6th April 2021

For the attention:
Liam Jukes
Senior Planner – Major Assessment
City Development Branch
Council of City of Gold Coast

Dear **Liam Jukes,**

Objection submission COM/2019/81 -

Nucrush Traffic Impact assessment (SCR Pavement Impact) is incorrect

Please accept this objection as it highlights that the submitted 'Nucrush Heavy Vehicle Record (1st June 2017- 30th April 2018)' which is 'Appendix C' of the Traffic Impact assessment (State Controlled Road [SCR] Pavement Impact Assessment) is, I believe, incorrect as it does not represent the actual number of Heavy Vehicles using the site.

This brings into question the calculated pavement impact contribution of $56,998 per year I assume will not be correct either (Attachment A1).

It would also bring into question the accuracy of all the Traffic Impact assessments submitted (including the Pavement Impact Assessments) and whether it is an accurate representation of the traffic movements in the vicinity of the quarry i.e. Oxenford and surrounding suburbs and whether the estimates of haulage traffic in the area are woefully inadequate and misleading.

Where is the Full Traffic Survey Promised?

In the Traffic Impact assessment (SCR Pavement Impact Assessment), Dated 28th November 2019, Version 1, it is claimed that "The full traffic survey is provided in Appendix C" (reproduced in attachment B1). However, Appendix C is just a record of loaded trucks exiting the site (Attachment B2). There is an extremely limited Traffic survey provided in Appendix B. However, this is not a "full traffic survey" it is merely two one hour snapshots taken in the morning and afternoon on a seemingly arbitrary day way back in December in 2014 (Attachment B3). Hardly "The full traffic survey" the Traffic Impact assessment infers and I beleive needs.

Section 2.3 Current Traffic Volumes, Fig 2.4 states it is "Surveyed Peak Hour Traffic Volumes at the Tamborine - Oxenford Road /Maudsland Road Intersection" (Attachment B1). But, there appears, however, to be absolutely no traffic survey information submitted for this Intersection. A cursory glance at the Figure 2.4, "AM Peak Hour" figure suggests 348 (247+101) vehicles approached the Nucrush site intersection via Maudsland Road, heading south, from the Tamborine - Oxenford Road (Attachment B1). However, in the Surveyed Traffic Volumes Appendix B (Attachment B3) shows that 395 vehicles made this journey. Thus, it would appear the Figure 2.4 results do not originate from the December 2014 highly inadequate two hour traffic survey. So where do the "Figure 2.4 - Surveyed Peak Hour Traffic Volumes at the Tamborine - Oxenford Road / Maudsland Road Intersection" originate? It certainly would not seem to have been submitted as part of the Traffic Impact assessment, as inferred.

Also, the statement within Traffic Impact assessment: 'Section 2.3 Current Traffic Volumes' states: "Traffic data provided by TMR indicates that Maudsland Road is currently carrying in the order of 11,000 vehicles per day adjacent to the site. The Tamborine - Oxenford Road to the north, currently carries in the order of 18,500 vehicles per day" (Attachment B1). However, there is no data submitted to verify these assumptions. Is this just based on the two hour inadequate traffic survey back in 2014? Or is there actual data from TMR available? If so, how old is this data, what is it based on? It would seem the Current Traffic Volumes used by this development application are based on historical data and/or undisclosed data. Either way it is clearly an inadequate Traffic Impact assessment for this development application.

Is the Nucrush Heavy Vehicle Record (Appendix C) correct?

In the Traffic Impact assessment (Pavement assessment) dated 28th November 2019, 'Appendix C - Nucrush Heavy Record (1st June 2017 - 30th April 2018)' indicates 36,173 heavy vehicles left the site during this eleven month period. This, using 257 working days in this period indicates '140.8' heavy trucks per day or '14.1' per hour (reproduced in Attachment B2).

This seems to be derived from 233 full days mon-fri and 48 half days on Saturdays.

These heavy vehicles hauled 755,265 tonnes over this eleven month period (derived from Appendix C calculations).

However, it would seem, there is no record of heavy vehicles entering the site to deliver the necessary sand and cement for the concrete batching facility. Similarly, there is no records of these delivery vehicles exiting the site. Why have these been omitted? Surely for a Traffic Impact assessment (SCR Pavement Impact Assessment) all heavy vehicles should be accounted for? It would seem all deliveries trucks for the Concrete Production / Batching facility entering and leaving the site have been disregarded from this Traffic Impact assessment.

It is simply not good enough to claim the Concrete Production / Batching Facility is not part of the current development application and therefore ignore it as per Traffic Impact Assessment, 'Section 4 Development Traffic Estimates' claims: "It is noted that the volumes below include traffic generated by the concrete plant, which is not part of this application" (Attachment B4). The Traffic Impact assessment should acknowledge all influencing factors and the production of concrete within the extractive footprint is definitely a highly influencing factor that significantly increases the amount of traffic for this development. To simply ignore the on-site Concrete Production / Batching Facility would be culpably negligent in my opinion.

Is the apparently disregarded Concrete Batching Facility deliveries significant for the Traffic Impact assessment (Pavement Impact Assessment)?

Looking at the Traffic Impact assessment submitted: "Appendix C - Nucrush Heavy Vehicle Record" (Attachment B2) it would seem it only accounts for haulage vehicles leaving the site that are loaded (Apparently completely disregarding unloaded trucks despite their obvious weight and strain on the local roads).

Of the loaded trucks exiting the site it would seem a high proportion are concrete trucks (six wheeler and eight wheeler). These are believed to make up 24.84% and 0.66% respectively of the hauled loads.

The six wheelers are believed to have hauled 187,593 tonnes whilst the eight wheelers hauled 5,010 tonnes (total 192,603 tonnes, as derived from Appendix C).

Of this 192,603 tonnes (which would represent approx. 77,041 cubic metres of concrete) it is estimated there is 26,964 tonnes of cement and 53,928 tonnes of sand that will have had to be delivered to the site (Attachment D1). Assuming a haulage truck haul 20 tonnes, this means 1,348 trucks carrying concrete and 2,696 trucks carrying sand will have delivered to the Nucrush site over these eleven months (4,044 in total). Assuming mon-fri deliveries this means 17 more deliveries per day (or 34 truck movements) just for the on-site Concrete Batching facility.

Therefore, of the claimed 141 Heavy loaded vehicles per day claimed, I would think there are an additional 17 more that are delivering to the Concrete Batching facility that are seemingly ignored in the Traffic Impact assessment (Pavement assessment). Thus, it would appear the Nucrush Heavy Vehicle record should indicate 158 loaded trucks per day (or 316 truck movements).

It would appear the Traffic Impact assessment (Pavement impact assessment) has failed to include approximately twelve percent of the heavy vehicles using the site.

How does this change the estimated number of vehicles in the development application?

In the Traffic Impact assessment, "Section 4.0 Development Traffic Estimates" states: "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" (Attachment C1).

Firstly, it must be stated that 141 loaded vehicles per day [for a ten hour day] cannot be simply reduced to 109 loaded vehicles by dividing the working days and multiplying it by 365 to get the average including Sundays, Christmas etc. The 281 working days, it would seem, is derived from mon-fri + saturday am and seven bank holidays, giving a 55 hour working week assuming a ten hour day as stated. By the applicant attempting to average it out for Sundays and bank holidays, to seemingly reduce the number of trucks per day is, I believe, makes a mockery of these calculations.

Notwithstanding, the claimed 141 loaded vehicles per day (282 truck movements) should I believe include the loaded vehicles required by the concrete Batching Facility also i.e. A total of 158 loaded trucks per day (or 316 truck movements). This is for an estimated 825,000 tonnes per year (See Attachment C1).

To factor in the proposed 1,000,000 tonnes per annum, the loaded trucks per day will be (as per Attachment C1):

158 loaded trucks x (1,000,00 / 825,000) = 192 loaded trucks per day (384 truck movements in total)

Therefore, the proposed total loaded trucks per day will not be the 171 claimed but will in fact be 192 instead (384 truck movements in total every day).

Or to put it another way, it would seem, it is proposed that thirty-eight Nucrush trucks, on average will travel through the local roads in and around Oxenford every hour throughout mon-fri from 6am - 6pm and 6am - 12pm on Saturdays approximately every ninety-five seconds. I believe a truly staggering and worrying statistic that has unfortunately not been divulged as part of the development application.

The above is a simplified calculations as per the Traffic Impact assessment, if we allow for the concrete within the output how does that effect the Traffic Impact assessment?

The above calculations, as per the submitted Traffic Impact assessment is assuming all output is extractive material it does not factor in that a seemingly high percentage of this is converted into concrete before leaving the Nucrush quarry site.

In fact of the 755,265 tonnes recorded leaving the site in the eleven months from 1st June 2017 to 30th April 2018 it is believed 25.5% was concrete (derived from the "Appendix C - Nucrush Heavy Vehicle Record", reproduced in Attachment B2). Assuming this is correct, the actual extractive product making up this weight is calculated below:

192,603 tonnes of concrete (25.5% of the total haul of 755,265 tonnes)

This 192,603 tonnes will be approx. (or 77,037 cubic metres of concrete).

This concrete is made up of approximately (as per Attachment D1):

- 92,640 tonnes of aggregate
- 26,964 tonnes of cement
- 53,929 tonnes of sand
- (plus approx. 19 tonnes of water, additives, etc.)

Therefore, of the 755,265 tonnes hauled over the eleven months, only 562,662 tonnes is raw product from the quarry whilst an additional 92,640 tonnes of quarry product is used to make up the concrete (along with imported sand and cement).

Thus, of the 755,265 tonnes logged, during these eleven months, it would seem only 655,302 tonnes was attributed to quarry product (562,662 + 92,640). The remainder being concrete requirements such as sand, cement, additives and water that are over and above quarry product and mostly imported from other locations. In fact, it seems, of the 755,265 tonnes logged, 655,302 tonnes is quarry product, 80,893 tonnes is sand and cement brought in and the remaining 19,000 tonnes water and any additives.

Therefore, it would seem, the correct calculation for the maximum number of vehicles is not: 755,265 tonnes for eleven months giving a total of 825,000 tonnes (Attachment C1). But it is 655,302 tonnes for eleven months giving a total of 714,000 tonnes for a year.

Therefore, using their figures (scaling up this to 1,000,000 tonnes per annum):

141 loaded trucks x (1,000,000 / 714,000) = 197 loaded trucks per day (395 truck movements).

However, if we include the Concrete batching facility delivery trucks which is 17 loaded trucks for 654,000 tonnes, factored up for a million tonnes:

17 x (1,000,000 / 714,000) = 24 loaded trucks delivering sand and cement (48 truck movements)

In summary, using their submitted figures it would appear that a 755,000 tonne output for the eleven month period monitored, required 655,302 tonnes of quarry product. This required 141 loaded trucks per day and an additional 17 loaded trucks delivering sand and cement (158 loaded trucks in total).

Factoring the quarry output up from the 655,302 tonnes for this eleven months (714,000 for the year) requires:

158 loaded trucks x (1,000,000 / 714,000) = 221 loaded trucks per day (442 truck movements per day).

Or, to put it another way, it would seem, forty-four Nucrush trucks, on average will travel through the local roads in and around Oxenford every hour throughout mon-fri from 6am -6pm and 6- 12pm on Saturdays every ninety seconds traversing through the local Oxenford suburbs and surrounding area. I believe a truly staggering and highly worrying statistic.

Is the Concrete Production as per development application claims?

In the Stormwater Management Plan, by BMT, version 5, dated 16th May 2019, Appendix C, Water Cycle Management Strategy states: "Water management strategy for the site for the existing site conditions and ultimate site conditions, for the following scenarios:

- Low concrete production: 17,616 m^3
- Low concrete production: 49,000 m^3
- High concrete production: 93,309 m^3

The results demonstrate that the proposed strategy for each of the two site conditions will ensure the water demands of the site operations will be satisfied. (include in here section on low, med, high production of concrete production." (Attachment E1).

It is plain to see this document was apparently not finished as required judging from the statement: "(include in here section on low, med, high production of concrete production.". However, it is also blatantly clear to see that the highest concrete production threshold of 93,309 m3 that was considered would seem to be a vast under estimate based on the figures already derived above.

It is estimated that the concrete production for the eleven months specified was 77,037 m^3. Giving a total of approximately 84,040 m^3 for the whole year.

This was for an output of 655,302 tonnes for that year (see above). If we factor this up to the proposed 1,000,000 tonnes:

84,040 x (1,000,000 / 655,302) = 128,247 m^3

This, it would seem, gives a Concrete production estimate in the region of 128,247 m^3. Clearly the Highest concrete production considered in the Stormwater management plan of 93,309 m^3 (Attachment E1) would appear to be vastly underestimated. If my figures are correct, as I believe they are, is this underestimate of concrete production a genuine mistake or a culpable oversight? Either way it means the Water Cycle Management Strategy requires an urgent investigation.

It would seem the highest calculated concrete production (or worst case scenario) in the Stormwater Management plan is woefully inadequate when the current concrete production is factored up to the proposed 1,000,000 tonnes output.

Conclusion

From the simplified calculations above, based on the calculations submitted as part of the Traffic Impact assessment, it would seem a jaw dropping 384 trucks will traverse the local Oxenford area every day.

If we include the proportion of this that is believed to be concrete deliveries, it would seem the proposed development application will generate up to 442 trucks per day, or one every ninety seconds, throughout the working day and much of Saturday.

The Traffic Impact assessment estimates of 342 trucks per day is already a deeply concerning statistic. However, the updated figures are simply eye-watering. How can this amount of heavy haulage vehicles be sanctioned for the next one hundred plus years, as proposed, and all within a suburban residential neighbourhood? Especially bearing in mind this is the Queensland Principle Cycle network also, as used by cyclists, pedestrians, buses, school buses, residents and tourists alike. All forced to share a predominantly single lane in each direction with no cycleway or pedestrian footpath through much of the route. Clearly this is not a suitable transport route for a heavy haulage vehicle or concrete truck every ninety or so seconds.

I believe, just based on the apparent errors in the Traffic Impact assessment so far uncovered, this will be unacceptable to the Council Planners and Council Decision makers who decide the fate of this development application.

It would also seem the Stormwater Management Plan is woefully inadequate and requires urgent investigation. If my calculations are correct, and I have no reason to believe they are not, how many other places within this DA has the Concrete production been underestimated (or completely ignored) and how will this affect the noise, the dust, the local environment, the local residents, traffic estimates, etc. ?

Given, that I do not even believe the Concrete Production / Batching facility has any place in this quarry (either presently or in the future) as it is a non-compliant facility, that is in direct opposition to the current approval by way of the Rezoning agreement, it would seem the whole development application is a complete shambles.

Thank you in anticipation,

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 - Section 6.0 Summary of Conclusions and Recommendations

6.0 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

- The site is located on the eastern side of the Tamborine – Oxenford Road and Maudsland Road. Access is gained via a single point off Maudsland Road located approximately 315 metres south of the Tamborine – Oxenford Road intersection.

- The Average Annual production rates is approximately 600,000 tonnes per annum although the upper production threshold is 1,000,000 tonnes per annum for production and processing. The existing quarry operates between 7am and 6pm Monday – Friday, and between 8am and noon on Saturdays and public holidays (maintenance or cartage only).

- The proposal intends to increase the area of the site that can be used for material extraction which will result in an extension of the life of the quarry, not an increase in current operations. The proposal will simply allow the current level of traffic generation to continue for the foreseeable future.

- Records indicate that the proposal generates in the order of 141 loaded truck movements per day, at an extraction rate of approximately 825,000 tonnes per year. This equates to 171 loaded trucks for an extraction rate of 1 million tonnes per year.

- Applying the above trip generation and SAR data provided by TMR, the proposal has an impact upon the northbound section of the Oxenford – Coomera Gorge Road between the site access and the Tamborine – Oxenford Road intersection; and the eastbound section of the Tamborine – Oxenford Road between the Oxenford – Coomera Gorge Road intersection and the Pacific Motorway.

- Applying the above parameters and the Marginal Cost Values provided by TMR, the project contribution towards pavement impact equates to **$ 56,998 per year of operation** for an extraction rate of 1 million tonnes per annum. The charge should apply on a per tonne basis at a rate of 5.70 cents / tonne.

Attachment B1 - Section 2.3 Current Traffic Volumes

2.3 Current Traffic Volumes

Traffic data provided by TMR indicates that Maudsland Road is currently carrying in the order of 11,000 vehicles per day adjacent to the site. The Tamborine – Oxenford Road, to the north, currently carries in the order of 18,500 vehicles per day.

Traffic counts carried out by Austraffic at the Maudsland Road / Nucrush site access intersection (in 2014) are provided as Attachment B (and discussed further in Section 4).

RTE carried out peak period traffic counts at the Tamborine – Oxenford Road / Maudsland Road intersection in March 2018. The full traffic survey is provided in Appendix C, with peak period traffic volumes summarised in Figure 2.4.

Traffic count data for Maudsland Road from 2016 (TMR) is provided as Appendix D.

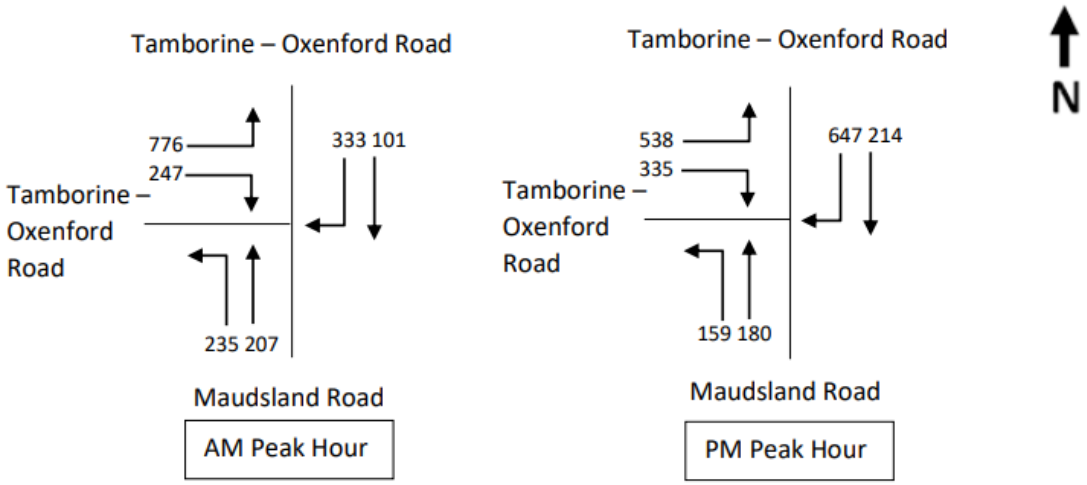


FIGURE 2.4 – SURVEYED PEAK HOUR TRAFFIC VOLUMES AT THE TAMBORINE – OXENFORD ROAD / MAUDSLAND ROAD INTERSECTION

Attachment B2 - Appendix C - Nucrush Heavy Vehicle Record (1st June 2017 - 30th April 2018)

Note actual submitted data is approx. nine pages long this is an abridged version.

2019-11-28 Traffic Impact Assessment by Rytenskild - Version 1 again.pdf 23 / 49

APPENDIX C – NUCRUSH HEAVY VEHICLE RECORD (1 JUNE 2017 – 30 APRIL 2018)

First Page:

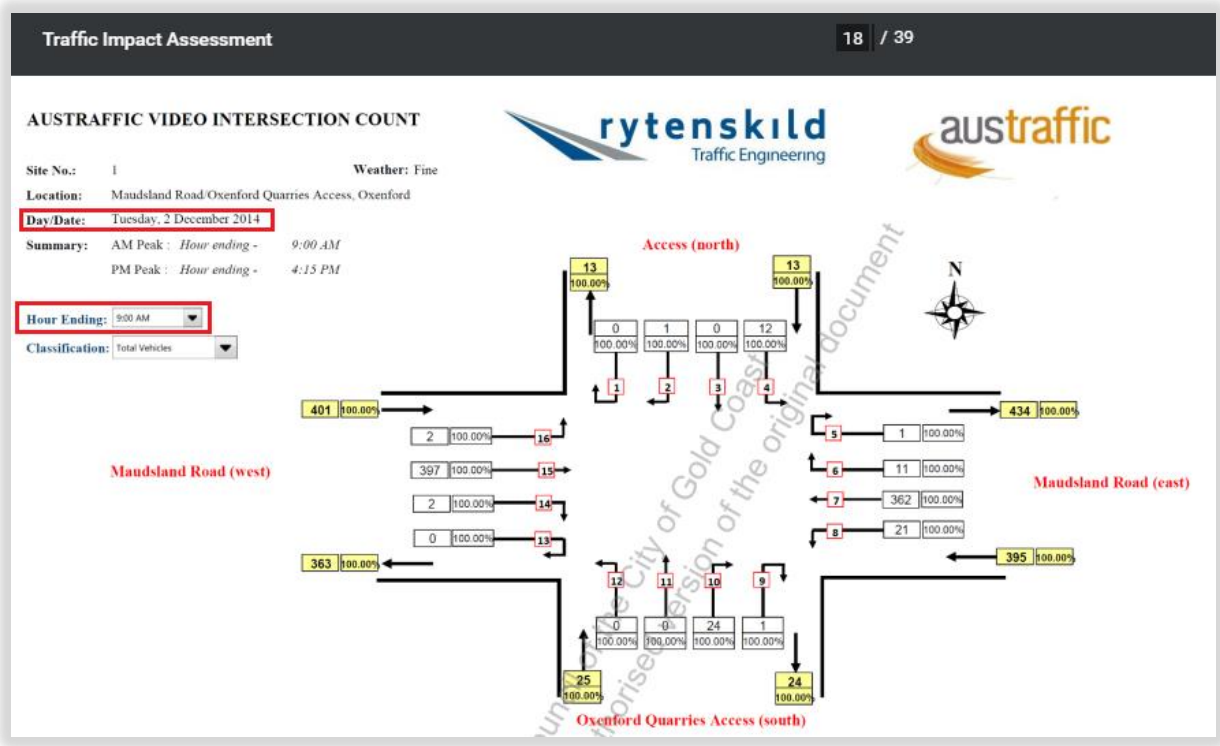
Operator	Truck Number	Description	Quantity	Loads	Qty/Load
Nucrush	Data removed	6 Wheeler	12,619.39	1,001	12.61
Nucrush	Data removed	6 Wheeler	15,304.23	989	15.47
Nucrush	Data removed	6 Wheeler	1,253.59	101	12.41
Nucrush	Data removed	6 Wheeler	16,149.44	1,278	12.64
Nucrush	Data removed	Semi	37,712.23	1,297	29.08
Nucrush	Data removed	Semi	35,183.59	1,224	28.74
Nucrush	Data removed	Semi	14,193.60	517	27.45
Nucrush	Data removed	Semi	35,371.48	1,242	28.48
Nucrush	Data removed	Semi	25,595.29	931	27.49
Nucrush	Data removed	Semi	33,431.49	1,162	28.77
Nucrush	Data removed	T&D	37,121.32	1,082	34.31
Nucrush	Data removed	T&D	1,112.71	92	12.09
Nucrush	Data removed	T&D	244.89	10	24.49
Nucrush	Data removed	T&D	27,049.45	854	31.67
Nucrush	Data removed	T&D	2,772.53	232	11.95
Nucrush	Data removed	T&D	37.46	2	18.73
Nucrush	Data removed	T&D	38,895.56	1,233	31.55
Nucrush	Data removed	T&D	1,175.24	97	12.12
Nucrush	Data removed	T&D	95.27	5	19.05
Nucrush	Data removed	T&D	40,337.90	1,290	31.27
Nucrush	Data removed	T&D	2,079.01	172	12.09
Nucrush	Data removed	T&D	157.68	8	19.71
Nucrush	Data removed	T&D	23,940.54	739	32.40
Nucrush	Data removed	T&D	1,990.72	164	12.14
Nucrush	Data removed	T&D	19.18	1	19.18
Coastal	Data removed	6 Wheeler	208.58	16	13.04
Coastal	Data removed	6 Wheeler	147.66	11	13.42

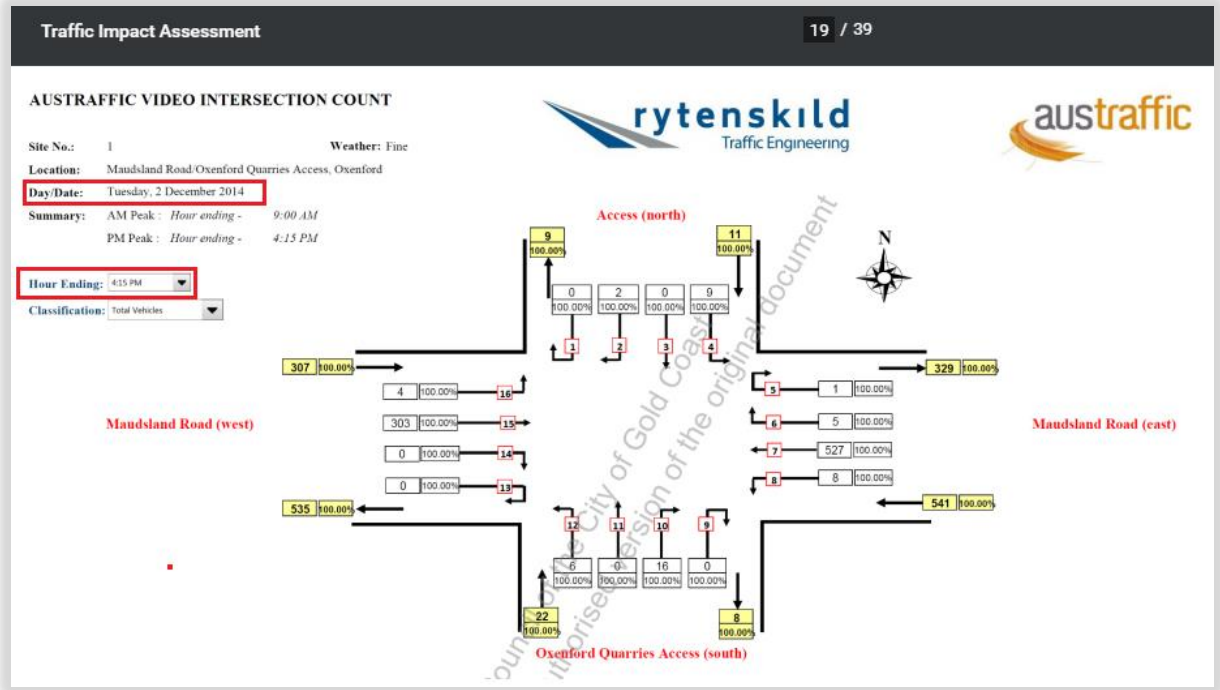
(9 pages of additional data omitted for clarity)

Last Page:

Xbin	Data removed	T&D	8,205.77	229	35.83
Xbin	Data removed	T&D	180.06	5	36.01
Xbin	Data removed	T&D	145.16	4	36.29
Xbin	Data removed	T&D	330.31	9	36.70
Xbin	Data removed	T&D	185.55	5	37.11
Xbin	Data removed	T&D	37.64	1	37.64
Xbin	Data removed	T&D	113.24	3	37.75
Xbin	Data removed	T&D	78.54	2	39.27
Xbin	Data removed	T&D	78.62	2	39.31
Xbin	Data removed	T&D	32.04	1	32.04
Xbin	Data removed	T&D	1,202.84	41	29.34
Xbin	Data removed	T&D	5,376.69	181	29.71
Xbin	Data removed	T&D	62.38	2	31.19
Xbin	Data removed	T&D	69.88	2	34.94
Xbin	Data removed	T&D	158.96	5	31.79
Xbin	Data removed	T&D	1,136.23	38	29.90
Xbin	Data removed	T&D	2,316.81	71	32.63
Xbin	Data removed	T&D	848.86	28	30.32
Xbin	Data removed	T&D	125.45	4	31.36
Xbin	Data removed	T&D	1,217.56	38	32.04
Xbin	Data removed	T&D	37.34	1	37.34
Xbin	Data removed	T&D	113.24	3	37.75
Total				36,173	
Per Day				140.8	
Per Hour				14.1	

Attachment B3- Appendix B - Surveyed Traffic Volumes at Site Access Intersection





Attachment B4- Development Traffic Estimates

4.0 DEVELOPMENT TRAFFIC ESTIMATES

As discussed previously, the proposal will result in an extension of the life of the quarry and not an intensification of current operations. The proposal will simply allow the current level of traffic generation to continue for the foreseeable future. The extended life of the quarry depends upon market demand.

Given that the quarry has been in operation for many years, the surrounding road network has been upgraded, and the design of such works has accounted for the project. On this basis, the surveyed traffic volumes shown in Attachment B (and summarised below) include traffic generated by the quarry and such will not change as a consequence of the proposed increase in area to be extracted.

Approximately 20% of the vehicles shown below are light vehicles (cars, utes etc) with the balance typically being the following mix of heavy vehicles:

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

It is noted that the volumes below include traffic generated by the concrete plant, which is not part of this application.

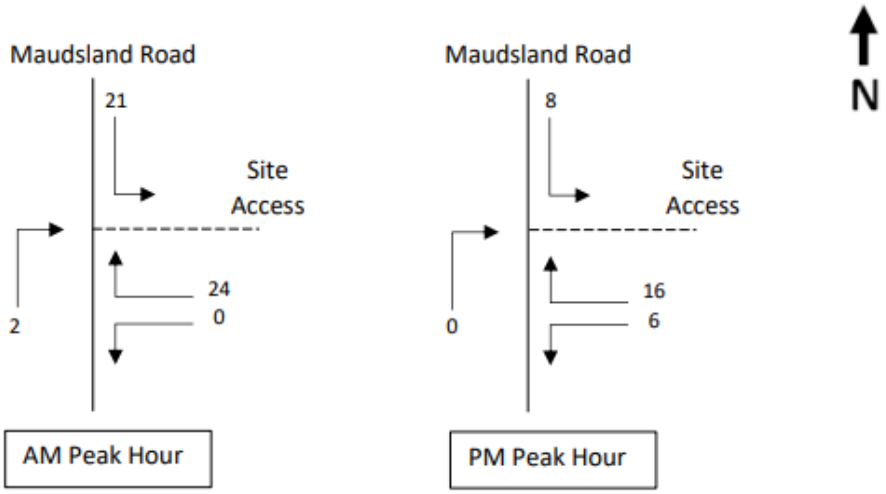


FIGURE 4.1 – SURVEYED PEAK HOUR TRAFFIC VOLUMES AT THE MAUDSLAND ROAD / SITE ACCESS ROAD INTERSECTION (AUSTRAFFIC – 2014)

Attachment C1- Section 4.0 Development Traffic Estimates

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 D1 - Concrete constituent parts

planete-tp.com/en/concrete-mix-design-a221.html

Concrete mix design

Published on 30 January 2008 (updated on 14 February 2008)

Concrete is a mixture of several natural constiuents.These include:

* **A binder**: cement, which hardens in the presence of water;

* **Water**: it is required for the cement to harden and in order to lay it. However, care is necessary as too much water reduces the strength and durability of the concrete.

* **Aggregate**: it varies in size from sand to gravel, which forms the "skeleton" of the concrete.

* And, when required, **additives**: they modify the properties of the concrete depending on their nature.

To formulate a concrete, it is firstly necessary to select:

* the type of aggregate (the stones) and the size of the particles

* then the type of cement (there is a large variety of types of cement with different characteristics and performances - in general 350 Kg of cement for 1m3 of concrete)

* then the amount of water (generally between 130 and 150 Litres for 1m3 of concrete)

* and lastly, if required, the amount of additives (a few Kilograms for 1m3 of concrete).

One cubic metre of concrete weighs 2.5 Tonnes.
Typically, 1m3 of concrete is made up of 350Kg of cement, 700Kg of sand, 1,200Kg of chippings and 150 Litres of water.

The mix design process can either be conducted on the basis of charts or experimentally. These methods are based on achieving the maximum density of concrete..

Approximate proportions of constituents in a conventional concrete

Constituent	Water	Air	Aggregate	Cement
Volume (%)	14-22	1-6	7-14	60-78
Weight (%)	5-9	-	9-18	63-85

Attachment E1 - Concrete production on site

2019-05-20 Section 4 - Noise and Dust assessment and Stormwater.pdf

Appendix C Water Cycle Management Strategy

C.1 Preamble

This appendix describes and assesses the recommended water management strategy for the site for the existing site conditions and ultimate site conditions, for the following 3 scenarios:

- *Low concrete production*: where annual concrete production is considered 'low' (with 17,616 m^3 per annum identified by Nucrush);
- *Medium concrete production*: where annual concrete production is considered 'medium' (49,000 m^3 per annum identified by Nucrush); and
- *High concrete production*: where annual concrete production is considered 'high' (93,309 m^3 per annum identified by Nucrush).

The results demonstrate that the proposed strategy for each of the two site conditions will ensure the water demands of the site operations will be satisfied. (include in here section on low, med, high production of concrete production.