TODOROSKI AIR SCIENCES
Suite 2B, 14 Glen Street Eastwood,
NSW 2122
Phone: 02 9874 2123
Fax: 02 9874 2125
Email: info@airsciences.com.au
Web: www.airsciences.com.au
ACN: 151 202 765 | ABN: 74 955 076 914

22 September 2020

Roger Kennard
Accent Superannuation Pty Ltd
Via email: roger.kennard@burgtec.com

RE: Peer Review of Kariong Sand and Soil Supplies Air Quality Impact Assessment

Dear Roger,

Todoroski Air Sciences has been engaged by five nearby landowners of Acacia Road and Debenham Road, Somersby (Lot 3 239 Debenham Rd East, Somersby, 252 Debenham Rd East, Somersby, 242 Debenham Rd East, Somersby, 10 Acacia Rd, Somersby, 12 Acacia Rd, Somersby), to conduct a peer review of the Kariong Sand and Soil Supplies – Proposed *Development Air Quality Impact Assessment* (**Northstar Air Quality, 2020**) (hereafter referred to as the AQIA) and relevant documentation associated with the Environmental Impact Statement for the proposed development of the Kariong Sand and Soils Supplies site (hereafter referred to as the Project).

Project overview

The site is currently operated as a soil and sand recycling business with recycled product sold for landscaping at a rate of up to 10,000 tonnes per annuum (tpa). The Project involves the construction and operation of a recycling and landscape supplies facility that will enable the receipt of up to 200,000tpa of sand, soil, timber, concrete, tiles, masonry, metal, asphalt and mixed building waste each year. The total quantum of activity would be receipt and dispatch of 210,000 tpa.

The AQIA states that all waste materials will be received and processed indoors to minimise environmental impacts. However, received material is tipped and spread in a three sided and covered shed equipped with water misting sprays.

Material will be inspected and moved by FEL to appropriate storage bays. Processing of materials, using a crusher, shredder or trommel are located within separate designated covered buildings. Processed materials are then stored within a designated outdoor storage bay (three-sided bins). All roads on-site would be paved and constructed of recycled crushed concrete and asphalt. The AQIA states that these surfaces will be swept regularly and cleaned to ensure no dust is generated from these surfaces on dry, hot and/or windy days.

Delivery of waste material is between 7:00am to 6:00pm Monday to Saturday with processing of waste limited to weekdays between 8:00am and 5:00pm.

A general concept layout for the Project is presented in **Figure 1**. It is stated that the total *"developed operational area on the site will be approximately 39,000 m²"* (i.e. 3.9ha).

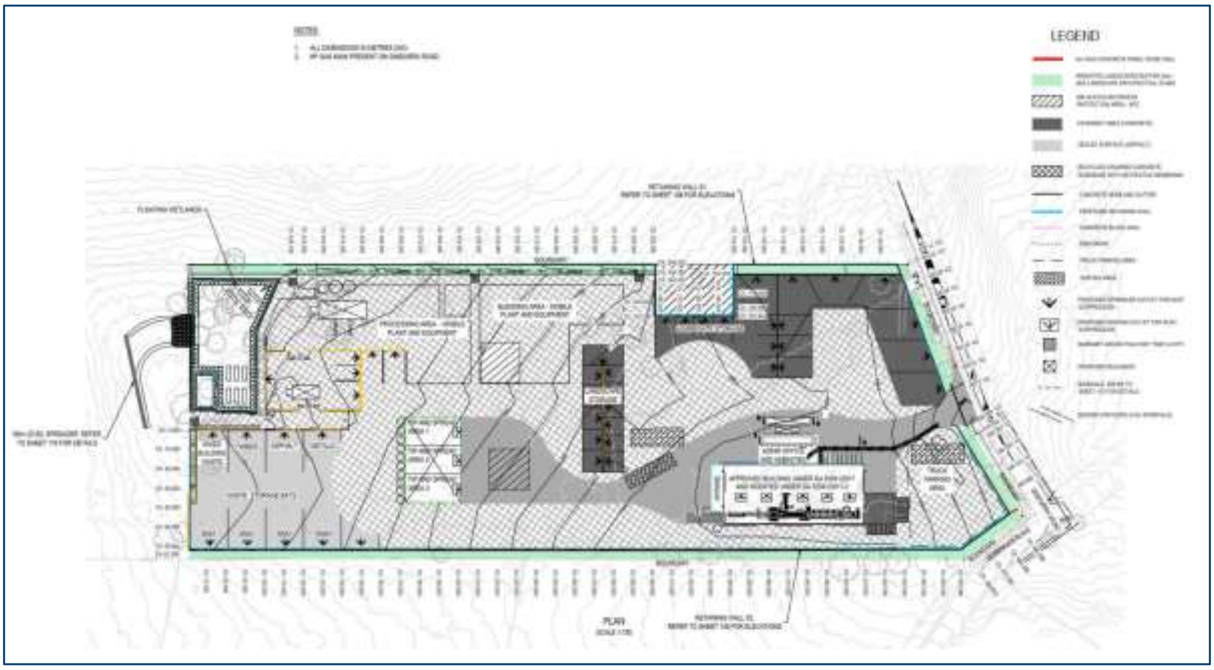

Figure 1: General concept layout

Review of the air quality impact assessment

The key components of the AQIA have been examined and possible issues that may adversely affect the results, or which may warrant a clarification response are discussed below.

Modelling approach is not ideal

The AQIA has assessed potential air quality impacts associated with the Project using the AERMOD air dispersion model.

Whilst it is a US Regulatory model and is used widely, AERMOD does not produce especially reliable results when modelling area sources such as wind erosion, and it is not a model recommended by the reviewer for modelling ground based sources of dust emissions, as occur in this case. It is noted that AERMOD was not the first choice of the AQIA modeller, rather this model was a last choice option selected to deal with meteorological issues identified during the government review process (see further below).

Construction

For the construction phase, the *IAQM Guidance on Assessment of Dust from Demolition and Construction* has been used. In general, the construction period should be relatively short given the minimal site infrastructure proposed, and any construction impacts would be governed by the practices of the builders, rather than anything discussed in an air quality assessment.

However this is not the case for the operation, where the impacts can be greatly affected by the design of the plant, it's position relative to receptors and the mitigation measures to be employed in the design.

Meteorological modelling data used in the modelling is not representative of the locality

The Meteorological (and air dispersion) modelling approach was revised from the previous AQIA approach following evaluation of the meteorological modelling outputs.

The assessed meteorological modelling approaches included: TAPM with no data assimilation, TAPM with data assimilation and WRF modelling used as input to CALMET with no data assimilation. The AQIA deemed none of these approaches to adequately represent the observation data recorded at the Gosford AWS station. The AQIA does not detail why it would be expected and necessary for the weather conditions at the project site to closely match those at Gosford AWS. However it was then decided to use observational weather data as input into the AERMET meteorological model as it was possible to make these data closely match the conditions at Gosford AWS. (This also meant the AERMOD model was used for the air dispersion modelling).

The observation data were input in AERMET and include data from Gosford automatic weather station (AWS) (approximately 6km away), Williamtown RAAF (87km away) and Sydney Airport (53km away).

The AERMET generated windrose is presented in **Figure 2** and for comparison, **Figure 3** presents the Gosford AWS windroses. The AERMET windrose shows similar wind patterns to the Gosford data.

It is to be noted that the Gosford AWS station is located in flat terrain near sports fields, north of a large body of water, and south of a steep wooded ridge which runs approximately east-west. On the other hand, the project site is positioned on the western ridgeline or plateau at a significantly greater elevation to the Gosford meteorological station, and does not have elevated terrain to the north, or flat level terrain nearby or to the south.

Due to these significantly different geographical features, the winds at the project site will be significantly different to those as Gosford AWS. These different features will necessarily cause the project site and monitoring station to experience significant meteorological conditions, that is, wind speed and wind direction will be affected by different anabatic and katabatic processes, differing nearby land surfaces and will be subject to different southerly and northerly flow and wind speeds.

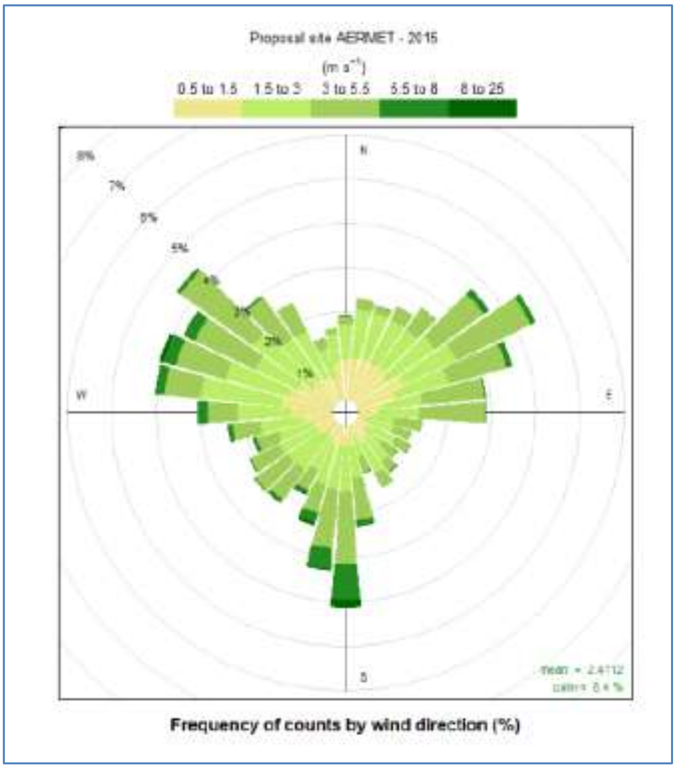

Figure 2: AERMET generated windrose

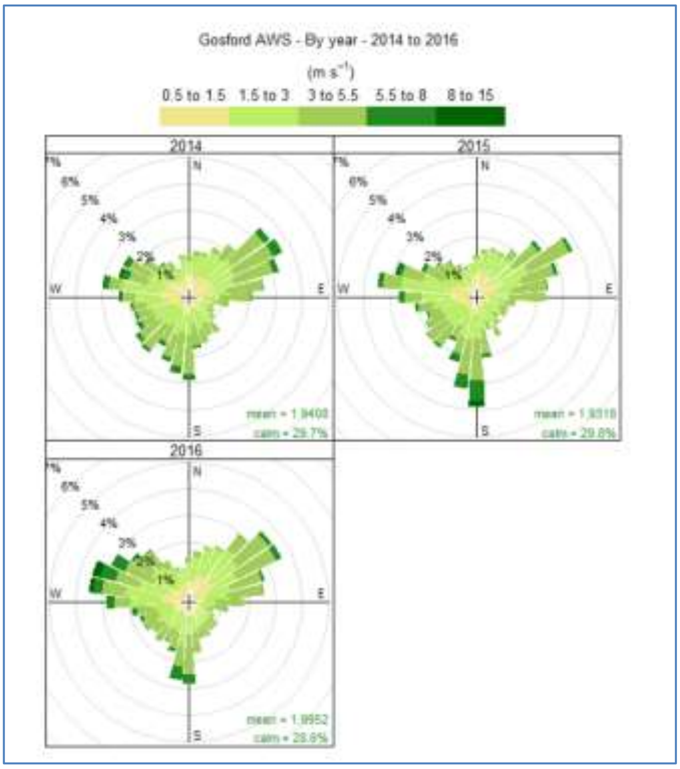

Figure 3: Gosford AWS windrose

The features in the observed Gosford AWS windrose can be directly related to the geographical features near the weather station; the large flat body of water to the south means that strong southerly winds are more likely (as we see in the windrose), the steep wooded ridge to the north will block northerly winds, and enhance NW and NE winds (as is the case)[1] (see **Figure 4)**. It is important to note that there are no such features at the project site (see **Figure 4)**, hence there will be different wind conditions, and there is no reason to expect similar wind conditions at the project site to those at Gosford AWS. However, the AERMET modelling shows no significant differences between the site windrose and the Gosford AWS windrose.

This means the AERMET data used in the air dispersion modelling is not representative of the project location. This is acknowledged in the AQIA which says *"Although the data do not represent site specific conditions (i.e. at the project site), no data is available to allow an assessment of that meteorological environment"*. It is important to note that unrepresentative meteorological data may cause invalid or incorrect dust modelling results. Meteorological modelling by the reviewer has been made for a location near to the project site, shown as "CALMET Extract" in **Figure 4**. These data can be used for a relative comparative assessment of the meteorological environment near the project site. A windrose showing the reviewer's results is presented in **Figure 5**, and is provided to indicate the weather conditions which are more likely to be experienced near the project site as may be expected due to the geographical features near the project site. It is also noted that due to differing geographical features in the area, there will also be some difference between different locations along the plateau or ridgeline also, however these local geographical differences would be smaller than those between the project site and the location of the Gosford AWS.

[1] A similar analysis can also be made of the closer Narara AWS data (not shown here) but this station is located at the foot of an approximately north-south aligned ridge and valley and features a significant wind bias along the ridge/valley axis.

Figure 4: Geographical features of the area, location of Gosford AWS, Project site and "CALMET Extract"

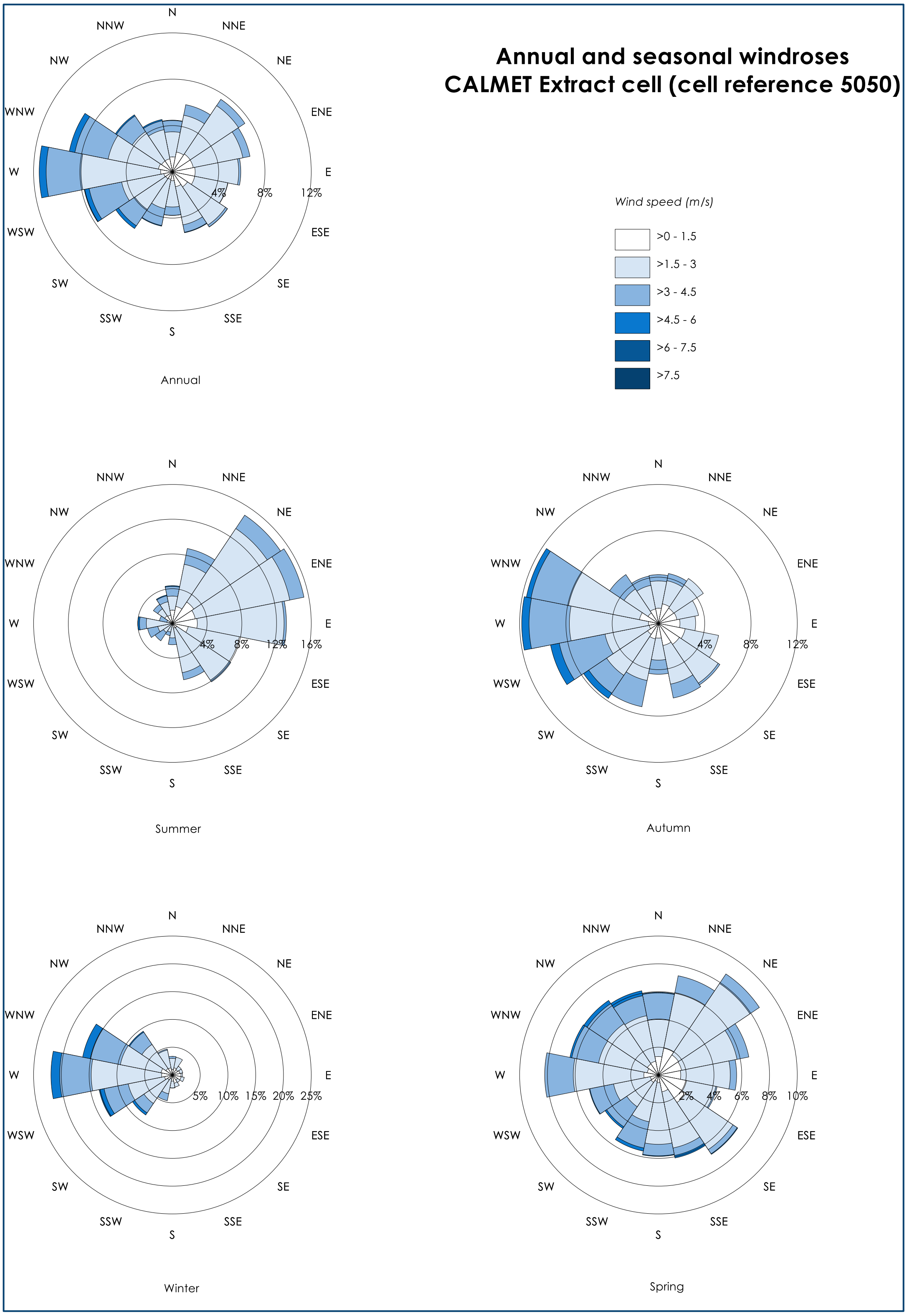

Figure 5: Indicative windrose at “CALMET Extract” location, likely more representative of the project site.

The indication from the above is that relative to the modelled winds, there are likely to be less southerly winds and more westerly winds present near the project site, i.e. more winds towards the nearest receptors. This is especially the case in the winter time, which generally tends to coincide with the poorest air dispersion.

Thus, the weather inputs and model used have potential to lead to invalid or incorrect results.

In addition, the selected meteorological data are not compared to long term climate data of at least five years (EPA Approved Methods Section 4.1 Minimum Requirements). The year 2015 was selected based on a comparison of 2014 to 2016 data (three years). Monitoring at Gosford AWS began in 2013 however there is no available long-term climate data. According to BOM Gosford AWS Daily Weather Observations, long term averages relevant to the Gosford AWS station can be compared to the Gosford (Narara Research Station) (AWS) (closed May 2013), Sydney Airport AMO (open), and Peats Ridge (Waratah Road) (closed June 2015).

Modelled sources and emissions appear to be significantly underestimated, and are not best practice

Annual average and peak maximum (for 24-hour impacts) have been assessed, which is appropriate. However, the annualised peak values used to develop the emission rates do not appear to reasonably reflect the likely additional activity on a peak day, relative to an average day. In general, it is unlikely that for this type of activity, which is governed by the day to day fluctuations in the construction industry, the peak activity rate would be close to the average rate of activity over the year. This indicates that there may be potential for underestimation of the peak 24-hour average dust impacts.

Other assumptions applied in the emissions calculations also underestimate the likely emissions.

Silt loading for paved roads was 0.6 g/$m^{2,}$ and in addition, a 30% control factor is used. The resultant emissions per vehicle kilometre travelled (VKT) are only approx. 33g/VKT, (whereas approximately 20 to 30 times more emissions are likely, e.g approximately 1,000g/VKT). The adopted emission rate for material hauling is for public roads, not industrial roads, and is especially not appropriate for representing industrial roads made of concrete rubble where heavy trucks and equipment will spill material, track material and grind the surface rubble into a fine silt. A more suitable silt loading representative of this type of road would be between 8 and 20g/m^2, and this will greatly increase the modelled emissions (as outlined above) and the predicted impacts given that this will become a significant site dust source. The impacts are likely to especially increase for the most affected receptors which the site roads are relatively closer to.

The 30% control factor applied to further reduce the emissions for this type of road cannot be achieved as it is not possible to sweep such a road surface or to use water flushing to remove the silt after sweeping to loosen it. In general, watering such a road simply tends to cause the silt to track further out onto public roads and can exacerbate, rather than alleviate the problem.

The claimed best practice design for the project is not consistent with the type of road proposed.

A 30% control factor (30% reduction) in emissions for material moved from the supplies bunker for sale by end loader (FEL) is applied. This is incorrect. Furthermore, the emissions generated by the FEL when transporting this material across the site are omitted. The 30% “controlled” plus the excluded emissions will be significant, especially as the loaders will spill significant material along the way, have intimate and significant wheel contact with the material and track it about, and due to frequent turning they will grind the surface causing significant surface silt.

Whilst more commonly used in Western Australia than in NSW, the wind erosion factor approach is reasonable, however the factor is applied to a much smaller area than proposed. It appears that wind erosion is only modelled to arise from 1.59 ha, whereas the approximate operational area is 3.9ha. This is an approximate 2.5 fold underestimation of the most significant source of emissions at the site. Noting that the weather data used also appears to underestimate the westerly winds which blow towards the most impacted receptors (and the wind erosion occurs under such conditions), this can mean that there may be a large underestimation of the predicted dust impact at receptors.

There is a doubling up of control factors in many cases, and this makes the emission implausibly low. An example is the tipping of every load in the 3-sided enclosure. Closer examination shows that this level of control (70%) is not realistic for this “enclosure”, and that there would be quite limited shielding offered in this case given there are three short walled adjacent tipping bays, and the frontal opening spans all three and is very wide. The mechanism by which a 3-sided enclosure provides benefit is that the stockpile is hemmed in on three sides (i.e. piled up the sides of 3 walls), giving it a much smaller surface area than the same material pile out in the open. Yet, the entire purpose of the receivals bay in this case is to take the entire pile and spread it thinly on the ground, greatly increasing the dust emissions relative to any normal pile. This will result in more emissions overall than a normal uncontrolled pile (not a total 85% reduction as has been assumed).

A further example is the application of a 77.7% watering control factor for water sprays on the crusher, and an additional 70% control factor for an enclosure, resulting in a total of 93.3% control. Closer examination shows that the enclosure is like a tunnel as it is open at each end and has what appear to be material conveyors protruding out of the sides. Thus, the key dust generating parts of the crusher are not in the enclosure, and the proposed enclosure provides limited shielding benefit, or no such benefit when winds along the axis of the crusher. Overall, it appears this source may be underestimated by up to approximately three-fold, relative to normal, controlled crusher emissions.

Similar such issues arise with other modelled processes.

The present industry standard control measure for the material spreading and related activities is to conduct these fully indoors with fixed water spays onto the unloading pad and/or direct hand watering as per currently proposed local industry practice (e.g. similar to the proposed Bingo facility across the road, which is referred to in the AQIA).

The entire design of this facility represents relatively poor practice and falls well short of best practice in terms of current design and emissions performance practices applied for new facilities. The road surfaces, the tipping bay and crusher issues outlined above, are notable examples. Other examples are the site design and layout featuring crossing travel paths of materials and trucks which cause additional silt track out, the many open bays of material, the numerous double handling steps, excessively long transport distance of material with heavy plant due to the poor shape and layout, and a range of other relatively poor practice aspects of the proposal.

The many sources of dust are shown to operate for limited hours per day, and these limited hours result in less total emissions (relative to the same rate of activity occurring in every hour of the day). However, while it is known that the modelling is conducted for every hour of the day, it is unclear if the modelled emissions are released over only the operating hours of the day for each source, or in every hour of the day. There is potential to further underestimate the dust impacts by approximately a factor of two if these limited emissions were spread over all hours. It would be reasonable for this to be clarified or corrected if necessary.

Modelled receptors

It is noted that not all of the existing and likely future receptors have been modelled. Notably, the proposed dwelling at Lot 3 239 Debenham Rd East, Somersby is not considered, nor is the juvenile corrections centre, where there may be many young persons present at any time. The corrections centre may warrant some additional consideration, given that inmates may be present for long periods and may be unable to leave for any respite.

Background dust monitoring data

There are no air quality monitoring data collected nearby to the project site. This is a relatively common issue affecting many air assessments. The nearest available air quality monitoring data are measured at the OEH Wyong station, approximately 20km north of the site. Whilst the nearest available background data from Wyong are used, it is noted that the project site is quite different to the Wyong monitoring location, and this may cause some potential for bias.

It is generally accepted that OEH monitoring stations, being specifically located to avoid "hot spots" such as main roads or industrial activities will record lower concentrations of air pollutants (dust in this case) than may arise in more urbanised or industrial areas.

The Wyong monitoring station is located north of a horse track, but south and southeast of low-lying wetlands/ well vegetated land and a golf course. Due to this, it is reasonable to expect the station will record some of the lowest dust levels when winds are from the north to north west, i.e. blowing over the golf course and wetland/ vegetated area. These wind directions are towards some of the nearest and most affected receptors to the project site. There is bare land and industrial activity north and north-northwest of the Project site.

Whilst there is uncertainty regarding the exact background dust levels at the site, on balance, using the best available information and considering the above, it is reasonable to assume that the Wyong monitoring data would underestimate the likely background dust levels at this site, and even more so when winds blow towards the nearest, most impacted receptors.

Cumulative impacts

Whilst two similar nearby facilities are identified to have potential to add to cumulative impacts, only one is considered, and not by direct modelling.

The proposed Bingo Facility across the road from the proposed site is noted in the AQIA to be fully enclosed, to represent best practice, and thus have minimal scope for any cumulative impacts. However, this highlights that the proposed development is not fully enclosed and is therefore not consistent with current industry best practice (as claimed throughout the AQIA). If it is the case as stated in the AQIA that an additional best practice facility across the road does not add any significant level of dust, it follows that the proposal must have much higher impacts than a best practice facility.

The emissions from the proposed Bingo Facility are not calculated or factored into the assessment as they are not available in the public domain. This will lead to underestimated cumulative impacts, especially at Receptor 1 and also the unassessed likely future receptor at Lot 3 239 Debenham Rd East.

The emissions from the nearby (not adjacent as claimed) Gosford Quarry are included on the basis of an assumed 26% addition to the site impacts only. However, because the emissions from this quarry are not directly modelled it means that the predicted cumulative impacts at the nearest most impacted receptors which are located between the two sites may not be adequately represented. The most impacted receptors cannot experience impacts from both sites at the same time, but may experience impacts from either site more often, i.e. from the proposal when winds have westerly components, and from the quarry when winds have easterly components.

This can lead to significantly different, and possibly higher impacts than presented, especially when one also considers the likely bias in the background data (previously outlined).

It is considered that the cumulative impacts are likely to be underestimated when considering the background data and the approach taken.

Discussion
It is noted that the meteorological data used are not representative of the site, and in the reviewer's opinion, this, along with the model choice, has potential to lead to a significant underestimate of the likely level of dust at receptors. The degree of any underprediction cannot be estimated reliably.

The emissions inventory appears to be far too low for a large number of key emission sources. Wind erosion emissions presented in the AQIA are the dominant source of dust from the site by a large margin, but appear to be underestimated by a factor of approximately 2.5 times, given that the actual operational area is stated to be 3.9 ha, but only 1.59 ha appear to be modelled. This will directly lead to significantly underestimated impacts at receptors and may be exacerbated further by the likely under-representation of westerly winds in the modelling. Such winds would blow these dominant dust emissions towards the most impacted receptors.

For this type of activity, the material haulage emissions are generally one of the largest sources of dust, or at least are similar to the total wind erosion emissions. However, in this case, the haulage emissions appear to be underestimated by a factor of approximately 20 to 30 times due to applying an emissions factor for low-traffic public road emissions and a further 30% control factor in addition to reduce the levels further (instead to using an emissions factor for industrial roads). This also has potential to exacerbate any underpredictions at the most impacted receptors which are generally near to the haul roads.

Material handling emissions are also underestimated due to incorrect assumptions regarding excess control factors, for example relating to 3-sided enclosures.

Based on previous experience with many such activities, the reviewer considers there may be an approximate three-fold underestimation in the AQIA in this case, relative to the likely emissions from this site. This would lead to an approximately similar scale of underestimation in the maximum level of predicted dust impact at receptors.

If this underestimation, and the other potential issues in the AQIA approach were to be corrected it is very likely that unacceptable dust impacts would be predicted, as might be expected in this case when considering the large scale of the development in relatively close proximity of many residential receptors, and the overall generally poor design of the facility which does not reflect industry standards or best practice.

Overall, the proposal does not provide a realistic assessment of the likely impacts or propose a suitable design consistent with good or best practice. Given the key shortcomings identified in this report, and the relatively close proximity of receptors, it is concluded that unacceptable impacts are likely to occur at the nearby receptors if this proposal is approved.

TODOROSKI AIR SCIENCES | info@airsciences.com.au | 02 9874 2123

Please feel free to contact us if you would like to clarify any aspect of this letter.

Yours faithfully,
Todoroski Air Sciences

References

Northstar Air Quality (2020)
"Kariong Sand and Soil Supplies – Proposed Development Air Quality Impact Assessment", prepared for Jackson Environment & Planning Pty Ltd by Northstar Air Quality, June 2020.

TODOROSKI AIR SCIENCES | info@airsciences.com.au | 02 9874 2123