17th July 2020

For the attention:
Hoagy Moscrop-Allison
Senior Planner – Major Assessment
City Development Branch
Council of City of Gold Coast

Dear **Hoagy Moscrop-Allison,**

Objection submission COM/2019/81 -

Modelled Dust Submission results are culpably misleading, incorrect and highly dangerous

Please find below further information that I think should be considered re this development Application and its Environmental Submission and the dust limits it claims to meet.

Document references are based on 'MWA Environmental's 'Noise and Dust assessment document (Version 2) dated 15th October 2019, that was submitted as part of the development application, unless otherwise stated.

The Dust Submission is clearly and culpably wrong, in my opinion, making the submitted data worthless, potentially very dangerous and ultimately inadmissible.

There are a number of factors that lead me to this conclusion. They are discussed below.

Ambient Conditions

'Table 8' shows how the ambient dust concentrations were derived for the Springwood Monitoring station (Attachment A1).

Section 3.3.1 Dust Modelling Methodology (Attachment A2) informs the reader that: "The model-predicted dust concentration and deposition rates due to emissions from the proposed quarrying activities **were added to the ambient concentrations in Table 8 to assess the cumulative dust exposure at surrounding receptors**"

However, for example, the PM2.5 Annual average is below the ambient level modelled for Receptors R1 through to R15 (Attachment A3). Receptor Locations shown in Attachment B1.

Therefore, the 'Noise and Dust assessment' submitted document seeks to claim every receptor in the the Eastern Receptor Group (R1 through to R9) and Southern Receptor Group (R10 through to R15) is below the Annual Average Ambient PM2.5. However, the 'Dust Modelling Methodology' (Attachment A2) clearly says: "The model-predicted dust concentration and deposition rates due to emissions from the proposed quarrying activities **were added to the ambient concentrations** in Table 8 to assess the cumulative dust exposure at surrounding receptors". This is obviously culpably incorrect. You clearly cannot add to the ambient values and get a PM2.5 value less than this ambient especially at such close proximity to a highly industrialised area.

Cumulative Totals

It is ridiculous to use (albeit incorrectly) the ambient conditions at the Springwood monitoring location to "assess the cumulative dust exposure at surrounding receptors" (Attachment A2).

The reasons are two fold:

Springwood Monitoring Location

Firstly, Springwood monitoring location is in a completely different location with extremely different ambient conditions and is over 36km from the Oxenford Quarry (as shown in Attachment C1). The ambient conditions at this location are completely irrelevant for this development application.

Relevant cumulative Sources of Dust

Secondly, there is additional major industrial activity very close to the quarry (Attachment D1). In fact major dust sources closer than the receptors specified.

These include the Bullrin Quarry, run by JGi Quarry Pty Ltd (between receptors R16 and R18) that has an environmental authority to process 200,000 tonnes per annum (100,000 tonnes quarrying + 100,000 tonnes of recycling concrete). As shown in Attachment D2. An extremely dusty environment with open crushers and screening plant. Approximately 450m from proposed extractive boundary.

Also, the Holcim concrete batching plant (between receptors R16 and R17) (Attachment D3). Approximately 190m from proposed extractive boundary. An additional dusty environment that should have been considered.

And, the 'JJ Richards recycling centre' (between receptors R20 and R1) that is joined to the Nucrush quarries proposed extractive boundary to the North (Attachment D4).

Also, the Nucrush batching operation in Hart Street Coomera (Attachment D5) within 1516 metres should also have been considered.

All of these additional dust sources are apparently completely ignored in the cumulative dust analysis. Thus the statement "The model-predicted dust concentration and deposition rates due to emissions from the proposed quarrying activities **were added to the ambient concentrations in Table 8 to assess the cumulative dust exposure at surrounding receptors**" (Attachment A2) is clearly and negligently inadequate.

By not including the cumulative effect of the surrounding industry the results are inadequate and ultimately meaningless.

Wind erosion (Increased TSP, PM10 and PM2.5 and Dust Deposition values

The 'Wind Erosion' Particle Emission Estimation calculations (Attachment E1) are based, in my opiion, on incorrect modelled data.

For instance the ‘Processing Plant and Stockpile area is claimed to be 30,000m² (Attachment E1). However, a cursory glance, using Google Earth shows the Processing and Plant and stockpile area is in the region of 136,874 m² (Attachment E2). Note there are stockpiles throughout the quarry area. This makes the data supplied to the modelling deficient as the actual area is 4.5 times larger than modelled.

Also, the exposed Pit and Plant area is modelled at 246,000 m² (Attachment E1). However, the proposed pit and plant area will be 695,571 m² (Attachment E3). Therefore, the modelled data is only about a third of the proposed pit and plant area.

When calculating the wind erosion it is imperative to include all the stockpiles that are throughout the quarry as they are completely unrestrained, have no visible means of damping down (as clearly visible in Attachment E2) and will thus be highly vulnerable to release of dust into the atmosphere during even mildly windy conditions.

To model these at only a fraction of the size that they are, and ultimately will be, is culpable and/or highly negligent in my opinion. As the highly dangerous emissions associated with this product and the relative closeness of sensitive receptors (homes) makes correct modelling of this data imperative as it is the health and safety of these residents who will be ultimately and chronically affected.

<u>Haulage Trucks underestimated by 60% (Raised PM2.5 values and Fine road dust contamination)</u>

This development application shows there will be 171 loaded trucks per day (342 in total) as shown in Attachment F1.

However, the particulate emission estimation assumes there will be 102.4 trucks per day, one way (Attachment F2). Therefore, the modelled data has 40% less trucks than there are proposed.

It is also concerning that it appears to only count vehicles in one direction and is not allowing for the unloaded vehicles to arrive also.

Therefore, the PM2.5 levels modelled will be artificially low as it does not include all the trucks and also does not appear to be including the unloaded trucks either. The carcinogenic, nitrogen oxides, diesel fumes will add to the PM2.5 levels significantly. Therefore to omit a large percentage of these will skew the PM2.5 results and artificially show far lower levels than will be actually experienced.

Also, the fine dust contamination, caused by movement of vehicles in and around and leaving the quarry (Attachment F3) will add to the TSP and the PM10 levels significantly. Therefore to ignore a high percentage of these vehicles and to only include one direction of travel would be unacceptable and would affect the results significantly.

<u>Blasting (Increased TSP, PM10 and PM2.5 and Dust Deposition values</u>

The blasting that happens currently on average every month (but is expected to increase, with the increased output to 1M tonnes per annum) generates an immense highly visible dust cloud (Attachment G1). The after effects of this are that I can personally taste the dust in the air for the next few days. This is not pleasant, especially when you consider it’s the respirable dust that is too small to see or taste that is the most dangerous.

It is therefore inexcusable to see that the modelled dust data has failed to include any blast details. Therefore, a significant dust generation process has been completely and culpably ignored.

This analysis is supposed to be worst case conditions. This omission of blast data will affect the modelled results significantly.

Finally, the development application submitted modelled results

It is hardly worth discussing the submitted results given the errors, inconsistencies and omissions from the analysis to obtain these erroneous results. However, I will attempt to discuss the pertinent points re one of the typical results table submitted (Attachment H1). This is for Stage 1 Operations (Northern Haul Route).

PM10 Values

It can be seen that the submitted results are apparently below the 'Maximum Acceptable Concentration' of 50 µg/m³. However, this is the occupational exposure maximum limit.

From Airborne Silica and Regulations (Attachment H2): "Converting between occupational and non-occupational exposure requires accounting for both exposure time and exposure risk. Occupational exposure time is assumed to be 40 hours per week, while ambient chronic exposure time is a full week of 168 hours. Workers who are protected by the OHSA (Occupational Safety and Health Administration) laws, are also assumed to be healthier than vulnerable segments of the general population, such as children and the elderly. A margin of safety (usually a factor of 30-100) is therefore built into chronic exposure limits to account for risk to the vulnerable populations. An occupational exposure limit of 50 µg/m³ [PM10] therefore may have a corresponding chronic exposure limit near 0.4 µg/m³".

Therefore, for non-occupational chronic exposure the PM10 modelled data is well above the 'Maximum Acceptable Concentration' of 0.4 µg/m³.

Clearly, for PM10 particulate exposure, the submitted results (Attachment H1), even ignoring the errors and omissions highlighted earlier, are approximately eighty times higher than the 'non occupational chronic exposure' limit required.

PM2.5 Annual Average

As per the PM10 values, It can be seen that the submitted results are apparently below the 'Maximum Acceptable Concentration'. However, again, this is the occupational exposure maximum limit. Using the margin of safety factor discussed in the 'PM2.5 Annual Average' section above, the corresponding chronic exposure limit should be approximately 0.06 µg/m³. The values submitted are again approximately eighty times higher than the 'non occupational chronic exposure' limit required.

Clearly, for PPM2.5 particulate exposure the submitted results (Attachment H1), even ignoring the errors and omissions highlighted earlier, are approximately eighty times higher than the 'non occupational chronic exposure' limit required.

Total Suspended Particulate (TSP) - Annual Average

Just a cursory glance at the results Table (Attachment H1) raises instant alarm bells as to the validity of the submitted TSP annual average results.

From the development application supplied 'Particle Size Distribution' (Attachment I1) it can be seen that the PM2.5 is 5.3% of the TSP (100%). Therefore, for the Eastern receptor, the PM2.5 is 4.9 $\mu g/m^3$ (Attachment H1) which equates to an approximate TSP of 92.4 $\mu g/m^3$. Which is over the 'Maximum Acceptable Concentration of 90 $\mu g/m^3$.

But, again this is occupational exposure. The non-occupational chronic exposure limit will be far less than the specified 90 $\mu g/m^3$ e.g. and thus it is clear to see the TSP 'Maximum Acceptable concentration' for non-occupational exposure would also be easily exceeded.

Dust Deposition

The Dust Deposition can be approximated from the TSP (Attachment I2). Thus for a TSP of 90 $\mu g/m^3$ will have an equivalent dust deposition of 4g/m^2 per month (130mg/m^2 per day).

Therefore, given the TSP calculated above the Dust Deposition will be 135 mg/m^2. Which is above 'Maximum Acceptable concentration'.

But, again this is occupational exposure. The non-occupational chronic exposure limit will be far less than the specified 120 mg/m^2 Maximum monthly average per day and thus it is clear to see the Dust Deposition 'Maximum Acceptable concentration' for non-occupational exposure would also be easily exceeded.

Respirable crystalline silica (RCS)

The silica column specifies a 'Maximum acceptable concentration' of 3 $\mu g/m^3$ (Attachment H1). There are three fundament problems with this.

Firstly, this is, again, an occupation exposure. So, the chronic exposure limit should be in the region of 0.024 $\mu g/m^3$.

Secondly, is that this is specified for a particulate matter of PM2.5 i.e. Particles of 2.5 microns (or micrometres) in diameter or less. However, there is strong evidence that particles up to 10 microns in diameter (PM10) are respirable and therefore extremely dangerous to health (Attachment H3). At the very least particles up to 5 microns (PM5) should be considered (Attachment H2).

Thirdly, the constituent parts of particles size less than 2.5 microns (PM2.5) are more likely to be made up of carbon matter (cars, trucks, heavy equipment, etc), nitrates (from cars and trucks), sulfates (power generation) with only approximately ten percent made up of crustal material (Attachment H2).

The dangerous inhalable/respirable crystalline silica is far more likely to reside in the range from 10 microns in diameter down to 2.5 microns. The silica dust analysis results are completely ignoring the particulate matter that is most likely to contain the vast proportion of the highly dangerous RCS. For instance, the particle size distribution (Attachment I1) shows how PM2.5 makes up only 5.3 % of the TSP and only 15% of the PM10. Therefore, of the analysed particulate matter, only a 15% of the respirable crystalline silica matter was included for analysis. Thus, the respirable crystalline silica results submitted are, I believe, vastly underestimated.

The dangers of allowing heightened RCS in the atmosphere with hundreds of homes receiving chronic exposure well above the modelled results is culpably criminal in my opinion.

Conclusion

The modelled PM2.5 annual average expected results (Attachment A3) are BELOW the ambient conditions (Attachment A1). This dust assessment claimed to have "added" their modelled results to the ambient conditions. Clearly this has not been done and thus we can only assume the PM2.5 figures are wrong and the data modelling results are thus significantly and inexcusably compromised.

Further, the claimed "cumulative dust exposure at surrounding receptors" has culpably ignored the industrial activity that is adjacent to the site. This is absolutely unforgiveable given the health and safety implications when considering dust exposure.

The reduced separation buffers means that this Dust assessment should be even more careful to ensure the safety of the local population and not completely ignore important aspects such as the cumulative effect of nearby industrial activity.

As a result of this development application hundreds of affected residents have come forward and made objections citing dust complaints. Yet here we have a quarry in the middle of suburbia who should be doing their upmost to protect the local residents around them and instead they are manipulating the results to attempt to convince the DES, the Council Planners and the Council decision makers that their dust assessment proves they are below the 'Maximum Acceptable Concentration' of dust limits. However, not only have they negligently in my opinion, falsified the results, they have also failed to consider the sensitive receptors (homes) that surround them yet they claim to be 'Good Neighbours' this would be laughable if the implications of falsifying the air quality results wasn't so serious.

There has also been a doctor's letter submitted, from a resident adjoining the quarry boundary to the South (Appollo Place) clearly stating health concerns for their son due to the contaminated air in the vicinity (Attachment J1). Numerous residents have further claimed the dust is affecting their personal amenity, be it on medical grounds (asthma, breathing difficulties, etc.) and/or dust nuisance in and around the home. However, it is clear to see the personal amenity of hundreds of families is being affected by the Air quality in the local environment.

In summary, not only is the submitted dust assessment completely inadequate, it is in my opinion, criminally negligent in ignoring important aspects that seek to ensure levels are below the 'Maximum Concentration permitted' without due regard to safety of either their workers and/or the local population.

To permit this development application, with such an inadequate, incorrect, culpably misleading air quality results, would in my opinion, be extremely, maybe criminally, negligent.

Thank you for considering my objection,

Kind regards

Tony Potter

* Disclaimer. Please note my findings are believed correct and are to the best of my ability. However, there may be errors and assumptions I have made that are incorrect. I do not believe this to be the case, but, realise with the vast amounted of submitted data from the applicant, errors and assumptions on my part may occur. Hopefully this is not the case, but please accept my apologises if this is so. Thank you.

Attachment A1 - Ambient Levels

3.0 DUST IMPACT ASSESSMENT

3.1 AMBIENT DUST CONCENTRATIONS

The Queensland Government operates a network of ambient air quality monitoring stations across the state. Ambient air quality monitoring data was sourced from the Springwood monitoring station. The Springwood monitoring station is located in a more urban locality in proximity to higher transportation density and is considered to be conservative for application as background data to the Oxenford locality. An analysis of monitoring statistics for 5 recent years has been undertaken. A summary of the ambient dust data applied to this assessment is presented in **Table 8**.

Table 8: Ambient Dust Data Applied to Assessment

POLLUTANT	AVERAGING TIME	AMBIENT ($\mu g/m^3$)*	SOURCE
TSP	Annual Average	26.2	Assumption of double PM_{10} Annual Average for 2012 to 2016 at Springwood
PM_{10}	24 Hour Average	14.6	24-hour average 70th percentile for 2012 to 2016 at Springwood
	Annual Average	13.3 *	Annual average for 2012 to 2016 at Springwood
$PM_{2.5}$	24 Hour Average	5.7	24-hour average 70th percentile for 2012 to 2016 at Springwood
	Annual Average	4.9 *	Annual average for 2012 to 2016 at Springwood
Dust Deposition	Monthly Average	40 $mg/m^2/day$	Assumption based upon typical data

* The only real data extracted from Springwood monitoring station
(24 hour average is derived and TSP annual average is derived from PM10)

Attachment A2 - Cumulative dust exposure

3.3 DUST MODELLING

3.3.1 DUST MODELLING METHODOLOGY

(extract)

The model-predicted dust concentrations and deposition rates due to emissions from the proposed quarrying activities were added to the ambient concentrations presented in **Table 8** above to assess the cumulative dust exposure at surrounding receptors.

Attachment A3 - Modelled predicted results showing levels incorrectly BELOW ambient values

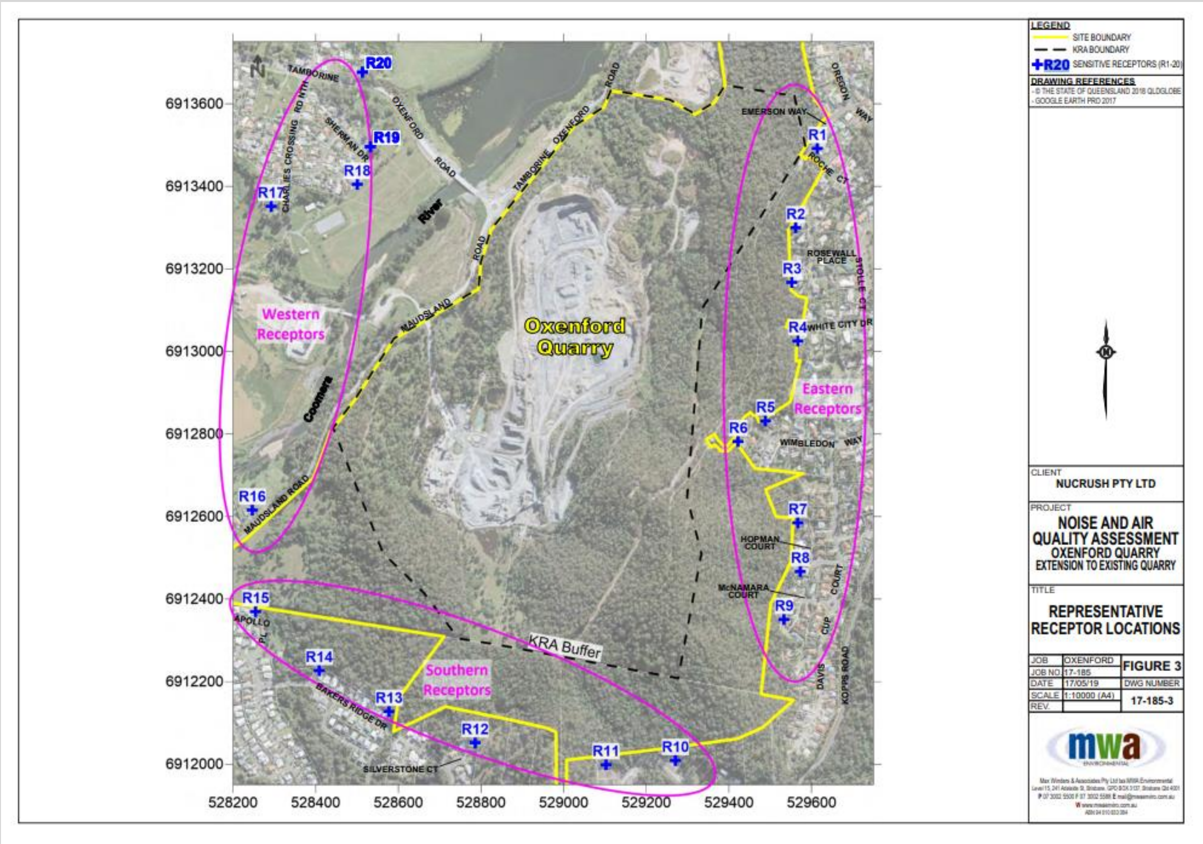
Table A13.2: Model-Predicted Particulate Exposure (including ambient) Stage 1 Operations (Southern Haul Route)

RECEPTOR	PM_{10}			$PM_{2.5}$	TSP	DUST DEPOSITION	Silica
	Maximum 24-hour average (µg/m³)	6th Highest 24-hour average (µg/m³)	Maximum 24-hour average (µg/m³)	Annual Average (µg/m³)	Annual Average (µg/m³)	Maximum Monthly Average (mg/m²/day)	Annual Average (µg/m³)
R1	22.2	16.9	8.1	4.7	26.5	44.9	0.02
R2	23.1	17.4	8.6	4.8	26.8	48.0	0.03
R3	23.4	17.6	8.1	4.8	26.9	50.4	0.03
R4	22.4	19.1	7.3	4.8	27.1	53.4	0.03
R5	26.1	22.1	7.2	4.8	28.0	64.8	0.05
R6	28.8	24.1	7.5	4.8	28.7	73.5	0.07
R7	22.6	19.6	6.7	4.8	27.3	55.4	0.04
R8	21.8	19.2	6.3	4.8	27.2	51.1	0.03
R9	23.7	18.4	6.5	4.8	27.2	48.2	0.03
R10	21.3	18.7	6.3	4.8	27.1	48.1	0.03
R11	24.7	18.5	6.8	4.8	27.2	48.7	0.04
R12	26.0	20.1	7.0	4.8	27.5	49.6	0.05
R13	30.2	20.1	7.5	4.8	27.6	52.4	0.05
R14	23.5	19.4	6.5	4.8	27.6	54.7	0.05
R15	24.3	19.0	6.7	4.8	27.7	53.9	0.05
R16	22.4	21.4	6.5	4.9	28.5	57.1	0.08
R17	24.1	22.0	7.8	5.0	29.4	52.9	0.14
R18	25.8	23.3	9.0	5.2	31.4	56.6	0.23
~~Air Quality Objective~~	50 µg/m³	50 µg/m³	25 µg/m³	8 µg/m³	90 µg/m³	120 µg/m³	3 µg/m³
Compliance?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

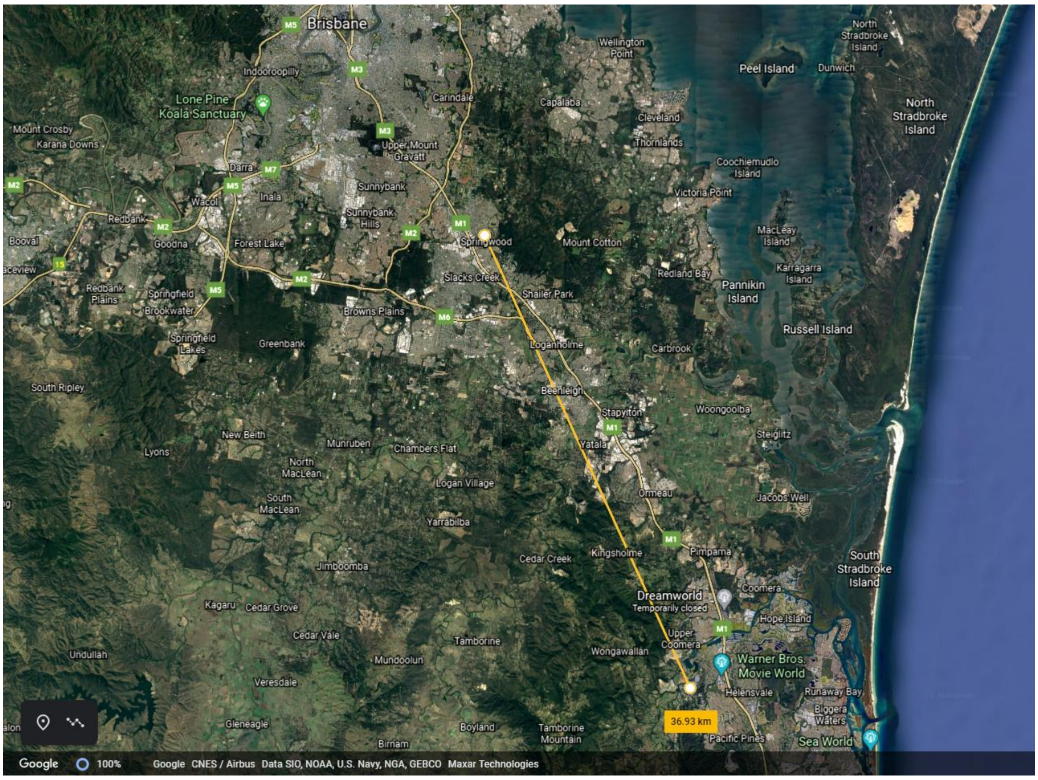
'Maximum Acceptable Concentration'

* Note: The 'MINIMUM value this should/could possibly be is 4.9 µg/m³ (the ambient value from Attachment A1). The modelled data has purportedly been 'added' to the ambient conditions (Attachment A2). Therefore this data is clearly modelled incorrectly.

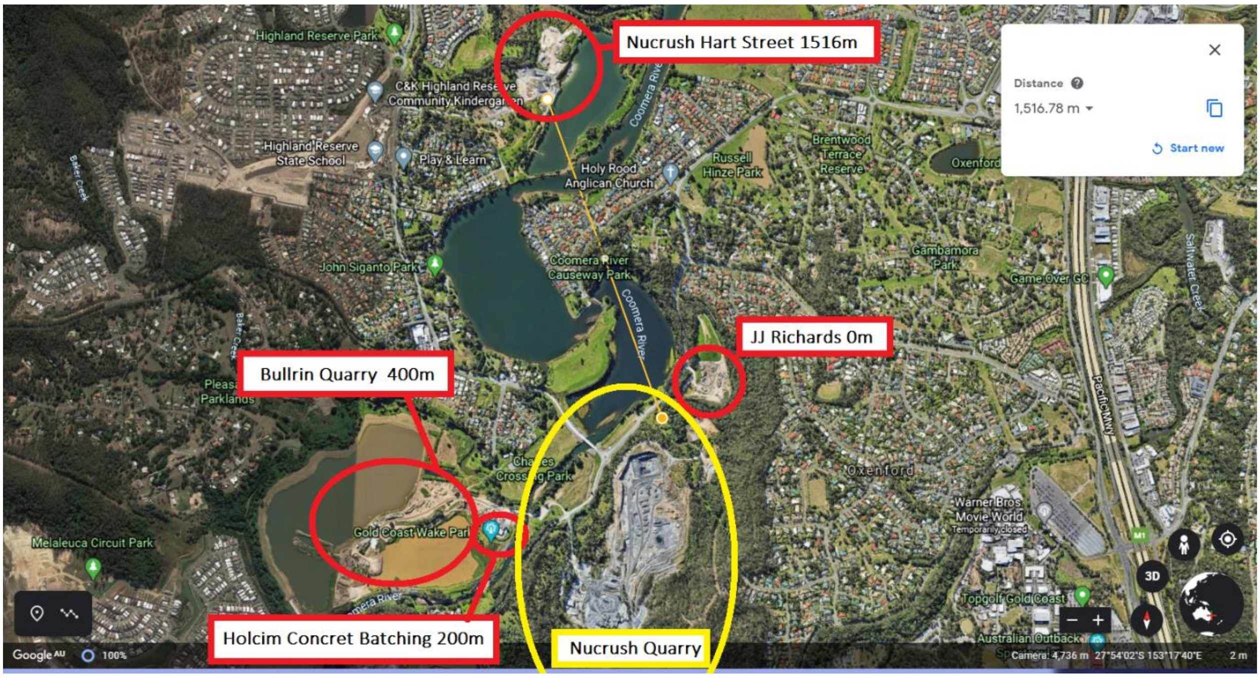
Attachment B1 - Receptor Identification



Attachment C1 - Springwood Monitoring Station completely different topography and 36 km from Oxenford



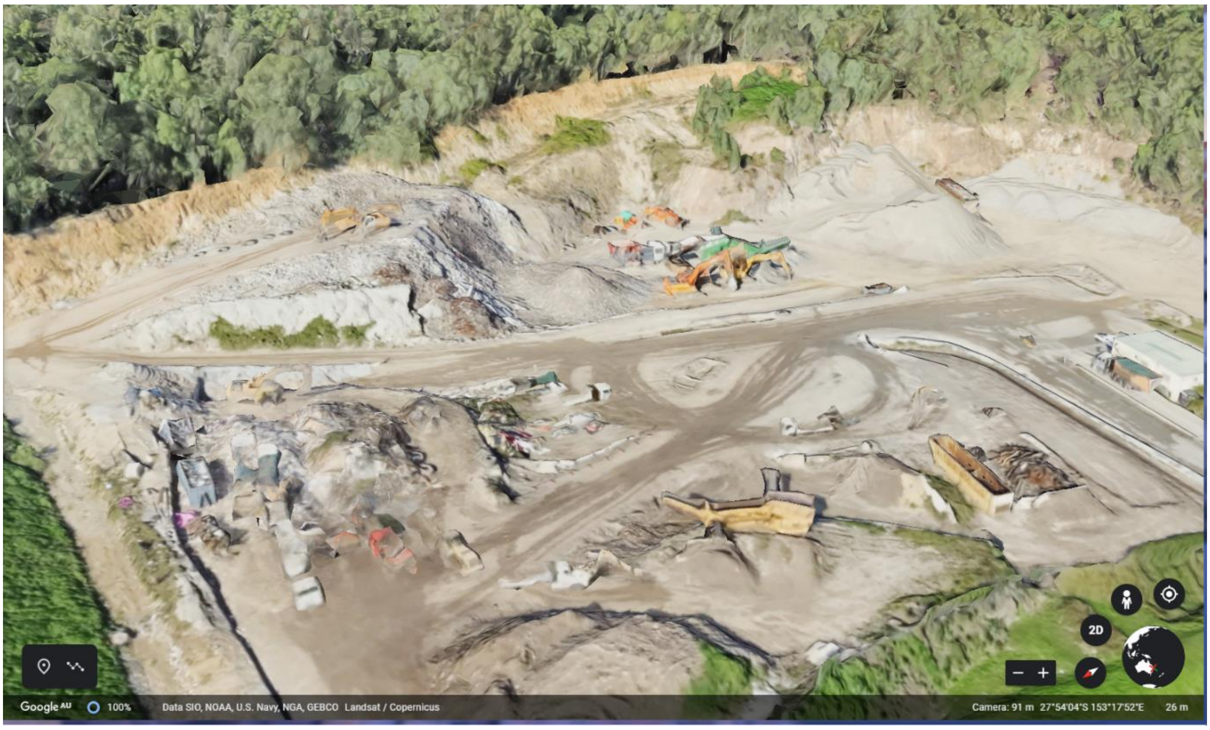
Attachment D1 - Industrial activity affecting local ambient conditions



Attachment D2 - Bullrin Quarry operation (34 Maudsland Road, Oxenford)

Attachment D3 - Holcim concrete batching facility (34 Maudsland Road, Oxenford)

Attachment D4 - JJ Richards quarry and recycling operation (241 Tamborine Oxenford Road)



<u>Attachment D5 - Nucrush Hart Street, Upper Coomera Concrete batching facility</u>

Attachment E1 - Wind erosion parameters

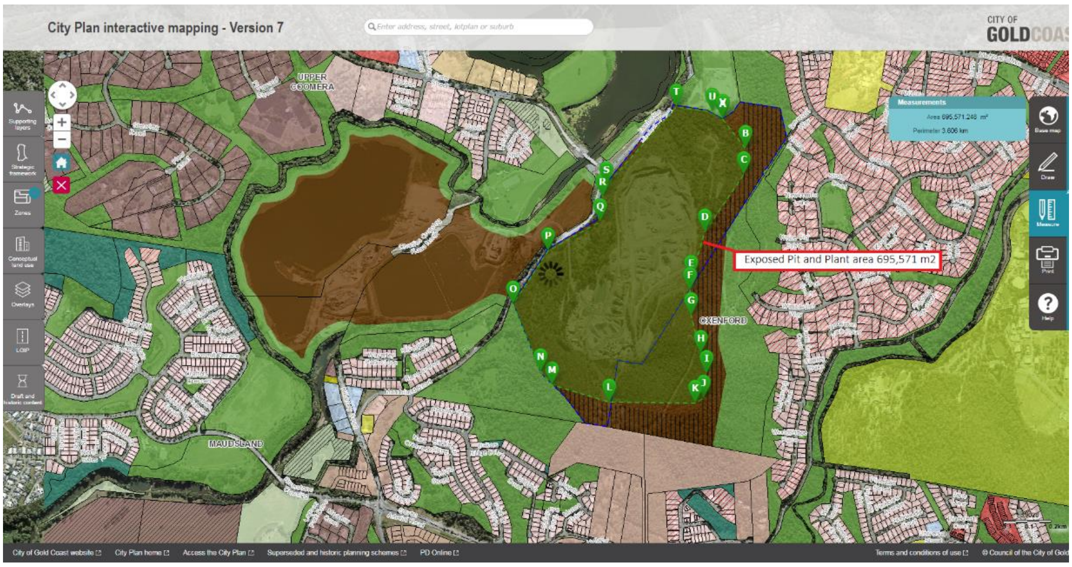
ATTACHMENT 6 *Particulate Emission Estimation Calculations*

WIND EROSION

Processing Plant and Stockpile Area:	30,000	m^2	MWA Estimate - Group to 3 Area Sources
Exposed Pit and Plant Areas:			
Existing Stage	246,600	m^2	MWA Digitised
Silt Content (s):	5	%	
Days of rainfall > 0.25mm (p):	126	days	Coombabah Water Treatment Plant 1998 - 2017
Percentage wind speed > 5.4m/s (f):	4.11	%	From CALMET
Mean wind speed m/s (U):	3.11	m/s	From 6am to 6pm (Affects stockpile area)
Material moisture content (M):	0.7	%	(mean from Table 13.2.4-1)

Attachment E2 - Existing Processing Plant and Stockpile area (136,874 m2)

Attachment E3 - Proposed Pit and Plant area (695,571 m2)



Attachment F1 - Haulage trucks is 342 per day (171 loaded trucks)

Traffic Impact Assessment by Rytenskild - Version 1.pdf 13 / 47

4.0 DEVELOPMENT TRAFFIC ESTIMATES

Nucrush has provided heavy vehicle traffic generation data for the period between 1 June 2017 and 30 April 2018 (11 months). This data provided as Appendix C indicates the following heavy vehicle composition :

- Heavy rigid - 45%
- Semi trailer - 15%
- Truck and dog trailer - 40%

The average heavy vehicle generation was 141 loaded vehicles per day (281 days per year), which equates to an average annual daily traffic generation of 109 loaded vehicles, for a ten hour day.

The total amount of material hauled from the site during the 11 month period was approximately 755,000 tonnes, which equates to approximately 825,000 tonnes for a year. Therefore, the heavy vehicle trip generation for the proposed upper extraction rate of one million tonnes per annum would be 171 loaded trucks per day, as follows :

141 loaded trucks x (1,000,000 / 825,000) = 171 loaded trucks per day

(342 trucks in total (loaded and unloaded)

Attachment F2 - Number of Haulage trucks underestimated by 60%

(PM2.5 value will be underestimated and Fine road dust contamination also).

ATTACHMENT 6 *Particulate Emission Estimation Calculations*

ACCESS ROADS - For Product Trucks

Number of Product Trucks (one-way)			
Average Trips Per Day	102.4	trips/day	MWA Calc
Average Trips Per Hour	9.3127	trips/hour	MWA Calc
Average Trips Per Hour - QA Check	9.3127	trips/hour	MWA Calc
Peak Trips Per Hour	13.6	trips/hour	MWA Calc

Attachment F3 - Fine Road Dust Contamination

Attachment G1 - Dust Assessment has ignored Blasting effects

(picture is Nucrush blast in November 2019 looking North to South)

Attachment H1 - Submitted results for Stage 1 Operations, Northern Haul Route (typical)

Section 4 - Noise and Dust assessment and Stormwater.pdf 31 / 853

Table 10: **Model-Predicted Particulate Exposure (including ambient)**
Stage 1 Operations (Northern Haul Route)

RECEPTOR GROUP	PM10			PM2.5	TSP	DUST DEPOSITION	Silica
	Maximum 24-hour average ($\mu g/m^3$)	6th Highest 24-hour average ($\mu g/m^3$)	Maximum 24-hour average ($\mu g/m^3$)	Annual Average ($\mu g/m^3$)	Annual Average ($\mu g/m^3$)	Maximum Monthly Average ($mg/m^2/day$)	Annual Average ($\mu g/m^3$)
Eastern	37.8	28.6	8.8	4.9	29.6	72.0	0.09
Southern	36.4	22.4	8.1	4.8	27.9	56.5	0.06
Western	28.6	25.2	9.3	5.3	34.8	64.4	0.30
~~Air Quality Objective~~	50 $\mu g/m^3$	50 $\mu g/m^3$	25 $\mu g/m^3$	8 $\mu g/m^3$	90 $\mu g/m^3$	120 $\mu g/m^3$	3 $\mu g/m^3$
Compliance?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Maximum Acceptable Concentration

* Note: 'Air Quality Objective' is actually the 'Maximum Acceptable Concentration'

Attachment H2 - Occupational compared to non-occupational chronic exposure

publiclab.org/notes/mlamadrid/06-21-2016/airborne-silica-and-regulations

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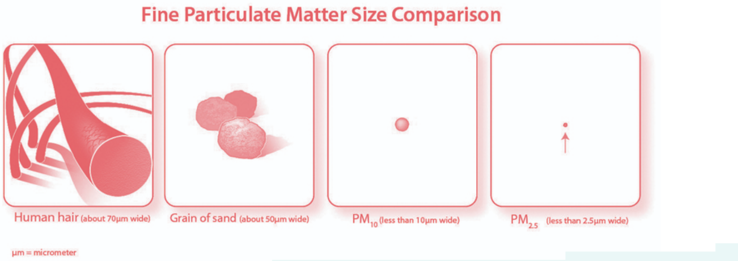


Airborne Silica and Regulations

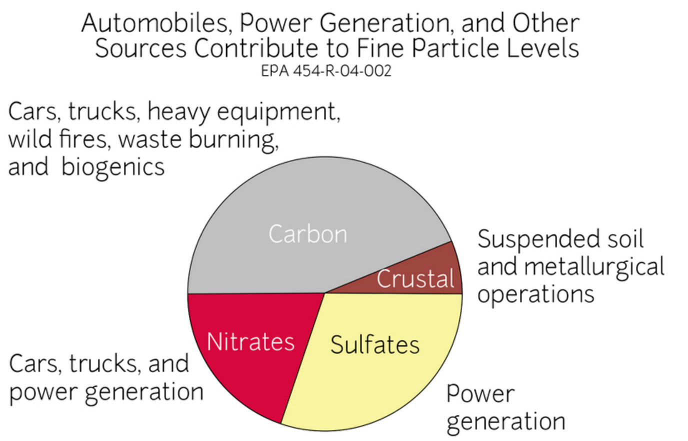
by mlamadrid with gretchengehrke | June 21, 2016 20:32 | #13218

Article by Gretchen Gehrke for Community Science Forum: Sand-Frac Issue.

When silica is part of industrial processes, airborne silica dust is a significant health concern. Silica does not naturally fracture smaller than 10 micrometers (μm), but in road construction, non-metallic mining, sand-blasting, and other high-pressure activities, it may break down to less than 5 μm, a size at which it becomes "respirable." Respirable dust can travel deep into the lungs' smallest structures, alveoli, where oxygen is exchanged. All respirable particles interfere with breathing and are difficult for the body to remove, but one type of respirable silica — respirable crystalline silica — also cuts and scars the lungs, creating a condition known as silicosis, and is carcinogenic.1

In occupational settings, respirable crystalline silica dust is regulated by the Occupational Safety and Health Administration (OSHA). Non-occupational exposure to respirable crystalline silica is regulated in just six states, whose ambient exposure limits are based on OSHA's 8-hour workplace exposure limit. OSHA has set a new limit of 50 micrograms of silica per cubic meter of air (50 μg/m3), going into effect June 23, 2016. This new limit may affect state non-occupational exposure rules. Converting between occupational and non-occupational exposure requires accounting for both exposure time and exposure risk. Occupational exposure time is assumed to be 40 hours per week, while ambient, chronic exposure time is a full week of 168 hours. Workers, who are protected by the OSHA laws, are also assumed to be healthier than vulnerable segments of the general population, such as children and the elderly. A margin of safety (usually a factor of 30-100) is therefore built into chronic exposure limits to account for risks to these vulnerable populations. An occupational exposure limit of 50 μg/m3 therefore may have a corresponding chronic exposure limit near 0.4 μg/m3. Currently no states routinely measure respirable crystalline silica to assess chronic exposure, and the methods to do so are still debated.2

The federal Environmental Protection Agency (EPA) does not regulate respirable silica or other respirable particles, but it does set ambient airborne concentration limits on two size categories of particles, without regard to their chemical composition: particles up to 10 μm diameter (PM10) and particles up to 2.5 μm diameter (PM2.5). PM10 are considered "inhalable" because they travel only into the upper reaches of the respiratory system, while PM2.5 is a subset of respirable particle sizes that travel all the way to the alveoli. Respirable silica is one of the components of particulate matter.



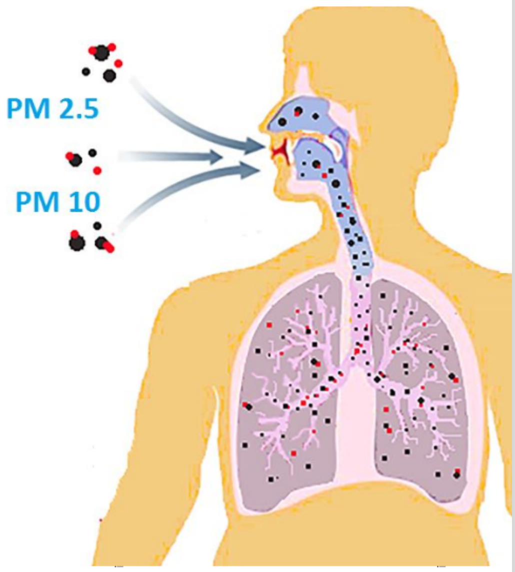
Agencies use a rough estimate for the composition of particles they expect to be in any given sample. They estimate that 10% of particulate matter is silica, which includes respirable crystalline silica and other forms of particulate silica. However, it is acknowledged that the percentage of total silica, and the percentage of respirable crystalline silica, varies by location and nearby activities. At sand mining operations, where silica can constitute 95-99% of the mined sand, the percentage of PM10 that is total silica is likely to be higher than the assumed 10%. If the respirable crystalline silica percentage of PM2.5 near industrial sand mines is more than 3%, the area could be in compliance with the ambient air limit of 12 μg/m3 PM2.5, but still exceed a chronic exposure risk level for respirable crystalline silica.

Attachment H3 - Particles PM2.5 and PM10 are respirable matter

jagranjosh.com/general-knowledge/what-is-pm-25-and-pm10-and-how-they-affect-health

What is PM 2.5 and PM10 and how they affect health?

PM stands for Particulate Matter. PM2.5 and PM10 are minute particles present in the air and exposure to it is very harmful for health. When the level of these particles increases and penetrate deeply in to the lungs, you can experience number of health impacts like breathing problem, burning or sensation in the eyes etc. Let's study through this article what are PM2.5 and PM10 and how they affect health?



Particle pollution consists of PM2.5 and PM10 which are very dangerous.

The particles in PM2.5 category are so small that they can only be detected with the help of the electron microscope. These are smaller than PM10 particles. PM10 are the particles with a diameter of 10 micrometers and they are also called fine particles. An environmental expert says that PM10 is also known as respirable particulate matter.

Due to small in size both PM2.5 and PM10 particles act as gas. When you breathe, these particles they penetrate into the lungs, which can lead to cough and asthma attacks. High blood pressure, heart attack, stroke etc. serious diseases may occur and as a result of which premature death can occur. The worst effect of these particles in the air is on children and the elderly people.

Who are at risk due to these particles?

exposure to air pollution is likely to affect children and senior citizens badly. People with heart and lung diseases can be more at risk to air pollution.

The American Heart Association also warns about the effect of PM2.5 on Heart's health and mortality rate:

"Exposure to PM <2.5 μm in diameter (PM2.5) over a few hours to weeks can trigger cardiovascular disease-related mortality and nonfatal events; longer-term exposure (eg, a few years) increases the risk for cardiovascular mortality to an even greater extent than exposures over a few days and reduces life expectancy within more highly exposed segments of the population by several months to a few years."

Attachment I1 - Particle Size Distribution

Noise and Dust.pdf

PARTICLE SIZE DISTRIBUTION

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053[a]

[a] Multiplier for < 2.5 µm taken from Reference 14.

TSP 100%

FRACTION #	1	2	3	4	5	6
PARTICLE SIZE (MICRONS)	>30	<30	<15	<10	<5	<2.5
ASSUMED MEAN PARTICLE SIZE (MICRONS)	**40**	**22.5**	**12.5**	**7.5**	**3.75**	**1.25**
% OF TOTAL	**0.26**	**0.26**	**0.13**	**0.15**	**0.147**	**0.053**
STANDARD DEVIATION	**0**	**0**	**0**	**0**	**0**	**0**
	26%	26%	13%	15%	14.7%	5.3%

PM10 35%

FRACTION #	4	5	6
PARTICLE SIZE (MICRONS)	<10	<5	<2.5
ASSUMED MEAN PARTICLE SIZE (MICRONS)	**7.5**	**3.75**	**1.25**
% OF TOTAL	0.15	0.147	0.053
% OF <PM10	**0.428571**	**0.42**	**0.151429**
STANDARD DEVIATION	**0**	**0**	**0**

PM5 20%

FRACTION #	5	6
PARTICLE SIZE (MICRONS)	<5	<2.5
ASSUMED MEAN PARTICLE SIZE (MICRONS	**3.75**	**1.25**
% OF TOTAL	0.147	0.053
% OF <PM2.5	73.5%	26.5%
STANDARD DEVIATION	**0**	**0**

PM2.5 5.3%

FRACTION #	6
PARTICLE SIZE (MICRONS)	<2.5
ASSUMED MEAN PARTICLE SIZE (MICRONS	**1.25**
% OF TOTAL	0.053
% OF <PM2.5	**100**
STANDARD DEVIATION	**0**

Attachment I2 - Dust Deposition Calculation

epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/licensing/sandy-point-quarry-air-quality.ashx

4.1.2 TSP and Deposited dust

As mentioned, there are no readily available site specific TSP and deposited dust monitoring data. The OEH monitoring site does not measure these components; however estimates of the background levels for the site are required to assess the impacts per the criteria presented in **Section 3**.

Estimates of the annual average background TSP concentrations can be determined from a relationship between measured PM_{10} concentrations. This relationship assumes that 40% of the TSP is PM_{10} and was established as part of a review of ambient monitoring data collected by co-located TSP and PM_{10} monitors operated for reasonably long periods of time in the Hunter Valley (**NSW Minerals Council, 2000**).

Applying this relationship with the annual average PM_{10} concentration of 17µg/m^3 from the Liverpool monitor estimates an annual average TSP concentration of the order of 42.5µg/m^3.

To estimate annual average dust deposition levels, a similar process to the method used to estimate TSP concentrations is applied. This approach assumes that a TSP concentration of 90µg/m^3 will have an equivalent dust deposition value of 4g/m^2/month.

This relationship indicates a background annual average dust deposition of 1.9g/m^2/month for the area surrounding the Project.

4.1.3 Summary of background air quality levels

The annual average background air quality levels applied in this assessment are as follows:

- PM_{10} concentrations - 17µg/m^3;
- TSP concentrations - 42.5µg/m^3; and
- Deposited dust levels - 1.9g/m^2/month.

Attachment J1 - Doctors Letter

brygon
medical centre

1 Brygon Creek Dr, Upper Coomera 4209 Ph: 5665 9299 F: 55560469

Dr Joy Lim Dr George Mitov Dr Natasha Lingard
Dr Ilian Kamenoff Dr Matthew Stark Dr Stephanie Clapham

Medical Certificate

19/11/2019

THIS IS TO CERTIFY THAT

Mast[redacted] health has been deteriorating in the last few months /mostly due to upper respiratory tract infecitons/ as a result of inhaling contaminated air from nearby industrial activities.

Dr George Mitov
235507BY
MBBS, FRACGP