the Environmental Assessment. The Ecological Impact Assessment concluded that subsidence would need to result in major changes to the surface hydrology of an area for a significant impact to occur to an ecosystem. The predicted 20 millimetres of surface subsidence would have no impact on the viability of the vegetation communities identified within the Main West mining area.

The Ecological Impact Assessment also identified that the 20 millimetres of surface subsidence would not:

- alter the habitat of the five threatened flora species that potentially inhabit the Main West mining area;
- result in any changes to fauna habitat; or
- change the habitat connectivity of the area.

As such, impacts of the Main West Mining Project on the proposed Awaba Nature Reserve are negligible and there are no requirements for Centennial Newstan to provide land offsets as a result of the Main West Mining Project. Submissions to the DP&I from the Office of Environment and Heritage have also not identified any requirement for Centennial Newstan to provide offsets for the Main West Mining Project.

4.6 Ecology

Further investigation and assessment of threatened species impacts is warranted as there appears to be a range of contradictory statements in documents concerning the population of threatened species in the area.

An Ecological Impact Assessment was completed by Hunter Eco for the Project and has been provided in Appendix 7 and discussed in Section 9.4 of the Environmental Assessment. The Ecological Impact Assessment report was prepared according to the Draft Guidelines for Threatened Species Assessment under Part 3A of the Environmental Planning and Assessment Act 1979 (DECC & DoP 2005).

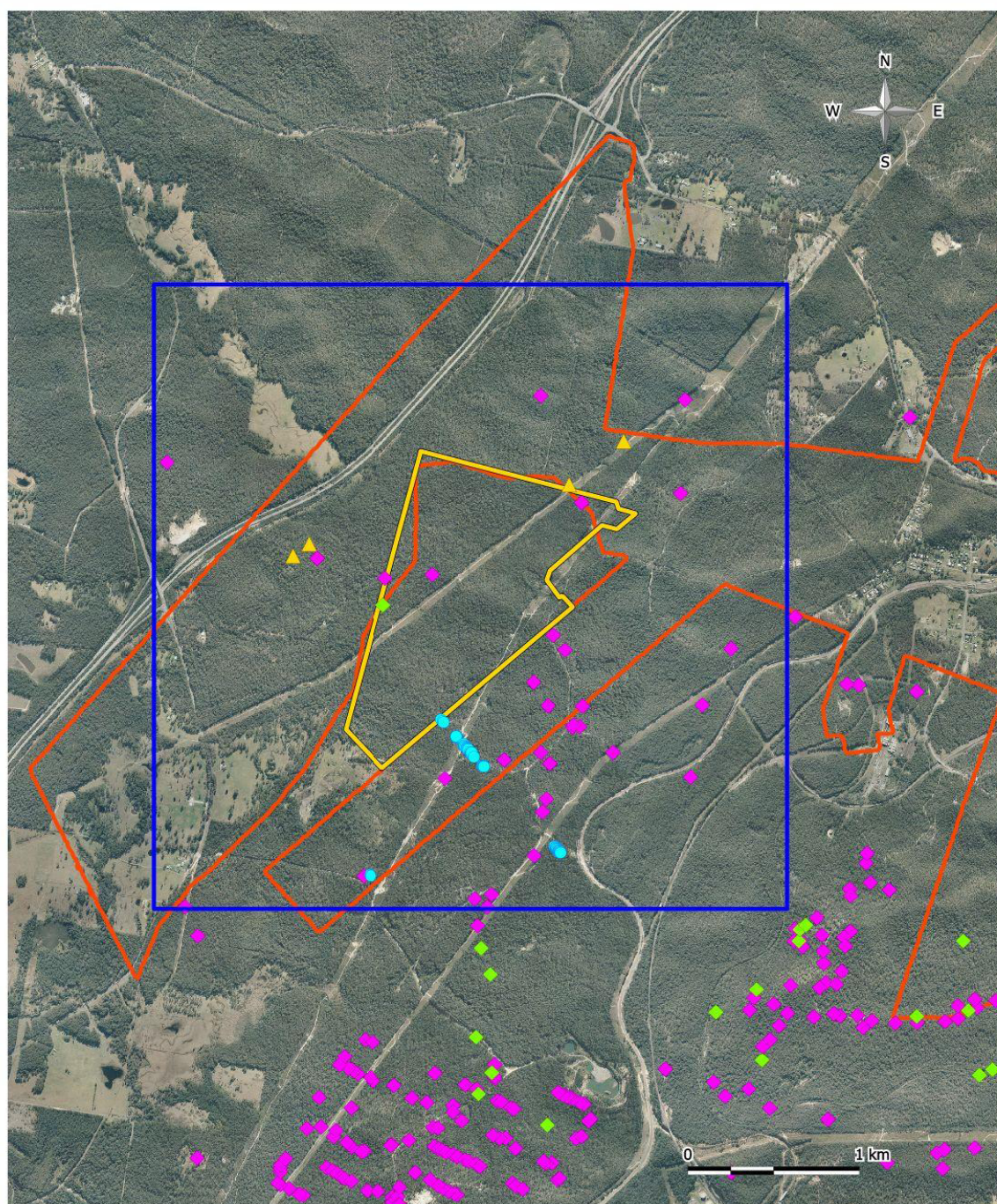
Records from the NSW Wildlife Atlas were relied on for fauna as no fauna field studies were conducted. The flora records shown in Figure 3 of Ecological Impact Assessment were a combination of Atlas records and unpublished records. An additional survey for *Tetratheca juncea* was undertaken by Hunter Eco to monitor the progress of the *Tetratheca juncea* that occurs in the areas of longwalls 22-24 and in

the buffer areas around the Newstan Colliery Northern Reject Emplacement Area and Southern Reject Emplacement Area. The data collected for this survey was in December 2010 after the Ecological Impact Assessment report for the Main West Mining Project Environmental Assessment was completed.

In addition, surveys for *Tetratheca juncea* were undertaken as part of the Newstan Colliery Life Extension Area - Environmental Impact Statement are recorded in the current Newstan Colliery Flora and Fauna Management Plan. This survey undertaken in 1998 identified one *Tetratheca juncea* record not represented in Figure 3 of the Hunter Eco Ecological Impact Assessment.

To consolidate all known records of threatened flora within and around the Main West mining area, an updated Figure is attached to this Response to Submissions.

Figure 1 – Threatened Flora Species Records – Updated August 2011



- | | |
|---|--|
|  Proposed Main West Mining Area |  <i>Grevillea parviflora</i> subsp. <i>parviflora</i> |
|  DA 73-11-98 Boundary |  <i>Tetratheca juncea</i> |
|  Ecology Investigation Area boundary |  <i>Tetratheca juncea</i> Williams (2006) Fig 4.2 |
| |  <i>Tetratheca juncea</i> Hunter Eco (2010a) |

HUNTER ECO

Figure 3 Threatened flora species records updated August 2011

The vegetation map prepared for the Project Area was based upon new field data, but did not appear to be based on any cluster or ordination analysis (Hunter Eco, 2010b). Such analysis could have helped resolve the relationship of the 'undefined riparian' vegetation community with the current vegetation community classification, and provided an indication of its conservation significance.

As is detailed within the Ecological Impact Assessment completed for the Main West Mining Project and provided as Appendix 7 to the Environmental Assessment, the vegetation communities were identified by comparing field data with the classification of NPWS (2000). The map unit profiles provided in the NPWS (2000) technical report provide detail as to the species composition of the classified communities.

The NPWS (2000) classification was arrived at through cluster analysis of floristic plot data from across the mapped area. In some instances it is informative to conduct a cluster analysis of plot data from within a specific survey area, particularly where community structure appears ambiguous. However in the case of the Main West mining area, the six communities present were clearly identifiable.

In the case of the Undefined Riparian community, as is noted in the Ecological Impact Assessment, it is undefined because the NPWS (2000) community profiles do not describe it. The nearest match to the Undefined Riparian community would be MU11 Coastal Sheltered Apple – Peppermint Forest, however the combination of species found in the Main West mining area is different to this community. This is a result of the fact that data for the NPWS (2000) community profiles did not include sampling from this vegetation type. Irrespective of its place in the wider analysis, this community is given conservation significance in the Environmental Assessment by it being classed as a groundwater dependent ecosystem.

4.7 Community Consultation

The Environmental Assessment or the Stakeholder Engagement Plan is not available on the Centennial Coal website.

Centennial Newstan has made the Newstan Colliery Main West Mining Project Environmental Assessment available on the Centennial website (www.centennialcoal.com.au). The Stakeholder Engagement Plan is an internal document and has not been made publicly available.

There has been insufficient community consultation regarding the Project

Section 6.2 of the Environmental Assessment provided a summary of the community consultation undertaken for the Main West Mining Project. Consultation included:

- presentations to the Newstan community consultative committee (CCC) on 26 May 2010, 15 September 2010 and 7 December 2010;
- letter to the CCC advising of change in the Main West Project description on 28 January 2011;
- newsletters distributed to Awaba, Fassifern and Wakefield residents in July and December 2010;
- discussion of the Project in an article in Lakes Mail on 5 August 2010;
- meeting with registered Aboriginal stakeholders to discuss the Project on 15 October 2010;
- consultation with relevant stakeholders during preparation of the Social Impact Assessment; and
- a presentation on the Project to representatives of the LT Creek Sustainable Neighbourhood Group on 19 April 2011.

A presentation was also provided to the Newstan CCC on the Project at the meetings held on 21 June 2011 and 23 August 2011. The CCC was briefed on the results of the technical assessments, advised that the Environmental Assessment was to be placed on public exhibition and provided an overview of the submissions received regarding the Project.

In addition to the consultation outlined above, a Social Impact Assessment for the Main West Mining Project was undertaken by Lantz Marshall and is provided in Appendix 2 and discussed in Section 9.9 of the Environmental Assessment. As part of the Social Impact Assessment, consultation was undertaken with Lake Macquarie City Council representatives, members of the Newstan CCC, some of whom represented groups such as Blackalls Against the Mine (BAM) and No Open Cut Mine For Awaba (NOCMFA), members of the local land care and groups such as the LT Creek Sustainable Neighbourhood Group. Other people consulted with during the development of the Social Impact Assessment were others not affiliated with any group but were residents of the general area.

There has been inadequate consultation with the Aboriginal community regarding the Project.

As part of the Heritage Impact Assessment (RPS 2010) and as identified in Section 6.2 of the Environmental Assessment, consultation with Aboriginal groups has and continues to be undertaken in accordance with the Aboriginal Cultural Heritage Consultation Requirements (ACHCRs) for Proponents (OEH 2010). The Aboriginal stakeholders who registered an interest in the Main West Mining Project and have been consulted with include:

- Westlakes Aboriginal Community;
- Wonnarua Nation Aboriginal Corporation;
- Cacatua Culture Consultants;
- Awabakal Descendants Traditional Owners Aboriginal Corporation; and
- Awabakal Traditional Owners Aboriginal Corporation.

Following the submission of the Main West Mining Project Environmental Assessment, invitations were sent to the registered Aboriginal Stakeholders to attend a Project update meeting. The meeting was held on the 28 June 2011 and was attended by Shane Frost of the Awabakal Descendants Traditional Owners Aboriginal Corporation and Kerrie Brauer of the Awabakal Traditional Owners Aboriginal Corporation. The Main West Mining Project was discussed and no issues regarding the Project were raised. The representatives at the meeting were informed of the Environmental Assessment being placed on public exhibition and were made aware of their ability to make submissions to the Department of Planning and Infrastructure regarding the Project.

4.8 Archaeology

The Environmental Assessment does not consider impacts of discharge on the Kurra-Kurran Aboriginal site.

The Kurra-Kurran Aboriginal site is located on the Foreshore of Lake Macquarie at Fennell Bay. The site is a registered Aboriginal site on the Office of Environment and Heritage Aboriginal Heritage Impact Management System (AHIMS) database as a mythological site 38-4-0191. The site has been identified in the Aboriginal Heritage Impact Assessment for the Main West Mining Project which has been provided in Appendix 3 of the Environmental Assessment. The location of the Kurra-Kurran Aboriginal site is not located along LT Creek into which water from the Newstan Colliery discharges. As such, the Kurra-Kurran Aboriginal site is unlikely to be impacted as a result of the current or proposed activities associated with the Newstan Colliery.

Aboriginal consultation has been undertaken with the Aboriginal community throughout the development of the Environmental Assessment in accordance with the Aboriginal Cultural Heritage Consultation Requirements (ACHCRs) for Proponents (OEH 2010). Details of Aboriginal consultation undertaken for the project are provided within the Aboriginal Heritage Impact Assessment provided in Appendix 3 and summarised in section 6.2 of the Environmental Assessment. No issues regarding the Projects impacts on the Kurra-Kurran Aboriginal site have been raised by the registered Aboriginal stakeholders.

The proposed Aboriginal Cultural Heritage Management Plan should specifically be updated to include details of the range of recent Aboriginal cultural heritage legislative reforms meet the current legislative requirements and cultural heritage management standards and include details of the additional proposed investigation processes for field surveys and monitoring.

The updated Aboriginal Cultural Heritage Management Plan will be developed to include details of the range of recent Aboriginal cultural heritage legislative reforms and will be designed to meet the current legislative requirements and cultural heritage management standards. The Aboriginal Cultural Heritage Management Plan will include details of the additional proposed investigation processes for field surveys and monitoring programmes. This commitment has been included in the revised Statement of Commitments provided in Section 5 of this Response to Submissions.

4.9 European Heritage

No field surveys were undertaken for non-Aboriginal Heritage to confirm that there are no non-Aboriginal Heritage sites within the area. Field surveys should be undertaken.

The Main West mining area was re-surveyed by an Archaeologist and representatives of the Aboriginal Community on 18/2/2011 and 25/2/2011 following the submission of the Environmental Assessment to confirm the non-existence of both Aboriginal and non-Aboriginal Heritage items from within the Project Area. No non-Aboriginal heritage sites were identified as a result of the archaeological survey.

There is no recommendation in the Environmental Assessment for the management of the discovery of unexpected non-Aboriginal sites within the Project Area.

A commitment by Centennial Newstan has been included in the revised Statement of Commitments provided in Section 5 of this Response to Submissions to include a process for managing the discovery of non-Aboriginal heritage items within the Main West mining area. The commitment is that if during the course of mining activities significant European cultural heritage material is uncovered, work in that area will cease and the NSW Heritage Branch notified. Works will only recommence when an appropriate management strategy has been formulated. Identification of potential European heritage items within the Main West mining area will be included as part of the subsidence checklist developed and undertaken as part of the existing and ongoing subsidence monitoring programme and Newstan Colliery.

4.10 Air Quality

Section 5.3.2 of the Air Quality Impact Assessment states that there is no PM_{2.5} monitoring data available for the Project Site or the wider region. Consequently, a background concentration of PM_{2.5} was not assumed in the Air Quality Impact Assessment. PM_{2.5} monitoring commenced at Wallsend, the nearest Office of Environment and Heritage monitoring station to the Project Site, in 1996. The Air Quality Impact Assessment should adopt the Wallsend 2009 PM_{2.5} monitoring data for the background air quality.

The air model developed for the Main West Mining Project and included in the Air Quality Impact Assessment has been updated to include the Wallsend 2009 PM_{2.5} data as background PM_{2.5} data for the area surrounding the Newstan Colliery Surface Facilities Area. An updated Air Quality Impact Assessment which incorporates the results of the revised air modelling has been attached to this Response to Submissions.

The specific emission rates used in the dispersion modelling are not included in the Air Quality Impact Assessment. It appears that the annual emission estimates were used in the dispersion modelling to predict ground level concentrations of TSP, PM₁₀ and PM_{2.5} for all averaging periods. An emissions inventory should have been developed for two scenarios:

- Annual average estimates; and
- Maximum hourly estimates.

The maximum hourly emission estimates should be used in the dispersion modelling for the prediction of short term air quality impacts such as environmental criteria that are based on daily or monthly averaging periods.

Twenty four hour average emission rates were incorporated into the dispersion modelling undertaken for the Main West Mining Project but were not presented in the Air Quality Impact Assessment for brevity.

SLR Consulting had correctly modelled the 24 hour average emission rates but due to some of the table sizes in the report the 24 hour average emission rates were left out of the inventory. The 24 hour average emission results have now been included in the revised Air Quality Impact Assessment attached to this Response to Submissions.

The emission factor used in the Air Quality Impact Assessment for unpaved haul route wheel dust was sourced from USEPA AP-42 and included a factor to account for natural mitigation of particles due to rainfall. The use of the rainfall factor in the unpaved haul route emission factor may result in an underestimate of worst case 24 hour average PM₁₀ impacts. The rainfall factor should not be used to estimate maximum hourly emissions.

In the Air Quality Impact Assessment provided as Appendix 9 to the Main West Mining Project Environmental Assessment, rainfall was set to zero for the unpaved haul road equation however was not communicated in the report.

Emissions from unpaved roads have been modified to the equation in the new NPI mining manual (CoA, June 2011). A revised Air Quality Impact Assessment has been attached to this Response to Submissions.

The Air Quality Impact Assessment does not use the most up to date version of the USEPA AP-42 emission factor for wheel dust from paved roads.

Paved road emissions have been updated in the Air Quality impact Assessment to reflect the latest AP-42 equation. A revised Air Quality Impact Assessment has been attached to this Response to Submissions.

For wind erosion, the Air Quality Impact Assessment uses the NPI default emission factor of 0.4 kg/ha/hr for TSP and 0.2 kg/ha/hr for PM₁₀ and an assumption that wind erosion does not occur below 5.4m/s. The NPI emission factor assumes wind erosion is constant above 5.4m/s and is not dependent on wind speed. As wind erosion is dependent on wind speed, the use of the NPI emission factor to calculate hourly emissions may result in an underestimate of 24 hour average PM₁₀ impacts. The effect of wind speed on wind erosion should be included in the estimate of maximum hourly emissions.

Wind erosion emissions used in the revised Air Quality Impact Assessment attached to this Response to Submissions have been updated to include a cubic relationship and a modified (up) wind speed based on the under prediction of TAPM wind speeds by a factor of three when compared to BoM monitoring sites in the same region (Williamstown Airport). TAPM Version 4 which was used for the air modelling has been noted to overpredict the number of low wind speed events (in comparison to version 3 that underpredicted the number of low wind speed events) at many locations with the consequence of unpredicting the number of high wind speed (>5.4 m/s) events. This is a result of an internal algorithm in the software. Despite some problems with the software it is still considered an industry standard methodology of generating meteorology for use with CALPUFF. The revised report now includes an assessment of the impacts of wind speed on wind erosion and the influence on maximum hourly emissions. Wind erosion at the Newstan Colliery is not a significant contributor to the offsite dust levels.

From Appendix B it would appear that the reclaim conveyor is enclosed as a 100% control of particulate emissions has been assumed. Please confirm the reclaim conveyor is enclosed. The current and proposed particulate controls applied to the primary crusher (including the screens, crusher, feeder, surge bin and conveyor transfer points) should be clarified.

The control factors used for the reclaim conveyor and the crusher are confirmed as total enclosure and the Air Quality impact Assessment has been modified to make this clear. A revised Air Quality Impact Assessment has been attached to this Response to Submissions.

The maximum cumulative 24 hour average PM₁₀ concentrations presented in Table 22 of the Air Quality Impact Assessment are not in accordance with the requirements of the Approved

Methods for Modelling and Assessment of Air Pollutants (the Approved Methods). The proponent must revise the results of the 24 hour average PM₁₀ impact assessment to be in accordance with the requirements of the Approved Methods.

The original Air Quality Impact Assessment provided as Appendix 9 of the Environmental Assessment did actually report the maximum and not the 6th highest 24 hour average PM₁₀ concentration, however Table 22 in the report was incorrectly labelled. The modified Air Quality Impact Assessment attached to this Response to Submissions again reports the maximum cumulative 24 hour average concentrations.

Additional air quality mitigation measures are not proposed to resolve predicted exceedences of the Office of Environment and Heritage impact assessment criteria.

The following changes have been made to the dispersion modelling as a result of the Office of Environment and Heritage submission regarding the Air Quality Impact Assessment undertaken by SLR Consulting for the Main West Mining Project:

- Paved road emissions have been updated to reflect the changes to the AP42 in January 2011;
- Unpaved roads have been updated to reflect the changes to the National Pollutant Inventory (NPI) mining manual in June 2011;
- Wind erosion for open areas and active stockpiles now include a cubic relationship to the wind speed;
- All emission factors affected by average wind speed are modified by an upgraded average wind speed from 1.3 m/s to 4.9 m/s (this was done as a study of TAPM wind speeds versus monitored wind speeds at Williamtown airport showed TAPM was under predicting wind speed by a factor of approximately 3. The reason for the underprediction of wind speed is that TAPM Version 4 which was used for the air modelling has been noted to overpredict the number of low wind speed events (in comparison to version 3 that underpredicted the number of low wind speed events) at many locations with the consequence of unpredicting the number of high wind speed (>5.4 m/s) events. This is a result of an internal algorithm in the software. Despite some problems with the software it is still considered an industry standard methodology of generating meteorology for use with CALPUFF; and
- Background PM₁₀ and PM_{2.5} concentrations were eliminated for 21 September 2008 to allow for elevated regional dust levels in the Hunter region associated with a dust storm that was highlighted by examination of the PM_{2.5} data.

As a result of the changes to the air model, 24 hour PM₁₀ concentrations now comply with the Office of Environment and Heritage air quality criteria at all sensitive receivers including the Fassifern Primary School. A revised Air Quality Impact Assessment has been attached to this Response to Submissions which Centennial Newstan will have peer reviewed by an independent third party to confirm the accuracy of our modelled predictions and scenarios.

To ensure that relevant air quality criteria are met, the following mitigation measures have been implemented and Newstan Colliery to control air emissions:

1. Use of designated haul routes by trucks;
2. Sealing of some haul roads;
3. Speed limit restrictions on all vehicles and equipment on the mine site;
4. Application of water to exposed surfaces, with emphasis on those areas subject to frequent vehicle and equipment movements which may cause dust generation and dispersal;
5. Progressive capping of exposed fine tailings;
6. Maintenance of stockpiles and handling areas to minimise windblown or traffic-generated dust;
7. Vacuum sweeping of hard stand areas and sealed roads;
8. Conveyor cleaning and collection devices to minimise amount of material falling from the return conveyor belt;
9. Water application at the feed hopper and at all conveyor transfer and discharge points;

10. Total enclosure of the crusher and reclaim conveyors;
11. ROM and product coal stockpile watering;
12. Use of covers on all loaded coal trucks; and
13. Progressive shaping and rehabilitation of areas once they are no longer required for operational purposes.

In addition to the current dust management practices currently implemented at Newstan Colliery, a review by site staff and SLR Consulting of the current Newstan Colliery dust management practices against international best practice dust management measures identified by the Office of Environment and Heritage report titled “NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining”, Prepared by Katestone Environmental Pty Ltd 2010) was undertaken. This review identified additional areas where dust management measures can be implemented that are achievable and feasible for the Newstan Colliery operations. This review is detailed within Table 32 of the Newstan Colliery Air Quality Impact Assessment attached to this Response to Submissions.

Monitoring of TSP, PM₁₀, and deposited dust will continue to be undertaken by Centennial Newstan in order to provide verification of the dispersion modelling of proposed operations. In addition, Centennial Newstan will commence PM_{2.5} monitoring on a 1-in-6 day cycle (concurrent with the PM₁₀ monitoring) for a period of approximately 12 months to collect data on background PM_{2.5} concentrations and also to determine site specific PM₁₀ / PM_{2.5} ratios associated with the current Newstan Colliery operations. Additionally a reactive monitoring program will be put in place to allow dust generating activities to be modified or ceased if conditions are such that exceedence of 24 hour PM₁₀ concentrations guidelines are likely.

The application has not demonstrated what cumulative impacts may occur on the air quality of the receiving environment inclusive of odour impacts around the Main West area. There is the likelihood that venting of odorous or acrid air will occur from existing vents within the Awaba mine workings area.

The Main West mining area will be ventilated using the existing ventilation system currently used at the Newstan Colliery utilising the existing ventilation fans located at the Newstan Colliery Surface Facilities Area. The impacts, including cumulative impacts, of the existing mine ventilation system on air quality has been taken into consideration in the Air Quality Impact Assessment prepared by SLR Consulting and provided in Appendix 9 of the Environmental Assessment.

The Air Quality Impact Assessment inadequately assessed the impacts from coal haulage on the Awaba residents.

The proposed Main West Mining Project does not result in any increase in coal haulage from or to the Newstan Colliery. All existing transport activities associated with the operation of the Newstan Colliery have been previously assessed and approved.

Centennial Newstan must ensure there is adequate mitigation measure in place to ensure that there is no dust drift across the F3 freeway.

The Main West Mining Project is proposed to undertake underground mining within the Main West mining area. An Air Quality Impact Assessment has been completed for the existing operations of the Newstan Colliery Surface Facilities and has been provided in Appendix 9 and discussed in section 9.7 of the Environmental Assessment. No impacts on the F3 freeway above the NSW air quality guidelines are predicted. Centennial Newstan has implemented all reasonable and feasible measures to minimise dust impacts from its surface operations.

4.11 Noise

Section 6.1.2 of the Noise Impact Assessment identifies existing and additional noise management and mitigation measures used in the noise modelling and assessment process. There are two management measures that have not been reiterated in the Statement of Commitments on page 70 of the EA, these are:

- 3) Night-time mobile plant management; and**
- 4) Reversing alarms on mobile plant.**

An amended Statement of Commitments has been provided in Section 5 of this Response to Submissions. The Statement of Commitments has been updated to include the restriction of coal train surface operations during the night-time period to two (2) front end loaders, avoiding the use of a dozer in the coal train surface operations area during the night-time period and to have all mobile plant onsite fitted with 'quacker' type reversing alarms.

Table 19 of the Noise Impact Assessment shows that the project specific noise criteria will be met at all receivers and time periods with the exception of a 2dB predicted exceedance at NC3 during a night-time temperature inversion. Therefore NC3 would be within the noise management zone under that night-time inversion scenario.

A noise impact assessment for the existing Newstan Colliery surface operations was prepared by SLR Consulting and is provided in Appendix 8 of the Environmental Assessment. The noise modelling undertaken for the Noise Impact Assessment predicted a 2 dB exceedance of the night time noise criteria under a temperature inversion scenario. Section 6.1.2 of the Noise Impact Assessment and Section 9.6.4 of the Environmental Assessment identifies additional noise mitigation and management measures that will be implemented at the Newstan Colliery to minimise the impacts of noise from its surface operations. Specific details on the implementation of the noise mitigation measures will be implemented in consultation with specialist consultants to ensure any noise mitigation measures are practical, feasible and achieve the required noise reduction levels.

Further to the additional noise mitigation measures identified, a real time noise monitor will be installed on site to determine when noise levels are approaching noise limits. If noise from the site is approaching the noise criteria limits, operational management measures will be triggered for implementation to ensure that operational noise criteria are not exceeded.

4.12 Subsidence

There should be a requirement that the proposed mining does not cause subsidence beneath the angled tension tower identified in the Environmental Assessment.

As is discussed within the subsidence assessment and section x of the Environmental Assessment. A 100 metre diameter block of coal will be retained beneath the tension tower. Centennial Newstan will undertake mining operations within the Main West mining area to ensure there is no subsidence beneath the angled tension tower. This commitment has been included in the revised Statement of Commitments provided in Section 5 of this Response to Submissions.

The proponent should be required to develop a subsidence monitoring program for the 330kV electricity transmission lines identified in the Environmental Assessment in consultation with the infrastructure owner.

Centennial Newstan will develop a subsidence monitoring program for the 330kV electricity transmission lines identified in the Environmental Assessment in consultation with the infrastructure owner. This commitment has been included in the revised Statement of Commitments provided in Section 5 of this Response to Submissions.

4.13 Rehabilitation

The proponent should amend the Mining Operations Plan to include the proposed modification, to the satisfaction of the Division of Resources and Energy.

Centennial Newstan will amend the Newstan Colliery - Mine Operations Plan to include the proposed Main West mining area. Any amendments to the Mine Operations plan will be to the satisfaction of the Division of Resources and Energy.

The proponent should review the proposed modification activities in the Annual Environmental Management Report to the satisfaction of the Division of Resources and Energy.

Centennial Newstan will include a review of the mining activities in the Annual Environmental Management Report.

Integrated rehabilitation and environmental management reporting is to be captured in the existing Mining Operations Plan and Annual Environmental Management Report to the satisfaction of the Division of Resources and Energy's Director Environmental Sustainability.

Integrated rehabilitation and environmental management reporting will be captured in the existing Mining Operation Plan and Annual Environmental Management Report and will be to the satisfaction of the Division of Resources and Energy's Director Environmental Sustainability.

The proponent should commence discussions with Division of Resources and Energy on the requirements for the preparation and submission of a Mining Operations Plan and Annual Environmental Management Report.

Centennial Newstan will commence discussions with the Division of Resources and Energy on the requirements for the preparation and submission of a Mining Operations Plan amendment and the Annual Environmental Management Report.

4.14 Impacts on Rail and Road Network

Centennial Newstan should consult with Transport NSW and Newcastle City Council regarding impacts of increased rail on the rail network, scheduling or the Adamstown level crossing.

As is identified in Section 4.3 and 4.8 of the Environmental Assessment, the Main West Mining Project does not result in any increase in the volume of coal produced, processed or exported from the site.

The application should be supported by a contingency plan detailing how coal will be transported to the port of Newcastle, should the rail network fail or be unavailable.

Section 3.7 of the Environmental Assessment describes the current approved coal handling and transport processes utilised by the Newstan Colliery. As is identified in Section 4.6 of the Environmental Assessment, the Main West Mining Project will not result in any changes to the current approved coal handling and transport processes and will continue to be undertaken in accordance with approved coal transport arrangements.

4.15 Surface Infrastructure

The application should be supported by additional information with regard to the likelihood of impacts at the Main West site from additional surface facilities.

As is identified in Section 4.1 and 4.8 of the Environmental Assessment, the Main West Mining Project will not result in any changes to the existing and/or approved mine support facilities and infrastructure and will continue to utilise the existing Newstan Colliery facilities. As no additional surface infrastructure

is required to support the Main West Mining Project beyond what has already been assessed and approved, no further assessment of impacts of additional infrastructure is required.

4.16 Community Impacts

The Environmental Assessment does not adequately assess impacts of the Project on the health of nearby residents or impacts on real estate values.

The Main West Mining Project is an extension to the existing underground operations of the Newstan Colliery and will not result in any increases in the volume of coal produced, processed or handled at the Newstan Colliery Surface Facilities Area. As such, the Main West Mining Project will not have any additional impacts on the community above those that have already been assessed and approved.

The Social Impact Assessment completed for the Main West Mining Project and provided as Appendix 2 to the Environmental Assessment identified that a negative impact on property prices was raised as a concern as a result of existing Centennial Coal operations, including those of the Newstan Colliery. Discussion undertaken with local real estate agents as part of the development of the Social Impact Assessment identified that the past proposals by Centennial Coal may have slowed sales of properties rather than reducing the median property price across the board. Changes to the median prices are influenced by the number of sales and the price range of property values in the local area. It is found that all areas surrounding the Newstan Colliery have a broad range of property values.

4.17 Mining Area

The mining footprint for the mining extension has not been made available in the Environmental Assessment.

Section 4.2 of the Environmental Assessment identifies that the Main West mining area encompasses approximately 152 hectares.

4.18 Company Ownership

Section 11.3 of the Environmental Assessment refers to Centennial Coal being Australian owned. This is incorrect.

As identified in Section 1.3 of the Environmental Assessment, Centennial Newstan is a wholly owned subsidiary of Centennial Coal, which is a wholly owned subsidiary of Banpu Minerals (Singapore) Pte Ltd. Centennial Coal was purchased by Banpu in 2010. Banpu is the largest independent pan-Asian coal group.

5 STATEMENT OF COMMITMENTS

A revised Statement of Commitments for the Newstan Colliery Main West Mining Project if approval were to be granted has been provided in Table 2 below.

Table 2 –Revised Statement of Commitments

Subsidence management
- Bord and pillar mining will be designed such that the vertical subsidence over the Project Area will be less than 20 millimetres. - A 100 metre diameter block of coal will be left directly below the Transgrid tension tower #18. - Centennial Newstan will undertake mining operations within the Main West mining area to ensure there is no subsidence beneath the angled tension tower. - Subsidence monitoring will be undertaken to confirm the predictions of less than 20 millimetres of subsidence. - Centennial Newstan will develop a subsidence monitoring program for the 330kV electricity transmission lines identified in the Environmental Assessment in consultation with the infrastructure owner.
Groundwater and surface water
Monitoring of the surface water and groundwater will continue to be undertaken in accordance with the current RWMP and EPL 395.
Aboriginal heritage management
Main West Project - An updated archaeological survey will be undertaken over and surrounding the Project Area prior to the commencement of mining and with the participation of the relevant Aboriginal stakeholders. The survey will aim to locate any archaeological sites within the Project Area not identified during previous archaeological investigations. - If during mining activities within the Project Area any additional Aboriginal site/s are identified that were not identified by the proposed additional survey works, then all works in the area will cease, the area cordoned off and contact made with the Office of Environment and Heritage Enviroline 131 555, a suitably qualified archaeologist and the relevant Aboriginal stakeholders, so that it can be adequately assessed and managed. Newstan Colliery - The Newstan Archaeological and Cultural Heritage Management Plan will be reviewed and updated as required in consultation with the relevant registered Aboriginal stakeholders. The Archaeological and Cultural Heritage Management Plan will be developed to include details of the range of recent Aboriginal cultural heritage legislative reforms and will be designed to meet the current legislative requirements and cultural heritage management standards. - A monitoring program will be developed to monitor any potential impacts on identified archaeological sites within and immediately adjacent to the mining activities prior to, during and post mining activities. - The relevant registered Aboriginal stakeholders will be invited to participate in any future monitoring of Archaeological sites.
European heritage management

If during the course of mining activities significant European cultural heritage material is uncovered, work in that area will cease and the NSW Heritage Branch notified. Works will only recommence when an appropriate management strategy has been formulated. Identification of potential European heritage items within the Main West mining area will be included as part of the subsidence checklist developed and undertaken as part of the existing and ongoing subsidence monitoring programme and Newstan Colliery.

Social

- Centennial will continue to implement the actions applicable to Newstan Colliery outlined in the LT Creek Catchment Water Quality Management Plan (LMCC 2010).
- A framework assessment of LT Creek will be undertaken in consultation with the Newstan CCC and other stakeholders. This assessment will:
 - review the history of operations at the Newstan Colliery;
 - consolidate the information and assessments completed by Centennial on LT Creek to date;
 - identify the root cause of water quality and water management issues at the Newstan Colliery;
 - identify options for improved water management at the source of water quality issues at Newstan Colliery.
- Future mining plans will remain an agenda item for the Newstan CCC.
- Centennial will undertake steps to improve the operation of the Newstan CCC. This will include providing the CCC with an agenda and briefing paper prior to the CCC meeting.
- Centennial's Regional Environment & Community Manager will attend all CCC meetings to provide, where requested, information on other Centennial operations in the region.

Noise management

Existing noise mitigation measures for Newstan Colliery will continue to be implemented. The following noise management measures will be implemented:

Coal Preparation Plant

- The sealing of openings in all walls around the preparation plant, as required;
- To continue existing plant external walls down to the ground level, as required;
- Fully enclosing exposed conveyors with the same colorbond steel currently being used for the building and conveyors, as required; and
- Replace alsynite panels on eastern wall with colorbond steel, as required.

Reclaim Conveyor Transfer House

- The sealing of openings in all the walls around the conveyor transfer house, as required;
- To continue existing plant external walls down to the ground level, as required;
- Fully enclosing exposed conveyors with the same colorbond steel currently being used for the building and conveyors, as required; and
- Replace alsynite panels on eastern wall with colorbond steel.

Compressor House

- Centennial Newstan will implement noise attenuation of the compressor house.

Noise bund

- Centennial Newstan will install a 6 metre high (top of noise wall RL 25) acoustic barrier proposed

for the south eastern side of the coal train rail loop. - A real time noise monitor will be installed on site to determine when noise levels are approaching noise limits. If noise from the site is approaching the noise limits, operational management measures will be implemented to ensure the noise criteria is not exceeded. Night-time (10pm – 6am) Mobile Plant Management - Coal Train Surface Operations - Restrict coal train loading operations during the night-time period to two (2) front end loaders. - Avoid use of a dozer in this area during the night-time period. Reversing Alarms on Onsite Mobile Plant - It is recommended that all mobile plant onsite are fitted with quacker type reversing alarms.
Air quality management Existing air quality mitigation measures for Newstan Colliery will continue to be implemented. The following improved dust management measures will be implemented: - More diligent monitoring of haul road and application of controls as surface dries out to avoid excessive emissions. - Reducing the speed of the grader on haul roads from 16 km/hr to 8 km/hr. - More vigilant stockpile watering, responsive to on prevailing weather conditions to allow greater or lesser watering intensity. - Utilise a truck wheel wash ensuring that truck is clean and free of loose material. - Monitoring of TSP, PM₁₀, and deposited dust will be continued in order to provide verification of the dispersion modelling of proposed operations. - Implement PM_{2.5} monitoring on a 1-in-6 day cycle (concurrent with the PM₁₀ monitoring) for a period of approximately 12 months to collect data on background PM_{2.5} concentrations and determine site specific PM₁₀ / PM_{2.5} ratios associated with the current Newstan Colliery operations. - Establish a reactive monitoring program to allow dust generating activities be modified or ceased if conditions are such that an exceedence of 24 hour PM₁₀ concentrations guidelines is likely.
Greenhouse gas management - Newstan Colliery's Energy Saving Action Plan (ESAP) will continue to be implemented to identify where potential savings in fuel and electricity might be made, together with the subsequent implementation of energy efficiency strategies where practical. - Centennial Coal will commit to the mitigation and offset of Scope 1 emissions across the Group, specifically by: - undertaking research into reducing the emissions generated by ventilation air methane (VAM). This includes government funding to investigate VAM technology at Mandalong Mine and, if proven successful and cost effective, then this technology will provide opportunities at other mines; and - committing to offset 10% of its Scope 1 and Scope 2 emissions per annum. This commitment will coincide with the reporting and auditing obligations outlined under the NGER Act, whereby the tonnes of CO₂-e offset each year will go through a rigorous verification process. These offsets will be located in Australia, will be accredited to a recognised scheme or standard (or in the process of achieving accreditation), will be independently verified, and will be undertaken in accordance with any relevant Australian government policies and standards at that time. These offsets will be put in place where opportunities to avoid or mitigate emissions are not available, or until a national emissions trading scheme is imposed on the colliery.

Appendix 1 – Revised Newstan Colliery Air Quality Impact Assessment



global environmental solutions

Centennial Newstan Air Quality Impact Assessment

Report Number 630.10002

12 September 2011

Centennial Newstan Pty Limited
PO Box 1000 Fassifern, NSW

Version: Revision 0

Centennial Newstan

Air Quality Impact Assessment

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Suite 7, 240 Waterworks Road Ashgrove QLD 4060 Australia
(PO Box 844 Ashgrove QLD 4060 Australia)
T: 61 7 3858 4800 F: 61 7 3858 4801
E: brisbane@slrconsulting.com www.slrconsulting.com

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EXECUTIVE SUMMARY

SLR Consulting Ltd has been commissioned by Centennial Newstan Pty Limited (Centennial Newstan) to undertake an Air Quality Impact Assessment for the Newstan Colliery underground coal mine located northwest of Fassifern on the western side of Lake Macquarie, New South Wales.

The objective of the air quality assessment was to identify the potential air quality impacts from operation of the Newstan Colliery and to provide advice with regard to effective mitigation strategies where necessary.

Project Description

The Newstan Colliery is an existing underground coal mining operation located in Fassifern on the western side of Lake Macquarie in the Newcastle Coalfield of New South Wales. Surface facilities at the Newstan Colliery include workforce amenities, mining support infrastructure, coal stockpiles, coal handling facilities, coal preparation plant (CPP) and a rail loop. The Newstan Colliery temporarily ceased underground mining production in 2009 however continued to operate the surface facilities to process and handle coal from other Centennial Coal operations. Mining recommenced at the Newstan Colliery in July 2011.

This report presents a detailed summary of existing air quality monitoring data conducted near to the Newstan Colliery, and other available monitoring data conducted by the NSW Office of Environment and Heritage (OEH).

Operational Dust Predictions

Emissions of Total Suspended Particulate (TSP), Particulate Matter less than 10 μm (PM_{10}) and Particulate Matter less than 2.5 μm ($\text{PM}_{2.5}$) from the proposed activities at the site were estimated using emission estimation techniques published by the National Pollutant Inventory (NPI) and the US EPA.

The estimated emission rates were then used as inputs into the CALPUFF dispersion modelling suite to predict spatial impacts of pollutant dispersion as a result of the Newstan Colliery operation. The predicted spatial impacts were assessed against New South Wales Office of Environment and Heritage (OEH) and National Environmental Pollutant Measure (NEPM) guidelines for particulate matter.

Annual average TSP, PM_{10} , $\text{PM}_{2.5}$, deposited dust (the fraction of dust that settles out of the airborne dust due to gravitation) and 24 hour average PM_{10} and $\text{PM}_{2.5}$ were not predicted to exceed the relevant OEH guidelines at any of the receptors. It should be noted that the NEPM $\text{PM}_{2.5}$ interim reporting guidelines have not formally been adopted by OEH and have been included for reference only.

The major emission sources on site are the front end loaders and wind erosion from the rail loop area. Background concentrations of PM_{10} also contribute significantly to predicted offsite 24 hour PM_{10} concentrations. To ensure exceedances of air quality criteria are avoided, Centennial Newstan will implement a range of best practice dust mitigation measures and develop a reactive management program to monitor and react to elevated PM_{10} concentrations.

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR consulting)) has been commissioned by Centennial Newstan Pty Limited (Centennial Newstan) to undertake an Air Quality Impact Assessment (AQIA) for the Newstan Colliery. Newstan Colliery is located in the township of Fassifern 16 km southwest of Newcastle, in NSW.

The NSW Office of Environment and Heritage (OEH) "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (DECCW, 2005) (the Approved Methods) outline the requirements for conducting an AQIA, as follows:

- 1 Description of local topographic features and sensitive receptor locations (**Section 2**).
- 2 Establishment of air quality assessment criteria (**Section 3**).
- 3 Analysis of climate and dispersion meteorology for the region (**Section 7**).
- 4 Description of existing air quality environment (**Section 4**).
- 5 Compilation of a comprehensive emissions inventory for proposed operations (**Section 6**).
- 6 Completion of atmospheric dispersion modelling and analysis of results (**Section 6**).
- 7 Preparation of an air quality impact assessment report comprising the above.

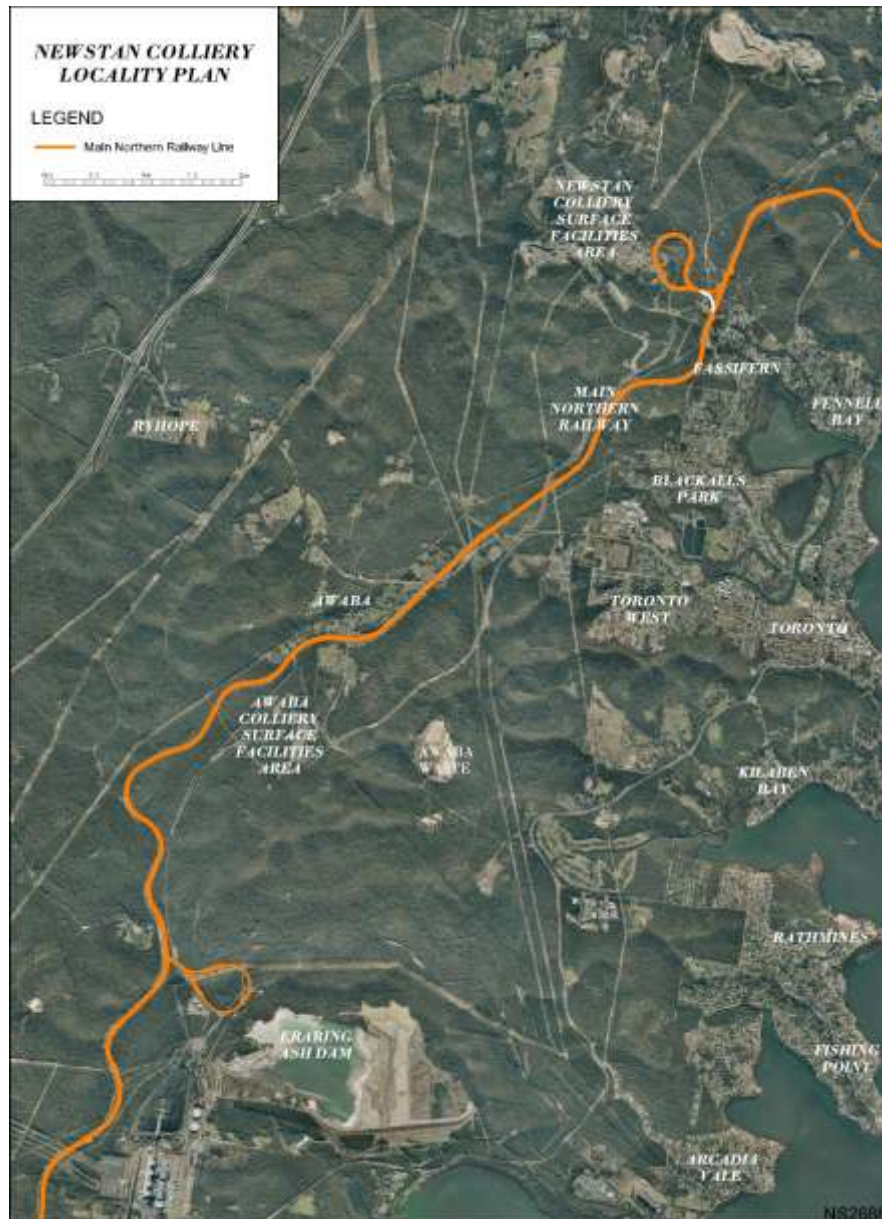
This assessment report describes the existing environment of the area surrounding the Newstan Colliery and contains detailed information relating to items 1 to 6 above in the sections noted.

2 PROJECT SETTING AND OVERVIEW

2.1 Project Setting

Newstan Colliery is an existing underground coal mining operation located in Fassifern on the western side of Lake Macquarie in the Newcastle Coalfield of New South Wales. It is located in gently undulating terrain bordered by vegetation. The site has an approximate elevation of 30 m at the surface facilities and an approximate elevation of 72 m (highest point) at the tailings dam west of the surface facilities. The township of Fassifern is situated approximately 1.5 km southeast and Wakefield is approximately 2.6 km northwest of the site. The western shore of Lake Macquarie is approximately 1.7 km southeast of the site. **Figure 1** illustrates the location of the Newstan Colliery.

Figure 1 Location of Newstan Colliery



Source: Centennial Newstan

2.2 Project Overview

Surface facilities at the Newstan Colliery include workforce amenities, mining support infrastructure, coal stockpiles, coal handling facilities, a coal preparation plant (CPP) and a rail loop.

The Newstan Colliery temporarily ceased underground mining production in 2009 however continued to operate the surface facilities to process and handle coal from other Centennial Coal operations. Mining recommenced at the Newstan Colliery in July 2011.

The Newstan Colliery is approved to process up to a maximum of 4 Mtpa of Run of Mine (ROM) coal.

Activities at the site are summarised as follows:

- Operate activities 24 hours per day 7 days a week;
- Extract up to 4 mega tonnes (10^6 t) per annum (Mtpa) of ROM coal;
- Receive up to 2 Mtpa of coal from the Cooranbong Colliery;
- Receive up to 888,000 tpa of coal from the Awaba Colliery;
- Process up to 4 Mtpa of ROM coal through CPP;
- Load up to 5 trains per day using front end loaders at a rate of 800 tonnes per hour;
- Export up to 3 Mtpa through rail loading facilities by train (average train size 2,100 to 3,000 tonnes);
- Transport 2 Mtpa of coal to Eraring Power Station by truck using the Eraring-Newstan private haul road;
- Transport coarse reject from the CPP to the Northern Reject Emplacement Area by truck;
- Transport coarse reject from the CPP to the Southern Reject Emplacement Area by truck;
- Construction of Southern Reject Emplacement Area to RL60; and
- Rehabilitation of the Northern Reject Emplacement Area.

2.3 Existing Air Quality Mitigation and Management Measures

To ensure that relevant air quality criteria are satisfied in accordance with the operational conditions of consent for the Newstan Colliery, the following mitigation measures have been implemented to control air emissions:

- Use of designated haul routes by trucks;
- Sealing of some haul roads;
- Speed limit restrictions on all vehicles and equipment on the mine site;
- Application of water to exposed surfaces, with emphasis on those areas subject to frequent vehicle and equipment movements which may cause dust generation and dispersal;
- Progressive capping of exposed fine tailings;
- Maintenance of stockpiles and handling areas to minimise windblown or traffic-generated dust;
- Vacuum sweeping of hard stand areas and sealed roads;
- Conveyor cleaning and collection devices to minimise amount of material falling from the return conveyor belt;
- Water application at the feed hopper and at all conveyor transfer and discharge points;

- Total enclosure of the crusher and reclaim conveyors
- ROM and product coal stockpile watering;
- Use of covers on all loaded coal trucks; and
- Progressive shaping and rehabilitation of areas once they are no longer required for operational purposes.

2.4 Non-Project Related Properties and Residences

A number of residences and sensitive land uses are located in the area surrounding the Newstan Colliery, which are termed “sensitive receptors”. The nearest sensitive receptors have been identified to be taken into account in this assessment.

A list of the nearest sensitive receptors identified and their respective distances from the site are presented in **Table 1** and **Figure 2**. **Figure 3** presents the receptor locations overlain on a graphical representation of the local terrain.

Table 1 Identified Discrete Sensitive Receptor Locations

ID	Location	Distance From Site (m)	Location (m, UTM)		Elevation (m, AHD)
			Easting	Northing	
R1	Davis Dwelling - 35 Jefferson Road, Wakefield	877	365,780	6,351,882	40
R2	Culgan Dwelling - Fassifern Road, Fassifern	345	365,720	6,351,115	58
R3	Orrock Dwelling - 4 Wallsend Road, Fassifern	413	367,463	6,349,487	12
R4	Phelps Dwelling - 33 Narara Street, Fassifern	521	367,399	6,348,880	27
R5	Parnell Dwelling - 51 Reynolds Street, Fassifern	466	366,904	6,348,626	72
R6	Fassifern Primary School - Fassifern Street, Fassifern	549	367,581	6,349,694	11

Figure 2 Surrounding Sensitive Receptor Locations Used in this Assessment

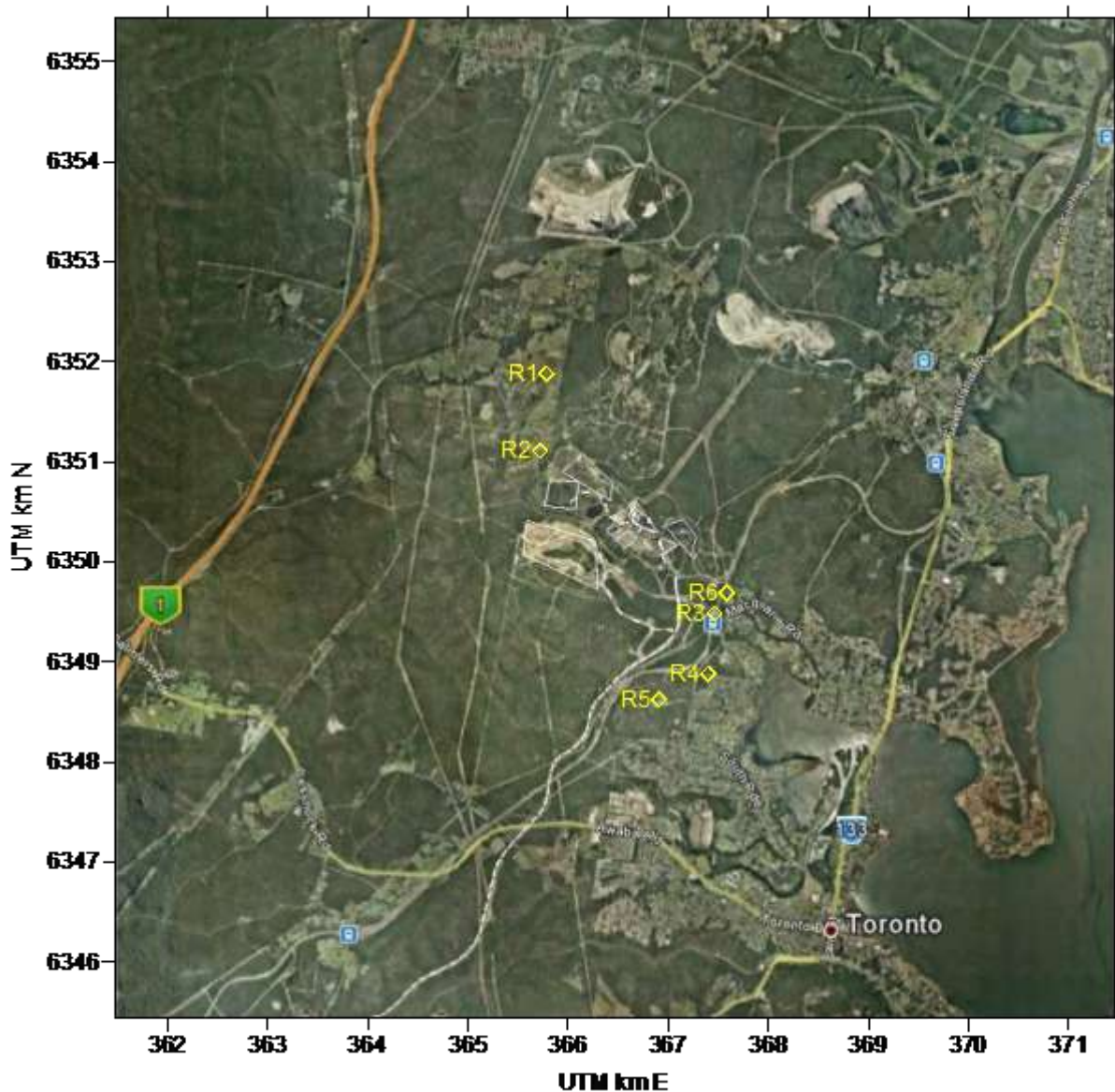
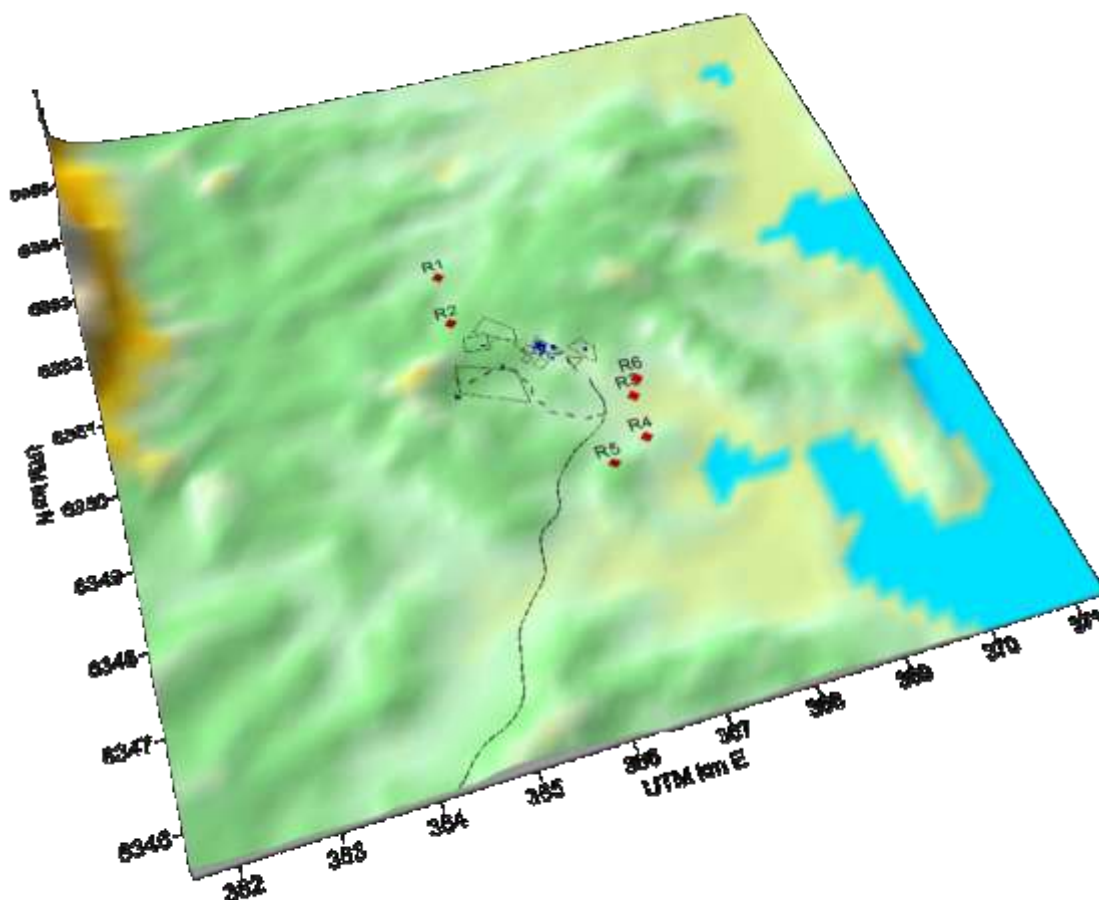


Figure 3 Location of Surrounding Sensitive Receptors with Overlain Topographical Features



Notes: Topography shown with vertical exaggeration of x1.5 to emphasise terrain features.
Red diamonds mark receptors, blue dots are volume sources, black outlines are area sources.

2.5 Other Pollutant Sources

2.5.1 Local Sources

Within the wider region of the Hunter Valley, there are a number of coal mining-related operations (as shown in

Table 2) that would have the potential to contribute to cumulative impacts at sensitive receptors surrounding Newstan Colliery.

Table 2 Local Pollutant Sources (<10 km)

Business	Business Type	Location (m, UTM)	
		Easting	Northing
Works Infrastructure Teralba	Other Petroleum and Coal Product Manufacturing	368,321	6,352,309
Westside Open Cut Mine	Coal Mining	366,684	6,354,670
Macquarie Coal Preparation Plant	Coal Mining	369,781	6,353,907

Business	Business Type	Location (m, UTM)	
		Easting	Northing
West Wallsend Colliery	Coal Mining	369,781	6,353,907
Awaba Colliery	Coal Mining	363,440	6,348,465
Eraring Power Station	Fossil Fuel Electricity Generation	361,896	6,340,857
Tasman Underground	Coal Mining	365,280	6,360,540
Myuna Colliery	Coal Mining	366,464	6,340,950
Incitec Pivot Cockle Creek Works	Fertiliser Manufacturing	371,910	6,353,555
Inghams Cardiff Feedmill	Prepared Animal and Bird Feed Manufacturing	373,688	6,354,594
Metromix	Quarry	368,121	6,352,286
RailCorp	Main Northern Railway	-	-

Note: NPI emission estimates are available at www.npi.gov.au/

2.5.2 Regional Sources

There is potential for concentrations of pollutants in the region to be elevated under certain conditions, such as bushfires or dust storms. Although these events are relatively unusual, they do occur and can result in elevated concentrations of pollutants, such as suspended particulates, over several days in some instances. These events are easily identified through the use of a network of air quality monitors as simultaneous elevations of particulate will be noted across an area (refer Section 0).

Other significant regional pollutant sources (refer **Table 3**) include power stations to the south of the site and mining-related activities in the nearby Hunter Valley.

Table 3 Significant Regional Pollutant Sources

Business	Business Type	Location (m, UTM)	
		Easting	Northing
Vales Point Power Station - Delta Electricity	Fossil Fuel Electricity Generation	364,125	6,329,906
Munmorah Power Station - Delta Electricity	Fossil Fuel Electricity Generation	364,048	6,324,286

Note: NPI emission estimates are available at www.npi.gov.au/

3 AMBIENT AIR QUALITY CRITERIA

3.1 Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms “dust” and “particulates” are often used interchangeably. The term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (μm) in diameter and ranging down to 0.1 μm and is termed total suspended particulate (TSP).

The annual goal for TSP recommended by OEH is 90 $\mu\text{g}/\text{m}^3$. It was developed before the more recent results of epidemiological studies suggested a relationship between health impacts and exposure to concentrations of finer particulate matter.

Emissions of particulate matter less than 10 and 2.5 microns (μm) in diameter (referred to as PM_{10} and $\text{PM}_{2.5}$ respectively) are considered important pollutants due to their ability to penetrate into the respiratory system. In the case of the $\text{PM}_{2.5}$ category, recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $\text{PM}_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

The OEH PM_{10} assessment goals as expressed in DEC (2005) Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (hereafter the “Approved Methods”) are as follows:

- A 24-hour maximum of 50 $\mu\text{g}/\text{m}^3$; and
- An annual average of 30 $\mu\text{g}/\text{m}^3$.

The 24-hour PM_{10} reporting standard of 50 $\mu\text{g}/\text{m}^3$ is numerically identical to the 24-hour average National Environment Protection Measure (NEPM) reporting standard for PM_{10} , except that the NEPM reporting standard allows for five exceedances per year. These NEPM goals were developed by the National Environmental Protection Council (NEPC) in 1998 to be achieved within 10 years of commencement (i.e. by 2008).

In December 2000, the NEPC initiated a review to determine whether a new ambient air quality criterion for $\text{PM}_{2.5}$ was required in Australia, and the feasibility of developing such a criterion. The review found that:

- There are health effects associated with these fine particles;
- The health effects observed overseas are supported by Australian studies; and
- Fine particle standards have been set in Canada and the USA, and an interim criterion is proposed for New Zealand.

The review concluded that there is sufficient community concern regarding $\text{PM}_{2.5}$ to consider it an entity separate from PM_{10} .

As such, in July 2003, a variation to the Ambient Air Quality National Environment Protection Measure (NEPM) was made to extend its coverage to $\text{PM}_{2.5}$. This document references the following interim advisory reporting standards for $\text{PM}_{2.5}$:

- A 24-hour average concentration of 25 $\mu\text{g}/\text{m}^3$; and
- An annual average concentration of 8 $\mu\text{g}/\text{m}^3$.

It is noted that the advisory reporting standards relating to PM_{2.5} particles are at the present time reporting guidelines only and not intended to represent air quality criteria.

3.2 Nuisance Impacts of Fugitive Emissions

The preceding sections are concerned in large part with the health impacts of particulate matter. Nuisance impacts need also to be considered, mainly in relation to deposited dust. In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition levels exceed 4 g/m²/month.

Table 4 presents the OEH impact assessment goals for dust deposition, showing the allowable increase in dust deposition level over the ambient (background) level which would be acceptable so that dust nuisance could be avoided.

Table 4 OEH Goals for Allowable Dust Deposition

Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2 g/m ² /month	4 g/m ² /month

Source: Approved Methods, DEC 2005.

3.3 Project Air Quality Goals

In view of the foregoing, the air quality goals adopted for this assessment, which conform to current OEH and Federal air quality criteria, are summarised below in **Table 5**.

Table 5 Project Air Quality Goals

Pollutant	Averaging Time	Goal
TSP	Annual	90 µg/m ³
PM ₁₀	24 hours	50 µg/m ³
	Annual	30 µg/m ³
PM _{2.5}	24 hours	25 µg/m ³
	Annual	8 µg/m ³
Dust Deposition	Annual	Maximum incremental (Project only) increase of 2 g/m ² /month Maximum Total of 4 g/m ² /month (Project and other sources)

Source: Approved Methods, DEC 2005.

4 EXISTING CONDITIONS

4.1 Newstan Air Quality Monitoring Network

Newstan Colliery operates an air quality monitoring network surrounding its operations. The air quality monitoring network includes:

- Eight (8) dust deposition gauges [D1-D7, D9]
- Two (2) PM₁₀ high volume air samplers (Hilltop and Watertank) [HVS1, HVS2]
- Two (2) TSP high volume air samplers (Hilltop and Watertank) [HVS1, HVS2]

The location for each of the monitoring points is indicated in **Table 6** and illustrated in **Figure 4**.

Table 6 Newstan Air Quality Monitoring Network Locations

Identifier	UTM (m)		Description
	Easting	Northing	
D1	365687	6350884	North west of the tailings dam on the NREA
D2	366285	6350893	East of LDP01 in NREA
D3	365675	6350572	Southern end of tailings dam of NREA
D4	366656	6350067	South of CCPP, north east of SREA
D5	366947	6349953	North of Centennial Fassifem Office
D6	367339	6349864	South eastern end of the rail loop
D7	367397	6349669	Within archery club on Miller Road
D9	365589	6350153	SREA, across Fassifem Road from Newstan Colliery
HVS1	365759	6351238	Hill top – 50m north of Culgan dwelling on Fassifem Road
HVS2	367329	6349579	Located near potable water transfer tanks – south of Wakefield Road

Figure 4 Newstan Colliery Particulate Monitoring Locations



4.2 Background Monitoring Data – Deposited Dust

On-site dust deposition monitoring has been performed by the Proponent since January 2005. The dust deposition monitoring program has been incorporated into a wider environmental monitoring campaign, and includes dust deposition measurements using eight dust deposition gauges (DDGs).

A summary of the measured dust deposition rates is presented in **Appendix C**, and a statistical summary of that measured data is presented in the following section.

Table 7 Statistical Summary of Discrete Historic Dust Deposition Monitoring Results (g/m²/month)

Statistic	D1	D2	D3	D4	D5	D6	D7	D9
Averaging period	month	month	month	month	month	month	month	month
Monitoring data start	3 Jan 05	3 Jan 05	3 Jan 05	3 Jan 05	3 Jan 05	3 Jan 05	3 Jan 05	26 Mar 07
Monitoring data end	25 Jul 10	25 Jul 10	25 Jul 10	25 Jul 10	25 Jul 10	25 Jul 10	25 Jul 10	25 Jul 10
Data points	76	77	74	77	77	71	45	50
Mean	1.2	5.0	1.6	2.1	3.5	1.7	2.7	4.4
Standard deviation	±0.8	±5.1	±1.6	±4.2	±6.2	±0.8	±2.8	±7.4
Skew ¹	+2.2	+2.4	+3.1	+7.5	+6.3	+1.3	+2.8	+4.6
Kurtosis ²	+9.0	+6.3	+13.4	+61.2	+45.8	+1.3	+8.6	+23.7
Minimum	0.2	0.3	0.1	0.3	0.7	0.3	0.5	0.3
Percentiles	1	0.3	0.5	0.1	0.4	0.8	0.5	0.4
	2	0.3	0.7	0.1	0.4	0.8	0.7	0.6
	3	0.3	0.7	0.2	0.4	0.8	0.8	0.7
	5	0.3	0.8	0.3	0.4	0.8	0.9	0.9
	10	0.4	1.1	0.4	0.6	1.1	0.9	1.0
	25	0.6	1.9	0.7	0.8	1.4	1.1	1.7
	50	1.1	3.2	1.2	1.4	2.1	1.6	2.3
	75	1.5	5.9	2.1	1.9	3.2	2.0	3.8
	90	2.1	11.1	3.2	2.6	5.6	3.1	6.5
	95	2.4	14.1	4.1	3.8	9.6	3.6	15.8
	97	2.5	18.7	4.2	5.3	13.8	4.0	21.2
	98	2.9	21.6	6.0	7.7	16.6	4.1	22.2
	99	3.8	24.7	8.3	16.3	26.0	4.1	34.8
Maximum	5.5	26.3	10.5	36.2	50.5	4.1	13.5	47.3
Data capture	99%	100%	96%	100%	100%	92%	58%	65%

- Notes
- 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.
 - 2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

The maximum measured results at all locations exceed the 4g/m²/month, although this criterion is to be applied to annual average deposition rates rather than the peak measured deposition rates. The data presented above demonstrate periodic high dust events, as can be demonstrated by the maximum measurements at each location and the high positive *skew* and *kurtosis* values which demonstrate a distribution dominated by infrequent elevated measurements. The maximum monthly dust deposition rate for all monitoring locations over the entire monitoring period was 47.3 g/m²/month at D9 over the period from 23 June 2011 to 25 July 2011.

Table 8 Statistical Summary of Annual Average Historic Dust Deposition Monitoring Results (g/m²/month)

Period	D1	D2	D3	D4	D5	D6	D7	D9	Period Average
2005	1.0	2.4	1.3	1.1	1.9	1.5	2.1	nd	1.6
2006	1.5	6.0	1.3	5.7	4.3	1.8	5.1	nd	3.7
2007	1.2	3.8	1.4	1.6	4.7	2.0	nd	6.4	3.0
2008	1.5	9.7	3.0	1.3	3.1	1.9	nd	3.3	3.4
2009	1.4	7.3	2.4	1.5	7.2	2.0	2.6	2.4	3.3
2010	0.8	3.8	1.0	2.1	1.4	1.5	1.9	2.0	1.8
2011 ¹	0.4	1.3	1.3	0.7	1.2	1.7	1.0	10.6	2.3
Average	1.2	5.0	1.6	2.1	3.5	1.7	2.7	4.4	2.8

Note 1 Incomplete year

The measured site-specific dust deposition results show an overall site-specific measured deposition rate of 2.8 g/m²/month, which accounts for all elevated readings at all monitoring locations over the period from 2005 to 2011, including the incomplete 2011 period. Over this monitoring period, annual average monthly deposition rates vary from 1.6 g/m²/month (2005) to 2.7 g/m²/month (2006).

These trends are presented in **Figure 5** (presented by monitoring location) and **Figure 6** (presented by year).

Figure 5 Background Dust Deposition Results by Monitoring Location (g/m²/month)

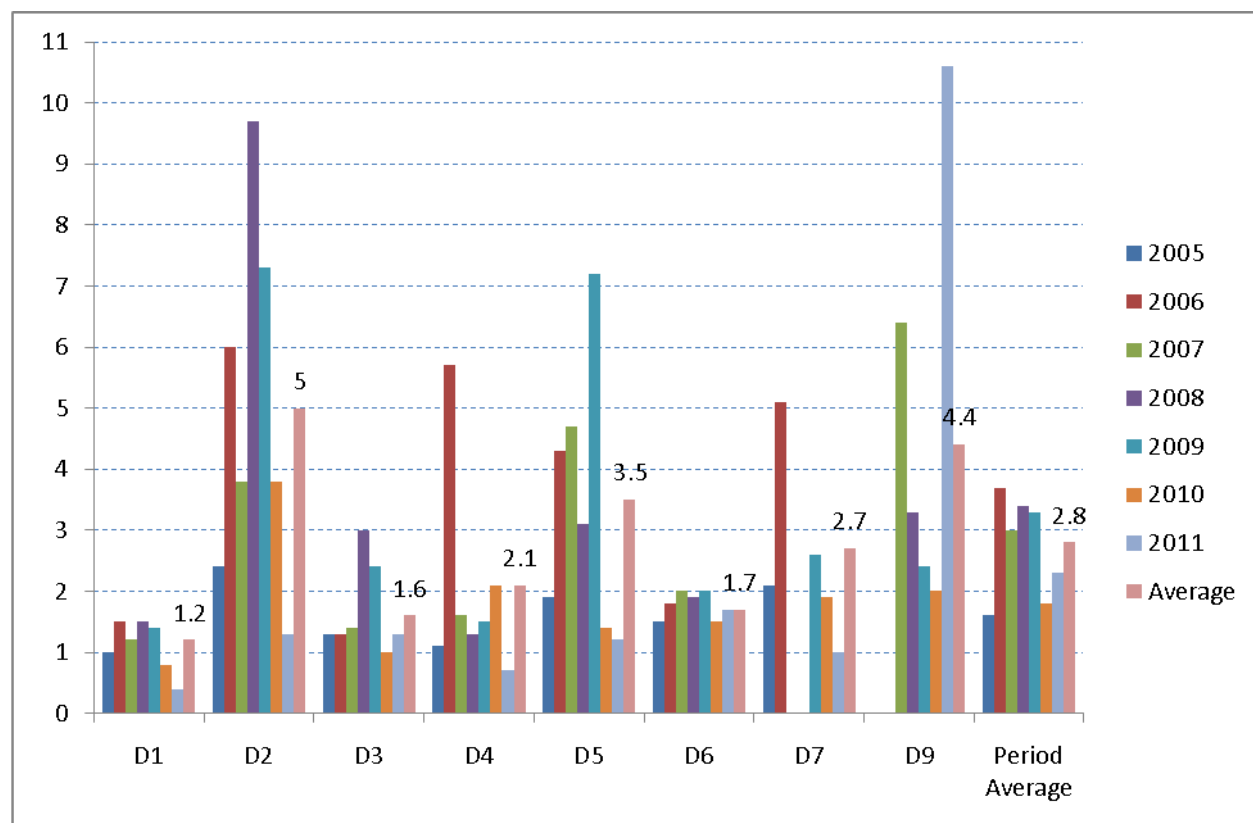
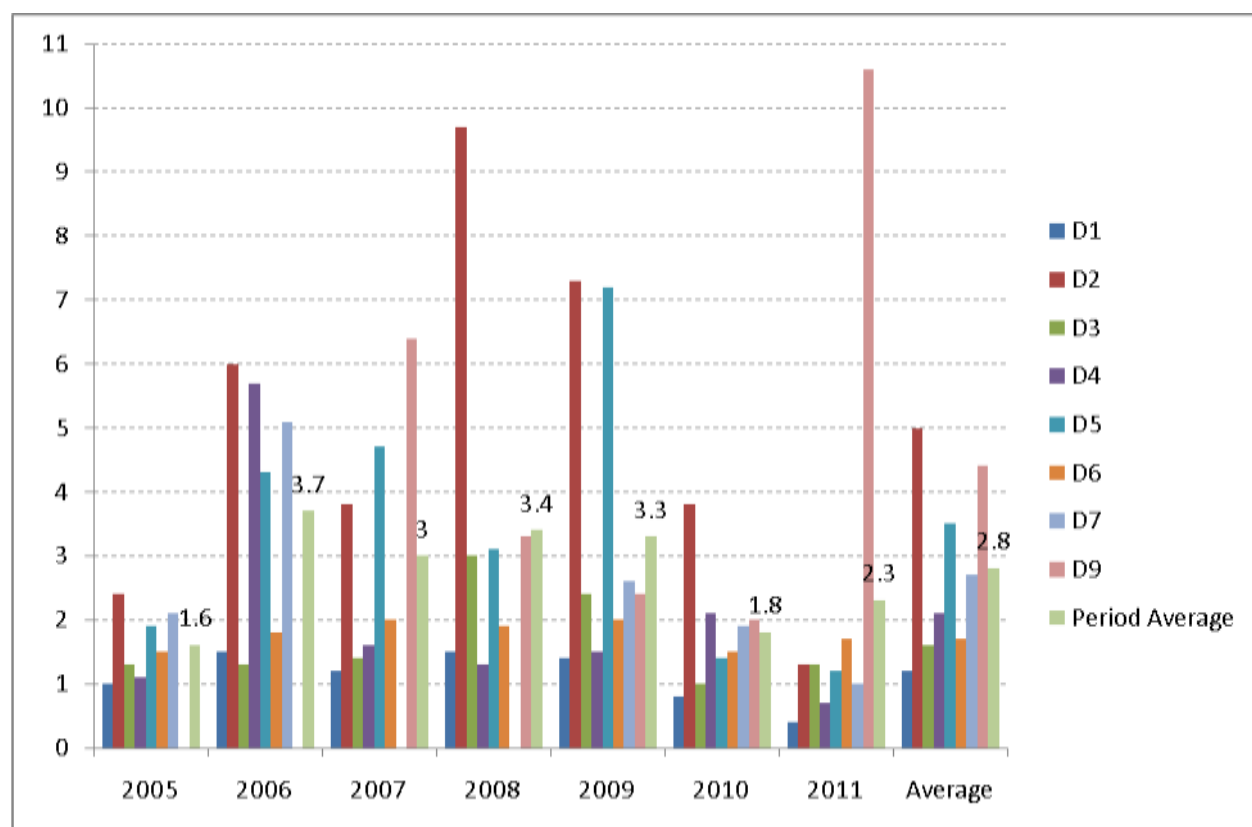


Figure 6 Background Dust Deposition Results by Year (g/m²/month)



4.3 Background Monitoring Data - Particulate Matter Concentrations

On-site ambient air quality monitoring has been performed by Centennial Newstan since October 2007. The ambient air quality monitoring program has been incorporated into a wider environmental monitoring campaign, and includes PM₁₀ and TSP measurements using two co-located High Volume Air Samplers (HVAS) located at both Hilltop and Watertank.

The monitoring was undertaken in accordance with AS3580.9.3:2003 and AS3580.9.6-2003 for TSP and PM₁₀, respectively.

A statistical summary of the measured PM₁₀ and TSP concentrations is presented in the following section.

Table 9 Statistical Summary of Newstan PM₁₀ and TSP Monitoring Data, Oct 2007 to Jan 2010 (µg/m³)

Statistic	24-Hour PM ₁₀		24-Hour Average TSP	
	Hilltop	Watertank	Hilltop	Watertank
Averaging period	24 hours	24 hours	24 hours	24 hours
Monitoring data start	2 Oct 2007	2 Oct 2007	2 Oct 2007	2 Oct 2007
Monitoring data end	31 Jan 2010	31 Jan 2010	31 Jan 2010	31 Jan 2010
Data points	139	116	143	116
Mean	17.2	23.4	34.0	45.1
Standard deviation	±11.6	±13.7	±22.5	±25.5
Skew ¹	+0.8	+1.1	+1.2	+1.2
Kurtosis ²	+0.8	+2.4	+2.4	+2.4
Minimum	0.0	1.0	2.0	5.0
Percentiles	1	1.0	1.3	7.5
	2	1.0	3.0	10.0
	3	1.0	3.0	10.9
	5	1.0	4.5	12.0
	10	3.0	8.0	18.5
	25	7.5	17.0	26.8
	50	17.0	22.0	40.5
	75	23.5	31.0	61.3
	90	33.2	41.0	81.0
	95	37.1	47.3	90.5
	97	39.9	50.1	94.8
	98	43.0	51.7	97.7
	99	46.6	57.1	111.6
	Maximum	62.0	84.0	158.0
Data capture	97%	81%	100%	81%

- Notes 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.
- 2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

The above data has been sorted in respective annual periods for each complete year of monitoring (2007, 2008, 2009 and 2010).

Table 10 Statistical Summary of Inter-Year Hilltop and Watertank 24-Hour PM₁₀ Monitoring Data, 2008 and 2009 (µg/m³)

Statistic	Hilltop (2008)	Hilltop (2009)	Watertank (2008)	Watertank (2009)
Averaging period	24-hour	24-hour	24-hour	24-hour
Monitoring data start	1 Jan 07	1 Jan 08	1 Jan 09	1 Jan 10
Monitoring data end	31 Dec 07	31 Dec 08	31 Dec 09	31 Dec 10
Data points	57	60	34	60
Mean	15.2	16.6	26.0	19.4
Standard deviation	±11.9	±10.8	±13.3	±11.4
Skew ¹	+1.4	+0.5	+0.8	+0.5
Kurtosis ²	+3.0	+0.0	-0.2	-0.5
Minimum	1.0	0.0	8.0	1.0
Percentiles	1	1.0	8.7	1.0
	2	1.0	9.3	1.4
	3	1.0	10.0	2.5
	5	1.8	10.7	3.0
	10	3.0	11.3	6.6
	25	6.0	14.3	12.0
	50	13.0	24.5	17.5
	75	20.0	31.0	27.0
	90	31.4	47.7	37.1
	95	36.0	50.1	40.1
	97	36.6	52.1	41.0
	98	37.8	54.0	41.0
	99	48.6	56.0	43.5
Maximum	62.0	47.0	58.0	47.0
Data capture	93%	100%	56%	100%

- Notes 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.
- 2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

A summary of the ambient PM₁₀ concentrations measured at the Hilltop and Watertank monitoring sites over the calendar years 2008 and 2009 are presented above. The data shows that the annual average PM₁₀ concentrations were measured to be below the annual average air quality criterion of 30 µg/m³ for all years at both sites. The 24-hour average PM₁₀ criterion of 50 µg/m³ is exceeded on the following number of occasions:

- 2008: Hilltop 1 occasion
- 2008: Watertank 2 occasions

Table 11 Statistical Summary of Inter-Year Hilltop and Watertank 24-Hour TSP Monitoring Data, 2008 and 2009 ($\mu\text{g}/\text{m}^3$)

Statistic	Hilltop (2008)	Hilltop (2009)	Watertank (2008)	Watertank (2009)
Averaging period	24-hour	24-hour	24-hour	24-hour
Monitoring data start	1 Jan 08	1 Jan 09	1 Jan 08	1 Jan 09
Monitoring data end	31 Dec 08	31 Dec 09	31 Dec 08	31 Dec 09
Data points	61	60	34	60
Mean	33.0	31.4	53.2	38.5
Standard deviation	± 25.0	± 19.7	± 26.2	± 20.3
Skew ¹	+1.6	+0.7	+0.5	+0.5
Kurtosis ²	+3.8	+0.0	-0.9	-0.5
Minimum	2.0	2.0	21.0	5.0
Percentiles	1	2.6	21.0	6.2
	2	3.4	21.0	7.5
	3	4.6	21.0	9.3
	5	5.0	21.7	11.9
	10	7.0	23.3	14.7
	25	15.0	31.0	21.8
	50	28.0	43.5	37.0
	75	46.0	76.3	53.0
	90	64.0	84.7	67.2
	95	70.0	94.1	70.1
	97	78.4	98.2	73.5
	98	94.6	103.4	80.0
	99	114.0	108.7	85.3
Maximum	135.0	83.0	114.0	90.0
Data capture	100%	99%	56%	99%

- Notes 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.
- 2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

A summary of the ambient TSP concentrations measured at the Hilltop and Watertank monitoring sites over the calendar years 2008 and 2009 are presented above. The data shows that the annual average TSP concentrations were measured to be below the annual average air quality criterion of $90 \mu\text{g}/\text{m}^3$ for all years at both sites.

The 24-hour average measured PM_{10} and TSP concentrations are presented graphically in **Figure 7** and **Figure 8** below.

Figure 7 24-Hour Average PM₁₀ Concentrations Measured at Newstan Hilltop and Watertank HVAAS

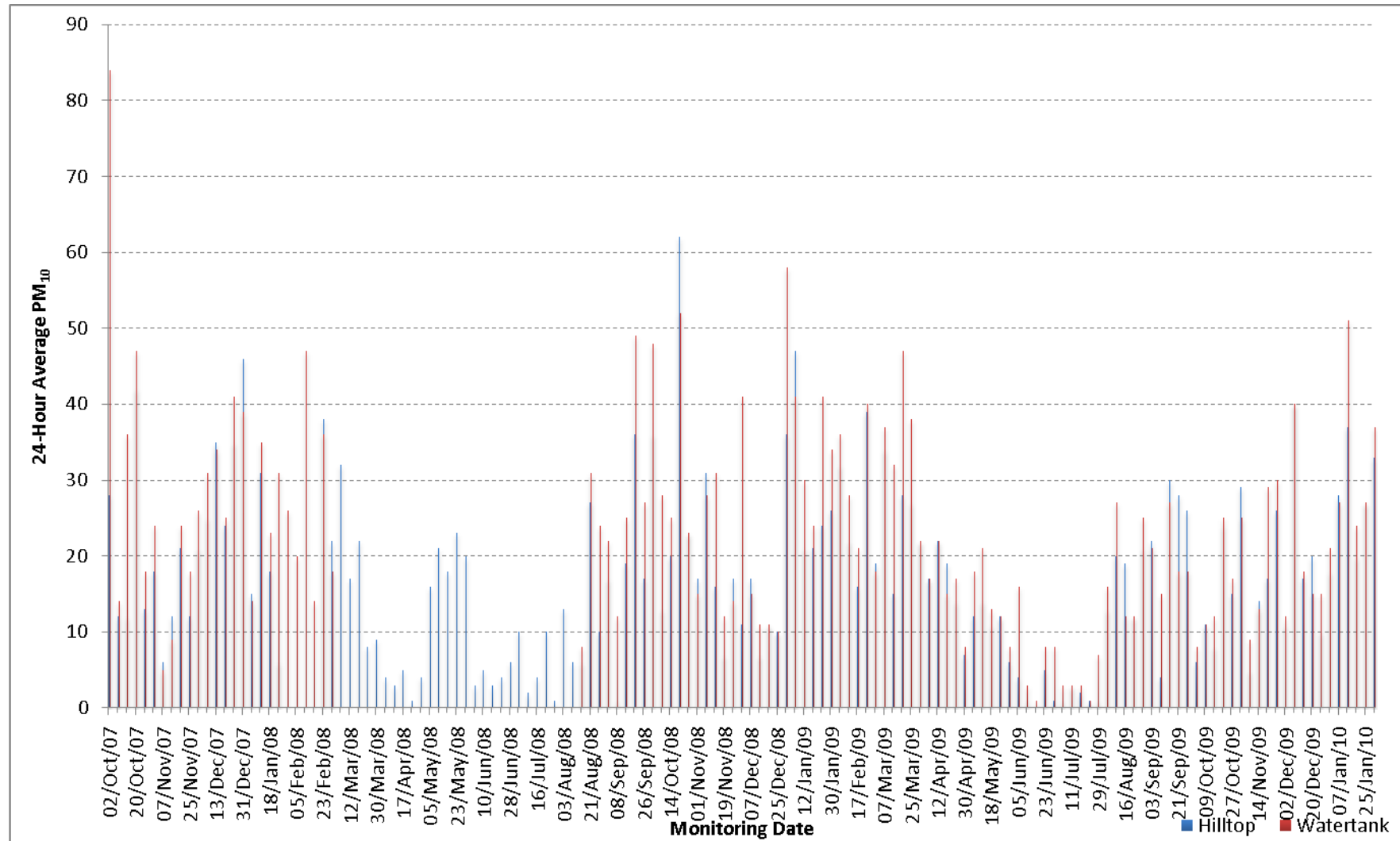
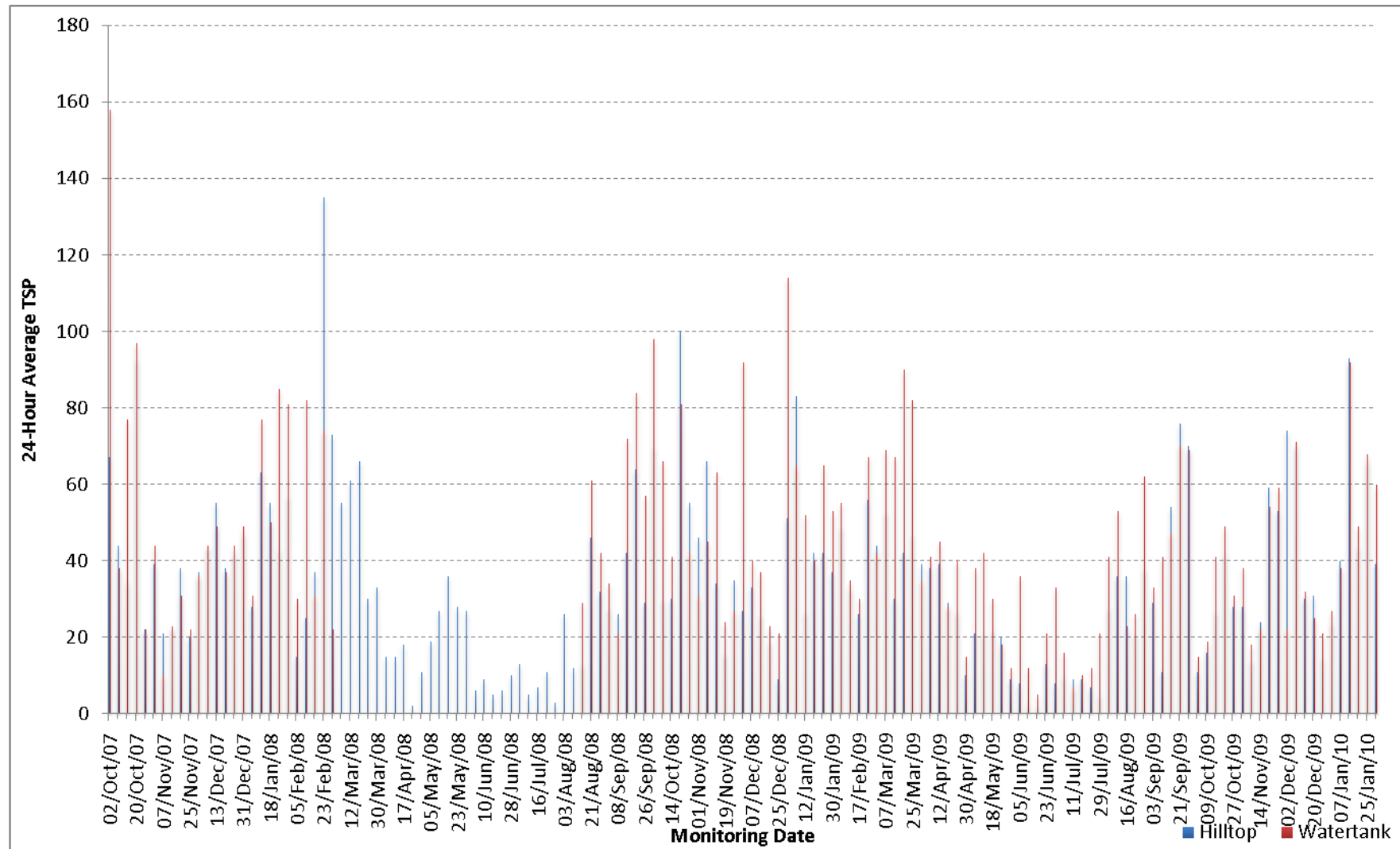


Figure 8 24-Hour Average TSP Concentrations Measured at Newstan Hilltop and Watertank HVAS



4.4 OEH Ambient Air Monitoring Data

An OEH air quality monitoring station, which includes a continuous PM₁₀ monitor, has been established at the Newcastle City Council Swimming Pool off Frances Street in Wallsend. The location of this monitoring station with respect to the Newstan Colliery is presented **Figure 9**. PM₁₀ monitoring data has been obtained from this station for use in this assessment to provide an indication of the existing air quality environment.

Figure 9 Location of Nearest OEH Air Quality Monitoring Station



Image source Google Earth

A statistical summary of the annual Wallsend 24-hour average PM₁₀ data is presented in **Table 12** by calendar year.

Table 12 Statistical Summary of Inter-Year Wallsend 24-Hour PM₁₀ Monitoring Data (2007 to 2010)

Statistic	2007	2008	2009	2010
Averaging period	24-hour	24-hour	24-hour	24-hour
Monitoring data start	1 Jan 07	1 Jan 08	1 Jan 09	1 Jan 10
Monitoring data end	31 Dec 07	31 Dec 08	31 Dec 09	31 Dec 10
Data points	341	303	335	318
Mean	17.4	15.7	26.9	14.7
Standard deviation	7.4	6.4	118.1	4.7
Skew ¹	+1.4	+2.0	+17.5	+0.7
Kurtosis ²	+2.9	+7.5	+315.2	+0.6
Minimum	3.6	5.0	6.9	5.0
Percentiles	1	6.9	6.3	7.2
	2	7.2	6.7	7.7
	3	7.3	7.3	8.3
	5	8.2	8.2	8.8
	10	9.6	9.0	9.9
	25	12.7	11.8	12.7
	50	16.0	14.8	16.6
	75	20.8	18.6	23.5
	90	26.5	23.2	31.5
	95	33.3	26.4	35.9
	97	35.0	30.1	42.9
	98	36.7	31.9	60.2
	99	40.0	39.9	142.3
	Maximum	50.9	56.5	2150.3
Data capture	93.4%	82.8%	91.8%	87.1%

A summary of the ambient PM₁₀ concentrations measured at the OEH Newcastle monitoring site over the period January 2007 to December 2010 is presented in

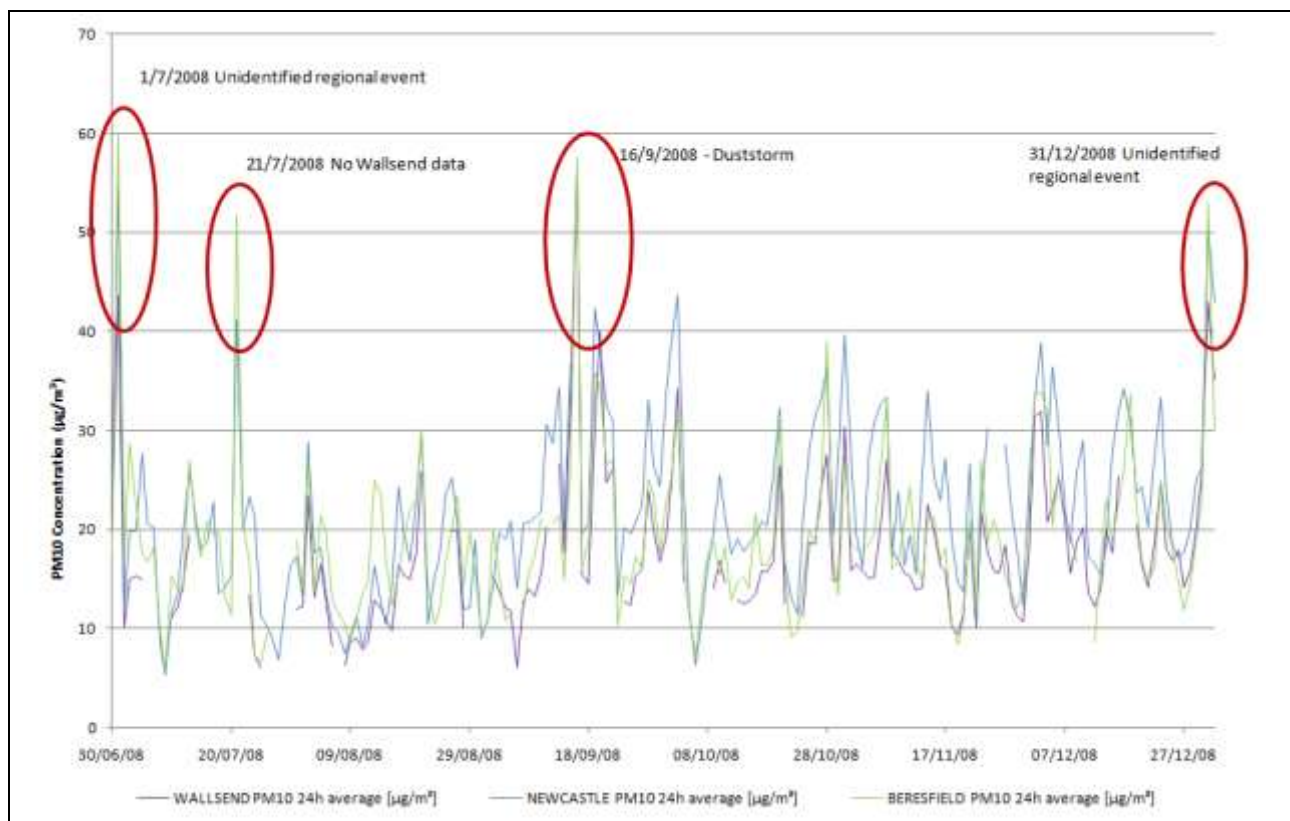
Table 12. It shows that the average PM₁₀ concentrations were measured to be below the annual average air quality criterion of 30 µg/m³ for all years.

The 24-hour average PM₁₀ criterion of 50 µg/m³ is exceeded on the following number of occasions:

- 2007: 2 occasions
- 2008: 1 occasion
- 2009: 10 occasions.

The year 2009 is dominated by extremely high maximum PM₁₀ concentrations, measured concurrent to significant regional dust storms. 2008 is also characterised by a number of regional dust storm events, which have been presented graphically in **Figure 10** below.

Figure 10 OEH 24 hour average PM₁₀ monitoring data for the Lower Hunter and identified regional scale dust events



4.4.1 Statistical Analysis of Site Specific and OEH Monitoring Data

A summary of the data used to assess the background conditions is presented below **Table 13**. All data is presented as 24-hour average concentrations in $\mu\text{g}/\text{m}^3$, except averaging period (hours), monitoring start and end dates (dates), skew and kurtosis (dimensionless), and data capture (percentage of the monitoring period).

Table 13 Statistical Summary of On-Site and OEH 2008 and 2009 PM_{10} Monitoring Data

Statistic	2008			2009		
	Hilltop	Watertank	Newcastle	Hilltop	Watertank	Newcastle
Averaging period	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour
Monitoring data start	1 Jan 08	1 Jan 08	1 Jan 08	1 Jan 08	1 Jan 09	1 Jan 09
Monitoring data end	31 Dec 08	31 Dec 08	31 Dec 08	31 Dec 08	31 Dec 09	31 Dec 09
Data points	61	34	303	60	60	335
Mean	33.0	53.2	15.7	16.6	19.4	26.9
Standard deviation	± 25.0	± 26.2	6.4	± 10.8	± 11.4	118.1
Skew ¹	+1.6	+0.5	+2.0	+0.5	+0.5	+17.5
Kurtosis ²	+3.8	-0.9	+7.5	+0.0	-0.5	+315.2
Minimum	2.0	21.0	5.0	0.0	1.0	6.9
Percentiles	1	2.6	21.0	6.3	0.6	7.2
	2	3.4	21.0	6.7	1.0	7.7
	3	4.6	21.0	7.3	1.0	8.3
	5	5.0	21.7	8.2	1.0	8.8
	10	7.0	23.3	9.0	1.9	9.9
	25	15.0	31.0	11.8	7.8	12.7
	50	28.0	43.5	14.8	16.5	16.6
	75	46.0	76.3	18.6	22.5	23.5
	90	64.0	84.7	23.2	29.1	31.5
	95	70.0	94.1	26.4	34.3	35.9
	97	78.4	98.2	30.1	39.2	42.9
	98	94.6	103.4	31.9	39.8	41.0
	99	114.0	108.7	39.9	42.9	43.5
Maximum	135.0	114.0	56.5	47.0	47.0	2150.3
Data capture	100%	56%	82.8%	100%	100%	91.8%

Notes 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.

2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

The variation in the measurement methodology between the HVAS taken on a 1-day-in-6 cycle at Hilltop and Watertank, and the continuous monitoring at Newcastle must be clearly acknowledged. Whilst both methodologies are compliant with respective Australian Standards, the different approaches adopted will lead to discrepancy between the measurements, particularly towards the high percentiles and maximum of the measured distributions. Over time, the comparison between average (mean) measurements using the two methodologies of the same environmental conditions would lead to comparable results, although the distribution of the measurements may not be comparable due to the frequency of measurement and the capture of episodic peak events and error may occur associated with the specific limitations of each monitoring methodology.

Figure 11 below demonstrates that the Hilltop monitoring station loosely correlates with the Wallsend monitoring station with an approximate one to one relationship. Further, **Figure 12** shows that the Watertank monitoring location is typically 15% higher than the Hilltop location indicating that it is more affected by the existing Newstan Colliery operations than is measured at Hilltop.

If the data recorded at Hilltop is considered a reasonable reflection of existing ambient concentrations of PM₁₀ excluding emissions from the existing Newstan Colliery operations, it can therefore be concluded that the Wallsend OEH PM₁₀ dataset provides a conservative daily-varying representation of existing concentrations of PM₁₀ in the vicinity of the Newstan Colliery. The use of the Wallsend dataset to account for existing PM₁₀ concentrations without double counting emissions from existing operations is therefore considered appropriate.

The annual average PM₁₀ concentration for 2008 Wallsend dataset was 15.7 µg/m³ compared to an average of 15.2 µg/m³ for the Hilltop data and 26 µg/m³ for the Watertank data for the same year. Watertank has a higher annual average concentration as it was not operating during the winter months when Hilltop was recording lower than average concentrations **Figure 8**.

Based on the above information, the 24-hour average PM₁₀ Wallsend data for the 2008 period is considered a reasonable estimate of background ambient levels for the dispersion modelling study.

Regional scale dust events as identified in **Figure 10** have been excluded from the Wallsend dataset.

Figure 11 Comparison of 24-Hour Average PM₁₀ Concentrations Measured at Hilltop and Watertank

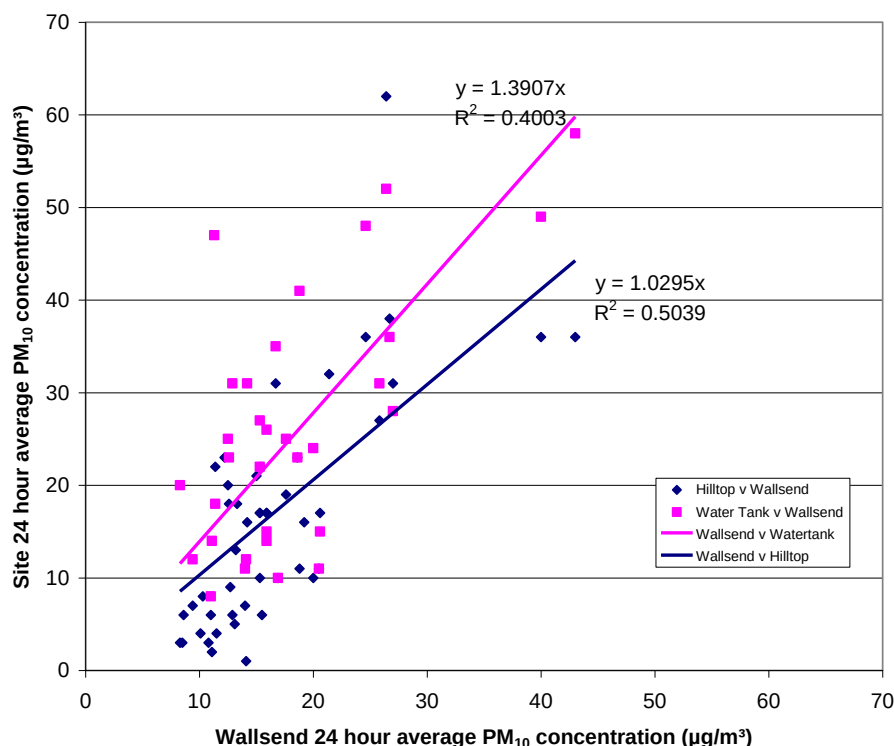
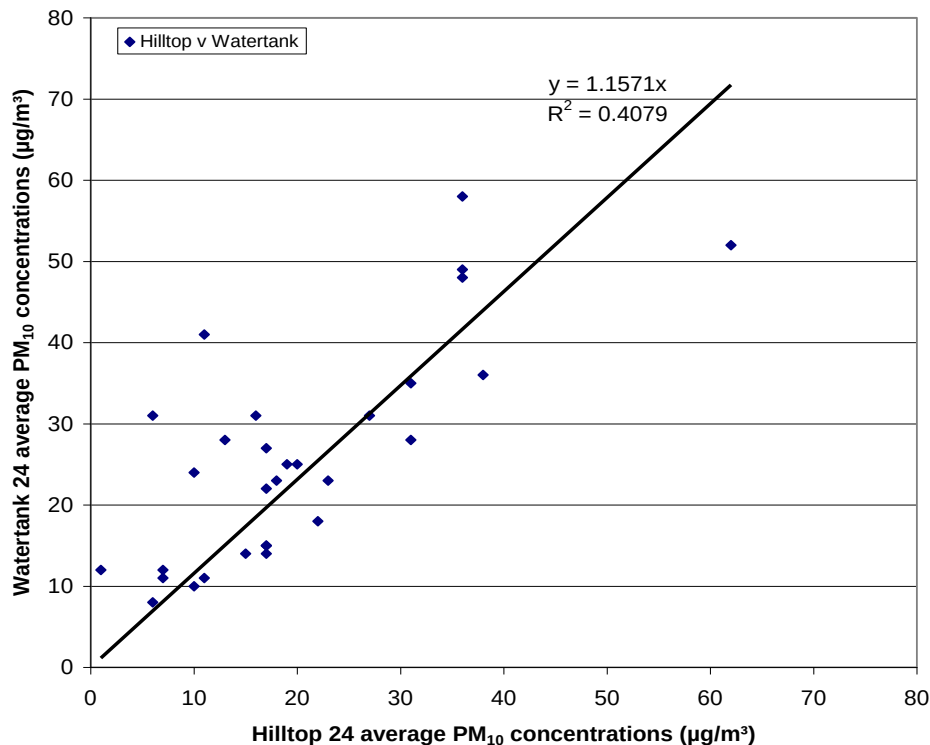


Figure 12 Comparison of 24-Hour Average PM₁₀ Concentrations Measured at Hilltop and Watertank



The results of the 24-hour PM₁₀ monitoring at Wallsend and the two site HVAS monitoring locations, conducted between January - December 2008, are summarised above. Concurrent concentrations recorded at the OEH Wallsend air quality monitoring station and the one-in-six day concentrations recorded surrounding the Project Site during the modelling period are also presented in **Table 13**.

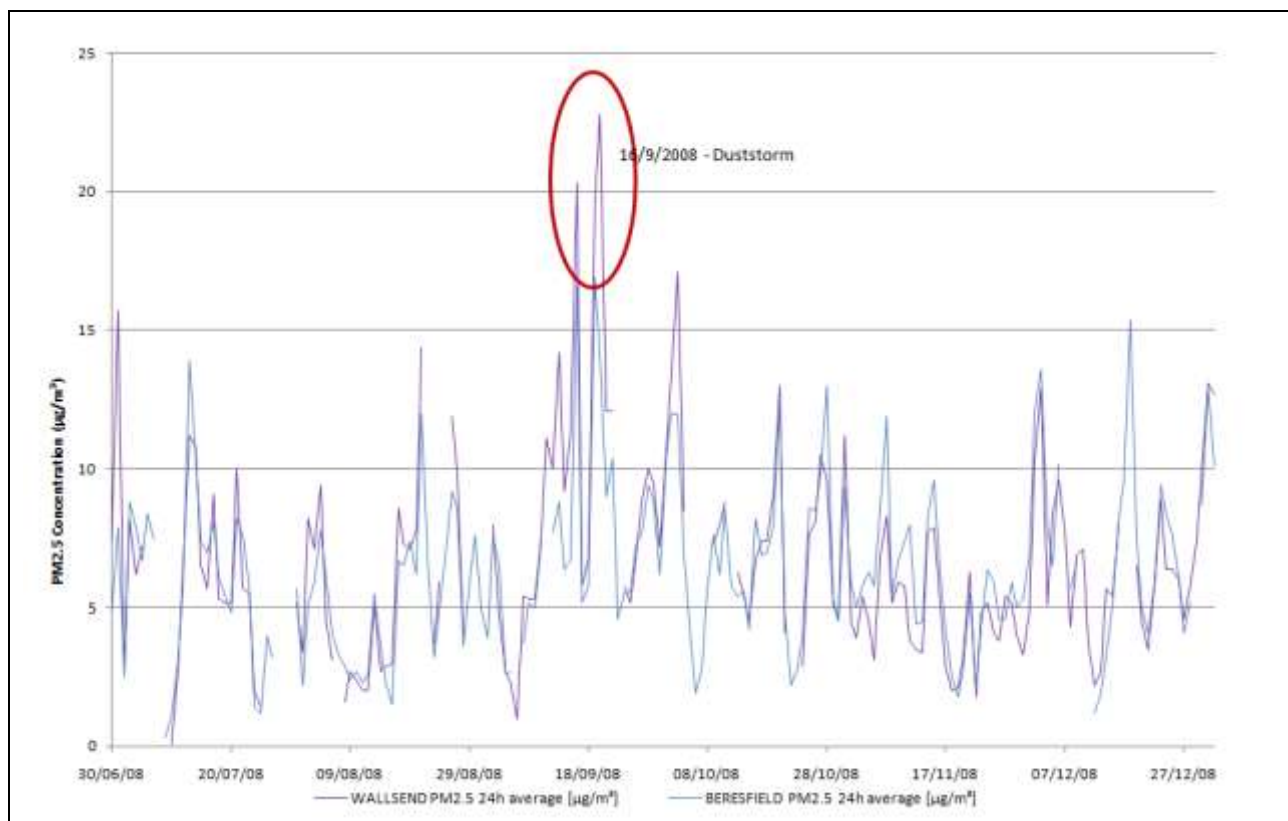
The data indicates that the highest 24-hour average PM₁₀ concentration measured by the OEH's Wallsend air quality monitoring site was 56.5 µg/m³, recorded on 16 September 2008. During this mid-September period in 2008 there were several major regional dust storms¹ and the single exceedance is almost certainly associated with one of these events. 24-hour average PM₁₀ concentrations recorded at the two HVAS locations, Hilltop and Watertank, are often greater than concentrations recorded at the Wallsend station throughout the comparison period, particularly during late summer and early spring.

4.4.2 PM_{2.5}

PM_{2.5} monitoring data has been obtained from the Wallsend station for use in this assessment to provide an indication of the existing air quality environment. As with the PM₁₀ dataset regional scale dust events have been excluded from the Wallsend dataset (see **Figure 13**). An hourly averaged daily varying file was used in the dispersion modelling. The annual average PM_{2.5} concentration for 2008 Wallsend dataset was 5.9 µg/m³.

¹ <http://www.abc.net.au/news/2008-09-22/dust-storm-blankets-southern-nsw-towns/518308>

Figure 13 OEH 24 hour average PM_{2.5} monitoring data for the Lower Hunter and identified regional scale dust events



4.5 Background Concentrations Used in this Assessment

For the purposes of assessing the potential cumulative air quality impacts from the Project, an estimation of background air quality levels is required. The site-specific background air quality levels adopted for this assessment are summarised in **Table 14** and are based on the discussion above.

Table 14 Background Particulate Levels Used in this Assessment

Air Quality Parameter	Averaging Period	Assumed Background Ambient Level	Data Source
TSP	Annual	33 µg/m ³	Newstan Hilltop HVAS, 2008
PM ₁₀	24-Hour	Daily varying file	OEH Wallsend, 2008
	Annual	15.7 µg/m ³	
PM _{2.5}	24-Hour	Daily varying file	OEH Wallsend, 2008
	Annual	5.9 µg/m ³	
Dust Deposition	Annual	None assumed ¹	-

Notes 1 Guideline used is based in the incremental impact, due to the 'double counting' of existing operations on the background data and also inclusion within the modelling study.

5 PARTICULATE SOURCES AND MODELLED SCENARIOS

This assessment has considered emissions of particulate matter from:

- Coal handling activities (trucks dumping, front end loaders, bulldozers, conveyors, coal washing and crushing);
- Rail loading facilities (trucks dumping, front end loaders, bulldozers, and conveyors);
- Reject Emplacement Areas (front end loaders, excavators, bulldozers and trucks dumping);
- Vehicle movements on paved and unpaved roads; and
- Wind erosion from disturbed areas.

These sources all relate to activities associated with the approved operations of the Newstan Colliery. This assessment has been therefore prepared based on a single proposed operational scenario that has been selected to give rise to maximum expected air quality impacts at the sensitive residences/properties identified in **Section 2.2**.

A site layout plan for the modelling scenario is presented in **Figure 14**. A full equipment list for the scenario is provided in **Section 6**.

5.1 Activity Rates and Material Composition

5.1.1 Material Process Rates

The Newstan Colliery is approved to produce and process up to 4 Mtpa of ROM coal and export up to 3 Mtpa of coal through the rail loading facility. In addition to the 4 Mtpa produced from the Newstan Colliery, a further 2 Mtpa of coal is approved to be transported from the Cooranbong Colliery and 0.88 Mtpa from the Awaba Colliery. Newstan Colliery is approved to transport up to 2 Mtpa of coal directly to Eraring Power Station using the privately owned Newstan-Eraring haul road.

Coal from the Newstan Colliery is transported directly to the CPP via the Newstan Colliery coal handling facilities. Excess coal may be stacked out onto the ROM stockpile area via the stack-out conveyor for reclaiming and processing at a later date. The reclaim process involves the use of dozers to push coal into reclaim feeders.

Coal transported by truck from the Cooranbong and Awaba Collieries may also be tipped and stockpiled onto the ROM stockpile for processing through the CPP via the same coal handling facilities.

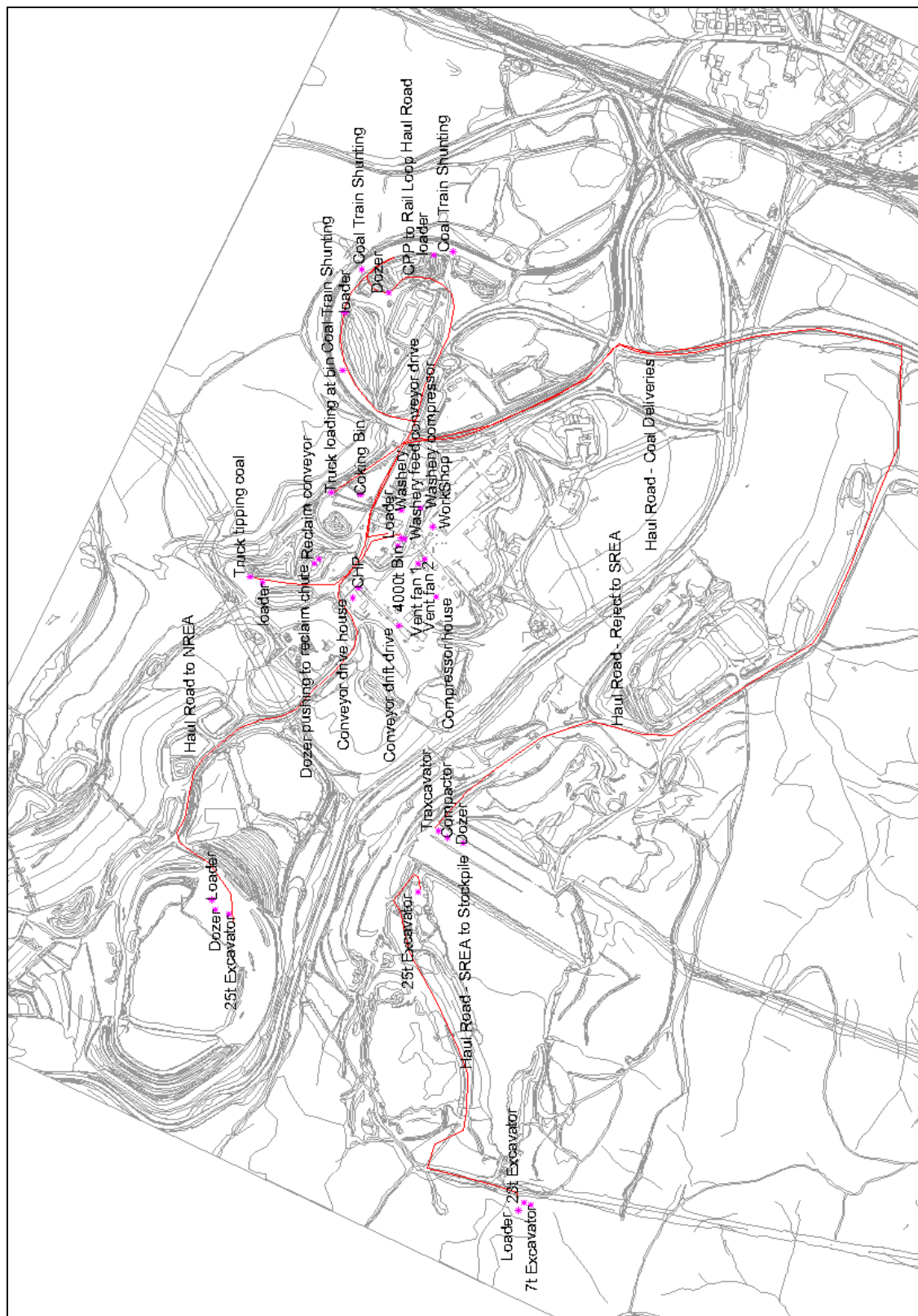
The coal from the mine and/or the ROM stockpile is fed into the CPP at a rate of 725 tonnes/hour where it is processed, resulting in a reduction of ash in the product coal and the generation of a high-ash reject material. The coarse reject material is trucked to the Newstan Southern Reject Emplacement Area (SREA) or Northern Reject Emplacement Area (NREA). The tailings are pumped to a tailings dam located within the SREA.

Product coal from the CPP is transported by enclosed conveyors to two truck loading bins. Trucks haul the coal from the truck loading bins to the Newstan rail loop or the Eraring Power Station using the privately owned Newstan- Eraring haul road.

Coal haulage is undertaken 24 hours per day, 7 days per week.

The coal has been assumed to contain 6% moisture and 6.6% silt as per AP-42 (2006) and confirmed as appropriate by the Proponent

Figure 14 Location of Plant and Equipment



Water sprays have been assumed on the conveyor systems in the processing plant area.

5.1.2 Haulage Distances

The haulage distances assumed in the dispersion modelling are provided in. These distances are based on the layout provided in **Figure 14**.

Unsealed haul roads have been assumed to contain 1.1% moisture and 6.4% silt as per the standard conditions published in US EPA AP-42 (2006).

Table 15 Haul Route Distances

Route	Road Type	Haul Route Length (m)	Vehicles per Hour (VPH)	Vehicle Kilometres Travelled per Hour (VKT)
CPP to Eraring Haul Road	Paved Roads	704	14.0	9.9
Eraring Haul Road to SREA	Unpaved Roads	1,000	16.5	16.5
SREA Internal Haul Road	Unpaved Roads	3,300	2.5	8.3
CPP to Coal Deliveries Area	Paved Roads	450	14.0	6.3
CPP to NREA	Unpaved Roads	695	2.5	1.7
Truck Loading Bin to Eraring Haul Road	Paved Roads	542	42.0	22.8
Rail loop	Paved Roads	60	21.0	1.3
Eraring Haul Road	Paved Roads	4,160	14.0	58.2
Total Paved Haul Roads		3,995	5.0	-
Total Unpaved Haul Roads		6,916	121.5	-
Total Haulage Distance		10,911	126.5	125.0

5.1.3 Open Areas

Open areas subject to wind erosion are presented in **Table 16**.

Table 16 Areas Exposed to Wind Erosion

Area	Source Area (ha)
Wind Erosion 1	1.25
Wind Erosion 2	3.66
Wind Erosion 3	0.78
Wind Erosion 4	29.29
Wind Erosion 5	7.92
Wind Erosion 6	1.08
Wind Erosion 7	10.20
Wind Erosion 8	1.78
Wind Erosion 9	5.16
Total	61.12

Figure 15 Wind Erosion Source Locations



Source: Google Earth

5.2 Emission Controls

As detailed in **Section 9**, Newstan Colliery currently implements specific measures to ensure that relevant air quality criteria are satisfied, in accordance with the operational conditions of consent for the project. The mitigation measures incorporated into the modelling assessment are shown in **Table 17** along with the percentage reduction in particulate emissions assumed in the emission inventory and dispersion modelling, where applicable. No emission reductions have been applied to active areas, nor as a result of the policy of ceasing mining activities during periods of concurrent high winds and temperatures which cause coal dust dispersal, independent of water applications.

Table 17 Mitigation Measures

Mitigation Measure	Control Assumed
- Application of water to exposed surfaces, with emphasis on those areas subject to frequent vehicle/equipment movements which may cause dust generation and dispersal. - Regular watering of internal haul roads. - Speed limit restrictions on all vehicles and equipment on the Project Site	50% reduction in particulate emissions based on Level 1 Watering (2 litres/m²/hour) on all unsealed haul roads on-site (NPI, 2001). - Further 44% reduction in estimated particulate emissions based on limiting vehicle speeds on site to 40 km/hour (MRI, 2001).
Water application at the conveyor transfer and discharge points	50% reduction in particulate emissions (NPI, 2001).

6 EMISSIONS INVENTORY

6.1 Methodology

Based on the information presented in **Section 5**, a particulate emissions inventory has been compiled for the proposed site operations.

Emission factors for TSP and PM₁₀ have been sourced from the Commonwealth of Australia Document “*National Pollutant Inventory (NPI) for Mining*, Version 2.3 (2001)” and the US EPA’s AP-42 Emission Factors where suitable factors do not exist within the NPI documentation. The emission factors used are presented overleaf in **Table 19**, which were derived using the assumptions discussed in **Section 5**.

While the National Pollutant Inventory for Mining, Version 2.3 (2001) and US EPA’s AP-42 contain emission factors for TSP and PM₁₀, no factors are provided within these documents for PM_{2.5}. This is because there is little data available on the fraction of PM₁₀ that is typically emitted as PM_{2.5} from the wide range of sources involved.

Some limited research has been conducted by the Midwest Research Institute (MRI) on behalf of the Western Regional Air Partnership (WRAP) with findings published within the document entitled ‘*Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors*’ (MRI, 2006). This document provides proposed PM_{2.5}/PM₁₀ ratios for a number of fugitive dust source categories, as presented in **Table 18**. The PM_{2.5} / PM₁₀ ratios presented in **Table 18** have been used within this assessment to calculate the emissions of PM_{2.5}. The most appropriate ratio has been applied to each emission source.

Table 18 Particle Size Ratios Proposed for Inclusion in US EPA AP-42

Fugitive Dust Source	AP-42 Section	Proposed PM _{2.5} / PM ₁₀ Ratio
Paved Roads	13.2.1	0.15
Unpaved Roads	13.2.2	0.10
Aggregate Handling and Storage Piles	13.2.4	0.10
Industrial Wind Erosion	13.2.5	0.15
Open Area Wind Erosion	-	0.15

Table 19 Emission Factor Equations

Activity	Emission Factor Equation	Units	Source	Variables	Controls Applied*
Excavator / Front End Loader on waste rock / overburden	$EF = k \times 0.0016 \times (U / 2.2)^{1.3} \times (M / 2)^{-1.4}$	kg/t	NPI EETM v3.0 (p15)	k = 0.74 (TSP) k = 0.35 (PM ₁₀) U = mean wind speed (m/s) M = Moisture content (%)	
Excavator / Front End Loader on coal	$EF_{TSP} = \frac{0.580}{M^{1.2}}$ $EF_{PM_{10}} = \frac{0.0441}{M^{0.9}}$	kg/t	NPI EETM v3.0 (p15)	M = Moisture content (%)	
Unpaved haul route wheel dust	$EF = k \times \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W}{3}\right)^{0.45}$	kg/vehicle kilometres travelled (VKT)	NPI EETM v3.0 (p16)	k = 4.08 (TSP) k = 1.24 (PM ₁₀) s = silt content (%), W = vehicle gross mass (tonnes)	Level 1 watering (2 l/m ² /hr) - (50%) Speed restriction (40 km/h) – (44%)
Paved haul route wheel dust	$EF = k \times (sL)^{0.91} \times (W)^{1.02}$	kg/vehicle kilometres travelled (VKT)	USEPA AP42 - Wheel Generated Dust from Paved Roads (2011)	k = 3.23 (TSP) k = 0.62 (PM ₁₀) k = 0.15 (PM _{2.5}) sL = silt loading (g/m ²), W = vehicle gross mass (tonnes)	Level 1 watering (2 l/m ² /hr) - (50%) Street weeping – (MRI 26%) 100 ft apron (MRI 42%)
Trucks dumping coal	Default of 0.01 for TSP Default of 0.0042 for PM ₁₀	kg/t	NPI EETM v3.0 (p15)		
Trucks dumping waste rock / overburden	Default of 0.012 for TSP Default of 0.0043 for PM ₁₀	kg/t	NPI EETM v3.0 (p15)		
Dozer on coal	$EF_{TSP} = 35.6 \times \left(\frac{s}{M^{1.4}}\right)$ $EF_{PM_{10}} = 6.33 \times \left(\frac{s^{1.5}}{M^{1.4}}\right)$	kg/hr	NPI EETM v3.0 (p15)	s=silt content (%) M=Moisture content (%)	Pit Retention - (50% for TSP, 5% for PM ₁₀)
Dozer on material other than coal	$EF_{TSP} = 2.6 \times \left(\frac{s}{M^{1.4}}\right)$ $EF_{PM_{10}} = 0.34 \times \left(\frac{s^{1.5}}{M^{1.4}}\right)$	kg/hr	NPI EETM v3.0 (p15)	s=silt content (%) M=Moisture content (%)	
Grader	TSP = $0.0034 \times S^{2.5}$ PM ₁₀ = $0.0034 \times S^{2.0}$	kg/VKT	NPI EETM v3.0 (p16)	S=mean vehicle speed (km/h)	Level 1 watering (2 l/m ² /hr) - (50%)

Activity	Emission Factor Equation	Units	Source	Variables	Controls Applied*
Primary Crusher (includes emissions from screens, crusher, feeder, surge bin and conveyor transfer points)	Default of 0.01 for TSP (Emission Factor for Primary Crushing, High Moisture Ore) Default of 0.004 for PM ₁₀ (Emission Factor for Primary Crushing, High Moisture Ore)	kg/t	NPI EETM v3.0 (p18)		Total Enclosure – 100%
Loading to trains	Default of 0.0004 for TSP Default of 0.00017 for PM ₁₀	kg/t	NPI EETM v3.0 (p16)		
Miscellaneous transfer points	$EF = k \times 0.0016 \times \left(\frac{U}{2.2}\right)^{1.3} \times \left(\frac{M}{2}\right)^{-1.4}$	kg/t	NPI EETM v3.0 (p16)	k = 0.74 (TSP) k = 0.35 (PM ₁₀) U = mean wind speed (m/s) M = moisture content (%)	Water sprays and enclosure (70%)
Wind Erosion (see Section 6.2) for full discussion)	$EF_{TSP} = 1.9 \times \left(\frac{s}{1.5}\right) \times 365 \times \frac{365}{235} \times \frac{f}{15}$ $EF_{PM_{10}} = 0.5 \times EF_{TSP}$	kg/ha/y	NPI EETM v3.0 (p57))	s = silt content (%) f = frequency of wind events greater than 5.4 m/s	

6.2 Wind Erosion

Total annual wind erosion for each exposed area has been estimated using Equation 22 from the National Pollution Inventory (NPI) Emission Estimation Technique Manual for Mining (CoA, 2001) assuming that no precipitation has occurred during the year to allow for worst case 24 hour emissions (see **Table 19**).

To model these emissions, a cubic wind power relationship has been assumed such that the cube of the hourly averaged wind speed has been divided by the sum of hourly cubic wind speeds to produce an hourly emission ratio for the total estimated annual emission. The cubic relationship allows for much larger emissions during high wind speed events and minimal emissions during milder wind speed events. Varying total hourly emissions for each source were divided by the area of the source for input into an hourly varying area source emission file.

6.3 Estimated Emissions

Total calculated emissions of TSP, PM₁₀ and PM_{2.5} are presented in **Table 20** for plant and equipment sources, **Table 21** for haul routes and **Table 22** for wind erosion sources.

Table 20 Estimated Annual Particulate Emissions from Plant and Equipment Sources

Area	Equipment	TSP (kg per annum)	PM ₁₀	PM _{2.5}
SREA operations	Trucks Dumping	402	169	25
	Excavator	17,827	8,586	1,291
	25 Tonne Excavator	5,402	2,602	391
	25 Tonne Excavator	216	102	15
	Traxcavator	22	11	2
	Compactor	17,573	4,741	387
	Trucks dumping	10,640	4,469	670
Rail Loop	FEL to train	13,198	6,342	952
	Dozer	2,197	593	48
	FEL to train	19,798	9,513	1,428
	Truck loading at bin	349	165	25
	Bin filling	349	165	25
	Stockpile	848	424	64
Coal delivery area	Truck tipping	19,272	8,094	51
	Reclaim conveyor	2.4	1.1	0.2
	Dozers	26,359	7,111	581
	Stockpiles	245	123	18
NREA operations	Dozer	11144	2,452	367
	Excavator	23	11	2
	950 Loader	23	11	2
Coal handling plant	Conveyor	3	1	0
	4000 tonne bin	1017	480	90
	CPP	305	144	27
	Loader	1237	595	640
	Feed conveyors	305	144	27
	Crusher ^b	-	-	-
	Screening ^a	-	-	-
Total		148,756.4	57,049.1	7,128.2

a High moisture content screening – zero emission

b Total enclosure – zero emission

Table 21 Estimated Annual Particulate Emissions for Haul Routes (kg/annum)

Haul Route	TSP	PM ₁₀	PM _{2.5}
Washery to Eraring Haul Road	3,569	686	171
Eraring Haul Road to SREA	2,988	574	143
SREA Internal Haul Road	28,608	6,954	695
Washery to Coal Deliveries Area	2,282	438	109
Washery to NREA	6,025	1,465	146
Truck Loading Bin to Eraring Haul Road	8,244	1,584	394
Truck Loading Bin to Eraring Haul Road	8,244	1,584	394
Rail loop	456	88	22

Haul Route	TSP	PM ₁₀	PM _{2.5}
Eraring Haul Road	27,336	5,253	1,307
Grader	2,081	1,150	65
Total	89,833	19,776	3,446

Table 22 Estimated Particulate Emissions from Wind Erosion Sources (kg/annum)

Area	TSP	PM ₁₀	PM _{2.5}
Wind Erosion 1	1,955	978	4
Wind Erosion 2	2,744	1,372	5
Wind Erosion 3	1,167	583	2
Wind Erosion 4	1,393	696	3
Wind Erosion 5	6,244	,5932	22
Wind Erosion 6	33,428	16,714	61
Wind Erosion 7	12,488	6,244	23
Wind Erosion 8	5,771	2,886	11
Wind Erosion 9	7,569	3,784	14
Total	72,759	39,189	145

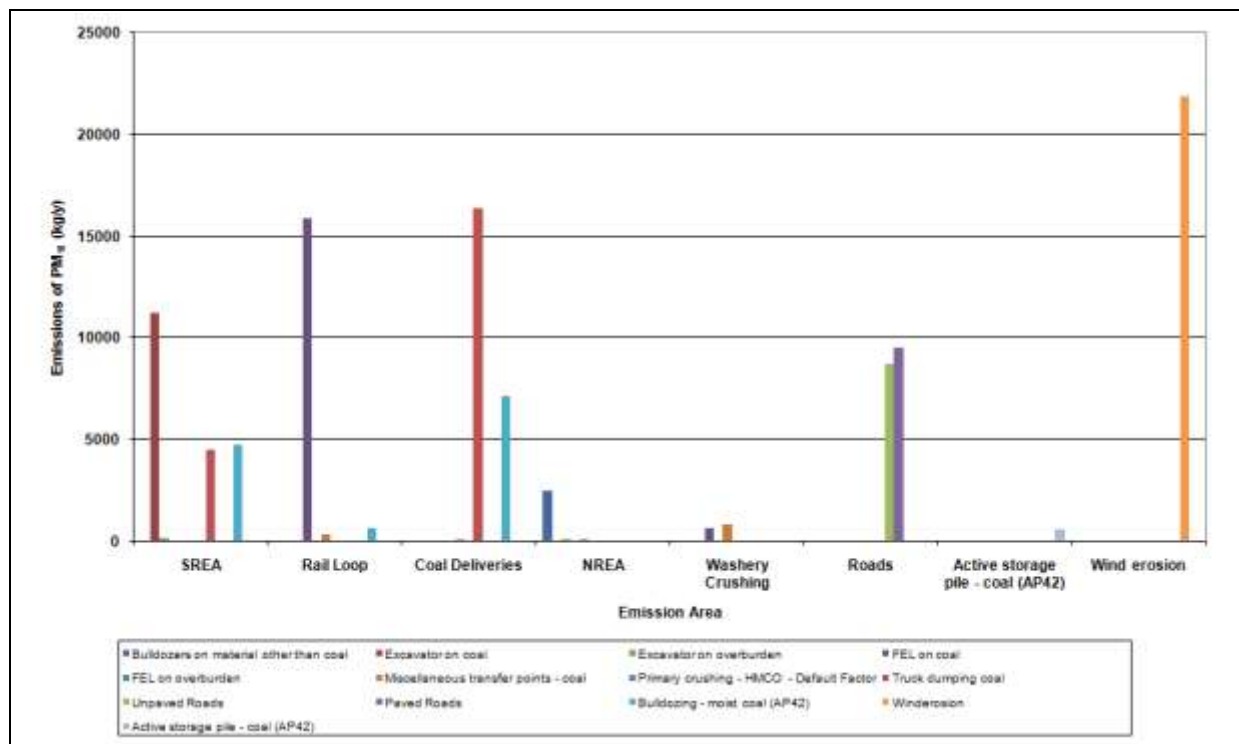
Summaries of the emission estimates are presented in **Table 23** and **Figure 16**.

Figure 16, which presents a breakdown of the estimated PM₁₀ emissions by activity area, clearly shows that the unpaved road, paved roads and bulldozers operating in the coal delivery area are the major emission sources. Given that the road sources are spread across a wide area and hence will have a more diffuse impact, it is concluded that the bulldozer operations are potentially the highest impact source.

Table 23 Total Estimated Particulate Emissions from Newstan (kg/annum)

Total Annual Emissions	TSP	PM ₁₀	PM _{2.5}
All Sources	696,000	224,000	38,100

Figure 16 PM₁₀ Emissions from Newstan Colliery by Source



7 AIR DISPERSION MODELLING METHODOLOGY

7.1 Model Selection

Emissions from Newstan Colliery have been modelled using the US EPA's CALPUFF (Version 6.267) modelling system. CALPUFF is a transport and dispersion model that advects "puffs" of material emitted from modelled sources, simulating dispersion and transformation processes along the way. In doing so it typically uses the fields generated by a meteorological pre-processor CALMET, discussed further below. Temporal and spatial variations in the meteorological fields selected are explicitly incorporated in the resulting distribution of puffs throughout a simulation period. The primary output files from CALPUFF contain either hourly concentration or hourly deposition fluxes evaluated at selected receptor locations. The CALPOST post-processor is then used to process these files, producing tabulations that summarise results of the simulation for user-selected averaging periods.

More advanced dispersion models (such as CALPUFF) are approved for use by the OEH in situations where these models may be more appropriate than use of the Ausplume model.

For this study, CALPUFF was run using a sub-domain of the CALMET domain (see **Section 7.2.2**) that had a southwest corner located at 361.468 km E and 6345.444 km S, extended 10 km east-west and 10 km north-south, and had a grid spacing of 200 m.

7.2 Meteorological Data

7.2.1 TAPM

In the absence of adequate meteorological monitoring data in the vicinity of Newstan Colliery, meteorological modelling using The Air Pollution Model (TAPM) meteorological model (Version 4.3) has been performed. TAPM, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is a prognostic model which may be used to predict three-dimensional meteorological data and air pollution concentrations.

TAPM model predicts wind speed and direction, temperature, pressure, water vapour, cloud, rain water and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere.

Additionally, the TAPM model may assimilate actual local wind observations so that they can optionally be included in a model solution. The wind speed and direction observations are used to realign the predicted solution towards the observation values. However, in this situation there were no available monitoring stations to include in the modelling. **Table 24** details the parameters used in the TAPM meteorological modelling for this assessment.

Table 24 Meteorological Parameters used for this Study (TAPM v 4.3)

Number of grids (spacing)	4 (30 km, 10 km, 3 km, 1 km)
Number of grid points	25 x 25 x 25
Year of analysis	2008
Centre of analysis	366,468m E, 6,350,444m S (-32° 58.5', 151° 34')
Data assimilation	No data assimilation

7.2.2 CALMET

CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field. The final wind field thus reflects the influences of local topography and land uses.

CALMET was configured using a 10 km x 10 km model domain with a 200 m grid spacing, with the southwest corner of the domain located at 361.468 km E and 6345.444 km S in Universal Transverse Mercator (UTM) zone 56.

Due to an absence of local meteorological monitoring data, CALTAPM was used to create three dimensional gridded data from TAPM to provide an initial guess field across the modelling domain for use by CALMET.

7.2.3 Wind Speed and Direction

A summary of the annual wind behaviour predicted by TAPM for the site is presented as wind roses in **Figure 17** and as a wind speed frequency distribution plot in **Figure 18**.

Figure 17 and **Figure 18** indicate that winds experienced at Newstan Colliery are predominantly light to moderate (between 1.5 m/s and 3 m/s) and wind direction is seasonally dependent. Winds occur more frequently from the west, especially during autumn and winter. Calm wind conditions (wind speed less than 0.5 m/s) were predicted to occur approximately 5% of the time throughout 2009.

The seasonal wind roses indicate that:

- In spring, winds are light to moderate with winds from all direction but with a higher frequency of winds from the north northwest;
- In summer, light winds are most common with wind directions from around the compass;
- In autumn, winds are light with wind directions from the west dominating; and
- In winter, winds are light to moderate and are experienced predominantly from the west.

Figure 17 Wind Roses for Newstan, as Predicted by TAPM (2008)

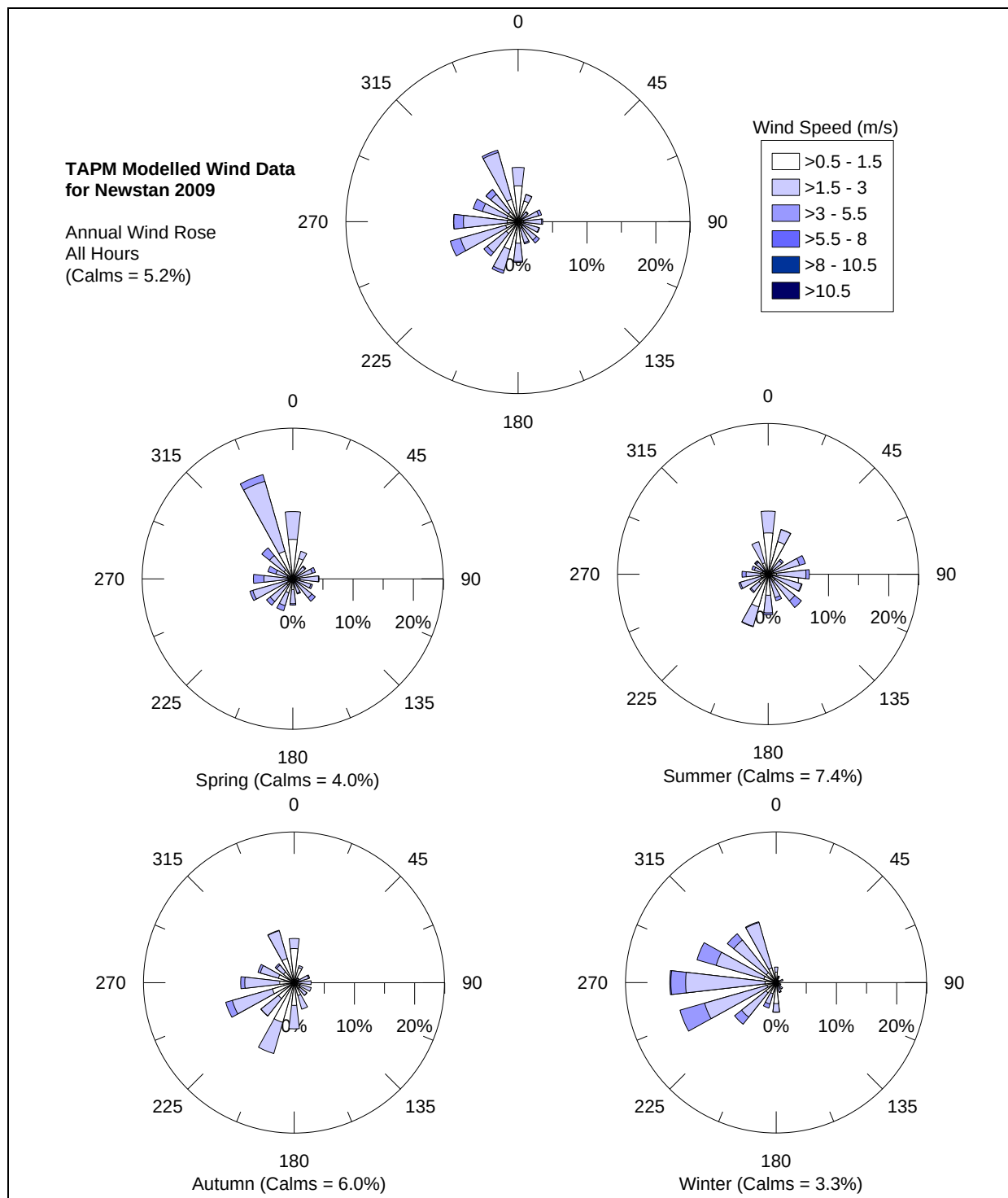
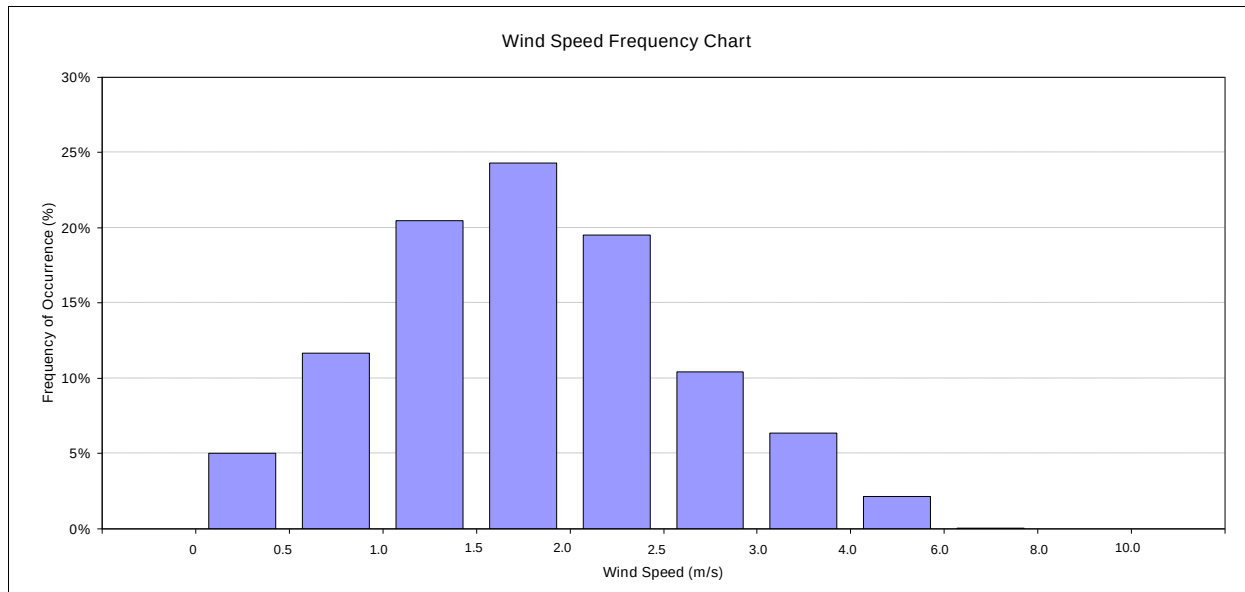


Figure 18 Wind Speed Frequency for Newstan (2008)



7.2.4 Atmospheric Stability

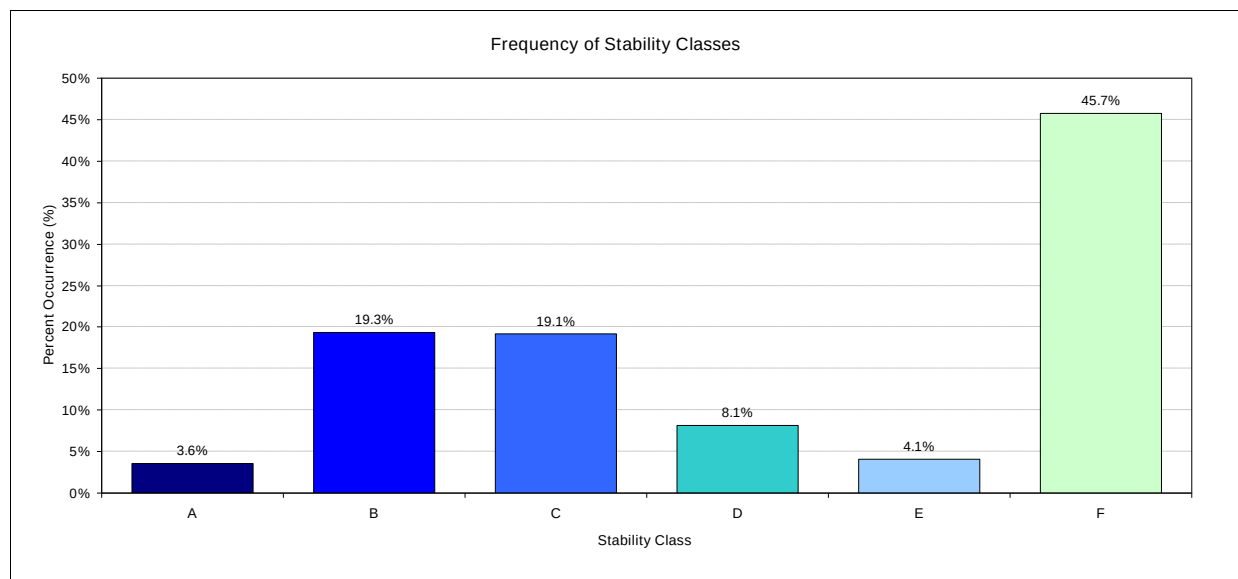
Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Turner assignment scheme identifies six Stability Classes, A to F, to categorise the degree of atmospheric stability (see **Table 25**). These classes indicate the characteristics of the prevailing meteorological conditions and are used as input into various air dispersion models.

Table 25 Description of Atmospheric Stability Classes

Atmospheric Stability Class	Category Description
A	Very unstable Low wind, clear skies, hot daytime conditions
B	Unstable Clear skies, daytime conditions
C	Moderately unstable Moderate wind, slightly overcast daytime conditions
D	Neutral High winds or cloudy days and nights
E	Stable Moderate wind, slightly overcast night-time conditions
F	Very stable Low winds, clear skies, cold night-time conditions

The frequency of each stability class predicted by TAPM at the project site during 2009 is presented in **Figure 19**. The results indicate a high frequency of conditions typical to Stability Class F. Stability Class F is indicative of very stable conditions typically found during night time, conducive to a low level of pollutant dispersion due to mechanical mixing. Daytime frequency classes are distributed across classes A to D with most occurring in Classes B and C (38% out of 50%).

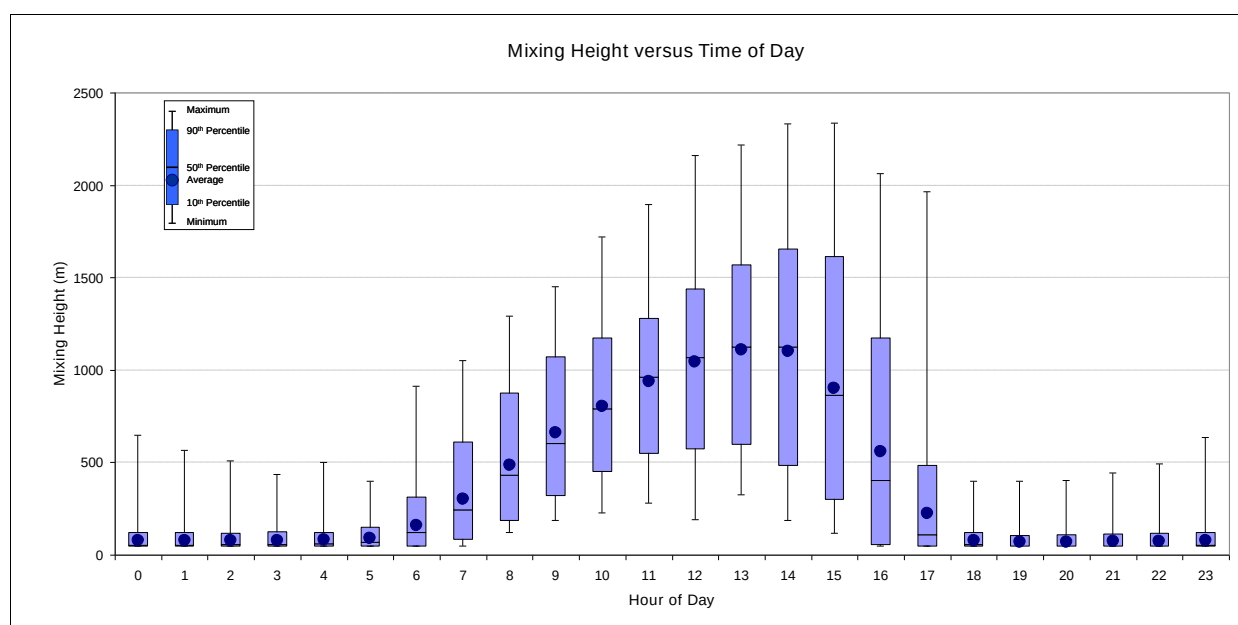
Figure 19 Stability Class Distribution Predicted by TAPM for Newstan (2008)



7.2.5 Mixing Heights

Diurnal variations in maximum and average mixing depths predicted by TAPM at the project site during 2009 are illustrated in **Figure 20**. As would be expected, an increase in the mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and the growth of the convective mixing layer. This is followed by a rapid collapse of the mixing height after 3 PM as the temperatures start to drop and thermally generated convective mixing decreases.

Figure 20 Mixing Heights Predicted by TAPM for Newstan (2008)



7.3 Topography and Land Use Data

The topographical data used in the model was sourced from the United States Geological Service's Shuttle Radar Topography Mission² database that has recorded topography across Australia with a 3 arc second (~90 m) spacing.

Land use data was generated using approximately 1 km resolution data sets taken from the providers of the CALPUFF software TRC (www.src.com, accessed 11/10/10).

7.4 Source and Emission Data

The source and emission data entered into the model was based on the emission inventory presented in Section 6.

CALPUFF requires particle distribution data (geometric mass mean diameter, standard deviation) to compute the dispersion of particulates. Alternatively, hourly varying deposition velocity data can be used. Deposition velocity data for TSP, PM₁₀ and PM_{2.5} have been taken from the VISTAS (2005) report (compiled to provide guidance to US CALPUFF modellers when predicting pollutant concentrations in sensitive areas), with constant values of 1 m/min (0.0167 m/s) for TSP and PM₁₀ and 1 cm/min (0.000167 m/s) for PM_{2.5} used.

² Sourced from http://www.src.com/datasets/datasets_terrain.html#SRTM_DATA

8 AIR DISPERSION MODELLING RESULTS

Dispersion modelling predictions of dust deposition rates and TSP, PM₁₀ and PM_{2.5} concentrations at the privately-owned residences/properties nominated in **Section 2.2** attributable to Newstan Colliery are presented in **Section 8.1** to **Section 8.4.2**.

Pollutant isopleth plots are also provided in **Appendix A** which show the maximum predicted cumulative (mining and background combined) concentrations and deposition rates of the pollutants assessed.

8.1 Results - Dust Deposition

Table 26 shows the results of the dispersion modelling for dust deposition from Newstan Colliery at each of the identified receptors using the emission rates calculated in **Section 6**. Contour plots of the incremental increase in dust deposition are also presented in **Appendix A**.

The results indicate that annual average dust deposition rates at all nominated residences/properties surrounding the Newstan Colliery are predicted to be well below the criterion of 2 g/m²/month (incremental dust deposition). As the nominated residences/properties were chosen as being indicative of all surrounding residences/properties, it can be concluded that cumulative dust deposition levels at residences/properties surrounding those modelled would also be below the relevant criterion of 2 g/m²/month.

Table 26 Predicted Incremental Annual Average Dust Deposition Rates

Receptor ID	Description	Annual Average Dust Deposition (g/m ² /month)
R1	Davis Dwelling	0.1
R2	Culgan Dwelling	0.2
R3	Orrock Dwelling	0.6
R4	Phelps Dwelling	0.5
R5	Parnell Dwelling	0.8
R6	Fassifern Primary School	0.5
Criterion (Incremental Impact)		2.0

Cumulative impacts are difficult to quantify, as the data presented in **Section 4.2** measure deposition rates which include contributions from existing operations, and none of the monitoring sites represents a true background monitoring location. The annual average deposition rates over the period range from 1.6 g/m²/month to 3.7 g/m²/month, with the 2008 annual average deposition rate for the monitoring network equating to 3.4 g/m²/month. Even taking these value as a background would only lead to marginal exceedence, which would also clearly be 'background driven' rather than 'process driven'.

Due to the inevitable 'double counting', the assessment of *incremental* dust deposition rates is considered to represent the most appropriate assessment criterion, and it is this impact which may be appropriately managed through the implementation of Best Practice measures.

8.2 Results -TSP

Table 27 presents the annual average TSP concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 6**. As discussed in **Section 2**, a conservative background concentration of $33 \mu\text{g}/\text{m}^3$ has been assumed.

Annual average TSP concentrations predicted to be well below the criterion of $90 \mu\text{g}/\text{m}^3$ at all the identified sensitive receptor locations.

As the nominated residences/properties were chosen as being indicative of ambient levels at surrounding residences/properties, it is unlikely that annual average TSP concentrations at other residences and properties surrounding these modelled residences would exceed the OEH criterion of $90 \mu\text{g}/\text{m}^3$.

Contour plots of the predicted cumulative increase in TSP concentrations are presented in **Appendix A**.

Table 27 Predicted Annual Average TSP Concentrations

Receptor ID	Description	Annual Average TSP Concentration – Incremental ($\mu\text{g}/\text{m}^3$)	Background ($\mu\text{g}/\text{m}^3$)	Annual Average TSP Concentration – Cumulative ($\mu\text{g}/\text{m}^3$)
R1	Davis Dwelling	3	33	36
R2	Culgan Dwelling	9	33	42
R3	Orrock Dwelling	17	33	50
R4	Phelps Dwelling	14	33	47
R5	Parnell Dwelling	23	33	56
R6	Fassifern Primary School	17	33	50
Criterion				90

8.3 Results – PM₁₀

8.3.1 Annual Averages

Presented in **Table 28** are the annual average PM₁₀ concentrations predicted at each of the nominated residences/properties using the emission rates calculated in **Section 6**. A daily varying background file was used in the modelling based on data collected by OEH at Wallsend in order to obtain an indication of the potential cumulative impacts associated with Newstan Colliery and to allow comparison with the annual average PM₁₀ criterion of $30 \mu\text{g}/\text{m}^3$.

The annual average PM₁₀ concentrations predicted by the modelling to comply with the criterion of $30 \mu\text{g}/\text{m}^3$ at all nominated residences/properties surrounding the Newstan Colliery. As the nominated residences/properties were chosen as being indicative of ambient levels at surrounding residences/properties, it is unlikely that annual average PM₁₀ concentrations at other residences and properties surrounding these modelled residences would exceed the OEH criterion of $30 \mu\text{g}/\text{m}^3$.

Contour plots of the predicted cumulative annual average PM₁₀ concentrations are presented in **Appendix A**.

Table 28 Predicted Annual Average PM₁₀ Concentrations

Receptor ID	Description	Annual Average PM ₁₀ Concentration – Incremental (µg/m³)	Annual Average PM ₁₀ Concentration – Cumulative* (µg/m³)
R1	Davis Dwelling	1	16
R2	Culgan Dwelling	2	18
R3	Orrock Dwelling	4	19
R4	Phelps Dwelling	3	18
R5	Parnell Dwelling	5	20
R6	Fassifern Primary School	4	19
Criterion			30

* Cumulative impacts derived using an hourly-varying background file based on data recorded during 2009 at the OEH's Wallsend ambient monitoring station

8.3.2 Maximum 24-hour Averages

Presented in **Table 29** are the maximum 24-hour average PM₁₀ concentrations predicted at each of the nominated residences/properties using the emission rates calculated in **Section 6**. As for the annual average predictions, these results include daily-varying background PM₁₀ concentrations based on data recorded at Wallsend during 2009.

As shown in the table, the maximum predicted ground level 24-hour average PM₁₀ concentrations due to emissions from Newstan Colliery are not predicted to exceed the criterion of 50 µg/m³ at any of the modelled residences/properties, excluding background concentrations.

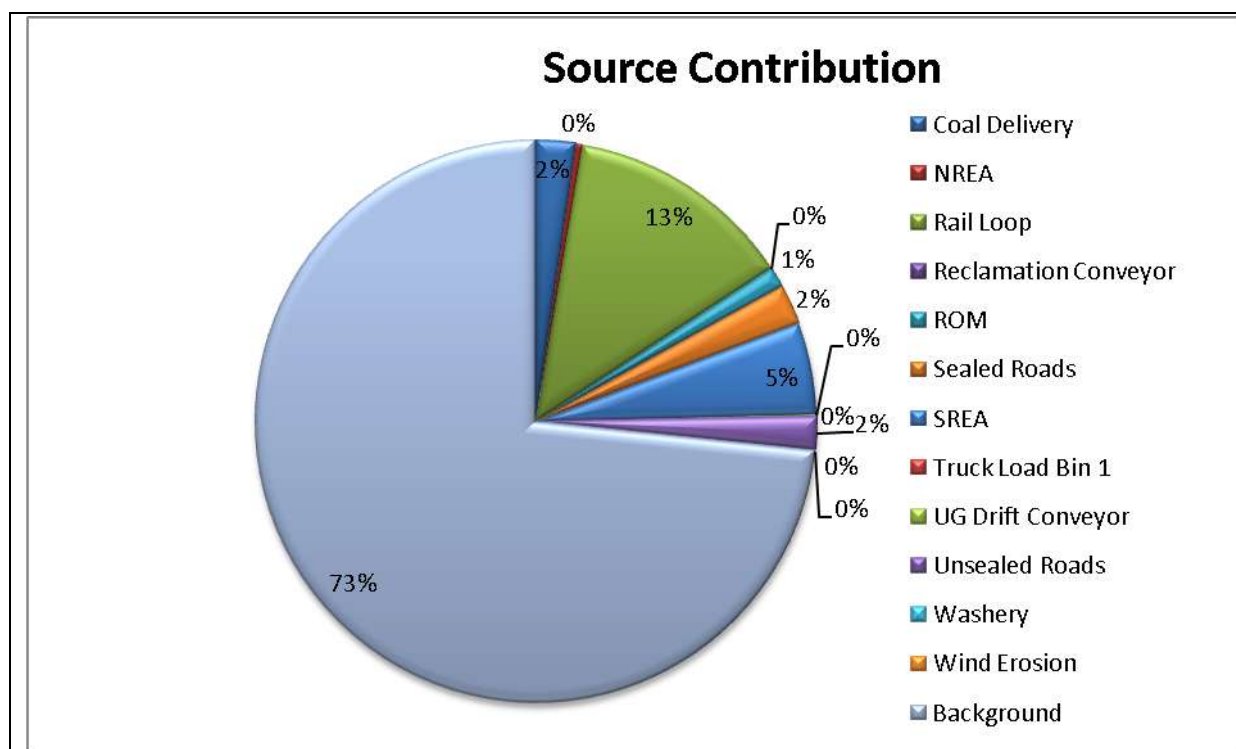
Contour plots of the maximum predicted cumulative 24-hour average PM₁₀ concentrations are presented in Appendix A.

Table 29 Maximum Predicted 24-Hour Average PM₁₀ Concentrations

Receptor ID	Description	Maximum 24 hour Average PM ₁₀ Concentration - Incremental (µg/m³)	Maximum 24 hour Average PM ₁₀ Concentration - Cumulative (µg/m³)
R1	Davis Dwelling	7	34
R2	Culgan Dwelling	15	35
R3	Orrock Dwelling	15	41
R4	Phelps Dwelling	17	43
R5	Parnell Dwelling	21	44
R6	Fassifern Primary School	17	42
Criterion			50

An analysis of the average contributions of various source groups (see **Figure 21**) at the worst-affected receptor (R6) shows that for the top three 24-hour average PM₁₀ concentrations, background PM₁₀ is the major contributing source (73%) followed by activity in the rail loop. Impacts from the rail loop, which contributes approximately 13% of the total impacts (for the three highest concentrations), are driven primarily by front end loaders and wind erosion.

Figure 21 Average Source Contributions for Top Three 24-Hour PM₁₀ Concentrations at R6



8.4 Results - PM_{2.5}

8.4.1 Annual Averages

Presented in **Table 30** are the annual average PM_{2.5} concentrations predicted at each of the nominated sensitive residences/properties using the emission rates calculated in **Section 6**.

The predicted incremental impact of the site's activities on downwind PM_{2.5} concentrations has been compared to the annual average Project criterion of 8 µg/m³. Background levels have been assumed from monitoring data measured at the Wallsend monitoring station.

Annual average incremental PM_{2.5} concentrations are not predicted to exceed the interim reporting guideline of 8 µg/m³ at any of the modelled residences/properties. Contour plots of the incremental increase in annual average PM_{2.5} concentrations are presented in **Appendix A**.

Table 30 Predicted Incremental Annual Average PM_{2.5} Concentrations

Receptor ID	Description	Annual Average Incremental PM _{2.5} Concentration (µg/m ³)
R1	Davis Dwelling	0.6
R2	Culgan Dwelling	1.4
R3	Orrock Dwelling	2.0
R4	Phelps Dwelling	1.8
R5	Parnell Dwelling	2.0
R6	Fassifern Primary School	2.2
Interim Reporting Guideline		8.0

Note: Hourly varying background data used

8.4.2 Maximum 24-hour Averages

Presented in **Table 31** are the maximum predicted 24-hour average PM_{2.5} concentrations at each of the nominated residences/properties using the emission rates calculated in **Section 6**. Daily varying background concentrations were applied to the modelling.

As shown in the table, the maximum predicted ground level 24-hour average PM_{2.5} concentrations due to emissions from Newstan Colliery are not predicted to exceed the criterion of 25 µg/m³ at any of the modelled residences/properties, excluding background concentrations.

Contour plots of the incremental increase in maximum 24-hour average PM_{2.5} concentrations are presented in **Appendix A**.

Table 31 Predicted Cumulative 24 Hour Average PM_{2.5} Concentrations

Receptor ID	Description	Maximum 24 hour Average PM _{2.5} Concentration –Cumulative (µg/m ³)
R1	Davis Dwelling	17
R2	Culgan Dwelling	17
R3	Orrock Dwelling	19
R4	Phelps Dwelling	21
R5	Parnell Dwelling	22
R6	Fassifern Primary School	18
Interim Reporting Guideline		25

Note: Hourly varying background data used

It is noted that there is some uncertainty associated with the estimation of PM_{2.5} emissions from PM₁₀ estimates using broad ratios for ranges of sources. The dispersion modelling predictions for PM_{2.5} should therefore be viewed as indicative only, with an appropriate level of uncertainty attached.

To address these limitations, it is recommended that the Proponent undertake PM_{2.5} monitoring on a 1-in-6 day cycle (concurrent with the PM₁₀ monitoring) for a period of approximately 12 months to collect data on background PM_{2.5} concentrations and also to determine site specific PM₁₀ / PM_{2.5} ratios associated with the current Newstan Colliery operations. This data will be invaluable in validating the findings of this assessment. Should PM_{2.5} concentrations be shown to be consistently below the criterion, monitoring can be ceased. If PM_{2.5} concentrations are shown to be consistently above the criterion, then a detailed assessment of the monitoring data and concurrent meteorological data should be performed to identify the most likely sources of the PM_{2.5} particles. Targeted management measures may then be applied to the identified key sources, with success of the implemented measures to be validated through continued monitoring.

9 BEST PRACTICE CONTROL OF PARTICULATE EMISSIONS FROM MINING

The following discussion of best practice control measures for the minimisation of particulate emissions from various mining activities has been sourced for a recent review of international best practice (DECCW, 2010).

9.1 Haul Roads

Wheel-generated particulate matter associated with trucks travelling on unpaved haul roads is a major source of particulate emissions for coal handling operations. The design, maintenance and management of haul roads is therefore fundamental to the minimisation of particulate emissions from coal handling operations.

Best practice haul road design should include:

- Minimisation of the distance travelled by taking the most direct route to the destination;
- Road safety (minimise steepness of ramps to less than 8%, eliminate sweeping intersections and avoid potential for equipment interactions);
- Optimise surface drainage, particularly at intersections;
- Optimise base materials to reduce silt content and increase the retention of larger aggregates, particularly at intersections;
- Restrict vehicle speeds on all roads to 40 km/hr or less; and
- Use larger trucks to minimise number of trips.

Best practice haul road maintenance should include:

- Scheduled grading and gravelling of heavy traffic areas such as intersections;
- Watering, application of chemical suppressants or paving of light traffic areas, such as the Coal Handling and Processing Plant (CHPP), underground mine portals and workshop and administrative areas;
- Regular resurfacing of high traffic areas such as intersections to reduce silt build up; and
- Regular maintenance of drainage design features at intersections (cross fall or camber).

Best practice haul road management should include:

- Diligent monitoring and application of controls as surface dries out to avoid excessive emissions. Real-time triggers should be used to identify problem areas for targeted application of controls;
- Regular watering of haul roads and at the direction of haul truck operators;
- Do not allow haul roads to become saturated as this will increase emissions once it dries out; and
- Regular grading and maintenance of intersections.

Alternatives to hauling using trucks on unpaved roads (e.g. the use of conveyors to replace haul routes) should also be considered.

With respect to grading emissions, there is very little information available in the literature that would provide a basis to define best practice. However, the NPI handbook for mining recommends a control factor of 50% for scrapers working on topsoil where the soil is naturally or artificially moist. A similar reduction would be expected to be achieved for graders. The emission factors for graders suggest that a 75% reduction could be achieved by reducing the speed of the grader from 16 km/hr to 8 km/hr.

9.2 Wind Erosion

The following subsections deal separately with measures to control emissions of particulate matter due to wind erosion of exposed areas and stockpiles. The reason for this separation is that stockpiles tend to be more exposed to the ambient wind due to their height and shape and stockpiles are continuously active, meaning that extra attention needs to be paid to stockpiles to minimise emissions. Notwithstanding this, the key techniques for minimising emissions of particulate matter from stockpiles and exposed areas are:

- Stabilise the erodible surface (e.g. by increasing the moisture content of the aggregate material being stored); and
- Shield the erodible surface from the prevailing wind.

9.2.1 Exposed Areas and Overburden Emplacements

The two fundamental drivers of particulate matter emissions caused by wind erosion are the area exposed to wind erosion and the strength of the wind. To mitigate emissions of particulate matter due to wind erosion of open exposed areas the following techniques are therefore recommended in the literature:

- Paving – usually feasible for small areas in and around workshops;
- Fencing, bunding or shelterbelts to reduce ambient wind speeds;
- Adding gravel to the surface to reduce surface fines content and to reduce the surface wind speed;
- Spillage clean-up;
- Watering;
- Chemical suppressants; and
- Revegetation – use of vegetation as an interim measure to minimise emissions of particulate matter from areas that may be exposed for extended period of time.

Avoidance of particulate matter emissions from exposed areas can be achieved by minimising areas exposed to the wind.

Mobile tankers can be used to successfully reduce emissions from accessible exposed site areas. These essentially un-trafficked areas can be sprayed with water containing suppressant chemical to achieve a reduction in emissions lasting several weeks before the need to respray the surface.

One of the most effective control measures for exposed areas is the revegetation of exposed soil or the rehabilitation of land that is not currently in use. It may be appropriate to consider the use of interim vegetation, for exposed areas that will not be used for a period time, such as hydraulic mulch seeding or (for broad and otherwise inaccessible areas) aerial seeding.

9.2.2 Coal Stockpiles

Best practice measures to control emissions of particulate matter from coal stockpiles include:

- Shaping and orientation to minimise emissions of particulate matter; and
- Stockpile watering on continuous cycle with modification of cycle depending on prevailing weather conditions to allow greater or lesser watering intensity.

9.3 Bulldozers

Best practice measures to control emissions of particulate matter from bulldozers include:

- Minimise travel speed and distance; and

- Keep travel routes and materials moist.

9.4 Loading and Dumping of Material Other Than Coal

Best practice measures for minimising emissions from loading and dumping of material other than coal include:

- Use of water sprays or water carts with boom spray;
- Cease or modify activities on dry windy days; and
- Minimise dump height.

9.5 Loading and Dumping ROM Coal

Best practice measures for minimising emissions from loading and dumping ROM coal include:

- Avoidance (i.e. bypass ROM stockpiles);
- Minimise drop height (reduce to 5 m);
- Water sprays on ROM pad or ROM bin
- Three sided and roofed enclosure of ROM bin; and
- Enclosure of ROM bin with control device.

9.6 Conveyors and Transfers

Best practice measures for minimising emissions from conveyors and transfers include:

- Application of water or enclosure at transfer points
- Wind shielding – roof and/or side wall
- Belt cleaning and spillage minimisation
- Transfers Enclosure

9.7 Stacking and Reclaiming Product Coal

The following measures are applied to minimise emissions of particulate matter from stacking:

- Bypass coal stockpile;
- Variable height luffing stacker to allow drop height to be minimised and stacking to occur without dozer push;
- Use of chutes or wind shields to shroud falling coal from static trippers; and
- Water application – boom tip sprays.

The following measures are applied to minimise emissions of particulate matter from reclaiming:

- Use of bucket-wheel, portal or bridge reclaimer;
- Water application – boom tip sprays;
- Reclaim tunnel with minimal mechanical disturbance;
- Minimise residence time in stockpiles; and
- Coal moisture management.

9.8 Train and Truck Load Out and Transportation

Best practice measures to control emissions of particulate matter from truck and train loader are the use of volumetric loading from an overhead silo or bin with a telescopic chute with the entire activity enclosed within a building. Clam-shell or front-end loaders should be avoided where possible due to the potential for spillage during loading operations. Spilled coal can be a source of particulate matter emissions particularly as the coal dries and where it is deposited on tracks and trafficked areas can be pulverised to produce a very fine and easily eroded particulate matter.

Best practice measures to control emissions of particulate matter from rail corridors include:

- Use of profilers to manage overloading or underloading of wagons;
- Maintain a consistent profile. (Loading via front-end loaders and clam shells produces uneven loads that are susceptible to spillage and reduce the effectiveness of suppressants);
- Maintaining the 100 mm freeboard around the edge of the wagon;
- Application of a suppressant to the surface of the coal profile;
- Removing parasitic coal from the surface of the wagons before leaving the site;
- Covering load (e.g. tarpaulins or lid); and
- Wagon wheel wash.

Best practice measures to control emissions of particulate matter from trucks include:

- Limit load size to ensure coal is not above the level of the sidewalls;
- Maintain a consistent profile;
- Use bedliners to minimise seepage and spillage from bottom dumping trucks;
- Covering load with a tarpaulin; and
- Utilise a truck wheel wash ensuring that truck is clean and free of loose material.

Table 32 provides an overview of those best practice dust management measures currently implemented at the Newstan Colliery and identifies additional dust management measures that will be implemented. The ability to implement the additional dust management measures has been determined following a review of the currently implemented and best practice dust management measures with SLR consultants and Centennial Newstan staff. The review identified additional areas where dust management measures can be implemented that are achievable and feasible for the current Newstan Colliery operations.

Table 32 Best Practice Dust Mitigation measures Implemented and Proposed for the Newstan Colliery

Activity	Currently implemented	Modelled	Will be implemented
Haul Roads			
<i>Best practice haul road design should include:</i>			
Minimisation of the distance travelled by taking the most direct route to the destination.	Yes		
Road safety (minimise steepness of ramps to less than 8%, eliminate sweeping intersections and avoid potential for equipment interactions).	Yes		
Optimise surface drainage, particularly at intersections.	Yes		
Optimise base materials to reduce silt content and increase the retention of larger aggregates, particularly at intersections.	No		

Activity	Currently implemented	Modelled	Will be implemented
Restrict vehicle speeds on all roads to 40 km/hr or less.	For internal but not long distance haul roads	Yes for internal	Yes for internal haul roads
Use larger trucks to minimise number of trips.	Yes		
Best practice haul road maintenance should include:			
Scheduled grading and gravelling of heavy traffic areas such as intersections.	Yes		
Watering, application of chemical suppressants or paving of light traffic areas, such as the Coal Handling and Processing Plant (CHPP), underground mine portals and workshop and administrative areas.	Yes	Yes	
Regular resurfacing of high traffic areas such as intersections to reduce silt build up.	Yes		
Regular maintenance of drainage design features at intersections (cross fall or camber).	Yes		
Best practice haul road management should include:			
Diligent monitoring and application of controls as surface dries out to avoid excessive emissions. Real-time triggers should be used to identify problem areas for targeted application of controls.	No		Yes
Regular watering of haul roads and at the direction of haul truck operators	Yes	Yes	
Do not allow haul roads to become saturated as this will increase emissions once it dries out.	Yes		
Regular grading and maintenance of intersections.	Yes		
Alternatives to hauling using trucks on unpaved roads (e.g. the use of conveyors to replace haul routes should also be considered.)	No		
Grading			
Reducing the speed of the grader from 16 km/hr to 8 km/hr.	No		Yes
Working on topsoil where the soil is naturally or artificially moist.	Yes	Yes	
Wind Erosion			
Stabilise the erodible surface (e.g. by increasing the moisture content of the aggregate material being stored); and	Yes	Yes	
Shield the erodible surface from the prevailing wind.	No		Not practical or achievable
Exposed Areas			
Minimise exposed areas as far as is practicable	Yes		
Paving – usually feasible for small areas in and around workshops	Yes	Yes	
Fencing, bunding or shelterbelts to reduce ambient wind speeds	Yes (some areas)	Yes	
Adding gravel to the surface to reduce surface fines content and to reduce the surface wind speed	Yes	Yes	
Spillage clean-up	Yes		
Watering	Yes	Yes	
Chemical suppressants	Yes	Yes	

Activity	Currently implemented	Modelled	Will be implemented
Revegetation of unused areas	Yes	Yes	
Coal Stockpiles			
Shaping and orientation to minimise emissions of particulate matter	Yes		
Stockpile watering on continuous cycle with modification of cycle depending on prevailing weather conditions to allow greater or lesser watering intensity	Yes - water cart has been equipped with a water cannon for applying water to stockpiles.	Yes	Yes – will be implemented more vigilantly
Bulldozers			
Minimise travel speed and distance	Yes		
Keep travel routes and materials moist	Yes		
Loading and Dumping Material Other Than Coal			
Use of water sprays or water carts with boom spray	Yes	Yes	
Cease or modify activities on dry windy days	Yes	Yes	
Minimise dump height	Yes		
Loading and Dumping ROM Coal			
Avoidance (i.e. bypass ROM stockpiles)	No		
Minimise drop height (reduce to 5 m)	No		
Water sprays on ROM pad or ROM bin	Yes	Yes	
Three sided and roofed enclosure of ROM bin	Yes	Yes	
Enclosure of ROM bin with control device	Yes	Yes	
Conveyors and Transfers			
Application of water or enclosure at transfer points	Yes	Yes	
Wind shielding – roof and/or side wall	Yes	Yes	
Belt cleaning and spillage minimisation	Yes		
Transfers Enclosure	Yes	Yes	
Stacking and Reclaiming Product Coal			
Bypass coal stockpile	No		
Variable height luffing stacker to allow drop height to be minimised and stacking to occur without dozer push	No		
Use of chutes or wind shields to shroud falling coal from static trippers	Yes	Yes	
Water application – boom tip sprays	Yes (some areas)		
Reclaiming:			
Use of bucket-wheel, portal or bridge reclaimer	No		
Water application – boom tip sprays	Yes	Yes	
Reclaim tunnel with minimal mechanical disturbance	Yes		
Minimise residence time in stockpiles	Yes		
Coal moisture management	Yes	Yes	

Activity	Currently implemented	Modelled	Will be implemented
Train and Truck Load Out and Transportation			
Use of volumetric loading from an overhead silo or bin	Yes (for trucks)		
Telescopic chute with the entire activity enclosed within a building.	No		
Front-end loaders avoidance	No		
Rail Corridors:			
Use of profilers to manage overloading or underloading of wagons	No		
Maintain a consistent profile.	No		
Maintaining the 100 mm freeboard around the edge of the wagon	Yes		
Application of a suppressant to the surface of the coal profile	No		
Removing parasitic coal from the surface of the wagons before leaving the site	No		
Covering load (e.g. tarpaulins or lid)	No		
Wagon wheel wash	No		
Trucks:			
Limit load size to ensure coal is not above the level of the sidewalls	Yes		
Maintain a consistent profile	No		
Use bedliners to minimise seepage and spillage from bottom dumping trucks	No		
Covering load with a tarpaulin	Yes		
Utilise a truck wheel wash ensuring that truck is clean and free of loose material	No		Yes

10 CONCLUSIONS AND RECOMMENDATIONS

SLR Consulting Ltd was commissioned by Centennial Newstan to conduct an air quality impact assessment of the current approved operations of the Newstan Colliery. Atmospheric dispersion modelling of fugitive emissions of particulate matter (as TSP, PM₁₀ and PM_{2.5}) from the site was undertaken using the CALPUFF dispersion model. Emissions from coal transport, storage, the washery and rail loading and transport activities were addressed in the study. Local meteorological conditions were predicted using The Air Pollution Model (TAPM) for the year 2008. Topography and land use data were sourced from published databases.

The results of the dispersion modelling conducted for Newstan Colliery indicate no potential for exceedance of the OEH annual average TSP, PM₁₀ and PM_{2.5} assessment criteria at the nearest non-project related receptors. Analysis of the model results indicates that the major contributors to these predicted impacts are background dust (by a significant margin) and then front end loaders and wind erosion in the rail loop area.

Deposited dust (the fraction of dust that settles out of the airborne dust due to gravitation) was not predicted to exceed the OEH guideline for incremental impacts at any of the receptors. The assessment of cumulative impact of deposited dust is not currently feasible, given the limitations of available background dust deposition rates.

A review of the best practice dust mitigation measures has been undertaken as part of this assessment and Centennial Newstan has identified areas where improved dust management measures will be implemented. These additional dust management measures are identified in **Table 32**.

Monitoring of TSP, PM₁₀, and deposited dust should be continued in order to provide verification of the dispersion modelling of proposed operations. It is also recommended that the Proponent commence PM_{2.5} monitoring on a 1-in-6 day cycle (concurrent with the PM₁₀ monitoring) for a period of approximately 12 months to collect data on background PM_{2.5} concentrations and also to determine site specific PM₁₀ / PM_{2.5} ratios associated with the current Newstan Colliery operations.

Additionally a reactive monitoring program will be put in place to allow dust generating activities to be modified or ceased if conditions are such that exceedance of 24 hour PM₁₀ concentrations guidelines are likely.

10.1 Limitations

The key limitations of this study are associated with:

- The representativeness of the published emission rates used to estimate emissions from proposed activities at the site for the purposes of predicting dust impacts at the receptor locations; and
- The limitations inherent to the use of numerical modelling tools such as TAPM, CALMET and CALPUFF. It is important to note that all numerical models that are based on approximating a governing set of equations will inherently be associated with some degree of error. The more complex the physical model, the greater the number of physical processes which must be parameterised. This frequently results in a large number of adjustable parameters within the model. There exists extensive in-house expertise in the use of TAPM, CALMET and CALPUFF within SLR and our modellers make every reasonable attempt to ensure that model results are of the highest possible quality.

This study necessarily relies on the accuracy of the following data sets:

- Information including material properties, production volumes and operational practices provided by the Proponent;
- Ambient monitoring data obtained from site monitoring network;
- Ambient monitoring data obtained from the OEH; and
- Terrain and landuse information for the region sourced from the databases described in **Section 7.3**.

A number of assumptions have been applied within this assessment. These include:

- Dust emission rates derived from published emission factors are representative of emissions from proposed activities at Newstan Colliery;
- Default values of parameters (in association with the development of emission factors) are representative of on-site conditions; and
- Simulated meteorology adequately represents local conditions.

11 REFERENCES

The following documents have been referenced in the preparation of this report

- Commonwealth of Australia (2001) "National Pollutant Inventory Emission Estimation Technique Manual for Mining Version 2.3".
- Midwest Research Institute (2006) '*WRAP - Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors*' (MRI, 2006).
- National Environmental Protection Council (1998) "Ambient Air Quality National Environment Protection Measure".
- NSW Department of Environment, Climate Change and Water (2010) "NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining", Prepared by Katestone Environmental Pty Ltd, December 2010.
- NSW Department of Environment, Climate Change and Water (2010), PM₁₀ and PM_{2.5} data from the OEH's Wallsend monitoring site for December 2007 to December 2009.
- NSW Department of Environment and Climate Change (2008) "National Environment Protection (Ambient Air Quality) Measure New South Wales Annual Compliance Report 2008".
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- NSW Department of Environment and Climate Change (2007) "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".
- NSW Department of Environment, Climate Change and Water (2005) "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW".
- United States Environmental Protection Authority (2003) Compilation of Air Pollutant Emission Factors AP-42 - Chapter 13.2.2 Unpaved Roads.
- United States Environmental Protection Authority (2006) Compilation of Air Pollutant Emission Factors AP-42 - Chapter 13.2.1 Paved Roads.
- United States Environmental Protection Authority (2006) Compilation of Air Pollutant Emission Factors AP-42 - Chapter 13.2.5 Industrial Wind Erosion.

12 CLOSURE

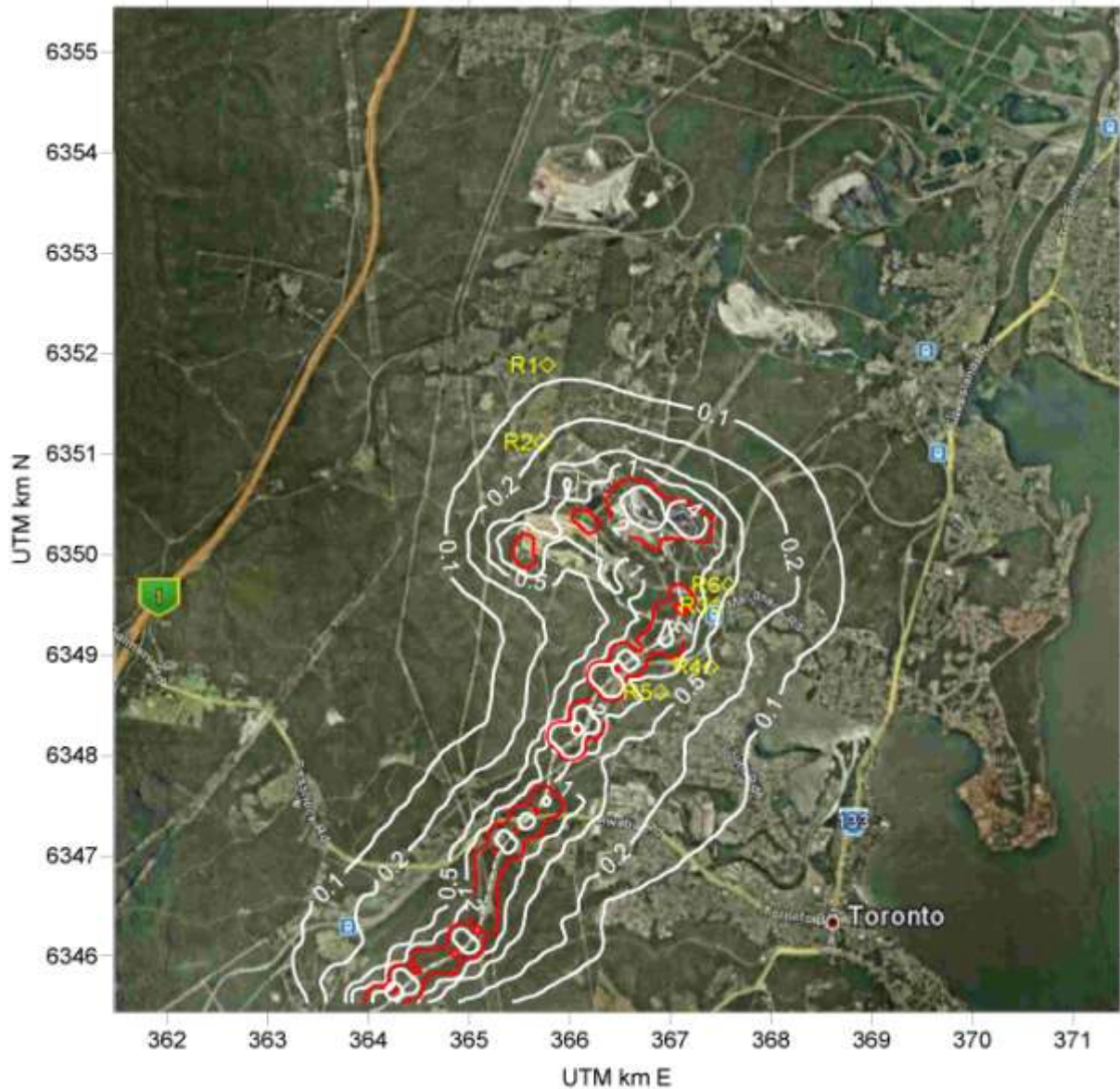
This report has been prepared by SLR Consulting with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Centennial Newstan Pty Limited ; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

APPENDIX A – DISPERSION MODELLING CONTOUR PLOTS

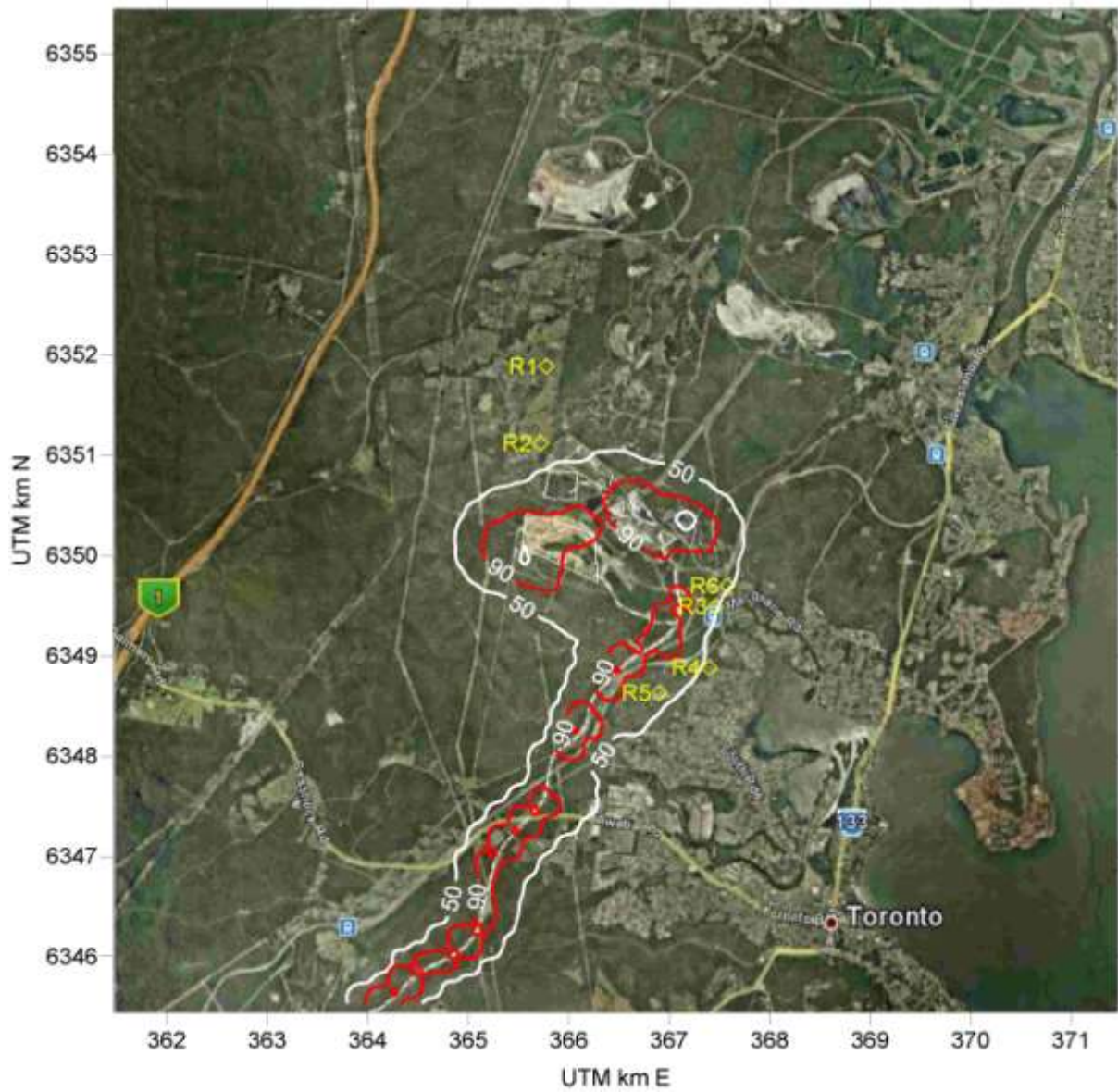
Predicted Annual Average Incremental Deposited Dust ($\text{g}/\text{m}^2/\text{month}$)



Modelled using Calpuff V6.267.

Guideline concentration (red line) = 2 $\text{g}/\text{m}^2/\text{month}$ (Incremental) or 4 $\text{g}/\text{m}^2/\text{month}$ (Cumulative)

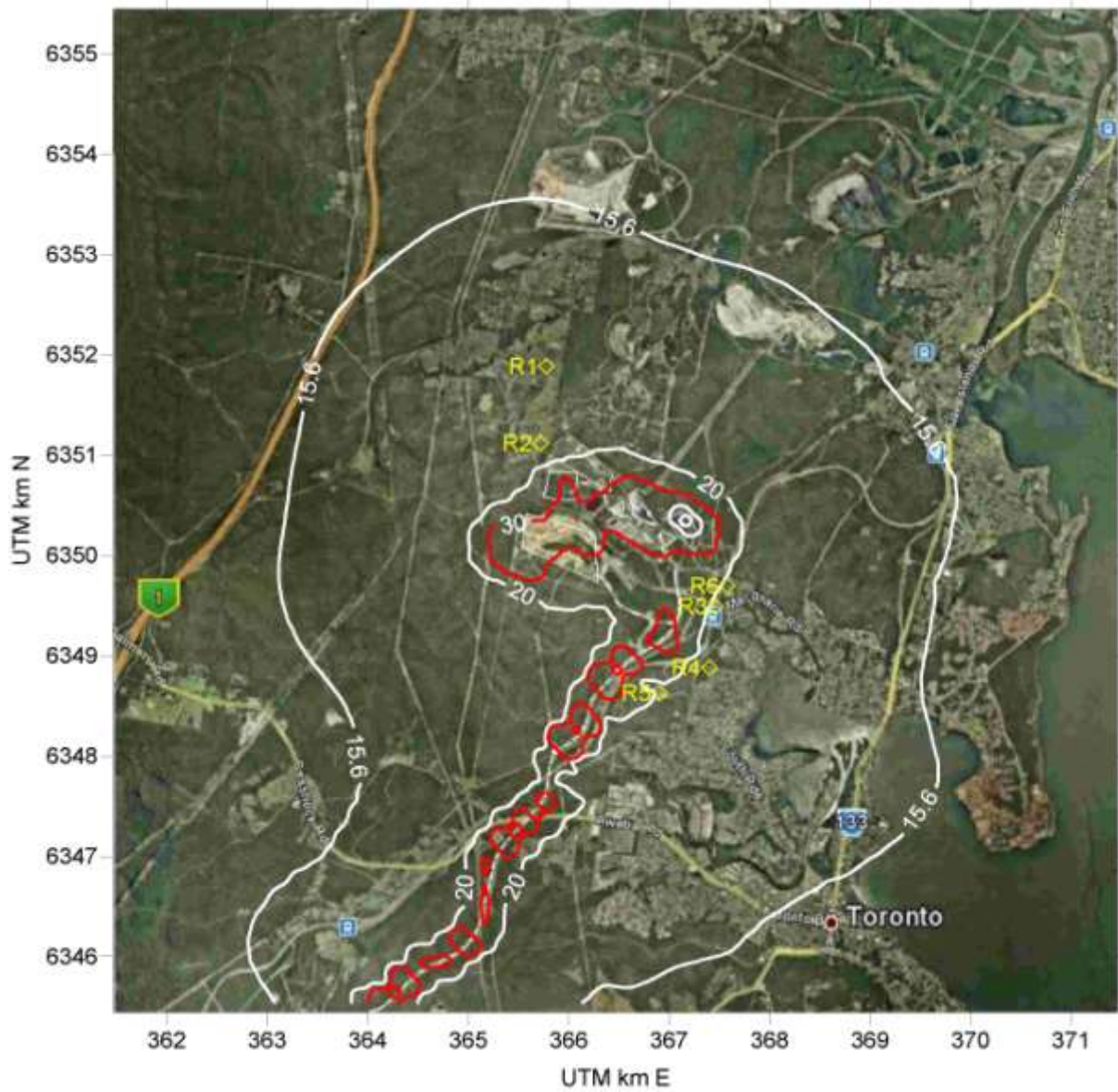
Predicted Annual Average Cumulative TSP Concentrations ($\mu\text{g}/\text{m}^3$)



Modelled using Calpuff V6.267.

Guideline concentration = 90 $\mu\text{g}/\text{m}^3$ (Cumulative)

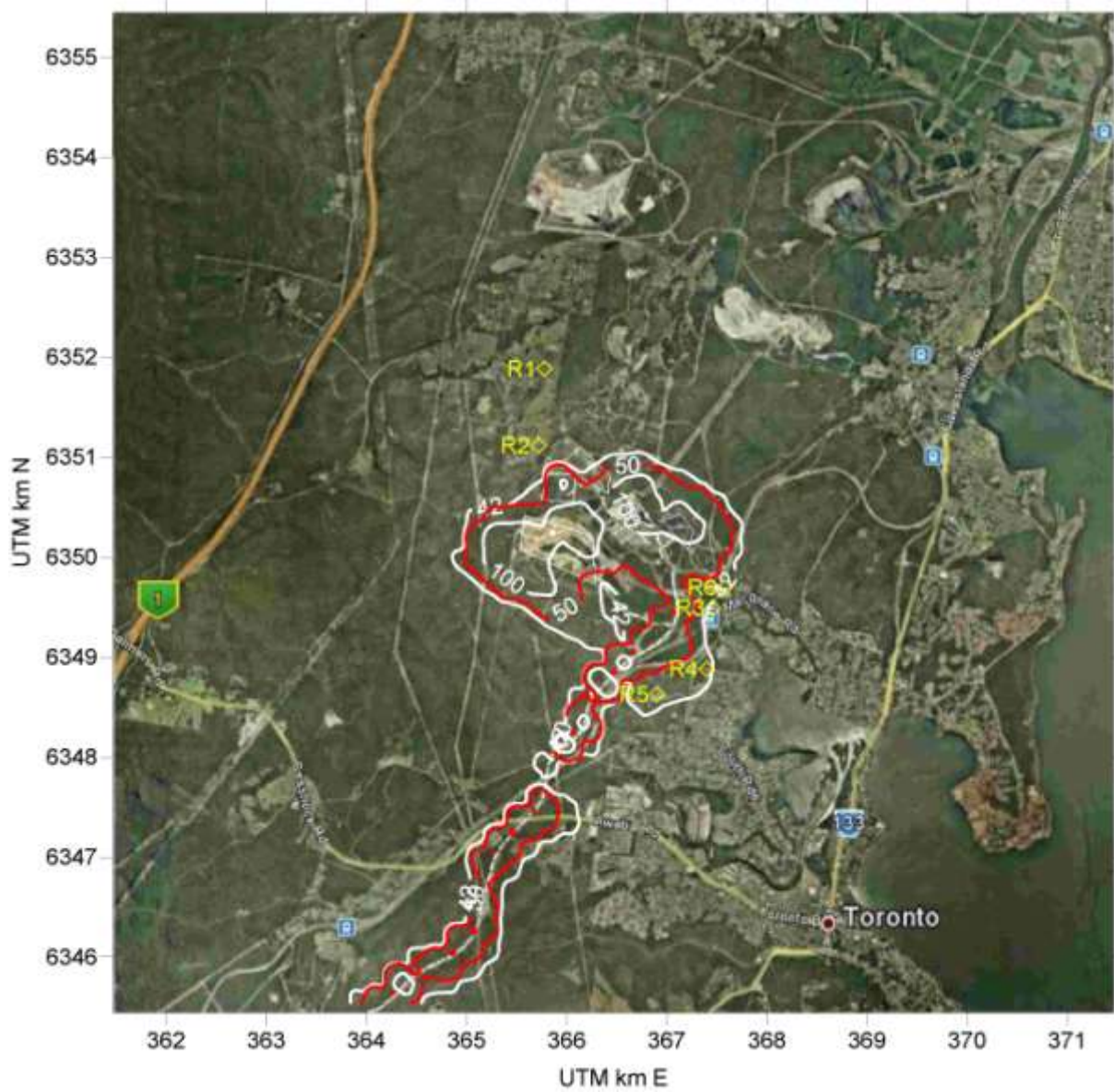
Predicted Annual Average Cumulative PM₁₀ Concentrations (µg/m³)



Modelled using Calpuff V6.267.

Guideline concentration = 30 µg/m³ (Cumulative)

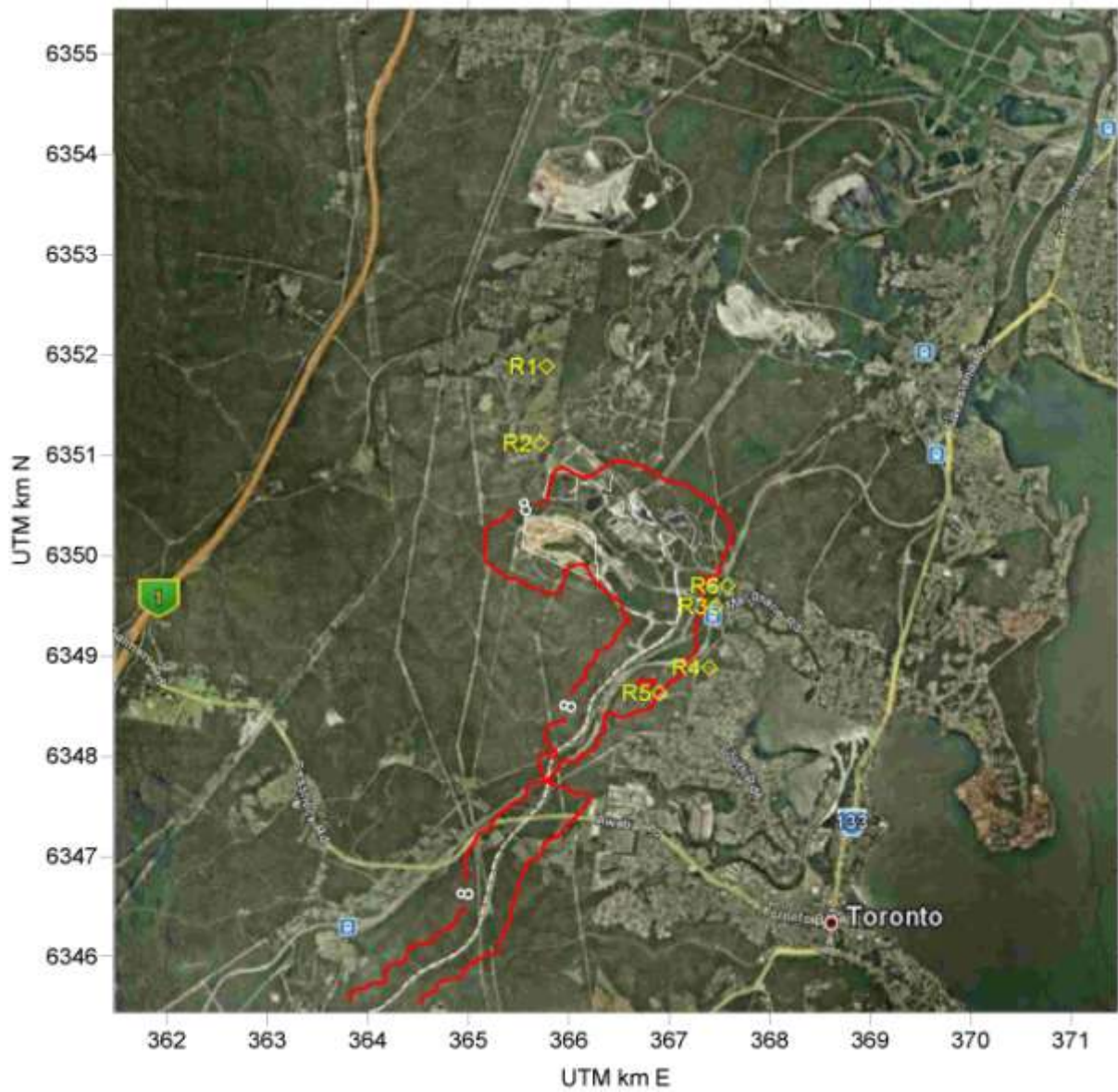
Predicted Maximum 24-Hour Average Cumulative PM₁₀ Concentration (µg/m³)



Modelled using Calpuff V6.267.

Guideline concentration = 50 µg/m³ (Cumulative)

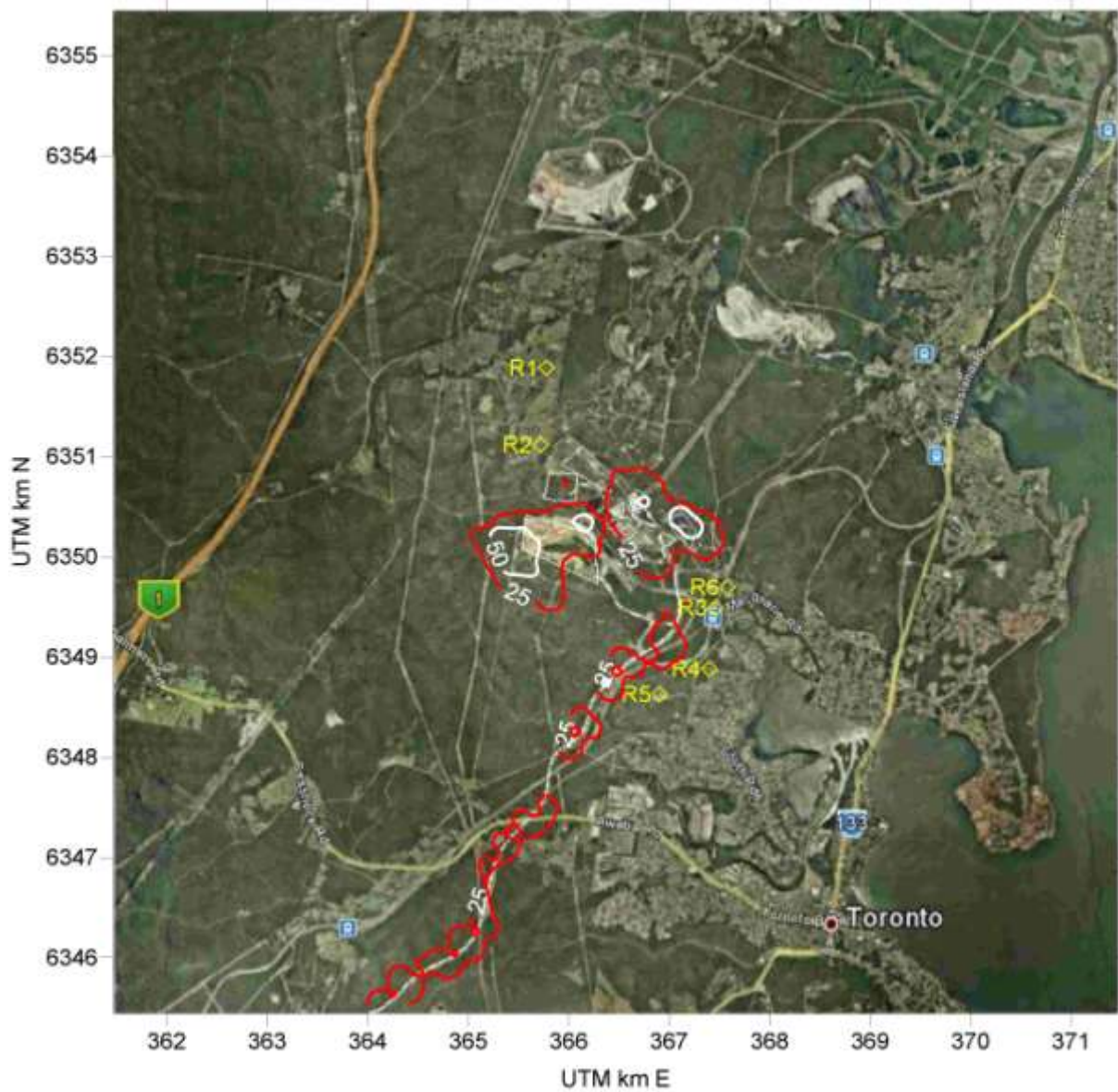
Predicted Annual Average Incremental PM_{2.5} Concentrations (µg/m³)



Modelled using Calpuff V6.267.

Guideline concentration = 8 µg/m³ (Cumulative)

Predicted 24-Hour Average Incremental PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$)



Modelled using Calpuff V6.267.

Guideline concentration = 25 $\mu\text{g}/\text{m}^3$ (Cumulative)

Area	Descriptor	Source Type	Activity	Units	Hr/Day	Operation		Control efficiency applied			Annual emission rate (kpy)		
						Day/Year	OpHrs	TSP	PM ₁₀	PM _{2.5}	TSP	PM ₁₀	PM _{2.5}
Coal Deliveries Area	Dump truck	Truck dumping coal	55	tonnes	2	365	730	100%	100%	100%	402	170	304
SREA Operations	7t Excavator	Excavator on coal	330	tonnes	8	365	2920	100%	100%	100%	17,800	8,590	3,870
SREA Operations	25 Tonne Excavator	Excavator on coal	100	tonnes	8	365	2920	100%	100%	100%	5,400	2,600	1,170
SREA Operations	25 Tonne Excavator	Excavator on overburden	330	tonnes	8	365	2920	100%	100%	100%	778	368	166
SREA Operations	Traxcavator	Excavator on overburden	34	tonnes	8	365	2920	100%	100%	100%	81	38	17
SREA Operations	Compactor	Bulldozing - moist coal (AP42)	1	VKT	8	365	2920	100%	100%	100%	17,600	4,740	1,160
SREA Operations	Trucks dumping	Truck dumping coal	364	tonnes	8	365	2920	100%	100%	100%	10,600	4,470	2,010
Rail Loop	FEL to train	FEL on coal	400	tonnes	8	365	2920	100%	100%	100%	40,800	6,260	2,820
Rail Loop	Dozer	Bulldozing - moist coal (AP42)	1	VKT	1	365	365	100%	100%	100%	2,200	593	48
Rail Loop	FEL to train	FEL on coal	400	tonnes	12	365	4380	100%	100%	100%	61,100	9,390	2,820
Rail Loop	Truck loading at bin	Miscellaneous transfer points - coal	200	tonnes	24	365	8760	100%	100%	100%	1,250	592	89
Rail Loop	Bin filling	Miscellaneous transfer points - coal	200	tonnes	24	365	8760	100%	100%	100%	1,250	592	89
Coal Deliveries Area	Reclaim conveyor	Miscellaneous transfer points - coal	450	tonnes	24	365	8760	0%	0%	0%	8	4	1
Coal Deliveries Area	Dozer	Bulldozing - moist coal (AP42)	1	VKT	12	365	4380	100%	100%	100%	26,400	7,110	1,160
Coal Deliveries Area	Truck tipping	Truck dumping coal	220	tonnes	24	365	8760	100%	100%	100%	19,300	8,090	1,210
NREA Operations	Dozer	Bulldozers on material other than coal	1	hrs	8	365	2920	100%	100%	100%	11,100	2,450	1,100
NREA Operations	Excavator	Excavator on overburden	35	tonnes	8	365	2920	100%	100%	100%	83	39	18
NREA Operations	950 Loader	FEL on overburden	35	tonnes	8	365	2920	100%	100%	100%	83	39	18
Coal handling plant	Conveyor	Miscellaneous transfer points - coal	700	tonnes	20	365	7300	0%	0%	0%	11	5	1
Coal handling plant	4000 tonne bin	Miscellaneous transfer points - coal	700	tonnes	20	365	7300	100%	100%	100%	3,650	1,730	310
Coal handling plant	CHP	Miscellaneous transfer points - coal	700	tonnes	20	365	7300	30%	30%	30%	1,100	518	93
Coal handling plant	Loader	FEL on coal	75	tonnes	4	365	1460	100%	100%	100%	36	17	15
Coal handling plant	Feed conveyors	Miscellaneous transfer points - coal Primary crushing - HMCO - Default Factor	700	tonnes	20	365	7300	30%	30%	30%	1,100	518	93
Coal handling plant	Crusher		700	tonnes	20	365	7300	0%	0%	0%	0	0	0
Active storage pile - coal (AP42)	CHP Stockpiles	Active storage pile - coal (AP42)	0.39	ha	24	365	8760	100%	100%	100%	19	10	1
Active storage pile - coal (AP42)	Rail Loop stockpiles	Active storage pile - coal (AP42)	1.35	ha	24	365	8760	100%	100%	100%	67	33	5
Roads	Washery to Eraring Haul Road	Paved Roads	10	VKT/hr	24	365	8760	37%	37%	37%	9,690	1,860	450

Area	Descriptor	Source Type	Activity	Units	Hr/Day	Operation		Control efficiency applied			Annual emission rate (kpy)		
						Day/Year	OpHrs	TSP	PM ₁₀	PM _{2.5}	TSP	PM ₁₀	PM _{2.5}
Roads	Eraring Haul Road to SREA	Unpaved Roads	17	VKT/hr	12	365	4380	37%	37%	37%	8,110	1,560	377
Roads	SREA Internal Haul Road	Unpaved Roads	8	VKT/hr	12	365	4380	28%	28%	28%	23,100	7,030	703
Roads	Washery to Coal Deliveries Area	Paved Roads	6	VKT/hr	24	365	8760	37%	37%	37%	6,200	1,190	288
Roads	Washery to NREA	Paved Roads	2	VKT/hr	12	365	4380	28%	28%	28%	4,860	1,480	148
Roads	Truck Loading Bin to Eraring Haul Road	Paved Roads	23	VKT/hr	24	365	8760	37%	37%	37%	22,400	4,300	1,040
Roads	Rail loop	Paved Roads	1	VKT/hr	24	365	8760	37%	37%	37%	1,240	238	58
Roads	Eraring Haul Road	Paved Roads	58	VKT/hr	24	365	8760	43%	43%	43%	66,400	12,800	3,090
Roads	Grader	Unpaved Roads	5	VKT/hr	12	365	4380	50%	50%	50%	2,080	1,150	65
Wind Erosion 1			1.2	ha				50%	50%	50%	61	31	18
Wind Erosion 2			1.7	ha				50%	50%	50%	86	43	26
Wind Erosion 3			0.7	ha				50%	50%	50%	37	18	11
Wind Erosion 4			1.1	ha				50%	50%	50%	52	26	16
Wind Erosion 5			7.9	ha				25%	48%	48%	196	186	112
Wind Erosion 6			21.2	ha				50%	50%	50%	1,048	525	315
Wind Erosion 7			7.9	ha				50%	50%	50%	392	196	118
Wind Erosion 8			3.7	ha				50%	50%	50%	181	91	54
Wind Erosion 9			4.8	ha				50%	50%	50%	237	119	71
Total Emission											368,588	91,809	25,548

Area	Descriptor	Maximum hourly emission rate (kg/h)		
		TSP	PM ₁₀	PM _{2.5}
Coal Deliveries	Dump truck	5.50x10 ⁻⁰¹	2.77 x10 ⁺⁰⁰	4.16 x10 ⁻⁰¹
SREA	7t Excavator	6.11 x10 ⁺⁰⁰	8.82x10 ⁺⁰⁰	1.33x10 ⁺⁰⁰
SREA	25 Tonne Excavator	1.85x10 ⁺⁰⁰	2.67x10 ⁺⁰⁰	4.02x10 ⁻⁰¹
SREA	25 Tonne Excavator	2.66x10 ⁻⁰¹	3.78x10 ⁻⁰¹	5.67x10 ⁻⁰²
SREA	Traxcavator	2.77x10 ⁻⁰²	3.94x10 ⁻⁰²	5.91x10 ⁻⁰³
SREA	Compactor	6.02x10 ⁺⁰⁰	4.87x10 ⁺⁰⁰	3.98x10 ⁻⁰¹
SREA	Trucks dumping	3.64x10 ⁺⁰⁰	4.59x10 ⁺⁰⁰	6.89x10 ⁻⁰¹
Rail Loop	FEL to train	1.40x10 ⁺⁰¹	6.43x10 ⁺⁰⁰	9.65x10 ⁻⁰¹
Rail Loop	Dozer	6.02x10 ⁺⁰⁰	1.62x10 ⁺⁰⁰	1.33x10 ⁻⁰¹
Rail Loop	FEL to train	1.40x10 ⁺⁰¹	4.29x10 ⁺⁰⁰	6.43x10 ⁻⁰¹
Rail Loop	Truck loading at bin	1.43x10 ⁻⁰¹	6.76x10 ⁻⁰²	1.01x10 ⁻⁰²
Rail Loop	Bin filling	1.43x10 ⁻⁰¹	6.76x10 ⁻⁰²	1.01x10 ⁻⁰²
Coal Deliveries	Truck tipping	2.20x10 ⁺⁰⁰	9.24x10 ⁻⁰¹	1.39x10 ⁻⁰¹
Coal Deliveries	Reclaim conveyor	9.65x10 ⁻⁰⁴	4.56x10 ⁻⁰⁴	6.84x10 ⁻⁰⁵
Coal Deliveries	Dozer	6.02x10 ⁺⁰⁰	1.62x10 ⁺⁰⁰	2.65x10 ⁻⁰¹
NREA	Dozer	3.82x10 ⁺⁰⁰	2.52x10 ⁺⁰⁰	3.77x10 ⁻⁰¹
NREA	Excavator	2.82x10 ⁻⁰²	4.01x10 ⁻⁰²	6.02x10 ⁻⁰³
NREA	950 Loader	2.82x10 ⁻⁰²	4.01x10 ⁻⁰²	6.02x10 ⁻⁰³
Washery Crushing	Conveyor	1.50x10 ⁻⁰³	8.52x10 ⁻⁰⁴	1.28x10 ⁻⁰⁴
Washery Crushing	4000 tonne bin	5.01x10 ⁻⁰¹	2.84x10 ⁻⁰¹	4.26x10 ⁻⁰²
Washery Crushing	CHP	1.50x10 ⁻⁰¹	8.52x10 ⁻⁰²	1.28x10 ⁻⁰²
Washery Crushing	Loader	2.48x10 ⁻⁰²	7.07x10 ⁻⁰²	1.06x10 ⁻⁰²
Washery Crushing	Feed conveyors	1.50x10 ⁻⁰¹	8.52x10 ⁻⁰²	1.28x10 ⁻⁰²
Active storage pile - coal (AP42)	Erosion	2.20x10 ⁻⁰³	1.10x10 ⁻⁰³	1.65x10 ⁻⁰⁴

Area	Descriptor	Maximum hourly emission rate (kg/h)		
		TSP	PM ₁₀	PM _{2.5}
Active storage pile - coal (AP42)	Erosion	7.63x10 ⁻⁰³	3.81x10 ⁻⁰³	5.72x10 ⁻⁰⁴
Roads	Washery to Eraring Haul Road	1.11x10 ⁺⁰⁰	2.12x10 ⁻⁰¹	5.14x10 ⁻⁰²
Roads	Eraring Haul Road to SREA	1.85x10 ⁺⁰⁰	3.56x10 ⁻⁰¹	8.60x10 ⁻⁰²
Roads	SREA Internal Haul Road	5.27x10 ⁺⁰⁰	1.60x10 ⁺⁰⁰	1.60x10 ⁻⁰¹
Roads	Washery to Coal Deliveries Area	7.07x10 ⁻⁰¹	1.36x10 ⁻⁰¹	3.28x10 ⁻⁰²
Roads	Washery to NREA	1.11x10 ⁺⁰⁰	3.38x10 ⁻⁰¹	3.38x10 ⁻⁰²
Roads	Truck Loading Bin to Eraring Haul Road	2.56x10 ⁺⁰⁰	4.91x10 ⁻⁰¹	1.19x10 ⁻⁰¹
Roads	Rail loop	1.41x10 ⁻⁰¹	2.72x10 ⁻⁰²	6.57x10 ⁻⁰³
Roads	Eraring Haul Road	7.59x10 ⁺⁰⁰	1.46x10 ⁺⁰⁰	3.52x10 ⁻⁰¹
Roads	Grader	4.75x10 ⁻⁰¹	2.63x10 ⁻⁰¹	1.47x10 ⁻⁰²
Wind Erosion 1		3.50x10 ⁻⁰¹	1.75x10 ⁻⁰¹	1.05x10 ⁻⁰¹
Wind Erosion 2		4.91x10 ⁻⁰¹	2.46x10 ⁻⁰¹	1.47x10 ⁻⁰¹
Wind Erosion 3		2.09x10 ⁻⁰¹	1.04x10 ⁻⁰¹	6.27x10 ⁻⁰²
Wind Erosion 4		2.99x10 ⁻⁰¹	1.50x10 ⁻⁰¹	8.98x10 ⁻⁰²
Wind Erosion 5		2.23x10 ⁺⁰⁰	1.12x10 ⁺⁰⁰	6.71x10 ⁻⁰¹
Wind Erosion 6		5.98x10 ⁺⁰⁰	2.99x10 ⁺⁰⁰	1.80x10 ⁺⁰⁰
Wind Erosion 7		2.23x10 ⁺⁰⁰	1.12x10 ⁺⁰⁰	6.71x10 ⁻⁰¹
Wind Erosion 8		1.03x10 ⁺⁰⁰	5.17x10 ⁻⁰¹	3.10x10 ⁻⁰¹
Wind Erosion 9		1.35x10 ⁺⁰⁰	6.78x10 ⁻⁰¹	4.07x10 ⁻⁰¹

Appendix C Dust Deposition Results (mg/m²/month)

Date	DG1	DG2	DG3	DG4	DG5	DG6	DG7	DG9	Period Ave
03-01-2005	3.2	3	0.4	1.8	2.3	1.3	3.3		2.2
03-02-2005	0.5	1.7	0.2	0.7	1.5	0.6	5.4		1.5
07-03-2005	2.5	2.4	4.1	2.6	3.4	4	3.6		3.2
06-04-2005	0.4	2		1.4	1.2	1.2	1.2		1.2
04-05-2005	0.6	4.1	1	1.1	2.2	1.1	1.1		1.6
05-06-2005	0.4	0.9	0.6	0.6	1.1	0.9	0.5		0.7
05-07-2005	0.6	2.3	0.4	0.8	1.6	1.2	2.1		1.3
05-08-2005	0.4	1.9	0.5	0.5	1.7	1.1			1.0
02-09-2005	0.7	1.9	1	0.6	1.9	1.9	1.2		1.3
04-10-2005	1.2	2.1	2.1	0.8	1.4	1.2	1.4		1.5
03-11-2005	1.1	2.7		1.1	1.9	1.6			1.7
02-12-2005	1.3	4.4	2.1	1.4	2.3	1.6			2.2
30-12-2005	1.8	1.8	1.1	1.8	2.4	1.1	2.6		1.8
30-01-2006	1.4	7.5	1.1	1.4	4.8	1.8	6.1		3.4
01-03-2006	1.1	5.6		36.2	2.9	1.9	13.5		8.9
29-03-2006	1.5	3.3	1.3	1.7	2.3	1.8	1.7		1.9
26-04-2006	1.4	2.4	1.1	1.6	2.5	0.3	1.7		1.6
26-05-2006	1.5	3.8	0.7	2.6	3.2	1.6	4.4		2.5
23-06-2006	1.8	3.9	1.2	10	1.4	1.7	2		3.1
25-07-2006	1.4	4.4	1.2	3.1	6.2	1.6	5.3		3.3
25-08-2006	2.2	12.3	1.1	1.2	15.1	2.2	2.3		5.2
26-09-2006	1.6	6.2	1.2	1.2	2.6	1	2.4		2.3
27-10-2006	0.7	3.1	2.5	1.6	1.7	2.2	3.2		2.1
24-11-2006	2.3	13.2	1.4	1.7	4.6	3.7	13.3		5.7
23-01-2007	1.8	6.3	1.8	3.2	2.1	4.1			3.2
23-02-2007	2.3	10.8	2.3	2.1	2.4	2.1			3.7
26-03-2007		1.9	1.1	1.4	1.7	1.9		3.8	2.0
24-04-2007	0.6	1.5	0.1	1.3	6.5	1.9		6.2	2.6
25-05-2007	1.8	3.6	1.3	1.9	2.7	1.9		9.5	3.2
26-06-2007	0.4	2.8	0.3	1.2	1.5	1.5		21.7	4.2
26-07-2007	0.2	5.4	0.6	0.4	10.3	1.1		3.8	3.1
27-08-2007	1.1	2.1	1.3	1.8	5.2	2.8		5	2.8
26-09-2007	1.9	2.5	0.9	1	18.2	2		3.2	4.2
25-10-2007	1.2	3.1	1.4	1.5	3.6	2		5.7	2.6
22-11-2007	0.7	2.7	1.5	1.4	1.8	0.9		2.8	1.7
20-12-2007	0.9	3.4	3.6	1.6	0.8	1.2		2.2	2.0
21-01-2008	0.8	4.7	1.6	1.5	2.4	3.1		2.1	2.3
20-02-2008	1.8	12.3	2.1	1.5	3.5	2.1		4	3.9
19-03-2008	0.9	26.3	1.2	1.5	1.1	1.1		1.3	4.8
17-04-2008	2.1	17.5	2.6	2.5	5	3.5		2.1	5.0
15-05-2008	0.4	4.3	0.6	0.7	1.2	1		0.3	1.2

Date	DG1	DG2	DG3	DG4	DG5	DG6	DG7	DG9	Period Ave
12-06-2008	0.6	6.5	1.3	1.6	1.2				2.2
15-09-2008	0.3	7.7	0.3	0.5	3.6	1.1		4.3	2.5
16-10-2008	5.5	3.6	10.5	1.1	2.9			9.7	5.6
17-11-2008	1.3	9.5	2	0.4	0.8	1.6		2.4	2.6
18-12-2008	1.3	4.3	7.5	2.1	9.4			3.1	4.6
19-01-2009	1.9	4.6	4.2	2	3.2			2.8	3.1
19-02-2009	1.2	4.5	1.5	2.1	2.1			1.4	2.1
23-03-2009	1.3	10.7	3.2	1.8	2.6	1.7		2.1	3.3
22-04-2009	1.2	24.2	3	2.5	50.5	1		3.9	12.3
21-05-2009	1.1	8.5	1.5	0.8	4.8	2.2		2.1	3.0
18-06-2009	0.6	2.4	0.8	0.7	3.4	1		2.3	1.6
20-07-2009	2.5	4.3	4.2	2.6	7.6	4.1		2.3	3.9
20-08-2009	0.8	5.9	1.1	0.6	1.6	1.5	1.3	0.6	1.7
17-09-2009	1.2	5.9	1.1	0.7	2.2	2	2.8	2.4	2.3
19-10-2009	1.8	11.5	1.7	1.9	3.6	2.8	3	3.2	3.7
18-11-2009	1	1.5	2.3	1.1	2.3	1.7	1.4	2.1	1.7
17-12-2009	2	3.1	4	1.5	2.5	2.2	4.4	3.9	3.0
18-01-2010	1.4	1.6	1.9	1.7	1.9	1.4	1.4	1.6	1.6
17-02-2010	1.7	1.7	0.7	4.8	1.1	0.8	0.8	1.2	1.6
18-03-2010	1	2.4	1.4	1.1	1.4	1	0.7	2.2	1.4
19-04-2010	0.9	5.9	0.7	0.7	1.3	0.8	0.8	2.3	1.7
19-05-2010	0.5	1.2	0.6	0.3	2.8	0.9	1.8	3	1.4
16-06-2010	0.5	1.4	1	2.7	1.3	1.1	1.9	1.3	1.4
15-07-2010	0.4	0.7	0.4	5.5	1.6	1.6	1.2	0.9	1.5
16-08-2010	0.4	0.3	0.1	0.7	0.8	3.5	6	2	1.7
15-09-2010	0.6	0.7	0.6	3.6	1	1.7	4.2	2.2	1.8
14-10-2010	1.2	8	0.3	1	1.2	1.2	2.2	3.2	2.3
15-11-2010	0.4	19.2	0.8	1.1	1.2	2	0.9	3.1	3.6
16-12-2010	0.6	2.7	3.2	2.4	1.7	1.5	1.1	1.2	1.8
17-01-2011	0.3	3.2	2.8	0.5	1.5	1.8	0.5	1	1.5
17-02-2011	0.6	1.6	2.3	1	1.5	3.3	0.8	1.4	1.6
21-03-2011	0.8	0.8	1.6	1.1	1.9	1.4	0.9	20.7	3.7
21-04-2011	0.3	0.8	0.9	0.8	0.8	0.9	1.5	0.9	0.9
23-05-2011	0.3	1.5	0.4	0.6	0.7	1.3	0.7	0.9	0.8
23-06-2011	0.5	0.8	1.1	0.4	1	1.5	1.4	1.8	1.1
25-07-2011	0.3	0.6	0.2	0.4	1		1.3	47.3	7.3

Appendix 2 – Submission from Transgrid



"Paul Freeman"
<Paul.Freeman@planning.nsw.gov.au>

19/09/11 10:42 AM

To "James Wearne" <James.Wearne@centennialcoal.com.au>

cc "Colin Phillips" <Colin.Phillips@planning.nsw.gov.au>

bcc

Subject Fwd: FW: Modification to Newstan Colliery

History:



This message has been replied to and forwarded.

1 attachment



p67912_01-07-2011_11-35-52_il.pdf

Hi James,

As discussed, Transgrid's submission on the Main West Mod is attached. Many apologies for the oversight in not sending this submission to you sooner. Please respond to the issues raised in the submission to the extent that they have not already been addressed in the Response to Submissions document, which I acknowledge receiving.

Regards

Paul Freeman | Planner

Mining Projects | Department of Planning & Infrastructure

23-33 Bridge Street SYDNEY 2000 | GPO Box 39 SYDNEY 2001

t: 02 9228 6587 | f: 02 9228 6466 | e: paul.freeman@planning.nsw.gov.au



**Planning &
Infrastructure**

>>> Colin Phillips 19/07/2011 9:28 am >>>

>>> Turvey David <David.Turvey@transgrid.com.au> 19/07/2011 7:33 am >>>

Your Ref : DA 73-11-98 Mod 4

Our Ref : 6039

File No : 2003/1735

Colin,

**Modification to Newstan Colliery – Main West Proposal
Exhibition of Environmental Assessment**

I refer to your correspondence dated the 15 June, 2011 regarding the abovementioned project.

The North West Mining Area as shown on your submitted plan is affected by existing TransGrid infrastructure namely-

Fdr 90/92 - 330kV Transmission Line (easement 60.96metres wide)

Fdr 93 - 330kV Transmission Line (easement 121.92metres wide) refer to attachment.

Approval for the proposed mining works by Centennial Newstan P/L (Centennial) will be subject to the following conditions and a letter of agreement to those conditions being forwarded by Centennial.

- No surface drainage shall wash over the easement within 30metres of the nearest part of any TransGrid structure.
- The EA refers to negligible subsidence (i.e. less than 20 millimetres) and as such will not result in any significant impacts to surface features.
- The maximum height of any plant, equipment or any other forms of machinery that can be brought onto or operated within the easement is limited to types that have a maximum height not exceeding 4.3metres when fully extended.
- A clear and unobstructed means of access on a 24/7 basis will be available to TransGrid personnel and any plant or equipment along the full extent of the easement.
- Excavation work or any changes to existing ground levels shall not be carried out within the easement without the prior written approval of TransGrid.
- Fly rock from any above-ground operations could damage the T/L, in particular the conductors, insulators or the structures. Even minor damage to the aluminium conductors could cause damage, which, may result in excess corona damage or electromagnetic interference. TransGrid would seek the opportunity of observing any blasting operations that have a high potential of creating damage the T/L.
- Dust deposits on insulators may adversely affect the operation of the T/L. Therefore, it is expected Centennial will undertake suitable dust suppression measures to minimise any risk to the T/L.
- A geotechnical report be prepared and submitted to TransGrid prior to commencement of work to assess the effects of any mining on the easement. The likelihood does exist that any excess vibration may have a detrimental effect to the stability of the T/L structures. In this respect vibration levels should be limited to 50mm/sec.
- Details of the levels of any roads or access tracks where they cross the easement shall be submitted to TransGrid for written approval prior to construction to ensure that adequate clearances to the overhead conductors are maintained.
- The change of land use within 16metres of the nearest part of any T/L structure may require the earthing system to be upgraded. In this case all costs will need to be met by Centennial.
- No flammable liquid containers or carriers shall be brought onto the easement.
- Minor structures, plant or equipment shall not be stored or constructed within the easement without the prior written approval of TransGrid.
- Any trench backfill and restoration works shall be completed to the satisfaction of TransGrid.
- The costs of repair work to any damages caused to TransGrid infrastructure by the mining works will need to be met by Centennial.
- All work on the T/L easement will need to be carried out in accordance with the WorkCover Code of Practice Act "Working Near Over Head Power Lines".

David Turvey
Easement Officer
TransGrid
Telephone: (02) 9620 0218
Fax : (02) 9620 0387
e-mail : david.turvey@transgrid.com.au

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Appendix 3 – Centennial Response to Trangrid Submission



21 September 2011

Mr H. Reed
Department of Planning and Infrastructure
GPO Box 39
Sydney NSW 2001

Dear Mr Reed

Re: Newstan Colliery Main West Mining Project (Mod 4)

On 19 July 2011, a submission by TransGrid was received by the Department of Planning and Infrastructure in regards to the Environmental Assessment for the Newstan Colliery Main West Mining Project. A number of conditions were proposed by TransGrid in relation to the Main West Mining Project to ensure the protection of the two 330KV transmission lines that intersect the proposed Main West mining area. Centennial Newstan provides the below response to the conditions proposed by TransGrid and issues raised in their submission regarding the Main West Mining Project.

The Main West Mining Project is a proposed bord and pillar underground mining operation designed to result in less than 20 millimetres of subsidence on the surface and will not result in any changes to the currently approved operations of the Newstan Colliery.

- 1. No surface drainage shall wash over the easement within 30 metres of the nearest part of any TransGrid structure.**

The Main West Mining Project will not result in any changes to surface drainage within the Project Area.

- 2. The maximum height of any plant, equipment or any other forms of machinery that can be brought onto or operated within the easement is limited to types that have a maximum height not exceeding 4.3 metres when fully extended.**

Centennial Newstan will ensure that all works undertaken within the transmission line easements will be carried out in accordance with the WorkCover Code of Practice Act "Working Near Over Head Power Lines".

- 3. A clear and unobstructed means of access on a 24/7 basis will be available to TransGrid personnel and any plant or equipment along the full extent of the easement.**

The Main West Mining Project will not require any fencing or result in any obstruction of the transmission line easements.

- 4. Excavation work or any changes to existing ground levels shall not be carried out within the easement without the prior written approval of TransGrid.**

There is no excavation works proposed to be undertaken as part of the Main West Mining Project. The underground mining activities will result in vertical subsidence of the surface of less than 20 millimetres.

- 5. Fly rock from any above-ground operations could damage the transmission lines, in particular the conductors, insulators or the structures. Even minor damage to the aluminium conductors could cause damage, which, may result in excess corona damage or electromagnetic interference.**

TransGrid would seek the opportunity of observing any blasting operations that have a high potential of creating damage the transmission line.

No blasting activities are proposed as part of the Main West Mining Project. As such, there will be no potential for impacts on the transmission line conductors, insulators or the structures and therefore no requirement to provide opportunities to TransGrid to observe such activities.

- 6. Dust deposits on insulators may adversely affect the operation of the transmission lines. Therefore, it is expected Centennial will undertake suitable dust suppression measures to minimise any risk to the transmission line.**

The Main West Mining Project will not result in any changes to surface infrastructure or coal handling process currently in place at Newstan Colliery and, as such, the Main West Mining Project will not have any impacts on air quality above what has previously been assessed and approved. An Air Quality Impact Assessment was undertaken by SLR consulting for the Newstan Colliery surface operations as part of the Environmental Assessment. The Air Quality impact Assessment did not predict any exceedences of air quality criteria within the vicinity of any TransGrid transmission lines.

- 7. A geotechnical report be prepared and submitted to TransGrid prior to commencement of work to assess the effects of any mining on the easement. The likelihood does exist that any excess vibration may have a detrimental effect to the stability of the T/L structures. In this respect vibration levels should be limited to 50mm/sec.**

A copy of the subsidence assessment undertaken by Seedsman Geotechnics for the Main West Mining Project was included as Appendix 4 to the Environmental Assessment provided to TransGrid. No blasting is proposed to be undertaken by Centennial Newstan as a result of the Main West Mining Project and as such vibration levels are anticipated to be negligible and remain well below 50mm/sec.

- 8. Details of the levels of any roads or access tracks where they cross the easement shall be submitted to TransGrid for written approval prior to construction to ensure that adequate clearances to the overhead conductors are maintained.**

The Main West Mining Project does not require the construction of any additional roads or access tracks within the Project Area.

- 9. The change of land use within 16 metres of the nearest part of any transmission line structure may require the earthing system to be upgraded. In this case all costs will need to be met by Centennial.**

The Main West Mining Project will not result in any changes to the existing land uses of the area.

- 10. No flammable liquid containers or carriers shall be brought onto the easement.**

The Main West Mining Project does not require any flammable liquids or containers to be brought on to the two TransGrid easements within the Project Area.

- 11. Minor structures, plant or equipment shall not be stored or constructed within the easement without the prior written approval of TransGrid.**

The Main West Mining Project does not require any additional structures, plant or equipment to be stored or constructed within the TransGrid transmission line easements identified within the Project Area.

- 12. Any trench backfill and restoration works shall be completed to the satisfaction of TransGrid.**

The Main West Mining Project will not require any backfill or restoration works to be undertaken within the two identified TransGrid transmission line easements identified within the Project Area.

- 13. The costs of repair work to any damages caused to TransGrid infrastructure by the mining works will need to be met by Centennial.**

Centennial Newstan will meet the costs for any repair work or damages to the TransGrid infrastructure within the Project Area as a result of any mining activities associated with the Main West Mining Project.

- 14. All work on the transmission line easement will need to be carried out in accordance with the WorkCover Code of Practice Act "Working Near Over Head Power Lines".**

Centennial Newstan will ensure that all works within the TransGrid transmission line easements are carried out in accordance with the WorkCover Code of Practice Act "Working Near Over Head Power Lines".

In addition to the information above, a meeting with TransGrid (Bruce Fraser - Mains Manager Northern Region) and Centennial Newstan representatives was held at the Newstan Colliery on 24 May 2011 to discuss the proposed Main West Mining Project. No additional issues were raised by TransGrid at this meeting. If you require any further information or wish to discuss this matter in more detail, please contact me on (02) 49730153 or my mobile 0407 207 530.

Yours sincerely
Centennial Newstan Pty Limited

A handwritten signature in black ink, appearing to read 'James Wearne', written in a cursive style.

James Wearne
Environment and Community Coordinator - Projects

Appendix 4 – Submission from NOW on the Response to Submissions



Office of Water

**Major Development Assessments
Department of Planning
GPO Box 39
SYDNEY NSW 2001**

c: Fergus Hancock
t: 02 4904 2532
f: 02 4904 2501
e: Fergus.Hancock@water.nsw.gov.au

Our ref : ER 21290
Your ref: DA 73-11-98 MOD4

Date 2 November 2011

Attention: Paul Freeman

Dear Paul

Newstan Colliery – Main West modification Response to Submissions

The NSW Office of Water has reviewed the Response to Submissions to the proposed Newstan Mains West modification of development consent. The following comments are submitted by the Office of Water to assist in finalising the assessment of the application to modify approval of the Newstan Colliery.

The Office of Water acknowledges the bord and pillar extraction method proposed to the Newstan Mains West area is unlikely to result in subsidence exceeding minimal levels. The nominated factor of safety of 5.18 in Section 4.2 of the Response to Submissions document imposes lesser risks to Lords Creek and other watercourses than resulting from longwall mining extraction by many orders of magnitude. As direct connective fracturing between the mining operation and Lords Creek and associated groundwater dependent ecosystems is highly unlikely, Centennial Newstan should be required to continue and extend monitor alluvial levels and trends in the Lords Creek alluvium following the existing monitoring arrangement from LW 25-26.

The Office of Water recommends a condition of approval to the Newstan Mains West which requires formation of an alluvial groundwater monitoring plan as part of the existing groundwater monitoring programme for the mining operation. This should enable correlation of porous hard rock piezometric monitoring to monitoring of shallow alluvial groundwaters, and explain any divergence of levels and trends in groundwater levels from climatic responses.

The Office of Water recommends this is developed in consultation with the Office, to the satisfaction of the Director General.

If you require any clarification of the above, please contact Fergus Hancock on (02) 4904 2532.

Yours sincerely

**Mark Mignanelli
Manager Major Projects and Assessment**

Appendix 5 – Submission from OEH on the Response to Submissions



our reference:
Our reference:
Contact:

DOC 11/43581 LIC08/510.05
Karen Gallagher (02) 49086822

Department of Planning and Infrastructure
Mining Projects
GPO Box 39
SYDNEY NSW 2001

Department of Planning
Received
11 NOV 2011
Scanning Room

Dear Mr Freeman

NEWSTAN MAIN WEST RESPONSE TO SUBMISSIONS

Reference is made to your email to the Office of Environment and Heritage (OEH) dated 20 September 2011 requesting a response to the Centennial Coal, Newstan Colliery, Main West Mining Project – Response to Submissions, September 2011.

OEH has reviewed the response to submissions which includes the revised report *Centennial Newstan Air Quality Impact Assessment*, 6 May 2011.

OEH is of the opinion that the Air Quality Impact Assessment (AQIA) has been conducted in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Approved Methods) and provides adequate information to recommend approval conditions for the project.

The original air quality impact assessment (AQIA) predicted exceedences of OEH's 24 hour average PM₁₀ impact assessment criteria at surrounding sensitive receptors. The dispersion model was revised to include amendments based on OEH's recommendations. The revised model predicts lower ground level concentrations and compliance with the impact assessment criteria for all pollutants assessed apart from PM_{2.5}.

PM_{2.5} impacts due to the project alone are well below the project criteria. However, the project dispersion model predicts annual average PM_{2.5} impacts will exceed the project goal at Fassifern Primary School, when background pollution is considered.

Health impacts from particles are more strongly associated with small particles such as PM_{2.5}. Numerous studies link particle levels to increased health impacts, OEH recommends you consult NSW Health for advice on potential health impacts regarding the model predictions in relation to PM_{2.5}.

The recommended Conditions of Approval in Attachment 1 include the requirement for best available control technology and best environmental practice to be implemented to ensure emissions are being reduced to the maximum extent achievable. In addition, the recommended Conditions of Approval include the requirement for Centennial Newstan to develop and implement an Air Quality Management Plan which is to contain a reactive management strategy incorporating real time dust monitoring and the use of appropriate triggers (Attachment 2).

The following recommended Conditions of Approval have been derived from the revised Air Quality Impact Assessment. Please refer to earlier correspondence (DOC11/28819) for the previously submitted recommended Conditions of Approval for the Modification to Newstan Colliery – Main West Proposal (DA73-11-98 Mod 4).

The Department of Environment, Climate Change and Water is now known as the
Office of Environment and Heritage, Department of Premier and Cabinet

PO Box 488G, Newcastle NSW 2300
Ground Floor 117 Bull Street,
Newcastle West NSW 2302
Tel: (02) 4908 6800 Fax: (02) 4908 6810
ABN 30 841 387 271
www.environment.nsw.gov.au

If you require any further information regarding this matter please contact Karen Gallagher on (02)49086822.

Yours sincerely



9 NOV 2011

MARK HARTWELL
Head Regional Operations Unit – Hunter
Environment Protection and Regulation
Office of Environment and Heritage
Department of Premier and Cabinet

Enclosed: Attachment 1 – Recommended Conditions of Approval
 Attachment 2 – Reactive Particulate Management Strategy

**ATTACHMENT 1 - RECOMMENDED CONDITIONS OF APPROVAL FOR
NEWSTAN COLLIERY MAIN WEST MINING PROJECT**

- **Dust**

The premises must be maintained in a condition which minimises or prevents the emission of dust on and from the premises.

- **Air Quality Management Plan**

A detailed Air Quality Monitoring Management Plan (AQMP) must be prepared for the Newstan Colliery Main West Mining Project by <<deadline>>.

The AQMP must include the following elements:

1. Relevant environmental criteria that are to be used in the day to day management of dust impacts;
2. Mission statement;
3. Dust management strategy consisting of :
 - a. Objectives and targets;
 - b. Dust risk assessment; and
 - c. Dust suppression improvement plan.
4. Appropriate methods to monitor control effectiveness, and processes to demonstrate and record that controls have been effectively implemented;
5. Communication strategy; and
6. System and performance review for continuous improvement. This is to include (but not limited to) investigation into:
 - a. The benefits of installing permanent water sprays on haulage roads for improved dust control;
 - b. Additional screens and sprays on infrastructure and or equipment to reduce dust emissions in material handling; and
 - c. Current best available technology and best environmental practice for emission control.

The AQMP must include dust management practices that effectively minimise dust emissions at all times and incorporate all mitigation measures discussed in the environmental assessment titled *Newstan Colliery Main West Mining Project S75W Modification Environmental Assessment, June 2011*, and response to submissions titled *Newstan Colliery Main West Mining Project Response to Submissions, September 2011*.

The AQMP must include a real time monitoring program and reactive management strategy to ensure the project does not contribute to any exceedence of air quality criteria at adjacent properties/residences. An outline of the reactive management strategy to be implemented for the project is provided in Attachment 1.1.

The AQMP including the reactive management strategy must be documented and submitted by the Proponent to the *Department of Planning and Infrastructure*.

The AQMP including the reactive management strategy must be made publicly available by the Proponent on the Newstan Colliery website within 3 months of the date of consent.

ATTACHMENT 2 - REACTIVE PARTICULATE MANAGEMENT STRATEGY FOR NEWSTAN COLLIERY MAIN WEST MINING PROJECT

Strategy for real-time management of site-specific particulate emissions

- 1 The Proponent must develop and implement a *Reactive Particulate Management Strategy* (the *Strategy*) for the Newstan Colliery surface operations, which is to be prepared in consultation with the *Department of Planning and Infrastructure*.
- 2 The *Strategy* is to be developed for the purpose of real-time management of short-term ambient particulate emissions from Newstan Colliery surface operations. The *Strategy* should be designed to prevent residences and properties in proximity to the Newstan Colliery surface operations from being adversely effected by Project emissions. To enable the effective reactive management of particulate emissions from facility-wide operations, the *Strategy* should incorporate the following elements:
 - use of ambient particulate monitoring sites for management and compliance purposes (see condition 3.1);
 - use of meteorological data (e.g. wind speed and direction) from an on-site meteorological station to assist in selecting and implementing the most technically and economically feasible particulate mitigation strategies (see condition 3.2); and
 - identification and implementation of specific mitigation measures for the effective reactive management of particulate-generating activities at the Project site in response to inputs such as wind speed and direction and particulate concentration trigger levels (see condition 3.2).
- 3 The *Strategy* must aim to monitor local meteorology and particulate impacts of the mining and related operations within/at the Project boundary and at receiver locations, by incorporating the following as a minimum:

3.1 Real-time ambient monitoring of particulates

3.1.1 Establish reliable ambient particulate monitoring program

The particulate monitoring program should be designed to include:

- the nomination and establishment of a network of real-time particulate monitoring sites within and/or beyond the Project boundary for the purpose of monitoring project activity emissions on short time-scales (less than 1-hour). These "management" monitoring sites shall be used to inform day-to-day reactive management measures;
- The nomination and establishment of a suitable number of ambient PM₁₀ monitoring sites at relevant locations, that are predicted to be the most impacted, for the purpose of determining compliance with the OEH 24-hour average concentration criterion (50 µg/m³). These "compliance" monitoring sites must be maintained so as to be capable of continuously monitoring the parameters specified in the following table.

Parameter	Units of measure	Frequency	Averaging Period	Sampling Method
PM ₁₀	µg/m ³	Continuous	24-hour	AM-22
Additional requirements				
- Siting				AM-1 & AM-4
- Measurement				AM-2 & AM-4

3.1.2 Establish trigger levels for reactive management of on-site emissions

The particulate monitoring program should:

- identify short-term (less than 1-hour) particulate concentration trigger level(s) at "management" monitoring sites consistent with achieving 24-hour PM₁₀ averages of 50 µg/m³ at "compliance" monitoring site(s); and
- alert the mine manager when particulate levels exceed the nominated trigger level(s).

3.2 Real-time meteorological monitoring

3.2.1 Establish a reliable meteorological monitoring station

A real-time meteorological weather station must be established and maintained on-site so as to be capable of continuously monitoring the parameters specified in the following table.

Parameter	Units of measure	Frequency	Averaging Period	Sampling Method
Rainfall	mm	Continuous	1 hour	AM-4
Wind speed @ 10 metres	m/s	Continuous	15 minute	AM-2 & AM-4
Wind direction @ 10 metres	°	Continuous	15 minute	AM-2 & AM-4
Temperature @ 2 metres	°C	Continuous	15 minute	AM-4
Temperature @ 10 metres	°C	Continuous	15 minute	AM-4
Sigma theta @ 10 metres	°	Continuous	15 minute	AM-2 & AM-4
Solar radiation	W/m ²	Continuous	15 minute	AM-4
Additional requirements				
- Siting				AM-1 & AM-4
- Measurement				AM-2 & AM-4

3.2.2 Establish trigger levels for reactive management of on-site emissions

- Identify meteorological parameters, such as wind speed categories and wind direction (at specified averaging periods) that would form the trigger(s) for the operational management of specific particulate-generating mining activities; and
- Alert the mine manager when the nominated trigger(s) are reached.

3.3 Identify management strategies

Options to be adopted in response to meteorological and ambient particulate concentration triggers, for the reactive management of specific particulate-generating activities should be outlined, including the following as a minimum:

- All specific activities that are particulate-generating must be identified;
- Avoid high particulate-generating activities during adverse wind conditions, such as when winds are blowing directly towards the nearest sensitive receptors;
- Cease or reduce excavator and dozer operations when prevailing winds are in the direction of sensitive receptors; and
- The mine manager must be provided with weather updates consistent with alerting to sudden onset of strong winds to enable timely application of water sprays necessary to reduce the potential for wind erosion.

- 4 The *Strategy* must incorporate reporting provisions for the local community. A *Complaints Register* for the Project must be established and any complaints regarding the mining operations must be recorded. All complaints must be correlated with prevailing weather

conditions and operational activities undertaken at the time of reporting. The *Complaints Register* must be available to the OEH and external auditors upon request.

- 5 Annual reviews of the effectiveness of the *Strategy* must be undertaken upon implementation (every 12 months). In accordance with the findings of the annual review, management practices implemented for controlling emissions from significant particulate-generating activities must be revised and the *Strategy* documentation updated. The outcome of the annual review must be included in the Newstan Colliery's Annual Environmental Management Report (AEMR), and details made available to the OEH

Appendix 6 – Centennial Response to the OEH Submission



5 December 2011

Mr H. Reed
Department of Planning and Infrastructure
GPO Box 39
Sydney NSW 2001

Dear Mr Reed

Re: Newstan Colliery – Main West Mining Project (Reference DA 73-11-98 MOD 4)

In September 2011, Centennial Newstan submitted to the Department of Planning and Infrastructure a revised Air Quality Impact Assessment as part of its Response to Submissions for the Main West Mining Project. Centennial Newstan has been requested by the Department of Planning and Infrastructure to provide a response to recommendations proposed by the Office of Environment and Heritage in a submission dated 9 November 2011 regarding the Response to Submissions and the revised Air Quality Impact Assessment.

The Air Quality Impact Assessment, prepared by SLR Consulting, included a review of air quality management practices currently undertaken at the Newstan Colliery against the best practice dust mitigation measures identified in the Office of Environment and Heritage (OEH) 2010 report prepared by Katestone Environmental Pty Ltd. The review identified that the primary source of dust emissions from the Newstan Colliery site was impacts from the rail loop driven primarily by front end loaders and wind erosion.

In addition, the review identified additional dust management practices that were reasonable and feasible for implementation at the Newstan Colliery to control dust emissions. As a result of the review undertaken, Centennial Newstan will:

- Undertake stockpile watering, responsive to prevailing weather conditions;
- Increase the monitoring of haul roads and apply additional controls as the surface dries out to reduce excessive dust emissions;
- Reduce the operating speed of graders from 16 km/hr to 8 km/hr; and
- Install a truck wheel wash to ensure trucks are clean and free of loose material prior to leaving the site.

In addition to the dust management measures currently undertaken and proposed to be undertaken, Centennial Newstan will install a real time air quality monitor to monitor and react to elevated dust emissions from the Newstan Colliery operations. The real time air quality monitor will allow Centennial Newstan to proactively manage its operations based on risks from air quality impacts associated with contributing factors including weather conditions and operating equipment.

Centennial Newstan will develop appropriate management strategies in response to results from the proposed real time air quality monitor and the meteorological station currently installed on site. These management strategies will be detailed in the Newstan Colliery Air Quality Management Plan that is currently being revised and updated.

Centennial Newstan will lodge a separate application in 2012 for an expansion of coal handling operations at the Northern Coal Services Site, located at the Newstan Colliery. This application will require a review of the effectiveness of the air quality management measures proposed to be installed as a result of the Main West Project and, wherever possible, include the results from the real time air quality monitor to validate the assumptions used in the air model. The expansion of coal handling operations will also investigate further upgrades to and automation of coal handling operations as a measure to reduce air quality impacts.

If you have any further questions or wish to discuss this matter in more detail, please contact myself on (02) 4956 0205 or James Wearne on mobile 0407 207 530.

Yours sincerely
Centennial Newstan Pty Limited

Terry O'Brien
Mine Manager – Newstan Colliery